European Musculo-Skeletal
Oncology Society (E.M.S.O.S.)

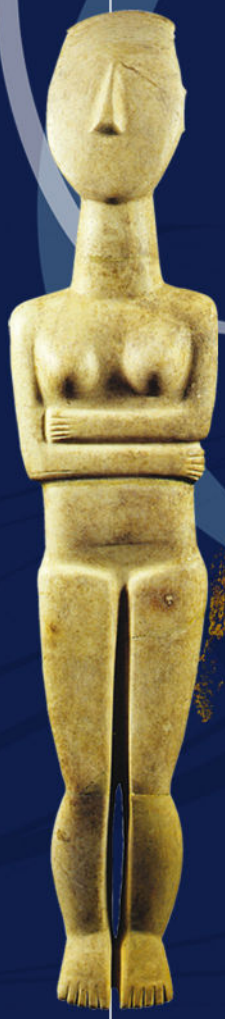
EMSOS2015

April 29th - May Ist 2015

Athens, Greece

28th Annual Meeting of the
European Musculo-Skeletal Oncology Society

& 16th EMSOS Nurse and Allied Professions
Group Meeting



BOOK OF ABSTRACTS

Abstracts are published in the present Abstract Book as submitted by the authors.
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Welcome Message

Dear friends,

The European Musculo-Skeletal Oncology Society (EMSOS) aims at advancing the science and practice of the diagnosis and treatment of bone and soft tissue tumors, to promote basic and clinical research, and to disseminate knowledge in order to provide a common high standard of musculo-skeletal oncology.

The particular purpose of the Society is to promote mutual collaboration between different specialists and institutes involved in the treatment of musculo-skeletal tumors.

The format of the meeting ensures not only a highly educational experience, but also ample networking and practice exchange opportunities.

The EMSOS 2015 Organizing Committee is enthusiastic to have developed a scientifically prolific programme, which is expected to cover all aspects of Musculoskeletal Oncology bringing together experts from all disciplines related to the field.

We anticipate your active participation, as members of the global Musculoskeletal Oncology community, for the success of the 28th EMSOS Annual Meeting.

Welcome to Athens!

With warm regards,

Panayiotis J. Papagelopoulos, MD, DSc
Local Host, EMSOS 2015
Professor & Chairman, Department of Orthopaedics,
Athens University Medical School & ATTIKON University General Hospital
Athens, Greece

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European Society for Radiotherapy and Oncology (ESTRO)

Hellenic Society of Radiation Oncology

Hellenic Association of Orthopaedic Surgery and Traumatology (HAOST)

Free Communications

FREE COMMUNICATIONS SESSION IA: Spino-Pelvis

FC-001

Outcome of pelvic/sacral resection and reconstruction for bone tumors

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Background: The pelvic girdle is a common location for primary bone sarcomas and metastatic lesions with the periacetabular region being the most common location followed by the ilium and the pubis. Refinements in surgical techniques have allowed the execution of limb salvage surgery in these locations.
Methods and Materials: Twelve patients received pelvic/sacral resection from 2006 to 2013 by same surgeon (A. Shehadeh), using appropriate surgical techniques. Type 1 (n=5), type 2 (n=2), type 3 (n=1), type 4(n=1), combined type 2&3(n=1), partial sacrectomy in 2 patients. Histopathology was chondrosarcoma 4 patients, Chordoma 2 patients, GCT, Fibromatosis, Ewing sarcoma, Osteosarcoma, High grade sarcoma and metastatic renal cell carcinoma one patient each. Reconstruction was performed in 3 patients (type 2 and combined type 2&3) using lumic cup prosthesis (Implant cast) and cage and Autogenous bone graft in one patient. Negative resection margin was achieved in 9 patients, and 3 patients there was a microscopic positive margin.
Results: At mean follow up of 33 month (6-55 month), 3 patients (OS, GCT, ChS) developed local recurrence, and 2 of them died of the disease, 9 patients were disease free at last follow up, one patient developed skin edge necrosis and managed successfully with wound debridement, and one patient developed deep wound infection and managed successfully with removal of the implant, repeated debridement, IV antibiotic and vacuum dressing. The average MSTS score for all patients was 80%.
Conclusion: Pelvic resection is demanding surgery, to be done only by expert surgeons and in well-equipped Centers. When done by expert hands, Pelvic resection can provide long term local control and very good functional outcome in patients with pelvic tumors. All patients with positive resection margins developed local tumor recurrence in our series. In carefully selected cases hemipelvctomy with all its physiological and psychological consequences can be avoided by doing internal pelvic resection with/without reconstruction.

FC-002

Clinical behavior of parosteal osteosarcoma

M. Laitinen, **M. Parry**, S. Vaiyapuri, J. Albergo, L. Jeys, A. Abudu, S. Carter, R. Grimer
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Introduction: Parosteal osteosarcoma (POS) is a rare, low-grade malignant bone tumour. Accounting for 4-6% of all osteosarcomas it most is most commonly located in the posterior distal femur. The aim of this single centre retrospective study was to evaluate the clinical features and surgical outcomes of patients with POS.
Methods: This retrospective study comprised 80 patients diagnosed with POS identified from the oncology database at the Royal Orthopedic Hospital, Birmingham, UK between 1968 and 2014. 1782 cases of osteosarcoma were identified, with POS representing 4.5% of the total osteosarcoma burden. Patient survival was assessed using the Kaplan-Meier method from the date of diagnosis using a log-rank test for univariate analysis, whilst a Cox regression analysis was used to identify independent factors affecting patient survival.
Results: The mean age of the population was 29.9 years and 64% were females. The mean follow-up period was 11.2 years. All patients were treated surgically. Histological grading from surgical specimens was low-grade in 56.3%, intermediate in 28.8% and de-differentiated high grade in 15.0%. Surgical margins were wide in 41.3%, marginal in 46.3% and intralesional in 12.5%. Local recurrence developed in 17.3% cases. Surgical margin was a significant factor for local recurrence ($p<0.001$). Overall survival was 91.8% at 5-years and 87.8% at 10-years. Local recurrence was a significant factor for overall survival ($p<0.001$). 80% of the local recurrences occurred in the de-differentiated high-grade histology. Chemotherapy was given to 30 patients with only 16.7% demonstrating a good response. 12 patients developed lung metastases, 6 of which had a prior local recurrence. Intramedullary involvement, as demonstrated by histology of the resected tumour, did not have an affect on local recurrence or survival.
Discussion: In conclusion, inadequate margins are associated with local recurrence in POS, even after long intervals. Therefore, the main goal in treating POS must be to achieve a wide surgical margin. Local recurrence has a negative effect on survival, which may in part be due to de-differentiation at the time of recurrence. The role of chemotherapy in the treatment of POS is not as apparent as in the treatment of conventional osteosarcoma.

FC-003

Total vertebrectomy in the treatment of spinal tumors

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Objective: The management of patients with spinal tumours (primary or metastatic) is challenging and complex. In the case of primary malignant tumours, the only acceptable goal is total resection; the same treatment can also be applied to aggressive benign spinal tumours

and for single metastatic lesions from tumours with favourable biology and prognosis. Total vertebrectomy is, nonetheless, a demanding technique with a non-neglectable number of possible complications. The aim of this study was to evaluate the outcome of patients with spinal tumours treated with vertebrectomy.

Methods: Five patients with spinal tumours were treated: 3 had malignant tumours (chordoma, angiosarcoma and high grade epithelioid sarcoma), one had an aggressive benign tumour (giant cell tumour (GCT)) and one had a single vertebral metastatic lesion from breast cancer (Table 1). One level vertebrectomy was performed in all cases (Figure 1). Three cases were treated with an all posterior technique (Figure 2, 3, 4 and 5) and the 2 others were treated using a combined approach. Patients were followed clinically and radiographically (including CT and scintigraphy).

Results: Complete tumour resection was achieved in 4 cases. There were 2 cases of infection, one that was treated with surgical debridement and antiobiotherapy (GCT) and other that rapidly progressed to sepsis and death. Four patients were disease-free at last follow-up (Table 1). In all these case vertebral fusion has been achieved (Figure 6 and 7).

Conclusion: Total vertebrectomy is a technically demanding surgery that allows for the complete resection of tumours involving the spine. Type of underlying malignancy, metastatic spread and adjuvant therapeutic options are important in the surgical decision-making. Due to the aggressiveness of the surgery it is not devoid of complications (excessive bleeding, infection) that can and should be managed peri and post-operatively; these risks must be adequately considered by the medical team. When currently indicated and successful it can be curative.

#	Gender, age	Tumour	Surgical Treatment	Complications	Follow-up (months)	Outcome
1	F, 32	T8 giant cell tumour	Total vertebrectomy	Infection	18	Disease-free
2	M, 68	L3 angiosarcoma	Total vertebrectomy	Infection	1	Death
3	F, 51	L1 metastatic lesion	Total vertebrectomy	None	84	Disease-free
4	M, 62	L3 chordoma	Total vertebrectomy	None	79	Disease-free
5	F, 42	L1 high grade epithelioid sarcoma	Total vertebrectomy	None	8	Disease-free

Table 1

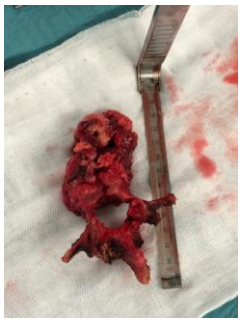


Figure 1

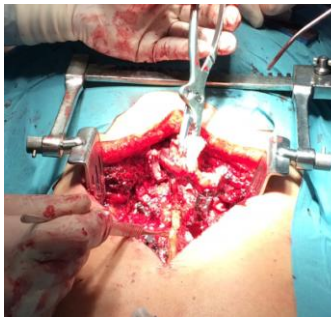
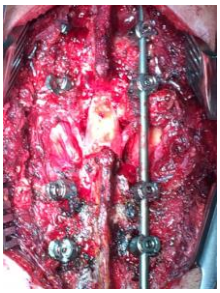


Figure 2



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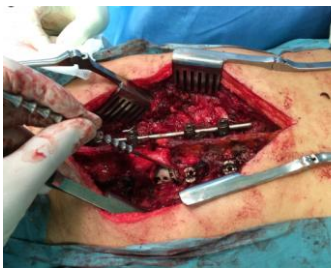

Figure 4

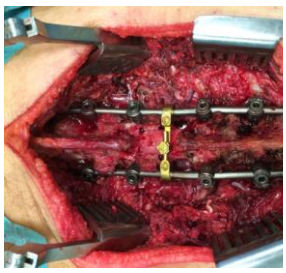

Figure 5

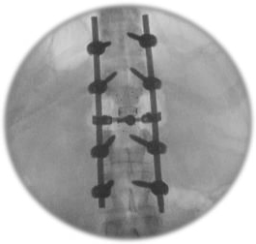

Figure 6

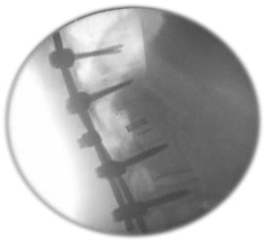

Figure 7

FC-004

Oncological and functional outcome following surgical treatment for sacral chordoma: a long-term follow-up study of 115 consecutive patients

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Background: Surgical treatment of sacral chordoma still remains the main technical challenge to orthopaedic surgeons. The purpose of the current study was to evaluate the long-term functional and oncological outcomes of 115 consecutive patients with sacral chordoma. Also a scoring system for detailed evaluation of lower limbs motor/sensory, bladder and bowel function of patients underwent sacral resection has been proposed.

Methods: One hundred and twenty-two patients with sacral chordoma received surgical treatment in our institution from Jul 2003 to Jul 2012. There were 78 males and 37 females. The mean age at the time of operation was 54.0 years old (range 18 to 82 years). There were 68 patients received primary resection at our institution and 47 patients, who received primary tumor resection elsewhere, were referred to us due to local recurrence. The extent of sacrum involvement was S1-S5 in 22 patients, S2-S5 in 48 patients, and S3-S5 in 39 patients. Tumor with lumbar vertebra involved was found in 6

patients. The developed scoring system consisted three domains, including motor function and sensation of lower limbs, urination and uriesthesia, and defecation and rectal sensation. There are three items under each domain with score from 0 to 3 representing from most severe function defect to normal function. The overall function was given as a percentage.

Results: Follow-up information was collected in 115 patients. The mean follow-up was 51 months (range, 20-126 months). The distal metastasis occurred in 17 cases (14.8%), including lung in 10, liver in 3 and bone in 9 patients. Eighteen (15.7%) patients died of disease at the last follow-up. The local recurrence rate was 37.4% (43/115) of the entire group. There were 19 (29.7%) local recurrence in patients who received primary surgery, and 24 (51.5%) in recurrent cases. The local recurrence for tumor with S3 and below involved was 20.5% and marginal or wide resection was achieved in 36 out of 39 patients. There were 48 patients with tumor involving up to S2 vertebra. The marginal or wide resection was achieved in 25 cases with local recurrence rate of 56.3%. As for tumor with S1 involved, marginal resection was achieved in 13 patients and local recurrence was observed in 11 (50.0%) patients. The overall sacral nerve function was 12.2% of normal in bilateral S1 (17 cases) preservation, 24.9% in bilateral S2 (in 37 cases) preservation, 72.2% in bilateral S3 (40 cases) preservation. Urine leakage was observed in 44.6% patients and 45.5% of the patients experienced loss of feelings of stimulus to urinate. Difficulty in defecation occurred in 39.8% patients. There were 75% patients had incontinence of feces.

Conclusions: Wide or marginal surgical margin is associated with significant improvement in disease-free survival. Surgical resection with adequate margin still remains the main treatment option.

FC-005

The LUMiC® prosthesis for reconstruction after periacetabular tumor resection: clinical results from eight European centers

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Introduction: Limb-salvage surgery for periacetabular malignancies is highly demanding and associated with dissatisfying complication rates. We initiated the current study to evaluate the early- to mid-term clinical results of reconstructing a pelvic defect with the modular LUMiC® prosthesis (implantcast, Buxtehude, Germany) following internal hemipelvectomy for a periacetabular tumor.

Methods: All consecutive patients who underwent periacetabular tumor resection and subsequent reconstruction with the LUMiC® from 2008-2013 were reviewed, in eight European centers. Minimum follow-up was 12 months.

Results: Forty-five patients (24 males, 53%) with a median age of 57 years (12-78) were included. Nine (20%) had undergone previous surgery. Thirty-six (80%) had a primary malignancy (predominantly chondrosarcoma; n=20, 44%), six (13%) had metastatic tumors, three (7%) multiple myeloma. Median follow-up was 29 months (12-73) for 35 patients (78%) alive at final review, and 12 months (2-27) for ten (22%) deceased patients. Four stems (9%) were cemented. Twenty-eight (62%) had a silver-coated 60mm cup. In all, 22 (49%) required further operations. Nine (20%) had a dislocation. Two patients with recurrent dislocations underwent revision to a dual-mobility cup, after which no further dislocations occurred. Only one dislocation occurred in 22 (49%) primary dual-mobility cups (p=0.03). Three patients (7%) had a periprosthetic fracture. One implant demonstrated migration, resulting from poor initial fixation due to an intraoperative fracture. Infections occurred in 13 patients (29%), necessitating removal in four (9%). Infection rates did not differ for silver-coated cups (p=0.20). Local recurrences were diagnosed in six (13%). Estimated implant survival rates at two and five years were 93 and 86%. Mean MSTS-score at final follow-up was 21/30 points.

Conclusion: Infection remains of major concern after periacetabular resection, and it was the sole reason for implant removal. Nevertheless, most infected implants could be retained. None were removed for mechanical reasons. Dislocations did occur, but all were adequately managed with closed reduction or cup revision. Dual-mobility cups provided excellent stability. Although longer follow-up is needed, our results indicate that, when used with the dual-mobility cup, the LUMiC® is a reliable implant for stable periacetabular reconstruction after tumor resection.

Source of Funding: Unconditional research grant (implantcast, Buxtehude, Germany).

FC-006

Osteosarcoma of the pelvis: factors predicting outcome and survivorship

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Introduction: Osteosarcoma of the pelvis, whilst rare, presents a particular challenge as tumours often present late, are often chondroid in origin and resistant to chemotherapy, can achieve a large size prior to presentation, and metastases are often present at

diagnosis. The surgical management of some tumours is also a challenge as the proximity of vital structures often precludes wide margins at resection. The aim of this study was to review our own experience in the management of osteosarcoma of the pelvis and identify features predictive of poor outcome.

Methods: 125 patients, comprising 76 females and 49 males, were treated at a single institution between 1983 and 2014. The mean age was 41.9 years, the mean follow up period was 2.3 years. 76 tumours were primary, predominantly chondroid and high grade, with the remainder secondary (radiation induced or Pagetic). 41 patients had metastatic disease at presentation. 55 patients (44%) underwent surgical treatment of which 34 (27.2%) were limb salvage. Survival analysis was by means of the Kaplan-Meier method with prognostic factors calculated by cox regression analysis.

Results: The 5-year survival for all patients was 27.2%. For those treated surgically, the 5-year survival was 54.3%. Features associated with a poor outcome were cell type, response to chemotherapy, secondary tumours and intralesional resection margins. In 11 cases, disease progression or death precluded definitive surgery.

Conclusion: In this large single centre series, we have identified factors associated with a poor prognosis in osteosarcoma of the pelvis. In particular, the importance of surgical margins and the risk of disease progression during neo-adjuvant chemotherapy, perhaps the debate should return to the timing and nature of surgical intervention for patients at high risk of disease progression.

FC-007

Recurrence of sacral chordoma treated with resection or carbon ion radiotherapy

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Aim: To compare the outcome of resection with that of carbon ion radiotherapy in the treatment of sacral chordoma.

Methods: 19 patients with sacral chordoma were diagnosed in our hospital. Between 1993 and 2000, all 5 patients were resected surgically. 2 patients had the tumor above S3, and 3 below or at S3. Since 2000, 4 patients (all below S3) were resected and 10 patients (5 above S3, 5 at S3) were referred to undergo carbon ion radiotherapy (CIRT).

Results: Average follow-up is 94 months (Resection; 108 months, CIRT; 81 months). 5 of 9 patients who had sacrectomy are continuously disease-free (CDF). There were 3 local recurrences (28, 78, and 151 months postop.) and 4 distant metastases after sacrectomy. 2 are no evidence of the disease (NED) after CIRT or resection for the recurrent tumor, and 2 died of the disease (DOD). 6 of 10 who underwent CIRT are CDF. 4 patients developed tumor progression after CIRT (39, 58, 69 and 75 months post-CIRT), 3 of those underwent second CIRT for the tumor progression, and 1 developed multiple lung metastasis. 1 NED, 2 are alive with the disease, and 1 DOD. 3 patients could not walk after resection, but all after CIR could walk with or without supports. 10-year overall survival is 80% for all patients. 5- and 10-year disease-free survival are 88% and 75% for sacrectomy, and 88% and 58% for CIRT, indicating no statistical difference.

Discussion: There is no statistical difference of disease-free survival between sacrectomy and CIRT. CIRT for chordoma was initiated in 1996 and its good treatment result was reported. Since 2000 in our hospital, chordoma below S3 was only resected, and chordoma above or at S3, or chordoma below S3 which was not safely resectable, were treated with CIRT. Recent paper demonstrated 89% of 5-year local control rate and 86% of 5 year OAS. We conclude that safely resectable chordoma below S3 should be treated surgically, and CIRT is now standard treatment for chordoma above or at S3 or unresectable chordoma.

FC-008

High rate of infectious complications after resection/reconstruction of periacetabular primary bone sarcomas

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Resection of primary sarcoma involving acetabular zone is a very challenging operation leading to a high rate of complications that affects post operative treatment and quality of results.

The **aim** of this study was to analyse the rate, impact and risk factors of early deep infection following this surgery.

Material and Patients: Retrospective review of consecutive patients files from a single institution. Resection including the whole acetabulum and metallic device reconstruction (at least for proximal femur). 43 patients were eligible for this study (over 53 patients referred during the same period: 6 patients non operated due to local extension of the tumor, 2 patients had had a hind-quarter amputation and 2 patients a hip transposition with no device for reconstruction). Primary tumor was a chondrosarcoma for 19 patients, an osteosarcoma for 6 patients a Ewing sarcoma for 14 patients and other primary bone sarcomas for 4 patients. There were 14 females and 29 men, 41 years old in average (11 to 76). Deep infection was defined as an infection that required reoperation and positive deep bacteriological specimen. The overall survival rate was 65.6% + 7.5 and 56.3% + 8.2 respectively at 5 and 10 years. No patient was lost of follow-up.

Results: Infection free survival rate was 69.7 % + 7 and 67.1 % + 7 respectively at 6 and 12 months. The species most frequently encountered were bacilli gram negative, coagulase negative staphylococci, and aureus staphylococci and most of infection were polymicrobial (12 over 16). The year following the resection operation, patients infected stayed 45.2 + 4.9 days at the hospital

versus 22.6 + 2.6 days for non infected patients ($p<0.0001$). Infected patients sustained 2 times more operation for orthopaedic reason than non infected patients (4.3 versus 2.03, $p<0.0001$).
Finally at the last follow-up, 6 (37.5%) over 16 infected patients were alive with chronic infection (or infected when they died from oncologic disease) and infected patients had a lower MSTS functional score (12.5 +2 versus 18.1 + 1.6, $p=0.055$). The histology type, peri operative chemotherapy, length of the operation and size of the tumor where not associated with a higher risk of post operative infection, but lower number of blood transfused units and younger patients are significantly associated with a lower risk of infection.
Conclusion: As previously reported by others, post operative rate of infection is high after peri acetabular resection and reconstruction for bone sarcoma in our department and is a heavy burden for both medical team and patients. These data is important for decision making process with patients as well as with oncologic colleagues of our multidisciplinary team no to jeopardize the planned multidisciplinary treatment strategy and is a reference for development of new infection prevention strategies in the future.

FC-009

A prospective cohort study to assess the efficacy of carbon ion therapy for sacrum chordoma and mobile spine chordoma: preliminary results

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[1] *Rizzoli Orthopedics Institute, Bologna, Italy*
[2] *Centro Nazionale Adroterapia Oncologica, Pavia, Italy*
[3] *Medicina Nucleare, Ospedale S. Orsola, Bologna, Italy*

Introduction: Chordoma is a malignant bone tumor locally aggressive with a poor prognosis. Arising from transformed remnants of notochord has a predilection for spine and sacrum. Nowadays the gold standard treatment for chordomas of the mobile spine and sacrum is en bloc excision. Reviewing literature, carbon ion radiotherapy has shown excellent local control rates (superior to conventional radiation therapy and surgery alone) for the treatment of chordomas previously not treated or treated with a partial surgical resection.
Methods: A prospective non-controlled cohort study has been designed to assess the efficacy of carbon ion therapy for the treatment of sacrum chordoma and mobile spine chordoma. Patients with diagnosis of sacrum chordoma or mobile spine chordoma are selected for carbon ion therapy, which is performed according to a predefined protocol during several treatment sessions. The efficacy of the treatment is evaluated by clinical examination at different follow up periods, by CT-scan biopsy and PET-CT performed 6 months after the end of the treatment, by MRI at 3-6-12 months after the treatment and then once a year for 5 years.
Results: 16 patients were treated by carbon ion therapy in the past 18 months from the beginning of the study. 12 patients were affected by sacrum chordoma and 4 patients were affected by mobile spine chordoma (2 in C2, 1 in T10 and 1 in L3). A significant reduction in pain levels was observed after the treatment, as indicated by VAS score mean values (pre-treatment VAS score 5.5; post-treatment VAS score 3.6). Moreover, a significant reduction of the tumor mass was generally detected starting from 3 months after the treatment, by MRI and CT scan. The histological analysis, performed on CT scan biopsy 6 months after the treatment, showed the presence of large areas of necrosis mixed with areas where the tumor was vital. In some cases the tumor was completely necrotic.
Conclusion: The preliminary results of this ongoing study demonstrate a good response of sacrum and mobile spine chordomas to carbon ion therapy, both at clinical, radiographical and histological point of view.

FC-010

Management of spinal metastases: results of a flow-chart driven decision making process

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Introduction: Spinal metastases represent a frequent complication in cancer patients (kidney, breast, lung, most commonly)[1] and cannot be just considered as a final event. Thus, they severely affect quality of life and even impact on the prognosis of this patients.
A huge number of papers have been written on treatment options for spine metastases. More than 40 scoring systems have been proposed, 10 of them collecting more than 150 references each[2-13]. Several of them assess specific features such as risk of fracture[8,10,12,14], cord compression[15], life expectancy[3,4,6,9,16-18] but a unique decision making process still requires wide consensus.
We retrospectively review the results of our decision making process that was already presented under the format of a flow-chart[19].
Materials and Methods: 321 patients (142 renal cell, 96 breast and 83 lung adenocarcinomas) were considered out of a consecutive series of 610 patients affected by spinal metastases treated from 1990 to 2014 Mean age was 59 years (S.D. 11), 55% of them were males and 45% females. Surgical treatment was indicated in 284 patients and was palliative (112 cases), debulking (146 cases: 69 renal cell, 35 breast and 42 lung adenocarcinomas) and en bloc resection with wide margins (26 case: 21 renal cell, 4 breast and 1 lung adenocarcinoma).
Results: Median survival rate according to Kaplan-Mayer was 46 months; 43 months (C.I. 95% 30-55) for debulking and 53 months (C.I. 95% 41-66) for en bloc. 7 complications occurred in the en bloc resection group (3 major and 4 minor) and no local recurrences. 6 major (5 in renal cell and 1 breast carcinoma) and 10 minor (6 in renal cell, 3 in lung adeno- and 1 in breast carcinoma) complications occurred in the debulking group.

Conclusion: Decision making process for management of spinal metastases must be able to exclude both ineffective undertreatment strategies, and too aggressive approaches which expose patients to unnecessary morbidity, being simple and practical for daily use in orthopedic and neurosurgical general departments. The reviewed flow-chart is simple and practical and allows clinicians to obtain a personalized strategy.

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FREE COMMUNICATIONS SESSION IB: Spino-Pelvis

FC-011

Resection and reconstruction of internal hemipelvectomy with recycling of bone containing tumor treated with liquid nitrogen

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Introduction: Intra-operative and post-operative bleeding determines systemic complications such as cardiovascular failure, kidney failure, higher risk for infection. Furthermore it increases the complexity of the patient's management and consequently the complexity of the nursing care. The aim of this study is to evaluate high-risk bleeding sarcoma patients with or without a bleeding-preventing intravascular device.

Methods: A case control retrospective study has been conducted comparing a group with (10 patients) and another without (10 patients) a bleeding preventing intravascular device for the surgical treatment of bone and soft tissue sarcomas. The number of single blood unit transfusions, the postoperative management and monitoring of respiratory rate, Oxygen saturation, temperature, systolic blood pressure, pulse rate, and level consciousness have been evaluated and compared.

Results: The number of single blood units transfused intra- and post-operatively was lower in the group with bleeding preventing intravascular device ($p<0.05$). In this group the patient was more hemodinamically stable and its management was possible in a regular ward. Nursing and assistance complexity was adequate to the ward and did not require an intensity care unit (ICU). An early mobilization and self-feeding of the patients, and a good pain control help the health professionals in facing the first postoperative days.

Conclusion: When the intro- and post-operative bleeding is limited, it is possible to manage the patient in the ward even in the first days. The complexity of the management is consequently lower because a hemodinamically stable patient is easier to be assisted. An ICU is not necessary because no constant instrumental, clinical and nurse monitoring is mandatory. Infection related to ICU are consequently lower.

FC-012

Total spondylectomy for bone vertebral tumor

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Introduction: Wide resection of tumors of the spine is the best form of cancer treatment, but remains possible contamination between the posterior and anterior elements, making challenge because the surgical margins, beyond technique properly. This resection proposed by Tomita et al. is the next ideal method of cancer rescue.
Objective: To describe clinical outcomes of cases of cancer in the spine undergoing resection for later via the technique described by Tomita et al.
Method: Patients considered with the possibility of complete tumor resection of the column, with local control underwent the surgical procedure consisted of two steps en bloc resection, the first, subsequent cutting by using t-saw, the pedicle the vertebra and the second step completely removed from the body of the vertebra posteriorly and replaced resected vertebra by autologous bone graft in a cage and the associated pedicle screw fixation, generally by fixing two vertebral bodies above and below the resection.
Results: 18 cases: 02 - DC Paget; 04 - aggressive benign; Hemangioendothelioma 02-, 03- single vertebral metastasis in the skeleton; 01- single and multiple vertebral metastases in the skeleton 06- malignant primary tumor.
Follow-up: neoplasia: 08 surviving patients, 01 with disease. death: 10: 01 AMI, 01 HDA; 08 disease progression. 01 patient FRANKEL B and 07 in FRANKEL E. Average time 16h 57min, maximum time 24h45min - minimum time 08:36. Bleeding 4550 ml.
One case reviewed by septic implant loosening, seroma 01; infection zero.
Conclusions: This technique has restricted indications, involves various levels of care, oncology, anesthesia, physical therapy, nursing and family. Spinal anatomical knowledge and relations with other structures such as the diaphragm and vascular viscera. In extra single lesions or intra-compartmental in vertebrae which may be resected with local control, job-specific surgical equipment developed by Tomita et al. As the gold-standard treatment for healing and rescue.

FC-013

Post-operative morbidity following hemipelvectomy and sacrectomy in a hospital without ITU facilities

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Introduction: Hemipelvectomy and sacrectomy are the most definitive treatment options for primary and secondary tumours in the pelvis. They are highly invasive operations, causing significant tissue damage, often with substantial blood loss and a prolonged period of hypotensive anaesthesia. Consequently patients undergoing such procedures experience a prolonged stay in hospital and have significant post-operative morbidity.[1-3] There are a paucity of data regarding post-operative morbidity following such procedures.
Methods: The hospital oncology database was retrospectively searched for patients who had a hemipelvectomy or sacrectomy between 01/01/00 and 31/07/14. 174 Patients were identified and their notes reviewed. Demographic data and length of hospital admission were obtained. Complications were graded according to the Clavien-Dindo Classification of surgical complications.
Results: There were 62 excisions, 40 endoprosthetic reconstructions, 37 hindquarter amputations, 16 hemipelvectomies, 16 sacrectomies and 3 pelvic exenterations with hindquarter amputation. Median duration of HDU admission was 20 hours (IQR 11). Median duration of hospital admission was 19 days (IQR 17). Clavien-Dindo Complications were: None - 49.1%, Grade 1 - 8.1%, Grade 2 - 16.2%, Grade 3a - 1.2%, Grade 3b - 20.8%, Grade 4a - 1.7%, Grade 4b - 1.7%, Grade 5 - 1.7%. The most common groups of complication were: Infection - 25.4%, dislocation 5.8%, poor fitting prosthesis 4.6%, post-operative bleeding 3.4%, bladder/ureter damage 2.9%, complications of anaesthetic 2.3%, nerve damage 2.3%, urinary retention 1.7%, DVT 1.2%, other 9.8%. Death occurred in 2.9% (3/173). In terms of post-operative infections: 52.3% were superficial, 40.9% were deep infections requiring surgical intervention, 9.1% were hospital acquired/aspiration pneumonia and 2.2% were osteomyelitis.
Conclusion: Pelvic oncological surgery has a significant post-operative morbidity. Infection rates are higher than other types of surgery which may be attributable to the extent of the surgical incision required for such procedures. In spite of this, the infection rates at our centre were comparable with others reported in the literature.[1-3] Mortality was also lower at our centre compared to others.[1-3] The results of our study consolidate the safety of performing radical hemipelvectomy/sacrectomy surgery at a centre with only level two beds (High Dependency).

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FC-014

Satisfactory mid-term results using tantalum acetabular reconstruction in difficult oncology patients

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Introduction: Reconstruction of periacetabular bone defects is one of the most demanding procedures, both, in revision and oncology orthopaedic surgery. There are several local conditions leading to failure of the procedure such as: multiple revisions, bulk allografted bone and, most of all, irradiated bone. In presence of previous radiotherapy treatment cup loosening is reported ranging from 19 to 52 %.Tantalum cup is considered one of the best options to achieve a ready integration between metal and host bone. The aim of this case review study is to report the performance of tantalum based reconstruction in different challenging reconstructions of the pelvic bone.
Materials and Method: Between January 2005 and January 2014 we treated 30 consecutive patients with un-cemented porous tantalum acetabular component. The implant was performed after periacetabular resection due to pelvic bone tumour in 17 cases: 5 as first reconstruction, while in 12 after a failure of a previous implant (5 hemipelvic allograft). In the other 13 cases the cup was implanted in irradiated bone (7 of them after a previous failed cup). They were 19 females and 11 males, average age 37 yrs (range 9-77). In 19 patients, tantalum cup was associated with other modular elements: 1 augment in 13 patient, 1 buttress in 2, 1 buttress and 1 augment in 2, 2 buttress in 1, 2 buttress and 2 shim in 1. A cemented polyethylene insert was applied in 21 patients, while in other 8 the polyethylene was inserted without cement and in the last case we used a ceramic insert.
Results: To now no patient had undergone acetabular revision for aseptic loosening after a mean follow-up of 39 months (range 12-123, 16 patients over 5 years). Superficial wound infection occurred in 4 patients, while only in one a two-stages procedure was performed to heal the infection. Postoperative hip dislocation was evident in 2 cases and only 1 required further surgical management. No clinical or radiographic evidence of acetabular loosening was registered at the most recent follow-up. Implant is well functioning and stable in all cases.
Conclusion: Although with short follow-up, this series was able to demonstrate the excellent proprieties of tantalum in term of bone grip. This material has confirmed its mechanical and biological potential, to achieve biologic fixation in primary and revision musculoskeletal oncologic surgery even after radiation therapy. A longer follow-up is necessary to identify later potential failures.

FC-015

Complex reconstruction for large metastatic acetabular defects

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Introduction: Often the treatment of large destructive acetabular bone metastases is a surgical challenge. Metastatic lesions may resist adjuvant therapy and create extensive acetabular defects which compromise integrity. In the current study we describe techniques of acetabular reconstruction of large metastatic acetabular defects, with impaction grafting, cemented arthroplasty and additional metal mesh augmentation.
Methods: Between 2006 and 2011, thirteen patients with large periacetabular metastatic lesions were operated. All patients had Karnovsky performance status >40. All lesions were subjected to curettage and debulking. The acetabulum was reinforced with bone graft (Ca3(PO4)2, 60:40 ratio) and a flexible titanium mesh and a cemented total hip arthroplasty was applied. All patients underwent pre or postoperative radiotherapy; in cases of haemorrhagic metastase such as renal cell and thyroid carcinoma, and multiple myeloma, local radiotherapy was applied preoperatively.
Results: All patients but one, were reviewed clinically and radiographically(follow up 5-62 months). All patients had complete pain relief and soon were able to ambulate and walk independently. The mean MSTS score was 73 % and TESS score 71%. There were no major complications such as excessive haemorrhage, deep infection, nerve injury, periprosthetic fracture or dislocation. X-rays showed adequate graft integration over time and no evidence of implant migration. We detected one late fungal infection 3years postop in a patient on aggressive chemotherapy.
Conclusions: We consider this technique as an effective and reproducible method with good clinical and functional outcome in terms of palliative treatment of periacetabular metastases. It provides excellent pain control, adequate mobilization and significant improvement of quality of life. It is a reconstructive technique with low complication rate even in patients with generalized metastatic disease.

FC-016

Factors predicting functional outcome after malignant pelvic tumor resection

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Introduction: Malignant pelvic tumor resection is a formidable challenge to surgeon from the viewpoint of not only appropriate surgical margin but also better function. This retrospective study was sought to clarify which factors are associated with functional outcome of the patients who underwent malignant pelvic tumor resection.
Methods: 67 consecutive patients who underwent pelvic tumor resection for malignant tumors at our institute with minimum follow up of 2 years were recruited to this study. Functional outcome of each patient was assessed by Toronto Extremity Salvage Scores (TESS) at several independent time points. Information of tumor- and treatment-related factors were collected from our database and analyzed statistically.
Results: The median patient age at assessment was 53 years old and median duration from the final surgical intervention to final assessment was 7 years. Tumor location (median TESS: periacetabular, 63%; non-periacetabular, 95%; P<.0001), final surgical procedure (excision, 95%; reconstruction, 65%; hemipelvectomy, 58%; flail hip, 42%; P=.0004), resection area (P1(+4), 94%; P2(+1 or +3), 65%; P3, 100%; P1+2+3(+4), 58%; P=.0001), pelvic ring continuity

(preserved, 95%; restored, 66%; no, 63%; P=.0002), and multiple surgeries (yes, 62%; no, 85%; P=.0013) were associated with final TESS. Analysis of TESS transition from earliest and latest assessment with 21 patients revealed that median TESS change was -3% at 17 years. No difference of TESS change was observed in the patients who underwent excision (-6%), reconstruction (-5%), and hemipelvectomy (+4%; P=0.63). Patients with past history of local recurrence demonstrated more deterioration of TESS compared to that with no local recurrence, although it was not statistically significant (yes, -23%; no, -2%; P=0.48).
Conclusion: Periacetabular location, flail hip status, discontinuity of pelvic ring, and multiple surgeries are the unfavorable factors for functional outcome after malignant pelvic tumor resection. Surgical procedure is not associated with long time deterioration of function.

FC-017

Treatment of pathologic acetabular fractures with tri-flange reconstruction cages

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Introduction: Periacetabular reconstruction for metastatic bone disease can be accomplished with a composite construct of PMMA and any combination of metal augments, mesh, pins, cages and/or plates. Reinforcement of such constructs by transiliac Steinmann pin fixation according to the technique described by Harrington or one of its modifications is typically recommended for more extensive lesions involving the acetabulum. We describe a cohort of patients treated with a simple cemented standard tri-flange pelvic reconstruction cage without additional transiliac Steinmann pin fixation.
Methods: We performed a retrospective review of all consecutive adult patients who underwent endoprostetic reconstruction for pathologic fracture of the acetabulum in our specialised ortho- paedic oncology unit between January 2008 - September 2014. We identified 20 patients (12f, 8m) with a mean age of 70 years (range 49-92) who received 21 implants, however, one patient was excluded from analysis as pathological examination failed to demonstrate any sign of malignancy. One patient with radiation induced, bilateral acetabular fractures, received custom triflange components (Mobelife), while standard, long flanged stainless steel cages (Link partial pelvis replacement) were implanted in the remaining 18 patients. Cemented acetabular components (Lubinus Eccentric) were used in all patients.
Results: Seven patients succumbed to their disease with the first year after operation, corresponding to an overall survival rate of 64 % at one year. There were 3 complications requiring a second intervention, 2 dislocations, treated with implantation of a constrainement device and one wound dehiscence, treated with wound revision and primary closure. All patients but one, regained ambulatory function and we did not observe any failures of the pelvic reconstruction constructs.
Conclusion: Our findings suggest that PMMA augmented standard tri-flange pelvic reconstruction cages can be a valuable treatment option in the management of pathologic acetabular fractures. Excellent construct stability can be achieved independent of supplementory Steinmann pin fixation in most cases, presumably due to the mulitiple fixation points available in the 2 long liliac flanges.

FC-018

The effect of hypotensive epidural anaesthesia (HEA) on blood loss during pelvic and sacral tumor surgery

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Introduction: Pelvic tumour resections cause significant blood loss.[1-2] This can have consequences for the patient such as occult myocardial infarction (MI), stroke, acute kidney injury (AKI) and the need for massive blood transfusions. Decreasing the need for blood transfusions reduces the risk of transfusion related pathology. Hypotensive epidural anaesthesia (HEA) maintains high cardiac output hypotension. This entails standard induction with propofol/alfentanil, spontaneous breathing on laryngeal mask airway, utilisation of the epidural to decrease the mean arterial pressure (MAP) to 50-60mmHg, an adrenaline infusion and tranexamic acid. The aim of this study was to examine the effect of HEA on blood loss during pelvic tumour resections.
Method: All patients who underwent a hemipelvectomy, sacrectomy or hindquarter amputation between 2000 and 2014 at the Royal Orthopaedic Hospital NHS Foundation Trust were included. Patient demographics, anaesthetic technique, operation details, and blood product transfusion requirements were obtained from the patients' medical notes. Blood results were collected electronically. Blood loss was calculated from the pre- and post-operative haemoglobin, estimated blood volume and volume of blood transfused. Patients were analysed depending on whether the received HEA or any other anaesthetic technique as the control group.
Results: HEA was performed in 59% (76/130) with 41% receiving standard anaesthetic (54/130). Intra-operative MAP was not significantly different between the groups (54mmHg v. 58mmHg respectively, P>0.05). There was no significant difference in mean blood loss (1560ml v. 1812ml respectively, P>0.05) or blood products transfused in the first 24 hours (median 2 units, IQR 0-3units, P>0.05). In the HEA group 5.8% of patients developed an AKI, compared to 3.2% in the control group. This difference was not significant (P=0.453). Two patients (1.5%) had a post-operative MI, one from each group. There were no post-operative strokes.
Conclusion: HEA did not demonstrate any significant difference in blood loss, or reduced transfusion requirements when compared to standard anaesthetic technique. This is likely because both groups were kept significantly hypotensive during their procedures.

Complications of hypotensive anaesthesia were in line with previous data. When compared to previously published data, however, our patients demonstrated substantially lower blood loss and consequently receive significantly fewer transfusion products. [1-2]

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FC-019

Periacetabular metastatic bone disease treated with porous tantalum reconstruction

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Background: Acetabular reconstruction of periacetabular metastatic bone disease tumors is challenging especially in the setting of large bone defects and history of local radiotherapy. Extended survival expectancy in patients with metastatic disease has inspired our group to seek for more durable reconstructions. Given the low failure rates of porous tantalum acetabular implants in other conditions such as large bone defects and irradiated bone, we have developed a technic to treat these patients utilizing these implants.
Patients and Methods: Forty consecutive patients (22 women) with periacetabular metastatic bone disease were retrospectively analyzed from 2001 to 2013. All patients were treated with our previously described technic. The median age was 61 years (range, 22-84 years). The majority of the patients had either myeloma (15 patients) or metastatic carcinoma (15 patients). The mean follow-up up was 48 months (range 20-101 months). We assessed for progressive radiolucent lines and component migration on follow-up radiographs, complications and overall survival of the patients using Kaplan-Meier estimate.
Results: We observed no cases of progressive radiolucent lines or component migration. Complications included one perioperative death, two superficial infections, three deep infections two deep vein thrombosis, and two dislocations. One patient was revised due to instability. Fifty percent of the patients were still alive at 4 years of follow-up.
Conclusion: Our experience has made tantalum reconstruction our chosen method for managing major periacetabular neoplastic bone loss. A durable reconstruction is required because of improved survival in patients with metastatic bone disease.

FC-020

Surgical treatment malignant tumors involving sacrum and rectum

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Introduction: Malignant tumors of the sacrum are quite rare. There are many cases where the tumor involving the sacrum and the rectum can cause serious problems in the choice of surgical technique. The aim of study to analyze results of surgical treatment of patients with tumors of the sacrum and the rectum. Defined indications and estimate results of treatment group of patients.
Materials and Methods: Between 2002 and 2013 years 67 patients with primary and metastatic sacral tumors were operated. In 12 cases we observed tumors involving the sacrum and the rectum. Histology rate was presented with chordoma in 5 cases and rectal cancer in 7. All patients with chordoma had previous non radical surgical treatment in other clinics. The patients age range from 47 to 70 years. In study group all patients were operated with combined approach. First step includes resection of sigmoid colon, mobilization of intrapelvic component, sigmoidostomy and transposition of recto-abdominal flap. Second step operation performed in prone position and includes nerve root mobilization, posterior sacral and rectum en-block resection with soft tissue plastic by RAF. The indication for describe surgical method was detected by CT, MRI examination and colonoscopy.
Results: Five operations were performed. The mean surgical time was 7 hours, blood loss was 3300ml. In postoperative period we not observed deep wound complications. All neurological complications were associated with nerve root resection. All patients followed up from 6 to 67 months. Eight patient alive and five without evidence of disease. One patient with previous non radical surgical treatment of sacral chordoma has multiple local recurrence 14 months after surgery. One patient died from cardiovascular disorder after 16 months. Three patients died from progression of disease. Patients with rectal cancer receive additional treatment. All patients in early postoperative period were ambulatory and had good function.
Conclusions: This method provides good results for difficult patient with tumor involves sacrum and rectum. Technical problems of surgical treatment can be decided only by multidisciplinary strategy.

FC-021

3D technology and large defect reconstruction in sarcoma patients after hemipelvectomy – Survival and functional results

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Introduction and Aims: Surgical treatment of primitive malignant bone tumors has radically changed in recent years since modern imaging, reconstructive surgery techniques and above all pre- and postoperative chemotherapy protocols were put into use. In massive or neglected bone tumors there is a frequent dilemma whether reconstructive surgery is a reasonable treatment or not. The aim of the study is to show the results of treatment in neglected cases of bone tumors around pelvis.
Method: Material was composed of 24 selected patients

hospitalised at The Department of Orthopaedic Oncology of Pomeranian Medical University of Szczecin between 2008 and 2015. All of them were diagnosed with extremely advanced forms of primary pelvic lesions and were initially disqualified for salvage surgery. The following surgical techniques were used: hemipelvectomy E1 with en bloc tumor resection without internal fixation (11 cases), tumor resection with hemipelvectomy E2, bone graft and internal fixation (2 cases), hemipelvectomy E3, reconstruction with LUMIC prosthesis (8 cases), hemipelvectomy E2 with Stanmore custom made prosthesis of posterior column (2 cases), external hemipelvectomy (2 cases). The follow-up period varied between 6 months and 5 years in different patients.

Results: Average 3 year survival rate was 52%. 13 alive patients/25 in all. In 12 patients the functional result was satisfactory, in one case the implant had to be removed due to periprosthetic fracture.

Conclusions: One of the main conclusions emphasized by authors is the problem of frequently seen late diagnosis which in most cases is the basic reason for recurrence and bad final result. In 4 cases patients' awarness of the disease was very little which influenced the final outcome. The tendency to limit the indications for amputation or disarticulation even in cases of advanced tumors was put forward.

FREE COMMUNICATIONS SESSION IIA: Oncology

FC-022

6-year results of child's osteosarcoma treatment

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Introduction: Osteosarcoma - one of the most common and aggressive bone tumors in childhood. Materials and Methods: In 2009 - 2014 we treated 517 primary patients in the age of 3 months to 17 years with bone and soft tissues sarcomas, 198 of them (38.2%) - with osteosarcoma. 119 (60.1 %) patients had localized stage of the disease, 79 (39.9%) - generalized one. The patients received the combination therapy. Chemotherapy consisted of 5 neoadjuvant and adjuvant 5 courses and included high-dose of methotrexate (12 g/m2 and 8, in proportion to).

Results: Organ-sparing therapy was performed in 192 (97%) patient, limb amputation - 6 (3%). Currently 101 patients are alive, that is, overall 5 - year survival is 51%. In the first year of treatment 39 (20.3%) patients died, in the second year of treatment - 41 more (21.3 %) patients died, thus, for the first 2 years, 80 patients died (41.7%). Over the next 3 years 11 (5.7%) patients died.

Discussion: 2 and 5 - year survival rates are virtually identical, as in the first 2 years disseminated patients die (first year) and patients with tumors resistant to treatment (in the second year of the treatment), and the total number of which is about 40%, whereas 60% survive 5-year milestone. It suggests the need to identify sarcomas on the early stages and providing targeted therapy.

FC-023

Features of the implantation of venous port systems for chemotherapy in children with tumors of the musculoskeletal system

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Introduction: The treatment of sarcomas is impossible without a venous access. What kind of properties should it possess? It has to be safe, easy to use, implanted only once during the treatment course and have minimal risks associated with implantation and use. Our aim was to prevent complications of intravenous chemotherapeutic agent administration.

Methods: From 2010 to 2013 we were monitoring the treatment of 228 children (aged 3 months to 17 years) with different sarcomas. 110 patients underwent 605 subclavian vein catheterization, 118 patients - 118 venous port implantation.

Results: Complications and technical difficulties during catheter insertion were observed in 98.3% of cases, during venous port implantation - in 23% of cases. Complications of subclavian catheter and venous port use were observed in 97.3% and in only 11% of cases, respectively. Subclavian catheters compromised cancer treatment in 45.9% of patients, implantable venous ports - in 1.7% of patients. Each patient with a subclavian catheter underwent central venous catheterization 4 to 19 times (mean 6 times) during treatment. Catheter dwell time exceeded the recommended limit in all patients except for cases of catheter removal by patients. On multiple occasions all patients were discharged with a subclavian catheter in place.

Conclusion: Venous ports obviously match the criteria mentioned in the introduction. Subclavian catheter use resulted in cancer treatment protocol deviation in almost 50% of cases, thus leading to a poorer prognosis and significantly increasing the number of invasive procedures and instances where general anesthesia was needed.

FC-024

Diagnostic delay does not have a negative effect on clinical outcome in high-grade sarcoma of bone; a tertiary oncological center report

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Goal: Delay in diagnosis and treatment of cancer may lead to unfavourable outcome, which could be partially prevented. According to Dutch guidelines the diagnosis, in cancer patients should be established within 42 days after

the referral letter to an oncological center. For bone tumours, diagnosis can be difficult and in many cases extends over this 6 weeks period. The purpose of this study was to analyse diagnostic delay and examine the effect on outcome in high-grade sarcoma of the bone in a single tertiary (refferal) oncological center.

Methods: A total of 102 patients were included consisting of 54 patients with osteosarcoma, 29 patients with Ewing sarcoma and 19 patients with chondrosarcoma. Diagnostic delay was defined as the period between initial clinical symptoms and histopathological diagnosis in our center. The delay period was divided in patients' delay and doctors' delay. The clinicopathological characteristics, mean delay and outcome were described. Survival was estimated and compared within the entities based on the degree of delay.

Results: Survival rates in our series were comparable to available literature. The mean total diagnostic delay was 688.0 days in patients with chondrosarcoma and thus significantly longer than 163.3 days in osteosarcoma ($p<0.01$) and 160.2 days in Ewing sarcoma ($p<0.01$). However, prolonged total delay (? 4 months) did not result in lower survival rates in our series. Most of the doctors' delay occurred extramurally at the general practitioner. We did not find differences in survival between patients diagnosed 42 days after referral in our oncological center compared to patients who were diagnosed later. Five-year-overall survival was significantly lower in metastatic disease for all three entities.

Conclusion: Prolonged diagnostic delay in high-sarcoma of the bone does not result in lower overall survival. Metastatic disease has proven to be disastrous for survival. Doctors' delay in the extramural setting could be decreased by a low-threshold plain radiograph ordered by the general practitioner.

FC-025

Analysis of toxicity profile of EURO.B.O.S.S.: A European chemotherapy protocol for bone-sarcoma in patients older than 40 years

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Background: European Bone Over 40 Sarcoma Study (EURO-B.O.S.S.) is the first prospective multicenter international study for patients 41-65 year old with high-grade bone sarcoma. The first aim of the study was to assess in this age group of patients the feasibility and the toxicity profile of an intensive chemotherapy treatment derived from chemotherapy protocols for younger patients

Methods: Patients with HG Osteosarcoma, HG sarcoma NOS, Fibrosarcoma, MFH, Leiomyosarcoma, Dedifferentiated Chondrosarcoma were included. Chemotherapy: Combinations of cisplatin/doxorubicin (CDP 100mg/m2/ADM 60mg/m2), ifosfamide/CDP (IFO 6g/m2/CDP 100mg/m2) and IFO/ADM (IFO 6g/m2/ADM 60mg/m2) were repeated three times (9 cycles). Surgery was planned after 3 cycles. Methotrexate (8g/m2) was postoperatively added in poor responders. Overall the planned cumulative dose was ADM: 360mg/m2, CDP: 600mg/m2, IFO 36g/m2, MTX:40g/m2. Immediate surgery was allowed and 9 cycles with CDP, ADM, IFO were postoperatively completed.

Results: As of June 2014, 430 patients (median age 52 years) were registered. Patients with wrong diagnosis or with inadequate demographic baseline data (67), who are on treatment or had disease progression during chemotherapy (21), or with missing toxicity data (35) were excluded from the present toxicity analysis that is then restricted to 307 evaluable patients. One surgical-related and one chemotherapy-related death were reported. The median received cumulative dose was lower than the planned (ADM: 300mg/m2, CDP: 480mg/m2, IFO 29g/m2, MTX:16g/m2) and only 28% of the patients completed the treatment without dose reduction. The incidence of Grade 4 WBC and G 3-4 PLT toxicity was 56% and 57% respectively, with 31% of patients who experienced febrile neutropenia. RBC transfusions or PLT transfusion were delivered to 59% and 33% of patients respectively. Renal toxicity was reported in 31% of patients with 3 patients who required dialysis. Nephrotoxicity was reported in 29 (41%) of the 70 patients who received at least 1 MTX cycle. Neurotoxicity (mainly peripheral) was reported in 25% of patients. There was a strong relation between age and chemotherapy compliance, and a higher incidence of febrile neutropenia and transfusion support was observed in female gender.

Conclusions: The EURO.B.O.S.S. protocol is feasible, but the chemotherapy-related toxicity is remarkable. The use of MTX requires a special caution due to the high risk of renal toxicity observed (41%) in this age group. Overall the incidence of renal and peripheral neurotoxity is higher compared to the one observed in younger patients. The chemotherapy compliance decreases over the age and a higher hematological toxicity can be expected in the female gender.

FC-026

Primary bone lymphoma

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Aim: Primary bone lymphoma (PBL) is a rare clinical entity. The aim of the present study is to evaluate the clinical and imaging characteristics of the disease.
Material and Method: We retrospectively followed 10 patients diagnosed with bone lymphoma without systemic involvement. The mean patients' age was 42 years old. The location of the disease was the in the femur in 7, the tibia in 1 and the humerus in 2 patients.
Results: All patients reported local, usually intermittent pain that was getting more intense and constant within several months. Mean duration of symptoms to diagnosis was 19 months (10-24). VAS pain score was 3.5 (2-10). Common initial clinical and imaging diagnosis was meniscal tear, bone edema and bone infection. On xray imaging mild periosteal reaction was evident in 2 patients, permeation in 4 and cortical osteolysis in 1 patient, whereas in 3 cases there were no xray findings. MRI revealed diffuse low in T1 and high in T2 images. The metaphyseal area was involved in all patients. Cortex infiltration and soft tissue extension was evident in 7 patients. Soft tissue core needle biopsy was performed in these 7 patients. Histolopathologic assessment revealed that in all of the cases the tumor was composed of small round cells, with increased nucleus/cytoplasm ratio. The neoplastic cells displayed strong immunopositivity for the leucocyte common antigen (LCA) and the B-lymphocyte markers CD79a and CD20, while they were negative for all the T-lymphocyte markers; thus the diagnosis of primary bone B-cell lymphoma was placed in all of the cases evaluated. Cultures were negative for infection, further supporting pathology.
Conclusion: Patients with PBL frequently demonstrate mild local symptoms for a long period, usually attributed to trauma or other benign conditions. X-ray findings are frequently minimal in sharp contrast to MRI that reveals a diffuse extension of the disease into the bone and in several cases a soft tissue mass even without obvious bone destruction. Pathologic analysis is cardinal for definite diagnosis.

FC-027

Efficacy of Denosumab for metastatic bone diseases after failed therapy with zoledronic acid

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Background: Bone resorbtion inhibitors is a standard of treatment for lytic metastatic lesions of bones. Recent studies showed that target agent denosumab (monoclonal antibody to RANK ligand) is more effective drug compared to bisphosphonates in treatment of osteoporosis and probably bone metasstatic disease.
Aim: To estimate efficacy of denosumab after failed treatment with zoledronic acid in palliative treatment of metastatic bone lesions.
Materials and Methods: 7 patients were include in study with diseases progression in bones after treatment by zoledronic acid as a component of complex therapy. 5 patients had bone metastases of renal cell cancer, 1 patient with bone metastases of bladder cancer and 1 patient - colon cancer (2 males and 5 females aged 49 to 62 years). Mean follow-up was 16.2 months.
Patients received denosumab (120 mg subcutaneously once monthly for 6 months). The efficiency was assessed by clinical data: pain syndrome intensity, Brief Pain Inventory questionnaire and CT scans comparison (volume and density of bone lesions).
Results: All 7 patients had pain syndrome intensity decrease after 1 or 2 injections of denosumab. In 2 patients such treatment demonstrated more than 30% regression of bone lesions, in 4 patients was revealed density increasing of tumors capsule. All patients are in remission from 8 to 22 months.
Conclusion: Application of denosumab in patients with bone metastases of cancer after failed therapy with zoledronic acid turn to be promising, which allows to achieve remission and improve the quality of life due to reducing of pain.

FC-028

The individualization of chemotherapy in patients with osteosarcoma depending on angiographic criteria

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Aim: To determine the possibility to individualize chemotherapy using angiographic prognosis criteria.
Methods: 47 patients with localized osteosarcoma (Stage IIB, G3), aged 18 to 63 years old (median age 30,6), male - 24 (51%) and female - 23 (49%), were treated in National Cancer Institute (Kiev, Ukraine) between 2009 and 2014. All patients' vascular net intensities have been examined through CT-angiography prior to the treatment. The treatment started with a standard regimen (cisplatin 120 mg/m², doxorubicin 60 mg/m², methotrexate 12 mg/m²). Patients have been divided in two groups after 4 courses depending on the angiography grading of tumor response to chemotherapy: first (39 patients) - prognostic good response treated at standard regimen (cisplatin 120 mg/m², doxorubicin 60 mg/m², methotrexate 12 mg/m²) and second group (8 patients) - bad response (remaining tumor vascularity in 10% to 50% of the tumor) treated by adding 2 courses of cisplatin 150 mg/m² (arterial infusion) and ifosfamide 9 g/m², etoposide 300 mg/m². Radical limb salvage surgery was performed in both groups followed by an estimation of the actual medical pathomorphosis (Huvos pathomorphosis grading). After the surgery, patients of both groups have been receiving adjuvant therapy with drugs which were used in a neoadjuvant regimen.
Results: In first group (comprised of 39) was determined a low level (necrosis less than 90%) of pathomorphosis in 5 (12,8%) patients and 3-years overall survival was 77,13%. In the second group, in 5 (62,5%) patients was revealed low level of pathomorphosis and 3-years overall survival was 47,13%.

Conclusion: A high level of residual vascularization of tumor after neoadjuvant chemotherapy was a poor prognostic factor. The dynamic of changing of tumor vascularization as a consequence of neoadjuvant chemotherapy correlated with achieved pathomorphosis. Assessment of the reaction in the tumor vasculature during neoadjuvant chemotherapy helps to individualize treatment and probably influence on long-term results. Necessity of treatment intensification in poor prognostic group remains uncertain. The study is ongoing.

FC-029

Ewing sarcoma: only patients with 100% of necrosis after adjuvant chemotherapy should be classified as good responders

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Introduction: Histological response to chemotherapy is known to be an important indicator of the systemic outcome of Ewing's patients. The purpose of this study is to review a large cohort of patients and further assess the correlation between histological responses to chemotherapy in Ewing sarcoma with overall survival and local recurrence.
Methods: All patients treated for Ewing's sarcoma at our hospital between 1977 and 2012 were identified and reviewed from the prospectively collated oncology database. Patients with no-metastasis at diagnoses, treated with neo adjuvant chemotherapy, oncologic surgery and a minimum of 2 years follow up were included. Three hundred and eight patients were included in the study. The median age at diagnosis was 17 years (1-62) and the mean follow up of the series was 103 months (6-385). Patients were grouped according to the percentage of necrosis: Group I: 0-50%, Group II: 51-99% and Group III: 100%. Disease-free and overall survival were analysed according to the Kaplan-Meier method.
Results: Overall Survival and Event Free Survival were 72% and 61% at 5 years. Significant differences in survival outcomes were found regarding necrosis between 0-50% vs 51-99% vs 100% ($p<0.0001$). Event free local recurrence was 85.5% at 5 years. The median time to develop local recurrence was 25 months (range 7 to 150 months) and with no differences in respect to histological response to neo adjuvant chemotherapy.
Conclusion: Only patients with 100% of necrosis after neo adjuvant chemotherapy should be classified as good responders. The presence of any viable tumour on histologic examination of surgical resection specimen after neo adjuvant chemotherapy should be enough to consider postoperative radiotherapy in the treatment protocol.

FC-030

A high TRAIL-receptor clustering is able to overcome TRAIL resistance in pediatric bone sarcoma models

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Osteosarcoma (OS) and Ewing's sarcoma (EWS) are the two most common pediatric bone tumors which mostly arise in children and adolescents. OS and EWS patients have not seen major therapeutic advances these last thirty years and the survival rate of 70 % at five years for a localized tumor still falls to around 20 % in the case of a metastatic tumor or a resistance to chemotherapy. The pro-apoptotic cytokine TNF-Related Apoptosis Inducing Ligand (TRAIL) can selectively kill tumor cells and could therefore represent a promising therapeutic approach for patients at high risk. However, the transfer to clinics seems limited because several OS and EWS cell lines show resistance towards TRAIL sensitivity in vitro.
In vitro and in vivo approaches allow us to identify several molecular mechanisms involved in TRAIL resistance in these particular pathologies: death receptor (DR4 and DR5) and decoy receptors (DcR1, DcR2, Osteoprotegerin) expression, involvement of inhibitory proteins of apoptosis (cFLIP; IAP1/2)...
Even if OS and EWS exhibit similar clinical features, these pathologies differ in response to TRAIL pro-apoptotic effects: the involvement of death receptor expression profile was clearly demonstrated in EWS with a very strong correlation between DR4 expression and TRAIL sensitivity, whereas OS cell lines are highly resistant to TRAIL independently of death/decoy receptor balance. In addition, a TRAIL-receptor agonist antibody (AMG655) induces MAPK pathway activation in OS cell lines, showing even a protumoral effect in vivo in a OS xenograft model. Accumulated evidences over the last years indicate that TRAIL, besides its well documented pro-apoptotic effects can also induce the activation of another signaling pathway involving NF-kB, MAPK, PI3K/Akt via binding to the same receptors, but leading to increased tumor cell proliferation, survival, migration and invasion. The key regulator of this kinase network is the RIPK1 protein which binds FADD and leads to the formation of a secondary signaling complex (Complex II) composed by TRADD, TRAF2 and RIPK1. We hypothesize that an efficient TRAIL-receptors clustering could raise resistance of tumor cells and trigger apoptosis instead of proliferation. To this aim, two different approaches were used: trimeric TRAIL presentation at the surface of carrier Mesenchymal Stem Cells (MSC) stably transfected with full length human TRAIL and a novel TRAIL-receptor agonist able to bind 6 receptors (APG880). We validate in vitro that coculture of tumor cells with MSC-TRAIL or use of APG880 can induce apoptosis even in initial resistant cell lines. In vivo, intratumoral injection of untransfected MSC accelerate tumor development in both EWS and OS models, whereas MSC-TRAIL inhibit tumor progression in EWS models but not in OS models. For these models, APG880 may represent a good compromise between the induction of receptor clustering and the lack of pro-proliferative effect of MSC by themselves.

FREE COMMUNICATIONS SESSION IIB: Oncology

FC-031

TRAIL-based therapeutics in osteosarcoma: involvement of bone tumor microenvironment in TRAIL resistance

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Osteosarcoma (OS) is the most common pediatric bone tumor. OS patients have not seen major therapeutic advances these last thirty years and the survival rate of 70 % at five years for a localized tumor still falls to around 20 % in the case of a metastatic tumor or resistance to chemotherapy. The pro-apoptotic cytokine TNF-Related Apoptosis Inducing Ligand (TRAIL) can selectively kill tumor cells representing a promising therapeutic approach for patients at high risk. However, therapeutic use of TRAIL in OS patients seems limited since several OS cell lines showed high resistance towards TRAIL sensitivity.
In vitro and in vivo studies identified several molecular mechanisms involved in TRAIL resistance in OS that could be targeted for subsequent therapeutic strategies. Different levels of TRAIL regulation signaling pathways have been explored: death (DR4 and DR5) and decoy (DcR1, DcR2, Osteoprotegerin) receptor expression, involvement of inhibitory proteins of apoptosis (c-FLIP, IAP1/2), activation of TRAIL-induced surviving, migration or invasion pathways (NF-kB, MAPK, PI3K/Akt...).
We hypothesized that the bone micro-environment may provide a favorable niche for TRAIL resistance due in particular to hypoxia, inflammation or acidic extracellular pH. Therapeutic perspectives are linked to the possibility to overcome TRAIL resistance by combining drugs targeting the bone micro-environment with TRAIL or death receptor agonist antibodies. Therefore, this area might be targeted by new re-sensitizing agents. For example, zoledronic acid already used as an antiresorptive agent in OS, shows a sensitizing effect to TRAIL by inhibition of IAPs in in vitro synergy studies. However the transition of these observations to nude mouse models reveals that zoledronic acid is not sufficient to overcome TRAIL resistance mechanisms, largely because of the induction of the TRAIL non-canonical pathway in OS cells which overrides the pro-apoptotic canonical pathway. Activation of this second signaling pathway leads to increased tumor cell proliferation, survival, migration and invasion. It is more importantly observed in vivo and may be linked to the particular bone tumor micro-environment observed in OS. We propose that a combinatory therapy based on a selective TRAIL activating apoptosis pathway (APG880) associated with zoledronic acid may overcome TRAIL resistance of OS models.

FC-032

The efficacy of TNM staging in Ewing's sarcoma

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Introduction: Staging systems should allow comparison of cases, guide treatment, allow estimation of prognosis, and aid research, especially in the treatment of rare cancer types. The TNM staging system, when applied to sarcoma, stratifies tumours on size, histological grade, nodal or skip lesions, and metastases. The aim of this study was to assess the efficacy of the TNM staging system in guiding prognosis in Ewing's sarcoma.
Methods: Patients were identified from the institutions database. All patients treated surgically for Ewing's sarcoma of bone or soft tissue between 1980 and 2012 were included. The affect of age, chemotherapy response and TNM stage on survival was assessed. The population comprised 277 patients with a mean age of 17.5 years (range 1-62) and a mean follow-up of 98 months (6-385 months). There were 244 stage II (40 IIa, 204 IIb) and 33 stage IV. Due to low numbers, stage 1 (0 patients) and stage 3 (5 patients) were excluded. Patients were stratified according to chemotherapy response as 100% or less than 100%. Survival was calculated by the Kaplan-Meier method.
Results: No difference in survival was demonstrated between stage IIa and IIb (p=0.57). The 5-year survival for stage II patients was 72% (95% CI 66-78), compared to 15.5% (95% CI 3-28) for stage IV. The 5-year survival for patients with stage II disease and a poor response was 59% (95% CI 51-67), stage II and a good response 91% (95% CI 85-97), stage IV and a poor response 8% (95% CI 0-19), and grade IV and a good response 43% (95% CI 62-79). There was no significant difference between survival for stage II disease with a poor response and stage IV disease with a good response (p=0.72). Age was not an independent predictor of survival at 5 years between stage II and stage IV disease.
Conclusion: Whilst the TNM staging system allows comparison between cases of Ewing's sarcoma, it is less predictive of survival than response to chemotherapy. Efforts should be focused on tools to assess the non-histological response to chemotherapy as this appears to be more predictive of survival than TNM staging.

FC-033

Does local recurrence affect prognosis for Ewing's sarcoma?

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Introduction: Recurrence of disease carries a poor prognosis in Ewing's sarcoma (ES), with long-term survival less than 30%. This study aimed to assess the affect of local recurrence on prognosis in patients with non-metastatic ES.
Methods: 308 patients were treated for ES without

metastases at diagnosis. The mean age was 17 and the mean follow up 103 months. 272 patients underwent limb salvage whilst 36 underwent amputation. 41 patients (13%) developed local recurrence at a median of 25 months.
Results: Survival was affected by local recurrence ($p<0.001$), particularly local recurrence presenting before 24 months ($p<0.03$). 23 patients had metastatic disease at the time of local recurrence, 11 had no metastases but subsequently developed them, and 7 had only local recurrence. These 7 patients were alive at latest follow up. The incidence of local recurrence was not affected by the response to chemotherapy but patients with a good response to chemotherapy had improved 5-year survival ($p<0.05$).
Conclusion: In conclusion, local recurrence is a poor prognostic indicator in ES, which may be explained by the presence of metastases at local recurrence. The development of local recurrence is not affected by the response to chemotherapy, though those that respond well have better survival following local recurrence.

FC-034

Childhood Ewing sarcoma family tumors: 25-year experience of a single center in Turkey

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Aim: Our study aims to evaluate the demographic features and survival outcome of Ewing sarcoma family tumors (ESFT) treated in a tertiary pediatric oncology center.
Methods: Patients, under 19 years old, with the diagnosis of ESFT treated between January 1989 and January 2015 at Istanbul University Oncology Institute were retrospectively evaluated in terms of demographic features and survival outcomes.
Results: 197 children (100 boys, 97 girls) with a median age of 12,3 years (0.4-18yrs) were evaluated. There were 119 (60%) non-metastatic and 78 metastatic patients. Primary localization was in the extremities in 136 (69%) patients, in other sites in 61 patients. Initial treatment consisted of 3 or 4 courses of neoadjuvant alternating IE/VAC chemotherapy given every 3 weeks, followed by surgery and or radiotherapy (RT) to the primary site and adjuvant chemo for a total of 1 year. Surgery was performed to 121 (61%) patients; RT was given to 125 (63%) patients as the local therapy. Median follow-up time was 3 years (2mo.-25 yrs). Relapse or progressive disease was observed in 53 patients (27%) at a median of 17 months (1mo-70 mo.). Presence of metastasis was significantly associated with poor prognosis in terms of overall survival (OS) and eventfree survival (EFS) ($p=0.000$). OS at 2yrs and 5 yrs were %80 and %71.1 in nonmetastatic group and %61.3 and %30.4 in metastatic group. EFS at 2 yrs and 5 yrs were %70.2 and %60 in the nonmetastatic group; %50.3 and %24.1 in the metastatic group.
Conclusion: Survival of our study group is consistent with the other studies in the literature. Presence of metastasis was significantly associated with poor outcome both in EFS and OS.

FC-035

Childhood osteosarcoma: 25-year experience of a single center in Turkey

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Aim: Our study aims to evaluate the demographic features and survival outcome of Osteosarcoma (OS) patients treated in a tertiary pediatric oncology center.
Methods: Patients, under 19 years old, with the diagnosis OS treated between January 1989 and January 2015 at Istanbul University Oncology Institute were retrospectively evaluated in terms of demographic features and survival outcomes.
Results: 189 children (105 boys, 84 girls) with a median age of 12 years (3-18yrs) were evaluated. There were 151 (80%) non-metastatic and 38 metastatic patients. Initial treatment consisted of 3 courses of neoadjuvant epirubicin, cisplatin, and ifosfamide chemotherapy given every 3 weeks, followed by surgery and 3 more cycles of chemo. Median follow-up time was 3,6 years (1mo.-24.7yrs). Relapse or progressive disease was observed in 69 patients (36.5%) at a median 15 months (1mo-63 mo.) time. The overall survival (OS) at 5 and 10 years for the whole group were 62.2% and 60.4%, respectively. Presence of metastasis was significantly associated with poor prognosis ($p=0.0001$). OS at 5 yrs and 10 yrs in non-metastatic patients were %73.8 and %70.5, and in metastatic patients both OS was %24. Since 2011 September, mifamurtide has been used postoperatively in 25 nonmetastatic patients.
Conclusion: Survival of our study group is consistent with the other studies in the literature. Presence of metastasis is associated with very poor outcome. Our results demonstrate that the combination of epirubicin, cisplatin, and ifosfamide is an effective regimen for childhood osteosarcoma.

FC-036

Extraskeletal osteosarcoma: a rare soft tissue sarcoma subtype. Results of an EMSOS study on 147 patients

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Introduction: Extra Skeletal Osteosarcoma (ESO) account 1% among soft tissue sarcomas. There is no agreement on the best strategy of treatment

Material and Methods: An EMSOS collaborative study was performed and data of patients treated for an ESO at different EMSOS centers were collected.

Results: 147 cases were evaluable. Median age was 53 years (13-84). There were 95 males, 52 females. 114 had localized disease and 32 were metastatic, 1 unknown. Median tumor size was 10 cm, median interval from symptoms onset to diagnosis was 4 months. Primary tumor site was lower limb in 73 patients, upper limb in 33 patients, 12 were in viscera. 109/114 with localized disease had surgical resection of primary tumor, 80 had R0 resection, 23 R1, 6 unknown. Among 114 patients with localized disease 79 received chemotherapy: 61 received a bone osteosarcoma-like chemotherapy regimen and 12 a soft tissue sarcoma like regimen;6 unknown type . 34/114 patient with localized disease received RT. Median follow up for all patients was 30 months (1-384 ms), 87 patients were alive and 60 dead at last FUP; median follow up for 87 survivors patients was 51 ms (1-384ms).. 5yrs overall survival (OS) for all 147 was 55%, 62% for patients with localized disease and 28% for those with metastatic disease. Among 114 patients with localized disease, local relapse occurred in 29/114 (25%), distant metastases in 41/114 (36%). In patients with localized disease the probability of 5-yr OS according to tumor and treatment variables is reported in the table below.

Conclusions: 5yr OS and prognostic factors (age, size, margins, surgical remission) are similar to soft tissue sarcoma group. Only a positive trend was seen for chemotherapy at univariate analysis but not at multivariate analysis.

	5-yr OS	p-value
Age		
18-40 (23)	71%	0.07
41-65 (59)	67%	
>65 (24)	47%	
<18 (8)	47%	
Size		
< 5cm (21)	89%	0.0007
5-10 cm (37)	69%	
>10cm (42)	42%	
Surgical CR		
Yes (100)	65%	0.0006
No (13)	37%	
Margins		
R0 (80)	71%	0.003
R1 (23)	57%	
UK (6)	17%	
Chemotherapy		
Yes(79)	69,5%%	0.05
No (35)	45%	
Radiotherapy		
Yes (34)	62%	0.8
No (79)	64%	

Table 1

FC-037

Oligo-recurrence of osteosarcoma patients: treatment strategies for pulmonary metastases

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Background: Distant metastases from osteosarcoma most commonly occur in the lungs. Osteosarcoma is a tumor that can be cured with complete surgical resection of all metastatic lesions. Recently, new notion of oligo-recurrence, that is a status in which cancer patients with 1-5 metastatic or recurrent lesions with controlled primary lesions and might have a more favorable prognosis by local therapy for metastatic lesions, has been accepted in the oncology field. This study aimed to clarify the prognostic factors for osteosarcoma patients with pulmonary metastasis and determine their oligo-recurrence status.

Methods: Patients with conventional osteosarcoma underwent definitive surgery for the primary lesion and at least 1 thoracotomy for pulmonary metastases were recruited to this retrospective study. Clinicopathological information was collected on each thoracotomy from 1976 to 2011 and was analyzed statistically. Two sequential thoracotomies for bilateral pulmonary metastases were deemed as one treatment. We counted the number of resected nodules that were pathologically confirmed as metastatic lesions from osteosarcoma.

Results: In total, 151 thoracotomies in 71 patients were analyzed. Forty-seven patients (66%) underwent up to 2 thoracotomies and the maximum number of thoracotomies was 6. The maximum number of resected nodules on each thoracotomy was 22 (median 2) and the total size of pulmonary metastases ranged from 8 to 120 mm (median 20mm). The 3-year overall and disease-free survivals were 41.7% (95% CI 34.0-50.0%) and 15.2% (95% CI 10.3-21.9%), respectively. Complete surgical remission (hazard ratio [HR] 0.24), a more than 1 year interval from a previous thoracotomy (HR 0.54), less than 4 resected nodules (HR 0.46), and total size of less than 30 mm for pulmonary metastases (HR 0.43) were independent predictors of decreased risk of tumor death by multivariate analysis. Patient group who met these conditions through their treatment history demonstrated significantly longer survival compared to patients that did not (10-year overall survival, 90.0% vs 17.5%, P=.0002).

Conclusions: We propose that the factors contributing to oligo-recurrence of patients with pulmonary metastatic osteosarcoma included complete surgical remission, an interval from a previous thoracotomy, the number of resected nodules, and total size of pulmonary metastases.

FC-038

Patients with Ewing sarcoma of the sacrum have a significantly better prognosis than when the tumor is localized in the innominate bones: the Scandinavian Sarcoma Group experience

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Aims: To compare sacral and non-sacral sites with regards to treatment and outcome of pelvic Ewing sarcomas.
Background: Treatment of Ewing sarcoma of the pelvic bones remains one of the most difficult tasks in the treatment of bone sarcomas. Whether surgery or radiotherapy is the best local treatment is still a matter of debate. We hypothesised that the treatment and outcome of sacral Ewing tumours differed from non-sacral pelvic Ewing tumours (innominate bone).
Methods: Patients with Ewing sarcoma of the bony pelvis, diagnosed between 1986 and 2014 were identified through the Scandinavian Sarcoma Group registry. Data regarding tumour size, local treatment (surgery or radiotherapy), metastatic disease, surgical margins, local recurrence and overall survival were analyzed.
Results: Of the 117 patients examined retrospectively, 88 had tumours in the innominate bones and 29 in the sacrum, with mean sizes of 10.6 and 8.7 cm, respectively (p=0.047). The 5-year event-free survival rate of the latter was greater than in the case of those with tumours in the innominate bones 69% vs 44%, p=0.01.
Conclusion: Event-free survival among patients with Ewing sarcoma was better when the tumour was localized in the sacrum than in the innominate bones, where these tumours are generally larger. Local radiotherapy alone appears to give good local tumour control and is the treatment of choice for sacral tumours.

FC-039

Local control in non-metastatic Ewing sarcoma

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Poor response to chemotherapy and inadequate surgical margins are negative predictive factors for local control and survival in patients with Ewing sarcoma. The role of postoperative radiotherapy in this subset of patients was retrospectively evaluated.
Methods: Patients enrolled in ISG/SSG-3 protocol and who received definitive local treatment were included. Induction chemotherapy with vincristin, doxorubicin, cyclophosphamide, ifosfamide, actinomycin, etoposide was followed by high dose busulfan and melphalan and stem cell support in patients with poor response (PR). Patients with good response (GR) received the same drugs in the maintenance phase Surgery (S) was the treatment of choice whenever possible. Radiotherapy (RT) (42-54 Gy) was given only in case of inadequate surgical margins or based on surgical judgment . RT (54 Gy) only was employed when surgery was not possible.
Results: Of the 300 patients enrolled, 27 were excluded (early surgery, surgery at the end of the treatment, early progression) and 273 patients were suitable for analysis. Median age was 15 years (3-40). 56% of tumors were localised at the extremities, 27% central and 17% in the pelvis/sacrum. 221 (81%) patients underwent surgical treatment..
Surgical margins, according to Enneking, were adequate in 168 (76%) inadequate in 40 (18%) N.A in 13 patients. Poor responders 108 (49%), Good Responders 110 (50%) N.A in 3. Overall 62 patients received post operative RT.
Local recurrence (LR) developed in 24 (9%) patients. Distant metastases occurred in 51 cases. The median time to LR was 15.2 months (6-47). With a median follow up of 53 months (8-118)5-year probability of LR-free survival (5y-LRFS) was 90 %; 91% for patients who received only S, 93% in case of S+RT and 85% with RT only (p<0.2).
Surgical margins did not influence local control (5y-LRFS: inadequate: 90%; adequate: 91%, p=0.9) nor did the histologic response (5y-LRFS: GR 92%, PR 92%, p =0.8).
Conclusion: Surgery is the treatment of choice for localised ES. An inadequate surgical margin can be rescued by the use of RT. In case of adequate surgical margins, the addition of adiuvant radiotherapy in patients with poor pathologic response does not improve the local control rate.

FC-040

Experience in the treatment of Ewing's sarcoma of the pelvis in children. East European Sarcoma Group

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Objectives: The aim of our study was to determine treatment outcomes in two protocols: 1) using high-dose chemotherapy and autologous peripheral blood stem cell transplantation (HDCT/autoPBSCT) and 2) protocol with decreasing doses of chemotherapy in pediatric patients with Ewing's sarcoma of pelvis treated at the East European Sarcoma Group (Russian Oncology Research Center N.N.Blokhin).
Methods: We retrospectively analyzed the data of patients with Ewing's sarcoma of pelvis who received HDCT/autoPBSCT and who received CT with decreasing doses of (VAC/IE) between 1997-2011y. All patients receive the same mode neoadjuvant chemotherapy regimens 5 courses (VAC, vincristine 1.5mg/m2 1,8,15 days i.v. + Adriamycin 37.5mg/m2 1,2 days i.v. + Cyclophosphamide 2.1gr/m2 1,2 days i.v. and IE, Ifosfamid 2.4gr/m2 1-5 days i.v. + Etoposide 100mg/m2 1-5 days i.v.).
Results: The first group of patients included 31 children who received HDCT/autoPBSCT with radiation therapy to the lungs (metastatic disease) and pelvic bones. Metastatic disease was found in 42% of patients. The average tumor volume was 345ml. Middle age was 11.5 y.o. High-dose chemotherapy was performed in only 25

patients, 6 patients died from complications of chemotherapy prior to HDCT/autoPBSCT.
The second group included 21 patients who received treatment in the adjuvant regime with a reduction dosage of VAC/IE (-30%). Metastatic disease was found in 33% of patients. The average tumor volume was 298ml. Middle age was 12.7 y.o. Only one surgery was perfomed with P3 resection (Enneking classification).
The third group of 9 children, patients treated without any protocol.
Overall 1-,3-,5-y survival after HDCT/autoPBSCT were 70%, 39%, 39%. Median was 17.2 months in first group. With metastatic disease overall 1-,3-,5-y survival were 46%, 7%, 7%. Median was 10.2 months. With non metastatic disease overall 1-,3-,5-y survival were 88%, 64%, 64%. Median not reached. Analyze data from patients in the second group, we obtained the following results overall 1-,3-,5-y survival were 100%, 70.5%, 58.8%. Median not reached. With metastatic disease overall 1-,3-,5-y survival were 100%, 68.5%, 34.2%. Median not reached. With non metastatic disease overall 1-,3-,5-y survival were 100%, 71.4%, 71.4%. Median not reached. Data is valid (p=0.008).
Conclusion: Although we obtained the best survival data in the second group than the first using HDCT/autoPBSCT, are different by selection the data volume of the primary tumor and rate of metastatic disease. Requires further study and monitoring of patients undergoing treatment for Ewing's sarcoma of the pelvis.

FREE COMMUNICATIONS SESSION III: Upper Extremity

FC-041

Primary malignant bone tumors of the proximal humerus: should we sacrifice the deltoid?

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Introduction: The proximal humerus is the third most common site for primary bone tumors and conservative treatment is possible in about 90% of patients. However, important structures, such as the deltoid or axillary nerve, may have to be sometimes sacrificed for oncologic reasons.
Objectives: The aim of our study was to assess tumor extension relative to anatomical structures, describe the surgical techniques for resection and reconstruction, and evaluate long term oncologic results.
Methods: This retrospective study was conducted at a tertiary care centre specialized in the treatment of musculoskeletal tumors. Patients were eligible if they presented with a primary bone tumor of the proximal humerus; had limb salvage surgery and were 15 years and older. Tumor extension on preoperative MRIs or CT scans was assessed by a senior radiologist with 2 years' experience in musculoskeletal radiology. Data on patients, tumors, surgery and follow-up were retrieved from hospital records. The cumulative probability of local recurrence was calculated in a competing risk scenario; the effect of relevant variables on the cause-specific hazard of local recurrence was estimated with Cox regression models.
Results: Forty-one patients met the inclusion criteria. The sex ratio was 1.4 M/F and the median age was 35 years (Q1-Q3: 21 - 48). The median follow-up was 62 month (Q1-Q3: 30-141). Chondrosarcomas (42%), osteosarcomas (40%), and Ewing sarcomas (15%) were the most common histologies. 52% of tumors were high grade. Intra-articular contamination of the joint was suspected in 10 (24%) patients; disappearance of the fat sign between the tumor and deltoid was reported in 12 (29%) of patients; and extension of the tumor to the axillary nerve was suspected in 14 (34%) patients. The deltoid and/or axillary nerve was sacrificed in 17 (41%) patients; an extra-articular resection was performed in 2 (5%) patients. A suspension (or equivalent) was performed in 18 (44%) patients; a reverse-shoulder prosthesis in 16 (39%) patients; and an arthrodesis in 7 (17%) patients. All reverse-shoulder prosthesis were allograft composite. A local recurrence was reported for 5 of 41 patients (12%). Factors statistically associated with local recurrence were: intraoperative contamination (p = 0.006) and positive margins in pathology (p = 0.009). Reverse-shoulder prosthesis were revised (any second operation) in 6/16 cases (38%); arthrodesis in 6/7 cases (86%); and suspensions in 9/18 cases (50%). The main reason for revision was mechanical.
Conclusions: Analysis of the local extension of the tumor with regards to critical anatomical structures is paramount preoperatively in order to maximize both local control and function. Tumor-free margins remain the goal to achieve this objective; therefore the deltoid and/or axillary nerve must sometimes be sacrificed.

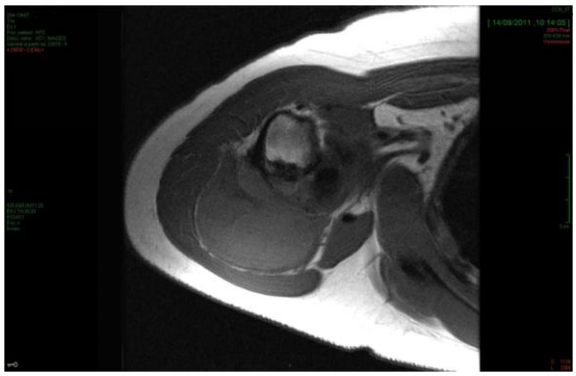

Figure 1. *MRI*

FC-042

How to investigate lesions of the clavicle

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The clavicle is a rare site for the presentation of tumours. Because it is subcutaneous, swelling of the clavicle is often detected early and will cause concern for possible

malignancy. We have evaluated the clinical features and diagnosis of 410 patients referred to our unit with clavicluar lesions in the last 36 years.
We have collected clinical and investigation results for all these patients to identify a possible algorithm leading to early diagnosis.
Of the 410 patients, 88 (21%) were found to have a malignant lesion in the clavicle, of which 17 (4%) were primary sarcomas, 44 (11%) metastases and the remainder haematological malignancy. 322 (79%) lesions were benign including 159 (39%) due to osteomyelitis, 59 (14%) benign tumours and 104 (25%) from other miscellaneous disorders. Infection is the commonest below age 20 whilst malignancy and degenerative changes are common in older patients.
Factors associated with the various diagnosis include age, location in the clavicle, radiological appearance and blood test results. We evaluated the sensitivity and specificity of different investigations. MRI is found to be the most sensitive diagnostic tool to identify abnormality and possible diagnosis. Biopsy is found to be the gold standard for diagnosis in cases of worrying clinical and radiological features.

FC-043

Scapular tumors. Case series

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Introduction: Musculoskeletal primary tumours are less than 1% of total cancer. They are more common in young patients and usually have an aggressive behavior. They tend to happen in the proximal articulations of limbs and in axial skeleton, as well as close to the more fertile physis of long bones. Proximal humerus is one of the most common sites affected. Nevertheless, scapula usually supposes a challenge for resection and reconstruction. We present a case of series of scapular tumours treated at our centre between 2007 and 2013.
Material and Methods: 9 cases were managed surgically from 2007 to 2013. Sex, age, type of tumour, localization, Enneking classification for extension, Malawer classification for resection, survival, and Musculo Skeletal Tumor Society Score were recorded.Results.6 patients were men and 3 women. Medium age was 31.5 years (range 16-60). There were 3 chondrosarcoma, 2 osteosarcoma, 2 synovial sarcoma, 1 aneurismatyc bone cyst and 1 case of metastatic clear cell sarcoma of kidney.6 cases had only affected the scapula whereas 3 cases were also affected the proximal humerus The Enneking classification of tumours was: 3 type IA, 2 type IIA, 3 type IIB and 1 type IV.
According to Malawer classification, 5 partial scapulectomy were performed (type II resection), 1 intrarticular total scapulectomy (type III), 1 extrarticular total scapulectomy (type IV) and 2 partial scapulectomy and proximal humerus resection (type VI) were done. No bone defect reconstruction was done in 6 patients. By contrast, 3 were reconstructed with prosthesis. 5 patients received adjuvant chemotherapy or inmunotherapy. Only 1 patient died a 1 year from the surgical procedure. The other patients were free of local disease at the final of the follow-up period (12 to 96 months). Average MSTS score was 23.1 points (range 17-30) at the end of follow-up.
Conclusions: Musculoskeletal tumours affecting scapula are rare. Early diagnosis and treatment in specialized centers are important to determine the prognosis correctly. Total and partial scapulectomy given good results in these patients.

FC-044

Total scapulectomy: is EPR a reasonable option?

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Introduction: Scapular endoprosthetic reconstruction (EPR) as an alternative after scapulectomy for sarcomas has limited indications. We present our experience on total scapulectomy (TS) focusing on functional results and complications in patients treated with humeral suspension versus EPR.
Material and Methods: Between 2000 and 2012 we performed eight TS. Shoulder suspension was done in five cases: four in Malawer type 3 and one Malawer type 4. Three constrained EPRs were performed: two Malawer type 3, and one type 6. Local soft tissue reconstruction was done in all cases but one where we used a pedicled latissimus dorsi muscle-cutaneous flap to cover the defect. For functional results we used MSTS and degrees of flexion and abduction.
Results: There were one extraeskeletal Ewing sarcoma (ES), one fibromixoid low grade sarcoma, two mioephitelial malignant tumour, two ES and two condrosarcomas. All but one were high grade with seven R0 and one R1 margin, which resulted in a malignant myoepithelial tumour. The Enneking stage was as follows: one Ib, six IIb and one stage III with complete remission after neoadyuvant therapy. Four patients are alive and free of disease nowadays. The other four died because of the disease. The range of movement was better in patients with EPR, one with 60? of abduction but MSTS results were similar MSTS. No major surgical complications were observed.
Conclusions: Our study has obvious limitations. It is restrospective and includes few patients with different types of ethiologies. Furthermore, depending on the case, oncologic soft tissue resection was different in terms of post-operative function. EPR is high demanding and may increase the rate of complications, such as infection. Besides, upper limb suspension might cause problems with difficult solution such as brachial plexus traction neuropathy and pathologic fracture of an irradiated collarbone. On the other hand, EPR function seems to be better in terms of range of movement as well as cosmesis. All in all, we think that at least EPR should be considered after total scapulectomy as long as muscle reconstruction is feasible.

FC-045

Reconstruction of the proximal humerus with a constrained type – Endoprosthesis: implant survival and functional outcome

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Introduction: The Bayley-Walker endoprosthesis (BWE), which includes a humeral component with a socket and a grenoid component with a ball and designed to obtain a stabilization of the glenohumeral joint by constrained joint mechanism, has been utilized in our institute for reconstruction after proximal humeral tumour resection or salvage surgery after dislocated prosthesis. The aim of this study was to evaluate the implant- and functional outcome after use of the BWE for reconstruction of the proximal humerus.
Methods: 22 patients who underwent surgery using the BWE for reconstruction of the proximal humerus between 2000 and 2013 were subjected to this study. We have used first-generation BWE from 2000 to 2006 and second-generation BWE that was revised because of unsatisfactory dislocation rate from 2006 to 2013. We assessed the outcome of these patients from the viewpoint of implant survival (Kaplan-Meier method) and functional outcome (Musculoskeletal Tumor Society Score (MSTS)).
Results: The median patient age at assessment was 57 years old and median follow up to implant failure was 24 months (2 - 131 months). Implant failure was observed in 6 patients and failure rate was significantly lower in the patients with second-generation BWE (2/14, 12%) compared with first-generation BWE (4/6, 67%) (P=.011). Whole 2-years and 5-years implant survival were 89.6% and 72.4%, respectively. No factors were associated with the implant survival. MSTS score was ranged from 40 to 96%, and median score was 76%. Dislocation history (median MSTS: yes, 60%; no, 84%; P=.032) was associated with MSTS score. Favorable MSTS score was observed even in the patients who underwent salvage surgery for continuously-dislocated endoprosthesis (primary, 74%, salvage, 78% P=.84).
Conclusion: Second-generation BWE would be able to provide a robust stabilization and favorable function to the patients who underwent salvage surgery.

FC-046

Cervicocapital prostheses of proximal humerus after the resection of tumors – 20 years of experience with own desing custom-made implant

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Background: Tumors affecting the proximal humerus are in total fairly frequent condition and present a common problem for orthopedic oncologist. The fundamental challenge is to provide the patient with a stable shoulder joint that would allow for daily activity. The most common options are allograft (or composite graft), spacer or prosthetic reconstruction. We have been using our own design custom-made tumor hemiarthroplasty of the shoulder (designed by prof. Z. Matejovsky) since the 1970s. However, the indication for hemiarthroplasty is lately being subsided by more sophisticated reverse shoulder arthroplasty. Nonetheless we believe that this type of reconstruction is still a good option for selected patients.
Materials and Methods: Altogether we found total of 80 patients who have received this type of reconstruction after proximal humerus tumor resections. We limited our retrospective study to only 20 years (1993 and 2013). Inclusion criteria were a minimum of a 1 year follow-up and surgery for oncological diagnosis. Patients who received this type of reconstruction for trauma or degenerative indications were not included in the study. We assessed demographic data, functional results and complications - both oncological and orthopedic.
Results: Total of 25 patients (15 male, 10 female) who met the inclusion criteria and for whom all the necessary data were available, were included in the study. Most of these patients were operated on for metastatic disease, followed by primary malignant bone tumors (7 patients), malignant soft tissue tumors (2 patients) and aggressive bone lesions (3 patients). The average active flexion was 65° (40 to 170), abduction 59° (10 to 165), extension 27° (10 to 45), external rotation 46° (10 to 90), internal rotation 77° (15 to 90). Three patients had no active movement in the shoulder. The most common complication was disease progression (22% of cases died of metastatic disease) and instability (18% of cases). We performed two revision surgeries for a local recurrence, two for mechanical complication and one for deep infection.
Conclusion: We believe that patients with adverse prognosis, especially patients with metastatic disease, where intralesional surgery is considered, can benefit from this procedure. It is faster and in most cases yields a stable shoulder with acceptable ROM and a functional hand. The fact, that the glenoid area is left intact limits the possible spread of local recurrence and facilitates the revision surgery, when reverse shoulder prosthesis can be implanted.

FC-047

Osteosarcoma of the clavicle: a single institution experience

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Introduction: Tumors of the clavicle are very rare, with an incidence of less than 1% of all bone tumors. Osteosarcoma (OS) of the clavicle is very rare and a paucity of data in the literature on this lesion makes

understanding of defining an optimal treatment. The aim of this study was to analyze oncologic outcome and complication in patients with clavicle osteosarcoma.
Methods: Between 1990 and 2013, 7 patients were treated: 4 males and 3 females, mean age of 33 years (13 - 55 years). The diagnosis was: osteoblastic OS in 3 cases, fibroblastic OS in 2 cases and chondroblastic OS in 2 cases. Five of these seven cases occurred in irradiated field and were regarded as post radiation sarcomas.
Results: At mean follow-up of 5.5 years (1.5 - 9 years), 4 patients were NED and 3 DWD. Overall survival was 57% at 4 and 8 years, higher in patients without local recurrence (p=0.0101). Patients with wide surgical margins had statistically higher overall survival (p=0.0082), survival to local recurrence (p=0.0143) and survival to metastasis (p=0.0082) than patients with marginal surgical margins. There was only one complication: a wound dehiscence that was treated with debrigment 1 week after surgery.
Conclusion: Clavicle is a rare site for osteosarcoma. Most of our cases (nearly 71,5%) were radioinduced. Disease free survival was worse than for OS of the extremities, similar to radio-induced OS. The best oncological outcome is obtained in cases with wide margins without metastases at diagnosis. Multicenter studies are needed.

FC-048

Extra articular resection of sarcomas of the shoulder girdle. Comparison of clinical and functional outcomes of forequarter amputation, Tikhoff-Linberg procedure and reconstruction with endoprosthesis

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Introduction: The shoulder girdle is a common site for primary sarcomas. The hyaline cartilage provides a natural barrier to tumor cells spread into the joint and in cases where it does spread, the surgical option is extra articular resection of sarcoma in the form of either forequarter amputation or limb sparing surgery. Limb sparing surgery can be performed after extra articular resection of these tumours followed by the use of either an endoprosthesis or Tikhoff-Linberg reconstruction. We present our clinical and functional outcomes for these three subgroups of patients after undergoing extra articular resection of sarcomas.
Methodology: Data was obtained retrospectively from a large prospective sarcoma database for patients undergoing extra articular resection for sarcomas of the shoulder girdle and patient notes were evaluated. Patient demographics along with diagnosis, neo adjuvant and adjuvant treatments, grading and staging of tumours, surgical treatment along with margins, complications, oncological outcomes and MSTS and TESS scores were collected. Survivorship analysis was undertaken for each surgical treatment and results were compared.
Results: A total of 68 patients were included in our study with high grade Osteosarcoma being the commonest diagnosis. Forty one patients underwent forequarter amputation and twenty seven had limb sparing surgery. Of the patients who had limb sparing surgery, fourteen had reconstruction with endoprosthesis and thirteen had Tikhoff-Linberg type reconstruction.
Patient demographics for age, gender, laterality, location and type of sarcoma along with neo adjuvant and adjuvant therapies were collected from the medical notes. Staging of tumors and grading after biopsy along with surgical margins and post treatment necrosis were also recorded. Any post operative complications and subsequent surgical procedures that were performed were recorded. Clinical, oncological and functional outcomes using the TESS scores at last follow up were also recorded.
Kaplan-meier curves will be constructed to present the survivor ship analysis of the sub groups and comparative analysis will be presented.
Conclusion: Extra articular resection for proximal humerus sarcomas is a challenging surgical procedure particularly in limb sparing surgery. Traditionally amputation has been plagued with poor functional and psychological results. To our knowledge this is the only study in literature comparing the clinical and functional outcomes of forequarter amputation, reconstruction with endoprosthesis and Tikhoff-Linberg type reconstruction for intra articular spread of sarcoma into the shoulder joint.

FC-049

Functional results after scapula resections

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Introduction: Tumours of the scapula are rare. Resection of the tumour is necessary in many cases. The anatomical location is most decisive for the extend of resection. Due to the functional importantance oft he shoulder girdle for all daily activities major consequences are seen. In a literature review only some reports with less cases are found.
Methods: Between 1995-2014 31 consecutive patients had been identified and included in this retrospective study. All patients had been surgicaly treated due to a benign or malignant tumour of the scapula. Patients who only had been curreted had not been included. Follow-up was done 2014. From 37 patients 27 could be included, 4 patients had been lost to follow-up. MSTS- and TESS-scores had been evaluated.

Results: In 16 men and 11 women the mean age was 45.6 years. 8 chondrosarcomas, 4 large exostosis, 3 liposarcomas, 3 metastasis, 2 osteosarcomas, 2 fibromas and in one case each chondroblastoma, desmoid tumour, desmoplastic fibroma, Ewing-sarcoma and leiomyosarcoma. The avarage follow-up was 6.5 years. 2 patients had been died due to tumour, one due to cardial disease. In 7 of 27 patients a total scapulectomy had to be performed, in all others a partial resection. The MSTS-score was with 75.2% at a satisfactory level. There was no significant difference between the different resections.
Conclusion: The resection of scapular tumours often leads to a significant dtoriation of function in the shoulder girdle. This is not represented in the MSTS-score and the overall acceptance oft he patients. Only ony patient (craftsmam) hast o change his job. In total the clinical results had quite good in short term and in long term follow-up.

FC-050

Reconstruction with a custom made prosthetic wrist arthrodesis after bone tumor resections of the distal radius

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Introduction: Reconstruction of the distal radius after tumour resection is challenging due to the complex anatomy of the wrist jont, the vicinity to important neurovascular structures, and the scarse soft tissue coverage. Also, these patients are often young and active, which increases the demand for a functional, stable and durable reconstruction. This study describes reconstruction of the distal wrist with a CAD-CAM titanium arthrodesis implant (Stanmore Implants Worldwide, Elstree, UK).
Methods: A single institution retrospective review was performed of 4 consecutive distal radius radius recontructions, in the period between 2009 and 2013.
Functional results were analysed according to the Musculo Skeletal Tumor Society (MSTS) and the Disabilities of the Arm, Shoulder, and Hand (DASH) scoring systems. Radiographical evaluation included implant position and fixation, joint alignment, and degenerative changes.
Results: There were two males and two females, average age was 43.5yrs, (range 22- 55 yrs). Initial diagnosis was giant cell tumour (GCT) in 3 cases and osteosarcoma in one case. In two cases of GCT an initial reconstruction with non-vascolarized fibular autograft failed (one infection, one local recurrence). At final follow-up 50 months (22-70 months), no major complications had occurred. No infection, no major mechanical failure, and no recurrence was recorded. Radiographically there were no signs of loosening and all implants were well aligned. During follow-up two minor revisions were performed for loose scews and a protruding plate.
Average MSTS score was 17 (range 13 to 21) and average DASH score was 41 (range 20 to 63).
Conclusions: Reconstruction of the distal radius after tumour resection with a custom made arthrodesis implant is mechanically reliable and durable, and was not associated with infection. However, functional results are not in all cases satisfactory. This reconstruction could be considered as a salvage procedure in case of failed autograft reconstruction and when bone bank facilities are not available.

FC-051

The long term follow up after salvage surgery and MUTARS custom made prosthesis implantation around the arm and forearm

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Introduction and Aims: The reconstruction of massive bone defects in patients with primary and metastatic bone tumors in the upper limb is a challenging procedure not only because of the complicated surgical technique but also due to the higher rate of postoperative complications. The aim of study is to present results of possible reconstruction around the arm and forearm.
Method: We have presented the possibilities of salvage surgery in patients with massive tumors around the shoulder, elbow and forearm. The material composed of 42 selected patients diagnosed with bone tumors treated at the Department of Orthopaedics, Traumatology and Orthopaedic Oncology of Pomeranian Medical University of Szczecin between 2000 and 2014. Twenty patients suffered from primary bone tumors and another twenty two had metastatic lesions. All of them were operated with the usage of Mutars modular and custom made systems of the forearm as well as reconstructive techniques and bone grafts and bone substitutes. The second look surgical procedures included: revision arthroplasty, reconstruction of the rotator cuff, periprostetic fracture treatment, recurrence and infection treatment, plastic surgery.
Results: The complication rate was 23,6 %. The clinical follow-up period varied in different cases. The most frequent complication was infection which occurred early after chemotherapy in 5 patients. One late infection was observed. In one case skin necrosis was present. We have treated two periprostetic fractures. Recurrence occurred in 1 patient with primary lesion. The survival rate was mainly dependant on the kind of tumor, range of resection and late diagnosis of the disease. In most cases it was the reason for the recurrence or metastasis.
Conclusions: The tendency to limit the indications for amputation in patients with bone tumors especially around the forearm has been strongly emphasized.

FREE COMMUNICATIONS SESSION IV: Minimally Invasive Techniques-Biopsies

FC-052

A new minimally invasive approach to pathological and impending fractures of the upper limb

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Introduction: Bone metastases are getting nowadays more frequent and affect mostly elderly people. Patients present with longer survival and a complex clinical history and often require minimally invasive treatments. Metastases in the upper limb have different biomechanical requirements from the lower limb because direct and bending loads are limited while torsional forces prevail. The aim of the study is to evaluate a new method to internally stabilize long bones in the upper limb.
Methods: We evaluated 5 patients treated with IlluminOss Photodynamic Bone Stabilization System (IlluminOss Medical GmbH, Germany) for bone metastases in the upper limb. Mean age was 57,8 years (range 35 - 77). The primary tumour was: hemangioendothelioma, multiple myeloma (2), lung adenocarcinoma, and invasive ductal breast carcinoma. 4 humeri and 1 radius were treated. The mean expected survival was lower than 1 year. The ASA grade risk was 4. Complication rate (fracture stability, symptomatic non-union/instability) and pain control were evaluated.
Results: One intraoperative displaced fracture occurred in a humeral lesion and it required an internal fixation with plate and screws. Pain control was achieved within one week postoperative (VAS< 3). No other complications were observed and particularly no symptomatic instability at fracture site (follow up range 4-10 months).
Conclusion: IlluminOss is a reliable system to stabilize pathological fractures and lytic lesions in the upper limb. No intramedullary devices are to date available for the radial and ulnar shaft. Even if it is a good solution for diaphyseal bone, meta-epiphyseal lesions are at high fracture risk with this technique and often require an additional stabilization with plate and screws. Potential further developments to adapt the procedure for the lower limb and to execute it in the radiologic room under local anesthesia.

FC-053

Hypervascular spinal tumors: preoperative embolization vs. local hemostatic agents

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Introduction: Management of patients with hypervascular spinal tumors (HVST) remains one of the most challenging issues in the field of spinal tumor surgery due to profuse intraoperative bleeding that is difficult to control. Recent studies' results have demonstrated the superiority of embolization (EMB).
Methods: This was a retrospective study of 110 cases involving patients with extradural HVST treated at our institute between 2003 and 2013. There were 69 male and 41 female patients with extradural HVST. The study included 61 patients with metastasis of renal cell carcinoma, 27 with multiple myeloma, 15 with plasmacytoma and 7 with aggressive hemangioma. The first group included 57 patients who underwent EMB of tumor. The second group consisted of 53 patients, which were treated surgically using intraoperative local hemostatic agents (HEM). We performed 2 types of treatment options: palliative decompression and en block spondylectomy. The first group was divided into two subgroups: 30 patients with decompression (EMB-D) and 27 with spondylectomy (EMB-S). In the second group there were: 28 patients with decompression (HEM-D) and 25 with spondylectomy (HEM-S). The following parameters were evaluated: blood loss volume, number of transfused packed red blood cell unit, drainage loss and time of hospital stay.
Results: Evaluation of blood loss volume of treating patients with palliative decompression proved no significant difference ($p>0.05$) between EMB-D and HEM-D (1175±330 vs. 1557±672 ml). In groups EMB-S and HEM-S (3012±780 vs. 3262±864 ml), we found some difference ($p<0.05$). HEM significantly decreased drainage loss volume compared to EMB at both types of operations ($p<0.05$). There was almost no difference in number of transfused packed red blood cell unit between two groups (EMB and HEM). The average hospital stay was significantly less ($p<0.05$) in groups with HEM.
Conclusion: The research proves that for patients with HVST, who underwent palliative decompression, there is no significant difference between two methods of reducing blood loss. Therefore, we do not see reasons to use expensive and risky procedure of EMB for such patients. While for patients with en block spondylectomy EMB is efficient to reduce intraoperative bleeding.

FC-054

Is there still a place for surgical biopsies in pre-operative diagnosis of adipose and myxomatous soft-tissue tumors?

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Introduction: Soft tissue mass is a classical clinical case, which can be worrysome, however benign in 99%. A painful lesion of a deep localization needs full exploration with CR, US, MRI, CT and frequently ends up with biopsy performing. Adipose and myxomatous tumors constitute a relevant biopsy indication because they are clinically, radiologically and histologically difficult to characterize, with a hard-to-manipulate jellyish material. Core needle biopsies are a seducing alternative compared to surgical

biopsies because of their easier scheduling, their diagnostic performances and the awaited benefits for patients.

Objectives: Determining the interest of percutaneous biopsies in the pre-operative characterization and clinical management of adipose and myxomatous soft tissues tumors and stress the significance of cytogenetics techniques in benign and malignant tumors distinction.

Methods: This is a retrospective study in the regional expert imaging department of musculoskelettal soft tissues tumors in Marseille, France. From 2008 to 2012, 64 biopsies were included. Basic data was collected and classical pathological examination was performed. Their embedded performances were evaluated through final diagnosis comparison after pathological and cytogenetics (fluorescence in situ hybridization, FISH) examination of CT-scan-guided biopsies versus final operative sample.

Results: Thirteen biopsies were non contributive and needed further surgical exploration.Pathological analysis specificity was 100% when radiological classification and microscopic analysis was combined with FISH technique. Its sensitivity was of 92%, its diagnosis accuracy 91%. Its positive predictive value was of 100% and negative of 86%.

Described in 1930, this technique represents a good alternative to surgical biopsies. Their lower cost compared to standard surgery stands for a strong argument, particularly nowadays.Easy to perform, they offer real comfort for the patient thanks to their quick handling (less than 30 minutes spent in ambulatory hospital with no anesthesia consultation compared to one day in case of surgery) and their far lower complication rate.Use of a specially designed system of extraction allowing complete sample removal is mandatory. Despite their fatty even gelatinous consistency, percutaneous biopsies of adipose and myxomatous tumours are of a high level of diagnosis value and their easy-to-perform technique make them impossible to despise for optimal handling.This is particurlarly true since the advent of routine cytogenetics techniques like FISH, especially towards MDM2 markers for adipose tumors and CHOP for myxomatous.Breakthrough in imaging and quality of sampling allowed to increase tremendously their diagnosis capacity, if some basic rules are followed.

Conclusions: Low morbidity of this technique and patient comfort tend to favor it. However one must note that such an approach must be conceived with a specialized radiologist, trained to biopsy technique with high knowledge of musculo skelettal tumors, especially to distinguish achievable cases and high success rate zones. It is imperative that the whole sequence should be in constant interaction with the surgeon.

FC-055

Comparison of fine needle aspiration and core needle biopsy in the diagnosis of bone tumors

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Introduction: Image-guided core needle biopsy (CNB) is currently considered the gold standard for bone tumours diagnosis although fine needle aspiration is gaining popularity. Much literature exists regarding the diagnostic yield and accuracy of these techniques individually but none compares the two parameters in the same tumour. It was asked if FNA could identify malignancy, establish an exact diagnosis, enable the appropriate treatment and substitute CNB in bone lesions.

Methods: Ninety four patients with bone lesions were prospectively studied performing a CBN followed by a CBA. The chosen route was anesthetized and an 8-gauge needle biopsy was introduced 3-4 times. Immediately after collecting the sample, a 22-gauge needle was introduced through the path created by de trucut and a cytoaspiration was performed. In the majority of these cases a diagnosis of bone tumour was necessary to start treatment but in a few the exclusion of malignancy was also mandatory. There were 61 males and 33 females.The average age was 53,5 years (12-86). All biopsies were performed under image guidance: 64 with CT-scan and 30 with radioscopy.The diagnostic yield and accuracy were evaluated. A diagnosis was considered to be accurate when it was confirmed by incisional biopsy, surgical specimen or ulterior clinical and imaging evaluation since in some benign tumours, metastases and hematopoietic lesions no histological confirmation is needed. The minimum follow-up was 2,5 years. Exclusion of malignancy or infection, when clinically suspected, was included in the group of diagnosis.

Results: In 92 patients (97,9%) a diagnosis was obtained with CNB. Of these, 91 (98,9%) were accurate with 38 being confirmed by histology and 53 by clinical and imaging elements. Diagnoses were: 29 metastases, 25 primitive malignant tumours, 14 benign tumours, 12 hematologic diseases and 5 infections. In 7 cases pathology could be excluded. Only 1 benign lesion was misdiagnosed - a low-grade chondrosarcoma of the proximal femur was assumed as an osteochondroma. With FNA 70 diagnoses were possible (77,7%). Two of them were wrong - a low-grade chondrosarcoma of the scapula was assumed as an enchondroma and a spinal discitis was initially interpreted as a giant cell tumour. Accurate diagnosis rate was 97,1%. With this technique, 15 results (16%) were completely inconclusive but in 9 cases, although diagnosis was not achieved, the pathologist could differentiate a benign lesion (n = 5) from a malignant one (n = 4) and this differentiation was correct in all cases. The diagnostic yield was 97,9% for CNB and 77,7% for FNB. The diagnostic accuracy was 98,9% and 97,1% respectively. There were no complications.

Discussion: The accuracy of the two techniques was similar showing the reliability of FNA in the diagnosis of all type of bone tumours. However, certain lesions can reduce the diagnostic yield: cysts, lesions with the surrounding cortex intact and lesions with a dense calcified matrix. Among the 24 non diagnostic FNA it was possible to find at least 18 lesions with these characteristics. This fact contributed for the comparative low diagnostic yield of FNA. In this study, the quantity and quality of the sample

was decided by the executant alone without the preliminary evaluation of the pathologist and the repetition, if necessary, of the procedure. This preliminary evaluation would substantially improve the diagnostic yield the FNA. Nonethless, in the present study FNA would allow for the initiation of treatment in all 70 patients with a diagnosis proven correct and in the other 5 in which malignancy had been excluded. This would be 75 of the 94 cases (79,8%).

Conclusions: FNA is reliable and enables the initiation of treatment every time it establishes a diagnosis or excludes malignancy. The number of inconclusive cases, the real problem with this technique, can potencially be decreased by a better selection of the lesions to be analysed by the technique and by the preliminary evaluation by a pathologist. Until that, CNB remains the preferable method for bone tumours diagnosis.

FC-056

Contrast enhanced ultrasound (CEUS) to improve the accuracy in differentiating benign and malignant soft tissue tumors

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Introduction: Musculoskeletal Soft Tissue Tumours vary in a wide spectrum of lesions. Both MRI and CT with contrast medium have a good sensitivity to discriminate benign and malignant lesions. CEUS can detect both vascularity and tumour neoangiogenesis[1] and help in differentiating them. The aim of the study is to identify the perfusion patterns and vascularisation time of malignant and benign lesions to improve the accuracy of CEUS.

Methods: 216 patients with soft tissue tumours were enrolled in this study (60% malignant tumours, 56% in the lower limbs). Informed consent and IRB approval were obtained. Seven CEUS perfusion patterns and 3 types of vascularisation (arterial-venous uptake, absence of uptake) were considered. The accuracy of CEUS was evaluated by comparing Imaging with the histological diagnosis. Statistical analysis: univariate and multivariate analysis, Chi-square test and t-test for independent variables ($p<0.05$, 95% CI).

Results: CEUS pattern 6 (inhomogeneous perfusion), arterial uptake and location in the lower limb were associated with high risk of malignancy. The best positive predictive isolated values were CEUS pattern (77%) and rapidity of vascularisation (69%). The combination of CEUS-pattern and vascularisation has 74% PPV, 60% NPV, 70% sensitivity. No statistically significant correlation with size and location (whether deep or superficial to the fascia) was found.

Conclusion: CEUS is a reliable Imaging technique in the diagnostic process of soft tissue lesions and it is helpful in guiding the US guided biopsy. CEUS could overcome the influence of the operator's experience. Its role and timing in the diagnostic process should be defined in international panels for diagnostic guidelines.

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FC-057

Vertebroplasty: an alternative treatment in selected pathological spine fractures. Our experience

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Introduction: Axial pain is frequently associated with pathological vertebral body fracture (PVF). Vertebroplasty (VP) can be a good minimally invasive percutaneous procedure alternative to conservative treatment, as radiotherapy, or open surgical procedures, usually highly invasive in nature. The palliative rule of VP is investigated in a consecutive series of patients.

Methods: 21 patients affected by VPF from plasmocitoma (14 cases), haemangioma (4 cases), breast cancer metastasis (2 cases), NH lymphoma (1 cases) underwent a total of 43 vertebroplasty under local (14) or general (7) anesthesia from November 2004 to November 2014. 13 were females and 8 males, mean age was 61, 3 years (27-85). Most common level were T12 (8 cases), L3 and L4 (6 cases each).

Vertebroplasty was performed under fluoroscopy with PMMA in 17 cases and silicon in 4 cases through mono-bipedicle posterior access. Preoperative or intraoperative trocar-biopsy was performed.

Results: Average follow up was 11months (1- 57); 4 patients were lost at FU. Preoperative, postoperative and longterm radiological and clinical evaluation was collected. No cases of cement leakage occurred. All patients benefited from surgery postoperatively with pain disappearance in 16 cases, pain lowering in 5. Long term pain was under control in 2 patients, absent in 14 and higher in 1 patient with adjacent fractures at 5th month FU. 4 patients recovered after adjuvant treatment; 12 patients are alive with disease.

Conclusion: Indications for percutaneous vertebral augmentation procedure in patients with PVF is intense intractable pain in (1) patients with lytic metastasis at high risk of developing complications during open surgery, in (2) RT not sensitive disease, in (3) good prognosis primary lesion responding to onchological treatment.

Slerotic lesions, high mechanical instability, neurological compression, adhiuvant radiotherapy are absolute controindications. Percutaneous vertebral augmentation represents a powerful tool in the management of oncology patients who suffer from painful PVF due to the minimally invasive nature of the procedure.

FC-058

Alcohol instillation in aneurysmal bone cysts: outcome of 15 patients treated for ABC solely with alcohol instillation or using a combination therapy in surgically challenging anatomic sites

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Introduction: Aneurysmal Bone Cysts (ABCs) are locally aggressive, osteolytic bone lesions. Treatment options such as curettage, embolization and alcohol instillation are reported as viable treatment options. Depending on tumor site and size using a combination of these techniques might help to prevent persistent bone deformities and functional limitations.
Methods: Fifteen patients treated for ABC who underwent alcohol instillation between 2009 and 2014 as a mono- or combination therapy were retrospectively evaluated.
Results: All patients underwent incisional or computed tomography-guided biopsy to confirm diagnosis before undergoing treatment. Alcohol instillation was performed as a primary procedure in eleven cases. In four cases persistent/recurrent ABCs were treated after a primary curettage and reconstruction using bone cement (n=3) or synthetic bone substitutes (n=1). ABC sites were as follows: scapula (n=3), pelvis (n=3), sacrum (n=2), proximal femur (n=2), talus (n=2), proximal tibia (n=1), distal ulna (n=1) and proximal humerus (n=1). Four patients had a bone infraction before the beginning of treatment. Tumor size was between 5-10 cm in 66,6% of cases. A mean of 3,8 alcohol instillations were performed (range 1-9 instillations). Three patients received successful embolizations in addition to alcohol instillation, in four patients embolization failed for technical reasons. A mean of 2,6 embolizations (range 1-5) was performed. Additional surgery was performed in two patients, for two other patients surgery is scheduled. Consolidation of the ABC was observed in ten patients after a mean time of 2,7 months (range 1-6 months) and 2,8 alcohol instillations (range 1-5). In three patients with recent initiation of therapy the success of treatment still remains to be seen. In two patients ABC growth was observed despite alcohol instillation. The mean follow up is 13,1 months.
Conclusion: In our case series both sole alcohol instillation as well as a combination therapy including embolization and/or surgery have proven to be successful in the treatment of ABC. Therefore, in surgically challenging sites, we believe that a combination of alcohol instillation with other treatment options may prevent the development of persistent functional impairment.

FC-059

Percutaneous injection of synthetic tricalcium phosphate for the treatment of active simple bone cysts in children and adolescents

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Background: Fracture risk and probability of spontaneous healing of simple bone cysts is mainly related to the cyst activity and can be quantified with the cyst-index. The aim of our study was to evaluate the results after a minimally invasive treatment of active simple bone cysts with percutaneous aspiration, hydrogen peroxide lavage and injection of synthetic tricalcium phosphate.
Methods: We retrospectively included 21 patients (13.2 ±3 years) with 21 simple bone cysts (5 femura, 11 humeri, 5 calcanei) and 27 treatments at our department between 2006 and 2011. All patients were treated minimally invasive. At the femur, an internal fixation was performed prior to injection depending on size and location of the cysts. 13 patients presented with preceding fractures. At follow-up radiological healing (modified Neer classification), activity level, (re-) fracture, reinjection and complications were examined. The mean follow-up was 40 ±19.6 months.
Results: Partial or complete radiological response was observed in 81% after 13 ±3.4 months. After 1,5 months 95% of patients returned to unrestricted activity. In total 1 refracture (femur) as well as 2 (7%) wound infections were recorded and 5 patients (28%) required a second injection after 21 ±4.6 months. Of the latter, 3 showed healing after 12 ±0.3 months, 1 patient required a second injection with healing after 13 months.
Conclusion: The shown technique is a proper and minimally invasive option for the treatment of active simple bone cyst in children and adolescents. The use of injectable synthetic tricalcium phosphate provides primary stability especially at the upper extremity as well as the calcaneus and helps to avoid refractures. At the proximal femur additional stabilisation (e.g. elastic nails) is strongly recommended.

FC-060

Is it safe to initiate the treatment of musculoskeletal tumors with a cytological diagnosis?

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Introduction: Fine-needle aspiration (FNA) has not yet reached the value of trucut biopsy. Nevertheless in specialized centres results demonstrate the safety in the initiation of treatment. The purpose was to analyse to what extent FNA enables the initiation of treatment of musculoskeletal tumours.
Methods: One hundred and thirty FNA were performed. Ninety four were bone and 36 soft tissue lesions. Imaging control was performed by CT scan (64), ultrasonography (36) and radioscopy (30). The diagnostic yield (ratio between diagnosis achieved and all procedures) and accuracy (ratio between confirmed and achieved

diagnosis) were evaluated. A diagnosis was considered to be accurate when it was confirmed by histology or ulterior clinical/imaging evaluation. Exclusion of malignancy or infection was considered as diagnosis.
Results: Ninety diagnosis (69,2%) were obtained. Of these, 87 (96,6%) were accurate and the remaining 3 were wrong. In 15 (11,5%) the only possible conclusion was that the lesion was malignant (6) or benign (9). FNA was inconclusive in 25 (19,2%) cases.
Discussion: Despite the low diagnostic yield (69,2%), accuracy was of 96,6%. FNA allowed for the initiation of treatment in all 87 patients with a correct diagnosis and in the other 9 in which malignancy had been excluded. This equates to 96 of the 105 (91,4%). Considering the 6 biopsies with the information of malignancy, 2 were soft tissue lesions. Even here, treatment could be done, as the majority of soft tissue sarcoma protocols begin with surgery.
Conclusion: This study validates FNA as a method with a high diagnostic accuracy.

FC-061

The role of PET scan and biopsy in restaging patients with primary bone lymphoma

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Introduction: Lymphomas rarely originate from bone, constituting less than 1% of these tumors. Chemoradiation is the mainstay of treatment; however, surgery is frequently needed either for bone stabilization or for curative purposes, since it is suggested that wide resection is associated with improved survivorship.[1]
Methods: We retrospectively analyzed 16 patients with primary bone lymphoma operated during the last 10 years in a single institution. All but one had non- Hodgkin lymphomas. 5 cases were located in the femur, 4 in spine, 2 in tibia, 2 in the hip, 2 in the pelvis and 1 in the humerus. After the diagnosis was established, most of the patients underwent chemoradiation (unless a pathological fracture necessitated stabilization) and then restaging was performed (typically including PET) plus biopsy in equivocal cases. If viable tumor remained or there was impending fracture, we proceeded with operative treatment. In this manner, 2 patients had hip megaprosthetic reconstruction, 4 patients' curettage-PMMA placement, 2 had ORIF and in one patient with progressive kyphotic deformity kyphoplasty was performed.
Results: In 2 patients data were missing and were considered non- evaluable. In the remaining cases, one from the two patients with megaprosthesis had deep infection and was successfully treated with 2 stage-revision. No other hardware or procedure related complications were encountered. None from the operated patients experienced local relapse and the majority of the patient are alive in the latest follow- up.
Conclusion: Whereas in primary bone lymphomas chemoradiation is the preferred treatment modality, surgery is frequently warranted either for stability purposes or to improve survival. PET scan plus/ or biopsy are very useful to determine if remaining tumor exists that needs to be addresses surgically.
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FC-062

Radiofrequency ablation of atypical cartilaginous tumors in the long bones: an update of our current experience

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Introduction: Atypical cartilaginous tumours (ACT) are nowadays considered as tumours with intermediate malignant potential. Treatment of these lesions tended to be less aggressive in the last decade. More recently, we proposed to treat these tumours by radiofrequency ablation (RFA) in a proof-of-principle study, with promising results. Aim of the current study is to evaluate our consecutive experience with treatment of ACT in the long bones, by RFA.
Methods: A second prospective study was undertaken, in which patients with ACT in the long bones with a maximum diameter of 35mm were included. CT-guided biopsy was taken, subsequently followed by RFA in the same session. Three months later, usual care by curettage and phenolisation was performed and retrieved material send for histological analysis. Prior to ablation, a Gadolinium enhanced MRI was made to check for residual tumour, which was our primary endpoint. Secondary endpoints were the percentage of necrosis of the tumor tissue retrieved during curettage, occurrence of fractures and disease free survival after curettage.
Results: In total, 23 patients were included, with a 1:5 male to female ratio. Mean age was 50.1 (range 31 - 75). In 16 patients (74%) there was a complete response on G-MRI three months after ablation. On a histological level, In 16 patients (74%) total ablation was reached. In five patients some viable cells were still present after ablation and in two patients substantial residual tumor was seen. In four patients (17%) a fracture happened after curettage and one (4%) after RFA, all in femoral lesions. Disease free survival was 95.8% at a mean of 28.6 months (range 15-43 months) after curettage.
Conclusion: In conclusion, we have demonstrated that an increase in experience of using RFA in treatment of ACT in the long bones improves efficacy rates. Results are still promising, moreover since G-MRI seems reliable in monitoring the event of residual tumour. Currently, studies are conducted to treat even larger lesions by multiple needle positions. In our opinion, minimal invasive treatment could become the gold standard if surgical treatment is needed in ACT.

FC-063

Percutaneous CT-guided biopsy of the musculoskeletal system: experience and revisited results of 4086 cases performed in the last 25 years at the Istituto Ortopedico Rizzoli

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Background: This is the revisited presentation of a single institution experience to confirm once more, the role of percutaneous CT-guided biopsy in the clinical management of musculo-skeletal lesions.
Purpose: To evaluate results and define indications emphasizing the role of CT-guided biopsy in the diagnosis and staging of inflammatory and neoplastic lesions of the musculo-skeletal system.
Materials and Methods: From January 1990 until January 2015, 4086 core needle CT-biopsy were performed. All histologic diagnoses and imaging studies were reviewed. Site of procedure included spine in 1506, thoracic cage in 184, upper limb in 333, pelvis in 891 and lower limb in 1172 patients.
Results: At histology 2303 lesions were tumors or pseudotumoral lesions: 525 malignant bone tumors, 752 benign, 63 pseudotumors, 620 metastases. In 343 patients was found a systemic disease, in 525 patients an acute or chronic inflammatory disease, 479 had other diagnoses (stress fractures, metabolic diseases, chronic degenerative arthropaties, Paget etc.) and 42 had a LCH. In 116 (3%) the sample was inadequate for diagnosis and in 621 (15%) CT-guided biopsies procedure was not diagnostic: 69 patients had incisional biopsies and 668 a second CT-biopsy, diagnostic in 551 patients. This gives an overall rate of non-diagnostic exams of 5%. Major difficulties in obtaining a diagnostic sample were related with site, histotypes (small cells, myelomas, lymphomas are more difficult for adequate sampling), cronic inflammatory, insufficient pre-biopsy evaluation, insufficient cooperation from the patient.
Conclusions: CT-guided biopsy is a useful, low-cost and low radiation dose technique that should be recommended for most of the bony lesions, with or without soft tissues involment, namely deeply located and spinal lesions. Failures of this procedure can be reduced in experienced hands with a careful previous evaluation of the case and a team approach from the radiologist, orthopedic surgeon and the pathologist.

FREE COMMUNICATIONS SESSION V: Metastatic Bone Disease

FC-064

Prediction of survival after surgery due to metastases in the extremities

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Background: Prediction of survival of patients having surgery due to metastatic bone disease (MBD) in the appendicular skeleton is a valuable tool for a surgeon in ensuring he/she chooses the optimal surgical technique and implants that will outlive the patient and still poses the least surgical trauma possible. Our aim was to develop a prognostic model for predicting survival of patients undergoing surgery due to MBD in the appendicular skeleton.
Material and Method: A historical cohort of 130 consecutive patients whom underwent joint replacement surgery due to MBD in the appendicular skeleton in a tertiary orthopedic oncology referral centre during the period January 2003 to December 2008 was included into the study. Primary cancer, preoperatively haemoglobin, fracture vs. impending fracture, Karnofsky score, visceral metastases, multiple bony metastases and American Society of Anaesthesiologist's score was included into a series of logistic regression models. The outcome was the vital status at 3, 6 and 12 months respectively. Results are presented as risk nomograms. The logistic regression results were internally validated based on 1000 cross-validations and reported as time-dependent area under the receiver-operating characteristic curves (AUC) for predictions of outcome at 3, 6 and 12 months postoperatively.
Results: Data of 121 patients were included into the model; data of 9 patients were removed due to missing predictor values. The Kaplan-Meier method showed a probability of survival of 66.9% (CI: 58.6%;75.3%), 49.6% (CI: 0.7%;58.5%) and 38.0% (CI: 29.4%;46.7%) at 3, 6 and 12 months postoperatively. The predictive scores obtained from logistic regression showed AUC values of 79.1% (CI: 65.6%;89.6%), 80.9% (CI: 70.3%;90.84%) and 85.1% (73.5%;93.9%) at 3, 6 and 12 months, respectively.
Conclusion: For the first time we presented and validated a model for predicting survival after surgery due to MBD in the appendicular skeleton, built solely on material of patients having only surgery in the appendicular skeleton.

FC-065

Prognostic factors for survival in 551 patients with symptomatic metastases of the long bones treated with radiotherapy or surgery

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Introduction: Adequate prediction of remaining survival is an essential factor in the decision-making process when determining a patient-specific treatment plan for

symptomatic bone metastases of the long bones. This study aims to assess survival and evaluate prognostic factors in a cohort of patients with cancer and symptomatic bone metastases treated with radiotherapy and/or surgery.

Methods: From 2000 to 2010, 551 consecutive patients (mean age 64 years (range 10-93)) were treated for symptomatic metastases of the long bones in our institution (67% radiotherapy; 6% surgery; 28% radiotherapy and surgery).

The following risk factors for survival were analysed: age, gender, primary tumour, metastasis localisation, pathologic fracture, visceral and brain metastases, local treatment of the primary tumour, previous chemotherapy, treatment of the metastasis, performance score (KPS<70 (32%) *vs.* KPS≥70 (68%)), ambulatory ability (yes (incl. walking aids; 76%), no (wheelchair-bound/bedridden; 24%)), and presence and extent of bone metastases (solitary (10%), oligometastatic (2-4; 13%), diffuse (≥5; 67%)). Primary tumours were categorised into three groups of proliferation rate (rapid (expected survival <6 months; 35%), moderate (expected survival 6-12 months; 26%), slow (expected survival >12 months; 36%)) based on the Bollen classification[1]. Survival times were estimated from the first moment of local treatment. For statistical analysis univariate log-rank tests and multivariate Cox-regression analyses were performed.

Results: Median overall survival was 7 months (95% CI 5.8 – 8.2). At 2 years, 79% of all patients had died. Based on multivariate analysis, primary tumour type (HR 3.9, 95%CI 2.8-5.4), number of bone metastases (HR 2.0; 95%CI 1.1-3.3), performance score (HR 1.6; 95%CI 1.2-2.1), and ambulatory ability (HR 1.4; 95%CI 0.9-2.2) influenced survival. A negative significant impact of the presence of visceral metastases on survival was noted only for patients with slow growing tumours. There was no difference in survival between patients with 2-4 bone metastases as compared to diffuse metastatic disease, whereas patients with a solitary metastasis had the best survival.

Conclusion: Most patients with cancer and symptomatic bone metastases of the long bones have a limited survival. When deciding upon treatment, the primary tumour type is the most important prognostic factor to distinguish between short and long-term survivors.

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FC-066

What influences the prognosis of patients with appendicular skeletal metastases from breast carcinoma?

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Introduction: Breast cancer most commonly metastasises to the skeleton causing pain, fractures, spinal cord and nerve root compression which present to orthopaedic surgeons. Little is known about the characteristics which predict survival in patients with skeletal breast metastases when they present to orthopaedic surgeons. For surgeons, accurate estimation of life is important when deciding upon operative intervention for such patients, as the decision to operate, as well as the choice of surgical procedure, is predicated on a patient's estimated survival.[1]

Methods: Between 2001 and 2011, 113 patients from a prospectively collected database were analysed for clinical, radiological, serological and surgical outcomes. Inclusion criteria were breast carcinoma and histologically proven breast metastases of the extremities. Patients were excluded if no histological confirmation of breast metastasis had been obtained or if the patient presented with spinal metastases.

Results: Median age was 61 (29 to 90) years. The cumulative one and five-year survival was 68% and 16% (95% CI: 60 to 77% and 10 to 26% respectively). Sixty one patients (54%) underwent at least one surgical procedure and three patients underwent two separate surgical procedures. Thirty eight (34%) presented with complete pathological fractures and 24 (21%) were felt to have impending pathological fractures. Patient survival was significantly longer if, at presentation to an Orthopaedic surgeon, serum alkaline phosphatase (p=0.001) and corrected calcium were normal (p=0.01), no visceral metastases were present (p=0.02), if the disease free interval was greater than four years (p=0.002), and if the patient did not have metastases at initial breast cancer diagnosis (p=0.008). Hormone status, previous hormonal or oncological therapies, type of skeletal metastasis and other serological parameters were not associated with survival.

Conclusion: These parameters should be sought by orthopaedic surgeons when breast cancer patients present with appendicular osseous metastases to help estimate survival and therefore guide surgical management.

References:

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FC-067

Metastases of the proximal femur – Different surgeries according with the prognosis

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Introduction: The proximal femur is a common site of metastases, pathologicfractures and impending fractures that almost always requires surgical treatment to ensure mobility, autonomy and well-being, and to improve survival. The preoperative evaluation, understanding the risks and complications and their integration in the prognosis of the disease is essential for the treatment option. There are several surgical attitudes: osteosynthesis, hip replacement, extended resection and

reconstruction with megaprostheses.
Objectives: Retrospective, clinical and radiological studie of pathological or impending fractures of the proximal femur treated surgically between January 2008 and March 2013, in different ways, to infer the suitability of the attitude.
Methods: Between 2008-2013 were operated in our institution 26 orpathological or impendig fractures of the proximal femur. The etiology was breast cancer metastases (5), lung (4), prostate (4), bladder (3), multiple myeloma (3), between others. Fractures occur or could happen in metastases involving the neck (12), the trochanteric and subtrochanteric region (11), the proximal femur shaft (2) or the entirety of the proximal femur (1). The treatments carried out were: osteosynthesis in 4 cases, intramedullary nailing in 12, total hip replacement in 10 wherein 2 cases of total hip replacement with prosthesis revision after extended resection of metastasis.
Results: Half of the patients treated with osteosynthesis were in an advanced stage, with a median survival of 3.5 months. 50% of patients treated with Nail died and the survival was 10.7 months. In Total hip replacement was registed 40% deaths with a median survival of 13.2 months. Despite Arthroplasty not seem the most appropriate treatment for most surgical aggressiveness and risk spreading, in mechanical and functional terms, may be the only recourse. The extended resection and total hip replacement with revision prosthesis was reserved for solitary metastases and extensive region of the proximal femur, and the goal was not merely to solve the problem but functional condition positively the prognosis.
Conclusions: The surgical option depends on the location of metastasis and mechanical constraints. However, the choice should take into account global aspects of the disease, survival according to ongoing treatments, and surgical attitude should be integrated into group lookup.
Keywords: Femur; Metastases; Prognosis

FC-068

Prophylactic fixation of impending fractures of long bones with unreamed expandable intramedullary nails

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Introduction: The aim of our study is to determine the safety and efficacy of an unreamed expandable intramedullary nailing system in stabilization of impending fractures of long bones due to metastatic disease.
Materials and Methods: An unreamed, expandable nail was implanted in 31 consecutive patients (13 male, 18 female) aged 41-86 years during 2006-2011. All patients had multiple bone or visceral metastases and signs of impending fracture due to extensive osteolysis. We stabilized 12 impending humeral fractures (11 antegrade/1retrograde, 15 femoral (13 antegrade/2 retrograde), 3 pertrochanteric with cephalomedullary nailing and 1 tibial fracture. No medullary reaming was performed. No distal interlocking was used due to the long frictional contact to the bone after the hydraulic expansion of the nail and consequent axial and rotational stability.
Results: The operative time was approximately 32 min (20-55). There were no problems related to the wound, deep infections, or nerve palsies. No blood transfusion was necessary. On follow-up (4-43 months) all patients were reviewed. Significant pain relief was demonstrated and patients soon regained functionality. There were three complications, which were treated successfully. An incomplete longitudinal diaphyseal femur fracture caused by the expansion of the nail, a fracture of the material after a violent fall and one periprothetic fracture of humeral diaphysis.
Conclusions: The expanding nail can be implanted quickly with minimal blood loss and morbidity. It is a safe method that achieves mechanical stability, improves pain and function, and ensures continuation of treatment for the primary disease.

FC-069

To vent or not to vent?

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Introduction: Spanning the whole femur is considered by most authorities the gold standard in the treatment of metastatic lesions, in order to avoid further fractures and reoperations. However, the incidence of cardiopulmonary complications may be higher when longer implants are being utilized; Venting (drill hole in the distal cortex) has been suggested to reduce the intraosseous pressure and subsequent cardiopulmonary events. The purpose of this study is to investigate the correlation of venting and pulmonary events in patients treated with long endoprosthesis for peritrochanteric metastatic lesions.
Methods: We retrospectively analyzed 19 consecutive cancer patients operated during the last 3 years in a single institution; patients suffered from peritrochanteric fractures (or impending fractures) and were operated on either with long stemmed hemiarthroplasty, calcar replacing hemiarthoplasty or proximal femoral endoprosthesis (up to 7cm resection). In 5 patients venting was performed in the distal part of the prosthesis; pulmonary events were recorded and analyzed (including death, pulmonary embolization or desaturation of more than 10mm Hg in Po2). Statistical analysis was done with SPSS version 19.0.
Results: In 2 patients data were missing and were considered non- evaluable. In the remaining patients 3 serious cardiopulmonary events were encountered: 2 pulmonary emboli (one fatal and the other requiring ICU admission) and one serious desaturation of 13mm Hg in Po2, in the non- venting group. No patients with vent hole experienced pulmonary events (0% vs. 25%); however difference was not significant ($p>0.5$, Chi -Square with Yate's Correction).
Conclusion: Venting may lessen the likelihood of serious

cardiopulmonary events during insertion of ling stemmed endoprosthesis, although our study was underpowered to support this notion. On the other hand surgery is prolonged and therefore each case should be individualized and tailored to the patient comorbidities, habitus and operative conditions.

FREE COMMUNICATIONS SESSION VI: Skeletal Reconstruction

FC-070

Preservation of the gluteus maximus blood flow reduces postoperative complications after pelvic tumor resection

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Introduction: Pelvic and sacral tumor resection is challenging, and is associated with considerable mortality and high morbidity. The difficulty of pelvic resection includes the difficulty in controlling the postoperative complications. Infection and wound healing problems are the most frequent postoperative complications that occur after pelvic tumor resection. Both of these problems are closely related to poor local blood flow. We aimed to assess the influence of the intentional preservation of the gluteus maximus blood flow on the postoperative complications following pelvic tumor resection.
Methods: From 2010 to 2014, a total of 14 pelvic and sacral tumor resections were performed; these included nine internal hemipelvectomies, two cases of intralesional resection and curettage, two sacrectomies and one external hemipelvectomy. The types of internal hemipelvectomies were five P1 cases, one P1/4 case, two P2/3cases and one P3 case. During all operations, the inferior gluteal arteries were preserved under direct vision. Approximately three months after each surgery, the blood flow of the inferior gluteal arteries, the feeder arteries of the gluteus maximus, was evaluated by computed tomography (CT) or magnetic resonance imaging (MRI).
Results: The preservation of the blood flow of the inferior gluteal arteries was confirmed by postoperative CT or MRI in all patients. The mean follow-up was 36.3 months (2-56 months). The postoperative complication rates were 21.4% (three out of the 14 operations), but no patients experienced a postoperative deep infection. Two patients suffered from skin necrosis and one patient had a wound hematoma. Wide margins were achieved in all patients except for the case with intentional intralesional tumor resection curettage. There was no tumor recurrence in any case. One patient died of brain metastasis six months after the operation. All other patients achieved complete disease-free survival.
Conclusion: The reported overall complication rates, wound infection rates and flap necrosis rates following pelvic and sacral tumor resection ranged from 45 to 60%, 29 to 77%, 26 to 80% respectively. We therefore conclude that the intentional preservation of the inferior gluteal arteries contributes to reducing the postoperative complication rate.

FC-071

Saving an extensor mechanism reconstruction after proximal tibia resection

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Introduction: The limb salvage surgery in bone tumors of the proximal tibia has encouraged the development of megaprostheses and osteochondral allograft that are used to preserve joint movement.
Despite numerous surgical options have been proposed, the recostrucion of extensor mechanism represent a challenge for the surgeon because of the poor functional outcome mostly related to unreliable surgical options. We describe a modified technique that saving the continuity of the extensor apparatus indicated for patients in which the lesion does not involve the anterior cortex of the tibia. The approach involves an appropriate oncologic resection, removing the whole proximal tibia, including the metaphyseal area, saving anterior tibial splint that includes the insertion of the patellar pretibial ligament. The loss of substance is replaced by the implant of a Stanmore hinged prosthesis. the patellar ligament is reattachment to the tibial tuberosity, and the repair is protected with a cerclage wire.
Methods: We retrospectively reviewed 8 patients (4 Male, 4 Female) with high- grade primary malignant tumours who underwent this procedure from 2012 to 2013. The mean age of the patients was 30 years (17 to 38). The mean follow-up was 1 years.
Results: Active knee extension was obtained in all patients, with an extensor lag of 0° to 15°. MSTS-ISOLS scores ranged from 67% to 90%. This technique resulted in good quadriceps function and a low incidence of complications, no patients had patellar ligament avulsion or deep infection.
Conclusions: Our experience confirms the ability of this procedure to provides good functional outcome. This may related to allows us to maintain the continuity of the extensor apparatus at its distal attachment, which is the most critical issue in extensor apparatus reconstruction.

FC-072

Postoperative complications prevents from giving radiation on time

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Introduction: Radiation therapy may be given pre or postoperatively as an adjuvant to the surgical treatment of a soft tissue sarcoma. Some patients who are planned to receive postoperative radiation have a wound complication or an event that sometimes delay the initiation of radiation

treatment. We retrospectively reviewed a series of 70 patients to determine how many patients did not receive radiation therapy in due time and the reasons for it.
Methods: 70 patients scheduled for postoperative radiation were included over a three year period. The mean age was 60; there were 38 (54%) male patients. The most common histologies were undifferentiated sarcoma, liposarcoma, and myxofibrosarcoma; 47 sarcomas were high grade. Patients presented with preoperative comorbidities such as: diabetes (n=11), cardiovascular diseases (n=19), smoking habit (n=22), preoperative chemotherapy (19).
Results: Overall 17 (24%) did not receive radiation on time; of which, 4 did not receive radiation at all. The main reason for not receiving radiation on time was a reoperation postoperatively (12 patients). Overall 27 patients underwent a reoperation; the main reasons for reoperation were wound complication, infection, and tumoral reasons. We could not identify preoperative variables associated with a higher risk of not receiving adequate radiotherapy; only reoperation was associated with inadequate radiotherapy.
Conclusion: When planning postoperative radiotherapy, surgeons and radiation oncologists should account for the possibility that some patients may not get it on time. Giving radiotherapy preoperatively ensures that patients get the complete local treatment.

FC-073

Polypropylene mesh use in orthopaedic oncologic reconstruction

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Soft tissue reconstruction following musculoskeletal tumor resection presents challenges in terms of anatomical and functional integrity. Polypropylene mesh is the gold standard in surgical repair of abdominal wall hernia, however it can also be used in a wide variety of conventional and unconventional settings in orthopedic oncologic reconstruction.
Review of our orthopedic oncology registry yielded 128 patients who underwent surgical treatment involving polypropylene mesh between 1990-2014. Twenty-three patients were excluded from outcome analysis due to insufficient follow-up. The mean age of the patient population was 34,0 (9-73) years and the mean follow-up was 23 (1-122) months. Eighty-six patients underwent surgery for primary or recurrent sarcoma, 10 patients for bone metastasis of carcinoma, 4 patients for chordoma, 3 for desmoid tumor, 1 for multiple myeloma, 1 for revision of tumor prosthesis, 1 for insufficiency of biological reconstruction and 1 for pre-radiotherapy spacer insertion. Polypropylene mesh was used in 39 lower extremity, 30 shoulder, 29 pelvis and 10 thoracoabdominal wall reconstructive procedures. When categorized according to purpose of use, polypropylene mesh was used to provide anchorage for muscle and/or tendons in 59 patients, shoulder and hip capsule reconstruction in 42, thoracoabdominal wall hernia prevention in 14, acetabular joint surface reconstruction in 2, femoral diaphyseal bone reconstruction in 1 and diaphragm reconstruction in 1 patient.
Wound problem, which was observed in 18 (17%) patients, was the most common complication with possible link to mesh use. Twelve (11%) of these 18 patients also developed deep infection. Ten (83%) out of 12 patients with deep infection were patients who underwent pelvic tumor resection and were therefore naturally more inclined to develop wound problems. Eight (66%) out of 12 patients with deep infection were successfully treated with intravenous antibiotic, debridement and negative pressure wound treatment. One patient with articular surface reconstruction showed degenerative changes. One patient with cortical reinforcement showed solid union. No symptomatic joint dislocation or herniation was observed. We conclude that polypropylene mesh is a mechanically and biologically reliable reconstructive tool in orthopedic oncology with a wide scope of usage depending on surgeon's creativity.

FC-074

The pedicled latissimus dorsi flap for soft tissue reconstruction following excision of a musculoskeletal neoplasm of the shoulder

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Introduction: Limb salvage surgery for musculoskeletal neoplasms of the shoulder region often results in large and complex soft tissue defects associated with exposed bone and massive orthopaedic implant. While primary closure of smaller defects is occasionally possible, suboptimal soft tissue coverage of larger may lead to wound breakdown, deep infection, and soft tissue contracture even when healing occurs. This study focuses on the pedicled latissimus dorsi flap reconstruction for oncologic shoulder defects in patients treated at our Institution. We hypothesized that pedicled latissimus dorsi flap is a reliable technique for soft tissue reconstruction of the shoulder region, associated with predictable healing, successful limb salvage surgery and low complication rate.
Methods: We retrospectively reviewed 47 consecutive patients that underwent a pedicled latissimus dorsi flap for reconstruction of a shoulder soft tissue defect following excision of a musculoskeletal malignant neoplasm between 1994 and 2013. Patient population and malignancy characteristics, adjuvant therapies, and oncologic resection defects were analyzed. Flap specifics, skeletal reconstruction, healing time and complications,

including flap loss, deep infection and need for further surgery, were analyzed.
Results: All underwent wide or radical en-bloc tumor excision. Adjuvant therapies included chemotherapy (32 patients), and radiation (16 patients; external beam in 14 and brachytherapy in 2). Twenty-three patients had an allograft or an alloprosthetic composite reconstruction, while a metallic prosthesis was used in 24 patients. Wound size averaged 280.1 cm2 (10-1,225 cm2). All 47 patients had successful healing. There were no flap losses. Two flaps exhibited partial skin necrosis that healed with conservative management. Two developed a seroma that resolved with aspiration. Healing ultimately occurred in all patients except one whom developed deep infection and was subsequently managed by staged revision. One patient with allograft-prosthetic composite required iliac crest bone grafting for humeral non-union. One required amputation due to local recurrence. Thirteen patients died during the study period (3 patients with unknown cause, 10 patients from tumor recurrence).
Conclusion: The pedicled latissimus dorsi flap in complex shoulder reconstruction provides well-vascularized tissue, minimizes infection risk, and maximizes limb salvage. While relatively limited anterior shoulder defects may be successfully managed by alternative methods or other flaps, eg. pectoralis major, the latissimus dorsi flap is reliable and addresses larger defects. For these reasons, the pedicled latissimus dorsi flap is our choice for reconstructing shoulder defects after tumor excision.

FC-075

How to avoid and treat nonunion of proximal humerus and femur after biological reconstructions – Biomechanical aspects

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Introduction: In cases where the resection lies below the intertrochanteric line of the femur or surgical neck of the humerus biologic reconstruction is an option to endoprosthetic reconstruction especially in young patients or low grade sarcomas. Due to the potential risk of infections autologous grafts are preferred by some. The initially inferior diameter of the fibula may lead to failure of the graft due to inadequate loading if positioned wrongly. We present the wrongly positioned grafts with different types of fixation rigidities and the resulting nonunion and disappearing bone syndrome as well as prompt healing after correct graft loading.
Material and Methods: From 107 fibular grafts 33 were proximal humerus and 15 proximal femurs. From these 5 humeral and two femoral intercalary grafts that biomechanically failed were evaluated according to graft positioning, fixation type, resection length and graft type, age and tumor type. We compared them with biological reconstructions that worked well.
Results: Proximal femur: 9 year old boy, Ewings, resection, 16 cm, rapid osteolysis and thinning of the 18cm autologous fibula when placed laterally, but recovered quickly when repositioned medially. 17 year old female, HG osteosarcoma, resection 21cm, 23cm long vascular fibula had repeated plate failure despite repeated bone grafting until placed medially. Proximal humerus: 8,11,13,21,45 years, 1 osteosarcoma, 3 Ewings, 1chondrosarcoma, resection 18cm (11-22), graft 21cm (15-27), 4 philos plates, 1 semicircular plate. 4 fibulas non-vascularized, one vascularized combined with allograft humeral head. When graft placed in medial part of humeral head it fractured proximally and resorbed, when centrally it fractured proximally, when laterally a non union occurred distally. |Allograft resorbed complete lateral to fibula position. Fixation with 3 compared to 5 screws in humeral head failed. This healed by brace and adaptive fixation with 3 K-wires.
Conclusion: Fibular grafts must be placed in compression parts: in proximal femur medially in proximal humerus laterally to achieve good healing. If placed opposite resorption of graft occurs. Central positioning leads to non unions especially with too rigid fixations. Proximal humeral non-unions can be healed with adaptive osteosynthesis and bracing - in contrary to distal humerus where rigid fixation is recommendable.

FREE COMMUNICATIONS SESSION VIIA: Allografts – Megaprostheses

FC-076

The mechanical effect of extracorporeal irradiation on bone

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Extracorporeal irradiation and re-implantation of a bone segment is a technique employed in bone sarcoma surgery for limb salvage in the setting of reasonable bone stock. There is neither consensus nor rationale given for the dosage of irradiation used in previous studies, with values of up to 300Gy applied. We investigated the influence of extracorporeal irradiation on the elastic and viscoelastic properties of bone. Bone specimens were extracted from mature cattle and subdivided into thirteen groups; twelve groups exposed to increasing levels of irradiation and a control group. The specimens, once irradiated, underwent mechanical testing in saline at 37^{o}C.
Mechanical properties were calculated by experimental means which included Young's Modulus, Poisson's Ratio, Dissipation Factor, Storage Modulus, Loss Modulus and Dynamic Modulus. These were all obtained for comparison of the irradiated specimens to the control group. We found there to be a statistically significant increase in Poisson's ratio after increasing irradiation doses up to 300Gy were applied. However, here was negligible change in all other mechanical properties of bone that were assessed. Therefore, we conclude that the overall mechanical effect of high levels of extracorporeal irradiation (300Gy) is

minute, and can be administered to reduce the risk of malignancy recurrence.

FC-077

Periprosthetic fractures after massive knee and hip prosthesis: a retrospective analysis of 21 cases

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Introduction: Massive hip and knee replacement have become the gold standard for reconstruction of patients with bone tumors. Fixation, either cemented or uncemented, into host bone has improved over time. However, some patients present with periprosthetic fractures. The treatment of these fractures remains challenging. The objective of this study is to analyze a series of 21 periprosthetic fractures.
Methods: 21 periprosthetic fractures (20 patients) were included. All patients were treated at tertiary care center by senior surgeons. There were 12 (57%) women, 7 (33%) patients had already had 1 or more revision. The median age was 39. All implants were fixed hinge cemented prosthesis. 19 patients had chemotherapy, and 6 had radiation. There were 9 (43%) fractures of the femur, 9 (43%) of the tibia, and 3 (14%) of the patella. There were 3 B1, 15 C, and 3 F according to the UCS classification.
Results: 4 fractures were treated conservatively and 17 were operated on. Only 1 patient had the implant revised. After the treatment, 8 patients were revised over followup. The cumulative probability of revision for any reason was 17% (4 - 37), 23% (7 - 45), and 46% (19 - 70) at 2, 5, and 10 years respectively.
Conclusion: Periprosthetic fractures around massive endoprostheses are different from that of standard implants. There are less implants loose at the time of presentation but the risk of revision after treatment is high.

FC-078

Use of osteoarticular bone allografts in limb salvage reconstruction of the proximal tibia

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Limb sparing procedures are the standard for local control of malignant or benign aggressive bone tumors in the appendicular skeleton. Reconstruction and restore of function can be achieved by means of osteoarticular allografts, alo-prosthetic composite and endoprothesis. The proximal tibia is a demanding surgical site due to the lack of soft tissue coverage and the need of sacrifice some of the vascular systems of the leg.
Objective: To evaluate of the functional, oncological outcomes and complications of 32 patients operated between 2001 and 2012 using osteoarticular bone allografts for reconstruction after resection of the proximal tibia. To compare this outcome with the ones obtained in resections of the distal femur.
Material and Methods: This is a retrospective descriptive study (case series) based on the analysis of the clinical records and imaging studies of patients suitable of limb sparing procedures in or institution. Follow up 3-132 months.
Results: Osteosarcoma was the most common diagnosis (65%). No local recurrences were found. The functional result according to the MSTS system was 70 (64-76). With regard to complications: superficial infection was found in 8 patients (25%) and deep infection in 5 (15,6 %). 2 out of these 5 patients ended in an amputation. Nonunion 5 patients (15,6%), and articular failure 14 patients (46,7%). The functional result of distal femur reconstruction in our historical series was 80 and the infection rate was 9% (difference statistically significant).
Conclusions: Osteoarticular bone allograft reconstruction of the proximal tibia is a reasonable alternative in limb sparing surgery providing an adequate tumoral local control is achieved. Restoration of bone stock and conservation of the adjacent joints favor the use of osteoarticular allografts, but higher rates of complications were found compared to other anatomic sites like distal femur.

FC-079

Joint sparing surgery using recycled tumor-bearing autograft for osteosarcoma

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Introduction: To avoid late complications of megaprosthesis, or dysfunctional loss from arthrodesis or amputation, we have performed joint sparing surgery using recycled tumor-bearing autograft for osteosarcoma in children or adolescents when more than half of their articular surface could be spared.
Methods: Eight patients with osteosarcoma who underwent joint sparing resection and reconstructed recycled autograft between 2005 and 2013 were included in this study. There were six males and two females with a mean age of 14 years (range, 8-26). Seven patients were diagnosed as conventional types and one was low grade central type. The average follow-up period was 49 months (range, 13-122). The location was around the knee in six patients and the distal tibia in two. We retrospectively analyzed the clinical data for each patient, including details of the recycled bone, bone union, oncological outcome, complications, and functional results.
Results: There was no local recurrence during follow-up. The overall 5-year survival rate was 100%. Early or late infection or absorption of recycled bone was not found. The average length of the recycled autograft was 164 mm (range, 70-300). Pasteurisation was performed in three patients and liquid nitrogen treatment in five patients. Intercalary grafting was conducted for six cases and hemi-osteoarticular grafting for two (fig.1). A bone union was achieved in six of eight cases (75%) after a mean interval of 9.3 months. In one case with non-union, we induced pseudarthrosis to allow bone growth. The other

non-union case is currently at postoperative 13 months and considered to be delayed union. The average Musculoskeletal Tumor Society (MSTS) score was 87% (range, 76-100) and the average Toronto Extremity Salvage Score (TESS) was 93% (range, 82-99). The range of motion of the affected joint averaged 86% (range, 63-100) compared to that of the contraslateral unaffected joint.

Conclusion: The functional result of the current series compared favorably with that of megaprosthesis in previous reports. The range of motion was excellent with an average of 86%. Although technically demanding, joint sparing surgery using recycled autograft is a useful and inexpensive reconstruction method which provides excellent function, a low complication rate and long-lasting local stability.

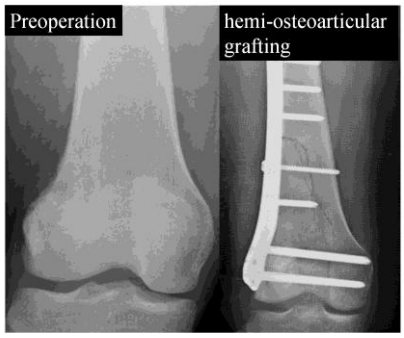

Figure 1

FC-080

Aseptic loosening of knee megaprosthesis: 22 years data analysys (the East-European Sarcoma Group)

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Introduction/Purpose: In spite of 5-year increasing of implants survival from 20% to 85%, nowdays the urgency of this problem isn't reduced. Identify the main causes of implants loosening, frequency and probability of re-replacement.

Material and Methods: Since 1992 to 2014, to 538 patients have been carried out 357/615 (58%) primary and revision replacement at the knee region. For the period of 22 years were conducted 66 revision replacements of knee region. After the distal femur resection was performed 40 and after proximal tibia 26 revisions. Repeated revision have been carried out to 9 patients after distal femoral and 6 after proximal tibial resection. One patient had 5 revisions. The mean follow up was 61,5 months (median 47,7; range, 0,1-252,1).

Results: Survival of the megaprosthetic after distal femur replacements was 70,3% and 53,9% at 5 and 10 years and after proximal tibia resection 55,8% and 26,8%. The incidence of aseptic loosening was 14,6%. The main complication was stem fracture. Terms of aseptic loosening in our study ranged from 0.47 to 124.7 months and average was 26.5 months (median 15.7 months). In our study, the probability of the first revision replacement was 10.4%, the second - 23.2%, the third - 38.5%. The number of aseptic loosening after revisions is 2.4 times higher after primary endoprosthesis.

Conclusion: The correct choice of stem and method of fixation extends the life of the endoprosthesis, to reduce the number of repeated revisions.

FC-081

Long-term results of knee replacement with MUTARS® modular endoprostheses in treatment of primary tumors

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Introduction: Modular endoprostheses are commonly considered the gold standard for reconstruction after resection of tumors around the knee. However, studies focusing on the long-term results of such prostheses in the treatment of primary tumors are scarce.

Methods: All consecutive patients in whom the knee was reconstructed with a non-silver coated MUTARS® modular endoprosthesis (implantcast, Buxtehude, Germany) between 1995 and 2009 were retrospectively evaluated. Implant survival was estimated with the Kaplan-Meier method. Patients were followed for a minimum of 5 years or until death.

Results: We evaluated 89 reconstructions, performed in 81 patients (46 males, 57%) with a mean age of 37 years (13-82). Predominant diagnoses were osteosarcoma (n=50, 62%) and chondrosarcoma (n=9, 11%). Mean follow-up was 10.2 years (5.0-18.0) for 50 patients alive at follow-up (62%), and 3.1 years (0.4-14.1) for 30 deceased patients (38%). Seventy reconstructions (79%) were distal femoral replacements (59 uncemented, 84%; 31 of which hydroxyapatite-coated, 53%). Nineteen (22%) were proximal tibial reconstructions. Median length of the reconstructed defect was 15.5 cm (12-30). Twenty-seven patients (33%) had an extra-articular resection. One or more further procedures were undertaken in 47 patients (58%). Complications of soft-tissue or instability occurred in four reconstructions (5%), aseptic loosening in 15 (17%), structural complications in 13 (15%). Hydroxyapatite coating significantly decreased the risk of loosening for uncemented distal femoral replacements (OR 0.1). Infections occurred in 13 reconstructions (15%), local recurrences in 11 patients (12%). Failures (implant removal, major revision or re-fixation) occurred due to aseptic loosening (n=15, 17%), infection (n=8, 9%), tumor progression (n=7, 9%) and structural failure (n=6, 7%). With failure for mechanical reasons as the end-point, implant survival rates at five, ten and 15 years were 78, 71 and 65%. At last follow-up, 70 patients (86%) had a MUTARS® in situ.

Conclusion: Although complication rates remain substantial, MUTARS® appears to represent a reliable solution for knee replacement after tumor resection. Mechanical failure rates are acceptable and most can be managed with a second procedure. Aseptic loosening is

the most important complication. We consider uncemented hydroxyapatite-coated implants the most viable solution for durable fixation.

FC-082

Uni- or bipolar proximal femoral endoprostheses following tumour reconstruction: are acetabular resurfacings necessary?

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Introduction: Proximal femoral endoprosthetic replacements (PFRs) have a reported dislocation rate of between 2% and 17%, which is reduced with large diameter uni- or bipolar heads. Without acetabular resurfacing, pain due to wear necessitating revision surgery has been reported.
Methods: We retrospectively reviewed 100 consecutive proximal femoral replacements used for tumour reconstruction from 2003 to 2014 without acetabular resurfacing. In 74 patients the procedure was undertaken for metastases, in 20 for a primary bone tumour, and in six for other malignant conditions. There were 48 males and 52 females with a mean age of 61.4 years (range 19 to 85 years) and a mean follow-up of 1.9 years (0 to 11.1 years). Fifty two presented with a pathological fracture and six presented with failed fixation of a previously instrumented pathological fracture.
Results: All patients underwent reconstruction with either a unipolar (n=64) or bipolar (n=36) articulation. There were no dislocations and no amputations. Groin or thigh pain was reported in 10 patients at last follow-up. Articular wear was graded from 0-3, whereby 0 is normal and 3 represents protrusio acetabuli. Of the 49 patients with radiological follow-up greater than one year, six demonstrated grade-1 acetabular wear and two demonstrated grade-2 acetabular wear, the remainder demonstrated no radiographical evidence of wear. Mean medial migration was 0.4mm (3.8 to -1.4mm) and superior migration was 0.6mm (3.5 to -0.5mm). There was no statistical relationship between groin pain nor heterotrophic ossification and acetabular wear. Revision surgery was required in 3 patients; two for periprosthetic sepsis and one for stem-fracture. The mean Toronto Extremity Salvage score was 65% (26% to 96%) at final follow-up. The estimated five-year implant survival with revision as the end-point was 94.7% (95% CI: 87% to 100%). The overall patient survival was 63% at one year and 26% at five years.
Conclusion: Acetabular wear with uni- or bipolar proximal femoral replacements for tumour reconstruction does not lead to acetabular wear necessitating revision to acetabular resurfacing and eliminates joint instability.

FC-083

Endoprosthetic failure after resection of primary or secondary bone tumors in the proximal humerus and reconstruction with the MUTARS™ system – A systematic analysis

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Introduction: We sought to evaluate the reasons for the first endoprosthetic failure following resection of bone tumors in the proximal humerus and reconstruction with MUTARS™ megaprostheses.
Methods: We retrospectively analyzed the files of 102 patients, who underwent resection of the proximal humerus due to locally aggressive (n=8), primary malignant bone tumors (n=66) or bone metastases (n=28) and reconstruction with the MUTARS™ system between 1998 and 2011. Failure modes were classified according to Henderson et al. as mechanical (soft tissue failure - type I, aseptic loosening - type II, structural failure - type III) and nonmechanical (infection - type IV, tumor progression - type V). Non-parametric analyses were performed with the Mann-Whitney U test. Survival curves were calculated with the Kaplan-Meier method and compared with the log-rank test.
Results: The mean duration of surgery was 193 minutes (range, 85-355 minutes). The mean reconstruction length amounted to 14 cm (range, 9-22 cm). The mean follow-up was 52 months (range, 1-172 months). 17 patients (17%) suffered from an endoprosthetic failure after a mean interval of 26 months (range, 1-155 months). The prosthesis survival probability amounted to 89% after 1 year and 81% after 5 years.
The most common failure mode was infection developing in 8 patients (47% of all failures), followed by soft tissue failure and structural failure in 4 patients (24%) each and an aseptic loosening in 1 patient (5%). A tumor progression developed in 7 patients, one of whom underwent an amputation, having previously developed a type IV failure. Neither reconstruction length nor duration of surgery correlated with the probability of endoprosthetic failure in general (p=0.512/p=0.807), or a type IV failure in particular (p=0.416/p=0.772). Local radiotherapy was also not associated with a significantly higher failure probability (26% vs. 19% after 5 years, p=0.358). The mean American Shoulder and Elbow Surgeons (ASES) score was 65 (range, 13-93).
Conclusion: The implant failure probability following tumor resection and prosthetic reconstruction with the MUTARS™ system in the proximal humerus is comparable to that of other systems. The most common failure mode was infection. Local radiotherapy, reconstruction length and duration of surgery appear to have no influence on failure probability.

FC-084

Intercalary allograft reconstruction after resection of primary bone tumors

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Introduction: The treatment of bone tumors in diaphyseal / metadiaphyseal sites of long bones (with joint preservation) has several options including massive intercalary allografts, autografts (vascularized or non-vascularized fibular autograft, extracorporeal irradiated bone autograft), endoprosthetic replacement (intercalary spacer), cementoplasty with ostheosynthesis and distraction osteogenesis. Reconstruction using massive intercalary bone allografts is the method of choice in case of curable primary bone tumor resections for us.

Methods: Our retrospective study reviewed 41 patients treated by intercalary allograft reconstruction after resection of primary bone tumors in the years 2000-2014. The group consists of 27 men and 14 women with mean age at the time of diagnosis 27 years and mean follow-up (from primary surgery) for 7 years. The diagnoses were Ewing/s sarcoma (14), chondrosarcoma (9), osteosarcoma (8), adamantinoma (6), OFD-like adamantinoma (2), aneurysmatic bone cyst (1) and giant cell tumor (1). The site of tumor were tibia (19), femur (16), humerus (4), radius (1) and ulna (1). We evaluated radiological and functional results of reconstruction, the incidence and risk factors for failure and complications, as well as the possibilities of failure solutions.

Results: 14 patients (35%) were succesfully treated without any complication. 8 patients (20%) had local recurrancy, metastatic disease has developed in 6 patients and 3 patients died because of progression of disease. The major complications of reconstruction were nonunion (51%), fracture of osteosynthetic material (24%), fracture of allograft (10%), allograft resorption (10%) and infection (7%). The average number of surgical revision for each patient was 1,2 (0-6). Extraction of osteosynthetic material, dynamization of intramedullary nails and open biopsy for suspected local reccurancy were not counted. 7 patients (17%) underwent amputation, 6 of them for local reccurancy and 1 for infection. Besides routine revisions (reosteosynthesis, spongioplasty) we used vascularized fibular autograft in 4 cases, new allograft in 3 cases, implantation of revision TKA (using the original allograft) in 1 case and implantation of tumorous type of THA in 1 case (after allograft infection and explantation) for solving of reconstruction-related complications.

Conclusion: The intercalary bone allograft reconstruction is the method of choice, however it is connected with high rate of complications.

FC-085

Results of massive osteochondral allograft reconstruction for tumors at the knee area

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Background: Limb preservation is now the standard method of treatment for most bone tumors. Limb-salvage operations in malignant bone tumors have been shown to have similar recurrence rates to amputation.

There are a variety of reconstruction options after excision of distal femoral and proximal tibial bone tumors including metallic prostheses (megaprostheses), expandable prosthesis for children, composite of an allograft and prosthesis, arthrodesis of the knee, reconstruction using autografts, allografts and reimplantation of sterilized tumor bone (after autoclaving/pasteurisation /microwave / liquid nitrogen/irradiation), rotationplasty remains an alternative Osteochondral allograft or total knee replacement are used to preserve joint movement in patients with bone tumours of the distal femur and the proximal tibia. Each of these techniques has different indications and complications.

In the osteochondral allograft surgical procedure, a higher incidence of infection, fractures, and loss of fixation is reported. Nevertheless, it has the advantage of minimising bone resection and preserving the articular surface of the distal femur (or proximal tibia) and patella. Better final functional results were found compared with other methods.

Patients and Methods: In our paper we retrospectively surveyed the results of 39 bone osteochondral allograft reconstructions in the knee area performed in our department between years 2000-2012. In those years we performed 19 distal femoral and 20 proximal tibial resections for bone tumours and conseqenting reconstruction of resected area using osteochondral allograft. There were 17 females and 22 males in the group. Average age was 29, 6 at the time of procedure (range 5 - 51 years), mean follow up was 7, 4 years (range 2-14 years). The basic diagnosis was osteosarcoma at 24 cases, giant cell tumor at 12 cases, and Ewing sarcoma at 3 cases.

Results: The complications includes generalization of tumor 9x, local recurrence 12x, allograft necrosis 4x, fracture at the site of allograft 5x, pseudoarthrosis 6x, instability 8x, arthrofibrosis 3x, infection 1x, other complication 5x. There were 7 patients without severe complication. Conversion to tumorous total knee arthroplasty was used in 9 cases as final solution, amputation or disarticulation of the limb in 6 cases.16 patients from our group survived with in situ allograft reconstruction with average survivor time 5, 4 years (2 -13 years). However in almost all of these patient signs of osteoarthritis occurs and/or they have some instability, stiffnes or deformity of the joint and they are planed to conversion to tumorous total knee arthroplasty in the future.

Conclusion: Reconstruction of resected bone in the knee area with osteochondral allograft is method of choice. However the results of osteochondral allografts are not very good, the allograft could provide sufficient bony support for composite of an allograft and prosthesis as final solution of disease.

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FREE COMMUNICATIONS SESSION VIIB: Allografts – Megaprostheses

FC-086

Proximal tibia reconstruction after primary bone tumor resections: endoprosthetic replacement versus osteoarticular allograft

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Introduction: Limb salvage surgery is at the present the standard practice for proximal tibia bone tumours. Benefits and complications have been described for the different reconstruction procedures, although, up to day the optimum method of treatment remains contentious. The aim of this study is to directly compare outcomes in terms of reconstruction survival, cause of failure and function between 2 groups of patients treated with endoprostethic replacement (EPR) or osteoarticular allograft (OAA) for proximal tibia bone tumours in 2 different oncologic units.
Methods: All patients between 15-60 years with a primary bone tumour of the proximal tibia treated with limb salvage surgery and reconstructed with EPR or OAA between 1990 and 2012 were included. A minimum follow-up time of 2 years was required, unless reconstruction failure or patient death occurred earlier. Two different oncology centres were involved in the study: Oncology Unit 1 specialized in endoprosthetic replacement and Unit 2 specialized in allograft reconstruction.
The following variables were compared: limb salvage reconstruction survival, failures of limb salvage reconstruction (Henderson classification) and functional results.
Results: A total of 88 patients were included in the EPR group and 45 patients in the OAA group. Five and Ten years reconstruction survivals were 69% (CI95% 58.5-79.5) & 37% (CI95% 33-50) for EPR and 60.5% (CI95% 46-75) & 53.5% (CI95% 38-70) for OAA (p=0.22). Fifty-one patients with EPR (58%) presented a reconstruction failure being mechanical causes (Henderson 1-2-3) the most prevalent (32 patients - 63%). Nineteen OAA reconstructions failed (42%) and early infection (Henderson 4A) was the most prevalent (9 patients - 48%). No significant difference was found in MSTS score results (26.5 vs 27) (p=0.18). Extension lag was considerable higher in EPR group than OAA group: 13.5° (range 0-80°) vs 2.5° (0-30°) (p=0.024).
Conclusion: Proximal tibia EPR and OAA reconstruction after bone tumour resection presented no significant differences in survival rates. Main cause of failure for OAA was early infection and for EPR mechanical complications. Active knee extension is significant better when biological reconstruction of the extensor mechanism is done. EPR patients were allowed for full weight-bearing significantly earlier.

FC-087

Silver ions levels in body fluids and clinical results in silver-coated megaprostheses: a 1 to 4 years follow-up

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Introduction: In recent years silver coating of orthopaedic implants was introduced to reduce infection rate due to silver antibacterial effect. Considering the high risk of infection in orthopaedic oncological reconstructions, this innovation could be particularly interesting for megaprostheses, but few data are reported in Literature.
Materials and Methods: From 2010 to November 2014 a modified MegaC System megaprosthesis with an innovative peripheral silver-added layer of titanium alloy ("Porag") was implanted in 37 patients after previous infection (23) or at high risk for infection for local or general conditions (14). Initial surgery had been performed for oncological diseases in 16 patients, for sequelae of joint replacement or trauma surgery in 21. Previous infection followed arthroplasty (16) or trauma surgery (7); a two-stage treatment was performed in 16 cases, one-stage in 7. A proximal femur replacement was performed in 15 patients, distal femur replacement in 14, total femur in 2, knee arthrodesis in 6.
Results: Follow-up ranged from 2 to 50 months with 21 patients presenting a follow-up longer than 1 year. No occurrence or recurrence of infection was detected so far. Two patients are under monitoring as they developed a fistula with persistent negative coltures (one healed, one is still under treatment). A stem revision was performed in one patient at two years from surgery. No clinical evidence of argyria was detected. No local or systemic side effects related to silver were detectable.
Levels of 0,1 to 7,5, 0.02 to 5 and 0.1 to 0.7 µg/L in urine and levels of 0.24 to 9, 0.8 to 20 and 0.3 to 3.7 µg/L in blood were detected respectively at one year, two years and three years from surgery. Average blood levels were higher in the first 3 to 6 months after surgery.
Conclusion: In our series promising preliminary results of silver coating in megaprostheses were observed for infection control in a high risk group of patients, mostly affected by previous infections. No side-effects were detected. The circulating silver levels observed confirm both the persistence of silver coating activity after three years and at the same time the safety of silver-coated implants. Longer follow-up and larger series are needed.

FC-088

The vascularized fibular graft for limb salvage after bone tumor surgery: a multicentre study

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Vascularised fibular grafts (VFG) are a useful surgical technique in limb salvage after tumour resection. The primary objective of this multicentre study was assessing predictive factors for failure and complications of VFG after tumour resection.
Consecutive patients from four tertiary centres for orthopaedic oncology undergoing VFG-reconstruction after tumour resection between 1996-2011 were evaluated. In total fifty-two primary and twenty-two secondary reconstructions, with a mean follow-up of 77 months were studied.
Sixty-nine patients had successful limb salvage after VFG (93%), all of these united and 94% showed graft hypertrophy. Time to union differed between upper (28 weeks) and lower limb (44 weeks). Fracture occurred in 11 (15%), and non-union in 14 (19%) cases. Thirty-five patients (47%) had at least one complication, with significant more complications in lower limb reconstructions, non-bridging osteosynthesis, and in skeletally immature patients. These complications resulted in revision surgery in twenty-six patients (35%).
VFG is a successful and durable technique for bone defect reconstruction after tumour resection, but is accompanied by a significant risk of complications that often require revision surgery. Union was not significantly influenced by the need for chemotherapy, but should not be expected during chemotherapy. Therefore, restricted weight-bearing within this period is advocated.

FC-089

Is silver worthwhile on all endoprostheses?

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Introduction: Silver coated endoprostheses are now becoming more widely used and early results suggest that they may be effective in not only preventing infection arising but also may allow easier treatment of infection if it does arise. This paper explores the cost effectiveness of adding silver to an Endoprosthesis.
Method: To identify if the addition of silver is cost effective a number of factors need to be taken into account. Firstly the cost of the silver per implant. Secondly the rate of infection expected with a conventional implant and the rate with the silver implant. Next, the cost of treating that infection and the success of so doing. As there is little date currently available on much of this, a model has been created which allows specific criteria to be entered for all of the above variables.
Results: Based on currently published data for the Agluna system of silver coating, one of the main benefits is the considerably greater success rate in controlling infection with a debridement, antibiotics and implant retention (DAIR) procedure than with a two stage revision. Figures suggest that with a silver coated implant, DAIR is successful in 70% of cases compared with a conventional prosthesis where it is successful in only 20%. Using the costs of DAIR as £5,000 and a two stage revision as £40,000 then for every 1% reduction in infection rate a silver implant produces, £330 per implant is saved. The model allows for modification of all factors to produce an estimate of the cost effectiveness of silver.
Conclusion: Reducing infection risk can easily pay for itself. If the promise of silver coating is maintained it should be considered for wider use as a cost effective innovation.

FC-090

Biological extramedullary fixation in limb salvage surgery with HA collars

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Introduction: The purpose of this study is to evaluate the role of hydroxyapatite collars in extramedullary fixation and prevention of aseptic loosening, which is the principal mode of failure of the implants.
Methods: We reviewed the records and radiographs of 92 consecutive patients who underwent tumour prosthetic reconstruction in St Savvas unit over the last eight years. Primary diagnoses were 47 high-grade tumors (IIA/IIB), 19 low-grade tumors (IA/IB or benign), and 26 metastatic disease. All cases were managed with wide resection and implantation of a cemented massive endoprosthesis with modular striated HA coated collars to encourage osteointegration at the prosthesis-bone interface. In two cases we used joint sparing intercalary endoprostheses with very short stems <4cm, reinforced with HA collars plus extracortical HA-coated plates.
Results: In most cases new bone formation was evident around the hydroxyapatite collar; the rest displayed partial bone-bridging. In 1 case, reoperated for other reason, we observed early formation of fibrous tissue firmly adherent to the collar. No loosening was noticed.
Conclusions: Cemented stems allow immediate stability and full weight bearing mobilization but the combination with HA collars leads to extramedullary bone formation and biological stabilization that eliminates the risk of loosening and offers the best chance of long-term survival of the prostheses.

FC-091

Allografts in children and adolescents after resection of malignant bone tumors

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Introduction: Musculoskeletal tumours in children are always a challenge for surgeons. Big defects after tumoural resection are difficult to manage, specially when patients are still growing up. We present a serie of 37 cases of primary malignant bone tumours in children treated in our centre and reconstructed with allograft.
Methods: 37 consecutive cases of malignant bone tumour between 1994 and 2007 were included in the study. A retrospective review of clinical histories was done.

Patients, who were alive in 2012, were clinically evaluated too. Type and length of resection, allograft characteristics, complications and functional and oncological results were recorded.

Results: Medium age was 11.02 years (range 2-17). There were 20 men and 17 women. Ewing sarcoma is the first diagnosis (18 cases). There were 17 cases of osteosarcoma too. The most frequently affected bones were femur (13 cases), humerus (9 cases) and tibia (8 cases). Proximal (12 cases) and distal (13 cases) metaphysis were the most affected zones in the bone. 22 cases had soft tissue mass. 3 cases presented metastatic disease at diagnostic. Wide resection was performed on all the cases. Average lengthening of resection was 14,50 cm (range 7-28 cm). 17 intercalary allograft were utilized, as well as 11 osteoarticular allograft. Femur allograft was used in 12 patients and tibia was also used in 9 cases. Average allograft follow-up was 91,66 months (range 4-216). Average patient follow-up was 113,05 months (range 4-216). 21 patients did not use crutches at the end of the follow-up. Average length discrepancy was 2,03cm (range 0-6,5). 27 patients had some kind of complication with the allograft, including 4 infections, 3 local recurrence, 8 pseudoarthrosis, 3 graft fractures, 5 graft resorbtion and 6 degenerative osteoarthritis. 3 allografts must be removed and 2 patients required an amputation. There were 27 alive patients at the end of the follow-up period.

Conclusions: Allograft reconstruction in skeletal immature patients is a procedure with a high rate of complications. Otherwise, its use is a good alternative to manage big defects in growing-up patients.

FC-092

Use of tricortical autologous graft from iliac crest reconstruction of long bone defects after block resection in tumor indications

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Background: Reconstructing a limited bone loss after partial bone resection or extensive curretage for tumor is a common problem in oncological orthopaedics. In the past such defects have been reconstructed mainly by cement filling, cancelous spongioplasty or massive bone allograft. Prosthetic reconstrucion or simple preventive osteosynthesis are also options in some patients.

Materials and Methods: We present a retrospective study of 19 patients with a minimum of one year follow-up, who were treated in our institution between 2000 and 2014 with primary bone tumors and recieved a reconstruction with autologous corticocancelous graft from illiac crest. Only patients with diaphyseal or periepiphyseal defects with preserved joint were included. Patients were evaluated for demografic data, type of reconstruction, location and size of defect, time to radiologic uninon, time to full weight bearing, MSTS score and complications. Donor site morbidity was evaluated as an independent factor.

Results: The average follow up was 45 months (12 to 146), mean age of pt. in our group was 33 years (18 to 56), male and female were equaly affected. 9 pt. recieved this treatment as a primary reconstruction, 10 patients as a secondary procedure mostly after bone cement extraction. We used plate osteosynthesis as a support in 7 patients. In 4 cases the metal has already been removed in average of 15 months after the reconstruction. The size of the defect ranged from 2 to 10 with mostly periarticular localization (68%). Full weight bearing was allowed in average of 17 weeks after the surgery. We did not encounter any fracture, nonunion or sequestration of the graft. Also no infectious complications were noted in our study. Results with regard to MSTS score were excelent (average 92 %), and all patients would reccomend this type of surgery to others. Donor site morbidity was mainly cosmetic. One pt. was revized for muscle contracture, probably not related to the procedure.

Conclusion: We believe, that the use of autologous cortical graft from iliac crest presents a good alternative for reconstructing of short to medium size extraarticular defects. This type of reconstruction allows for an early weight bearing compared to simple cancelous spongioplasty and in selected cases does not require osteosynthesis. Unlike bone cementing this is a biological and definite type of reconstruction. The use of autologous graft benefits the patient with faster incorporation than allograft struts. Provides similar primary stability that probably even increases in time. Also has less infectious complications and eliminates the need for a bone bank. Donor site morbidity was acceptable in all patients in our group and does not pose a significant problem.

FC-093

Massive intercalary allograft reconstruction after long bone tumor resection

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Introduction: Reconstruction of a bone defect after malign tumor resection in diaphysis is demanding, and complication rate of various techniques is relatively high. Aim of this study was to analyze our results of massive bone allografts reconstruction after en bloc resection of the tumours in long bones.

Methods: We reviewed all patients treated with allograft for bone tumor in the Department of Orthopaedic Surgery, Clinical Hospital Centre Zagreb, between 1999 and 2012. In total, we found 23 patients in whom diaphysis (or metadiaphysis) of the femur (n=14), humerus (n=5), and tibia (n=4) were reconstructed with bone allograft. The average age of the patients was 32 years (range: 9-70). The indication for the operation were osteosarcoma (n=7) and periosteal sarcoma (n=3), Ewing sarcoma (n=4), chondrosarcoma (n=3), giant cell tumor (n=2), singular metastasis (n=2), aneurismal bone cyst (n=1), and

undifferentiated pleomorphic sarcoma (n=1).
Results: Fixation of the graft was performed with a plate (n=9), nail (n=9), plate and nail (n=3), or in with endoprosthesis-allograft composite (n=2). Overall patient survival rate at five years was 74%; all 6 patients died of primary tumor. Allograft failure, defined as removal of graft for any reason, or amputation, was observed in 6 patients (26%). Mechanical problems with a graft with the need for additional surgeries (while retaining the allograft) was observed in 9 (39%) of our patients. In total, host bone - allograft junction union (union of at least two cortices) was evident at an average 4 months (range 2 to 12 months), whilst the complete union (union of all corteces) occurred after 12 months. No significant correlation between results of treatment and other individual patients' characteristics was found in our cohort.
Conclusion: Intercalary allografts have high mechanical complication rate, but still provides a valid alternative in reconstructing tumor resections in diaphysis of the long bones.

FC-094

Are we aggressive in performing two-stage reimplantation for periprosthetic infection after tumor resection around knee?

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Introduction: Infection is the commonest mode of failure in tumour endoprosthetic reconstruction and most dreaded. Two-stage reimplantation has reported success rate between 70~77 %. This retrospective study was performed to analyse the outcome of two-stage reimplantation for infection of tumour endoprosthesis around knee and determination of possible risk factors for failure.
Methods: Heterogeneous population of 49 patients with tumour endoprosthetic reconstruction around knee were identified and treated for infection (type II and III Coventry-Fitzgerald classification) during period July 2004-June 2014. Aggressive debridement and antibiotic cement spacer implantation in the first stage was followed by reassessment and reimplantation of tumour endoprosthesis after 6 weeks of parenteral antibiotics. Cases in distal femur were 38 and proximal tibia 11. Failure was defined as either inability to perform reimplantation or relapse of infection after successful reimplantation procedure. Possible risk factors for failure such as site, organism-virulence, type of explantation and time to reimplantation were assessed.
Results: At mean follow up of 34 months (range, 6~115), successful salvage of infected limb was possible in 35 (73%) patients. Two-stage reimplantation was possible in 43 patients, while 6 patients underwent amputation for failure to control infection. Athroplasty was performed in 36 patients compared to arthrodesis in 7 (silver coated in 8). Infection subsequently relapsed in 8 in whom subsequent two stage reimplanation was performed in 2, debridement and lavage in 2, amputation in 3 and antibiotics in 1. Time to reimplantation (longer than 6 weeks) was a significant (p=0.037) risk factor for failed limb salvage. Site, organism-virulence and type of explantation were not significant factors for failure. The mean number of surgeries per patient was 3.2±1.6.
Conclusion: Two-stage reimplantation of infected tumour endoprosthesis around knee when performed aggressively by 6 weeks after explantation improves the success of limb salvage. Complete explantation of prosthesis may not be essential to eradicate infection, even in multiresistant organism setting. Silver coated endoprosthesis may prove beneficial in preventing infection in larger long term studies.
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FC-095

Infected tumor prostheses: a review of 125 cases from two institutions

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Background: Infection of tumor megaprostheses is a major concern; their management is challenging. This study evaluates the survival to infection, microbial isolates, treatment strategy, and outcome of megaprosthetic reconstructions.
Methods: We retrospectively studied over 1500 patients who underwent megaprosthetic reconstruction after limb salvage for a sarcoma from 1983 to 2013. Mean follow-up was 9 years (1-24 years). We evaluated the overall survival of the megaprosthetic reconstructions to infection and the survival to infection with respect to the type of megaprosthesis, site of reconstruction, cemented or cementless fixation, type of tumor and adjuvant treatments, the microbial isolates, treatment strategy, and outcome.
Results: The incidence of infection was 8.3%. Most common microbial isolate was Staphylococcus epidermidis (49%). Overall survival to infection was 88% at 10 years and 84% at 20 years. Survival to infection was higher for cementless megaprosthetic reconstructions, and not different with respect to the type of the megaprostheses, site of reconstruction and adjuvants. Infections resolved completely with one or two-stage surgery in 78% of

patients. The rate of amputation because of infection was 20%.
Conclusions: Megaprosthetic reconstructions may be infected in 8.3% of the cases. Infections are more commonly late, caused by Staphylococcus epidermidis. The survival to infection is higher for cementless megaprosthetic reconstructions, and no different with respect to the type of the tumor, type of the megaprosthesis, and administration of adjuvant treatments. One-stage revision is effective for acute postoperative infections; however, a two-stage revision surgery is necessary for early and late infections. The rate of amputation because of the occurrence or persistence of megaprosthetic infection is 20%.

FC-096

Massive resection of diaphyseal primary bone sarcomas and reconstruction using recycled pasteurized tumor segment

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Introduction: Several methods of reconstruction have been used after resection of an intercalary malignant bone tumor such as the use of allografts, autografts, reimplantation of the bone tumour segment after being treated and intercalary endoprosthesis.
Patients and Methods: This study included ten patients. 2 males and 8 females. Age ranged from 7 to 38 years (mean 21 years). 2 cases were Ewing sarcoma, one chondrosarcoma and 7 cases were osteosarcomas. 5 cases were tibial and 5 were femoral tumours. Wide local resections were successful in all cases and reconstruction was done by reimplantation of the tumour segment after thermal treatment using pasteurization technique. Fixation was done by either intramedullary nail or a plate or both. Follow up ranged from 4 to 60 months (mean 23.6 months).
Results: The reimplanted graft was united in 7 patients at a mean time of 6.8 months ranging from (6 to 16months). Delayed union or non union in 3 patients One case had superficial infection. 2 patients died; one due to complications of chemotherapy after 4 months follow up, one due to lung metastasis after 46 months follow up. One case of local recurrence and treated by above knee amputation. 2 cases had distant metastases. One case had a fracture that was treated by revision of the internal fixation.The mean musculoskeletal society functional score was 68.5% (range from 0% to 95%).
Conclusions: Re-implantation of the tumour segment after pasteurization is a safe method of limb reconstruction after resection of intercalary malignant bone tumor provided that; the tumour is not an osteolytic lesion.
Keywords: Malignant bone tumor; Pasteurization; Local resection; Diaphyseal.

FREE COMMUNICATIONS SESSION VIIIA: Soft Tissue Tumors

FC-097

Soft tissue sarcoma abutting the bone, does it carry a worse prognosis, and what surgery is the most appropriate?

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Background: The incidence, surgical treatment and effect on overall survival and recurrence of bone invading/abutting soft tissue sarcoma, still poorly described in the literature.
Objectives: To present an institutional experience regarding; surgical treatment and outcome of soft tissue sarcoma which are abutting the bone.
Material/Methods: From July 2006 to Dec. 2013, 125 patients with wide local/compartment resection, at KHCC. Twenty five patients (20%) the tumor were abutting the bone, 22 patients as first presentation and 3 as recurrent disease, age 15-65 year, Median age 49 years. Tumor location includes: extremity 23 patients, one case pelvic and one case chest wall, 16/25 patients received bone surface burring and adjuvant radiation <9/25patients in whom signs of cortical invasion and early destruction seen in MRI or more than 50% circumferential bone involvement was observed, we resect the adjacent cortex en-bloc with the tumor and reconstructed using unicortical bone allograft and prophylactic bone fixation. All patients received adjuvant radiation 3-6 weeks after surgery.
Results: At mean follow up of 30 months, (10-58), 4 patients died due to metastatic disease, 2 patient developed metastatic disease and still on palliative care, and 3 patients developed local recurrence (12%).One patient developed radiation related femur fracture. 5 years event free survival was 53% and overall survival 76%.
Conclusion: This is a small group retrospective pilot study; the results show that STS abutting bone probably do not lead to worse outcome, bone surface burring or uni-cortical resection is sufficient, and no need to do bi-cortical bone resection. Multicenter cooperation is needed to recruit more patients to have statistically significant number.

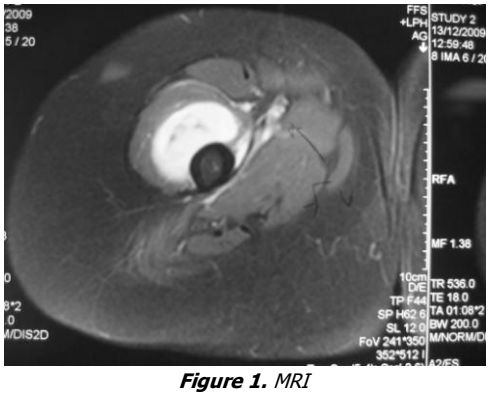

Figure 1. *MRI*

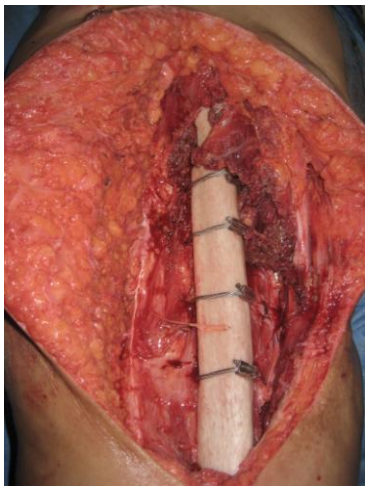

Figure 2. *Reconstruction*

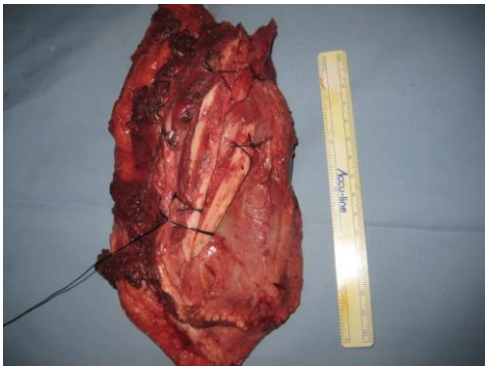

Figure 3. *Resection*

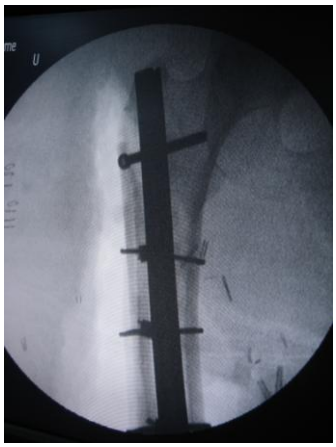

Figure 4. *Xray*

FC-098

Marginal resection for lipomas and atypical lipomatous tumors of the extremities: retrospective comparison with histology and MDM2 gene amplification

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Background: Lipomas and atypical lipomatous tumors are the most common mesenchimal tumors. Differentiating atypical lipomatous tumors from lipomas can be challenging based on a histologic analysis alone. The purpose of this study was to evaluate the clinical outcomes for molecular-confirmed lipomas and atypical lipomatous tumors after a marginal excision.
Methods: We reviewed 97 patients with lipomas or atypical lipomatous tumors of the extremities, determined by MDM2 amplification. All tumors were excised marginally without a rim of normal tissue. No patient had any treatment other than surgery.
Results: Fifty-three patients were classified as having lipomas and 44 specimens were classified as having atypical lipomatous tumors. No patient with lipomas had a local recurrence, whereas six patients with atypical lipomatous tumors had a local recurrence (13.6%). Disease recurrence did not correlate with gender or age of the patient, size or location of the tumor. Histologic type emerged as the only independent risk factor for local recurrence. No distance metastases occurred.
Conclusions: Marginal resection seems to be adequate for both lipomas and atypical lipomatous tumors as they have respectively no or low risk of local recurrence, without any risk of distant metastases. A follow-up is recommended only for patients with atypical lipomatous tumors.

FC-099

What is the significance of a fungating soft tissue sarcoma?

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We set out to establish the frequency and the clinical implications of patients who present with a fungating soft tissue sarcoma (STS). Of 2663 patients with a STS treated since 1996, 86 (3.2%) were fungating by the time of presentation. Fungation arose in older patients ($p<0.001$), females ($p=0.038$) and mostly in superficial tumours ($p=0.01$). The most common diagnosis was angiosarcoma followed by UPS. They arose at many different sites. 19% had metastases at diagnoses (compared to 10%) ($p=0.01$) and 73% of patients had stage 3 or 4 disease (compared to 54% of the others). Management required amputation in 25% and excision and flap cover in 58%. There was a 2.3 times greater risk of patients developing local recurrence and 2.5 times greater risk of dying in patients with fungating STS. The 5 year survival was 27% for those with fungating tumours compared to 60% for those without fungation. On multivariate analysis with TNM stage and age, patients with a fungating STS had a 1.7 times worse prognosis when matched for other factors. Fungation of a STS is usually an indication of either rapid growth or delayed diagnosis or both. The results presented suggest that fungation carries a dismal prognosis.

FC-100

The "two-week wait" referral system: how predictive of malignancy are the worrying

features for soft tissue sarcomas?

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Introduction: This study was conducted in order to find out how accurate general practitioners (GPs) evaluated the current NICE criteria and whether they should be advanced. According to the criteria, each soft tissue swelling with a size > 5 cm, increase in size, pain and location deep to the fascia should be referred to a specialist centre urgently.
Methods: All patients referred under the two-week wait rule between 2013 and 2014 were included into the study. The accuracy of the referrals was evaluated by comparison of the criteria identified by GPs and those approved at the specialist centre. Furthermore, the parameters were investigated for prediction of malignancy.
Results: 135 patients with a mean age of 56.4 years were referred to our unit from whom 45 were subsequently diagnosed with a soft tissue sarcoma (STS). GP determined features were accurate in 74% of all cases. The at least useful parameter in predicting malignancy was "pain" (27% sensitivity), while "size > 5 cm" was the best predictor (76% sensitivity). The sensitivity for size increased to 89% when the worrying size was lowered to 4 cm. Imaging techniques performed in 106 cases did not increase the probability of detecting malignancy. The combination of factors most predictive of malignancy was increase in size, deep location, no pain and a size > 5 cm (77% precision).
Conclusion: Based on the results of this study we recommend adaption of current NICE guidelines. The feature "size" should be lowered by 1 cm to "size > 4 cm". Furthermore, factor "pain" should be removed from the urgent referral form, as it is not predictive of malignancy.

FC-101

Aggressive primary synovial chondromatosis of the hip

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Primary synovial chondromatosis (PSC) is a rare disorder characterised by cartilage formation in synovium-lined joints, tendon sheaths and bursae. It is thought that PSC cartilage arises from proliferation and cartilaginous metaplasia of mesenchymal cells in subsynovial connective tissue. The degree of cellularity and nuclear atypia seen in synovial chondromatosis is equivalent to that seen in low-and intermediate-grade bone chondrosarcomas. There are reports of transformation of PSC to chondrosarcoma, although the precise incidence and nature of this sarcomatous change is uncertain. In this study we reviewed 181 cases of PSC and noted 4 cases (3 hip joint, 1 elbow joint) of aggressive behaviour characterised by infiltration of surrounding soft tissue and bone. Radiologically, these cases were reported as showing features consistent with PSC. Histologically, in addition to the typical features of PSC (i.e. nodules of cellular hyaline cartilage in synovium and/or formation of hypercellular loose bodies), there was also evidence of an infiltrating cartilaginous tumour which showed morphological features of an atypical cartilaginous tumour/ Grade 1 chondrosarcoma. No high grade chondrosarcoma was identified histologically. These tumours were locally aggressive; no metastases were reported. In summary, our findings indicate that chondrosarcoma-like change rarely can occur in PSC but that this is usually of a low-grade (locally aggressive) nature similar to that of an atypical cartilaginous tumour/ Grade 1 chondrosarcoma arising in bone.
Acknowledgements: The authors acknowledge the support of the Oxford NIHR BRU, The Sasakawa Foundation, The Rosetrees Trust, Sarcoma (UK) and The Bone Cancer Research Trust.

FC-102

Re-excision of residual sarcomas ("second-look surgery"): analysis of our results

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Introduction: Sarcomas represent less than 1% of all malignant tumours but can cause significant morbidity and mortality at any age and site. It is frequent that some may be misdiagnosed and inappropriately resected before establishing a correct histological diagnostic. It is also important to do a histological review of the tumour specimen not only to confirm the diagnostic, but also to know the surgical margins because they predict the risk of local recurrence.
Aim: The aim of our study is to describe the oncologic evolution of patients that were operated for a re-excision of a residual sarcoma. We also want to correlate the efficacy of MRI in detecting residual tumors with the histological findings.
Methods: Retrospective review of patients undergoing second-look surgery of sarcomas between November 2001 and July 2013. Epidemiological data and data related to the initial surgery, to the second-look surgery, the subsequent evolution and adjuvant treatments were analysed.
Results: 35 patients, mean age 48 years were treated. Follow-up 52 months. 34 cases (97%) came from another centre after the first surgery: 26 (74%) with surprising diagnosis on histologial examination ("whoops surgery"), 5 (14%) due to tumour persistence and 3 (9%) surgical margins positive. In all cases histology was reviewed, with the most frequent diagnosis being synovial sarcoma. Before the first surgery, 29% of patients had no additional examinations, and only 11% had previous biopsy. MRI detected the presence of tumour persistance in 53% of patients. The average time between the first surgery and the second-look surgery was 3 months. In the histological

analysis after the second-look surgery, 22% of cases showed that residual tumour persisted.
Conclusions: The preoperative evaluation of sarcomas is essential to plan the removal and / or optimal adjuvant therapies. Synovial sarcoma is the most common finding in the "whoops surgeries". MRI is a good imaging technique for the detection of residual tumor but we must consider that there are false positives and negatives, so in cases of inadequate surgical resection of sarcoma we must restudy and expand margins to ensure early full excision of residual foci that could compromise the oncologic patient outcome.

FC-103

Extraskeletal chondrosarcomas: how to identify bad prognostic factors for local recurrence and survival?

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Introduction: According to WHO classification extraskeletal myxoid chondrosarcomas (EMC) are classified within malignant tumours of uncertain differentiation. The aim of the study is to evaluate the case series of a national reference centre to evaluate prognostic factors, local recurrence rate and survival.
Methods: 11 patients (7 males, mean age 54 ys, range 20-80) have been surgically treated for EMC in the period 2005-2010 in a regional reference centre for bone and soft tissue sarcomas. Inclusion criteria: minimum follow-up of 5 years. Two amputations, 8 wide margins excisions, and 1 marginal margins excision have been performed. All the tumours were in the pelvis or in the lower limb. Follow up for local recurrence and survival was evaluated.
Results: 8 patients developed a local recurrence (all treated with wide excision) and 1 a skip lesion in the same thigh (wide excision and local flap). 4 developed lung metastases: 2 at the diagnosis and 2 after local recurrence following wide excision. 3 of them died of disease (2 palliative hip disarticulation for pain control) and 1 is alive with lung disease. All the local recurrences and skip lesion had a histologic dedifferentiation but only one developed lung metastases with subsequent death of disease.
Conclusion: EMC often require wide surgical excisions and do not respond to traditional adjuvant treatment. Only palliative oncologic treatments for metastatic and not surgical diseseas are described in contrast to other high grade soft tissue sarcomas. All local recurrence present with a histologic dedifferentiation but it does not reflect a more aggressive disease with an increased risk of lung progression of disease and death. New targeted therapies are going to be developed and will go under experimentation in the early future. Further studies and multicentric case series analysis are mandatory to better understand this type of tumour.

FC-104

IMRT delivery of preoperative high dose radiotherapy with Simultaneous Integrated Boost (SIB) in retroperitoneal sarcomas: a feasibility study

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Introduction: Retro-peritoneal sarcomas are rare tumours which present late and are difficult to treat. The role of radiotherapy remains debatable. While no randomized controlled trials have been completed or reported, single centers prospective experiences have been favorable. More recently a SEERS data base analysis have shown no benefit to the use of pre-operative radiotherapy. Perhaps that is not surprising as the use of radiotherapy have been hampered by the need to treat very large volumes while trying to limit the dose to sensitive organs. The dose of radiation used has been very limited in order to limit the toxicity.
Methods: All newly diagnosed patients with intermediate or high grade retroperitoneal sarcoma were enrolled into a prospective study using pre-operative radiotherapy. Patients had to have an operable tumor and no evidence of distant metastases. The majority of the tumours were fairly extensive and displacing abdominal organs. All patients were treated with megavoltage radiation with IMRT delivery. A minimum dose of 45 Gy was delivered to full volume with a margin to the PTV. An SIB was delivered to the GTV or the high dose areas to a dose of 55 GY all in 25 Daily Fractions. Surgery followed 4-6 weeks later.
Results: During the period of 2011 to 2014, 23 patient s have been accrued. The use of IMRT have facilitated dose delivery and escalation in a safe manner. The patterns of toxicity including bowel symptoms and delayed haeling have been compared with historical controls. None of our patient has developed any significant toxicity necessitating stopping radiotherapy.
Despite the large volume treatment surgical resections have been successful in all patients. Follow up is ranging from 6 months to 4 years. Detailed toxicity analysis will be presented at the meeting.
Conclusions: Dose escalation and dose delivery to a large abdominal volume are safe and feasible in RP Sarcomas with the use of IMRT. Acute and subacute side effects are limited and much less than historical controls. It remains to be seen if that will translate into long term improvement in survival.

FC-105

Myxofibrosarcoma: a particularly difficult-to-treat soft tissue sarcoma – Considerations from a series of 85 patients

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Introduction: Myxofibrosarcomas constitute a difficult-to-treat subset of soft tissue sarcomas due to a high rate of recurrence. Few wide series were reported. An evaluation of a series of 85 patients was performed with the aim of improving treatment efficacy for this pathology.
Methods: 85 patients affected by myxofibrosarcomas of the limbs or superficial trunk were treated from 2004 to 2013, including patients presenting for first surgery or reexcision. Age ranged from 21 to 88 years (average 66). Dimension of the tumor was > 10 cm in 26 patients, between 10 and 5 cm in 31, < 5 cm in 28. Tumor was low-grade in 26 patients, high grade in 59, affecting the lower limb in 56 cases, the upper limb in 25 and superficial trunk in 4. Only two patients had metastatic disease at presentation.
Radiotherapy was usually performed in over 5 cm sized high grade lesions.
Follow-up ranged from 2 to 132 months (average 51).
Results: Disease-specific Overall Survival was 86.9 % at 5 years. Local Recurrence and Distant Metastases free survival were respectively 77.6 and 75 %. Marginal or focally contaminated margins occurred in 28 % of surgeries. 16 patients (19%) were affected by local recurrence. 4 of them suffered multiple subsequent recurrences (2 to 4), with only 1 of them developing distant metastases, which occurred in 20% of the patients. A high grade pattern was the only factor significantly affecting OS, LR and DM survival. Tumor size affected DM survival. LR survival at 5 years was 84% in wide-radical excisions and 55% in inadequate margins. We could not statistically prove the effect of radiotherapy.
Discussion: Our series confirm how obtaining wide margins in myxofibrosarcomas is often difficult due to a microscopic spreading in the surrounding tissues. Local recurrence occurs more often than in other soft tissue sarcomas and multiple subsequent recurrences are not rare. Overall survival was 87% in patients without and 85% in patients with local recurrence, showing the feasibility of a limb-sparing surgery also in re-excisions. Preoperative ultrasound mapping and particularly wide surgery (aided by plastic surgery reconstruction procedures) are recommended in this subset of tumors.

FC-106

Sarcoma of the foot: changes in amputation rate over one decade

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Background: Over the last decade, there has been a clear trend towards a decrease in radical resections in the surgery of soft tissue sarcomas (STS). The incorporation of plastic surgery has been hailed as a relevant argument in favor of a less aggressive surgical approach. As far as the location of all the STS of extremities is concerned, one of the lowest percentages of limb-sparing is seen in the case of STS of the foot, with an amputation rate above 30% in most historical registries.
As plastic surgeons have been incorporated into multidisciplinary sarcoma teams (MST) in the last 10 years, at least in most sarcoma reference centers in our country, we set out to analyze changes over one decade in the type of surgery offered within the initial therapeutic plan in STS of the foot.
Patients and Methods: Patients included in this analysis were accrued in two different registry programs spanning two time periods: 1994-2000 and 2004-2011. A queries-based task was carried out for data cleaning. The Chi-square test was used to compare categorical variables and Kaplan-Meier estimations were carried out; the Log-Rank test was employed to compare groups.
Results: A subset of 72 STS of the foot was identified (46 and 26 in the first and second time-period, respectively). Median age was 44 years; the female/male rate was 44/28, with a median size of 4 cm (1-25). The most frequent histologic types were synovial sarcoma 32%, clear cell sarcoma 17% and undifferentiated pleomorphic sarcoma 13%. There was a similar number of stage III for both time intervals: 20% vs 19%. Amputation-rate was 49% vs 20%, p=0.017, and the median size was 4 (1-25) and 5 (1-15), p= 0.09, for the first and second time-period, respectively. There were no statistical differences in 3y RFS: 53% vs 43 % (p =0.58).
Conclusions: Our data confirms a significant decrease in amputation procedures in STS of the foot over the last decade. This fact coincides with the significant emerging role of plastic surgeons in MST.

FREE COMMUNICATIONS SESSION VIIIB: Soft Tissue Tumors

FC-107

Extra-abdominal desmoid tumor: prognostic factors and clinical outcome in a surgical series

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Purpose: Extra-abdominal desmoid-type fibromatosis is an extremely rare disease and presents unpredictable and enigmatic nature. Optimal management has not been established ever, and different consideration may be needed discriminating from intra-abdominal and abdominal types. We investigated the clinical characteristics, clinical outcome, and prognostic factors on recurrence in patients surgically treated.
Methods: We retrospectively reviewed the medical records on 133 lesions in 89 patients who underwent surgical excision of extra-abdominal desmoid-type fibromatosis at three tertiary institutions from 1990 to

2013. Patients with R2 margin were excluded. Gender, age, size, multifocality, site, surgical margin, and adjuvant treatments were regarded as potential factors on recurrence-free survival and statistically analyzed.
Results: Median Follow-up was 66 months in all patients and 27 months in those with recurrence. Forty-seven lesions in 29 patients recurred, 28 lesions of which were primary lesions. Twelve lesions recurred despite negative surgical margin. No patients reported family history or Gardner's syndrome. Trunk lesion showed no recurrence. Eleven lesions recurred over 2 times. Median age in patients with primary lesion was significantly higher than in those with recurrent lesion. Median size was larger in patients with recurrence over 2 times than in those without relapse. Age and site were documented as independent prognostic factors in all tumors, all primary tumors, girdle and extremity tumors, and girdle and extremity primary tumors. Any independent prognostic factor was not identified in all recurrent tumors, and girdle and extremity recurrent tumors.
Conclusion: Age may be correlated to proliferative activity of the disease. Tumor site must be closely related with surgical margin. If it is impossible to achieve R0 margin, the key on management for desmoid-type fibromatosis may be assessment for biological activity rather than treatment selection itself. Functional imaging modalities could be of help to predict the activity, and multicenter collaboration must be mandatory for future study.

FC-108

The impact of "extended surgical procedures" on the outcome of soft tissue sarcomas

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Introduction: Wide resection of soft tissue sarcomas (STS) may result in large defects of surrounding structures. The balance between aggressiveness of surgical intervention, functional restoration and cosmetic outcome represents a challenge for surgeons. The aim of this study was to investigate the impact of "extended procedures" of STS on survival of a large series.
Patients and Methods: The Vienna Bone and Soft Tissue Tumor Registry has documented 752 patients treated for STS (406 men and 346 women, average age 51 years). Out of them 443 sarcomas of the limb where a surgical resection was performed, could be identified. A minimum follow up of 24 months was available in all cases. In 301 patients only a tumor resection without reconstruction was the treatment of choice, 142 patients received a tumor resection followed by reconstructive procedures. Collectively, these "extended procedures" implemented endoprosthetic supply, soft tissue flap reconstructions, nerval-, vascular-, or osseous-interventions or a combination of these. The mean overall follow up was 89 months (range: 24-636 months, median: 65 months).
Results: Overall survival (OS) of the entire group at 1, 5 and 10 years was 85%, 60% and 48%, respectively. Statistical analysis showed no difference in OS between the group where a resection without additional procedure was performed and the group where extended procedures were applied (p=0.897). Multivariate subgroup analyses indicated a significantly improved OS in cases where extended procedures with involvement of bone were performed (p=0.038).
Conclusion: The indication for use of extended procedures was commonly a locally progressed tumor. Usually a worse OS would be expected in these cases, however our evaluations revealed an equal survival of these patients. Extended procedures on the bone even showed improved OS rates. Our results indicate that extended surgical procedures might be favoured in borderline cases where it is unclear, whether the best treatment implements just a tumor resection or if there is evidence for a more aggressive surgical approach. Further investigations have to be performed to confirm our findings.

FC-109

Prognostic factors and follow-up strategy for superficial soft-tissue sarcomas: analysis of 2626 surgically treated patients from the Scandinavian Sarcoma Group register

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Background and Objectives: Our study aimed to describe the clinical outcome of patients with superficial soft-tissue sarcomas (SSTS), define prognostic factors and provide evidence for a rational surveillance scheme.
Methods: Data for 626 consecutive, surgically treated SSTS patients were retrieved from the Scandinavian Sarcoma Group Register. We assessed local recurrence (LR), metastasis (M), overall survival (OS), as well as local recurrence free- survival (LRFS) and metastasis-free survival (MFS).
Results: The incidence of LR and M was 11% and 13% respectively. OS at 5 years was 80%, LRFS was 74% and MFS 76%. Factors that affected OS and MFS were tumour size and patient age, whereas tumour grade, size and patient age were independent prognostic factors for LRFS. The majority of LR and M events were observed the first 2 years of follow-up. Wide surgical margins were correlated to lower risk for LR. Selected patients benefited from adjuvant radiotherapy.
Conclusions: SSTS have a favourable prognosis, which is mainly determined by tumour-associated factors. Adequate surgical margins are important for local control, whereas radiotherapy has a secondary role. The data

support current surveillance schemes, with a closer follow-up the first 2 years after surgery.

FC-110

Outcome following resection of synovial sarcoma – Analysis of prognostic factors with a minimal follow up of 5 years

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Background: Synovial sarcomas (SS) are malignant soft tissue tumors, whereas 77% of patients are younger than 50 years and 30% even younger than 20 years. The prognosis of SS is mostly influenced by individual factors, which are controversely discussed in the recent literature. Aim of this study was an outcome analysis of patients with SS with respect to prognostic factors.
Material and Methods: We retrospectively included all patients who were treated for SS between 1998 and 2009 at the musculoskeletal tumor center. Treatment as well as course of disease and survival were examined with regard to location, age, biology, tumor size, gradig and metastases.
Results: In total 52 patients (48% male, 52% female) were analysed with a mean follow up of 11±3,6 years. Age at diagnosis was 37,4±16,0 years (8-77 years). Histopathological findings revealed monophasic SS in 33 cases (63 %), biphasic SS in 18 (35 %) and dedifferentiated SS in 1 case (2%). 15 patients (29%) were previously operated in external hospitals, none had clear margins. The grading was G1 in 1 patient (2 %), G2 in 19 (36 %) and G3 in 32 patients (62%). Primary metastases were recorded in 3 patients. Most frequent location was the thigh 26,9%. Clear resection margins were achieved in 79% and limb salvage in 77%. Adjuvant radiation was performed in 26 patients (50%). In 40 patients a local recurrence was recorded after a mean of 25,2 months. 16 patients (30,8%) developed distant metastases during the course of disease, only 1 after more than 5 years postoperatively. 5 year survival rates were lowest in patients older than 40 years or with big, metastasized and/or high grade tumors. Complication rate was 25%.
Conclusion: Synovial sarcomas are frequently seen in young patients and children. Almost one third of our patients was insufficiently treated at peripheral hospitals, because a benign entity was suspected. Prognosis was mainly affected by factors such as tumor size, grading, age and resection margins.

FC-111

Atypical lipomatous tumor and liposarcoma of the musculoskeletal system – Outcome analysis with a minimal follow up of 5 years

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Background: One of the most frequently seen soft tissue sarcomas is the liposarcoma. Due to the heterogenous biology and aggressiveness, the treatment of liposarcomas is often challenging. The well-differentiated liposarcoma was last classified as a locally aggressive tumor (atypical lipomatous tumor), whereas a marginal resection is performed at most institutions. The aim of this study was an outcome analysis of patients with liposarcomas and atypical lipomatous tumors of the extremities with respect to prognostic factors.
Patients and Methods: Patients with liposarcoma or atypical lipomatous tumor of the muskuloskeletal system who were treated at the musculoskeletal tumor center between 1998 and 2007 were identified. The outcome as well as the course of disease was retrospectively analysed with regard to grading, treatment concept, resection margins, relapse, metastases and survival.
Results: In total 81 patients with a mean age of 56 years (15-86 years) were included. Previous operation at peripheral hospitals had been performed in 21 patients (26%), 67% did not have clear margins. Histopathological findings revealed a G1 tumor in 48 patients (59%), G2 in 11 (14%) and G3 in 22 patients (27%). Most frequent location (70%) was the thigh (n=57). Local relapse was recorded in 19 patients (24%), whereas 37% (n=7) had a G1 tumor. In 2 of them (11%) the recurrent tumor was dedifferentiated. In total 3 patients with G1 tumors showed distant metastases. The mean follow up was 9,8 years (5-20 years). The worst 5-years survival rate was seen in patients with dedifferentiated and metastasized tumors or in cases with positive resection margins. The complication rate was 10% (n=8).
Conclusion: Among soft tissue sarcomas the survival rate of patients with liposarcoma is relatively good. However, it is of great importance that the tumor is resected completely with negativ margins. Therefore, even atypical lipomatous tumors should be resected with proper safety margins in order to prevent dedifferentiated recurrence.

FC-112

Single institution experience of isolated limb perfusion with melphalan in treatment of advanced extremity melanoma and soft tissue sarcomas

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Objective: Isolated limb perfusion (ILP) attracts major interest in the treatment of soft tissue sarcoma and melanoma. The procedure combines innovative approaches such as hyperthermia, the use of cytokines, as well as the administration of high-dose chemotherapy. Although results ILP mast be continuously investigated.
Materials and Methods: In our institution from 2010 to 2014 were treated 42 patients with ILP procedure. Mean age 49±16,7 years (range 21-79). Female - 33 (78,6%), male - 9 (21,4 %). Patients underwent ILP via the femoral (n = 37) and axillary (n = 5) approach. With diagnosed melanoma - 23 cases (stage IIIB, IIIC) and soft tissue sarcoma - 19 cases (large, recurrent or multiple). Control of

leakage from the isolated limb in the general blood circulation system was provided by the dynamic radiometry with 99mTc-red blood cells (labeling in vivo) and precordial scintillation probe. Leakage was <6% (mean 0.5-2%). Perfusion was at mild hyperthermia. Assessment of the degree of toxicity by Wieberdink scale. Evaluation of systemic toxicity was conducted by NCI-CTC.
Results: Median follow-up - 21 months (in range 1 - 57 months). OR was recorded in 20 (86,9%) patients with melanoma, CR - 6 (26%), PR - 14 (60,9%), SD – 3 patient. OR was recorded in 16 (84,2%) patients with sarcoma, CR - 4 (21%), PR - 12 (63,2%), SD - 3 patient. In our study, there was no local toxicity above level 2 (moderate hyperemia and edema). None of the patients had systemic toxicity.
Conclusion: Implementation of high dose isolated regional chemotherapy is possible without significant local and systemic side effects. In our institute we received up to 86.9% of overall responses in group of patients with melanoma, up to 84.2% of overall responses in group of patients with sarcoma. Limb salvage rate 97,6%.

FC-113

Soft tissue sarcomas in patients over 65 years old. Clinical outcomes of different subgroups from a regional centre in the UK

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Introduction: Soft tissue sarcomas (STS) are heterogeneous malignancies with a bimodal age distribution. An estimated 30% of STS's are diagnosed in patients aged 65 and over, yet little published data is available for outcomes in this group. We present our outcomes of STS's in patients aged 65 years and over from the East Midlands Sarcoma Service.
Objectives: To determine the prevalence of STS's and outcomes in patients aged 65 and over.
Methods: Data including date of diagnosis, site, margins of excision and staging was obtained from a pathology database. All patients aged 65 and above with STS's referred between 01/01/2002 to 31/12/2011 were included, allowing a minimum of 1-year follow up. Patients were divided into three groups: 65-74 (group A), 75-84 (Group B) and over 85 (group C). Survival curves were produced with alive patients censored. Comparative analysis was undertaken to investigate any difference in mortality between the groups.
Results: A total of 291 patients were included in the study including 138 (47%) females. The mean age of the cohort was 76 years with 131 patients in Group A, 127 in group B and 33 in group C.117 cases (39.3%) involved the trunk wall or limbs. 79 patients (27.1%) developed metastatic disease and 51 patients (17.5%) developed local recurrence following surgical excision. The overall mortality rate was 71.4% with the highest in Group C (85%).
Median survival days from first diagnosis in Group A was 1162 days, followed by Group B with 605 days and Group C with 226 days. There was a statistically significant difference between survivorship of group A and Group B (P= 0.0126.95% CI 1.172 to 2.669) with no difference noted between groups B and C. (p=0.075.95% CI 2.045 to 3.309). A statistically significant difference between group A and Group C was noted. (p=0.005, 95% CI 4.507 to 5.776)
Conclusions: Our results show that the mortality rate amongst the elderly population with STS's is high. There is no statistically significant difference in mortality between patients aged 76 to 85 and over 85 but both groups shows significant difference compare to age 65-75.

FC-114

5-Aminolevulinic acid photoablation of fibrotic soft-tissue tumors

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Background: Soft-tissue tumors with fibrotic element were shown to have a unique absorbing capacity to 5-aminolevulinic acid (5-ALA), a photodynamic agent with a cellular-killing potential upon exposure to red light. We report the use of 5-ALA photoablation of the microscopic disease, remaining in the surgical field following resection of these tumors, assuming that it will facilitate tumor kill and decrease the likelihood of local tumor recurrence.
Materials and Methods: From June 2013 to February 2014, we treated 24 patients who had soft-tissue tumor with fibrotic element. Histological diagnoses included desmoid tumor -12, high-grade myxofibrosarcoma -3, low-grade fibrosarcoma -3, dermatofibrosarcoma protuberans - 3, and solitary fibrous tumor -3. Treatment protocol included preoperative administration of 5-ALA (60 mg/kg given orally 3h before surgery), wide tumor resection, illumination of the resected specimen with blue light (420nm) to verify 5-ALA uptake by the tumor cells, followed by illumination of the surgical field with red light (635 nm) to induce tumor kill via formation of oxygen free radicals.
Results: All tumors demonstrated positive and considerable 5-ALA uptake and activity. Four local recurrences were detected; all of which occurred in patients who had desmoid tumors. Three of these recurrences occurred in patients who, because of technical error, were not exposed to the desirable intensity of red light. No morbidity was associated with the photoablation.
Conclusions: We report a novel treatment modality in the management of soft-tissue with fibrotic element. This adjuvant treatment to surgery provides selective tumor kill within the surgical field and, therefore, may result in decreased rates of local tumor recurrence.

FC-115

Extraabdominal desmoid tumors – From watchful waiting to extensive surgery: results of different treatment modalities in Switzerland

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Introduction: Extraabdominal desmoid tumors (DT) are benign and rare with a persistent treatment dilemma due to its high recurrence rate and its heterogenous behaviour. In the past wide local excision was the usual treatment, however the risk of local recurrence was high (> 40%). The goal of the retrospective study is to evaluate the mid- and longterm results of extraabdominal desmoid tumors with respect to the different treatment modalities in Switzerland.

Material and Methods: From January 1970 through December 2013 93 patients with DT were initially treated with surgery (n = 41) or surgery with radiation (n = 14). Further alternative initial treatment options were radiation alone (n = 7), systemic therapy (n = 12) or waitful watching (n = 19) in the three sarcoma centers. Patient demographics, tumor site and histology, history of previous recurrences, and follow-up status with recurrence rates of the different treatment modalities were recorded retrospectively.

Results: There were 59 females and 34 males with a mean follow-up of 6 years in the current study. All patients presented with primary tumors located at the extremities in 51%, pelvis in 6%, trunk in 17% and at the abdominal (15%) or thoracic (11%) wall. By immunohistochemistry, 86% of patients in this study were positive for beta-catenin. Overall 45 % (n = 25) of DT patients developed a recurrence after primary surgical treatment (n = 55). The overall recurrence rate in the surgery group was 50%, depending on the resection margins with wide margins 36 %, 50 % with marginal resection margins, and 80% with intralesional resection. In the surgical plus radiation group 36% presented a recurrent DT. The DT patients who received radiation alone, all patients presented stable or regredient disease. The patients with systemic therapy showed in 33% progression and required further treatment. In the watchful waiting group we observed 67% stable disease, 21 % spontaneous regression and in 12% progression.

Conclusion: The results of our observation group could encourage us not initially resect DT and to wait with careful observation. Besides surgery, radiation is an additional treatment option for better local control also in our study. Extraabdominal DT have been also treated with systemic therapy. The goals of the medical therapies are the stabilisation of the disease, which has achieved in a similiar rate than the therapy with surgery plus radiation in our study. The result of this study should be the basis for clear guidelines for a therapeutical strategy for these patients. In a second stage, a prospective study should be carried out in order to evaluate the adequacy of the strategy.

FC-116

Adjuvant radiotherapy in leiomyosarcomas and liposarcomas – Experience of a center

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Introduction: Soft tissue sarcomas are rare tumors, accounting for 1% of adult tumor. A multidisciplinary approach is recommended for diagnostic, treatment and follow up. Radical surgery remains the basis for curative treatment. Although controversial, adjuvant radiotherapy is offered in high-risk patients to improve overall survival and reduce local recurrence.

The objective was to evaluate the impact of adjuvant radiotherapy on time to recurrence and overall survival in high-risk leiomyosarcomas and liposarcomas patients in our center.

Methods: All leiomyosarcoma and liposarcoma cases treated and followed in the Centro Hospitalar Lisboa Norte from January of 2007 and December of 2013 were evaluated in a retrospective study. Definition of high-risk was at least 1 factor (size>5cm, R1, grade ≥2). Adjuvant antracicline-based chemotherapy and surveilance were employed according to clinical judgment. Time to recurrence and overall survival were analyzed (univariated analysis).

Results: Seventy two patients were identified (50% leiomyosarcomas – n=36; 50% liposarcomas – n=36), median age was 60 years and there was female predominance (51,39% – n =37). Only 38,89% patients (n=28) were submitted to adjuvant radiotherapy (39,29% leiomyosarcomas – n=11; 60,71% liposarcomas – n=17). Adjuvant chemotherapy were used in 12 patients (16,67%) in which 8 patients (28,57%) had also combined with radiotherapy. The median total dose was 60 Gy (range: 50-66) and median of 30 fractions (range: 25-33). Forty one patients had only surveillance after surgery. Median follow up was 37 months.

Eight patients who underwent radiation had relapse (5 systemic; 3 both systemic and local). Four of these patients had adjuvant chemotherapy. Relapse was seen in 13 patients in the non-radiation group (10 patients had only surveillance).

A trend for superior time to recurrence (61 vs. 51 months; p = 0.595) and overall survival (67 vs. 65 months; p = 0.621) was seen in the adjuvant radiotherapy group.

Conclusion: In this study adjuvant radiotherapy demonstrated a trend for prolonged time to recurrence and overall survival in high-risk patients with leiomyosarcomas and liposarcomas. Small sample, short follow up, disease and treatment heterogeneity features are possible causes for these results. Further studies are needed.

FREE COMMUNICATIONS SESSION IX: Cartilaginous Tumors

FC-117

Chondrosarcoma in children and adolescents – Are they different?

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Introduction: Chondrosarcomas are uncommon in children and adolescents (<10%) and literature is lacking on their behaviour in this population.
Methods: 241 patients underwent surgery for chondrosarcoma between April 2002 and November 2012 at our institute. 15 (6 %) were under 21 years (11 male and 4 female). 3 patients had disease in humerus, 5 in pelvis, 3 in femur and one each in tibia, clavicle, scapula and spine. 6 patients had primary chondrosarcoma and 9 (60%) had secondary chondrosarcoma (enchondroma 1; osteochondromas 8). 2 patients were metastatic at presentation. 1 patient underwent intralesional spinal decompression, 1 had an open biopsy only, 1 underwent amputation and 12 patients had limb salvage surgery. Of these 12 cases margins were free in 10 patients.
Results: 13 of these patients were available for follow up. The mean duration of follow up was 37 months (range 6 months - 7 years). There were 2 local recurrences. At final analysis, 9 patients had no evidence of disease, 1 was alive with disease and 3 had died due to metastasis (including the 2 who were metastatic at presentation). The disease free survival at 5 years was 69 % and overall survival at 5 years was 76%. The patients with secondary chondrosarcoma at presentation had a better survival compared to those with primary tumors.
Conclusion: Secondary chondrosarcomas account for 60 % of tumors in the younger population. Apart from this their behaviour and oncologic outcomes are similar to chondrosarcomas that occur at a later age.

FC-118

Vectorization of hypoxia activated prodrugs to chondrosarcoma proteoglycans: evaluation and characterization of antitumoral activity

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Introduction: Chondrosarcoma, or malignant cartilage tumor, represent the second most frequent primary malignant bone tumor in adults after osteosarcoma. Due to its abundant chondrogenic extracellular matrix, its poor vascularization and its hypoxic microenvironment, chondrosarcoma is highly resistant to conventional chemo and radio-therapeutic treatments. Today, only effective treatment remains surgical resection. UMR990 Inserm/UDA unit, develops a new innovative therapeutic targeting strategy which exploit the two characteristics of chondrosarcoma microenvironment: a chondrogenic extracellular matrix (ECM) and a hypoxic tissue. Due to the high sulfate and carboxylate groups of the glycosaminoglycan moieties of proteoglycans (PG), the ECM exhibit a high density of negative charges that may interact with the positively charged quaternary ammonium (QA) function. We propose thus, to vectorize, with QA as vectors to PGs of chondrosarcoma, cyclophosphamide derivative hypoxia activated prodrugs with nitroimidazole or nitrofurane as cleavable entity.
Methods: Firstly, QA derivatives of nitroimidazole and nitrofurane were synthesized and evaluated for their cytotoxic activities on human chondrosarcoma HEMC-SS cell line, respectively to their non vectorized equivalents and to a vectorized but non cleavable equivalent, in normoxia (21 % O2) versus hypoxia (0.3 % O2). In a second time, antitumor efficacy was determined on HEMC-SS xenograft model in SCID (Severe Combined ImmunoDeficiency) mice, with tumor volume, anatomopathology and Western-Blot analyses (PCNA and p53). Adverse side effects were also determined by mouse weight and hematological analyses.
Results: QA derivatives of nitroimidazole prodrug evidenced, in vitro, the best hypoxia versus normoxia differential cytotoxic activity (4.5 times more apoptotic cells in hypoxia than in normoxia). In vivo, this molecule demonstrated a very promising antitumor efficiency, with a tumor growth inhibition (TGI) of 62.1% compared to only 8% for its non-vectorized equivalent. Interestingly, hematological side effects were less pronounced for the QA-prodrug respectively to the non vectorized molecule.
Conclusion: These promising results validate the approach of dual selectivity for chondrosarcoma treatment, especially for the nitroimidazole compound, by increasing its therapeutic index. This new innovative therapeutic strategy offer a real hope for treatment of the tumoral pathology of cartilage, relatively rare, but redoubtable.
Grants: This work was supported by Ligue Contre le Cancer Auvergne Region, and State-Region Planning Contract (CPER).

FC-119

Surgical treatment of primary central conventional chondrosarcoma of pelvic bone: an evaluation of outcome in four European centers of orthopaedic oncology

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Introduction: The pelvis is among the preferential sites for primary central conventional (grade 1-3) chondrosarcoma of bone. To date, no effective adjuvant treatment modalities

exist and therefore, resection with clear surgical margins is the mainstay of treatment. Studies focusing on outcome after surgical treatment of pelvic primary central conventional chondrosarcoma are lacking.

Methods: We retrospectively evaluated all consecutive patients who underwent surgical resection of primary central conventional chondrosarcoma of pelvic bones from 1985-2013, in four European centers of orthopaedic oncology. Aims were to assess (1) oncological outcome and (2) risk factors for local recurrence and impaired survival. Minimum follow-up was 24 months.

Results: Ninety-six patients (68 male, 71%) with a median age of 53 years (15-78) years were included. Lesions were grade 1 in 17 patients (18%), grade 2 in 57 (59%) and grade 3 in 22 (23%). Margins were wide in 59 (62%), marginal in 23 (24%), questionable in 4 (4%) and intralesional in 10 (10%; including three curetted grade 1 lesions). At review, 62 patients (65%) were alive with a median follow-up of 7.9 years (2.1-27.4): 48 continuously NED (50%), 11 NED following treatment of local recurrence or metastases (11%), three AWD (3%). Thirty-four patients (35%) had died (27 DOD, 28%), after a median of 3.6 years (0.0-15.1). Local recurrences were diagnosed in 32 patients (33%), after a median of 16 months (4 months-27.3 years). Twenty-three patients (24%) underwent hindquarter amputation: 15 as a primary treatment (16%), five for recurrences (5%) and three for infection (3%). Mean disease-free survival was 20.7 years for grade 1, 12.8 years for grade 2 and 5.1 years for grade 3 lesions ($p<0.001$). Patients with a recurrence had significant worse overall survival (mean 18.3 vs 10.0 years, $p<0.001$). Tumor grade and surgical margins independently influenced disease-free survival (table 1).

Conclusion: Tumor grade and surgical margins are independent factors influencing the risk of disease progression in primary central conventional chondrosarcoma of the pelvic bones. As tumor recurrence strongly influences overall survival, it is essential to obtain wide margins during primary resection in order to gain control over these challenging lesions.

Covariables	HR	95% CI		p
		Lower	Upper	
Tumor grade: 1	Ref	-	-	-
Tumor grade: 2	3.6	1.1	11.2	0.03
Tumor grade: 3	14.8	4.2	52.2	<0.001
Margins: wide	Ref	-	-	-
Margins: marginal	2.3	1.1	5.0	0.03
Margins: questionable	8.1	2.1	31.4	0.002
Margins: intralesional	3.0	1.1	8.4	0.03

Table 1. *Results of Cox regression analysis with disease-free survival as the end-point, and tumor grade and resection margins as covariables*

FC-120

Local recurrence following curettage and cementation of low-grade chondrosarcomas

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Introduction: The difficulty of histopathological diagnosis leads surgeons to operate conservatively in the treatment of low-grade cartilaginous tumours. Curettage and cementation of such lesions is the accepted treatment modality with low-rate of local recurrence. Features of recurrent cases are investigated to find out which lesions are recurring.

Method: 53 patients with low-grade cartilaginous tumour; 41 female and 12 male with a mean age of 42,3 years (17-62) were treated by curettage and cementation between 1993-2014 with a mean follow-up of 46,3 months (6-240). Anatomical distrubition was: 17 proximal femur, 12 distal femur, 22 proximal humerus and 2 proximal tibia. All patients had direct X-ray, CT scan, Tc99 labeled whole body bone scan and MRI before open biopsy (11 patients) or intraoperative frozen biopsy (42 patients). Histological diagnosis was low-grade cartiliginous tumour in all patients.7 patients had titanium-screw embedded in bone cement; the rest had no internal fixation. All patients had direct X-ray and MRI at every three months first year, every six months second year and yearly X-ray and MRI up to ten years unless symptomatic.

Results: At 42,3 months average follow-up, 5 patients (2 proximal humerus,2 distal femur and 1 proximal femur) developed local recurrence (%9,43). Time to local recurrence from index operation was mean 6,6 months (6-9). 2 proximal humerus and 2 distal femur recurrences were treated by local wide excision and tumour resection prosthesis. 1 proximal femur patient received curettage and recementation, 1 distal femur patient recurred again and was amputated. This patient also had lung metastasis and received metastasectomy. All other patients had no local recurrence or metastasis. There was no significant difference between recurrent and non-recurrent patients regarding pain, dimension of lesion, endosteal cavitation, cortical invasion and preoperative MRI. There was no histological difference between initial biopsy, curettage material and recurrent lesion. All had low-grade cartilaginous tumours, except the metastatic patient who had dedifferentation of metastasectomy specimen. All patients had slight Tc99 uptake in initial bone scan.

Conclusion: We could not find any striking feature in recurrent patients clinically, histologically or radiologically; but all recurrences were seen approximately in postoperative sixth month MRI without any clinical symptom. Any gadolinium enhancing post-operative MRI cement-bone interface should be regarded as recurrence and local wide excision is the preferred method of treatment. A strict follow-up regimen of every three months for first year is strongly recommended.

FC-121

Extended curettage followed by ethanol application and bone graft for grade 1 chondrosarcoma of the appendicular skeleton

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Purpose: The optimal management for grade 1

chondrosarcoma is controversial, and lesions of axial skeleton such as pelvis present more aggressive behavior. We analyzed oncologic and functional outcomes in patients with grade 1 chondrosarcoma treated by extended curettage, ethanol application, and bone graft compared to wide excision and reconstruction.

Methods: We retrospectively reviewed the medical records on 18 patients with grade 1 chondrosarcomas of the appendicular skeleton who underwent surgical treatment in our institution since 1993. There were 5 men and 13 women. The mean age was 48 (31-76) years old. Proximal humerus was the most common site. Enneking stages were IA in 15 and IB in 3 patients. Extended curettage, ethanol application, and bone graft were performed in 9 cases, and wide resection and reconstruction in remaining 9. Mean follow-up period was 70.3 (31-215) months. Mann-Whitney test was used to analyze functional outcome statistically.

Results: No local recurrence and distant metastasis developed. Regardless of surgical methods, all patients were clinically disease-free at last follow-up. Difference in functional outcome after extended curettage followed by ethanol application and bone graft, and wide resection and reconstruction was statistically significant.

Conclusion: Oncologic outcome in patients with grade 1 chondrosarcoma of the appendicular skeleton surgically treated was excellent regardless of surgical methods. However, functional outcome was better in the patient who underwent extended curettage, ethanol application, and bone grafts. The surgical method, therefore, could be a better surgical option for grade 1 chondrosarcoma.

FC-122

Chondrosarcoma of the pelvis: a critical review of 58 consecutive patients from a single center cohort

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Introduction: Few studies focusing on chondrosarcoma of the pelvis are currently available. There is still no consensus on clinical- and treatment-related factors that influence the outcome of patients and surgery related complications were rarely analyzed in previous studies. The current investigation aimed to illuminate these conflicting reports, moreover we determined to identify high risk factors which might trigger the development of complications.

Patients and Methods: The Vienna Bone and Soft Tissue Tumor Registry has documented 750 patients treated for bone tumors of the pelvic girdle. After excluding other tumor entities, 58 patients who were treated surgically for chondrosarcomas of the pelvis could be identified. The group consisted of 27 female and 31 male patients with a mean age of 49 years (median: 52 years, range: 20-77 years). The mean overall follow-up was 88 months (range: 0.4-277 months).

Results: At the time of final follow-up, 26 patients (45%) were alive and 32 patients (55%) had died from disease. Overall survival was 76%, 56% and 46% at one, five and ten years, respectively. On multivariate analysis, tumor grade and age > 40 proved to be important predictors for survival (p=0.038, p=0.026). Resection margin was the most important predictor for local recurrence (p=0.001). Overall survival was significantly affected by grade 4 and 5 complications (p=0.033). Endoprosthetic reconstruction and patients age > 40 were significantly associated with development of complications (p=0.002, p=0.05).

Conclusion: We conclude that the histological grade is the most powerful prognostic factor in terms of OS. Anything less than a wide resection margin will jeopardize the development of a local relapse and will increase the risk for further surgical interventions. Our results indicate that patients aged > 40 years were endoprosthetic reconstruction was performed, seem to be particularly susceptible for the development of complications. In view of the fact that 83% of these patients developed at least one complication, resection only should be followed by reconstruction methods that warrant the lowest complication rate and strategies to minimize the intra- and perioperative complication rate must be taken seriously.

FC-123

Chondrosarcoma surveillance – The Stanmore experience

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Introduction: Chondrosarcoma (CS) represent a heterogeneous group of tumours ranging from indolent and low-grade (grade 1) to aggressive and high-grade with the ability to metastasise (grade 2 and 3). No guidelines exist for post-operative CS surveillance. Our unit monitors low-grade CS treated with curettage according to the following protocol: clinical review with surgical site radiographs three monthly during year one, 6 monthly during year two, then annually until discharge at the end of year five. High-grade CS are monitored as follows: clinical review with chest and surgical site radiographs as follows: three monthly for two years, six monthly until the end of year five, then annually until discharge at the end of year ten. Suspicious symptoms or radiographic lesions are investigated with CT or MR. We analyse CS surveillance at one of the United Kingdom's largest bone sarcoma units with the aim of proposing a protocol for general use.

Methods: A retrospective review of 50 consecutive CS cases diagnosed between 2008 and 2010 was completed. Exclusion criteria included CS managed conservatively or affecting the small bones of the hand, and cases with incomplete clinical information. Data was collected from patient notes, radiology and histopathology records.

Results: A total of 50 patients with a mean age 52.4 years (range 24-81) were included (33 males; 17 females). Twenty-four low-grade and 26 high-grade CS cases were monitored according to the above surveillance protocol.

Mean follow-up was 4.5 years (range 1.6-6.5) after deaths were excluded (n=12). Local recurrence was identified in 2 low-grade and 5 high-grade cases using routine plain radiographs or MRI following symptom change. Pulmonary metastases were identified in 8 cases (mean onset 16.6 months, range 3-32). Chest radiographs identified metastases in 5 cases, with 3 cases identified on CT. No recurrent or metastatic disease was missed, with changes in symptoms (i.e. pain) or radiographic appearance prompting review with CT and/or MR imaging.
Conclusion: Monitoring CS cases according to our evidence-based surveillance protocol facilitates an appropriate balance between the frequency of out-patient clinical and radiographic review and the need to identify recurrent or metastatic disease at the earliest opportunity in order to achieve optimal patient outcomes.

FC-124

Chondrosarcoma of the pelvis a review of sixty five cases between 1996 and 2013

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Background: Treatment of pelvic chondrosarcoma is a difficult problem for the musculoskeletal oncologist. Poor rates of survival and high rates of local recurrence after surgical treatment have been reported in previous studies. The present study was designed to review the long-term oncologic outcomes of surgical management in a large series of patients with pelvic chondrosarcoma who were treated at a single institution.
Methods: The cases of 65 patients with localized pelvic chondrosarcoma that had been surgically treated between 1996 and 2013 were reviewed retrospectively. The study was limited to patients who had received no previous treatment for chondrosarcoma. There were 47 male and 18 female patients who had a mean age of 50.9 years (range, 17 to 86 years). The patients were followed for a minimum of one year or until death. The mean duration of follow-up of the living patients was 55 months (range, 0.3 to 209 months).
Results: 28 of the sixty-five patients were first seen with grade-1 chondrosarcoma; 26, with grade-2; 6, with grade-3; and 5, with grade-4 (dedifferentiated chondrosarcoma). 8 patients had an external hemipelvectomy to achieve local tumor control, whereas 57 patients underwent a limb-salvage procedure. 10 patients (15.4%) had local recurrence, and 11 (16.9%) had distant metastases. At the time of the final follow-up, 47 patients (72.3%) were alive, 18 (27.7%) had died. 5 years overall survival rate was 70%, and disease free survival was 75%. High-grade tumors correlated with poor overall survival ($p < 0.05$). Less than a wide surgical margin correlated worse overall survival ($p < 0.05$). Our results were similar with our previous series between 1975 and 1996[1].
Conclusions: Aggressive surgical resection of pelvic chondrosarcoma results in long-term survival of the majority of patients. Tumor grade and margin status are correlated with overall survival.

Reference:

1 Pring, M.E., et al., Chondrosarcoma of the pelvis. A review of sixty-four cases. The Journal of bone and joint surgery. American volume, 2001. 83-A(11): p. 1630-42.

FC-125

Argon beam and high speed bur as adjuvants in the treatment of low grade cartilage tumors

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Introduction: Intralesional treatment by curettage and different adjuvants for low grade condrosarcoma and enchondromas of uncertain malignancy without cortical breakage and soft tissue extension has been proposed in the last years as an alternative therapy. In the same way Argon beam and high speed bur have shown good results in terms of local recurrence and complications when they are used as adjuvant in the treatment of benign aggressive tumors. We made a retrospective evaluation of a series of patients who were treated for, Grade 1 chondrosarcomas and enchondromas of uncertain malignancy, by curettage, argon beam, high speed burr, and bone grafting.
Material and Methods: We retrospectively reviewed the record of 29 patients treated at our institution by curettage, argon beam, high speed bur and bone grafting since 2007 for cartilage tumors. 12 tumors where located at the humerus, 8 at the femur, 4 at the phalanx and 1 at the acetabulum, tibia, fibula and metacarpal. Patients where follow up for a minimum of 6 months (range 4 years-6 months) for evidence of local recurrence, fractures or any other complication. There were 11 males and 17 females. The average age at treatment was 44 years old. All patients were evaluated with the Musculoskeletal Tumor Society Score (MSTS).
Results: We had no local recurrence in this series of patients and no evidence of metastatic disease. 12 (42%) of the patients had internal fixation during the initial surgery in order to prevent the risk of fracture. We had 2 complications, 1 patient had a fracture at the proximal humerus, after a trauma in the first 3 months postoperatively, he had not received internal fixation during the initial surgery. One patient had allograft reabsorption on the phalanx and needed reoperation. The mean MSTS score was 28,85 at the latest follow-up. No patients where lost to follow-up.
Conclusion: Our observation showed that Argom beam coagulation and high speed burr used as adjuvants in the treatment of low grade condrosarcoma and enchondromas of uncertain malignancy are a reasonable alternative with a low rate of complications and excellent functional results.

FC-126

Chondrosarcoma of hand and feet – Review of 37 cases from single institution

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Introduction: Solitary enchondromas (ECH) first described by Lichtenstein and Jaffe in 1943 are rather frequent bone hamartomas. They are believed to be the most common benign tumor of the hand, however their true incidence is unknown as they are mostly asymptomatic. M.Altay et al. reports rate of malignization 4,2% at average age of 49,8 years (7,7years from the diagnoses). Despite the commonness of ECH, chondrosarcoma (ChSA) of hand and accounts for less than 2% of all ChSA of the body and is believed to have an indolent course. Nevertheless the biggest yet published series of 111 patients from Mayo Clinic found chondrosarcoma of small bones to have the potential to be fatal. At present still neither radiotherapy nor chemotherapy are of practical value. Therefore adequate surgery is utter most imporant in achieving a cure. Nonetheless no consensus.

Matherial and Methods: We reviewed charts of all patients operated in our clinic form 1965 to present day and found total of 45 patients treated for acral CHSa. Tumors originated in distal antebrachii or crus with extension to periphery, as well as soft tissue CHSa, were not included. We also excluded patients with mesenchymal, dedifferentiated and clear cell chondrosarcomas were not included as they have a different biological behaviour and only patients with diagnosis of convenctional bone CHSa were included in the study. Patients were evaluated for demografic data, duration and type of presenting symptom, localization, type of surgery, local recurrence and metastatic disease. 37 patients with follow-up of minimum 2 years, who met all inclusion criteria were included in the study.

Results: Of these patients 25 had tumor in hand and 12 bellow ankle. Men and female were equaly affected. Mean age at the time of diagnosis was 50,1 years (6y to 87y) with peak incidence in 7th decade. The most common presenting symptom was a bulge enlarging for relatively long time (40,7 months in average) before the patients seeked medical attention. Pain was a rare symptom and few cases manifested via pathological fracture (n=5). CHSa most often originated in metacarpal (metatarsal) region followed by proximal phalanges, with 3rd and 5th ray of the hand beeing the most commonly affected. Tumors in the foot were more often higher grade, when compared to those in hand. The great majority of CHSa in our series were secondary. The most frequent underlying condition was enchondroma (in 5 cases associated with Olliere disease and in 1 case with Maffucci sy.), followed by osteochondroma. In 5 cases no previous laesion was indentified. The treatment was always surgical. Of all the patients 4 (10,8%) developed distant pumonary metastases that were fatal for two of them, one patient died of unrelated causes and one is alive with disease. Patients with GI CHSa tend to be younger (40,6y vs 58,2y) and except for one all have been primarily treated by intralaesional surgery. Nine of these patients (75%) suffered local recurrence at an average of 131 months after the primary surgery. In all cases of multiple LR we encountered propensity to reccur in a higher grade then previous tumor (two of these patients susequently developed distant pulmonary metastases). On the other hand majority of patients with GII-III CHSa had an wide resection as a primary treatment. Four of them had an intralaesional surgery and all suffered early LR at an average of 5,75 months.

Conclusion: Despite the rarity of peripheral CHSa the consequences of these tumors are significant and they deserve a highly specialized treatment, espetialy if dominant extremity is affected. However their behavior is not as benign as proposed by Bovee and successful treatment requires careful planning. Despite high rate of recurrence after intralaesional surgery, we still would reccomend this as treatment of choice for GI laesions as it is difficult to distinguish them from benign ECH and this approach gives best functional results. However in case of a LR, more aggressive approach should be taken in consideration as the risk of developing a HG laesion raises with every reccurrence. Despite believed benign course of peripheral CHSa, fatal metastatic disease can develop in GIII laesions. The fact that feet were more likely to harbor a HG CHSa can be atributed to the the fact, that in this location they can go longer unnoticed. The peak incidence correlates with average life expectancy in Czech Republic and it is likely, that if this is to increase, the increase in incidence of peripheral CHSa will follow. Prefably those of higher grades.

FC-127

Follow-up of untreated chondroid lesions in the long bones

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Introduction: Enchondroma and atypical cartilaginous tumours are common bone tumors. The true incidence of enchondroma and ACT is unknown, since most enchondromas and ACT are asymptomatic. About half the cases in long bones are incidental findings, found when radiographic studies are performed for other reasons. To radiologically distinguish enchondroma from atypical cartilaginous tumors is sometimes difficult. Size more than 5 cm, endosteal scalloping and soft tissue expansion are indicators of ACT or chondrosarcoma grade 2/3. Enchondromas are benign lesions that do not need surgical treatment if inactive and symptomless. ACT almost never metastasize and are therefore now considered a locally aggressive neoplasm rather than a malignant sarcoma. In case of conservative treatment, follow-up frequency and duration are unclear. The risk of malignant degeneration of enchondroma/ACT is estimated to be 4%. The aim of the present study is to evaluate the course of follow-up of untreated enchondroma and ACT in the long bones.

Patients and Methods: For this study we reviewed all patients diagnosed with enchondroma or ACT from our pathology database diagnosed between 2008 and 2012. Patients who had only undergone biopsy, but no surgical treatment of the tumor, were included. Besides these patients, all patients with enchondroma or ACT based on the radiologic findings without previous biopsy or surgical treatment were included too. Exclusion criteria were age

under 18 years, lesions in other than long bones, Ollier or Maffucci disease, and follow-up less than 24 months. Patients with the conservative treatment were followed according to a standard protocol of radiograph or MRI scan 6 months after first diagnosis and further follow up annually by radiograph or MRI scan and clinical examination.

Results: A total of 38 patients were included in this study so far. 12 of the included patients had a biopsy that showed enchondroma and 26 patients were diagnosed with enchondroma/ACT based on the radiological findings. 13 of the 38 cases (34%) that had follow-up of the tumor only received surgical treatment during follow up. The reasons for this surgery were radiologic growth of the lesion in 5 cases, patient request in 4 cases, pain in 2 cases, TKA due to arthrosis combined with curettage of the lesion in one case and the development of a benign soft tissue lesion requiring surgery in the same limb in one patient. Surgical treatment was requested by 3 out of 26 patients without biopsy and by 1 out of 12 patients with previous biopsy.

Conclusion: In this small series of conservatively treated enchondroma and ACT, 34% of patients had surgerys of the lesion after all during follow-up. Radiologic growth of the lesion was seen in 13% of the patients during a follow-up period of at least 24 month. Those patients who did not have a biopsy more often requested surgery for the lesion than those who had pathological confirmation of the diagnosis enchondroma. Annual follow-up of the lesions is mandatory to follow the natural course of the lesions.

FC-128

Surgery of pelvic chondrosarcomas: a review of 285 cases from two institutions

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Introduction: Treatment of pelvic chondrosarcoma (CS) is a difficult problem for the musculoskeletal oncologist. Aim of this retrospective study was to review the long-term oncologic and functional outcome of surgical management in a large series of patients with pelvic CSs.

Methods: We analyzed 285 patients treated in two institutions between 1975 and 2013: 169 males (61%) and 116 females (39%) with a mean age of 46.8 years (range, 15 to 81 years). There were 124 central CSs (22, 81 and 21 cases grade 1, 2 and 3 respectively), 103 peripheral CSs (54, 47 and 2 cases grade 1, 2 and 3 respectively), 35 dedifferentiated CSs, 4 clear cell CSs, 2 mesenchymal CSs and 3 periosteal CSs, 14 otherwise defined CSs. Tumor involved the iliac wing in 66 cases, iliac wing and sacro-iliac joint in 13 cases, iliac wing and periacetabular bone in 35 cases, anterior arch and periacetabulum in 57 cases, anterior arch only in 33 cases, acetabulum only in 40 cases and the entire hemi-pelvis in 42. Forty-seven patients had an external hemipelvectomy (17%), whereas 238 patients (83%) underwent a limb-salvage procedure: 131 resections without reconstruction and 107 resections with reconstruction. Margins were wide in 192 cases, wide but contaminated in 26 cases, marginal in 45 cases and intralesional in 22 cases.

Results: Survival on Kaplan Meier curve was 73% and 70% at 10 and 15 years respectively. At a mean of 9 years (1 to 32 years), 174 patients (61%) were continuously NED, 24 were NED after treatment of local recurrence (8%), 50 (18%) DWD, 12 (4%) died of other causes and 25 (9%) AWD. In central and peripheral CSs, high-grade tumors correlated with worse survival. Dedifferentiated CS had a significantly worst prognosis ($p<0.0001$). At multivariate analysis on survival, stage and grade statistically influenced prognosis. Overall incidence of local recurrence was 27.3% (78 patients).

Conclusion: Surgery is the mainstay of treatment for pelvic CS. CSs with acetabular involvement offer challenging technical problems to reliable and lasting reconstruction. There was a significant correlation between histologic grade and survival. New medical treatments need to be investigated for high grade CSs.

FREE COMMUNICATIONS SESSION X: Giant Cell Tumor of Bone

FC-129

Giant cell tumor of bone in children and adolescents: a report of 10 cases

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Introduction: Giant cell tumor (GCT) of bone is a benign entity, characterized by aggressive local growth with rare metastatic disease. Incidence of GCT in the immature skeleton has been reported presenting in less than 10%, ranging from 1.8% to 10.6%. Very few series have been reported documenting GCT in the immature skeleton. In our country global incidence and incidence of GCT in the immature skeleton is unknown. We present a series of 10 cases to display the demographic characteristics, treatment and follow-up in our practice in a standardized manner.

Methods: Between the years of 2000 and 2012 a total of 10 out of 77 patients, with GCT, displayed skeletal immaturity at the time of diagnosis. These patients have been treated and followed in our center. Retrospectively these cases were analyzed. All had histological confirmation of GCT and radiographs, chest CT, bone scintigraphy and MRI of compromised region were reviewed. Skeletal immaturity was stated if open physis were present at time of diagnosis. A mean of 6.6 year follow-up was conducted (range 2 to 10).

Results: A total of eight girls and two boys compromised the series with an average age of 14.8 years at time of presentation. Our incidence of GCT in skeletal immature

patients is 7,7%. Compromise site was eight around the knee; four in the proximal tibia, four in the distal femur and two in the proximal humerus. All were treated with allografts; nine had structural allografts and one an osteo-chondral allograft. Seven out of 10 patients had no complications. Complications occurred in three patients, one local recurrence, one required removal of hardware and the third presented with a fracture. The patient that underwent osteo-chondral allograft had a traumatic fracture with successful non-surgical management.

Discussion and Conclusion: Giant cell tumor in skeletal immature patients is rare and poses a challenge to the surgeon. Incidence in our practice is similar to that stated in literature. Successful reconstruction was achieved in a great number of patients with a recurrence rate in one patient. Reconstruction with allograft has been observed to be a good modality of treatment with successful outcomes. Our data may contribute to understanding different and successful treatment options. The treatment modality exposed in our work may provide important elements to the knowledge of GCT in immature skeletons. The modality of this study limits our capacity to evaluate usefulness, and low incidence limits the number of cases presented. A prospective study that additionally brings into consideration aspects such as length discrepancy, local recurrence and functional scales may improve our knowledge about the treatment impact in our population.

FC-130

Clinical presentation and outcome of giant cell tumor of the pelvis and sacrum

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Background: Giant cell tumours of bone affecting the pelvis are rare but challenging to treat. We have evaluated our treatment of these tumours over a 36 year period to offer insights into management and suggest treatment in the modern era.

Methods: 43 patients with benign GCT in the pelvis and sacrum were studied. Treatment included radiotherapy, embolization, bisphosphonates and Denosumab, with or without surgery. Blood loss, recurrence rate, complications and functional scores were noted.

Results: 26 were females and 17 males with a median age of 37. Median follow-up was 54 months (1 - 222 months). The sacrum was involved in 22 patients, ilium in 9, ischium in 7 and pubis in 5 patients. Pain in lower back and buttock radiating down the leg was the most common symptom. Median duration of symptoms before diagnosis was 32 weeks (0 - 1040 weeks). Visceral symptoms occurred in 9 patients (21%) and neurological symptoms in 21 (49%). Surgery including extended curettage or resection was performed in 32 patients and 9 patients were treated non-operatively with embolization +/- radiotherapy (n=4) or embolization +/- Denosumab (n=5). Blood loss ranged from minimal (<100ml) to a maximum of 16,000 ml. Blood loss was higher for curettage (mean 5274ml) versus resection (mean 2850ml). Surgical complications included 2 cardiac arrests during surgery due to massive intra-operative blood loss. Local recurrence (LR) occurred in 13 patients (30%) with 85% of the recurrences occurring within 24 months, but no patient developed metastases or died from the condition or its treatment. Mean MSTS functional score was 74% (23-100%) which appeared better in patients treated non-operatively with Denosumab (mean 88%).

Conclusions: Therapy for pelvic and sacral GCT is evolving. Modern treatment may well be multidisciplinary involving surgery, drug treatment, embolization and sometimes radiotherapy.

Level of Evidence: Level II, retrospective study.

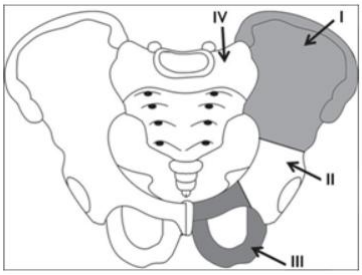

Figure 1. *Modified classification system by Enneking & Dunham (1978). Region I: ilium, Region II: acetabular, Region III: ischiopubis, Region IV: sacrum*

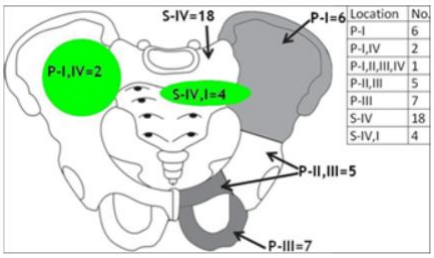

Figure 2. *Tumor locations; PI: Ilium (6), PI, IV: ilium with sacral extension (2), PI, II, III, IV: ilium with extension to all areas (1) (not illustrated), PII, III: acetabulum and ischiopubis (5), PIII: ischiopubis (7), SIV: sacrum (18), SIV, I: sacrum with extension to the ilium*

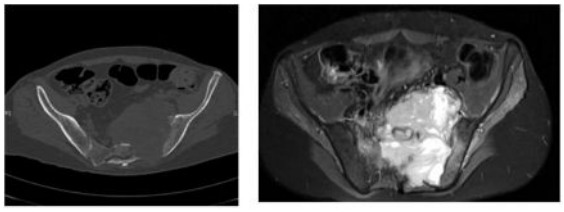

Figure 3. *CT and MRI of a typical GCT of the sacrum showing extensive bone loss and anterior soft tissue extension*

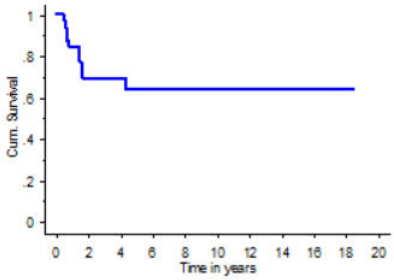

Figure 4. *Kaplan Meier survival curve showing local recurrence free survival*

Nr	Age/Sex	Duration of symptoms	Type of symptoms	Site	Stage	Diameter	Therapy	Blood loss (ml)	Complications	Local recurrence	Follow-up	MSTS
1	F15	28	P+V+N	s-IV	3	90	SAE-C	15500	cardiac arrest, foot drop, sensory loss perianal region, infection	yes, 18	280	100%
2	F38	13	N	s-IV	3	180	C+SS-BP-C+EBI-SAE	2000	sensory loss perianal region, double incontinence, EBI induced menopause	yes, 10	77	77%
3	F35	60	P+V	s-IV	3		C-C	13000	cardiac arrest	yes, 10	137	100%
4	F14		P+N	s-IV	3		C		no	no	1	100%
5	F48	36	P+WL	p-II,III	3	30	SAE-C-SAE-C+EBI-E-BP-C+CMT	400	pain, urine incontinence, foot drop, ischaemic claudication	yes, 7	114	23%
6	M49	1040	P+N	s-IV	3	100	C+EBI	1800	pain, erectile disorder	no	222	37%
7	M34	10	P	p-III	3	100	C	100	AVN femoral head	yes, 6	51	57%
8	F25	32	P	s-IV,I	3	110	C	16000	no	no	132	100%
9	M55	52	P+L	p-I,IV	3	120	SAE-C-C	1000	infection, motor weakness	yes, 52	71	53%
10	F50	250	P+L+N	p-I,IV	3	120	C	1500	infection	no	85	100%
11	F47	170	P+WL+VHN	p-I,II,III,IV	2		C-EBI-C+THR-C	8600	motor weakness	yes, 20	61	37%
12	F68	52	P	p-II,III	3		C	100	floating hip, faecal incontinence	yes, 18	112	43%
13	F37	8	whoops	p-I	3	75	C+H2O2		numbness around the scar	no	59	100%
14	F52	0	whoops+ V	s-IV	3	80	R	1800	no	no	87	100%
15	F18	144		p-III			R		no	yes, 19	163	
16	F59	52	P	p-III	3		R	8300	numbness left thigh	no	115	93%
17	M41	418	V+N	s-IV,I	3	60	EBI-SAE	-	erectile dysfunction after EBI	no	13	
18	F22	70	P+WL+N	p-I	3	180	no		N/A		1	
19	M41	32	P	p-I	2		SAE	-	SVT during anaesthesia for embolization	no	75	93%
20	F46	32	P+N	s-IV	3	80	SAE-BP-EBI-SS-Sling operation	2500	bladder retention+ incontinence+ UTI, bowel problems, EBI-induced menopause, infection	no	107	53%
21	M50	20	P+L+V	p-II,III	3	200	hemipelvectomy	3690	mild urge incontinence bowel and bladder	no	13	67%
22	M15	10	N	s-IV	2	50	SAE-C+ALL-D	7000	diarrhoea + osteonecrosis of the jaw	yes, 6	54	100%
23	F13	13	P+N	s-IV	3	94	D-SAE-C-D	4000	leg weakness when standing	no	5	30%
24	M36	13	N	s-IV	3	120	D-R-EBI-ID-D	500	lumbar pain	yes, 8	36	57%
25	F67	26	P+N	s-IV	3	60	D	-	no	no	12	100%
26	F18	36	P	s-IV	3	96	D	-	severe hypocalcaemia, nausea	no	15	87%

Table 1a

Nr	Age/Sex	Duration of symptoms	Type of symptoms	Site	Stage	Diameter	Therapy	Blood loss (ml)	Complications	Local recurrence	Follow-up	MSTS
27	F31	35	P+N	s-IV	3	98	SAE-D		no		26	63%
28	M55		P+L	p-I	3	170	D	-	no	no	45	100%
29	M61	12	P	p-II,III	2	125	D		no	no	10	
30	F58	18	P+V+N	s-IV	3	40	SAE-C+ALL	3060	numbness surgical site	no	7	77%
31	F56			p-III			C		no		44	
32	M24	5		p-III			C		no		20	
33	M29	78		p-I			R		no		64	
34	M23	16		p-III			R		no		29	
35	M39	36		p-III			R		no		58	
36	F27	34	P+V+N	s-IV	3	80	D-R	800	atypical femoral stress fracture	no	27	
37	M62	6		p-I	3		R		no		6	
38	F31	74	P+N	s-IV,I	3	62	C-SAE-D-R+C	3600	no	yes, 40	46	43%
39	F39	26	P	p-II,III	3	50	no		N/A		1	
40	F30	1	whoopin N	s-IV	3		no		N/A	no	2	
41	M18	13	P+N	s-IV	3		SAE-C+SS	5000	infection	no	111	100%
42	M28	130	P+N	s-IV,I	3	110	C-SAE+D+BP	5000	Abdominal discomfort, urinary incontinence	yes, 19	107	
43	F44	4	P+V+N	s-IV	3	70	EBI	-	no		184	40%

Table 1. *Number of patients (nr), Age/sex, Duration of symptoms, Type of symptoms; P=pain of tumor site, L=Lump, N=neurological symptoms, V=Visceral symptoms, WL=weight loss, Whoops=incidental discovery Tumor location (site); p=pelvis, s=sacrum, I=ilium, II=acetabulum, III=iliopubis, IV=sacrum. Companacci stage (Stage), Diameter in mm, Therapy; C=curettage, R=resection, SAE=selective arterial embolization, EBI=external beam irradiation, BP=bisphosphonates, D=denosumab, SS=spinal stabilization, ALL=allograft, CMT=bone cement, H202=hydrogen peroxide, THR=total hip replacement Blood loss in ml, Complications, Local Recurrence +months until local recurrence, Follow-up in months, Functional scores (MSTS) in %*

	No. patients	Median age	%Female	Duration of symptoms (months)	LR-rate	MSTS (mean)	Median follow-up (months)
Balke 2009	20	41	60%	-	5%	-	36
Balke 2012	19	25	68%	-	37%	-	36
Dahlin 1986			56%				
Donati 2008	10	33	30%	Mean: 6	20%	-	96
Guo 2012	27	27	66%	-	15%	77%	41
Vd Heiden 2013	26	41	58%	-	54%	80%	98
Kattapuram 1996	7	26	86%	-	43%	-	67
Li 2012	32	31	56%	-	38%	-	42
Leggon 2004	16	27	-	Mean: 12	24%	-	74
Osaka 1987	5	32	80%	Mean: 3 Median: 5	0%	-	135
Ruggieri 2010	31	-	-	-	10%	-	108
Sanjay 1993	19	31	79%	Mean: 8	21%	-	-
Current study	43	37	60%	Mean: 18 Median: 7	30%	74%	54

Table 2. *Demographics and outcomes in other studies on pelvic and sacral giant cell tumor, comparing number of patients, median age, percentage of females, duration of symptoms in months, local recurrence rate in percentages, functional outcome in percentages and median follow-up in months*

FC-131

Denosumab – A new bullet in the armamentarium for giant cell tumor

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Introduction: In view of the benign nature of giant cell tumors (GCT) there is generalised consensus that function preserving intralesional surgery (curettage) is preferable to more morbid resections. Often there is a dilemma when a surgeon has to decide on a procedure that would offer the least risk of local recurrence while reducing the morbidity of surgery and achieving the best long term functional outcome. Denosumab a fully human monoclonal antibody that binds and inhibits RANKL has the possibility of reducing the morbidity and facilitating surgery in GCT.
Methods: An analysis of prospectively collected data of 64 cases of GCT operated during February 2014 to December 2014 was done. 17 (27%) of these patients received Denosumab. The indication to start Denosumab was on a case by case basis with the aim to either reduce the morbidity of surgery or facilitate the ease (by formation of an ossific rim) of the planned procedure. The intent was documented at the start of therapy: convert resection to curettage (R-C), facilitate ease of resection (FR) or facilitate ease of curettage (FC). Denosumab was given in a dose of 120 mg subcutaneously at 0, 8th, 15th and 30th day and subsequently at monthly intervals (max-6 doses). The response during treatment was assessed radiologically and clinically and documented as: desired response obtained or no response /disease progression.
Results: The mean number of doses received was 5.5 (3 to 6). 14 cases achieved the desired result (R-C: 8 cases, FR: 3 cases, FC: 3 cases). 2 cases did not show a response to Denosumab. 1 case (R-C) had a good response but the patient sustained fracture neck femur and underwent resection. None of the patients reported any adverse effects while on treatment.
Conclusion: Though a longer follow up is mandated to decide its effect on local disease control, Denosumab has the potential to reduce the morbidity and facilitate ease of index surgery in GCT thus improving functional outcomes.

FC-132

Sacral giant cell tumors – To operate or not to operate!

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Introduction: Primary sacral tumors are rare. Sacral giant cell tumor (GCT) accounts for 3% to 4% of all GCTs. Although sacral GCTs are histologically benign, their optimal management is controversial in view of their aggressive behavior which is further complicated by the local anatomy and associated neurological deficit.
Methods: We treated 27 cases of GCT of sacrum between Jan 2003 to Dec 2011. The median age at presentation was 28 years (range - 20 to 60 years). Patients were treated with definitive angioembolisation or surgery decided on a case to case basis.
Results: 19 patients were planned for definitive treatment with angioembolization. The average no: of embolizations performed for each patient was 3 (range 2 - 6) at an average interval of 2 months. Bladder/ bowel function was absent in one case pre treatment which did not improve and three cases lost bladder/bowel function due to disease progression post embolization. 8 of the 19 patients treated with angioembolization had disease progression. 5 underwent subsequent surgery, two patients received radiotherapy and one patient died. 13 patients had surgery (including five cases which progressed on angioembolization). 11 patients underwent curettage and 2 had a partial sacral amputation. 3 cases

who had loss of bladder/bowel function prior to treatment did not regain it. Of the ten patients with intact bladder/bowel function, eight retained their function after surgery .At average follow up of 45mths (median 37mths), 3 patients developed local recurrence. 2 were reoperated and one underwent radiotherapy.

Conclusions: Sacral GCTs present a management dilemma and are best managed on a case by case basis using various options. A treatment algorithm for these complex lesions is presented based on our experience.

FC-133

Efficacy of Denosumab with special reference to its role in joint preservation as an adjuvant in the management of giant cell tumor of bone

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Objectives: Giant Cell Tumors of bone (GCTB) are aggressive primary bone tumors causing progressive osteolysis, most commonly in periarticular locations, thereby putting the adjacent joint at risk. Histologically, GCTB are composed of osteoclast-like Giant Cells that are activated by the neoplastic stromal cells via the RANK (receptor activator of nuclear factor kappa-B) / RANKL (Ligand) pathway and leading to extensive bone resorption. Denosumab, a human monoclonal antibody which specifically targets RANKL, inhibits this process and eliminates giant cells. This is thought to potentially allow for remineralization of the osteolytic cavity, particularly the subchondral bone and the residual thin and expanded cortex, often referred to as a neocortex. These potential bony changes following denosumab treatment would facilitate joint preservation surgery, especially in cases where significant thinning, breech or fracture through the surrounding neocortex or subchondral bone would otherwise necessitate more radical surgery.

Materials and Methods: This is a prospective non-randomized study conducted in patients with histologically proven GCT of bone. All patients consented to receiving Denosumab as an adjuvant before definite surgery. Patients received an initial loading dose of denosumab (120 mg) subcutaneously on days 1,8,15 and 29 and then every 4 weeks for a minimum of 6 month. Serial radiographs were used to monitor response to treatment. Radiographic imaging was compared at diagnosis and following pre-operative treatment with denosumab, and the results were categorized as one of four: stable, progressive, complete or partial. Thickness of the subchondral bone pre and post treatment helped quantify the amount of useful mineralization that would help in joint preservation. Histological response was evaluated postoperatively.

Results: A total of 20 patients with GCTB were included, (16 primary and 4 recurrencess). The majority of tumours were located around the knee joint (n=12). All tumors demonstrated some positive response to denosumab, hence none had stable or progressive disease. Six patients had evidence of fracture thru the subchondral bone prior to treatment, all fractures healed under the treatment. Reappearance of the subchondral bone following treatment with denosumab strongly favoured the prospects of joint preservation. Seventeen patients underwent joint salvage treatment with thorough curettage, intralesional high speed burring, and allograft or cement reconstruction. On histological examination the treated samples were characterized by an absence of osteoclast-like giant cells in all but a few examples; in these cases, the osteoclast-like cells were rare and difficult to identify. The presence of residual giant cells did not appear to be associated with recurrent GCTB - which occurred in three patients - as none of these individuals were found to have residual giant cells following denosumab therapy.

Conclusion: Denosumab provides consistent and favorable response referred to improvement of clinical symptoms, diminish of osteoclast-like giant cells, formation of mineralized woven bone, improvement of subchondral plate and cortical thickness. Denosumab appears to be a useful adjuvant in the treatment of patients with GCTB especially to facilitate joint preservation and reduce explicitly the extent of surgery. The rate of local recurrence of GCTB seems not affected by denosumab.

FC-134

Adjuvant zoledronic acid in high-risk giant cell tumor of bone – Preliminary results of a randomized phase II study

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Introduction: Systemic targeted therapy has been introduced as adjuvant to surgery aiming at reducing recurrence-rate and avoiding morbid surgery in patients with advanced giant cell tumor of bone (GCTB). Based on small retrospective series, bisphosphonates are assumed to inhibit GCTB-derived osteoclast formation. This study aims to determine if adjuvant zoledronic acid improves 2-years recurrence-rate of high-risk GCTB compared with standard care. Secondary, the predictive role of bone markers will be studied.

Methods: In this prospective multicenter randomized open-label phase II trial (www.clinicaltrials.gov, NCT00889590), patients with high-risk GCTB were included (December 2008-October 2013). Recruitment was stopped because of low accrual. High-risk GCTB

included soft tissue extension, pathologic fracture, axial localization, histological atypia, absence of local adjuvant use (i.e. phenol or polymethylmethacrylate [PMMA]) or recurrent GCTB. Patients with malignant GCTB or metastases were not included. In the intervention group, patients received adjuvant zoledronic acid (4mg) intravenously at 1, 2, 3, 6, 9 and 12 months after surgery with daily calcium (500mg) and vitamin D (400IU) supplements.

Results: Fifteen patients were included (intervention group n=8, control group n=7; Table 1). Surgery consisted of curettage with adjuvants (n=9), isolated curettage (n=3) or en bloc resection (n=3). Median follow-up was 41 months (range 8-80). Two-years recurrence-rate was 25% (2/8) in the intervention versus 29% (2/7) in the control group (p=0.99); after curettage with adjuvants 40% (2/5) in the intervention versus 25% (1/4) in the control group, respectively (p=0.75; Table 2). There was one recurrence after isolated curettage (control group; 1/1); no recurrence after resection. Overall estimated 5-years recurrence-free survival was 75% in the intervention versus 83% in the control group (p=0.84). Two patients in the intervention group had recurrence 3 months after start of zoledronic acid; systemic therapy was switched to denosumab. Complications included osteonecrosis of the jaw after 3 months zoledronic acid and 2 years denosumab (n=1), infection (n=2), chondromalacia (n=1), intra-articular PMMA leakage (n=1) and hospital-acquired pneumonia (n=1).

Conclusion: The low accrual was due to the introduction of denosumab in this patient group. Adjuvant zoledronic acid was feasible, but it did not result in a decrease in 2-years recurrence-rate in this study.

	Total (n=15)	Intervention group (n=8)	Control group (n=7)
Females	6	3	3
Age (median, range)	36 (19-73)	38 (21-55)	36 (19-73)
Follow-up (median, range)	41 (8-80)	44 (18-80)	41 (8-60)
Soft tissue extension	9	5	4
Pathologic fracture	5	2	3
Localization			
- Distal femur	5	3	2
- Sacrum	2	1	1
- Proximal femur	2	1	1
- Fibula	2	1	1
- Proximal tibia	1	1	-
- Distal tibia	1	1	-
- Proximal humerus	1	-	1
- Spine	1	-	1
Histological atypia	1	1	-
Surgical treatment			
- Curettage	3	2	1
- Curettage with local adjuvants	9	5	4
- En bloc resection	3	1	2
Local adjuvants with intralesional surgery			
- Phenol and PMMA	8	4	4
- PMMA	1	1	-
- None	3	2	1
Recurrent GCTB	6	4	2

Table 1. *Patient, tumor and treatment characteristics*

	Total (n=15)	Intervention group (n=8)	Control group (n=7)	p-value
2-year recurrence rate	27% (4/15)	25% (2/8)	29% (2/7)	0.99
- Curettage	33% (1/3)	0% (0/2)	100% (1/1)	<0.001
- Curettage with local adjuvants	33% (3/9)	40% (2/5)	25% (1/4)	0.75
- En bloc resection	0% (0/3)	0% (0/1)	0% (0/2)	1.0
5-year recurrence free survival	80%	75%	83%	0.84

Table 2. *Local recurrences after adjuvant systemic therapy with zoledronic acid compared with standard care*

FC-135

Giant cell tumor of the distal radius: is resection better?

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Purpose: Giant cell tumor of bone (GCT) is a benign disease usually treated by extended curettage and cementing /bone grafting. There have been reports suggesting that GCTs involving the distal radius are more aggressive in their behavior, predicting higher rates of local recurrence and increased incidence of lung metastasis. For these reason some have favored en bloc resection of the distal radius over extended curettage. Although many treatment options exist their oncologic and functional outcome are still vaguely estimated. The aim of our study was to focus on GCT of the distal radius, comparing local control, metastatic rate and function between those who underwent curettage and those who underwent en bloc resection with wrist arthrodesis.

Methods: Four Canadian institutions collaborated to this work. Cases were identified through prospective databases in existence in each center. 58 patients were recorded between 1989-2011 with giant cell tumors of the distal radius. Age ranged from 18 to 69 years old (mean 25). 57% were female. The mean follow-up was 86 months (range 1 to 280 mos). 15 were classified as Campanacci Gr 2 and 40 were Gr 3 (4 unknown). 16 had fractured. 35 patients underwent extended intralesional curettage. Bone cement was used in 23 of them and internal fixation was used in one. 11 were bone grafted among which 7 needed internal fixation. Wide resection and wrist arthrodesis using plate and screws for fixation where preformed on 23 patients from which 7 had free vascularized fibula transfer. All resection were performed for Gr 3 tumors.

Results: There were no deaths or lung metastases in both groups. 10 local recurrences occurred in the curettage group (29%). 9 of them where Campanacci grade 3. 9 of the 11 patients had PMMA insertion. This group had no other post-operative complications. Among these 10 recurrences, two had one more local recurrence. 3 of the 10 recurrences ultimately required resection. The primarily resected group sustained one local recurrence (4%) but 7 post-operative complications (30%) including 4 infections, 1 malunion, 1 nonunion and 1 fracture. Difference in local recurrence rates was significant (p= .021). Complications beside local recurrence were only reported in the resection group. The median Musculoskeletal Tumor Society score was 33 in the curettage group and 27 in the resection group (p= .103). The Toronto Extremity salvage Score in the curetted group displayed a median score of 94.7 compared to 85.1 for the resection group (p= .012)

Conclusions: Intralesional curettage is an effective alternative to wide resection with the advantage of preserving the distal radius and wrist function but with indeed a notable local recurrence rate. Most local recurrence could be managed with iterative curettage. Wide excision showed significantly lower recurrence but was technically challenging and associated with many post-operative complications. Resection should be reserved for most severe Gr 3 tumors.

FC-136

Is it possible to predict recurrence of giant cell tumor of bone – Our experience and dilemmas?

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Background: Giant cell tumor of bone (GCTB) is a primary bone tumor with unpredictable biological behavior. Our research refers to determining various clinical, radiological and pathohistological parameters which may indicate an increased risk of GCTB recurrence after surgical therapy.
Methods: The analysis included a total of 164 GCTB samples, 118 (72%) were primary tumors, whereas 46 (28%) were recurrences. In the paraffin embedded tissue we analyzed immunohistochemical expression of Ki67, p53, Cyclin D1 and β-catenin.
Results: Out of 16 analyzed clinical, radiological and histological variables, which presented possible predictive factors for the incidence of relapse of GCTB, univariate logistic regression (ULR) was used to extract 4 highly statistically significant parameters: 1) lesion localization, 2) number of surgical interventions, 3) nuclear p53 expression in mononuclear cells, 4) nuclear Cyclin D1 expression in giant multinuclear cells. The multivariate logistic regression (MLR), revealing that p53 expression in mononuclear cells was the most significant predictive factor (HR=6,181 p<0,001), the positivity of which indicated 6 times higher probability for recurrence in GCTB. The expression of Cyclin D1 in giant cells, containing less than 15 nuclei, was also statistically significant (HR=8,398, p=0,038) for predicting the recurrence, and that it demonstrated 8 times more frequent recurrence in positive tumors.
Conclusions: In addition to generally known parameters, such as: localization of lesion, number of surgical interventions, clear destruction of cortex with the presence of extracompartmental lesion and histological criteria for malignancy, the study also found the following independent predictors: p53 expression in mononuclear tumor cells and Cyclin D1 expression in giant multinuclear cells. Clinical Relevance It is necessary to test these results on an even larger sample of patients, so that they, if verified, might resolve the dilemmas in the therapeutic approach to Giant Cell Tumor of Bone.

FC-137

Comparison of clinical results with bone allograft or PMMA after intralesional curettage for giant cell tumors of bone

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Introduction: The optimal technique for reconstruction of the residual bone defect after intralesional curettage for giant cell tumors (GCT) remains a matter of debate. PMMA is a popular option, advocated by many authors, as it gives immediate strong mechanical support to the often thin subchondral bone remnant beneath the adjacent articular surface and it has also been suggested to reduce local recurrence rates, presumably due to local heat generation associated with polymerization. Remodeling to normal bone on the other hand, is precluded by the presence of PMMA, which is why cancellous allograft remains the preferred material for bone defect reconstruction in some centers. Wide resection is usually only considered when the joint is deemed unsalvageable.
Methods: We performed a retrospective review of all consecutive patients (n=104, M/F: 60/44, mean age 35 (11-84 years) who underwent surgical treatment for GCT in the appendicular skeleton at two orthopedic oncology centers between 1998 and 2013. We recorded choice of treatment and the local recurrence rates and evaluated our data with statistical methods including Kaplan-Meier survival analysis and log rank test.
Results: Primary wide resection (16 arthroplasties, 15 local bone resections and 4 amputations) was performed in 35 patients. The remaining 69 patients underwent primary intralesional curettage and bone defect reconstruction with cancellous allograft bone in 37 cases or bone cement (PMMA) in 32 cases. Local recurrence occurred in only 1 case (3%) of patients treated with wide resection, whereas it occurred in 23 cases (33%) of patients treated by intralesional curettage. This difference between wide and intralesional treatment was statistically highly significant (P<0,001). When comparing local recurrence rates of reconstruction methods for intralesional treatment, we found no statistical difference (p=0.75) between bone cement (32%, n=10) and bone graft (35%, n=13).
Conclusion: Wide resection of GCT's is associated with very low recurrence rates compared to intralesional treatment. The lack of a statistical difference in recurrence rates when using PMMA for bone defect reconstruction compared to bone allograft without further adjuvant therapy may suggest that the use of a presumably effective local adjuvant in itself, is not necessarily a guarantee for a lower recurrence rate.

FC-138

Denosumab in giant cell tumor of bone: innovation or chimera?

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Introduction: While the introduction of Denosumab in the treatment of Giant Cell Tumor of Bone (GCTB) has been described by many authors, less are the reports regarding timing and type of surgery and the overall rate of morbidity. We report the effect on surgical downstaging in patients treated with pre and postoperative denosumab in our single institution experience.
Methods: From 2010 to 2014 we have surgically treated 91 patients with GCTB. Eighteen of these were pre-operative treated with denosumab 120 mg SC every 4 weeks for median time of 5.7 months (range 3-6), and then post-operative denosumab every 4 weeks for 6 months. Timing of surgery was based on clinical findings and modification of radiological images (according to RECIST criteria). RESULTSAll pts were evaluable, n=10 women and n=8 men with an average age of 36 years (range 19-72); most had the lesion in the lower limb (n=5 distal femur, n=2 proximal femur, n=3 distal tibia, n=2 proximal tibia, n=2 proximal fibula), 3 in the upper limb (n=1 distal humerus , n=1 distal radio, n=1 proximal radio) and 1 in the sacrum. 17 pts were treated at first diagnosis and 1 pts at relapse. All patients were operated, 15 with curettage (83%), 3 with resection (17%). The resected bone were or in not weight bearing bone (proximal fibula and radius) or in extensively destroyed bone (one distal femur). The pts who has undergone surgery with no severe morbidity was 83.3% and the preservation rate of the native joint function was 94.4%. The median follow-up is 12.3 months; to date, 2 pts are relapsed and restarted denosumab at the same schedule.
Conclusion: Denosumab in GCTB seemed to be effective in clinical practice, with effective downstaging of tumoral size, less rate invasive surgical procedures and a good preservation rate of joint function. Despite the encouraging results, long term and blinded study has to confirm the timing of treatment and possible long term complication drug related.

FC-139

Clinical and pathological results of Denosumab in the treatment of giant cell tumor of the bone

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Introduction: Giant cell tumor (GCT) of the bone is primary aggressive tumor of bone causing an osteolytic lesion with cortical thinning, expansion and destruction. It consists of osteoclast like giant cells and stromal cells stimulating them. Although surgical treatment is the treatment of choice, the main problem is the rate of recurrence in long term follow-up. In literature, there are recurrence rates between 6-25 % despite aggressive curettage, high speed burr and adjuvants as phenol, liquid nitrogen, bone cement. In recent years after the discovery of RANK receptors in giant cells and RANK ligand in stromal cells activating them, a human monoclonal antibody against RANK ligand, Denosumab started to be used in the treatment of GCT.
Aim: The aim of this study is to evaluate the clinical and pathological results of denosumab in the treatment of GCT of the bone.
Material and Method: 11 patient (5 male and 6 female) diagnosed as GCT of bone between 2011 and 2014 included in this study. Mean age was 39.09 years (between 26-51 years). Tumor localized in distal femur in five (one of them was multicentric located also in ipsilateral proksimal femur), proximal fibula in two, proximal tibia in one, proximal humerus in one, distal radius in one and sacrum in one patient. 6 of the patients has previous operations (one proximal fibula resection and other curettage and bone cement) in other centers and has pathologically and radiologically proven recurrences. Three of the patients which has operated before has recurrence in both bone and soft tissue. Two of the patients has lung metastasis. Mean follow-up period is 17 months (between 10-30 months). 10 cycles of 120 mg Denosumab (Xgeva®, Amgen-GlaxoSmithKline) used with the permission of Ethical board of Ministry of Health. The radiological investigation, VAS scores and MSTS scores recorded in the beginning, after third cycle, at the end of the cycles and at the last follow up.
Results: The lytic lesion is progressively ossified in all patients, especially the soft tissue expansion of the tumor is ossified at the end of the treatment. Two patients with lung metastases underwent regression. Eight patient underwent to surgery (3 curettage and bone grafting, 1 curettage and bone cement, 2 resection and endoprostetic replacement and 1 resection with reconstruction with vascularized fibula and resection in one patient who underwent proximal fibula resection and had recurrence in soft tissue). 3 patients which has excellent radiological response followed without any intervention. Pathological examination showed loss of giant cells in 95% of tumor and increased osteoblastic activity. Visual analog pain scores was 7 and dropped to 2 at the last follow-up. Mean MSTS scores was 87.6 at the last follow-up. No complications occurred during treatment.
Conclusion: Denosumab is showed to be very effective in the medical treatment of GCT of the bone. The confusion in the literature is that no studies answers if Denosumab treatment alone is enough for treatment.

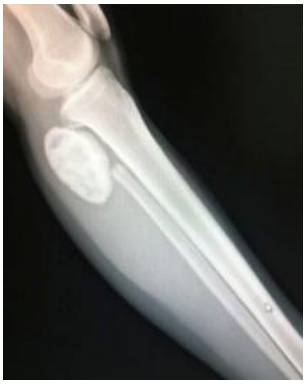

Figure 1

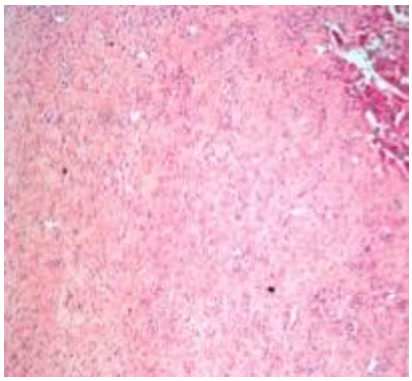

Figure 2

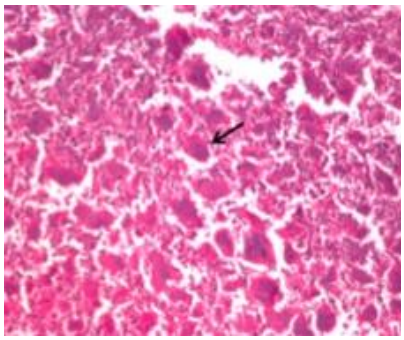

Figure 3

Figure 4

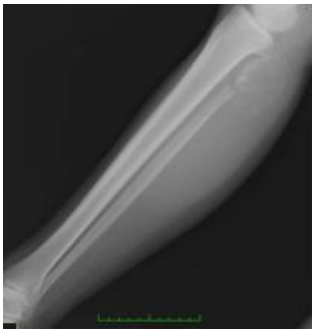

Figure 5

FC-140

Emerging role of Denosumab in the management of giant cell tumor of bone

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Denosumab is an inhibitor of giant and stromal cells and showed significant activity against giant cell tumour. Although surgery is the standard treatment for giant cell tumour, yet in some situations the associated surgical morbidity is unacceptable. In the current work, we evaluated the oncological outcome of patients suffering from inoperable giant cell tumour and treated by Denosumab.

Methods: 17 patients (3 males and 14 females) with advanced and/or metastatic giant cell tumour were treated with Denosumab (120 mg) by subcutaneous injection every 28 days for 6 injections initially, and was extended upon clinical judgment.

Results: The median age of the patients was 29.5 years (Std. Dev. +/-12.06). The sacrum and dorsolumbar spine was the primary site in 10 patients. Pain was the main symptom among all patients at presentation. 10 patients had neurological affection. Six patients had pulmonary deposits at presentation. 13 patients presented after a failed surgical procedure. 8 patients received arterial chemoembolization. Radical radiation therapy was delivered in 2 patients. Pain was effectively controlled in 14 patients with maximum effect following the 2nd injection. Significant regression of the pulmonary deposits was noted in 3 patients.

No Denosumab-related adverse events were reported.

Conclusions: Denosumab is an effective therapeutic approach for patients suffering advanced giant cell tumour. These include metastatic patients and patients in whom surgery is associated with unacceptable morbidity.

FREE COMMUNICATIONS SESSION XI: Pediatrics

FC-141

Prevention of infectious complications in children with bone tumors after the arthroplasty

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Introduction: The treatment of bone tumors in children requires numerous courses of chemotherapy - both before and after surgery. An initial problem to be solved is providing venous access: comfortable for the patient and entailing minimal risk of infections. This is particularly important to prevent infection of bone implants in the joints. The best option is fully implantable venous port systems.

Methods: From 2008 to 2013 we observed 219 children with bone tumors of extremities (aged 3 years to 17 years). Sparing surgery (limb arthroplasty) was performed in 213 patients (97.2%): in 2008 - 24 patients, in 2009 - 34, in 2010 - 28, in 2011 - 44, in 2012 - 37, in 2013 - 46. The lowest age of the patient, who underwent surgery for knee replacement - 3.5 years, the shoulder joint - 4 years. We have used venous ports since 2010 and implanted them in 80 (45.2%) patients with limb bone sarcomas: in 2010 - 5 (17.8%) patients, in 2011 - 39 (88.6%), in 2012 -36 (97.2%), in 2013 - 44 (95.6%). Subclavian catheters were

implanted in 96 (54.8%) patients.
Results: Infectious complications developed in 20 patients with limb endoprosthesis (9.1%). There were 3 infected implants (12.5%) in 2008, 5 (14.7%) - in 2009, 3 (10.7%) - in 2010, 4 (9.0%) - in 2011, 3 (8.1%) - in 2012, 2 (4.3%) - in 2013. Two-step re-arthoplasty was performed in 11 (61.1%) patients, conservative treatment (antibiotic therapy with Maxipime, Amikacin, Zyvox or Cubicin) helped to keep the implants in 7 patients (38.8%). In this early - developed within 3 months after the operation - infectious complications occurred in 64.3% of patients, delayed - from 3 months up to 2 years - 24.1%, and late - over two years - in 11.6%. Catheter-related bloodstream infection developed in 28 (29.1%) patients with subclavian catheters, while in patients with implantable venous ports such infections were not noted. The most common cause of catheter-related infections - S. epidermidis (71.8%) and S. aureus (18.2%), also inoculated when infected implants.
Conclusion: The introduction of implantable venous port-systems for the treatment of child patients with bone tumors has significantly reduced (1.8 times) the number of infectious complications and infections of limb prostheses, improving quality of life.

FC-142

Limb salvage in skeletal immature patients: Japanese experience

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Selecting a reconstruction method in children is difficult because they may have a complication as they mature physically. In this paper, I highlight the patients with bone sarcoma under the age of 15 and discuss limb salvage surgery and complications in those patients.
Patients and Methods: We selected 34 patients under the age of 15, who underwent limb salvage surgery including rotationplasty after 1992 after excision of sarcoma of the extremity. There were 28 patients with osteosarcoma, 5 with Ewing sarcoma, and one with mesenchymal chondrosarcoma. The age ranged between 4 and 15 (average, 12.6) years at operation. Tumors in 5 patients were located in the upper extremity and 29 in the lower extremity. The average follow-up period was 108 months. In those 34 patients, types of surgical procedures, postoperative function (MSTS), complications, additional surgery, and prognosis were evaluated.
Results: All patients received both pre- and post-operative chemotherapy. Reconstruction methods were as follows; tumor prosthesis in 12 (including expansion type in 5), vascularized fibula in 4, irradiated bone in 4, pasteurized bone in 3 (including 1 with vascularized fibula), frozen bone treated by liquid nitrogen in 2, arthrodesis in 1, "clavicle pro hemero" in 1, amputation and re-implantation in 1, and rotationplasty in 6. At the last follow-up, 18 patients were CDF, 6 were NED, 1 was AWD, 8 were DOD, and 1 was death for some other reason. The 5-year overall survival was 81.1% and progression-free survival was 61.2% by the Kaplan-Meier analysis. As for complication, leg length discrepancy over 2cm at the final follow-up was observed in 7 patients, fracture in 3 (including nitrogen liquid treated bone in 1), bone absorption of radiated bone in 2, and breakage of prosthesis in 1. Additional surgeries were as follows: elongation of the growing prosthesis in 5 patients (9 times in total), implantation of tumor prosthesis due to breakage of irradiated bone in 2, amputation due to local relapse or infection in 3, revision of prosthesis in 1, local flap in 1, and excision of relapsed tumor in 1. The MSTS functional evaluation was 85.3% and 74.4% in average for the patients with reconstruction of the upper extremity and of the lower extremity, respectively.
Discussion: For selection of the limb salvage technique in the growing children, postoperative complications such as prosthesis loosening or breakage of the grafted or recycled bone may happen because the patients' prognosis is keep improving and they are active after treatment. It seems important to plan the initial operation with consideration to the possibility for additional surgery as the patients mature physically.

FC-143

Outcome of pelvic bone sarcomas in children under 16 years of age

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Introduction: Sarcomas of the pelvis in children are rare and present a particular challenge due to their often large size, and difficulty in achieving surgical margins due to the close proximity of vital structures. The aim of this study was to assess the outcomes in children presenting with a primary sarcoma of the pelvis.
Patients: This retrospective study comprised 113 cases of pelvic sarcoma in children under 16 diagnosed between 1983 and 2014 at the Royal Orthopaedic Hospital, Birmingham, UK. Outcomes assessed included patient survival using the Kaplan-Meier method with a log-rank test for univariate analysis, and independent factors for survival using Cox regression analysis.
Results: The tumours comprised 88 cases of Ewing's sarcoma (ES) (78%) and 25 cases of osteosarcoma (OS) (22%) with a mean age at diagnosis of 12.7 years (12.4 in ES and 14.1 in OS). Sixty-one patients (54%; 63% of ES, 28% of OS) were treated with radiotherapy, 32 (28%; 23% of ES, 48% of OS) by surgery alone, 16 (14%; 14% of ES, 16% of OS) by surgery and radiotherapy and 3 (3%; 1% of ES, 8% of OS) with chemotherapy alone. Negative predictors of survival included local recurrence (LR), metastases at diagnosis, tumour location, and a poor response to chemotherapy. The choice of treatment did not affect survival in ES without metastases at diagnosis. Surgical margin and response to chemotherapy affected LR in OS but only response to chemotherapy affected LR in ES, which occurred in 44% (4 out of 9) with a poor response, regardless of surgical margin. In those with a good response to chemotherapy, LR occurred in 18% (3 out of 17) regardless of margin. Patients with ES treated by radiotherapy had a LR of 28%.
Discussion: Whilst attaining a wide surgical margin should

be the aim of treatment in children with OS, in ES response to chemotherapy has a greater impact on survival and those with a poor chemotherapy response should be treated with radiotherapy. Effort should be concentrated on identifying non-histological predictors of response to chemotherapy as those who demonstrate a poor response may be better suited to radiotherapy.

FC-144

Long-term follow-up of functional outcome after malignant bone cancer surgery around the knee

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Introduction: Literature concerning prospective functional outcome in primary bone cancer is lacking. Functional outcome has been investigated for two years in a prospective multi-center study among young patients after a limb-salvage (LS) or ablative surgery (AS) due to a malignant bone tumour around the knee. The significant improvement of functionality in the first year decreases in the second year. At 5 years or more after surgery we re-investigate these patients for their functional outcome.

Methods: Twenty, 15 LS (6 allografts, 9 endoprostheses) and 5 AS (amputation: 2 femur, 3 tibia) patients, of the 44 patients of the original study were included. Twenty-one patients died of disease. Mean follow-up duration was 7.2 years (5.1-8.8) with a mean age of 22.3 years (18.2-31.6). None of these patients had a local recurrence, 19 patients were free of disease and one patient was alive with disease after surgery because of lung metastases. Functional ability was assessed with the Toronto Extremity Salvage Scale (TESS), the Musculoskeletal Tumor Society score (MSTS) and 3 functional performance tests; timed up and down stairs (TUDS), various walking activities (VWA) and 6 minutes walking test (6 MWT). Physical activity was assessed with the Baecke questionnaire. Statistics analysis has been conducted with Linear Mixed Model Analysis.

Results: All obtained measurements show no significant difference after 2 years vs. more than 5 years after surgery. Mean differences of 2 years vs. more than 5 years after surgery: TESS -5.2 (-10.9- 0.5), functional tests: TUDS 0.4 seconds (-5.2- 6.0), VWA 0.2 seconds (-3.6- 4.0), 6 MWT -18.9 meters (-68- 30.2), Baecke 0.0 (-0.6- 0.6) (CI 95%). MSTS score of 75% for AS and 86% for LS patients. LS patients (10/15) had more complications than the AS patients (1/5). Within the LS group 7/9 endoprostheses and 3/6 allograft patients; each subgroup needed 7 re-operations for their complications.

Conclusion: After at least 5 years follow-up we found no significant improvement in functional outcome in comparison with 2 years after malignant bone surgery around the knee, as no significant difference was found between surgery type.

FC-145

First report of X-pand tumor prosthesis experience in Ukraine

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Goal: Over one third of malignant bone tumors in children will occur in skeletally immature patients. Physeal resection is frequently necessary and the resultant limb length discrepancy potential can be quite significant. Efforts to address this problem have included modular oncology non-invasive prostheses. The purpose of this study is to report a first Ukrainian single institutions 5 year experience with a non-invasive MUTARS-expand prosthesis.

Material and Methods: Between 2009 and 2014, 9 expandable prostheses for distal femur and proximal tibia were implanted in 9 patients. All patients had previously failed tumor prosthesis replacements because septic loosening and limb length discrepancy. In this retrospective analysis, the clinical charts for all patients receiving this prosthesis were reviewed for surgical information, diagnosis, and number of expansions, length of expansion, adverse events, and final endpoints.

Results: The study population was comprised of 3 males and 6 females, receiving a total of 9 implants. The average age at surgery was 15.5 ± 1.8 years of age. There were 5 distal femurs and 4 proximal tibias. The primary diagnosis was Osteosarcoma and all patients had a good oncological outcome. Any prostheses were implanted as the primary treatment following tumor resection. All cases were a prosthesis revision.

All 9 prosthesis are currently undergoing expansion with an average follow up of 36.8 ± 12.2 months. One patient was amputated due to progressive local recurrence and one prosthesis was removed due to infection. One revision was due to the failure of the expansion mechanism. There were no expansion related complications and all functioning devices expanded without fail. Overall, 9 prostheses underwent expansions. The average elongation achieved per patient was 5.0 ± 2.8 cm.

Conclusion: Our 5 year experience with non-invasive MUTARS-expand prosthesis has been promising. Of the original a total number of procedures, excluding those with infection or amputation, achieved the goal of reaching skeletal maturity with equal leg lengths or are undergoing active expansion. The more young patients seemed to have the better results and least failures. Based on our first single institutions experience in Ukraine, this technology holds benefit for young patients undergoing resection of malignant bone tumors about the knee.

Keywords: Limb salvage; Non-invasive expandable prosthesis; Bone tumors; Revision surgeries

FC-146

Fibrous displasia of craniofacial area in children and adolescents

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Introduction: Fibrous dysplasia (FD) is benign medullary genetically-based sporadic fibro-osseous lesion, which may involve one or more bones and is the most common in children and adolescents, especially in the craniofacial area.
Methods: We analyzed 585 cases of bone tumors and tumor-like lesions in children and adolescents from 2009 to 2014. FD was found in 48 patients (8,2%), craniofacial localization was diagnosed in 30 children (62,5%). The specimens were examined grossly and fixed in 10% formalin. Paraffin embedded sections stained with haematoxylin and eosin and examined histologically. In 18 cases, we have performed immunohistochemical staining with MDM2 and cdk4 in order to differentiate FD from low-grade osteosarcoma. Initial diagnoses of all the cases were based on their clinical, radiological, and histological features.
Results: The age of most of the patients was from 7 to 18 years (25), 5 patients were younger age 7. The male/female ratio was 13/17. Most cases of FD occurred in the maxilla (14), and frontal bone and orbit (8). A few cases were localized in the mandible (3), temporal and occipital bones (3), ethmoid and nasal cavity (2). Two patients (6,6%) had multiple craniofacial lesions. The approximate time to treatment from the first symptoms may be from 1 month to 8 years, the mean time is 24,7 months. The main complaints were a painless swelling often leading to facial asymmetry, displacement of teeth and/or malocclusion. The size of the lesions varies from 13 to 70 mm in diameter. Radiographically FD has well-defined margins, produces ground-glass appearance without prominent periosteal reaction. Histological evaluation revealed extensive osteoblastic rimming of trabeculae and focuses of marked stromal hypercellularity in comparison with FD of other locations. FD has overlapping histological features with juvenile ossifying fibroma and giant cell reparative granuloma. Immunohistochemically all cases were negative for MDM2 and cdk4 except 1 case - slightly positive for cdk4.
Conclusion: The craniofacial FD is most common in children and adolescents. Histologically we revealed extensive osteoblastic rimming of trabeculae and marked stromal cellularity in comparison with FD of other sites. FD should be differentiated with low-grade osteosarcoma, juvenile ossifying fibroma, and giant cell reparative granuloma.

FC-147

The spectrum of bone giant cell lesions in children and adolescents

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Introduction: Giant cell lesions (GCLs) in the bones of children and adolescents are represented by various pathologic entities are sometimes very difficult to differentiate, chose correct course of treatment, and predict the prognosis.
Methods: We analyzed 585 cases of bone tumors and tumor-like lesions in children and adolescents from 2009 to 2014. GCLs were found in 27 patients (4,61%). The specimens were examined grossly and fixed in 10% formalin. Paraffin embedded sections stained with haematoxylin and eosin and examined histologically. Initial diagnoses of all the cases were based on their clinical, radiological, and histological features.
Results: All cases of GCLs were divided into 4 groups: giant cell tumors (GCT) (9), giant cell reparative granuloma (GCRG) (15), cherubism (2) and solid variant of aneurismal bone cyst (ABC) (1). The main age of GCT-patients were 13-16 years, 6 cases with long bone involvement and 3 in flat bones (2 in the pelvis, 1 in vertebra, Th5), local recurrence registered in 3 cases (33,3%). The age of patients with GCRG was from 3 to 17 years old, an equal male/female ratio, sites of involvement were maxilla (7), mandible (7) and 1 case in the frontal bone. Local recurrence registered in 5 cases (33,3%). In one 3 y.o. boy with GCRG multiple bone lesions were revealed. We observed 2 cherubism cases with multiple GCLs of mandible and maxilla. A solid variant of ABC was registered in the right femur of a 13 y.o. girl. Radiographically GCLs are a lytic lesion, sometimes focally destroy cortex and invade into neighboring soft tissues. Despite the generally accepted criteria for differential diagnosis, histologically GCLs have closely overlapping features. Microscopically, in 3 cases of GCRG of the jaw we revealed features indistinguishable from GCT (numerous multinucleated osteoclast-like giant cells, mononuclear cell nuclei identical to nuclei of giant cells).
Conclusion: Despite the generally accepted criteria for differential diagnosis, histologically and radiographically GCLs in children and adolescents have closely overlapping features. GCT and GCRG have locally aggressive behavior and equal frequency of relapses in our investigation. GSLs should be differentiated by multidisciplinary approach on their clinical, radiological and histological features.

FC-148

Early management of pathological fractures in the skeletally immature

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Introduction: Pathological fractures in children can be a cause of anxiety for patients, parents and surgeons alike and often present spontaneously requiring assessment in the emergency department. Concern exists due to uncertainty in the underlying pathology and subsequent management including the need for biopsy, the timing and definitive treatment.
We **aim** to outline a protocol for the management of pathological fractures in the skeletally immature.
Methods: Retrospective analysis of all patients under the age of 17 years presenting between 1998 and 2014 with a fracture as the first indication of underlying bone

pathology. Pathologies were retrospectively characterized by histology and radiological appearance, with validation of the "fallen leaf" sign.
Results: Fifty-three patients (38M:15F) with a mean age of 11 years 1 month (Range: 3 years 1 month - 16 years). Forty-six diagnoses represented benign pathologies, with 7 being malignant. Nineteen fractures occurred in the upper limb and 34 in the lower limb. Forty-one patients underwent biopsy. Simple bone cysts (n=17) and non-ossifying fibromas (n=10) were the most prevalent with the malignant pathologies being Ewing's sarcoma, osteosarcoma and B-cell lymphoma.
Conclusion: We recommend that primary fixation of pathological fractures should be avoided until histological diagnosis is obtained, although not all pathologies ultimately require biopsy.
If radiographic appearances are reassuringly benign, biopsy can be avoided if conservative management is successful. Definitive treatment of benign lesions with protective intra-medullary nailing or curettage and grafting can follow frozen section under the same anaesthetic.

FC-149

Expandable prosthesis in reconstructing distal femoral defects following tumor resection: evaluation of a two-stage procedure

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Reconstruction following resection of distal femoral tumours in children is a real challenge. Limb salvage is possible using an expandable prosthesis that will aim at achieving equal lower limb length at maturity. However, this prosthesis is expensive and custom made for the patient. This may require 4 to 6 weeks before it is available for implantation. Delay in surgical resection or altering the chemotherapy protocol would affect the patient's oncological outcome.
Thus to avoid this delay we did a 2 stage procedure for some patients with specific circumstances. These included patients referred to our institution after having their preoperative chemotherapy, patients not financially capable for covering the expenses of an expandable prosthesis at the time of surgery and patients with poor prognostic outcome (multicentric, chest metastases at presentation).
The aim of this study was to evaluate the advantages, disadvantages and functional outcome of patients having an expandable prosthesis as a second stage of reconstruction.
19 patients suffering from distal femoral osteosarcoma were treated by preoperative chemotherapy followed by resection and reconstruction using a cement spacer. 10 of them had removal of the spacer and implantation of an expandable prosthesis after they finished their postoperative chemotherapy. They were 7 males and 3 females with an average age 10 years (range 7 to 14). The average time between the 2 procedures was 12 months (range 6 to 19). All the prosthesis had semi invasive mechanisms for expansion.
Of the remaining 9 patients, 2 had rotationplasties, 3 had hip disarticulation (2 due to local recurrence and 1 due to infection) and 4 developed chest metastases. After a minimum follow up of 2 yrs the average functional outcome of the patients who had 2 stage reconstruction was 24 (18 to 28). 1 patient developed infection and was treated by hip disarticulation.
Performing 2 stage reconstruction allowed us to perform surgical resection in the appropriate time without delaying chemotherapy. It also allowed us to implant this expensive prosthesis in the ten patients who had more favourable oncological outcome. Moreover, performing 2 stages did not affect the final functional outcome.

FC-150

Bone sarcomas of the proximal femur in small children: the challenge of hip reconstruction in a growing patient

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Introduction: Proximal femur (PF) is a very rare location for bone sarcoma in first decade of life. On 238 children of this age group, affected by HG Bone sarcomas and surgically treated at author's Institution in the last twenty years, only 20 cases (8,4%) involved the PF. The authors reviewed the results of these cases where a functional reconstruction of the hip joint was pursued by different implants
Methods: From 1994 to 2013, 20 children (13 females and 7 males, age range 1-10, median 8) with a localised bone sarcoma (7 Osteosarcoma, 13 Ewing's Family Tumors) were surgically treated by intrarticular resection of the PF and by a limb-salvage procedure with reconstruction of the hip. Two patients received a modular total femur (TF) megaprosthesis (1 mechanically expandable) with hinged knee and uncemented smooth tibial stem. In 13 cases (since 1994) PF was reconstructed by an allograft/prosthesis composite (APC). With a small stem cemented into the massive bone allograft (MBA), then fixed to the residual femur by a plate. According to the acetabular size, the femoral head was reconstructed by fixed heads in 3 children between 1 and 4 years of age.(22mm in one case and 32 mm ceramic in two) and by bipolar cups (36-44mm) in 12 cases (age 6-10). In five small children (4 or 5 y/o) an original reconstructive technique was applied: the ipsilateral proximal fibula was autotransplanted with its vascular supply to the hip, with the fibular head inside the acetabulum, and with the diaphysis inserted inside a MBA, fixed to the distal femur by a plate. Functional results were evaluated through MSTS functional score in all the patients available at last follow-up (F-up)
Results: At a mean F-up of 92 months (13-220) 13 patients are alive (65%) six after the skeletal maturity. In the 5 patients with biological reconstructions, only one girl maintained the original surgery and at 17 year follow-up displays a fascinating remodelling of the autotransplant with a normal gait. All the other four children are alive but

showed mechanical (3 cases) or early septic failure (1 case) of the implant and were revised by an APC. All primary APC patients recovered walking autonomy in the first postoperative year. One out of the 12 primary bipolar heads and two out of the 4 secondary ones were revised with uncemented acetabular cups at an interval from 5 to 17 years after the primary surgery. In the 13 survivors the functional results at last F-up were scored as Excellent in 4, Good, in 5, Fair in 4.
Conclusions: Hip reconstruction in children is a challenge. In youngest children, APC with a small prosthetic stem cemented into a MBA reconstruct the bone stock and allow a early adequate function. Bipolar cups represent an effective and durable method that preserves the acetabulum during the skeletal growth but also fixed prostethic heads may be useful in smallest patients.

FC-151

Non-invasive growing prostheses in children affected by malignant tumors of the knee: early results from a single institution

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Introduction: The treatment of malignant bone tumors in young patients is often challenging because of the possible involvement of the physis. The use of expandable prostheses allows to perform a limb-salvage surgery without a significant limb length discrepancy at the end of the growth.
Methods: From 2007 to 2014 we used Implantcast MUTARS® Xpand prostheses in seven young patients affected by malignant tumors involving the distal femur (6) or the knee articulation (1). The mechanical, non-invasive growing module of the prosthesis uses a miniaturized, mechatronic actuator inside the prosthesis activated by a high frequency transmission (from control unit via transmitter head and receiver) from outside the skin. Every impulse determines a 0,03 mm elongation allowing a tailored control of the lengthening. The diagnosis was Osteosarcoma in six patients and intra-articular Synovial Sarcoma in one patient. The average age at surgery was 10 years and the mean femoral resection was 18,93 cm. Limb length has been measured on scaled X-rays examination. Functional outcome has been evaluated using the Musculoskeletal Tumor Society score (MSTS).
Results: Mean follow-up was 34 months (3-93). One patient died for disease before starting the lenghtening. Mean elongation was 31,03 mm (0-76), with a mean limb length discrepancy of 9,2 mm (0-19) at last follow up. In one case the implant was replaced with a conventional knee megaprosthesis at the end of the growth with a final discrepancy of 5 mm. The mean Musculoskeletal Tumor Society score was 23 (77%). One complication occurred: intraoperative breakage of the connection wire.
Conclusion: The Xpand Mutars Implantcast prosthesis is a good choice in skeletally immature patients affected by malignant bone tumors of the distal femur. Advantages of non invasive lengthening are: no need of open procedure, high degree of emotional acceptance, accurate control of limb length.

FC-152

Short term experience with the Xpand non-invasive expandable endoprosthesis

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Introduction: Since July 2012 we have used the Xpand prosthesis in 11 skeletally immature and one adult patient to avoid and/or correct limb length discrepancy (LLD) in patients who underwent long bone resection involving the Femur or Tibia due to primary bone sarcoma. Indications for use of were expected LLD of more than 3 cm or existing LLD exceeding 3 cm and a minimal resection length of 15 cm.
Patients and Methods: The study group consists of 6 male and 6 female patients diagnosed with either Osteosarcoma or Ewing Sarcoma and involvement of the hip or knee joint. There were 9 cases of distal femur, one proximal femur and one proximal tibia resection respectively. 7 prostheses were implanted at index surgery and 5 at a later stage, when LLD did occur.
Results: Of 12 patients, 11 are alive, of which one with metastatic lung disease. One patient died of disseminated disease within a year of surgery. Average lengthening of 2.4 cm (range 0-6 cm) was achieved during an average period of follow-up of 15 months (range 1-27). Three implants were revised to insert a longer segment when maximum extension was achieved. Deep infection that necessitated implant removal occurred in one patient (after implant revision). No loosening has been observed in this group. 50% have equal leg length, while all other patients have not reached equal length yet. There were three mechanical failures were the motor-unit stopped to function during follow-up, of which two have been revised and are functioning properly.
As a group all patients except two ambulate without assistance (short time follow-up), and have good knee function with full extension and at least 90 degrees of flexion except for two patients who cannot bend their knee at all and have a functional arthrodesis. No local recurrence has occurred. The MSTS score for six patients with equal leg length is 24 (range 19-27).
Conclusions: The Mutars Xpand provides good function and proper leg length with a minimal need for surgical interventions. A major concern is the amount of mechanical failures (3 out of 12) in this small series that necessitated revision surgery. A minimal resection length of 17 cm in order to obtain 5 cm of lengthening makes the use of this implant in small tumors problematic.

FC-153

Expandable prosthesis in children after bone tumour resection of the distal femur. The experience of the Rizzoli Institute

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Introduction: The challenge of reconstructing the distal femur after bone tumour resection in a growing child is related to small anatomical size, age-specific bone characteristics, potential limb length discrepancy (LLD), and long-term high functional demand.
Over the last decades several types of expandable prostheses have been introduced to overcome the problem of growth loss, maintaining good function and reducing the need for major surgical revisions.
The authors present their experience with expandable prostheses in growing children.
Methods: Between 2000 and 2013, 38 custom-made expandable prostheses were implanted in patients under the age of 12, all after distal femur bone tumour resections. Average age was 8 years (range 5-11 years). Diagnosis was high grade osteosarcoma in 37 cases, Ewing sarcoma in one. Cases were divided in three groups, based on type of implant. Group A: 7 cases with a Stryker prosthesis (Howmedica Osteonics, Rutherford, New Jersey), expandable through a mini-invasive surgical procedure. Group B: 15 cases with a Repiphysis prosthesis (Wright Medical Technology, Arlington, Tenesee USA), expandable through an electromagnetic field, usually under general anesthesia. Group C: 16 cases with a JTS (Stanmore Implants Worldwide, Elstree, UK), expandable through an electromagnetic field in an outpatient setting.
Results: Group A: 6 long term survivors. Average Follow-up 81 months (56-150 months). No mechanical failure, no residual LLD. Group B: 10 long term survivors. Average follow-up 104 months (range 85-148 months). Nine cases required revision for mechanical failure/implant breakage, 6 of these required another expandable prosthesis, and 5 needed massive allografts to restore bone stock. Group C: 12 long term survivors. Average follow-up 44 months (range 18-68 months). In 4 cases (25%) partial growth arrest of the proximal tibia, with loosening of the tibial component.
Conclusions: The use of expandable prostheses after bone tumour resections in growing children can avoid the problem of LLD. Non-invasive implants reduce the need for further surgery and hospitalization. However, they are associated with high revision rates due to mechanical failure or stem loosening with related bone loss. Stem fixation in the proximal femur and design of the tibial component should be customized to optimize durability of these implants.

FC-154

Internal hemipelvectomy – Possibility of reconstruction in children and youth with primary malignant bone tumors

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Introduction: The aim of the study is recapitulation of the patients with the primary lesion localized in pelvis treated in one bone tumors clinical center. During last twenty years the possibilities of surgical treatment were changed. In this paper authors made the summery of these methods.
Method: In the period 1994 to 2014 in our Clinic 54 patients have been operated with primary malignant bone tumors in pelvis localization; 32 boys and 21 girls, in age from 5 to 16 years, average 13 years. Operations have been made in second step, after neoadjuvant chemotherapy. In histopathological diagnosis were sarcoma Ewing in 27 pts., osteosarcoma in 19 pts., and chondrosarcoma in 8 pats. Localization by Enneking classification; stage I were in 13 pts, stage II in 39 and stage III in 10 pts.
Results: Total hemipelvectomy have been made in 4 pts and internal hemipelvectomy in 50 pts In reconstruction were used different systems; bone grafts, AO plates, endoprostheses (18 pts) and trevira tube. Alive 35/54 pts, follow up 2-22 yrs., mean 5,2 yrs. Early and late complications were observed in 24 cases. Satisfactory functional results in 65 %
Conclusions: Possibility of internal hemipelvectomy depends on; 1) localization and extent of the tumor; 2) tumor reaction after neo-adjuvant chemotherapy; 3) patients age. Internal hemipelvectomy as limb salvage surgery is satisfactory, but sufficient results of surgery depend on extent of operation and rehabilitation. Operators' experience is of basic importance for surgery.

FC-155

Expandable endoprosthesis in children and adolescents after malignant tumor resection – Own experience

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Introduction: The aim of the study is recapitulation of the children and adolescents with the primary bone tumors treated in one bone tumors clinical center. During last fifteen years the possibilities of surgical treatment were changed. In this paper authors made the summary of these methods.
Method: In the period 2000-2014 185 children with primary bone tumors were treated. They were 102 boys and 83 girls. The age of the patient was from 4 to 25 years old. Median was 13 yrs. old. The treatment was begun from neoadjuvant chemotherapy. After achievement the regression or stabilization of primary lesion, the patients were qualified to surgery procedures. It was excision of the tumor end reconstruction by the using of the expandable endoprosthesis in spite of young age of the patients. After that adjuvant chemotherapy was used with or without metastasis treatment.

Results: In this study the own department experience in implantation of variety types of expandable endoprosthesis were shown. The defects and advantages of each type of expandable endoprosthesis were introduced. The all data were displayed as peer analysis of the patients with variety types of endoprosthesis.
Conclusions: As the summary the authors published the guidelines according the handling of, service the variety types of expandable endoprostheses.

FC-156

Limb salvage surgery for primary malignant bone tumors in children younger than 5 years

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The **aim** of the study was to present a result of limb salvage surgery performed in children with primary malignant bone tumors (PMBT) under five years old.
Between 2000 and 2014, fourteen children with PMBT (5 boys and 9 girls) aged from 23 to 60 months (the average: 26 months) were treated in the National Research Institute of Mother and Child, Warsaw. Seven of these children suffered from Ewing sarcoma, and the other half – from osteosarcoma. In 11 of them localized disease was confirmed at diagnosis. The localizations of the primary tumor were as followed: 6 in femur, 2 within pelvis, two in tibia and four in humerus. Prior to limb sparing surgery all of them received neo-adjuvant chemotherapy. In 12 children with tumors localized in extremities, "expendable" endoprosthesis were implanted in order to reconstruct the bone affected by the tumor. In case of two children, one with tumor localized in femur and other with tumor localized in tibia, total resection of involved bone was performed due to massive bone involvement. In another 2 patients with pelvic involvement, we performed internal hemipelvectomy: in one with allografting of damaged bones stabilized by AO plate and in the other with stabilization of the femur achieved with Trevira tube.
Result: All children survived till now. One out of 14 children is still being treated with chemotherapy, whereas remaining 13 successfully completed the treatment. In two patients complications included local recurrence and deep wound infection which led to amputation. Deep wound infection occurred in 3 cases, which needed to be treated surgically, followed by amputation in one case. Local metastasis was found in one patient, and amputation was preformed. All treated children underwent physiotherapy with various results. All of the patients required endoprosthesis elongation, and some of them eventually exchange due to body growth.
Conclusions:

1) Limb-sparing surgeries carried out in patients less than 5 years create a challenge for surgeons.
2) Primary surgical endoprosthesis reconstructions represent the first step in longstanding process of limb's sparing process, as patient require additional interventions concerning the age of operated children and their further growth.
3) The functional results of limb sparing surgery are satisfactory, even though concerns regarding troublesome rehabilitation process in such a young children as well as the need of completion of post-surgical chemotherapy.

FREE COMMUNICATIONS SESSION XII: What's New?

FC-157

Evidence of a monoclonal origin of tenosynovial giant cell tumor

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Background and Objective: Tenosynovial giant cell tumor (TGCT) is a benign but destructive proliferation arising from the synovia of joints, bursae and tendon sheaths. It is unclear whether TGCT represents a neoplastic or proliferative process. To address this question, we analyzed the X chromosome inactivation (XCI) pattern in specimen of female patients with TGCT.
Methods: DNA was extracted from paraffin-embedded specimen of 27 women with a median age of 48 years at diagnosis that had surgical resection. The XCI pattern was analyzed by means of methylation-sensitive polymerase chain reaction and primers that target the polymorphic CGG trinucleotide repeat of the FMR1 and HUMARA genes, respectively.
Results: Due to the generally poor quality of the extracted DNA we were only able to amplify eight of the 27 samples that were initially used for DNA extraction. A clonal pattern (skewing 70-90%) was obtained in five of eight samples in HUMARA and FMR1 analyses combined. Three specimens showed a random XCI pattern (50:50).
Conclusion: The fact that a monoclonal pattern was detected in five out of eight specimens suggests that at least part of TGCT results from a monoclonal proliferation and provides further evidence of a benign neoplastic origin.

FC-158

Post-surgery wound fluid stimulates ex vivo soft sarcoma re-growth

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Introduction: Surgery is the mainstay of treatment localized soft tissue sarcomas (STS)[1]. Despite optimal

treatment with surgery alone or as part of multimodality treatment approximately one third of all STS patients will develop locoregional recurrences in the first 2-3 years after treatment[2]. The frequency of distant recurrences is more difficult to quantify, because more dependent on disease biology (e.g., tumor grade) than treatment related factors. Although, early detection of recurrence is a gold standard for better disease control, it is not well understood whether microenvironment by primary tumor removal is involved in the process of local or distant relapse. For this purpose we hypothesized that wound fluid from patients following surgery may stimulate re-growth of cancer cells residual.

Methods: Tissues, surgical resected from 13 cases, were classified as soft sarcoma by histologic and immunohistologic criteria, according to UICC/AJCC by Istituto Nazionale Tumori, Fondazione G. Pascale (Naples, Italy). 5ml of Wound Fluids (WF) from patients were collected 24 h after surgery.Cells from surgical resection were growth in 10% DMEM or wound fluids 1/1. Scientific use of biological material was approved by local Ethics Committee. Cytofluorimetric analysis. Cells were analyzed on a FACS Vantage cell sorter (Becton Dickinson). Data were analyzed using CellQuest software (Becton Dickinson).

Results: Immunophenotyping of human STS biopsies revealed the presence of 90% of mesenchymal stem cells with bone marrow origin[3]. Wound fluids, collected 24h following surgery, stimulated proliferation, migration, and invasion of mesenchymal stem cells from individual patient. The stimulatory effect was almost completely abrogated when fluids from untreated patients were used. In line with these observations, western blots analysis revealed that wound fluids activated antiapoptotic pathways in tumor cells promoting survival.

Conclusions: Collectively, these ex vivo findings suggest that the stimuli present in the post-surgical fluids can promote growth of sarcoma cancer cells challenged in hostile settings such as local and, possibly, distant site.

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FC-159

Chemotherapy revived - intraarterial cisplatin-based chemotherapy in an osteosarcoma xenograft model

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Objective: Osteosarcoma (OS) patients have five-year-survival rates (5-ysr) of approximately 60% receiving standard systemic intravenous (IV) application of cytotoxic drugs such as cisplatin (CDDP). However, intraarterial (IA) chemotherapy can potentially improve treatment efficacy. Although clinical trials performed earlier failed to show a clear benefit, some studies using IA CDDP demonstrated 5-ysr of >80%. Therefore we evaluate IA chemotherapy under controlled experimental conditions.

Methods: Intratibial OSs were induced using 143B cells. After tumor establishment (determined by caliper), CDDP (at 4 mg/kg) or vehicle (0.9% NaCl) was administered IV (tail vein) or IA (arteria femoralis). Infusion was performed using custom-made polyethylene catheters and a syringe pump. During the treatment period, blood flows and body weights (BW) were monitored. Post mortem, kidney damage and numbers of metastases were assessed.

Results: IA CDDP yielded the largest reduction of tumor volume measured by caliper (87±20%; mean±SEM % of initial tumor volume) compared to IV CDDP (251±18%), IA NaCl (340±76%) or IV NaCl (426±36%). Furthermore, neither significant loss of BW, nor a significant reduction in blood flow of the tumor leg CDDP-specific kidney damage was observed. In addition to tumor volume reduction, IA CDDP significantly reduced the number of micrometastases (IA CDDP: 68±42 (mean±SEM); IV CDDP: 200±15; IA NaCl: 680±296; IV NaCl: 212±41) as well as the number of macrometastases.

Conclusion: IA infusion of CDDP shows superior efficiency in treating OS xenografts, without increasing kidney damage or loss of BW. Despite being technically challenging, this route of administration should thus be reconsidered for clinical application.

FC-160

Metilation of p14ARF and p16INK4a – A possible role in the pathogenesis of liposarcoma

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Introduction: Liposarcoma represents the most abundant group of soft tissue sarcomas, but their pathogenesis is not quite clear. Molecular studies showed that p53-p14 and Rb-p16 pathways may play important roles in it. Due to histopathological differences between liposarcoma subtypes it is likely that the genetic and epigenetic alterations are subtype specific.

Material and Method: The study included 33 liposarcoma (23 low and 10 high grade) samples that were diagnosed in Institute of Pathology, Medical Faculty, University in Belgrade. Immunohistochemistry was done for p53, Ki-67, p16 and Cyclin D1. Direct sequencing was performed for mutational analysis of the p53 gene. Methylation status of p16INK4a and KLF6 promoters has been analyzed using the methyl-specific PCR method.

Results: Immunohistochemical analysis showed increased expression of p53 in correlation with tumor grade: 4% in atypical lipomatos tumor (ALT) , 30% in myxoid liposarcoma (MLS), 100% in pleomorphic subtype (PLS). Expression of p16 protein was very similar, with overexpression in 28/33

samples (84.5 %). All of the pleomorphic samples had increased p16 expression, while ALT and MLS showed p16 immunoreactivity in 3/6 and 16/18 cases. The Cyclin D1 expression was increased in 19/33 (61.3 %) samples: WDLS 2/6 (40.0 %), MLS 11/17 (62.5 %) and PLS 6/10 (66.7 %). There was significant difference in Ki-67 expression between p53 positive and negative tumors, and correlation between p16 and Ki-67 expression was established. Regardless of histological subtypes of the samples analysis showed that 18.2% MLS and 33.3% PLS contained mutated p53 gene. Overall, mutation frequency for p53 was 23.5%. Analysis showed that 16.7% samples had methylated p16 promoter. In contrast to recurrent tumors (37.5%), none of the primary tumors had ethylated p16INK4a gene promoter. Hypermetilation of the p14ARF promoter showed 72.2% of samples, without statistical significance between primary and recurrent lesions.

Conclusions: The results from the current study suggest increased expressions of p16 and cyclin D1 are early changes in the pathogenesis of liposarcoma. Also we postulate the significant impact of the p14ARF gene methylation on the pathogenesis and for progression. Despite the limited number of samples, our study points to necessity of further investigate on of p53-p14 and Rb-p16 pathways in liposarcoma.

FC-161

EURAMOS-1: results from the randomised questions of the first European-American osteosarcoma study

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Background: EURAMOS-1 is an international study supported by 4 study groups which addresses whether changing systemic treatment on the basis of histological response to preoperative chemotherapy improves event-free survival (EFS) and overall survival for patients with resectable osteosarcoma.

Patients and Methods: Patients (pts) ≤40 years with operable osteosarcoma were treated with 2 cycles of MAP preoperatively methotrexate (M, 12 g/m^2 x 2), Doxorubicin (A, 75mg/m^2) and cisplatin (P, 120mg/m^2). Consenting pts with poor histological response (≥10% viable tumor in the resected, poor responders) were randomised to MAP or MAP plus ifosfamide and etoposide (MAPIE); consentings pts with good histological response (<10% viable tumor, good responders) were randomised to continued MAP followed by pegylated interferon-α2B (0.5-1.0µg/kg/week) up to 2 years from first chemotherapy, (MAPifn) or to complete MAP alone.

Results: Over 75 months, 2,260 patients were recruited by 326 centers in 17 countries. This is this largest ever osteosarcoma study. 1,334 (59%) pts were randomized after surgery. Good response was reported by 1,041; 716 were randomised. There was no difference EFS: hazard ratio 0.83 (95%CI: 0.61, 1.12) with 3-year EFS for MAP (n= 359): 74% (95% CI: 69%-79%); MAPifn (n = 357): 77% (72% 81.0%). Failure to start or complete planned IFN was common. Poor response was reported in 1,059; 618 were randomised. There was no difference in EFS: HR=1.01 (0.80-1.26) with 3-year EFS for MAP (n = 310): 54% (49%-60%); MAPIE (n = 308): 52% (46%-58%). Acute toxicities were more frequent in the MAPIE arm, and secondary leukaemia developed in at least 7 MAPIE patients and only 2 randomised to MAP.

Conclusions: The results confirm that the standard of care for resectable osteosarcoma is for no adjustment to post-operative treatment to be made on basis of histological response. EURAMOS-1 is an example of successfully conducted international collaboration to evaluate new approaches to treatment in a rare cancer and has created a platform for future trials to be undertaken rapidly and to the highest standards.

FC-162

L-MTP-PE and zoledronic acid association in osteosarcoma: preclinical evidence of positive therapeutic combination for clinical transfer

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Background: Zoledronic Acid (ZA, zometa(r)), a potent inhibitor of bone resorption is currently evaluated in phase III clinical trials in Europe for the treatment of malignant primary bone tumors. The beneficial effect of the liposomal form of MuramylTriPeptide-Phosphatidyl Ethanolamine (MTP-PE, MEPACT(r)), activating the macrophage population in tumors, has also proved its efficacy in osteosarcoma. The objective of our study was to evaluate the safety of the combination of zoledronic acid and liposomal mifamurtide in pre-clinical models of osteosarcoma before transfer to patients.

Methods: Two protocols were developed in mouse syngenic models of osteosarcoma: (1) 1 or 2.5 mg/kg MEPACT alone in primary tumor progression and pulmonary metastasis dissemination (experimental model induced by paratibial injection of murine osteosarcoma cells), (2) the potential interference of MEPACT on ZA (100microg/kg) induced effect on osteosarcoma. These effects were evaluated at clinical, radiological (bone

microarchitecture by microCT analysis), biological and histological levels.
Results: MEPACT alone induced slight but not significant inhibitory effect on primary osteosarcoma growth. However, it significantly inhibits spontaneous (lung metastasis dissemination from primary bone tumor) and experimental (lung colonization after intraveinous injection of osteosarcoma cells) metastases at pulmonary site. ZA alone protected against tumor-associated bone lesions. Surprizingly, combination of both drugs induced significant inhibition of primary bone growth.
Conclusions: In mouse, MEPACT alone has a potent inhibitory effect on lung metastasis development, probably due to high macrophage infiltration in the lung parenchyma. Preliminary data did not evidence any interference of MEPACT with ZA potential therapeutic activity in preclinical models of osteosarcoma. In addition, combinatory drugs inhibit primary osteosarcoma development.

FC-163

Navigated joint sparing bone tumor resections

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A sawbones study assessing accuracy and reproducibility of resection planes.
Objective: To assess the accuracy and reproducibility of joint sparing bone cuts using a navigation system with a navigated oscillating saw.
Methods: Using a novel navigation system and 3-dimentional (3D) planning tool, we navigated bone cuts to resect bone tumors. The system includes a prototype moblie C-Arm for intraoperative cone-beam CT, real-time optical tool tracking (NDI Polaris), and 3D visualization software. 3D virtual views and color coded real-time guidance visual scales were utilized to guide navigation. We developed three saw-bone tumor models identical to actual patient scenarios. Three surgeons each completed 3 navigated and 3 non-navigated resections for each tumor model.
Results: There were 126 navigated cuts in sawbones which were compared to 126 non-navigated cuts. Non-navigated cuts went through tumor in 22% (6/27) of the resections compared to navigated cuts which did not go through tumors (0/27)/ In the navigated sawbones cuts the mean entry was 1.6mm (SD 1.4) from the plan compared to the non-navigated cuts which were 3.4mm (SD 2.6) from the planned osteotomy site. Pitch and roll were 3.5 deg (SD 4.3) and 3.7deg (SD 4) in the navigated cuts compared to 13.3deg (SD 10.6) and 10.9deg (SD 9.1) in the non-navigated cuts, respectively. The navigated cuts were significantly more accurate ($P<0.001$). The variation between three different users using navigation was less than 0.6mm on the entry cut and 1.5deg on pitch and roll.
Conclusion: Navigation to guide joint sparing resections of bone tumors is accurate and feasible. 3D views and visual guidance should be used for improved accuracy. Navigated cuts were significantly more accurate than non-navigated cuts.
Clinical Implication: Navigated resection can reduce the rate of positive margin resection and lower the local recurrence rates while sparing function.

FC-164

Halofuginone inhibits primary tumor growth and lung metastasis development in osteosarcoma

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Purpose: Osteosarcoma is the main malignant primary bone tumor in children and adolescents for whom the prognosis remains poor, especially when metastases are present at diagnosis. Because we recently demonstrated that TGF-β/Smad signaling pathway plays a crucial role in osteosarcoma metastatic progression, we investigated here the effect of halofuginone, an alkaloid identified as an inhibitor of the TGF-β/Smad3 signaling pathway, on osteosarcoma progression.
Experimental Design: A preclinical model of osteosarcoma induced by paratibial injection of tumor cells was used to evaluate the impact of halofuginone on tumor growth, tumor microenvironment and metastasis development.
Results: In vivo experiments showed that halofuginone reduces both primary tumor growth and the development of lung metastases. In vitro experiments firstly demonstrated that halofuginone decreases cell viability and suggested that this effect is mainly due to the ability of the drug to induce caspase-3 dependent cell apoptosis. Secondly, halofuginone inhibits the TGF- β/Smad3 cascade and the response of TGF-β key targets involved in the metastases dissemination process such as MMP-2. In addition, halofuginone treatment affects the "vicious cycle" established between tumor and bone cells, and therefore the tumor-associated bone osteolysis.
Conclusion: Taken together, these results demonstrate that halofuginone decreased primary osteosarcoma development and associated lung metastases by targeting both the tumor cells and the tumor microenvironment. In this context, the use of halofuginone may be a promising therapeutic strategy against tumor progression of osteosarcoma specifically against lung metastases dissemination.

FC-165

Blocking TGF-beta signaling pathway inhibits the development of osteosarcoma lung metastases

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Background: Osteosarcoma is the main malignant primary bone tumor in children and adolescents for whom the prognosis remains poor, especially when metastases are present at diagnosis (survival rate drops to 20%

whenlung metastases were detected).
Aim: Because TGF-beta has been shown to promote metastases in many solid tumors, we investigated the effects of inhibition of the TGF-beta/Smad cascade on osteosarcoma behavior.
Material and Methods: To this end, two independent procedures,a pharmacological approach with TGF-beta Receptor I inhibitor (SD-208) and a molecular approach using the natural Smad inhibitor (Smad7), was used. The impact of these procedures was assessed on tumor growth, tumor microenvironment, bone remodeling and lung metastases development by using a mouse model of osteosarcoma induced by paratibial injection of osteosarcoma cells.
Results: We first demonstrated that TGF-beta levels are higher in the serum of osteosarcoma patients compared to healthy volunteers. We also showed that Smad7 slows the growth of the primary tumor and increases mice survival. In this context, we demonstrated that Smad7 expression does not affect osteosarcoma cell proliferation but affects the microarchitectural parameters of bone. In addition, Smad7-osteosarcoma bone tumors expressed lower levels of osteolytic factor RANKL, suggesting that Smad7 overexpression affects the "vicious cycle" established between tumor cells and bone cells by its ability to decrease osteoclast activity. Interestingly, we finaly showed that Smad7 overexpression in osteosarcoma cells and SD-208 inhibits the development of lung metastasis. In this context, we demonstrated that Smad7 and SD-208 reduced the capacity of osteosarcoma cells to invade Matrigel in Boyden migration chambers and gelatin zymography identified reduced MMP-2 secretion by osteosarcoma cells.
Conclusions and Clinical Implications: These results suggest that the inhibition of TGF-beta/Smad signaling pathway could be a promising therapeutic strategy against the tumor progression of osteosarcoma

FC-166

A prospective cohort study using computer assistance during resection of musculoskeletal tumors

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Introduction: The surgical management of musculoskeletal tumours is a challenging problem and has to be individualised according to anatomical location, with an aim to achieve optimum oncologic margins. This can be particularly difficult in resection of pelvic tumours and in complex geometric osteotomies as accurate determination of bony transection points is extremely important to achieve and optimise oncologic, functional and reconstructive options. The use of computer assisted navigation in these cases could improve surgical precision with the potential for optimising preservation of adjacent anatomical structures and achieving pre-planned oncological margins with improved accuracy.
Methods: From December 2009 onwards we resected musculoskeletal tumours in twenty patients requiring resection and subsequent reconstruction of multiplanar pelvic, geometric or diaphyseal resections, using commercially available computer navigation software (Orthomap 3D). Of the eleven pelvic tumours, three underwent biological reconstruction with extra corporeal irradiation; four endoprosthetic replacement (EPR); two underwent Harrington type reconstruction and two required no bony reconstruction. Four diaphyseal tumours had biological reconstruction. Two patients with proximal femoral sarcoma and two with proximal humeral sarcoma underwent extra-articular resection and where appropriate EPR. One soft tissue sarcoma of the adductor compartment involving the femur was resected with EPR.
Results: Primary outcome was assessed in terms of registration error, resection error, and reconstruction adequacy. Secondary measures included histological margins; time taken for preoperative planning; time taken for tracker insertion and intra-operative registration and completion of surgery under computer assistance as planned.Post-operative radiographs and CT show resection as planned in all cases where navigation was utilised. In two patients learning points were identified related to patient specific factors and surgical planning error. Histological examination of the resected specimens revealed tumour free margins in all cases.
Conclusion: The use of computer navigation in musculoskeletal oncology allows integration of local anatomy and tumour extent and thus resection margins can be identified accurately. Our experience so far has been encouraging. Further clinical trials, ideally multicentre, are required to evaluate its long-term impact including functional and oncological outcomes.

FC-167

Mifamurtide (L-MTP-PE) in children with osteosarcoma: the Turkish experience

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Objectives: Mifamurtide (liposomal muramyl tripeptide), activates macrophages, provides antitumor effect in lungs. Mifamurtide+chemotherapy improved survival in non metastatic osteosarcoma patients, in phase III study. After EMA approved mifamurtide for nonmetastatic osteosarcoma, it could be used off-label by the approval of the Ministry of Health on a patient basis, in Turkey. This multicentric study aims to evaluate the demographic characteristics, adverse effects, outcome of adding mifamurtide to chemotherapy in children with osteosarcoma in Turkey.
Methods: From September 2011-February 2014, in 40 nonmetastatic, 3 metastatic (after metastasectomy) osteosarcoma patients, mifamurtide was added to chemotherapy after surgery in 7 centers in Turkey. Chemotherapy regimens used were epirubicin/ifosfamide/cisplatin in 21 (Istanbul University Oncology Institute-IUOI) and other in 22 (MayoPilotII, EURAMOS, ICE etc.). Mifamurtide was given i.v.2 mg/m^2,

twice weekly for 12 weeks, followed by once weekly for 24 weeks.
Results: Median age was 13 years (4-17 years). Total of 1296 doses of mifamurtide were administered, with no major side effects. Chills, fever initially were frequent. Median follow-up time for all was 15 months (3-57mo.). For nonmetastatic patients 2 year EFS was 76 %, OS 83 %. Fifteen/40 (38%) nonmetastatic patients completed mifamurtide, all have no evidence of disease (NED) at median 17,5 mo. (12-29 mo.); 4 relapsed at median 14 months (11-17), 1 died, 3 AWD; 21 continue treatment. 2/3 metastatic patients died (28, 57 months). When 20 nonmetastatic patients from center IUOI were compared with the historical control recieving same chemotherapy, the median FU was 14 mo (4-57), 2 had relapsed at present, whereas 33/94 of the historical cases had relapsed at median 9 months (1-40).
Conclusions: In this multicentric study, mifamurtide could be administered safely with no major side effects. The experience with mifamurtide in patients with nonmetastatic osteosarcoma is promising; a longer follow up is needed to make further conclusions for survival benefit.

FC-168

Identification of CD146 as a marker of tumor-propagating cells in human sarcomas leads to novel treatment opportunities

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Tumor-propagating cells (TPCs) are believed to drive cancer initiation, progression and recurrence. These cells are characterized by enhanced tumorigenicity and self-renewal capacity. No cell surface markers for TPCs have been identified in primary human sarcomas. Therefore, our aim was to identify a robust marker that can isolate TPCs in primary human sarcomas and identify signaling pathways that are activated in TPCs, and which could be targeted for therapy. We previously used a functional dye-efflux assay to identify side population (SP) cells from sarcomas which have stem-like properties. Using a high throughput cell surface antigen screen, we identified markers highly enriched on the surface of side population (SP) cells from primary human osteosarcoma and undifferentiated pleomorphic sarcoma (UPS), which have TPC characteristics. In vivo serial transplantation assays were performed to test the tumorigenic potential of these markers. We found that CD146 is significantly enriched on the surface of SP cells, and serial transplantation assays of CD146+ cells from UPS and osteosarcoma in immunocompromised mice demonstrated that this cell population is highly tumorigenic, and can sustain tumor growth over multiple passages. Furthermore, we show that CD146+ and SP cells represent both distinct and overlapping populations of TPCs. Transcriptional profiling of CD146+ and SP cells revealed common activation of several signaling pathways including TGF-beta and Notch. Inhibition of the Notch pathway using a γ-secretase inhibitor significantly reduced tumor growth and self-renewal in both osteosarcoma and UPS, suggesting possible novel therapeutic options to reduce tumor recurrence for patients with high grade sarcomas.

FC-169

PET response criteria (PERCIST) predict progression-free survival and time to local or distant progression after chemotherapy with regional hyperthermia for soft-tissue sarcoma

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Purpose: We evaluated the prognostic accuracy of established positron emission tomography (PET) and computed tomography (CT) response criteria in patients with soft-tissue sarcoma (STS) after combined chemotherapy plus regional hyperthermia (RHT).
Experimental Design: 73 patients underwent [18F]-2-fluoro-2-deoxy-D-glucose (FDG) PET/CT before and after 2-4 cycles of neoadjuvant chemotherapy with RHT for STS. Progression-free survival (PFS), and time to local and distant progression were among other factors correlated with response according to PET Response Criteria in Solid Tumors (PERCIST 1.0) and Response Evaluation Criteria in Solid Tumors (RECIST 1.1).
Results: Metabolic response by PERCIST (n = 44/73) was an independent predictor for PFS (p = 0.002; HR 0.35, 95% CI 0.18-0.68), and time to local or distant progression. Other independent predictors for PFS by multivariate analysis were adjuvant radiotherapy (p =

0.010; HR 0.39, 95% CI 0.20-0.80) and baseline tumor size < 5.7 cm (p = 0.012; HR 0.43, 95% CI 0.22-0.83). Response by RECIST 1.1 was seen in a small group of patients (n = 22/73) and allowed prediction of PFS for patients with sarcoma outside the abdomen (p = 0.048; HR 0.13, 95% CI 0.02-0.98).

Conclusion: Metabolic response by FDG PET predicts progression-free survival and time to local and distant progression after 2-4 cycles of neoadjuvant chemotherapy plus RHT for STS.

FREE COMMUNICATIONS SESSION XIII: Miscellaneous – Quality of Life

FC-170

Validation of EQ-5D in patients treated for extremity sarcoma

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Introduction: Assessment of generic health-related Quality of Life (QoL) is important in the management of patients with extremity sarcoma (ES). The purpose of this study is to test the validity of EQ-5D questionnaire to assess generic QoL in patients treated for ES.

Methods: QoL data were collected using EQ-5D, EQ-VAS, Toronto Extremity Salvage Scale (TESS) and Musculoskeletal Tumor Society scale (MSTS) from 200 patients with ES who had undergone limb preservation surgery or amputation. Construct validity was assessed by comparing the EQ-5D scores and sub-components with measures of functional status in TESS and MSTS. Further, QoL in our sample of ES patients was compared with the general population and cancer patients in other studies. Binary logistic regression adjusted for age, gender and upper vs. lower limb ES was used to study the association between predictor variables and EQ-5D sub-scales.

Results: Preliminary analysis of a sub-sample of respondents (n = 109) found that mean score (SD) for EQ-5D=0.65(0.30), EQ-VAS=73(19), TESS=72(25), and MSTS=76%(21). The scores were positively correlated (Spearman's rho =0.6-0.8, P<0.001). EQ-5D sub-scale responses in lower and upper limb ES were different only for mobility (Fisher's exact test two-tailed P<0.001). Lower TESS and MSTS scores were associated with problems concerning mobility, self-care, usual activities and pain/discomfort, but no association was found for anxiety/depression. Younger patients and those who had not continued education after minimum school-leaving age were more likely to feel anxious or depressed. EQ-5D was lower and EQ-VAS higher compared to all cancers [EQ-5D=0.72(0.22); VAS=(68(20)][1]. The functional scores were lower compared to soft tissue ES [MSTS=89%(16)][2] and lower limb ES [TESS 84(16)][3].

Conclusion: The preliminary results suggest good construct validity for EQ-5D in ES patients and additional ability to measure feelings of anxiety or depression. Lower limb ES patients may experience lower QoL after limb preservation surgery or amputation. EQ-5D may be a shorter and more powerful tool in assessing outcome than current instruments.

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FC-171

Proton beam radiotherapy for unresectable bone and soft tissue sarcoma

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Purpose: Radiotherapy is often performed to achieve the local control of unresectable bone and soft tissue sarcomas. The purpose of this study was to evaluate the results of radiotherapy for unresectable sarcoma and clarify the efficacy of definitive proton beam radiotherapy.

Materials and Methods: Between 2002 and 2014, 84 patients with unresectable sarcoma underwent radiotherapy. Cases of retroperitoneal liposarcoma and small round cell sarcoma in children were excluded, and the remaining 79 patients were the subjects of this study. There were 42 males and 37 females, with a mean age of 59 years (14-94). The mean follow-up period was 28 months (2-126). Among the subjects, 35 patients received systemic chemotherapy and 28 received intra-arterial chemotherapy. Forty-four (44) patients underwent 3D conformal radiotherapy with photons (CRT), whereas, 35 patients received high-dose proton beam radiotherapy (PBRT). We evaluated the overall survival rate and local control rate in all patients and compared the results between the CRT and PBRT groups.

Results: The overall survival rates for all patients at 1, 2 and 5 years were 73%, 49% and 27%, respectively, while the local control rates were 83%, 64% and 44%, respectively. The total radiation dose averaged 52.6 Gy in the CRT group (40-70) and 69.7 Gy (54-84) in the PBRT group. The 2- and 5-year survival rates were significantly higher in the PBRT group than in the CRT group (71% and 56% vs. 34% and 7%, P<0.0001), as were the 2- and 5-year local control rates (78% and 58% vs. 56% and 28%, P<0.02, Figure 1). Serious complications were observed in six patients (skin ulceration with deep infection in four patients, gastrointestinal perforation in one patient and a fracture requiring amputation in one patient). Concomitant systemic chemotherapy tended to improve survival, although the difference was not statistically significant.

Conclusions: Although the PBRT group included many large (greater than 10 cm) tumors, PBRT enabled the use

of a higher dose of radiotherapy, and, consequently, the local control rate was better in the PBRT group than in the CRT group (FigureB, enhanced CT of malignant SFT). PBRT with a dose of more than 60 Gy is an excellent alternative for unresectable sarcoma.

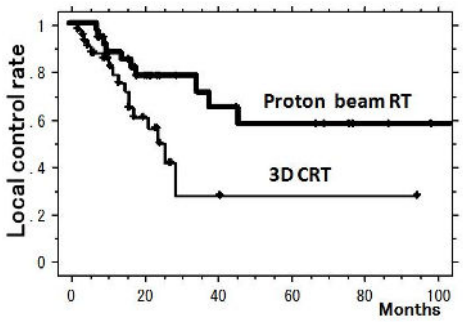

Figure 1. *Local control rate of patients treated with PBRT and CRT*

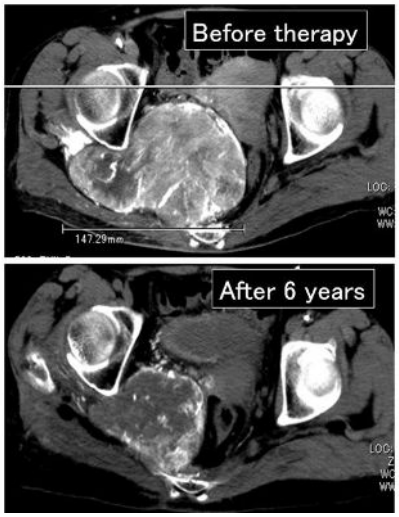

Figure 2. *Enhanced CT of patient treated with 70Gy of PBRT*

FC-172

Clinical and radiological presentation of osteoid osteoma of the foot

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Introduction: Osteoid-osteoma (OO) is defined as a benign bone-forming tumor with limited growth potential. Literature on OO in the foot consists mainly of case reports and small case series. It is unknown how many patients present with characteristic symptoms and diagnostic appearance, such as local pain with nocturnal exacerbation, pain relief after the intake of NSAIDs, or visible nidus on X-ray and/or CT. Non-typical pain in the foot poses a challenge for orthopaedic surgeons, especially when diagnostic presentation is inconclusive.
Methods: We retrospectively analyzed tumor database from two university orthopaedic departments. All patients with histology finding of the OO distal of the talocrural joint, treated in the time period of 15 years (2000-2014) were included in the study. We analyzed images (X-rays, CT, MRI), major patients' complain, clinical findings, differential diagnoses, and the time intervals from beginning of the subjective discomfort to surgery.
Results: We found in total 14 patients with OO of the foot and ankle. The average age of the patients at the time of diagnosis was 28 years (range: 18 to 57). Tumor was located in talus (n=2), calcaneus (n=3), medial cuneiforme bone (n=2), metatarsal (n=4), and phalanx (n=3). The time from starting of the symptoms until final surgery was at average 18 months (range: 3 to 42 months). Typical clinical presentation with night pain unrelated to activities, decreasing to salicilates, was present in 6 patients (43%). Other 8 patients (57%) had one or more differential diagnoses: synovitis, plantar fasciitis, avascular necrosis, Brodie apsces, chondroma, Ewing sarcoma, and Sudeck distrophy. Nidus was clearly visible on conventional X-ray in only 3 patients (21%), on CT in 10 patients (71%), and on MRI in 2 patients (14%). All patients were pain-free after the definitive treatment (open surgery and/or arthroscopy).
Conclusion: OO may occur at any localization. Foot is a less common localisation for osteoid osteoma. Typical clinical presentation was absent in less of the half of patients in this cohort. Orthopaedic surgeon should always bear in mind that foot pain could be caused by a tumor, including OO.

FC-173

Laboratory based measurement of physical functioning after treatment for sarcoma using a triaxial accelerometer – A feasibility study

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Introduction: The assessment of physical functioning is critical to understand the impact of treatment of musculoskeletal tumours. Quantitative measures may be more informative and more sensitive than traditional measures such as the Toronto Extremity Salvage Scale (TESS), but they have not been widely used in this population (Ng Kee Kwong, Furtado et al. 2014).
Aims: To pilot and test the feasibility of novel quantification of physical functioning using a triaxial accelerometer (Axivity) in a laboratory setting,
Methods: Prospective cohort study (n=40) of patients treated for lower extremity sarcoma. Clinic based assessment included TESS and instrumented testing of gait, postural

balance and timed up and go (iTUG) using Axivity.

Results: Of 40 patients, 34 were adults (results from 6 children are being analysed). Mean age was 43 (19-89) years. They were treated for tumours in the femur (19), pelvis/hip (3), tibia (9), or ankle/foot (3). 7 had amputation. Median reported TESS values were 83.62 (8.33 - 100). Balance and Gait assessments using axivity were well tolerated and produced clinically useful data with face validity (Mancini, Salarian et al. 2012) (Senden, Grimm et al. 2009) . For eg: Postural balance (predictor of falls) measured using axivity presented with median values of F95_AP (Hz) = 1.35 (0.200 - 2.520), RMS (m/ s2) = 0.010 (0.005 - 0.088), RMS _ AP (m/ s2) = 0.007 (0.004 - 0.044). Median values for spatio-temporal parameters of gait (walking) were duration of Instrumented Timed Up and Go Test (iTUG) (seconds [s]) = 19.48 (12.95 - 40.91), step time (s) = 0.560 (0.46 - 0.90), stride time (s) = 1.070 (0.92 - 1.88), stance time (s) = 0.690 (0.59 - 1.07), swing time (s) = 0.390 (0.32 - 0.74), step length (m) = 0.670 (0.46 - 0.89), step velocity (m/s) = 1.17 (0.88 - 1.54). There was significant correlation between TESS and postural balance (p=0.013, r=-0.462) and iTUG (p=0.020, r=-0.438)

Conclusion: This study supports the feasibility of Axivity to quantitatively measure physical function after treatment for lower extremity musculoskeletal tumours in the clinic. Results agree in part with patient reported function.

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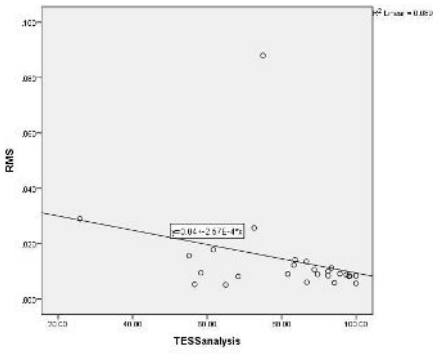

Figure 1

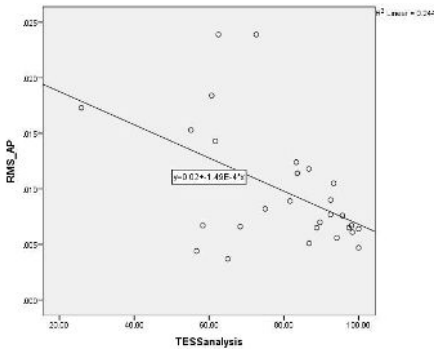

Figure 2

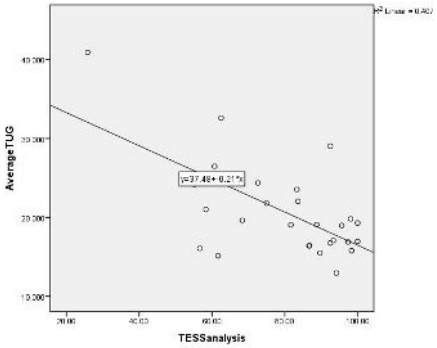

Figure 3

FC-174

Evaluating physical activity in the community after sarcoma treatment using triaxial accelerometry. A new paradigm for outcome assessment?

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Introduction: The quantitative assessment of community-based physical functioning after sarcoma treatment could enhance understanding of the impact of treatment and survivorship.[1-3]

Aims: To test feasibility of community-based physical functioning assessment in sarcoma patients through measurement of ambulatory activity with a triaxial body worn monitor (Axivity).

Methods: A prospective cohort study (n=40) of patients treated for lower extremity bone or soft tissue sarcoma. 7-day ambulatory activity the community was recorded using Axivity on mid-thigh and wrist alongside Toronto Extremity Salvage Scale (TESS) and patient completed activity diaries.

Results: Of 40 patients, 34 were adults of mean age 43 (19-89) years, treated for tumours in femur (19), pelvis/hip (3), tibia (9), or ankle/foot (3). 27 were treated with limb sparing surgery and 7 had amputation. 11 (32.4%) were treated with excision, 11 (32.4%) with excision + endoprosthesis, 1 (2.9%) with excision + endoprosthesis + muscle transfer, 1 (2.9%) with excision + filling of defect, 2 (5.9%) with excision + flap, 1 (2.9%) with excision + skin graft. Median TESS values for these patients were 83.62 (8.33 - 100). Devices were acceptable to patients. Median values were within acceptable ranges (Godfrey, Lord et al. 2014) such as: total steps 56796 (1400 - 168895), ambulatory bout count 2769 (61 -

12592), number of hours walked 15.5 (0.477 - 58.54), mean walk time in seconds 19.13 (9.70 - 39.11), alpha 1.585 (1.46 - 1.84) and variability 0.916 (0.70 - 1.16) (the latter two being measures of bout distribution). There was a trend towards positive association between TESS and Axivity values.

Conclusion: This study confirms the feasibility of triaxial accelerometry as a quantitative and objective measure of community based ambulatory activity in sarcoma patients. This has the potential for development into a clinically useful tool with significant advantages over patient reported measures and older uniaxial accelerometers.

References:

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Acknowledgement: Funded by Children with Cancer Charity and Sarcoma UK Charities.

FC-175

Service redesign for tertiary sarcoma referral service

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Introduction: Primary bone and connective tissue malignancy is rare, and diagnosis requires a high index of suspicion. Appropriate investigation and its interpretation, as in all cancer services, should be done in the context of multidisciplinary, specialist services. However, the large volume of concerning lumps and swellings presenting in the limbs and spine make clinical review of all cases in a timely manner difficult. Here we present the results of the first 3 years (1480 patients) reviewed through the Scottish Sarcoma Tertiary Referral Virtual Clinic.

Methods: All suspected musculoskeletal sarcoma cases are discussed, along with available history and imaging, in a virtual clinic by a multidisciplinary team within a week of first referral. Clinic decisions allow either immediate discharge, or progress to further imaging or biopsy prior to the need for physical clinic appointment. Data from the initial 1480 patients referred was prospectively collected and evaluated as to waiting time, initial management decision, and final intervention.

Results: 26.2% of patients (388) were discharged back to referrer from the virtual clinic without need for physical appointment. A further 46.4% (687) of patients were sent for further investigation (imaging or biopsy) prior to first clinic appointment. Mean waiting time between referral and clinic was 5.1 days.

Conclusion: The virtual clinic model shows rapid specialist assessment in possible sarcoma cases, with the avoidance of at least one unnecessary clinic appointment in 72.6% of cases. This model reduces patient waiting time to investigation and diagnosis, reduces the number of unnecessary clinic appointments and reduces patient travel. This is beneficial to both patients and service providers, and also facilitates rapid and improved communication between the sarcoma service, referring clinicians and patients.

FC-176

Transhumeral amputees treated with the OPRA implant system – Results and future possibilities with bionic limbs integrated to the bone

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Background: The OPRA (Osseointegrated Prosthesis for Rehabilitation of Amputees) implant provides direct anchorage of the prosthesis to the residual extremity skeleton and has recently been published in the first prospective report of such a system in transfemoral amputees (Bone Joint J 2014;96-B:106-11). It has also been used in upper arm amputees in Sweden since 1995 with a two-stage surgical procedure (S1 and S2) with a 6-month interval. We report the results on clinical outcome and future application possibilities.

Patients and Methods: Eighteen transhumeral amputees with 20 implants have been treated. Medical charts and plain radiograms were retrospectively reviewed. The median follow up was 8 years (2-19). In May 2013 the system was further developed when the first patient in whom implanted electrodes could pick up neural and myogenic signals from the residual limb was operated. These signals were led through the OPRA-implant to a bionic limb integrated to the bone thus allowing the patient to control the missing limb with his mind and thoughts. Through osseoperception there are afferent signals returning to the brain allowing a modified sensitivity (www.youtube.com/watch?v=V4UQU4392wM).

Results: The 2- and 5-year implant survival was 85% and 82% respectively. Superficial infection of the skin penetration site occurred in 15 cases in 5 patients. Incomplete fracture at S1 surgery occurred in 8 cases, and defect bony canal at S2 surgery was noted in 3 cases. Only one deep implant infection was noted. The functional improvement for the patient with the robotic arm is extraordinary and will be presented.

Conclusions: The OPRA implant in transhumeral amputees presented a high survival rate and an acceptable frequency of infectious complications which makes it an attractive alternative to conventional socket arm prostheses. The concept of mind-controlled bionic limbs integrated to the residual bone holds very promising rewards for future improvement both of the afferent and efferent function in transhumeral amputees.

FC-177

Oncologic and functional result after treatment of patients with fibular osteosarcoma

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Introduction: Fibular osteosarcoma is rare and historically associated with a worse prognosis compared to other localization. Objective was to analyze oncologic outcomes, complications and functional result in patients with fibular osteosarcoma in relation to different sites and surgical techniques.

Methods: Between 1985 and 2011 were treated 61 patients with fibular osteosarcoma: proximal fibula (53 cases) or distal fibula (8 cases). Surgical treatment was amputation in 15 patients and resection in 46 patients. Tumor volume was calculated. Oncologic results, complication and functional result were analyzed; amputation and resection were compared.

Results: At a mean follow up of 9 years (9 mos - 27 yrs), 36 patients were NED, 1 AWD and 24 DWD. Disease-free survival was 54.5% at 10 and 20 years, lower in proximal fibula than in distal fibula ($p = 0.0144$), in patients treated with amputation than in patients treated with resection ($p = 0.0196$) and in patients with tumor volume > 400 cc ($p = 0.0392$). There were no complication after amputation, while there were 4 complications after resection: equinus talipes (1 case), claw toes (1 case) and varus-valgus knee instability (2 cases). Functional results (MSTS) were good/excellent in all patients, better after resection.

Conclusions: Fibular OS remains associated with a worse prognosis compared to other localization. Actually, limb salvage is the treatment of choice for fibular osteosarcoma; however, amputation remains a viable alternative in case of neurovascular involvement or higher tumor volume. Functional results were satisfactory in all cases, better after resection.

FC-178

Outcome of primary leiomyosarcoma of bone – Current evidence and a report of 21 cases from two musculoskeletal tumor centers

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Introduction: Primary leiomysarcoma of bone is an extremly rare musculoskeletal tumor. Therefore evidence regarding clinical characteristics, treatment strategies and surgical outcome is limited depending on single case reports and case series. The aims of the present study were to evaluate the (1) clinical characteristics, (2) the surgical treatment and, (3) the outcome of primary LMS of bone. of pooled data for this seldom musculoskeletal tumor.

Methods: A systemic search for the MeSH terms "leiomyosarcoma" AND "bone" with use of the online Databases MEDLINE, Embase, CINAHL and Google Scholar was conducted. The search was not limited to any language. Case reports and case series of primary LMS of extragnathic bone were included. The tumor had to be intraosseous, with other primary sites of origin clinically excluded (i.e. patients with previous history of LMS of the uterus). We evaluated demographic, pathological and therapeutic variables. Descriptive summary statistics included means and frequencies. Kaplan-Meier analysis with 95% confidence intervals (CI) was performed to estimate survival.

Results: Eighty-eight studies with a total amount of 197 primary LMS of bone have been found in the literature. Additionally 21 new cases treated at two musculoskeletal oncologic institutions were added, resulting in a total amount of 218 cases included in analysis. Mean age at diagnosis was 49 years (range 9 - 87). 50,5% of patients were female and 49,5% were male, respectively. Mean follow-up was 35,1 months (range 0 - 220,4). The most common site of appearance was the distal femur (36,1%) followed by the proximal tibia (22,0%). Amputation was performed in 21,5% of patients. In 27,0% limb salvage was achieved with endoprosthetic reconstruction and 5,0% had biological reconstrcution. 6,9% of patients presented distant metastasis at diagnosis and 29,8% of patients developed metastasis during follow up. The local recurrence rate was 10,1%. The mean overall survival was 125,7 months (range 2,2 - 220,4).

Conclusion: Pooled data analysis reveals clinical characteristics and outcome for rare tumor entities. This study analyzed all reported primary LMS of bone to date. About the knee (distal femur, proximal tibia) is the most common site of LMS occurence. Survival is comparable to other primary malignant sarcomas of bone.

FC-179

Can feed-back based gait training in tumor arthroplasty influence motion sequence?

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Introduction: Following resection of bone Tumors the defect often is reconstructed by Tumor endoprosthesis. A possible complication in the knee region is early loosening of the stems and problems with the bushing or connection system of the knee prosthesis caused by hyperextension. Hyperextension often is seen during gait analysis because of loss of muscle mass and deep sensibility. From former studies hyperextension is known to lead to very high forces and torque to the joint and bushing. Aim of the study was to find out whether feed-back controled gait training can influence motion sequence in a positive way.

Material and Methods: With instrumental gait analysis

using motion analysis system based on 8 real time cameras and a motion capture software joint angles of the knee endoprosthesis was measured. The patient was real time shown the gait and angles and by visual control of current status and target status patient could adapt and normalize his gait under visual control. 15 patients with knee tumor endoprosthesis after resection of malign bone tumor were enclosed in the study.
Results: Feed back based gait training improved joint angles and gait in a significant way. Median flexion in standing phase without feed back showed hyperextension of -0.82°, with feed back +3.36°. Deviation from normal knee kinematics could be significantly reduced.
Conclusion: By feed-back based gait training destructive angles and forces on the knee prosthesis could be significantly reduced.

FC-180

Can neoadjuvant radiotherapy facilitate a safer resection and limb sparing surgery in the treatment of osteosarcoma?

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Introduction: Although preoperative radiotherapy is not currently a part of osteosarcoma treatment algorithms. It might still help to enhance resectability and achieve limb salvage. We hereby report an osteosarcoma series where neoaduvant radiotherapy was used in order to ease the operation so that vital organs and tissues can be protected.
Patients and Methods: In our orthopedic oncology database, we identified 15 patients with osteosarcoma who received radiotherapy before the operation between 1992 and 2015. The median age was 20,1 (14-52 years). The location of the disease was proximal humerus and scapula in 4 cases, proximal tibia in 3 cases, distal femur in 5 cases, proximal femur and pelvis in 2 cases, distal humerus in 1 case and thoracic wall in 1 case (one patient underwent two separate operations for distal femur and proximal femur). The cases were either primary osteosarcoma (10 cases) or recurrent disease (6 cases). The mean tumor volume was 485 cm3. Vital tissues such as femoral artery, radial and sciatic nerve were in danger in all cases. Two patients had presented with pathologic fracture. A dose of 35 Gy in 10 fractions or 50 Gy in 25 fractions was administered before the operation.
Results: Wide resection was performed in all cases, and reconstruction with tumor prosthesis was applied in 10 cases. Limb salvage was achieved in all patients with clean margins except two cases, where tumor cells were found inside the femoral vein margin although the vein was sacrificed. Among all cases, femoral/popliteal vein was sacrificed in 3 patients, femoral artery was sacrificed in one patient (who underwent femoropopliteal bypass afterwards) and unilateral T11-L1 nerve roots were sacrificed in one patient. All other vital tissues were preserved. The tumor necrosis rate was grade 1 in 5 cases, grade 2 in 6 cases and grade 3 in 5 cases according to Huvos classification. The mean follow-up period was 30,2 months (1-204 months). There were three (19%) local recurrences at a mean period of 7 months. Six patients (37,5%) had distant metastases (lung or vertebra) at a mean period of 7,3 months. One patient underwent amputation due to deep infection two years after the operation. Other complications included wound detachment in two cases (12,5%). Three patients (19%) died due to metastases at a mean period of 23 months (7-45 months).
Conclusion: Neoadjuvant radiotherapy may aid in the surgical treatment of selected osteosarcoma patients by enhancing the resectability of the tumor without damaging vital tissues. It is a safe method without any major complications given that the right dose is administered.

FC-181

Stereotactic Body Radiotherapy (SBRT) for the treatment of renal cell carcinoma metastases with oligometastatic disease

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Introduction: Second only to lung, the skeleton is the next most common site of metastatic spread from RCC. Despite the use of modern chemotherapy, targeted therapy bisphosphonates and RANK-L inhibitors progression of skeletal metastases result in pain, disability, cord compression and fracture. RCC is typically a radioresistant tumor and conventional forms of radiation have had limited success. We utilized stereotactic radiosurgery in a select group of patients with oligometastatic disease and expected long survival. To date there is little published about the treatment and efficacy of stereotactic radiosurgery in treatment metastatic RCC in patients with oligometastatic disease.
Methods and Results: We prosepectively enrolled 48 patients in an IRB approved study with metastatic renal cell carcinoma with oligometastases who received stereotactic radiosurgery. Patients were followed for at roughly 6 month intervals for at least 4 years. Of the 48 patients areas of oligometastasis included: spine (26), brain (4), pelvis (3), lung (3), scapula (2) and other bone or soft tissue location (10). The median age was 68. The median tumor volume treated was 59 cc. The average dose of radiation was 2753 cGy most dosed over 3 fractions. Fourty-one out of the 48 patients receiving treatment had either improvement in pain or complete pain relief. Thirty-eight out of the 48 reported a general improvement in quality of life. When reviewing the patients with metastatic RCC to bone all reported reduced pain or complete pain relief, with all reporting improved quality of life. Survival at 1 year was 37/48 (77%), 2 years was 29/48 (60%), 3 years 26/48 (54%) and 4 years was 23/48 (47%). Seven patients underwent retreatment at

least once for a lesion found at the same location showing a two year survival of 5/7 (71%). Eight patients underwent retreatment at least once for a lesion found at a different location with a two year survival of 4/8 (50%).

Conclusion: Analysis showed that patients with oligometastatic disease treated with SBRT achieved excellent results with respect to palliation of symptoms and local control in the long term.

Nurse Programme - Free Communications

NURSE PROGRAMME SESSION I: Free Communications

NS-01

High local recurrence rate after surgical treatment of extra-abdominal desmoid-type fibromatosis

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Introduction: Desmoid-type fibromatosis (DF) is a rare monoclonal, fibroblastic proliferation that usually arises in deep soft tissues. Although histologically benign they are characterized by infiltrative growth. Surgical treatment was often the first choice except if mutilating and associated with considerable function loss. However, choosing the right treatment for DF is challenging because of the unpredictable behaviour, including long periods of stable disease or even spontaneous regression. This study is meant to quantify the results of different treatment modalities, in order to change our strategies in the future, if indicated.
Methods: Eighty-two patients who were treated for extra-abdominal DF (52 female, 63%) from 1978-2014 were retrospectively studied. Mean age was 41 years (8-79). Sixty-four (78%) presented with a primary lesion; 18 (22%) were referred for a residual or recurrent lesion following treatment elsewhere. Seventy-six patients (93%) had unifocal disease. Lesions predominantly affected the thorax and trunk (n=33, 40%), thigh (n=11, 13%), head/neck (n=8, 10%) and shoulder (n=8, 10%).
Results: Of 64 patients presenting with a primary lesion, 28 (44%) underwent surgery alone (2 wide margins, 10 marginal, 17 intralesional or questionable), 19 (30%) surgery and radiotherapy, eight (13%) radiotherapy alone, four (6%) received systemic treatment (tamoxifen) and four (6%), watchful waiting (three had symptomatic treatment with NSAIDs). Twenty-two (34%) had progression after treatment; progression rates were 0% after radiotherapy alone (0/8), 26% after surgical treatment with adjuvant radiotherapy (5/19), 50% after surgery alone (14/28) and 50% after systemic treatment (2/4). First relapses all occurred within three years (range). Of 18 patients who presented with residual or recurrent lesions in our center, nine experienced a further relapse after treatment (50%).
Conclusions: Progression of disease was frequent, especially in patients presenting with a residual or recurrent lesion. Local control of primary lesions was most often achieved with radiotherapy or a limited resection combined with radiotherapy. Based on the high recurrence rate in this study we recommended a more watchful waiting policy, such as the recent European consensus.

NS-02

The network for the management of bone and soft tissue sarcomas: the experience of a reference centre in Northern Italy and the role of the nurse

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Introduction: The goal of the treatment of bone and soft tissue sarcomas is a joint management involving different medical specialists and other health professionists (nurses, physical therapists, psychologists, ...) and taking into account the territorial situation in order to ensure adequate treating standards. Following the experience in the management of other visceral and solid tumours, the oncologic network of Piemonte and Valle d'Aosta (North of Italy) developed an analogue system adapted to the specific characteristics of these neoplasms.
Methods: Different critical phases of the diagnosis and the management of musculoskeletal sarcomas have been identified: the doubt of having a sarcoma, the diagnosis, the multidisciplinary discussion for treatment, the surgical/oncologic treatment, and the follow up. The role of the nurse in the single phases has been evaluated.
Results: The first approach for the patient with a doubt for sarcoma is within the CAS (Centre for Welcome and Services) where an orthopaedic oncologist and a specialist nurse communicate the possible diagnosis and take care of the diagnostic process and after a complete Imaging study, the patient undergoes a biopsy either Imaging-guided or open. The multidisciplinary team (GIC) in presence of the specialist nurse discusses every single case for the correct surgical/oncologic management and one of the specialists talks to the patient afterwards. The follow up is in accordance with the current guidelines or is discussed altogether in GIC for specific cases.
Conclusion: The nurse has a key-role in the management of bone and soft tissue sarcomas. He/She should guarantee a global coverage to the patient, including full, continuative and integrated information with the medical figure, as well as therapeutic education on the home management of oncologic treatments and surgery consequences.

NS-03

The AYA box: a creative patient centered communication tool for use in adolescents and young adults with cancer

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Aim: There is a growing recognition that taking care of adolescents and young adults (AYAs) is distinctive from that of children or adults.
A study has been conducted to explore the personal views of AYAs with cancer in order to get insight in their perspectives during treatment and survivorship. The integration of study results in a patient centered tool in order to enhance the communication with the AYA and the multidisciplinary team was a secondary objective.
Methods: A qualitative study based on the principles of Grounded Theory was conducted. Twenty four adolescents aged 15 to 25 years were interviewed. Interviews were transcribed and coded using NVIVO 7. Constant comparison was used to analyse the data. Datacollection and -analyse took place in a cyclic process.
Results: From the AYAs' perspective, cancer is something temporarily passing their life-path.
The diagnosis is a shock but their coping strategies are focused on preserving identity and guarding normal life. Three phases were identified: cancer freezes life - maintaining normal life is hard and cancer changed their life forever.
The AYA is the director in his treatment and customized information, social network, contact with friends, ... are key aspects in AYA care
A creative AYAbox has been developed to meet these specific needs and to enhance the communication with the AYA. The box belongs to the AYA and contains a booklet with revealing stories of AYAs' experiences, postcards, a unique AYA tag, stickers mentioning feelings or concerns, cards with information or instructions and smart aids in communication with their relatives and professional caregivers.
Conclusions: The results are translated in a practical and meaningful tool, based on the experiences of the AYAs, inspiring caregivers on our pediatric ward to provide patient centered care in accordance to the specific preferences and wishes of the AYA.

NS-04

Osteosarcoma – What's new?

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…we asked ourselves when we were thinking about a topic we would like to present. Looking at the history of treatment, we found that the survival rate didn't improve essentially in the last three decades, since chemotherapy was introduced.
Treatment of osteosarcoma didn't change significantly during the last 30 years.
The "goldstandard" is still the combination of chemotherapy and surgical tumor resection. In the case of non-resectable tumors, radiotherapy is used. Surgical methods and radiotherapeutic techniques could be improved significantly. The rate of amputation has significantly decreased. New treatment strategies in radiotherapy like Heavy In Radiotherapy (HIT) were developed and are under investigation with children and young adults. However, systemic treatment (chemotherapy) consists more or less of the same substances since decades.
New strategies like for example the therapy with interferon have failed…
So there is really not much "new" in treatment of osteosarcoma, but research still goes on! Current projects, like the "German Consortium of Translational Cancer Research" (DKTK) offers the possibility to investigate numerous tumor samples with modern techniq2ues like the "Next generation sequencing" giving us information about tumor subgroups, tumor biology and possible therapy targets.

NS-05

Palliative care in terminally ill patients

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Quality of life (QOL) is believed to be the most important outcome of care at the end of life and it has been conceptualized in two ways: Global Quality of Life (GQOL) which is defined as an individual's subjective well-being and Health-Related Quality of Life (HRQOL), which is a more focused concept related to the impact of a medical condition or the impact of specific medical interventions on a person's physical, psychological and social well-being.
As far as terminally ill patients are concerned, there is a variety of instruments used, in order to evaluate their own QOL in the following domains: material, emotional and physical situation, relationships with other people, social activities, pain management and independence. Chronically ill patients can receive care at home, hospital or Hospice. Hospices offer compassionate care for the terminally ill, their families and the caregivers. Anyone with a life expectancy of less than six months can benefit from Hospices services, whether at home or in a nursing facility. Hospice care is based on an interdisciplinary approach to patient and caregiver support.

NURSE PROGRAMME SESSION II: Free Communications

NS-06

Retrospective analysis of the management of the high-risk bleeding sarcoma patient with bleeding-preventing intravascular device

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Introduction: Intra-operative and post-operative bleeding determines systemic complications such as cardiovascular failure, kidney failure, higher risk for

infection. Furthermore it increases the complexity of the patient's management and consequently the complexity of the nursing care. The aim of this study is to evaluate high-risk bleeding sarcoma patients with or without a bleeding-preventing intravascular device.
Methods: A case control retrospective study has been conducted comparing a group with (10 patients) and another without (10 patients) a bleeding preventing intravascular device for the surgical treatment of bone and soft tissue sarcomas. The number of single blood unit transfusions, the postoperative management and monitoring of respiratory rate, Oxygen saturation, temperature, systolic blood pressure, pulse rate, and level consciousness have been evaluated and compared.
Results: The number of single blood units transfused intra- and post-operatively was lower in the group with bleeding preventing intravascular device ($p<0.05$). In this group the patient was more hemodinamically stable and its management was possible in a regular ward. Nursing and assistance complexity was adequate to the ward and did not require an intensity care unit (ICU). An early mobilization and self-feeding of the patients, and a good pain control help the health professionals in facing the first postoperative days.
Conclusion: When the intro- and post-operative bleeding is limited, it is possible to manage the patient in the ward even in the first days. The complexity of the management is consequently lower because a hemodinamically stable patient is easier to be assisted. An ICU is not necessary because no constant instrumental, clinical and nurse monitoring is mandatory. Infection related to ICU are consequently lower.

NS-07

Physical exercise in patients with osteosarcoma or Ewing sarcoma in the lower extremity: a literature study

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Background and Objective: Research shows that in patients with cancer exercise programs including aerobic and/or muscle conditioning exercises are effective with respect to aerobic capacity, muscle strength and/or cancer related fatigue. Specifically in patients with cancer undergoing chemotherapy, a number of studies, in particular in breast and colon carcinoma, demonstrated that body-exercises during and after treatment with chemotherapy had a positive effect on the patients' quality of life. Little is known on the effectiveness of exercise in patients with a malignant bone tumor of the lower extremity. In this patient group, the chemotherapeutic treatment regimen is relatively long, and aerobic capacity and muscle strength may be even more limited than in other types of cancer, as the putting of weight on the affected limb is hindered by pain, fragility of the bone by the tumor and the consequences of local surgical treatment. The purpose of the present study was to investigate the literature regarding the evidence for the effectiveness and safety of aerobic and/or muscle conditioning exercises in patients with a malignant tumor of the lower extremity before and after surgery.
Methods: Systematic literature search using a predefined search strategy in the electronic databases PubMed, Embase, Web of Science, CINAHL, Cochrane CENTRAL and Academic Search Premier from 2000 until October 2014 Studies were included if they concerned a clinical study on the effectiveness and/or safety of an exercise program including aerobic and/or muscle strengthening program in patients with osteosarcoma or Ewing sarcoma of the lower extremity administered before or after surgery or both before and after surgery. Endpoints should include at least one measure of aerobic capacity or muscle strength. Participants in studies must be 16 years of age or older.
Results: No studies on the effect of an exercise program administered specifically to patients with primary bone cancer of the lower extremity in the preoperative and/or postoperative phase were identified.
Conclusion: Further investigation into these effects, tailor-made for patients with primary bone cancer is needed. Recommendations for a pilot study using a tailor-made exercise program will be presented.

NS-08

Quality of life after malignant bone cancer surgery; a long term follow-up study

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Background: During a previously conducted study, quality of life (QoL) of children and adolescents after malignant bone tumor surgery was longitudinally evaluated. Significant improvements were reported during this two years follow-up. However, QoL scores differ from scores of healthy peers and it remains unclear. if further improvements could be expected after this period. Aim of the present study was therefore to assess progression of QoL scores of the remaining patients from the evaluation at 2 years until long-term follow-up at minimal 5 years postoperative.
Methods: Malignant bone tumor survivors of the initial short-term study were included into this multicenter study. Long-term follow-up assessments were done at least 5 years after surgery. QoL was measured with the Short Form-36 (SF-36), the TNO-AZL Adult's Quality of Life Questionnaires (TAAQOL) and the Bone tumor (Bt)-DUX. Statistical analysis included Linear Mixed Model Analysis.
Results: From the original cohort of 44 patients; 20 patients were included for the long term follow-up

reassessment, 10 of them were boys and 10 girls, and mean age at surgery was 15.1 years and follow-up duration 7.2 years. Twenty-one patients of the initial cohort (47%) died on disease; one patient was excluded due to social-emotional problems and 2 refused to participate in the extension of the study. Fifteen patients (75%) underwent limb-salvage and 5 (25%) ablative surgery. At long-term follow-up, patients after bone cancer surgery reported significantly lower QoL scores in comparison with their healthy peers at the Physical Component Summary (PCS) scales of the SF-36 and TAAQOL ($p<.05$). Significant advantages were reported for patients after limb salvage in comparison with ablative surgery at the PCS scale of the SF-36 (mean difference 13.7, $p=.05$) and the cosmetic scale of the Bt-DUX (mean difference 17.7, $p=.04$) . QoL improved significantly during the follow-up at the PCS scale of the SF-36 and TAAQOL and at all subscales of the Bt-DUX ($p< .01$). However, no significant differences were reported between the evaluations at 2 years and long-term follow-up (p; .41-.98).

Conclusions: After 5 year of follow-up, no further QoL improvements were achieved in comparison with the 2 years follow-up.

NS-09

Intravenous chemotherapy at home

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Home care nursing is the type of care that is delivered in the privacy and comfort of the patient's home. Intravenous chemotherapy provided at home, is an alternative to the extended hospital care system, especially for patients with cancer disease requiring several therapeutic treatments. The infusion of intravenous chemotherapy at home always originates with the prescription of the treatment from a certified physician who is overseeing the treatment of the patient and is designed to achieve physician –defined therapeutic endpoints.

Home intravenous nursing is carried out by oncology-certified nurses that are usually provided by agencies specialized in providing medical staff. The specific nursing staff is fully experienced and provides personalized attention, instruction and counseling to the patient and his family.

The infusion networks need a provider of the chemotherapies which must be a licensed pharmacy either independent or hospital affiliated.

Home care intravenous therapies can be financially supported either by the patient or his family or by private insurance companies as well as public health systems.

This innovative type of home care nursing in Greece is lacking the necessary legal framework and requirements.

NS-10

Computer use, staff hygiene and infections in Orthopedic Clinic

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Nosocomial infections are a major source of morbidity, mortality and increased expenses in hospital settings. The most important defenses against all infections are continuing education of staff and strict adherence to infection control policies. Over the past 50 years, various forms of computer-based, information management applications have been developed and deployed in clinical settings. A computer is a valuable tool in medicine and Orthopedics uses technology before, during and after surgeries and for data collecting. The question is whether this tool can also harm the patient. The use of a computer, especially in a clinic, is associated with hand hygiene. Hand washing is emphasized as the single most important measure to prevent cross transmission of microorganisms and thus to prevent nosocomial infections. Nowadays, there is also an increased use of cell phones and tablets. The issue is no longer whether hand hygiene is effective, but how to produce a sustained improvement in health workers' compliance.

Poster Presentations

POSTER PRESENTATIONS SESSION I: Complex Skeletal Reconstruction

PP-001

Reconstruction of pathological fracture due to aneurysmal bone cyst by curretage, allograft, locking compression plate

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Introduction: A study of 15 cases of pathological fracture due to aneurysmal bone cyst treated by curretage and bone graft, locking plate fixation.
Material and Methods: The lesions were principally located in the tibia, femur, humerus, and, in most cases, presented the imaging appearance originally described by Jaffe and Lichtenstein as a blowout with thin cortices.
Results: The patients were treated primarily with curettage and implantation of allograft chips, locking plate fixation. The local recurrence rate was 20%. Toronto Extremity Salvage Score (TESS) is 90.8.
Conclusion: Aneurysmal bone cysts are enigmatic lesions of unknown cause and presentation and are difficult to distinguish from other lesions. Overall, the treatment is satisfactory by curretage and bone graft, locking plate fixation.

Figure 1

PP-002

Endoprosthetic reconstruction of the distal humerus: still a challenge in limb salvage surgery

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Introduction: The distal humerus is a rare location of bone tumors. Due to the complexity of the ellbow-joint, poor soft tissue coverage and the proximity of nerves and vessels both resection and endoprosthetic reconstruction is demanding. This retrospective study evaluates the clinical results and complications after distal humerus or total elbow resection and reconstruction with MUTARS tumour endoprosthesis in 13 patients.
Methods: All patients were traced by our tumour database. Patient files were reviewed for clinical information. Limb and prosthetic survival was estimated according Kaplan-Meier analysis. Postoperative function and patients' contentment have been assessed using the MSTS-Score.
Results: Between 1998 and 2014 we performed a resection of the distal humerus in 13 patients (median age 46 years). The predominant diagnoses were bone or soft tissue sarcomas (n=6), giant cell tumour (n=2) and renal cell carcinoma metastasis (n=2). According to Kaplan-Meier estimation limb survival was 78% after a median follow-up of 77 months (range 3-168). Local recurrence (Ewing`s sarcoma n=1, soft tissue sarcoma n=1, renal cell carcinoma n=1) was the reason for secondary amputation in all cases (n=3). All of these patients had a marginal or intralesional resection before. Prosthetic survival without any reoperation was 77% at 2 years and 62% at 5 years postoperatively. Prosthesis failure was mainly caused by aseptic loosening of the humerus stem in 36% (n=5), aseptic loosening of the ulna stem in 7% (n=1) and periprosthetic infection in 7% (n=1). One wound healing disturbance made a free radialis flap necessary in one patient. The mean Musculoskeletal Tumor Society score was 24 (range 19-30, n= 11). An extension gap over 10° was noted in 4 patients.
Conclusion: Our results suggest that limb salvage with a distal humerus or total elbow replacement can achieve good functional results in the majority of patients, although the complication rate with special emphasis on the loosening rate of the humerus stem is high. However, limb salvage was not achieved in 21% of patients due to local recurrence.

PP-003

Utilizing 3D solid modeling technique for pelvic reconstruction after malignant tumor resection

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Introduction: Because of the complex pelvic anatomy and generally large tumor masses; resection and reconstruction of malign pelvic tumors are challenging.
Objectives: We aimed to present our case of pelvic reconstruction with custom-made endoprosthesis utilizing

3D Solid Modeling Technique.

Methods: 24 year old female patient had undergone curettage and grafting surgery twice at another institute with the diagnosis of "fibrous dysplasia" at periacetabular region. With the onset of groin pain, she admitted to our institute and after imaging studies local recurrence was observed. We performed a tru-cut biopsy and it revealed fibrosarcoma based on fibrous dysplasia. After neoadjuvan chemotherapy, an anatomic model of her pelvis was made at our institute's Medical Design and Manufacturing Center utilizing 3D solid modeling techniques using her CT and MRI images. After determining safe surgical borders at MRI images, a special cutting guide for bone resection and custom made endoprosthesis was produced with laser sintering method. During this manufacturing process she suffered a pathologic right collum femoris fracture.

Results: We performed tumor resection and pelvic reconstruction using custom made pelvic and cementless total hip prosthesis. With the special cutting guide, we optimized and gained our preoperatively defined resection borders. Also with the custom made endoprosthesis we achieved the most anatomic reconstruction.

Conclusions: Pelvic reconstruction with custom made endoprosthesis after malignant tumor resection is a successful limb salvage surgical technique for chosen patients. Preoperative surgical planning can be optimized utilizing 3D solid modeling technique. With this technique, surgical outcomes and patient adaptation can be increased by custom-made implants.

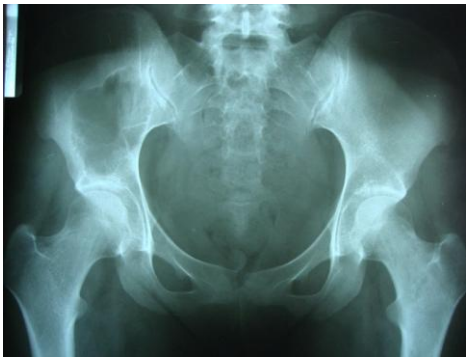

Figure 1. *Preoperative Xray*

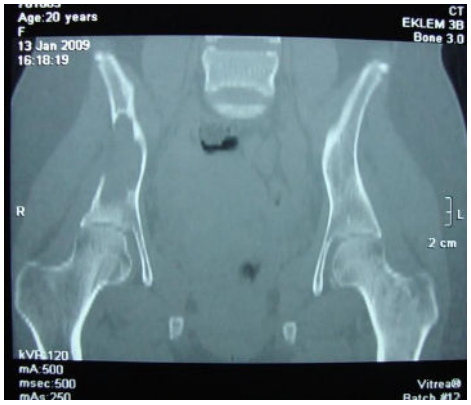

Figure 2. *Preoperative Ct*

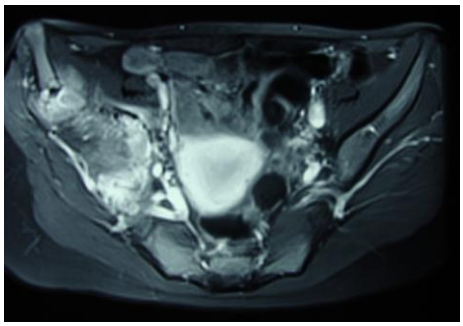

Figure 3. *Preoperative MRI*

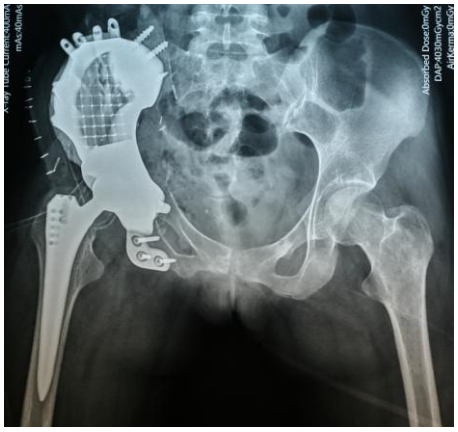

Figure 4. *Postoperative Xray*

PP-004

A case of sacroiliac chondrosarcoma excision and spinopelvic reconstruction

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Introduction: In this report we present a sacroiliac chondrosarcoma excision and spinopelvic reconstruction.

Objectives: Primary malignant tumors of the sacrum are rare. Chondrosarcoma is one of the most common malignant ones. Although it is a low-intermediate grade malignancy, it is invasive and has a high potential for local recurrence.

Methods: 27 year old male patient presented with limping and hip pain. He was diagnosed with chondrosarcoma at Azerbaijan. After one year later his complaints worsened and applied to our clinic. CT studies revealed destructive lesion consisting of irregular osteogenic nodules at the left sacroiliac joint expanding to S1-S2 laminae and to iliac bone juxtaarticularly. Lesion also infiltrated the left S1 foramina. Posteriorly a large soft tissue component (approximately 10x3.5 cm) accompanied the bony lesion.

Results: We performed an incisional biopsy and validated the histopathologic diagnosis. Partial sacrum, sacroiliac joint and juxtaarticular ilium excision was performed. Neural exploration was performed by two neurosurgeons. S1 root was intact. After bone and soft tissue resection, sacroiliac instability was observed. L4-L5 transpedicular screws and two iliac screws over an iliac plate were placed

and connected with a rod. 6x3 cm autologous iliac crest graft was harvested ipsilaterally and inserted to the bone defect. Afterwards stability was achieved. Soft tissue defect was evaluated and reconstructed by two plastic surgeons utilizing a rotational gluteal flap.

Conclusions: Surgical resection of pelvic chondrosarcomas can be challenging because of the complex pelvic anatomy and the frequently large tumor size. After excision sacroiliac stability should be restored using proper instrumentation.

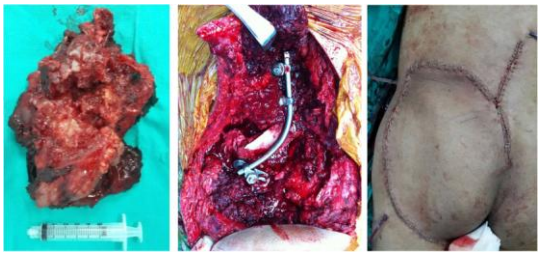

Figure 1. *Intraoperative pics*

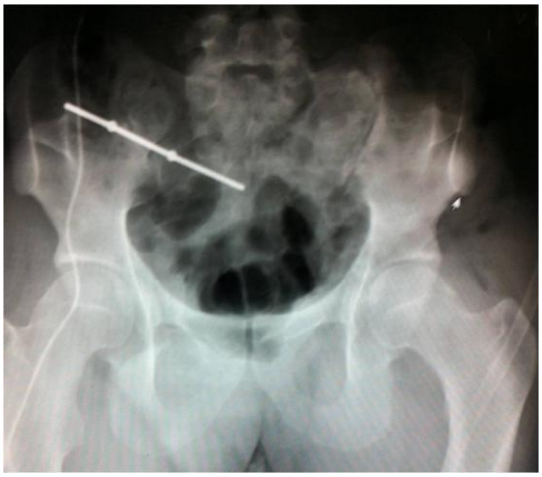

Figure 2. *Intraoperative Xray*

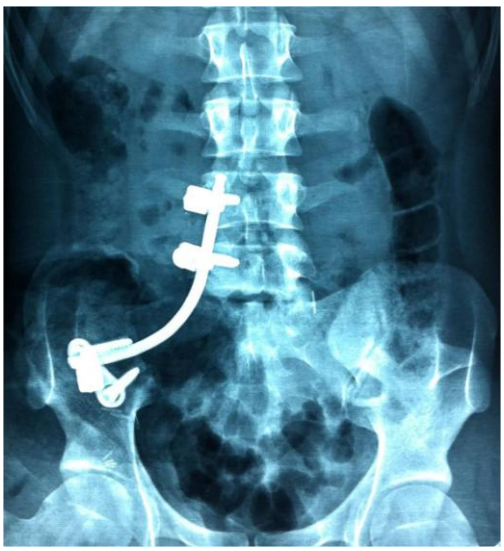

Figure 3. *Postoperative Xray*

PP-005

Survival and complications of skeletal reconstruction after surgical treatment of bony metastatic renal cell carcinoma

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Introduction: Skeletal metastasis is common in advanced renal cell carcinoma (RCC). Improvements in survival have resulted in an increase in the burden of disease due to skeletal metastases. Radiotherapy plays a major palliative role in treatment of bone metastases in general, but in skeletal metastases from RCC, radiotherapy is less effective. Surgical intervention remains a valid treatment to improve function and relieve pain. The aim of this study was to assess the factors affecting reconstruction survival, especially prosthesis survival in endoprosthetic replacement (EPR), when applied to the management of skeletal metastases from RCC.

Methods: A retrospective analysis of all patients treated for non-spinal skeletal metastases for metastatic RCC in three international specialist orthopaedic oncology institutions (ROH, Birmingham, UK, Tampere, Finland, Karolinska, Stockholm, Sweden) between 2000 and 2014 was performed. Reconstruction survivorship was calculated using the Kaplan-Meier method whilst factors affecting reconstruction survival were assessed using Cox-regression multivariate analysis.

Results: A total of 268 procedures were performed in 253 patients. EPR was performed in 76.9% of cases, intralesional curettage and cementation with or without fixation in 13.8%, plating or intramedullary nailing in 4.1%, bone resection without reconstruction in 4.5%, and amputation in 1.1%. The overall rate of complications was 17%, which were classified as Henderson type 1 (soft tissue failure) 1.1%, type 2 (aseptic loosening) was not seen, type 3 (structural failure) 7.1%, type 4 (infection) 4.9% and type 5 (tumour progression) 3.7%. Endoprosthetic replacement when performed as the primary procedure demonstrate the best survivorship whilst factors associated with poor reconstruction survival included previous surgical intervention, pre operative radiotherapy, and intralesional resection margins.

Conclusion: We have identified three key predictors of failure following resection and reconstruction, previous radiotherapy when combined with pre-reconstruction radiotherapy, intralesional excision, and most notably, previous surgical intervention. We conclude that endoprosthetic replacement be considered as the index surgical intervention for skeletal metastases from renal cell carcinoma as this carries the lowest incidence of complications. Revision of previous skeletal stabilisation, especially when combined with radiotherapy carries a high risk of complication, including infection, which often necessitates amputation.

PP-006

Clinical outcome of endoprosthetic reconstruction for the treatment of bone metastases

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Introduction: Bone metastases are associated with a poor prognosis and predispose to a pathological fracture. Surgical treatment is generally palliative, aimed to relieve pain and provide stability. Resection and endoprosthetic reconstruction present a better outcome than internal fixation. However, the main selection criterion for these patients is a relatively long expected survival, when the benefits of a durable and stable implant outweigh surgical risks, rehabilitation time, and high costs. For that reason, patients receiving an endoprosthesis frequently have a solitary metastasis, one of the factors associated with a long survival. Other indications for an endoprosthesis include large bone defects, previously failed surgery, and intra-articular invasion.
Objectives: To evaluate the clinical outcome with endoprosthetic reconstruction for the treatment of long bone metastases over a 15-year period and with special emphasis on the cost-effectiveness and re-intervention in relation to patient survival.
Methods: A retrospective analysis of 25 patients with 26 endoprostheses, 13 cemented and 4 hybrid (MUTARS®) placed between 1999 and 2014 was performed. Eight of these were MUTARS®-FILIA Femur endoprostheses. Parameters concerning patient and tumour characteristics, and surgical, functional and oncological outcomes were analysed. The Kaplan-Meier method was employed to calculate survival rates.
Results: The distribution of indications for endoprosthetic reconstruction was: 17 (65%) solitary bone metastasis, 13 (50%) actual pathological fractures, 8 (31%) impending pathological fractures, and 8 (31%) endoprosthetic reconstructions were performed after failed previous surgery. The most common localisations were the proximal and distal femur (together 69%), followed by the proximal humerus (19%). Patients were discharged after a median of 8 days (range 3-46). Complications occurred in 11 cases (42%) of which 5 (45%) were Henderson type 4, infection failures (1 acute, 2 sub-acute and 1 late infection). These were treated with suppressive therapy (2 patients), removal of the implant (1 patient) or amputation (2 patients). Seven patients (27%) required revision for any complication. The functional improvement achieved immediately after surgery is durable till last follow-up. Overall, 17 patients died of disease progression, 3 patients had local recurrence and 6 patients were still alive at the moment of analysis. Median postoperative survival was 18 months (range 3-79).
Discussion: Resection and endoprosthetic reconstruction allows for local disease control, and immediate and sustainable functional stability. Functional outcomes, although differing between joints, are generally good. The relatively long postoperative survival in this series shows that indications are generally set well and that patients have the time to benefit from their endoprosthetic reconstruction. Additionally quality of life scores are necessary to evaluate more accurate the cost-effectiveness and quality of life in these patients.
Keywords: Bone metastases; Endoprostheses; Pathological fracture; Local recurrence; Survival.

PP-007

Custom-made, anatomical reconstruction of the scapula for Ewing's sarcoma in a 14-year-old patient: case report and review of the literature

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Introduction: Ewing's sarcomas are rare primary malignant bone tumours and known to occur at skeletal and extra-skeletal sites. Involvement of the scapula is uncommon. Nevertheless, if Ewing's sarcoma occurs in the scapula, this may indicate total scapulectomy and intra-articular resection of the gleno-humeral joint (= Malawer Type III shoulder girdle resection), which is treatment of choice following preoperative chemotherapy.
Case Report: Herein we report the case of a 14-year-old male patient suffering from Ewing's sarcoma of the right scapula. The patient was admitted with an osteolytic destruction in May 2013. An open biopsy revealed Ewing's sarcoma, so that neo-adjuvant chemotherapy was started. Staging examinations did not reveal metastases. Chemotherapy was followed by local irradiation. Thereafter, a wide resection of the scapula including the rotator cuff was done. Reconstruction was performed with a custom-made, anatomical, constrained MUTARS scapular prosthesis. Adjuvant chemotherapy started postoperatively. At a follow-up of 13 months, there was no evidence of disease. The functional outcome is good with an abduction range of 40° and a flexion and extension range of 20°, respectively. The patient retained normal hand and elbow function.
Discussion: In the past, custom-made reconstructions were mainly used for malignant bone tumours of the pelvis with a poor outcome. Infection, loosening and mechanical failures were the most common complications. On the other hand, in the literature less is reported about custom-made reconstructions of other anatomical reconstructions. There are two series of Zhang et al. (2009) and Tang et al. (2011) reporting scapular reconstructions for malignant bone tumours. These authors stated that the goal of shoulder reconstructions was to provide a stable and painless joint that allows positioning of the arm and hand in space. Compared to patients left without scapular reconstruction, prosthetic replacement partially restores abduction and external rotation. Chandrasekar et al. (2009) reported the use of an irradiated scapular autograft which also showed a sufficient outcome with a range of motion of 60° for

abduction and forward flexion. Although there are limitations in the shoulder's active range of motion, reconstruction with a scapular prosthesis can provide sufficient postoperative function in cases of total scapulectomy.

PP-008

Silver concentrations following extremity reconstruction using silver-coated MUTARS megaprostheses

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Introduction: Silver-coated megaprostheses have been shown to reduce the infection rate following extremity reconstruction after tumour resection or in case of revision arthroplasty. Nevertheless, there is less information about systemic silver exposure and possible side effects. The aim of the study was to report the blood silver concentrations during a follow-up up to ten years.
Materials and Methods: Between 2004 and 2014, 31 patients (17 female and 14 male) received MUTARS megaprostheses with galvanised silver coatings (Implantcast, Buxtehude, Germany). The mean age at operation was 48 years (range, 10-81). Ten patients received the prosthesis after resection of a malignant soft-tissue or bone tumour. Twenty-one silver-coated implants were used for revision surgeries as prophylaxis against recurrent infection or in case of poor soft tissue coverage. The mean postoperative follow-up ranged from one to 130 months (mean, 48). There were 12 proximal, six distal, five total and one intercalary femoral reconstructions. Furthermore, five proximal tibias and one proximal humerus were replaced. In one case a sliver-coated arthrodesis nail for the knee was used. Blood for silver concentration determination was taken from every patient within the first days following surgery as well as at every six months at outpatient treatment. The concentration of silver was determined using inductively coupled plasma mass spectrometry (ICP-MS, Agilent 7500ce; Agilent, Waldbronn, Germany) after microwave-assisted digestion with nitric acid in a microwave-heated autoclave (MLS ultraClave III; MLS-Mikrowellenlaborsysteme, Leutkirch, Germany).
Results: During the follow-up three patients died of disease, four died due to an unrelated cause and one patient was lost to follow-up. Overall, 23 patients were available for determination of blood silver concentrations; most of them appeared routinely to the outpatient care, whereas some appeared every once in a while. Nevertheless, within the follow-up we could observe a slight increment of systemic silver concentrations with a decrease after a peak at 30 months. Thereafter, we found an undulation course of blood concentrations with two further peaks which might be caused by several cases of re-infections and massive release of silver ions from prostheses' surface (Table 1 & Figure 1). In this series, we had four cases of local agyria without any correlation between local and systemic silver concentrations and implant size as well as differences in silver concentrations between affected and non-affected patients, which has been shown by Glehr et al. in 2013.
Discussion: There are several studies in the literature reporting outcome and implant survival of silver-coated megaprostheses but less is known about systemic silver exposure and long term effects. In the current series we observed an undulating course of silver concentrations in the blood of our patients which might be caused by several cases or re-infections or other implant-associated complications leading to an increased release of silver ions from the prosthesis' surface. We could not identify any systemic complications like polyneuropathia or other toxic reactions, except of local agyria. Therefore, we can state that silver-coated implants seem to be a save solution in case of megaprosthetic reconstruction following tumour resection, in case of revision surgery as prophylaxis against re-infection or in case of poor soft tissue coverage. Nonetheless, we recommend monitoring of silver concentrations in the blood.

PP-009

Rates and causes of revision of tumor endoprostheses: a review of the literature and meta-analysis

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Introduction: Endoprostheses have become the preferred option for reconstruction after bone tumor reconstruction of the proximal femur, distal femur, and proximal tibia. However, revision rates remain higher than that of conventional prosthesis. We conducted a review and meta-analysis of tumor endoprostheses to estimate the rates of revision for mechanical, infectious, and tumor reasons.
Methods: A literature search was conducted on PubMed (Medline) with an extension of the following search terms: tumor, endoprosthesis, and location (femur or tibia). The search and abstraction of the data was performed by two independent reviewers. Random effect models were used for pooled estimates.
Results: The search included 31 studies from 21 different centers. A total of 3227 patients were included. 48 series could be isolated from these 31 studies: 11 proximal femur (569 patients); 21 distal femur (1789 patients); and 16 proximal tibia (919 patients). The pooled estimate for revision for any cause was 22% (95% CI: 19 - 25); it was 13% for proximal femur, 24% for distal femur, and 26% for proximal tibia (figure 1). The pooled estimate for revision for mechanical reason was 13% (95% CI: 10 - 15); it was 9% for proximal femur, 14% for distal femur, and 13% for proximal tibia. The pooled estimate for revision for infection was 9% (7 - 11); it was 2% for proximal femur, 9% for distal femur, and 14% for proximal tibia. The pooled estimate for infection (with or without

revision) was 11%. It was 7% for proximal femur, 10% for distal femur, and 17% for proximal tibia. The pooled estimate for local recurrence was 7%. It was 7% for proximal femur, 6% for distal femur, and 8% for proximal tibia. When comparing designs for knee endoprostheses, there was no effect of fixation (cemented or uncemented), or hinge mechanism (fixed or rotating); there was however a significant difference according to modularity with custom-made implants showing worse results.

Conclusions: One patient in five will need a revision during followup. Endoprostheses located at the proximal femur do better than those located around the knee. Tibial endoprostheses show worse infection rates.

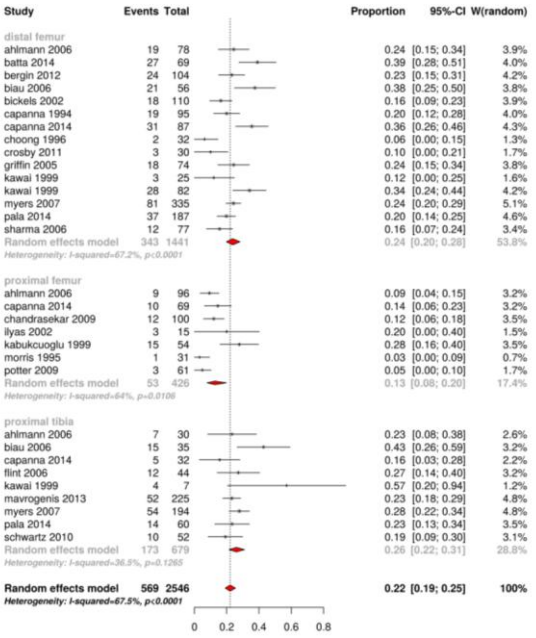

Figure 1

PP-010

Adamantinoma of the bone - Long-term results of a retrospective two-center study

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Background: Adamantinomas are very rare malignancies, they account for about 0.1 to 0.48% of all malignant bone tumors. They are commonly located in the tibia. Their characteristics are slow destructive growth, late recurrences and late metastases. The treatment of adamantinomas is surgery. The aim of this retrospective analysis is to determine the diagnostic criteria and long term prognostic factors.

Patients/Methods: From 1993 to 2014 12 patients (female n = 4, male n = 8) with an adamantinoma (classic adamantinoma n = 11, juvenile adamantinoma n = 1) were treated. The age average was 39.2 years (5 to 78 years). The tibia was the most common site (n = 10), followed by the proximal femur and the fibula (n = 1). The tumor size was in average 10.62 cm. The median follow up was 42.5 months. The data collection was based on the medical records and the follow-up-results.

Results: The median time interval from first symptoms to the first imaging was 28 weeks, from imaging to biopsy 3.75 weeks and from biopsy to surgery 7.6 weeks. All patients were treated surgically. Replacement of an endoprosthesis (n = 3), biological reconstruction with a bilateral fibula graft and plate fixation (n = 7), amputation (n = 2) were performed. An R0 resection was documented in 10 patients, for 2 patients there was no information about the resection status. 4 patients had complications after the surgical treatment (nonunion n = 1, infection of endoprosthesis n = 1, dislocation of the endoprosthesis n = 1, wound infection n = 1). In one case, a recurrent infection of the endoprosthesis resulted in an amputation. No local recurrence was identified and in no case metastases were detected during follow-up.

Conclusion: The striking findings are the extremely long intervals from the first complaints to the first imaging and from biopsy to the therapy. They both can be explained by the moderate symptoms in most cases, as well as the difficulty of the histopathological diagnosis. Due to the frequent diaphyseal localization biological reconstruction methods have been established. The prognosis after R0 resection can be assessed as very good.

PP-011

Chondrosarcoma of the femur. Total femoral replacement with modular prosthesis

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Introduction: Total femoral replacement with modular prosthesis is a feasible technique nowadays that can be used in cases of complete tumor involvement of the femur. This paper discusses a case where a low-grade chondrosarcoma had encompassed most of the femur.

Material and Patient: A 51 year old woman with pain in the anterior upper third of her left thigh for 3 months. Full mobility of the hip and knee. On initial x-ray, an expansive lytic lesion in the upper two-thirds of the femur. CT and MRI showed an expansive lytic lesion occupying the full length of the femur. PET-CT showed a heterogeneous metabolic increase in the femur, characteristic of a low-grade lesion. Free of disease in other locations. Biopsy confirmed the diagnosis of a low-grade chondrosarcoma.

Surgical Treatment: Complete resection of the femur. Reconstruction with femoral modular prosthesis. In the hip, a press-fit double mobility acetabular cup was used, and in the knee a cemented hinged knee prosthesis was implanted.

Results: One year later the patient tolerates walking without crutches and presents 0-90° knee flexion and extension. She has a score of 26 points on the MSTS scale.

Discussion: Chondrosarcoma is the second most common primary malignant bone tumor. The treatment of choice is surgery with resection of the affected compartment. Radio and chemotherapy are largely

ineffective. Total femur replacement is a demanding technique which has allowed us to treat this case with a limb-sparing surgery.

PP-012

Evaluation of long-term results in using diaphyseal endoprosthesis: the East-European Sarcoma Group (EESG)

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Introduction/Purpose: The surgical management individualization of musculoskeletal tumors is a challenging problem which requires performing the highest possible topographic-anatomic resection of bone. To conduct a thorough analysis of the most frequently occurring complications in endoprosthetic reconstruction of femoral and humerus diaphysis affected by primary and metastatic tumors.
Material and Methods: In a current of 16 years with 1998 for 2014, to 12 patients were performed a wide resection of the femur and humerus diaphysis, followed by endoprosthesis reconstruction. Resection of the femur performed in 8 patients, shoulder 4. Among the treated patients 4 were with primary sarcomas, 7 with metastatic lesion and 1 with multiple myeloma. The mean duration of follow-up after the operation was 66,8 months (1 to 202). Reconstruction of the diaphyseal defect was carried out using 2 types of endoprosthesis: metal alloy and isoelastic RM with additional locking stem with crew.
Results: Common free of recurrence surviving was 92%. Implant survival to all complications was 4/12 (66,7%). Aseptic loosening occurred in 2/12 (16,7%): all metal endoprosthesis. Breakage occurred in 2/12 (16,7%): 1 metal alloy and 1 isoelastic RM endoprosthesis. One patient with metal endoprosthesis had aseptic loosening and breakage of stem. Local recurrence occurred in 1 (8,3%). All complications occurred in patients with resection of the femur. During the whole period of supervision no one patient had periprostheses infection.
Conclusion: Most frequent cause of failure was aseptic loosening and breakage of endoprosthesis. Using diaphyseal endoprosthesis allows perform operations with joints preservation without decreasing oncologic outcomes. The use of additional stem locking screw avoids aseptic loosening.

PP-013

Use of total scapular arthroplasty for treatment of a recurrent alveolar soft tissue periescapular sarcoma

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Introduction: High-grade sarcomas arising from the scapula or periscapular soft tissues traditionallyhave been treated with either a total or partial scapulectomy (Tikhoff-Linberg resection). The major challenge is to restore shoulder girdle stability while preserving a functional hand and elbow. The development of a constrained scapular prosthesis could improve glenohumeral stability by passively restoring rotator cuff and glenohumeral capsular function. We present a patient with recurrent alveolar soft tissue sarcoma treated by total scapular prosthesis.
Patient and Methods: 31 year old male, smoker, diagnosed with alveolar soft tissue sarcoma periscapular with pulmonary metastases in December 2011. Marginal resection including lower margin of the scapula was performed in February 2012. The patient presented as sequela a postganglionic brachial plexus injury for full axonotmesis of the middle and lower trunk, so surgery of nerve transfer (motor and sensitive) was performed in another hospital with good results.Adjuvant chemotherapy (cediranib) treatment was started 8 weeks after surgery.
In subsequent follow-up tests (October 2013), the patient presented a local recurrence with scapular bone invasion. Then we performed surgery with tumour resection, and reconstruction with a "constrained" (rotator cuff substituting) scapular prosthesis (Stanmore Implants®). There were no intra-operative complications. The patient's shoulder was placed in a sling for 4 weeks and then gentle physical therapy was started.
Results: No deep wound infections or prosthetic failures in one year of follow up. The patient's shoulder is painless and stable with 75° active abduction and flexion, internal rotation to T6, and external rotation to 30°. Passive shoulder motion is complete. The patient can actively protract, retract, elevate, and depress his scapula. His periscapular muscles actively contract to stabilize his scapula and upper extremity. The patient is free of local recurrence and presents no progression of lung metastasis. At latest follow-up, the Musculoskeletal Tumor Society functional score was 26.
Conclusion: Total scapula prosthetic reconstruction appears to be safe and reliable for anatomically reconstructing the shoulder girdle following total scapulectomy. It permits reconstruction of the glenohumeral and scapulothoracic mechanisms, both functionally important and constrained components ease reconstruction.Even so, further follow-up is necessary.

PP-014

Total femoral replacement for primary sarcomas. Short term results

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Introduction: Total femoral replacement represents a possible solution for the treatment of femoral sarcomas that require large bone resections when limb sparing surgery is elected. The objectives of this study were to assess the clinical and functional short term results of three patients surgically treated in the Hospital Clinico San Carlos (Madrid) of femoral bone tumors by a total femoral replacement.

Material and Methods: The sample includes three male patients diagnosed of osteosarcoma, Paget-related sarcoma and Ewing sarcoma, involving femoral epiphysis and diaphysis. Surgeries were performed in 2012, by total femoral replacement. Two of the patients had previous surgeries including allograft and reconstruction for limb salvage, but failed with bone recurrence. Lateral femoral approach was performed, with full femoral excision and total femoral replacement, including total hip arthroplasty and total knee arthroplasty (Link). Radiographic evaluation with orthogonal weight bearing x-rays and functional assessment with Toronto Extremity Salvage Score (TESS) were performed postoperatively.
Results: Free range of motion excluding adduction started in the immediate postoperative period. Partial weight bearing was allowed two weeks after surgery, using crutches and a hip abduction orthesis for four weeks after discharge. There were no complications of surgical wounds. There was one sciatic nerve palsy recovered clinical and elecrtromyographilly within the first six months after surgery. No hip dislocations were found.
Postoperative teleradiographies showed between 3 and 1 cm of lenght discrepancy (median: 1 cm), necessary to achieve hip stability, due to the large tumoral resections that were required. All of the patients walk pain free with a cane, 6 months after surgery. TESS media was 79.53%.
Conclusion: All of the cases undergoing total femoral replacement have evolved without major complications, and are able to walk with a cane and independent for activities of daily liveng. Total femoral replacements in our Service provide satisfactory short-term results in selected patients with malignant bone tumors that require extensive resections patients.

PP-015

Surgical treatment of bone pathological fractures

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Background: Bone tumors complicated with pathologic fractures require limited surgical treatment only in 5-15% of patients (M. Malawer, 1989; R. Wedin, 2001; Babosha VA 2011).
Material and Methods: 28 patients with pathological fracture of bones were treated in Tashkent regional oncology center from 2010 to 2014. The age of patients ranged from 17 to 63. The main clinical signs of pathological fracture were pain- either spontaneous or after work and bony deformation. The femur was affected in 6 cases, proximal tibia in 4 cases, distal tibia, humerus, wings of ilium, ischia bone and radius in 2 cases each and sacrum in 8 cases. The histology of tumors were: giant cell tumor - 13 cases, osteosarcoma-4 cases, chondrosarcoma- 4 cases, fibrosarcoma-3 cases, metastatic adenocarcinoma-2 cases, reticulosarcoma -1, and cyst in 1 case. Excoriation of tubular bones with substitution of defect with medical cement was done in 6 cases, high level (SII) resection of sacrum in 4 cases, resection of ischium in 2 cases, resection of the iliac wing in 2 cases, intramodular osteosynthesis of femoral bone in 2 cases, segmental resection of lower third of femoral bone with knee arthroplasty in 2 cases, segmental resection with middle third of femoral bone with intramodular osteosynthesis in 1 case, segmental resection of radial bone with defect replacement and fixation of fibula with iron plastic and segmental resection of the humerus with replacement of defects and fibula fixation with iron plasticin 1 case each. Thus good results were obtained in 17 cases, satisfactory in 10 cases, poor results only in 1 case.
In one case, a patient with chondromixoma was operated due to recurrence twice during the year.
Conclusion: Thus, limited surgical treatment in patients with pathological fractures improves long-term outcomes and quality of life.

PP-016

Cemented endoprosthetic intercalary replacement for pathologic fracture of the clavicle with a modular custom-made titanium spacer: a case report

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Introduction: Disability associated with pathological fractures of the clavicle can be substantial, good treatment options however, are limited. Conservative treatment is hardly ever successful, simple resection does not always provide predictable pain relief or restoration of function and internal fixation with or without cement augmentation using intramedullary devices or locking plates is prone to failure, particularly when the disease process already involves large portions of the remaining bone.
Methods: We report the case of a 46-year old female patient with a pathological clavicle fracture due to myelomatosis, which was treated with an OsteoBridge Small Bone titanium spacer fixed with custom-made, cemented intramedullary titanium nails. Calculations of the expected bending forces, based on a computational model for internal fixation of the clavicle and the pre-operative imaging were used to design a range of optimally shaped and dimensioned titanium nails.
Results: Pre-operative CT scans demonstrated that only 3cm of intramedullary canal with a diameter of 4.5mm laterally and 5.5mm medially were available for intramedullary fixation after projected resection for the 4cm intercalary spacer. Calculated safe transmission of bending moments for 4.5mm, 5mm and 6mm nails were 4Nm, 6Nm and 10Nm respectively, indicating that the surgical effort was to be directed towards accommodating the largest possible nail, in order to achieve the strongest possible bone-cement-nail composite beam construct. Calculations also revealed that the desired 20 degree bend in the 4.5mm nail was not of sufficient strength. Implantation was performed through a standard transverse incision, intramedullary reaming with a straight

drill and standard cementation. Post operative imaging demonstrated satisfactory implant position and the patient maintains pain free function at 1 year follow up.
Conclusion: Cemented endoprosthetic intercalary replacement with a modular custom-made titanium spacer is technically feasible and may develop into a promising treatment option for pathological clavicular shaft fractures in the future.

PP-017

Prosthetic reconstruction of distal humerus after bone tumor resection: oncological and functional outcome

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Introduction: Distal humerus is an uncommon site for primary bone tumours or metastatic disease. Surgical options for reconstruction after bone resection are limited. Alongside with oncological adequacy of resection, it is capital to maintain the best possible function of elbow.
Methods: Retrospective review of prospectively collected databases in two Italian referral centres (Milan and Florence) for collection of clinical, oncological and surgical data; update of clinical follow-up for functional assessment. We included in this study 53 patients (19 males, 34 females; mean age 49); 43 underwent distal humeral replacement and 10 total humeral replacement, 18 for primary sarcoma, 29 for bone metastasis and 6 for degenerative disease/failure of other reconstruction. Mean follow-up duration was 62 months (range 12-247); we considered patients at a minimum follow-up of 12 months.
Results: For oncological patients, we considered local recurrence rate and prostheses that required surgical revision for aseptic loosening (5), for infection (1), or for neurological problem (1). Nerve palsy occurred postoperatively in 10 patients. The mean MSTS score was 26/35 (range 8-35), and the mean MEPS score was 82 (range 50-100).
Conclusion: Tumour prostheses provide a reliable reconstruction for bone defects at the distal end of humerus, with good to excellent preservation or restoration of function. As nerve preservation is crucial in order to obtain a functional limb, careful patients selection is vital with respect to local recurrence risk.

PP-018

Intercallary prosthesis-joint sparing for humerus malignant bone tumors

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Introduction: The aim of our study is to present our experience with intercallary joint sparing prostheses in limb salvage surgery of malignant bone tumors of humeral diaphysis with emphasis in clinical and functional outcome.
Methods: We present two cases of high-grade (stage IIB Enneking) bone sarcomas of humeral diaphysis extending to the supracondylar region which were treated with limb salvage surgery. Through a two incision approach (dorsolateral and posterior) we performed wide resection of tumors. The bone defect was reconstructed with a custom-made intercalary tumor endoprosthesis. The proximal stem was cemented into the medullary canal. The distal end had a short stem and hydroxyapatite-coated extracortical plates which were secured to the residual remaining metaphysis using unicortical screws. The prostheses had HA collars at the bone interface to improve fixation.
Results: Both excisions had tumor-free margins and no local recurrence was noted. No neurovascular complication or infection was noted and patients were able to comfortably perform most activities of daily living with an excellent range of elbow motion. Radiographic evaluation revealed varying amounts of extracortical bone formation around hydroxyapatite collar and plate.
Conclusions: Segmental resection of malignant bone tumors in the humeral diaphysis and subsequent limb reconstruction with custom made prostheses with extracortical HA plates, achieves a good clinical and functional outcome without compromising the oncological principles.

PP-019

Tibial periosteal Ewing sarcoma

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Introduction: Ewing sarcoma is classically known as "big simulator". Reconstruction after resection is sometimes difficult, there is not a perfect option. We present a case of an periosteal Ewing sarcoma, an extremely rare entity.
Method and Results: A young sport man(21 years old) refered a postraumatic pain in right tibia since 3 years. He had an increasing pain and swelling mainly in the last 6 months. No relevant antecedents exist. Physical exploration was normal, except to a 5x5 cm mass in medial border of distal third of the right tibia. An important periosteal reaction at the distal third of right tibia was seen by X-Ray. MRI and CT informed the presence of periosteal mass compatible with periosteal post-traumatic haematoma. Percutaneous biopsy was done and the pathology report suggested round cell malignant tumour of soft tissue, Ewing's sarcoma as the first possibility. Bone marrow biopsy revealed no infiltration by the tumour. The sarcoma conference decided a neoadjuvant chemotherapy treatment and after that, surgery and adjuvant chemotherapy. After neodajuvant chemotherapy and new staging, the soft tissue mass decreased and we decided a limb-salvage surgery. Wide intercalary resection of distal tibia (14,5cm) was done, continued by reconstruction with free combined anterolateral thigh flap (ipsilateral) and vascularized fibula bone graft (contralateral). The complex was synthetized with a locking compression plate One week later, thigh flap failed and was substituted by a free vascularized latissimus dorsi flap. Definitive pathologic study revealed a periosteal

Ewing's sarcoma from the right tibia which is a very rare malignant tumour presentation.Fourteen months later, the patient walks in partial weight bearing with two canes, without any signs of local recurrence and no pain. X-ray shows a union of the distal fibula graft. However, the proximal junction is still without clear union. The patient has not metastatic disease at the last revision.

Conclusions: Periosteal Ewing sarcoma is an extremely rare entity. Few cases have been reported. Large intercalary bone defects are still challenging and difficult to manage, even when a good surgical technique is performed.

PP-020

The ROMA-Integra prosthesis: a new solution for reconstruction after proximal femur resection for secondary tumors

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Introduction: Femurs are commune sites for oncological disease, primitive and secondary. In case of metastatic lesion the proximal third and moreover the femoral neck and head are the most frequent site of bone metastases after spine. Even if medical therapies and radiotherapy have to be considered the mainstay of the treatment, surgery still plays an important role for oncological and biomechanical purposes. Resection of the lesion is mainly indicated in case of long life expectance, femoral neck and head metastases or in case of important lose of bone. Several prostheses are commercially available in literature but unfortunately the most of them are expensive, don't allow to spare the great and little trochanters and don't allow to reinforce the entire segment in case of minimal resection. Our intent is to present the first results of the reconstructions with "Resection Oncological Modular Arthroplasty-Integra" prosthesis after proximal femur resection for metastases.

Methods: The first 30 prostheses ROMA-Integra performed at the Oncological Orthopedic Department of the Regina Elena National Cancer Institute of Rome (Italy) and of the Galeazzi Orthopedic Institute of Milan (Italy) were enrolled. Main Outcomes were considered the length of the hospital stay, the complication rate and the function at six months of follow-up valued by MSTS-score. The results were confronted to those of a second cohort with similar demographic and clinical characteristics whereof reconstructions were performed with other prosthetic systems.

Results: The two groups obtained similar results regarding hospital stay, complications rate and function at six months of follow-up.

Conclusion: The ROMA-Integra prosthesis can be considered a suitable option for reconstruction after proximal femur resection; nevertheless its cost is consistently lesser so that it could be particularly adapt for metastatic patients and for decreasing the economic impact on the health system.

PP-021

Extra-articular resection of the knee preserving extensor mechanism: a radiological and cadaver study to predict the remaining patellar bone stock; patellar bone stock in extra-articular knee resection

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Background: Extra-articular knee resection (EKR) is performed in patients with malignant lesions contaminating the knee joint in order to achieve negative margins and preserve the extremity. Surgical removal of the knee with extensor mechanism is a well-known technique but an alternative technique was defined without resecting the complete extensor apparatus in contrast to the traditional technique which includes allograft or artificial ligament reconstruction. Preserving the extensor mechanism has been criticized because of the contamination risk and the fracture risk of the remaining patella. This study investigated the thickness of the remaining patella after a bone cut dorsal to the joint capsule in cadaveric dissection and from MRI measurements to predict the risk of patellar fracture.

Methods: The remaining patellar thickness from the dorsal cortex of the patella to joint capsule insertion, was measured by surgical dissection in 14 cadaveric knees (Fig1), and by magnetic resonance imaging (Fig2) (MRI) in 100 adult knees with a meniscal tear (Group 1) and in 24 pediatric knees who had surgical treatment for periarticular malignant tumors (Group 2).

Results: The average remaining thickness of the patella after EKR preserving extensor apparatus (Fig3) was 9.2 mm in cadaveric knees, 10.0mm in group 1 and 7.9mm in group 2. The rate of < 11 mm remaining patellar bone was 71.4% (10/14) in the cadavers and 79% (79/100) and 95,8%(23/24) in group 1-2 respectively.

Conclusions: This study highlights that preserving extensor apparatus may have a theoretical risk of patellar fracture in a certain group of patients undergoing EKR with a patellar cut. Our results and method may guide the surgeon to choose the method of resection preoperatively or discuss the option of not resurfacing the patella with the patient.

Level of Evidence

Level IV

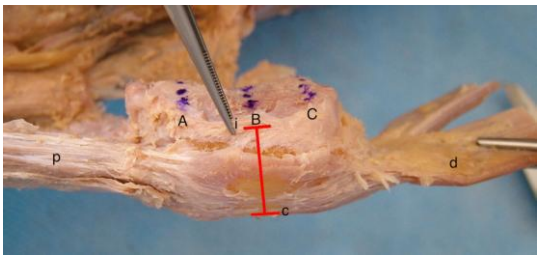

Figure 1

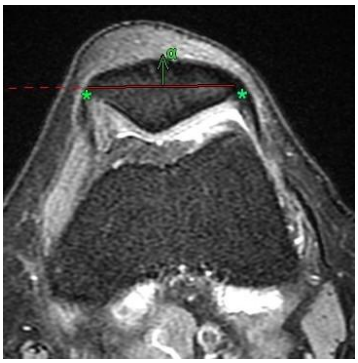

Figure 2

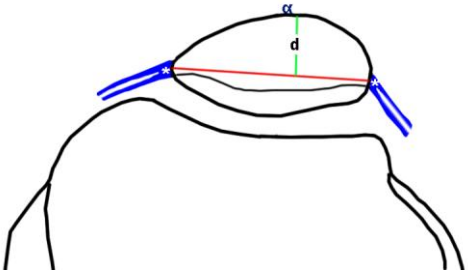

Figure 3

PP-022

Sartorius muscle: the major significance of its innervation and vasculature in the survival of the muscle flap

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Introduction: The Sartorius muscle (SM) is the longest muscle of the body and the most superficial muscle of the anterior thigh. It has been widely used for complex femoral wounds closure.
Methods: The aim of this study was to provide detailed information of SM innervation, vasculature and anatomical topography references in the body surface of SM nervous and arterial pedicles. A literature review was performed on SM anatomical studies published in the last two decades and a detailed description of SM innervation and vasculature has been quoted.
Results: SM has been classified as type 3, according to its nerve supply pattern, with multiple motor nerve branches deriving from the same trunk. Nervous branches originating from the femoral nerve innervate SM. Most of the studies reviewed showed single or double extramuscular branch (one study showed three to four branches), three to five intramuscular branches and multiple further divisions. SM has been classified as type IV according to its vasculature because it has six to ten segmental pedicles. Most of the studies showed four to nine pedicles that further split into two or more branches after entering the muscle. Source arteries: superficial femoral artery, deep femoral artery, superficial circumflex iliac artery, descending branch of lateral circumflex femoral artery, saphenous artery, descending genicular artery, popliteal artery. The diameter of these pedicles as well as their distance from the anterior superior iliac spine has been described. SM flaps have been described in the literature with multiple indications such as coverage of femoral vessels and occasionally skin defects after inguinal lymphadenectomy or sarcoma excision, vascular graft salvage, genitourinary tract reconstruction, chronic knee osteomyelitis, knee reconstruction and reconstruction of trochanteric pressure sores.
Conclusion: Different studies conclude that SM can be potentially based on a single major pedicle without a surgical delay. However, the possibility of surgical delay to increase the flap viability should be always considered. There is still lack of detailed data regarding SM nervous and vascular distribution, which can lead to successful construction of SM surgical flaps.

PP-023

Constant score in the evaluation of postoperative results in proximal humeral fractures in cancer patients with osteoporosis

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Introduction: In the past decades, the treatment of proximal humeral fractures has evolved with improved understanding of both fracture biology and biomechanics. The prevalence of proximal humeral fractures in chemotherapy treated cancer patients is increasing due to secondary osteoporosis.
Objective: Our aim is to compare the results obtained using two osteosynthesis methods developed for the surgical treatment of these fractures: intramedullary locking nail and locking plate - Philos plate, using the Constant Score.
Material and Method: Authors present a retrospective study of 46 cancer patients with osteoporosis who sustained different types of proximal humeral fractures treated surgically in the Orthopedic Department between January and July 2014. There were 27 females with an average age of 71 (51 - 87 years old) and 19 men with an average age of 74 (61 - 86 years old).
Fifteen proximal humeral fractures were treated using intramedullary locking nail and thirty-one were treated with locking plate, with a minimum follow-up of three months. Radiographs were analyzed for fracture classification, evaluation of fracture reduction, implant positioning and complications. Postoperative functional status of the patients was recorded using the Constant Score.
Results: Ten percent of the patients in the Plate group and seven percent in the Nail group suffered significant secondary fracture dislocation during the three months follow-up, leading to a varus malunion, lag screw cutout, or excessive lag screw sliding with medialization of the distal fracture fragment.
On the six weeks follow-up we obtained an 86 (66-97) medium Constant Score for the Nail group and a 77 (63-98) for the Plate group. On the three months follow-up

we noticed that the medium Constant Score for the Nail group increased up to 91 (75-99), while for the Plate group was 89 (69-98).
Conclusion: The use of close reduction, internal fixation with the locking nail has proven to be superior in the treatment of these fractures because intramedullary nails have a biomechanical and biological advantage over standard compression plate, especially in unstable fractures with reverse obliquity and diaphyseal extension that cannot be treated easily with standard compression screws. However at the three months evaluation the Constant Score leveled for the two groups.
Acknowledgments: This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/138907 "Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical fields -EXCELIS", coordinator The Bucharest University of Economic Studies.

PP-024

Treatment of periprosthetic fractures in patients treated with a megaprosthesis for bone sarcoma

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Introduction: Periprosthetic fractures after massive endoprosthetic reconstructions occur infrequently. However, as the life expectancy and the number of patients with endoprosthetic replacements increase, more periprosthetic fractures are expected to occur.
These fractures represent a treatment challenge and jeopardize limb preservation, due to high incidence of revisions as a consequence of prosthetic loosening, infection, non-union and/or re-fracture or even amputation.
Methods: Between Aptil 2004 and January 2012, we retrospectively reviewed the records of 10 patients with periprosthetic fractures after tumour resection followed by reconstruction with megaprostheses. Initial diagnosis was predominately (8 cases) primary high-grade sarcoma, although 2 patients had bone metastasis.
All 10 patients with periprosthetic fractures underwent limb salvage procedures. Adjuvant chemotherapy was administered in 6 and local radiotherapy in 4 patients. The average patient age was 44.6 years. Fracture site was the femur in 7 cases and the tibia in 2 cases and the humerus in one case.
Results: Fracture occurred after a medium of 28 months after initial implantation. Cause of fracture was high energy trauma in 2 patients and inadequate in 8 patients (4 of them associated with tumour recurrence). Open reduction and internal fixation was possible in 6 patients. In the other 4 patients an exchange of the implant with an average additional bone loss of 3.2 cm (range 2-6 cm) was necessary. In 2 cases an additional joint replacement was involved (1 knee joint and 1 hip joint) was performed due to the absence of sufficient bone stock for a stem implantation.
Complications were 2 periprosthetic infections requiring a two-stage revision, and two non-unions after osteosynthesis that were treated with an additional implant exchange. Seven patients with limb salvage achieved full weight bearing at the latest follow up.
Conclusion: Periprosthetic fractures in patients treated with megaprostheses are demanding, but most may be treated successfully with salvage surgery. The common goal of treatment should always be the preservation of as much bone as possible. Careful assessment of risks and benefits is of paramount importance

PP-025

Modified technique of Harrington's procedure for periacetabular solitary myeloma: a case report

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This case report presents the management of a 65-year-old male patient who suffered from severe hip joint pain due to periacetabular lytic lesion caused by solitary myeloma. Although various strategies have been described in the literature, we present a modified Harrington technique aiming to optimize mobilization and quality of life.

PP-026

Tumor of the scapula. Total shoulder reconstruction

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Aim: Malignant tumors of the scapula are very rare. Apart from limited small series and case reports, international literature on flat bone sarcoma is exiguous and not much is known about the oncological outcome. The aim of this study is to present our experience with shoulder reconstruction following total scapulectomy for malignant tumors of the shoulder girdle.
Materials and Methods: Four patients who underwent constrained scapular prosthetic replacement after total scapulectomy between 2006 and 2014 were reviewed retrospectively.
Diagnoses included Ewing's sarcoma in two patients, lung cancer metastasis in one patient, and malignant fibrous histiocytoma in one patient.
Results: At a mean follow-up of 24 months, one patient died of his disease. One patient showed recurrence and metastasis. Complications, including dislocation occurred in one patient. All patients had a stable, painless shoulder. All patients can raise their hands above their waist. All

patients retained normal hand and elbow function.
Conclusion: Although there are limitations in the shoulder's active motion, reconstruction with a scapular prosthesis can provide oncologic salvage and result in good postoperative function with a low rate of complications.

POSTER PRESENTATIONS SESSION II: Expandable Prostheses in Children

PP-027

The first experience of knee joint endoprosthetic reconstruction in children and adolescents with sarcoma in FCCH PHOI n.a. D.Rogachev

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Introduction: Endoprosthetic reconstruction is the most common method of limb-sparing surgery in oncology, including practical pediatrics. Primary bone tumors localized in metaphyseal areas require joint arthroplasty. Bone tumors in patients with sceletal immaturity occur in the metaphyseal region, close to the growth plate, so that sacrifice of a major plate often is necessary when tumor is excised. These patients need expandable prostheses.
Methods: Since June 2012 in our surgery department 20 endoprosthetic reconstructions of knee joints have been performed. Among them 14 endoprosthetic reconstructions of the distal femur, including 4 cases with the use of "growing" non-invasive endoprosthesis; 6 endoprosthetic reconstructions of proximal tibia, including 4 cases using "growing" non-invasive endoprosthesis. The youngest patient was 7 years old, the oldest - 17 years old. The MSTS scale was used for evaluation of functional results in 3 months after operation.
Results: During endoprosthetic reconstruction in the case of distal femur sarcomas in 14 patients range of volume replacement ranged from 160 to 315 mm. proximal. Range of proximal tibia replacement was 140-160 mm. In all cases, the results of histological examination of the resection margins showed no tumor cells, but 3 patients were diagnosed with progressive disease. 1 patient after 12 months was diagnosed with local relapse and required rotation plasty.
All patients have started rehabilitation from the first days after surgery. The worst functional outcome scale MSTS after 3 months was - 50%, the best - 93%. Average - 76%. At present time, just 3 patients with "growing" endoprosthesis have require extension, which was performed without any problems.
Conclusion: Limb-sparing surgery in children with oncological diseases of the musculoskeletal system is the preferred method of treatment. Endoprosthesis secures good oncological and functional results, as well as favors the most adequate social adaptation of a child. The use of modern systems for arthroplasty in pediatric and adolescent surgical practice may achieve good oncological and functional results.

PP-028

When do members of the European Musculoskeletal Oncology Society (EMSOS) consider the implantation of a growing prosthesis in bone sarcoma patients?

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Introduction: According to literature indications for the implantation of growing prostheses are age over ten years and an expected growth deficit above 3- 4 cm. Some orthopaedic oncology centres do not recommend growing prostheses in metastatic disease. The aim of this survey was to analyse the indications leading to the implantation of growing prosthesis in bone sarcoma patients.
Methods: A ten- minute web-based survey was sent via email to 98 active, orthopaedic members of the EMSOS. Participants were asked about their experience in orthopaedic oncology and the implantation of growing prostheses. Factors reported in literature to influence the decision upon the implantation of growing prosthesis were asked in individual questions and three case scenarios.
Results: 36 members of EMSOS, from thirteen different countries, completed the survey (37%). 67 % (n=24) of participants implanted between one and fifteen growing prosthesis over the last three years, whereas 25 % (n=9) did not implant any. The mean minimum age was considered 6.6 years (range 1-10, ± 2.3 SD). 3-5 cm of predicted growth deficit was stated as the minimum for the implantation of a growing prosthesis by 60 % (n=20) of participants. However, one third of surgeons does not use growth calculation methods. Two out of three surgeons would rather not implant a growing prosthesis in children with metastatic disease. Epiphysiodesis to guide growth is used by 43 % of participants. The answers given in the case scenarios were consistent with the individual questions.
Discussion: Compared to literature, our survey confirmed 3- 4 cm as the minimum of estimated growth deficit. The minimum age for the implantation of a growing prosthesis is approx. 6.6 years and therefore younger than reported in previous publications. One fourth of orthopaedic surgeons does not use growing prostheses at all. It remains unclear whether growing prostheses are indicated in patients with metastatic disease. A future multicentre EMSOS study on the outcome of growing prostheses could lead to further clarification.

PP-029

Do steep helix angles lead to collapse of the growing module in minimal-invasive expandable prostheses?

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Introduction: In the course of wide resection the physis of the lower extremity has often to be resected in bone sarcoma patients. To avoid limb-length inequality one possibility is the implantation of minimal-invasive expandable prostheses. According to literature mechanical failure rates vary between 5- 50 % in minimal-invasive growing prostheses.

Case Presentation: Herein we present three patients (one osteosarcoma, two Ewing's sarcoma) with complete collapse of the minimal-invasive HMRS® (Howmedica Modular Resection System) growing prosthesis following bone sarcoma resection between 2003 and 2005. Eight growing prostheses of the same type were implanted in our center in total. Lengthening was performed under general anesthesia and one full rotation of the lengthening screw equates to 0.9 mm. Patients were nine, ten and twelve years respectively at the time of implantation. Complete collapse of the growing module occurred after six (10.3 cm of lengthening), four (5.8 cm of lengthening) and three (4.7 cm of lengthening) lengthening procedures respectively (s. Fig 1 and 2). Intraoperatively, loosening of the adjustment screw was seen in all three patients and. Despite technically correct tightening of the fixation screw the growing module re-collapsed shortly after revision surgery and severe limb-length inequality occurred which ultimately resulted in loss of prosthesis. During in-vitro testing of the explanted prostheses we were able to lengthen the growing module although the fixation screw was locked.

Discussion: The same mechanical failure mechanism of the growing module lead to major complications in all three patients. This complication has not been described in literature before. In contrast to non-invasive prostheses the helix angle of the thread of the growing module is quite steep to increase the efficiency when lengthening manually. However, this might result in a loss of self-locking property and ultimately lead to the collapse of the growing module.

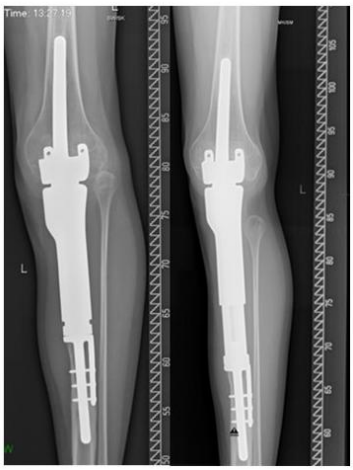

Figure 1. *Patient 1*

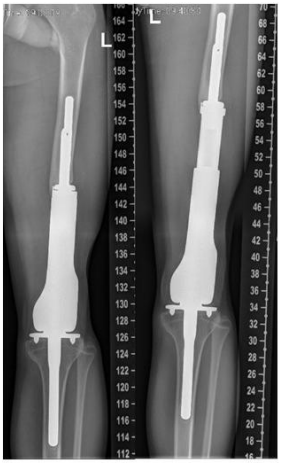

Figure 2. *Patient 2*

PP-030

Lower limb lengthening with intra-medullary nail for hypometry secondary to sarcoma resection. Preliminary experience at the Rizzoli Institute

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Introduction: Skeletal reconstruction after resection of bone tumors in the lower extremity of children remains a difficult challenge. Equal limb length at maturity and good functional outcome are the main goals of these surgeries but are difficult to be achieved. Expandable prostheses may require repeated operative interventions, and induce a progressive loss of patients' bone stock in the affected limb. On the other hand biological reconstructions with various type of bone grafts may preserve and replace the bone stock but leave unsolved the issue of the longitudinal growth. The Authors report their preliminary results with a not-invasive lengthening nail in patients with femoral shortening due to previous femoral reconstruction for bone tumors during childhood

Methods: PRECICE (Ellipse-Technologies, Irvine, California) is a magnetic intramedullary nail usable for non invasive lengthening of the femur and tibia. Core technology includes an internal magnet, a gear box and a lead screw that turns when activated by a hand held external remote controller. Lengthening procedures are self-perfomed by the patient three times a day. From February 2014 to January 2015 the nail was implanted in 4 cases: three patients were skeletally mature and had a mean length discrepancy of 4.6 cm (4.2 to 5.2 cm) after resection of a femoral bone sarcoma; two of them were treated with a retrograde, one with an anterograd nail.

In one 6 years old girl the nail was implanted to stabilize an hemiarticular composite device where the polyethilene platform of an unconstrained tibial component of total knee prosthesis was cemented on a proximal tibial allograft: the patient was affected by osteosarcoma in the proximal two thirds of the tibia, and we used this original reconstruction trying to allow a late lengthening of the tibia sparing the distal femur and the tibial bone stock.

Results: The mean lengthening was 4.4 cm (4.2 to 5 cm). The time to full weight-bearing was 2 months after the end of lengthening. The consolidation index was 1.7 (0.75-1.62) months/cm. Complete consolidation was obtained in all cases. Running back was not observed in any case.
Conclusions: Limb length discrepancy is a frequent complication of surgical treatment for bone sarcomas in children. These patients need repeated surgeries during their childhood and in the adult life. The Precice lengthening nail allows to lengthen up to 8 cm, with non-invasive lengthening procedures, and is a highly promising aid to recover lower limb length discrepancy after biological reconstructions in children with bone tumors.

POSTER PRESENTATIONS SESSION III: Individualized Treatment

PP-031

Ductal eccrine carcinoma – A sweat gland carcinoma with ductal differentiation, with bony metastasis – A case report

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Ductal eccrine carcinoma is a rare malignant eccrine sweat gland tumor with ductal differentiation. The tumor may grow de novo or in the setting of underlying poroma. It has been found more commonly in lower extremity (44%) and trunk (24%). A few have been reported in the upper extremities (11%). One third of ductal eccrine carcinomas are fatal from distant metastasis. We present a case of ductal eccrine carcinoma in a 46-year-old male who developed a painful nodular lump at his right leg and painless bone lesion at left thigh. Seven months ago, he had a painless 2.5 cm nodular lump at his left axilla and histopathology from marginal excision confirmed ductal eccrine carcinoma. We performed prophylaxis fixation and cementation at right tibia and left femur.

PP-032

Analysis of prognostic factors in patients with localized primary synovial sarcoma treated with multidisciplinary treatment: Japanese multi-center study of 162 patients

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Introduction: It has been widely accepted that synovial sarcoma (SS) is a chemosensitive tumor and chemotherapy (CTx) containing ifosfamide might be beneficial for the patients. However, it is still debatable whether CTx would improve the outcome of those patients. Adjuvant radiotherapy (RTx) is also recommended for the high-grade SS, whereas acute and late sequelae after RTx seriously affect the quality of life. The objective of this study was to evaluate the independent prognostic factors of localized primary SS including tumor-related factors as well as treatment-related factors.
Patients and Methods: 162 patients with a primary localized SS and surgically treated at 5 Japanese tertiary musculoskletal oncology units from 1990 to 2011 were recruited. Patients who received initial excision of the tumor at non-musculoskeletal oncology hospital and sequentially underwent additional excision at our institute were also included. Information of tumor-related factors, such as age, site, size, and stage, and treatment-related factors regarding surgery, CTx, and RTx in each patient were collected and analyzed statistically.
Results: In 162 patients, 40 were died of disease, 56 experienced distant metastases, and only 3 patients had local recurrences. The 5-year overall survival (OS) was 79.7% (95%CI 72.0-85.7%) and the 5-year event-free survival (EFS) was 64.9% (95%CI 56.8-72.3%). Tumor size, depth, and stage were significant prognostic factors for OS and EFS. Surgical margin (R0, 141 cases, 5y-OS 81.4%; R1, 16 cases, 5y-OS 60.0%; P=.0076) was a significant prognostic factor for OS, whereas RTx did not linked to superior outcomes in both patient groups with R0 and R1. Administration of CTx was marginally associated with the better OS for the 88 patients with stage IIB/III (Yes, 73.4%; No, 77.3%; P=.057). CTx regimen containing high-dose ifosfamide (=>10g/m2) had a tendency toward better EFS comparing to that containing low-dose/no ifosfamide (high-dose, 56.8%; low-dose/no, 20.0%, P=.058).
Conclusion: This Japanese multi-center study demonstrated that tumor size, depth, and stage are significant prognostic factors of primary localized SS patients. Achieving wide surgical margin strongly affects a better outcome regardless of presence or absence of RTx. CTx containing high-dose ifosfamide might improve the outcome of the selective high-risk patients with SS.

PP-034

The consequences of tumor surgery, from the patient's perspective

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The present study focuses on the patient's perception of the impact and consequences of tumor surgery. As patients are first confronted with the fact of having a cancer causing tumor the next medical step is preparing

them for possible surgery. This event can be life changing and therefore it is essentiell to gather and analyse the patients opinion in retrospect.
The data is collected by personal interviews, which are recorded and then transcribed in compliance with the previously established transcription rules. The analysis will be conducted using the Mayring method. This will be a qualitative analyist because we want to get a subjectiv perception. Therefore we are using open questions and the respondent is able to answer as he likes.
The results can generate ground for future psychological hypotheses regarding doctor-patient interaction, sociological changes and cancer patients expectations.

PP-035

Surgical management of metastatic periacetabular lesions

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Introduction: The treatment of acetabular bone metastases presents numerous clinical challenges, but may offer good results in pain relief and functional skills, increasing the overall quality of life.
Objectives: Evaluate functional results, comorbidity and pain improvement related to different surgical techniques for treating periacetabular tumors.
Methods: Retrospective study of 19 patients who underwent surgery due to periacetabular metastasis between 2007 and 2013. Evaluation of subjective pain perception with Visual Analogue Scale(VAS) , time to full weight-bearing, and functional assessment with Harris Hip Score (HHS) were described as main variables. Early (<6 weeks) and late (>6 weeks) complications where also registered
Results: Age average 64 years (35-87). Breast cancer was the most common primary malignant tumor (7) followed by kidney (3). 6 patients did not have other metastasis, 4 had multiple bone metastasis, and 9 visceral dissemination. There were 3 Harrington type I lesions, 4 type II, and 12 type III. 14 had continouos pain and used major opiod analgesics (VAS > 8). One was not able to walk. Anterolateral approach with trochanteric osteotomy was performed, followed by intralesional tumor resection. Reconstruction with Burch-Schneider Cage (8), hydroxyapatite dome with rod (5) and Harrington modified proceedings (6) were performed. HHS improved from 35 (19-45) to 68 (51-84). VAS from 7.8 to 4.1. The follow-up of 16 months was due to the underlaying disease. 3 neurological ciatic lesions, and a posterior dislocation were found. One hip prosthesis was rejected due to deep wound infection. Partial weight bearing started after medical stabilization (9 days average0) .
Conclusion: Although it is a palliative procedure, reconstructive periacetabular surgery after carefully selection, give patients a higher expectancy of life with less pain and better funtional assessment.

PP-036

The unlikely pathologic fracture of the humerus

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Introduction: The humerus is the second most affected bone by metastasis. Despite the initial treatment with radiotherapy, surgery is usually necessary in case of pathologic fracture or iminent one. Mirels Criteria, accepted to determine the need of a prophylactic treatment of a pathologic fracture, are dependent of the fact that the bone is or is not subjected to loading. These criteria may not be valid for the humerus because, with the dysfunction of the inferior limbs, the superior ones are functionally requested.
Objectives: Evaluation of both, the operated pathologic humerus fractures and Mirels classification, on the metastasis where the fracture occurred, in order to determine if it would be advantageous for those fractures to be treaten prophylactically.
Material and Methods: Between 2008 and 2013 were operated 17 pathologic fractures at our Hospital. Three corresponded to metastases of a primitive tumor of lung, 5 of the breast, 4 myeloma, 3 prostate, 1 kidney and 1 hemangiopericyoma of the skull. We analyzed the metastases by consulting the X-rays of the fractures or, when available, before the fracture happened, and classified them by Mirels criteria. We also consulted the clinical records to determine the pain and the presence of other metastases, including at the inferior limbs, pelvis and spine. All the fractures were treated by closed nailling.
Results/ Discussion: The radiological evaluation showed that 5 (30%) metastases had a score equal or inferior to 7, five (30%) had a score of 8 and 7 (40%) had score equal or superior to 9. Moreover, from the ten metastases with a score equal or inferior to 8, 60% had metastases at the pelvis, spine or femur. Despite this score, which wouldn't indict the need of nailling, the fracture occurred, which reinforces the non validity, at least in absolut terms, of these criteria at superior limb. That fact is probably explained by the solicitation of superior limb on patients with diffuse metastases affecting pelvis, spine and lower limbs.
Conclusion: The functional and mechanic evaluation of the humerus in the presence of metastases shouldn't be based only on Mirels criteria. Probably the prophylactic surgical treatment of the fractures should be more frequently used.

PP-037

High grade osteosarcoma in adults: a single institution experience in the Czech Republic

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Background: The peak incidence of high grade osteosarcoma comes in the second life decade. Survival data for adult osteosarcoma patients are limited. Our aim was to study the treatment outcome of adult patients newly diagnosed and treated by a multidisciplinary team in Brno, Czech Republic.
Patients and Methods: At a mean follow up period of 57.6 months (2-211, median 36.5), 36 adult patients with osteogenic sarcoma were diagnosed and treated between years 2000 and 2010 - using standard protocols, including doxorubicin, cisplatin +- methotrexate. The impact of age, disease extent, histologic response to preoperative chemotherapy, baseline alkaline phosphatase (ALP) and lactate dehydrogenase (LD) serum levels and other possible prognostic factors were evaluated.
Results: 36 adults (17 males, 19 females) aged 19 to 82 (median 28.5 years) were included. 44 % of patients were older than thirty, 36 % older than forty years old. Extremity was affected in 69 % of cases. 31 % of patients were initially metastatic, only 27 % had good response to neo-adjuvant chemotherapy, 75 % underwent surgery. The 5-year OS in patients with localised disease was 65 % with the median survival of 93 months. The 2-year OS with initially metastatic disease was 27 % (median 15 months), 3-year OS 9 % only. The median survival of all patients was 44.5 months and 5-year survival 47 %. Dose reduction because of toxicity was necessary in 39 % of patients - 2 treatment related toxicity deaths occured. A univariate analysis revealed that the prognosis of adult osteosarcoma patients was significantly related to distant metastasis (p=0.002), surgical stage (p=0.003), serum ALP level (p=0.002) and serum LD level (p=0.024). Age, pathological subtypes, response to chemotherapy, and others were insignificant in this population regarding survival outcome.
Conclusion: In our adult patient population we observed metastatic disease and axial or pelvic localisation more often in comparison with younger population. The treatment results of localised disease in adults are comparable to results of younger patients. In the case of metastatic disease in adult patients, the prognosis has been poor for past 20 years and remains so.
Acknowledgement: Supported by MH CZ - DRO (MMCI, 00209805).

PP-038

Our experience with chondrosarcoma affecting hand bones

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Introduction: The chondrosarcoma is a malignant tumour resulting from cartilaginous proliferation. It represents 10% of all malignant tumours. It is very rare in the hand, representing 0.5-3.2% of all chondrosarcomas. Chondrosarcomas of the hand can be described as a primary lesion itself or it can appear as a result of the malignant transformation of other benign tumours as chondroma, which is also extremely rare but more frequent in the context of multiple enchondromatosis.
As it is radio and chemo-resistant, classically it was said that this tumour required aggressive surgical treatment to avoid the risk of recurrences or metastasis: Nowadays, several studies have demonstrated that low grade chondrosarcomas in other locations can be treated more conservatively. The aim of our study is to describe our series of chondrosarcomas of the hand, regarding the epidemiological data, treatment performed and oncologic outcomes.
Methods: We retrospectively reviewed our experience in the treatment of chondrosarcomas of the hand. We revised our database between April 1985 and April 2013. Epidemiological data, and data related to the characteristics of the tumour, to the surgery and to the subsequent evolution were analysed.
Results: 4 patients, 2 women and 2 men, mean age 66 (46-85) were found. Mean follow-up 40 months (6-120). The main symptom was an increase in volume over years of evolution in three cases and a pathological fracture in one case. The most common affected bone was metacarpal, followed by proximal phalanx. One patient, affected by Ollier syndrome, had affectation in two metacarpals. The most commonly affected finger was the 4th.
3 patients were treated with curettage (2 of them required bone grafting), and 1 underwent a thumb amputation (affectation of 1st metacarpal). Nobody received adjuvant therapy. Histopathology was positive to chondrosarcoma grade I/III in 3 cases and grade II/III in 1 case.
Conclusions: The chondrosarcoma affecting hand bones is extremely rare. A prompt diagnosis and an aggressive surgical treatment is required in order to avoid local recurrences especially. However, in low grade chondrosarcomas, less aggressive treatment, like curettage with or without bone grafting, can be an option.

PP-039

Common fibular nerve motor lesion as first syntom of a neoformation

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Introduction: Lesions in the common fibular nerve occur, in most cases, associated with iatrogenic nerve injury caused by compression of the knee during surgical procedures. Other causes can be due to proximal fractures of the fibula, sprain nerve by external patella dislocation, sustained compression in the region (casts, anesthesia, or occurred during sleep), or due to internal causes such as tumors.
Objectives: Description of a clinical case of compression injury in the common fibular nerve by a lipoma, at the level of the proximal fibula.
Methods: 38 years old female patient observed in an emergency room for inability to perform extension of the

right hallux since 8 weeks ago. No known traumatic event. The patient also refered pain around the knee and decreased sensibilly in the territory of the common fibular nerve. CT study revealed "lipoma/liposarcoma along the proximal fibula which can compress nerve structures". NMR revealed a large mass of about 9x4cm concerning the three compartments of the leg and to surround the proximal fibula with a set of suggestive of possible liposarcoma. Electromyography described axonal sensorimotor lesion, moderate to severe, in common fibular nerve with fascicular involvement in the extensor muscle of the hallux and short extensor of the fingers.
Was performed a guided needle biopsy of the lesion whose clinical pathology study revealed a lipoma (without malignancy sinal). The patient was submitted to a surgical excisional biopsy. During the procedure it was identify the fibular nerve (figure 1) and was performed it`s decompression (also checked the nerve integrity)
Results: Complete excision of the lesion (figure 2), which was compressing the nerve. Pathological examination confirmed lipoma. So far the patient keeps the motor deficit and diminution of sensibilly.
Conclusions: The peripheral nerve compression change nerve conduction and can damage the axon leading to Wallerian degeneration. The recovery time after injuries of peripheral nerves is variable, and in more severe cases the reversal of the injury does not occur.
In this clinical case the folllow-up is short (6M), and with unsatisfactory results.
It is necessary at this stage to wait for a longer period of follow-up to determine the evolution of the lesion. As final conclusion, this is a case of atypical presentation of a common fibular nerve injury, as a sequel to an internal compression, demonstrating the importance of a complete physical examination for definitive diagnosis.
Keywords: Common Fibular Nerve; Nerve; Lipoma; Motor Nerve Lesion

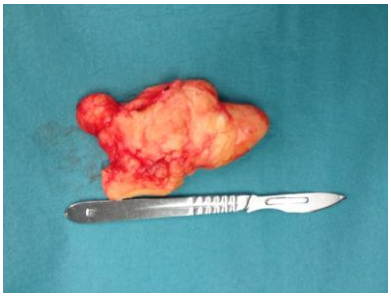

Figure 1

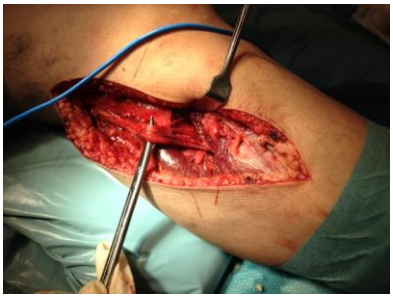

Figure 2

PP-040

Loosening in tumoral megaprosthesis after primary tumors of the femur

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Introduction: The reconstruction of the femur using tumoral prosthesis after tumor resection is a surgical challenge. The function reacquired is usually satisfactory. However, the increase in survival reported in these patients, must leave the orthopedic surgeon aware of the high potential for complications in the short and medium term.
Objectives: Two cases report.
Methods: Two cases of sarcoma (parosteal osteosarcoma and fibrosarcoma) of the distal femur which surgical treatment was excision and total knee replacement with megaprosthesis of "rotating hinge" The prosthesis had a cemented stem with a porous ring in the transition stem-prothesis. It was found loosening and proximal migration of the prosthesis after 40 and 33 months, respectively. In the first case the solution was a total femur prosthesis and in the second one was the review with a new proximal cemented and screwed stem.
Results: Great functional outcome in both cases, with no evidence of recurrence of injury.
Despite tumoral megaprosthesis be a great solution for treating bone tumors, is described a high percentage of complications in a short and medium term. Excess stress applied to the bone-cement interface and articulation seems to result in early osteolysis and component wear. The first megaprosthesis models without "rotating hinge" only allowed the movement of flexion and extension of the knee, and complications were recorded elevated. To solve this problem have added new modules that allow axial rotation thus dissipating the forces transmitted to the bone - cement interface and cement - prosthesis. The latest models incorporate features that offer improved torsional stability for fixation, as well as provide a better link between the "rotating hinge" and the tibial component. In literature these models show promising results in the medium term. However, in the presented cases, complications were more precocious than the results of the current literature, perhaps due to the fact of patients have a high stature, with a very good initial functional result allowing them to normal gait, without restrictions on the activities of daily life.
Conclusions: Despite the drama, the solutions seemed appropriate and functionally satisfactory. The case of revision with cemented and screwed stem can not be final yet, and shall be required a reintervention using the total hip replacement of the femur.
Keywords: Megaprosthesis; Loosening; Total Femur Replacement

PP-041

Intraarticular synoviosarcoma of the knee presenting as a nodular synovitis and meniscus rupture: case report

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Introduction: Synovial sarcoma (SS) is a rare mesenchymal tumor, accounting for less than 10% of soft tissue sarcomas. It is considered that SS is the result of the SYT-SSX gene fusion, detected in more than 95% of all SS cases. Primary intraarticular SS is extremely rare: less than 5% of synovial sarcomas arise within the joint space. We report a case of intraarticular SS mimicking nodular synovitis and meniscus rupture in 26 year old male patient.
Case Report: The patient had 6 months of knee swelling and pain on the lateral side. MRI indicated nodular synovitis and lateral meniscus rupture. According to arthroscopy finding of suspected nodular synovitis over the lateral meniscus, synovectomy was performed, and lateral meniscus was sutured. Histology analysis confirmed the suspected diagnosis of nodular synovitis.
After four years, due to progression of swelling, pain and decreased range of motion of the knee, the second arthroscopy was performed, and a part of synovium over the lateral meniscus was sent for analysis. Histology examination demonstrated a monophasic SS, and molecular analysis showed translocation SYT/SSX1 which confirmed the diagnosis. Repeated histology of the first specimen confirmed appearance of nodular synovitis, with no histology criteria for sarcoma, but molecular analysis of the first biopsy showed positive SYT/SSX1 translocation.
Following surgical treatment consisted of extraarticular knee resection, including resection of all biopsy tracts from arthroscopies. Reconstruction was made with a knee megaprosthesis, and a homologous patella - tibial tuberosity allograft. Resected specimen had tumor-free margines, and there was no tumor present in biopsy tracts; SS size was 2cm. Adjuvant therapy was not conducted. After two years the patient has good knee function, and no evidence of local recurrence or metastases.
Conclusion: This case report showed that in a case of benign histological appearance, underlying sarcoma is possible and could be identified with advanced pathology methods. It remains unclear at what amount should the pathologist use molecular and imunohistochemical analysis in seemingly histology benign cases. A true extraarticular knee resection and reconstruction with megaprosthesis and extensor allograft seems to work well in this patient in a short term follow-up.

PP-042

Characteristics of pathologic fracture around the proximal femur in prostate cancer patients with osteoblastic bone metastasis

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Purpose: It is not easy to predict risk of pathologic fracture in prostate cancer patients with osteoblastic bone metastasis by established universal scoring systems, because of different characteristics from osteolytic or mixed lesions. This study is to evaluate distinct characteristics of pathologic fracture around the proximal femur in prostate cancer patients with osteoblastic bone metastasis and consider how to prevent established pathologic fracture.
Methods: We reviewed the medical records on 122 metastatic prostate cancer patients with C61 and C7950 International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) codes in registry of this hospital from 1998 to 2014. Among them, 9 patients underwent pathologic fracture around the proximal femur. Information on pre-fracture pain, injury mechanism, radiographic findings including cortical involvement, and other imaging modality findings was reviewed.
Results: Eight patients of 9 had not complained pain in 3 months before established fracture occurred. Eight patients reported trauma history. Basicervical femoral neck fractures without displacement or with minimal displacement occurred in 6 patients. It was difficult to assess cortical involvement because cortical density could not be distinguished from osteoblastic metastasis density.
Conclusion: Pain assessment seems to be unreliable to predict risk of pathologic fracture in prostate cancer patients with osteoblastic bone metastasis. Injury mechanism may be different from those of osteolytic or mixed bone metastasis. Because most fractures occurred at the osteoblastic region where cortical discontinuity was not identified easily, frequent radiographic follow-ups could be recommended and MRI could be helpful to identify preceding occult microfracture. We also assume that comparison in bone mineral density around metastatic region could also be of help to predict fracture risk because stress concentration caused by difference in bone mineral density can provoke fracture at osteoblastic region.

PP-043

Large chondrosarcoma of the chest wall invading the toracic cavity and the spine

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Introduction: Chondrosarcoma is the most common primary tumor of the chest wall. In general this malignancies are not responsive to chemotherapy and radiotherapy. Successful treatment depends on early recognition and radical excision with adequate margins and immediate reconstruction. The authors present a case of a paravertebral chondrosarcoma invading the toracic cavity and the spine.

Case Report: A 39-year-old male was admitted with an extremely large mass in the right dorsal paravertebral region detected two months before. It was hard and painless. There were no neurological deficits or changes in respiratory function. A plain x-ray film of the chest revealed a large opacity with an ill-defined border on the right side. Chest computed tomography showed a lobulated tumor with calcific deposits, measuring about 13x7x6 cm, centered in the seventh rib, involving also the sixth and the eighth ribs. On magnetic resonance imaging, the tumor showed low to iso-intensity on T1-weighted images and irregularly mixed low to hight intensity on T2-weighted images. It extended into the thoracic cavity and spinal canal pushing the spinal cord. CT of the abdomen and pelvis and a bone scan showed no evidence of metastatic disease. A CT guided biopsy confirmed grade 1 chondrosarcoma. We performed na intralesional surgery, including the resection of the posterior portion of 6th-9th ribs and the spinous processes and laminas of the 6th-8th thoracic vertebra for tumor resection and decompression of the spinal canal. Chest wall reconstruction included the coverage of the soft tissue defect with a polytetrafluoroethylene (Gore-Tex) prosthesis. The spine was stabilized with transpedicular instrumentation (T5-T11). The patient had an uneventful postoperative course. The definite pathological diagnosis was grade 1 chondrosarcoma. Three years after the operation, the patient is alive without any evidence of recurrence.

Discussion/ Conclusion: Large chondrosarcomas of the chest wall are difficult lesions to treat because of the anatomic proximity of vital neurovascular structures and the limited surgical margins that can be achieved. Sometimes, intralesional surgery cannot be avoided in the case of a large tumor originating in the chest wall.

A good prognosis in terms of survival can be expected, even in the cases in which adequate wide resection cannot be achieved, so long as the histologic malignancy grade is low.

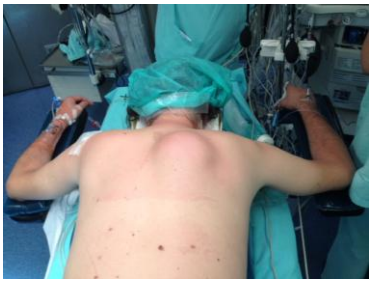

Figure 1. *Inspection*

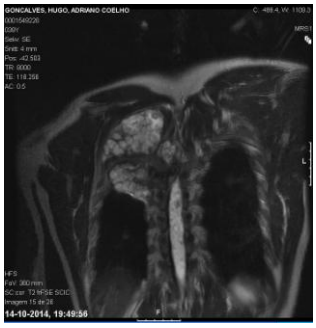

Figure 2. *MRI 1*

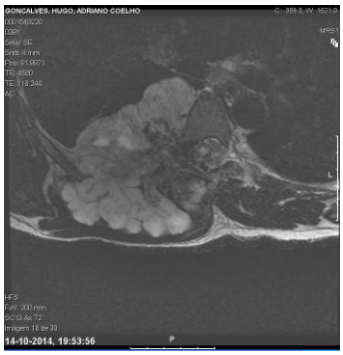

Figure 3. *MRI 2*

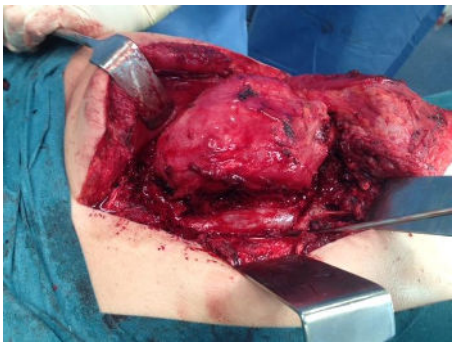

Figure 4. *Surgery*

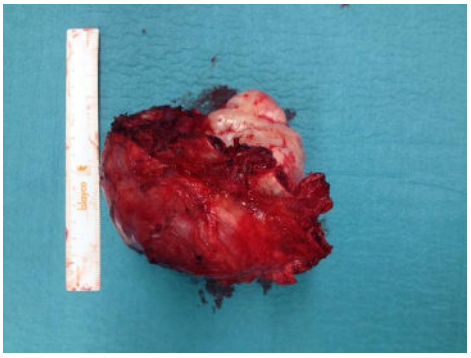

Figure 5. *Ressected specimen*

PP-044

Extreme chondrosarcoma: is there any end of the palliative surgery?

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Material: Two patients, a man aged 56 years old and a woman 57 years old, suffer of extreme chondrosarcoma. With the term "extreme chondrosarcoma" we intend a low-grade, primary or secondary chondrosarcoma which is difficult to control it because of its multiple recurrences or metastases. The first patient presented a pathological fracture in his right femoral neck and underwent to his first operation some 25 years ago on 1990. The second patient presented an eminence in she's left public ram and operated 20 years ago, on 1995, for first time.

Method: The two patients underwent to numerous operations since - more than twenty (20) - for both, in two continents. Multiple surgical specialties required to involving during the years, such as general surgeons, neurosurgeons, urologists and others. Some very demanding operations were

performed to both with the most demanding one, lasting for 13 hours. Nouvelle approaches required to conceiving, at least two. More than 100 units of blood were administrated and the estimated total cost exceeds the 2 million euros.
Results: The "common" in these patients is the inadequate first operation. Both are alive and the mean survival time is over 22 years. They learned living with the tumor, facing it as part of their life. The woman is a very active teacher despite of her nephrostomy and the man is a businessman, owner of 3 companies, walking with a prosthetic leg because of his right hip disarticulation and he is recovering from his last operation, some 2 weeks ago (cervical spine decompression and tumor debulking).
Conclusion: There is no limit for palliative surgery as long as it benefits the patients. Is notable that despite the controversial treatment, every time is much harder for the surgeon but is surprising good the patient respond.

PP-045

Radiation-induced angiosarcoma of the breast (RIA): what is the optimal management? Review of the literature our centre experience and a case report highlighting the value of a novel chemotherapeutic regimen

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Background and Objectives: Angiosarcoma of the breast is an uncommon, extremely hostile neoplasm of vascular origin. The frequency of this rare tumor is 0.04% of primary mammary tumors and appoximately 8% of mammary sarcomas. It carries a very poor prognosis, with a five-year survival of 8-50%. RIA were first reported in literature in 1929. This presentation addresses the value of aggressive treatment with novel neo-adjuvant chemotherapy followed by surgery.
Methods: An extensive review of the literature have been carried out to detect any possible guidelines in the management of RIA. We report the case of a 73-year-old woman with locally advanced RIA that was otherwise too extensive to be treated surgically. A novel neoadjuvant chemotherapy regimen with gemcitabine 675 mg/m2 on Day 1 and 8 and docetaxel 100 mg/m2 on day 8. For 6 cycles was used.
Results: There is general consensus in literature that the only logical treatment of RIA regardless of histologic type is wide surgical resection. Conservative treatment even with negative margins exposes the patient to early recurrences and metastatic spread. Adjuvant Chemotherapy in RIA has so far produced disappointing results. Radiation therapy has been avoided in these cases due to concerns about the toxicity of repeated treatment. However recently some encouraging results have been achieved with the use of hyperfractionated radiotherapy.
In our case and following initiation of Chemotherapy, Dramatic improvement was seen after 2 cycles, with diminution of skin discoloration, skin thickening and papule appearance. After 4 cycles, MRI revealed a near-complete resolution of the areas of asymmetric enhancement in the breast as well as marked improvement of skin thickening and enhancement. Clinically, the involvement beyond the mastectomy borders had resolved, making the patient eligible for resection with intent to achieve wide negative margins. Subsequently, wide local resection has been carried out. Pathologically, there was no residual tumour in the surgical specimen.
Conclusions: Review of the literature reveals that Survival of patient with RIA is poor and current treatment options have traditionally been ineffective. We report the first case of a locally advanced radiation-induced angiosarcoma of the breast that was not only rendered operable, but also showed dramatic complete resolution after neoadjuvant gemcitabine-docetaxel chemotherapy. That response has facilitated complete surgical resection. Despite that excellent response, patient succumbed to her disease 5 years later.

PP-046

3D-planned allograft reconstruction with patient specific jigs for the reconstruction of the proximal radius

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Introduction: Primary tumors of the proximal radius are rare. Often, they can be resected without the necessity of reconstruction. However, if the tumors are large and the chorda obliqua has to be resected, some sort of reconstruction may be considered. The literature on this type of reconstruction is sparse, and there is no proven single best method. Leaving the radius flail may necessitate the reconstruction of a one bone forearm, prosthetic reconstruction may end up in loosening, and allograft reconstruction may be prone to failure because of the lack of a perfect match. Herein, we present the use of 3D planning based on preoperative MRI's and CT-scans using 3D print-outs and patient-tailored jigs for performing the osteotomies to reconstruct the proximal radius.
Patients and Methods: We herein present a 25 yo male and a 29yo female both with a Ewing's sarcoma of the proximal radius, as well as a 20 yo saleswomen with a intracortical aneurismal bone cyst of the proximal radius. Whereas in the latter patient, 1.5cm of the radial head could be spared, the resection length in the other two patients was 14 and 16 cm, respectively, including the radial head. 3D planning based on preoperative MRI's and CT's were used for all cases, with manufacturing custom-made jigs.
Results: Intraoperatively, custom-made jigs could be confidently used to perform the osteotomies. In the case of intercalary resection, an allograft was fitted into the defect while maintaining the correct position of the radial head, fixating the construct with a custom-made plate. Four years after resection, the patient is free of recurrence and has nearly normal pro-/supination. In another patient, the ipsilateral vascularized proximal fibula was harvested to use jigs to carpenter a radial head, which was fixated in place including the reconstruction of the annular ligament. The patient developed overt metastases thereafter and died 12 months post surgery. He had full flexion and extension, pro-/supination was 60/45. An allograft was used for the third

patient, and 3D planning allowing to reconstruct the proximal radius that it perfectly matched the opposite side. Three months after surgery, the patient is pain free with full flexion/extension and pro-/supination of 70/45.

Discussion: 3D planning with 3D print-outs and custom-made jigs greatly assists in the reconstruction of the proximal radius, independent of using an allograft or a vascularized fibula, to correctly (and technically easily) place the construct in space allowing for optimal movement.

PP-047

Early clinical outcomes for juxta-articular distal humeral tumors treated with hemiarthroplasty concept

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The concept of elbow hemiarthroplasty, for the treatment of Juxta-articular tumours of the distal humerus, has not been popularized among surgical oncologists. While treatment with total elbow arthroplasty has been well described in the literature, very little has been published about hemi-arthroplasty modality for such group of patients.

We report the clinical and functional outcomes of two cases treated with this surgical technique. We used a custom-made distal humeral endoprothesis in a 26 and 35 year-old patients. The indications were chondrosarcoma and unknown tumour that was treated elsewhere with resection, fibular grafting and fixation.

Satisfactory functional outcome with mean Toronto extremity salvage score of 83% of normal. Radiological appearances were satisfactory. No complications were reported.

This report warrants further long term evaluation of this technique and with a larger number of cases. The authors believe that custom-made endoprosthetic reconstruction of the distal humerus for bone tumours is a viable treatment method in carefully selected patients.

PP-048

The value of gait analysis in lower limb salvage surgery of children with bone sarcomas

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Introduction: Limb salvage options for reconstruction of lower limbs in children with high grade sarcomas are increasing over time but long-term functional results are still to be evaluated. Since these techniques are technically demanding and time consuming for both patients and surgeons, they deserve careful appraisal. Beside the assessment of surgical and oncological criteria of reliability of these techniques, it is also very important providing objective data on functional results in the long term both for clinician's feedback on surgical and rehabilitative outcome and for patients and families counseling regarding their potential recovery.

Many metrics are used to assess the outcome of limb salvage interventions: the MSTS score systems is used for musculo-skeletal impairment, limitations in activities of daily life are generally assessed using the TESS score, the quality of life by means of SF36.

In the last years gait analysis emerged as assessment tool for the functional outcome of limb salvage procedures. The types of intervention and the sacrifice of different bone structures and muscle involve specific residual functional abnormalities that may influence the residual growth and can be documented through the analysis of the movement.

The **aim** of this presentation is to give an overview on the insight gait analysis can provide in long-term survivors who received different types of limb salvage surgery when skeletally immature.

Materials and Methods: Between 1994 and 2011, about 100 subjects who received a femur or a tibia major skeletal reconstruction in their childhood were evaluated by gait analysis at more than 2 years from surgery.

Reconstructions were: Proximal femur rotationplasty (1), Proximal femur biological reconstruction with Vascularized Fibula (1), Proximal femur composite endoprosthesis (10), Proximal femur allograft-prosthesis composite (10), Intercalary femur Massive Allografts plus Vascularized Fibula (10), Distal femur mega prostheses with hinged joints (18), Distal femur osteoarticular allografts (1) Distal femur rotationplasty (16), Proximal tibia mega prostheses with hinged knee (10), Proximal tibia composite endoprostheses (3), Proximal tibia composite prostheses with rotating hinged joint (8) Intercalary tibia Massive Allografts plus Vascularized Fibula (8), ankle arthrodesis (3).

Results: Specific gait abnormalities were found according to the surgical intervention:

Proximal femur: Although both modular prosthetic replacement and allograft-prosthesis composite reconstruction procedures provide good functional outcome in the long-term follow-up, gait analysis revealed mechanical changes during gait that were probably related to the muscle reinsertion procedure. Direct fixation of the muscles to the bone graft, as in the allograph-prostheses results in a more efficient muscular recovery.

Distal femur: good gait function can be achieved in patients treated with distal femoral resection, partial excision of the quadriceps, and total knee arthroplasty with insertion of a hinged prosthesis. Patients in whom the vastus lateralis and vastus intermedius were removed have better gait performance and a more physiological knee-loading pattern than patients in whom the vastus medialis is removed

Proximal tibia: total knee modular megaprosthesis functional performance during gait is in most cases abnormal, consistent with the weakness of the extensor apparatus and knee extension lag. Although a greater rate of normal walking is present in osteochondral allograft patients, problems related to a short patellar tendon, knee instability, and joint mismatching can account for abnormal knee kinematics.

Intercalary Femur Biological Reconstructions: subtle gait anomalies in proximal versus distal site of femur reconstruction are present, mainly dependent on muscles removed.

Rotationplasty: Functional results obtained in rotationplasty patients are maintained at a follow up of about 15 years. The symmetry of the limb length seems to be a factor influencing the better motor performance.

Conclusions: In conclusion, gait analysis allows analyzing objectively the movement, entering into the merits of functional impairment in dynamic conditions through the study of muscle activity, of forces applied to the joints, and kinematics of primary and compensative gait patterns. This is relevant both for general information on outcome of surgery with respect to the technique, and for customizing the best rehabilitative treatment with respect to the individual patient's dysfunction.

PP-049

Atipical location of bizarre parosteal osteochondromatous proliferation

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Introduction: Bizarre parosteal osteochondromatous proliferation (Nora's Disease) is considered a rare pathology. It occurs in adults in their 20's and 30's and males are slightly more affected. It is most common in the hands followed by feet, long bones (commonly of the upper extremity), skull, jaw, and others. Clinical symptoms are variable, it can be asymptomatic and showed up as an incidental finding, or it can be very painful. Mass sensation varies according to location. The classical treatment was wide resection, but, as it may recur locally in as many as 50% after surgery, at present the trend is "watch and wait" attitude and follow up, except in symptomatic cases. The diagnosis can be difficult, and sometimes it is required not only the imaging, but also biopsy and histopathological analysis. Differential diagnosis must include osteochondroma, periosteal chondroma, and even parosteal osteosarcoma.
Methods: We present some cases of Nora's disease in rare locations, different than the usual ones. Two of them had an initial diagnosis of parosteal osteosarcoma following simple radiology, CT and MRI. Histopathological analysis after biopsy leaded to the definitive diagnosis. We present the imaging studies and histopathological findings.
Results: CT guided biopsy was perform in the two cases with image diagnosis of osteosarcoma (distal radius and distal femur). Histological diagnosis was finally Bizarre parosteal osteochondromatous proliferation. Surgical treatment was performed in one of the cases (wide resection), and we report the outcome after one year of follow up. The one in the femoral location was asymptomatic, so we decided to watch and wait, and at the moment the patient is stable.
Conclusion: Bizarre parosteal osteochondromatous proliferation is a disease to keep in mind because in spite of its rarity it may show up in our daily practice. It is important to make an accurate diagnosis. Differential diagnosis may include parosteal osteosarcoma, so sometimes the biopsy must be performed. The current treatment is wide surgery in symptomatic patients and following up in the asymptomatic ones.

PP-050

Operative treatment of soft tissue sarcomas in upper extremities

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Purpose: Approximately 20% of all extremity sarcomas occur in the upper extremity. When operating soft tissue sarcomas (STS), the vicinity of functionally important structures in the upper extremity may result in smaller margins, if function is tried to preserve to the last point.
Methods: We conducted a retrospective review of 54 consecutive patients with STS in the upper extremity (2006-2015) managed with the same treatment strategy (Figure 1. Resection line (red) and postoperative x-ray of an intramuscular high grade sarcoma of the extensor carpi ulnaris muscle). Our strategy with low grade tumors: we aim at negative margins, but accept <10mm of healthy tissue around the tumor especially if there's a natural barrier present. If the margins are compromised, we refer the patients to radiation therapy or to close follow-up depending the tumor histology. Reoperation is performed always in intralesional cases. With high grade tumors the strategy is as follows: we aim at >10mm margins, but accept a fascia as a natural barrier. If there is no fascia present, we are ready to sacrifice nerves, vessels and bone to accomplish 10mm of healthy tissue around the tumor. All patients with deep high grade tumors will go through radiation therapy.
Results: There were 25 females (46%) and mean age of all patients was 63 years (range 9-88 yrs) (Table 1). Follow-up time was average 47months (range 1-108mo). 33 tumors were deep seated and 21 superficial (subcutaneous). There were 17 low-grade and 37 high-grade tumors (Figure 2). Four patients had metastatic disease at the time of diagnosis and three of them were operated. We conducted eight amputation, but the rest of the resections were done with limb salvage maneuver. The final margins concurred the margins preoperatively planned in 52/53 cases (wide 32, marginal 20 and intralesional in one patient) and a patient was treated conservatively because of metastatic disease at the time of diagnose. There were only two recidives (4%) and six metastases (11%) during the follow-up period.
Six patients (11%) died during the follow-up, three because of disease and three of other cause.
Conclusion: With pedantic preoperative determination of possible natural barriers around the primary tumor, it is possible to minimize unnecessary soft tissue resections and possibly maintain functionality of the upper extremity without jeopardizing oncologic outcome.

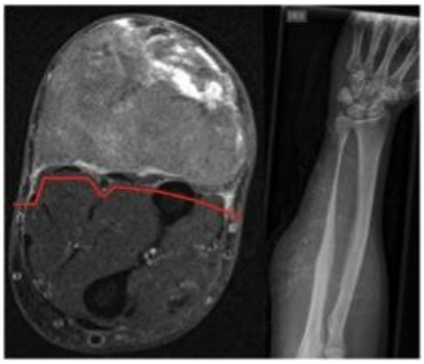

Figure 1

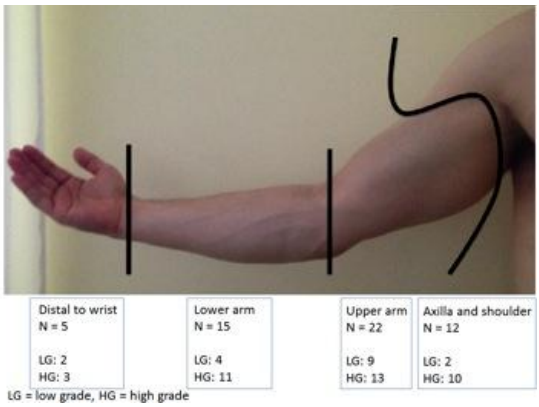

Figure 2

	N
Age	
0-20	2
21-60	18
61-100	34
Gender	
Female	25
Male	29
Localization	
Distal to wrist	5
Lower arm	15
Upper arm	22
Shoulder	6
Axilla	6
Histology	
Liposarcoma	11
Pleomorphic STS	8
Leiomyosarcoma	8
Myxofibrosarcoma	7
Epitheloid sarcoma	4
MFH	3
MPNST	3
SFT	3
Fibrosarcoma	1
Rhabdomyosarcoma	1
Alveolar soft part sarcoma	1
Angiosarcoma	1
Triton tumor	1
Synovial sarcoma	1
Malignant epitheloid hemangioendothelioma	1
Depth	
Deep	33
Subcutaneous	21
Grade	
Low grade	17
High grade	37
Margins	
Intralesional	1
Marginal	20
Wide	32
Radioation therapy	20
Chemotherapy	13

STS = soft tissue sarkooma
SFT = solitary fibrous tumor
MPNST = malignant peripheral nerve sheet tumor
MFH = malignant fibrous histiosytooma

Table 1. *Demographic data of patients*

PP-051

Approach to tumors of the acetabulum and proximal femur by surgical hip dislocation

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Rational: Surgical dislocation of the hip is used to treat femoro-acetabular impingement, and femoral head reconstruction (e.g. Perthes). Few cases have been reported using hip dislocation for the treatment of tumors (Gunel U 2013; de Los Santos 2013; Li M 2012 and Jellicoe P 2009). We wish to add our experience with 4 cases.
Materials: The surgical technique of hip dislocation was used as described by Ganz et al. 2001.
Patient 1: 9y old girl; Ewing sarcoma of the acetabulum. En bloc removal, reconstruction of the posterior wall by a muscle pedicled bone block from the iliac crest , f/u 8 yrs
Patient 2: 24y old female patient; Osteochondroma anterio-cranial to lesser trochanter. Tangential resection, without recurrence at f/u 4 yrs
Patient 3: 57y old male patient; Recurrent chondrosarcoma femoral neck. En bloc resection, reconstruction with autologous iliac bone graft and protective LCP, f/u 3 years
Patient 4: 29y old male patient; Giant cell tumor acetabulum. Curetted and thermocoagulated intralesionally, f/u 6 months
Results: All patients recovered uneventfully from the surgical hip dislocation approach and regained full hip function. In patients 1 to 3, pathologic examination showed uncontaminated margins; they are free of recurrence at 3 to 8 years follow-up time. The follow-up time for the giant cell tumor in patient 4 is too short for final evaluation.
Conclusion: Surgical hip dislocation can be a useful approach for the treatment of intraarticular hip tumors or those close to the hip joint and needing excellent visual control to avoid damaging articular structures.

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PP-052

Custom diaphyseal endoprosthetic reconstruction for malignant bone tumors. Experience of the East European Sarcoma Group

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Introduction: The best method of reconstruction after resection of malignant tumors of the bone diaphysis is unknown. The aim of our study was to analyze and integrate data endoprosthesis replacement diaphyseal bone in children and adults.
Methods: We present a retrospective review of 19 patients (1998-2014y) who underwent limb salvage using a bone diaphyseal endoprosthetic replacement following excision of a bone tumor. Nine patients were children with bone sarcoma aged 8 to 15 years, mean age was 11.6 years. Ten patients were adults aged 28 to 67 years, mean age was 52.5 years. The most frequent pathology was metastatic kidney cancer.
Results: All patients after surgery were activated in the early stages and, if necessary, resumed adjuvant treatment protocol adopted at the institute. The most frequent complication in patients after total diaphyseal defects was aseptic loosening of the endoprosthesis, which occurred in 6/19 patients (31.5%). From the progression of the underlying disease 2 patients died and one patient developed local recurrence, which required disarticulation of limbs. 6 patients underwent revision surgery for instability of the endoprosthesis. In neither case was not observed the development of infectious complications. Follow-up of 1 year to 8 years in adults and from 6 months to 10 years were in children.
Conclusion: Patients with primary and metastatic tumors of the diaphysis of long bones require an individual approach when choosing a treatment strategy and the method of reconstruction. Not looking at high frequency complications and revision surgery, joint replacement in the early stages allows to activate the patient and resume adjuvant treatment is an alternative to amputation and other methods of reconstruction without compromising oncological prognosis.

PP-053

A rare tumor at a rare location at a rare age: adamantinoma

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Adamantinoma is a rare low grade malignant bone tumor accounting for less than 1% of all primary bone tumors. It is often clinically, radiologicaly and hystologicaly mistaken for many other tumors like synovial sarcoma, metastatic carcinoma, fibrous cortical defect. Most patients with adamantinoma are adolescents and young adults, and 90% of reported long bone cases have arisen from tibia. We report a case of adamantinoma of distal femur.
A 77 years old man presented a nearby hospital in October 2011 with a 6 months history of pain and mass of his right femur. Metastatic bone tumor of femur diagnosed according to his age, clinical findings and radiological images. He was treated with open biopsy and intramedullary nailing in November 2011. The histology was reported metastasis of adenocarcinoma according to the local pathologist. Adenocarcinoma of prostate was detected during the evaluation of the primary lesion. He had total prostate resection operation and medical oncologic treatment for this diagnosis. But the pain and mass complaints recured in August 2012.
He refered to our clinic in September 2012. We planned an operation of biopsy, curretage of the lesion and cement application due to his previous diagnosis and complaints. The operation was done in October 2012. But the histopathology showed findings indicating adamantinoma. The specimens were verified by another two different pathology units and the diagnosis of adamantinoma was confirmed. The lung CT showed no metastatic lesion. Due to the diagnosis of adamantinoma of femur with no metastasis, hip disarticulation surgery was recommended to the patient. He refused to have an amputation and had radioterapy to the surgical site. He had 3 monthly clinical examinations with chest x ray and 6 monthly femur X ray+ chest CT for 2 years. He has no evidence of recurrence or lung metastasis so far after a period of 28 months.
Although the wrong diagnosis and wrong management are going well for this patient, the steps of exploration of bone lesions should not be violated in any patient. So this is an interesting case with the rare diagnosis, rare location, rare age and also inadequate treatment. Adamantinoma is a rare low grade malignant bone tumor accounting for less than 1% of all primary bone tumors. It is often clinically, radiologicaly and hystologicaly mistaken for many other tumors like synovial sarcoma, metastatic carcinoma, fibrous cortical defect. Most patients with adamantinoma are adolescents and young adults, and %90 of reported long bone cases have arisen from tibia. We report a case of adamantinoma of distal femur.
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PP-054

Abdominal sacral – Coccyx and rectal abutment resection technique due to relapse of squamous cancer of the anus

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Introduction: Squamous anal cancer is a rare malignancy and consists the 75% of all anal cancers. It metastasizes rarely, however the therapy of the loco-regional relapses are challenging for the surgeon.The purpose of this study is to describe the surgical technique performed in two patients, a 65 years of female and a 75 years old male with locally recurrent squamous cancer of the rectum with participation of the coccyx and sacral bone.

Methods: The preoperative planning includes pelvic and lower abdomen MRI, thoracic CT as well as a pelvic CT, a PET-CT, bone scanning and pigtails insertion in the ureters. With the patient in supine and low lithotomy position, a midline incision between the umbilicus and pubis is performed. Is performed ablation of the vagina posterior and lateral from the rectum with complete separation. It follows identification and preparation of both the ureters and dissection of the colon or rectum in acceptable distance from the tumor, creation of left colostomy and suturing of the abdominal wall. The patient is relocated in prone position with projection of the anus and coccyx.

Midline incision between the S1 vertebrae and the lower end of the coccyx, follower by an elliptical incision from the lower end of coccyx terminating 2-3cm anterior of the anal orifice. After the excision of the coccyx and lower sacrum, we proceed with division of the sacrum and coccyx surrounding tissues and ligaments. Excision of the perianal skin and the anal tube with the outer anal sphincter and the levator muscle of the anus circumferentially. Meeting of the two excision points upwards. In case of a large deficit, a flap of maximus gluteal muscle or rectus abdominis muscle can be mobilized.

Results: The mean post-operative follow up was 1.5 years and it revealed that both patients are free of disease.

Conclusion: In cases of relapse of squamous cancer of the rectum, extensive pelvic resection which includes the en block resection of the tumor and the surrounding anatomical structures which are infiltrated by the tumor constitutes the only curative surgical option for the patients with recurrent anal cancer. Male patients present more challenges due to the existence of the seminal vesicles and the possible complication of infertility or impotence.

POSTER PRESENTATIONS SESSION IV: Massive Bone Defects: What's the Best Reconstructive Option

PP-055

Allograft-prosthesis composites after resection of a malignant bone tumor: a systematic review of the revision rates, complications and functional results

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Introduction: The use of allograft-prosthesis composites for joint reconstruction after resection of a malignant bone tumor is widely reported in the literature. However, large variations exist in the surgical techniques and they could have an impact on the results.

Objective: Our objective was to conduct a systematic review of all the surgical techniques of allograft-prosthesis composites for joint reconstruction after resection of a malignant bone tumor in order to assess the revision rates, complications and functional results.

Material: A protocol of systematic review was specified in advance and recorded on 01/26/2014 in a specific database. Medline via PubMed, Embase and the Cochrane Library were systematically searched with the following search terms: allograft AND (prosthesis OR replacement) AND (hip OR knee OR shoulder OR elbow OR wrist OR ankle OR femur OR humerus OR tibia). Only studies presenting the results of allograft-prosthesis composites for joint reconstruction after malignant bone tumor resection were considered.

Method: After inclusion, two authors identified the relevant data using a predetermined form that was priory tested on the first 10 studies included. The primary outcome was the survival of the reconstruction evaluated by a revision for any reason as the event of interest. Secondary outcomes included post-operative complications, results (revision for mechanical reasons or for infection) and function.

Results: The search yielded 3153 citations. Among those, 34 papers met the inclusion criteria: 9 studies about reconstructions of the acetabulum, 9 about the proximal femur, 3 about the distal femur, 4 about the proximal tibia and 9 about the proximal humerus. The overall rate of revision of each joint was 0.29 (SD 0.24-0.35) from 0.38 (SD 0.26-0.52) for pelvic APC, 0.31 (SD 0.24-0.38) for proximal femur APC, 0.35 (SD 0.14-0.63) for proximal tibia APC and 0.16 (SD 0.10-0.25) for proximal humerus APC. The overall rate of complications of each joint was 0.52 (SD 0.42-0.61) from 0.70 (SD 0.59-0.78) for pelvic APC,

0.46 (SD 0.36-0.58) for proximal femur APC, 0.80 (SD 0.45-0.95) for proximal tibia APC and 0.27 (SD 0.19-0.37) for proximal humerus APC. By cons, large variability in the rates and types of complications was observed between the different anatomical sites where allograft-prosthesis composites were used. However, we found that the infection rate was 0.10 (SD 0.06-0.16) when fresh allografts were used and 0.26 (0.19-0.36) when irradiated allografts were used. Finally, the normalized function at last follow-up was good after humeral and proximal femoral construct but fair after pelvic construct.
Conclusion: Allograft-prosthesis composites for joint reconstruction after malignant bone tumor resection are reliable in term of survival rates, complications and functional results. However, large differences exist between the surgical techniques and some aspects could improve the results in the medium and long term.

PP-056
Results of surgical treatment in tumor of diaphysis of long bones

K. Abdikarimov, U. Islamov, D. Polatova, S. Urunbaev, R. Davletov, B. Sultonov
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Background: To study the direct results of surgical treatment of patients with diaphyseal tumors of long bones.
Materials and Methods: Endo prosthetics for the replacement of post resectional defects of diaphysis of long bones was developed in surgical department of motor system tumors of Republican Oncological Research Centre of the Health Ministry of the Republic of Uzbekistan (patent FAP 2012 0025 'Device for endoprosthetics of bone diaphysis'). Safety operation with using of prosthetics was performed in 16 patients with primary and metastatic tumor diaphysis of long bones. Men-8(50%), women-8 (50%), patients age-from 16 to 68. In 12 patients was primary tumor (5-giant cellular tumor, 4-solitary myeloma, 2-sarcoma of Ewing, 1-hondrosarcoma), in 4-metastatic affection (in one case- stomach and lungs cancer, in two case - breast cancer), in all cases with solitary character. In 12 patients had a diaphysis affection of thigh bone and in 4 humerus. The length of affected bone was from 5 to 17 cm. Threat of pathological fracture was in 4 (25%) patients, fractures occurred in 12 (75%). All 16 patients segmental resection was performed with endoprosthetics. The length of resection was from 7 to 24 cm.
Results: There were no inter-operative complications. 90 % of patients had not pain syndrome in post operative period. Depending to the volume of operation patients were activated on the 2-5 days, that gives the possibility of independent service and continuation of special treatment. The complications in early postoperative period were not observed. In distant period two complications were observed (12,5%). One patient after 12 months of endoprosthetics of thigh bone diaphysis loosening the upper legs of endoprosthetics occurred, in another patient after 14 months endoprosthetics of humerus, the loosening of lower legs of endoprosthetics occurred. Reendoprosthetics was performed in both cases. The functional condition by scale MSTS: after endoprosthetics of humerus diaphysis- 90 %, thigh bone -85%, anatomical-functional results by scale Enneking in 4 (25%) patients were marked as excellent, in 8 (50%) as good, and in 4 (25%) as satisfactory.
Conclusion: Thus, received results show efficacy of applying the developed device for endoprosthetics of bone diaphysis. Its usage for the replacement of formed post resectional defect of diaphysis allows to restore capability of functional condition of extremity and to get satisfactory anatomical-functional results.

PP-057
Surgical treatment of the metastatic affection of long cortical bones

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Background: To study the results of surgical treatment of the patients with metastatic affection of long cortical bones.
Materials and Methods: Operative treatment was performed in 12 patients with metastatic affection of the long bones during the 1997-2014 at the surgical department of motor system tumors of the National Cancer Center. Men were 8 (66,6%), women - 4 (33,4%), median age- 57. Morphological types of the tumors in 4 cases were presented by metastasis of the breast cancer, in 2 - renal cancer, in 1 - stomach and lung cancer and in 4 - metastasis from has not been detected primary focus. There was the site of solitary affection in all cases. Metastasis were localized in proximal part of the femoral bone in 6 patients, in 1- distal and in 3 - in diaphysis of the femoral bone, in 1 - in proximal part and in 1- in diaphysis of humeral bone. Extension of affection on the length of bone was from 5 to 22 sm. Threat of pathological fractures was in 4 patients, fractures in 8. For the determination of the treatment tactics in all patients was carried out complex examination including X-ray, CT and MRI in the affected area, CT of lungs, radioisotope scintigraphy of skeleton, ultrasonography of regional lymph nodes and organs of abdominal cavity. In all 12 patients segmental resection with endo-prosthetics was performed. The length of the resection of bones made from 8 to 25 cm. Localization of the metastatic affection of endo-prosthetics of coxofemoral joints out in 6 patients, knee-joint in one, humeral in one, in three diaphysis of femoral bone were carried respectively. Prosthetic device of Verabov and 'Eskulap' were used in endo-prosthetics of coxofemoral joints, but endo prosthetic device of proper construction were used in humeral and diaphysis of femoral bones.
Results: There were not any inter-operation complications. 90 % of patients had not been pain syndrome in post-operative period. Depending to the volume of operation patients were activated on the 3-5th day, that gives the possibility of independent service and continuation of special treatment. The complication in early postoperative period were observed in three (25 %)

patients. The disjunction of coxofemoral head of endo prosthetic device occurred in two patients (reduced under X-ray control) and infection of endo prosthetic device site (removed by conservative preparations). In one patient loosening the lower legs of endoprosthetics occurred after a year of diaphysis of femoral bone, reendoprosthetics has been performed. The functional condition by scale MSTS: knee-joint -90 % humeral joint - 70%, coxofemoral joints-80%, after endoprosthetics diaphysis-90%. Anatomo-functional results by scale 'Enneking' in 6 (50%) patients were estimated as excellent, in 4 (33,3%) as good, and in 2 (16,7%) as satisfactory.
Conclusion: Thus, received results show expediency of organ safety surgical approach to the treatment of metastatic affection of long cortical bones, which allows to restore capability of extremities and to get satisfactory functional results to improve the quality of patient's life.

PP-058

The results of endoprosthetics of coxofemoral joint in the tumors of proximal part of the thigh bone

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Introduction: To present the surgical treatment results of patients with primary and metastatic tumors of proximal part of the thigh bone.
Methods: There were controlled 30 patients with primary and metastatic tumors of proximal part of the thigh bone, who had been performed endoprosthetics of hip bone joint. Men 23 (76, 6%), women-7 (23, 4%), patients age ranged from 16 to 63. Morphological types of the tumors: 13 cases giant cellular tumor, in 6-chondrosarcoma, in one case sarcoma of Yuing, reticulosarcoma, fibersarcoma, solitary myeloma, fibrous dysplasia and metastasis of breast cancer, in 2-metastasis of renal cellular cancer and in 3- metastasis which was not detected primary focus. 7 patients had epimetaphyseal affection, in 4-metaphyseal, in 18-metadiaphyseal and in 1-diaphyseal.The length of affected bone was from 5 to 22 cm. Threat of pathological fracture was in 9 (30%) of patients, fractures occurred in 21 (70%). All 30patients segmental resection was performed with endoprosthetics. The length of resection was from 6 to 25 cm. In 25 cases non cement fixation of endoprosthetic stem in medullary canal.
Results: There were not any interoperative complications. Depending on the volume of operation patients were activated on 3-15 days. Complication in early postoperative period was observed in 3 (10%) of patients. The disjunction of endoprosthetic head occurred in two patients (reduced under X-ray control) and infection of endoprosthetic device site (removed by conservative preparations). In distant period: loosening the lower legs of endoprosthetics occurred in one patient after two years of endoprosthetics, reendoprosthetics has been performed; a female patient with endoprosthetics of Verabov fracture of endoprosthetics neck occurred after three years, reendoprosthetics has been performed again. The functional condition of hip bone joint by scale MSTS: -80 %, anatomo-functional results by scale Enneking in 18 (60%) patients were marked as excellent, in9 (30%) as good, and in 3 (10%) as satisfactory.
Conclusion: The received results show that endoprosthetics of thigh bone joint is the method of choice of organ safety surgical treatment of primary and metastatic tumors of proximal part of the femur and in 90% of cases it allows to get excellent and good functional results.

PP-059

Length of bone window correlated with length of restricted weight-bearing after curettage of bone tumors and tumor-like lesion with beta-tricalcium phosphate grafting

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Introduction: We examined the association of length of restricted weight - bearing after treatment with the clinical and demographic characteristics of patients with benign bone lesions in the femur or tibia which had been treated with curettage followed by application of ethanol and β-TCP grafting.
Methods: Fifteen patients with benign bone lesions in the femur or tibia had undergone curettage followed by application of ethanol and β-TCP grafting between 2004 and 2011. After surgery, the patients were maintained using crutches until complete relief of pain at full-weight-bearing ambulation was achieved. The period of using crutches after treatment was noted (length of restricted weight-bearing). Two patients under 4 years old were spending 12 weeks in non-weight bearing castings. For these patients, the period of walking with a limp was noted as length of restricted weight-bearing.
Results: The mean age of patients was 20 (4-39) years. There were 10 males and 5 females. The average follow up was 49 (12-97) months. The histological diagnosis were giant cell tumor in 6 patients, osteofibrous dysplasia in 5, aneurismal bone cyst in 3 and non-ossifying fibroma in 1. The locations of the lesions were: proximal femur (1), mid-shaft femur (1), distal femur (3), proximal tibia (3), mid-shaft tibia (4), and distal tibia (2). The mean width, depth, and height of the lesions were 2.2 (1.1-4.0) cm, 2.3 (1.0-4.1) cm, and 4.5 (2.1-8.9) cm, respectively. The mean length and width of the bone windows were 4.1 (1.3-12) cm and 1.9 (0.8-4.4) cm, respectively. Partial weight-bearing was allowed after an average period of 14 (1-36) weeks. An average length of restricted weight-bearing was 32 (13-110) weeks.Single regression analysis showed that length of restricted weight-bearing correlated with tumor height (γ=0.876, $p<0.01$) and bone window length (γ=0.964, $p<0.01$). Multiple regression analysis revealed that gender and bone window length were significantly and independently correlated with length of restricted weight-bearing.
Conclusion: β-TCP was good bone filler for treatment of benign bone lesions. However, length of the restricted weight - bearing was very long. Gender and bone window

length were significantly and independently correlated with length of restricted weight-bearing.

PP-060

Revision endoprosthetic megareconstruction after tumor prosthesis replacement

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Goal of this study is to review the Sytenko Institute experience in revisions of prosthetic reconstructions of the lower limb for bone tumors and examine. Special attention was given to the analysis of megaprosthesis-related complications.
Methods: Incidence of complications and type of revisions were analyzed in a series of 28 Ukrainian tumor prostheses implanted from 2006 to 2014 after resection of proximal femur 2, distal femur 11, total femur 2, distal femur and proximal tibia 9, proximal tibia 4, in 12 males and 16 females.
These prostheses included 24 INMED, Kiev, Ukraine; 1 SIMEKS, Kharkiv, Ukraine and 3 biological reconstructions. All patients were periodically checked in the Institute Clinic. Data for this study was obtained from clinical charts and imaging studies were carefully. Revision surgery was performed overall in 28 cases for prosthesis-related major complications. Functional results were assessed according to the MSTS and TESS system.
Results: In 23 INMED prostheses causes of major revisions included infection (82%) and aseptic loosening 1 (3%), breakage of the stem for 1 SIMEKS and bone defects after failed biological reconstructions 3 (10%). Infection was treated with removal of prosthesis, debridement and customized temporary metal-cement antibiotic loaded spacers until infection healed and new modular megaendoprosthesis were implanted in most of the cases. Non healed infections required amputation. Revisions for infection were successful in 21 pts., while 2 pts. were amputated (7%).
Aseptic loosening of the stem was treated with a new implant, preferably with uncemented stem, related with the quality of bone. Revisions for aseptic loosening achieved good durable results at an average follow-up of 6 years. In revisions for stem breakage cemented stems were preferred. Revisions for prosthetic breakage achieved positive functional results. Following complications were not necessarily related with the revision procedures. Statistical analysis showed reduction of the complication rate with the evolution of designs and materials. Functional results were evaluated in 20 MUTARS megaprostheses and were good or excellent in 71% of the patients. 8 patients have had infection complications and were treated by secondary revisions with spacers and following bone grafts arthrodesis.
Conclusions: Newer designs and materials of modular prostheses were significantly associated with a decreased incidence of major complications and therefore positively affected the implant survival. Functional results were satisfactory in most of the patients. Treatment of major complications is challenging and appropriate timing of revision surgery is a crucial issue, affecting functional outcome.
Keywords: Prosthetic revision surgery; Limb salvage; Modular megaprostheses; Complications; Bone tumors

PP-061

Clinical results of MUTARS® proximal femoral replacement

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Introduction: Endoprosthetic replacement is the most commonly employed technique for reconstruction of proximal femoral defects. However, studies evaluating the results of such reconstructions are scarce. We aimed to assess the clinical results of proximal femoral replacement with MUTARS® endoprostheses (Implantcast, Buxtehude, Germany).
Methods: All consecutive patients in whom a MUTARS® modular proximal femoral prosthesis (PFP) or cemented MUTARS® filia prosthesis was used to reconstruct a defect of the proximal femur from 1999-2013 were retrospectively evaluated. Minimum follow-up was 12 months.
Results: Fifty patients with a total of 54 reconstructions (41 PFPs, 76%; 13 filia, 24%) were included. Mean age was 55 years (14-89). Predominant diagnoses were chondrosarcoma (n=18, 36%), osteosarcoma (n=9, 18%) and osseous metastases (n=6, 12%); three (6%) were treated for non-tumorous conditions. At follow-up, 21 patients had died (42%), after a mean of 2.3 years (2 months-11.5 years). Twenty-nine patients (58%) were alive with a mean follow-up of 4.4 years (12 months-13.8 years). Forty-three reconstructions (80%) were bipolar hemiarthroplasties. Thirty-one PFPs (76%) were uncemented, 22 of which (71%) hydroxyapatite-coated. Mean length of the reconstructed defect was 18 cm (8-32). Attachment tubes were used in 49 (91%). Nine PFPs (22%) were silver coated. During follow-up, six implants (11%) dislocated (four recurrent), three of which were hemiarthroplasties (all had attachment tubes). One patient (2%) had loosening after a complicated previous reconstruction. Liner wear occurred in two reconstructions. Deep infections occurred in eight (15%), resulting in failure of four (7%; two within two months). Of 39 patients treated for a primary tumor, four had a local recurrence (10%) and 14 had metastases (36%). None of the filia prostheses failed. With failure for mechanical reasons as the end-point, PFP survival rates at one, two and five years were 100, 92 and 85%, respectively.
Conclusion: MUTARS® PFPs and filia prostheses are associated with acceptable rates of mechanical complications; dislocation was the most frequent. The rate of other mechanical complications was excellent. Half of the infected implants could be retained. In all, MUTARS® prostheses provide a reliable option both for patients in the palliative phase and for those with good projected life expectancy.

PP-062

Reconstruction of large defects after tumor resection in proximal tibia with modular prosthesis

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Introduction: In limb salvage surgery, tumour resections in proximal tibia leave large osseous defects to solve; among the different reconstruction options, the surgeon must choose one that offers both good functional results and low complication rates.The purpose of this study is to present the experience in reconstruction of proximal tibial defects after malignant tumour resection using a modular rotating hinge prosthesis in evaluating both functional results and complication rates.
Methods: Between (2009-2014), five (5) cases of malignant tumor resections in proximal tibia have been reconstructed using the METS Modular rotating hinge prosthesis (Stanmore Implants, Elstree, UK). Functional results and complications have been retrospectively reviewed. Functional results have been evaluated using the MSTS (Revised Musculoskeletal Tumor Society Rating Scale) six months after surgery. Overall and specific complication rates including infection, superficial and deep wound dehiscence, requirement of full thickness flaps, extensor apparatus disruption or elongation, "low" patella and revision rates have also been assessed.
Results: Of the five (5) cases, two (2) were osteosarcomas, two (2) were chondrosarcomas and one (1) was a malignant fibrous histiocytoma. With a mean follow up of 27.4 months (12-36), the mean MSTS result measured six months after surgery was 23.4 points. The overall complication rate of the series was 40%: superficial wound dehiscence was present in one case, deep wound dehiscence that required a gastrocnemius rotational flap for coverage was present in one case, elongation of extensor apparatus and "low" patella were present in 2 cases, no cases of extensor apparatus disruption and no deep infection. There were no revisions at the end of follow up which was limited by an overall mortality rate of 60% (3 cases) due to metastatic disease.
Discussion: In the institution department tumours of the proximal tibia were reconstructed using customized APC (allograft-prosthesis composite). Concerned by the high complication rates of APC, as an alternative, modular prosthesis has been used during recent years in the department. These implants offer the known versatility advantages of modularity, and they are found to require a shorter surgical time and a less demanding technique.

PP-063

The free osteofasciocutaneous fibula flap: clinical applications in skeletal reconstruction

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Introduction: The free microsurgical transfer of the osetofasciocuteaneous flaps is one of the most frecquently used methods for skeletal reconstruction. The fibula has advantages and disadvantages, but, at least for the moment, it reptresents the golden standard for the reconstruction of various bone defects, including mandible, middle face, long bones such as the humerus or femor.
Methods: We review our experience of skeletal reconstruction using free fibula osetofasciocutaneous flaps in a series of 4 patients with long bone defects due to trauma, tumor resection or bone necrosis. We adopted a two team approach - palstic and orthopaedic surgeon. While the orthopaedists preformed tumor or debris excision, the plastic surgery team performed the flap dissection, the receptor vessel dissection and the vascular anastomosis. Both teams paticipated in bone shaping and final closure.
Results: Short term follow-up (6-24 months) shows satisfactory functional and aestetical outcome. Bone integration was complete. Limb function was preserved.
Keywords: Bone defect; Free fibula flap; Extremitity reconstruction; Composite tissue allograft
Acknowledgement: This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources development 2007-2013, project number POSDRU/159/1.5/S/138907 "Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical field- EXCELIS", coordinator The Bucharest University of Economic Studies".

PP-064

Surgical management of periacetabular sarcomas

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Introduction: Surgical treatmen of malignant tumors involving periacetabulum is changing. Complex acetabular reconstruction imporves quality of life without worsening the oncologic prognosis. The aim of this study is to describe functional outcome and complications related to surgical resection and reconstruction of tumors involving Enneking zone II.
Material and Methods: 15 patients between 2000 and 2012 were retrospectively reviewed. According to Enneking/s classification ther were: Type II-4, Type I + II - 2, Type II + III - 2, Type I + II + III - 1. Five were chondrosarcoma and two osteosarcoma. Four males and three females, with a mean age 47.9 (21-75). Minimum follow up was 10 months due to underlaying extended disease, with a mean of 76 months.
Resection followed of periacetabullum reconstruction was performed in all of the patients, with limb-salvage procedure. All of them had wide resection margin. Structural pelvic allograft without hip replacement (2 patients), allograft with hip conventional replacement (5 patients) or saddle prostheses (2) were made. Radiographs, surgical complications and functional outcome according to MSTS (1993) score were assessed.
Results: Mean MSTS score (1993) was 65.3 %

(54.6%-77%). Saddle prostheses offered the best functional results. We had one deep wound infection, one aseptic prostheses loosening, and two dislocations in non-replaced hips with allograft reconstruction. Five-year stimated survival was 71%.
Conclusions: Complex periacetabullum reconstruccion following wide bone resection in primary bone tumors of the pelvis offer favorable oncological and functional outcome. Limb salvage still leads to high complication rate, but acceptable in selected patients.

PP-065

Sonication cultures improve the microbiological diagnostic in low-grade infection of modular megaprostheses

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Introduction: Microbial biofilms growing adherently on prosthetic surfaces may inhibit the detection of pathogens causing prosthetic joint infections. In this context, especially modular megaprosthesis are known for high infection rates followed by high rates of revisions.
Objectives: To evaluate the sonication culture method performed on modular megaprosthesis to improve the microbiological diagnostic in comparison to tissue culture.
Methods: The sonication cultures of the explanted modular megaprostheses were cultured according to the protocol by Trampuz et al in the NEJM. Included were 14 patients with a modular megaprosthesis of lower extremity, whose prostheses had been explanted due to suspected joint infection or revision surgery. The prosthesis was implanted initially due to: Osteosarcoma N=9, Liposarcoma N=1, Malignant Fibrous Histiocytoma N=1, Lymphoma N=1, trauma N=1 and revision of total hip arthroplasty N=1. The diagnosis of infection was evaluated according to the definition of the Musculoskeletal Infection Society (MSIS).
Results: We investigated 14 patients with an explanted modular megaprosthesis of proximal femur (n=4), the distal femur (n=7), total femur (n=2) and the proximal tibia (n=1). ?From all detected pathogens in sonication cultures the most frequently were Staphylococcus epidermidis (n=4) and Staphylococcus aureus (n=2) as well as low virulent pathogens (Small colony variants / Micrococcus species / Finegoldia magna)?The sensitivity / specificity of sonication cultures in all patients was 91% / 100% compared to 54% / 100% in periprosthetic tissue cultures.? The sensitivity / specificity of sonication cultures in patients without preoperative antibiotic therapy was 100% / 100% compared to 57% / 100% in periprosthetic tissue cultures.
Conclusions: The outcome of this study showed encouraging results, especially in detection of low grad infection of modular megaprosthesis. Furthermore the differences in sensitivity in patients with and without preoperative antibiotic therapy showed a high impact in false negative microbiological results.

PP-066

Clinical results after intralesional curettage in benign and borderline bone tumors

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Introduction: Intralesional curettage is a common surgical treatment for benign bone tumors. Although, in principle, the tumor recurrence rate is higher with intralesional surgery, the functional outcome is often better than in wide resections. Recurrence rates range from almost non-existing for enchondromas, to almost 50 % for recalcitrant giant cell tumors (GCT), in particular when treated without adjuvants. Curettage has also been reported as an acceptable method of treatment for low-grade chondrosarcomas due to relatively low recurrence rates.
Methods: We performed a retrospective review of all consecutive patients (n=166, F/M: 86/80, mean age 31 (2-72 years)) who underwent intralesional curettage for benign or borderline bone tumors in the appendicular skeleton at our orthopedic oncology center, between 2009 and 2013. We recorded histology and anatomic region of the bone tumors, choice of treatment and biopsy verified local recurrence rates.ResultsThe most common lesions treated were enchondromas (n=57), simple cysts (n=31), aneurysmal bone cysts (n=16), fibrous dysplasia (n=14) and GCT's (n=13). Four cases of grade 1 chondrosarcomas were also treated intralesionally by curettage. Cancellous allograft was used for bone defect reconstruction in the majority of the cases (n=141). Autograft was used in 3 cases and a bone graft substitute in 5 cases. In 17 cases, the bone defect was left empty, mainly following surgery in the hand (n=9) or for enchondromas (n=10). Preoperative fracture was present in 16 cases (10%) and fixation/augmentation with a plate or nail was deemed necessary in 20 cases (12%). The most commonly affected long bones were femur (n=47), tibia (n=26) and humerus (n=10), and the most commonly affected region was the knee (n=47). We recorded 10 complications, with postoperative infection (n=3), postoperative fracture (n=2) and nerve palsy (n=2) being the most common. Local recurrence occurred in 13 cases (8%), with simple cysts in children (n=3) surprisingly being the most common.
Conclusion: In this 5-year review of 166 patients, treated for a benign or borderline bone tumor in a single orthopedic oncology center, we found that intralesional curettage and bone defect reconstruction with cancelleous bone allograft is a reliable treatment with acceptable recurrence and complication rates.

PP-067

Histological and radiological evaluation of low intensity pulsatile ultrasound on osteointegration of fresh frozen massive allografts in rabbits

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Introduction: The fresh frozen massive allografts are used in the treatment of musculoskeletal tumors frequently. The most important problem in these kind of massive grafts is the union of the graft to host bone. This osteointegration is a long and complicated process. The investigation of the factors that helps in union of these massive grafts will lower the complication rates and helps to improve patient satisfication. The aim of this study is to show the effects of low-intensity pulsed ultrasound (LIPUS) to allograft osteointegration on fresh-frozen massive femoral allografts applied rabbit model.

Material and Methods: In our study, twenty four skeletally-mature New Zealand rabbits were used that the weights were among 2750 to 3250 g. They divided three groups equally. The first group are the source of rabbit femoral allografts group and the second group of LIPUS study group that will be applied, and group 3 was planned as a control group. Totally, sixteen femoral allografts were taken from both limbs of the first group of eight rabbits. Taken femoral allografts were stored in sterile packs for 4 weeks at a temperature of -80 degrees. After 4 weeks allografts were placed instead of the defects that created on femur of rabbits in both study and control groups. The allografts were fixed with two kirschner wires as intramedullary. LIPUS was applied 20 minutes per day, 6 days a week, during 8 weeks to the study group. After 8 weeks, study and rabbits were sacrificed in both study and control group, and than femurs were excised. Taira scoring was utilized for radiological examination. Statistical significance levels were 0.05.

Results: On histological examination, the study group in terms of cortical bridging callus size and type of callus achieved a statistically significant difference compared to control group ($p < 0.05$). Osteoblast / osteoclast continuum, graft vasculature and presence of live cells on the graft for the both groups was not statistically significant difference ($p > 0.05$). Radiological examination of the study group, showed statistically significant difference compared to control group ($p < 0.05$)

Conclusion: In the literature, activity on fracture healing of LIPUS has been shown in many studies. The number of studies of effectiveness for allograft (especially fresh frozen allografts that used in solid tumors surgery frequently) is less in the literature. In our study concluded that LIPUS increase the osteointegration of fresh-frozen massive allograft on rabbit femur model. With LIPUS that may be obtained successful for clinical use to patient who applied massive fresh-frozen allograft results delayed union or nonunion. However, to find the effectiveness of allograft osteointegration and this effect provides by which the mechanism that is needed more.in vitro and animal studies.

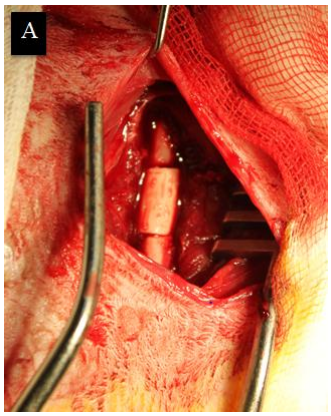

Figure 1. *Massive allograft of the femur of the rabbit*

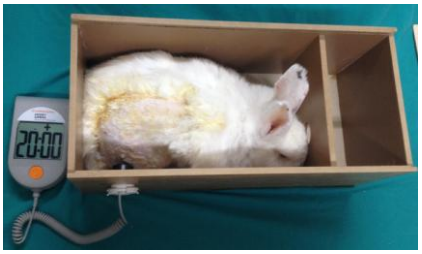

Figure 2. *Low intensity pulsatile ultrasound applicatioN*

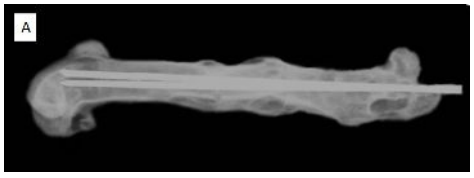

Figure 3. *Union of the allograft*

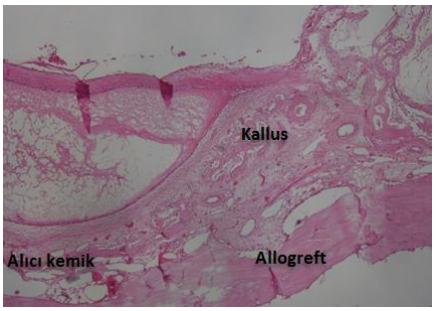

Figure 4. *Pathological examination of the union of the allograft in ultrasound group*

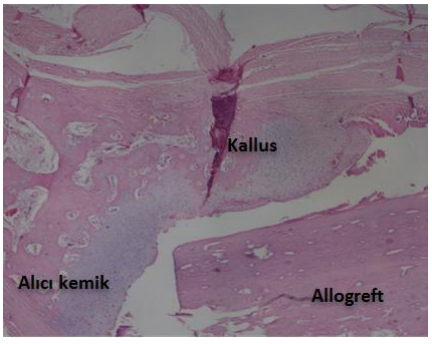

Figure 5. *Pathological examination of the union of the allograft in control group*

PP-068

Incarcerated hernia with colon perforation and skin necrosis after internal hemipelvectomy for G3 chondrosarcoma: report of a case

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Introduction: Chondrosarcoma of the pelvis is a rare malignant tumor needing radical resection if there is no evidence of metastatic disease. If an internal hemipelvectomy has to be performed it results in a weakness of the groin region with the consequence of an herniation in this new pelvic space. We present a case of a patient with acute incarcerated and perforated hernia with local skin necrosis to the right hemipelvic region six month after internal hemipelvectomy.

Case Report: We performed internal hemipelvectomy in a 54years-old male patient with a pelvic G3 chondrosarcoma. The pstoperative course was uneventful and the patient was discarged 14 days after surgery. Six month later he developed acute abdominal pain and was transferred to the next hospital. CT scan revealed an incarcerated hernia wich was managed in a open fashion with pelvic incision reduction of the herniated bowel and inferior onlay mesh closure. Soon after he developed peritonitis and re-incarceration with bowel perforation. After referral to our clinic median laparotomy was performed with ileocoecal resection. The abdomen was left open with negative pressure system inside. At the pelvic site necrotic skin was removed along with the infected mesh and a second negativ pressure system was applied on the outside. After three times of abdomial dressing changes an inlay mesh was peritoneally fixed (IPOM) and the abdomen was closed. The skin defect was reconstructed using a latissimus dorsi flap. Thereafter the postopertaive course was uneventfull and the patient could leave the hospital after 40 days. Now at one year-follow-up year he is able to walk with sticks and he oncological follow-up is uneventful.

Conclusion: Especially in obese patients a prophylactic mesh reinforcement after hemipelvectomy should be recommended to avoid pelvic herniation. This should be performed by a specialised hernia surgeon an could be done secondly after hemipelvectomy with a laparoscopically or with an open IPOM technique. An open onlay mesh fixation from the pelvic site however should be avoided because of difficult fixation and lack of peritoneal stabilisation as seen in our case. IPOM could avoid such fatal cases like ours with an extensive reconstruction.

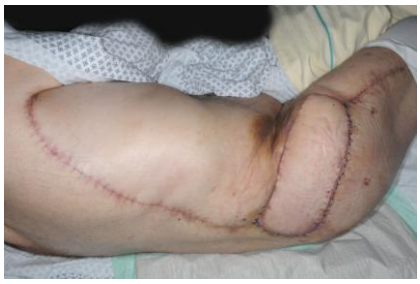

Figure 1. *Reconstruction*

PP-069

Biological skeletal reconstruction after sarcoma resection. Histological evaluation and CT scan analysis of retrieved cases

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Aim: Massive bone allografts (MBA) are a worldwide biological solution for reconstructing skeletal sarcomas but the risk of mechanical failure of the allogenic bone remains high in the follow-up (f-up) because of the slow resorption without revascularization. On the other hand, vascularized fibula autotransplants (VFA) are effective solutions to reconstruct radius, ulna or humerus but do not have the right size to reconstruct femur or tibia. In order to add the mechanical characteristics of MBA to the biological activity of VFA, an original combination of a vascularized fibula placed inside a bone allograft was used at Istituto Ortopedico Rizzoli since 1989, as primary reconstruction in lower limb skeleton in a consecutive series of 96 young patients (mean age 13, range 4-38) affected by lower limb bone sarcomas The patients had an intercalary segment (mean length 16cm , range 8-30 cm) of the tibia (71 cases) or femur (25 cases) reconstructed at the time of tumor resection. VFA was inserted into the MBA, that was molded and adapted to receive the fibular bone in an intramedullary fashion. At a mean follow-up of 100 months (range 6-280 mo), 69 patients (72%) are continuously disease-free (CDF) and 10 are disease-free after treatment of a relapse (10%). During f-up, the biological implant was harvested in 16 children because of: Local recurrence (7 cases), Infection (4 cases), Mechanical failure (5 cases). The authors present the results of the multimodal analysis performed in these 16 cases.

Method: All retrieved specimen were histologically processed (7 decalcified and paraffin embedded and 9 undecalcified and polymethylmethacrylate embedded). In 10 patients a pre-harvest CT dataset densitometrically calibrated to obtain quantitative information from the gray levels of the images was available (with at least 3 serial CTs performed in the f-up: the first in the first postop month and the last in the last pre-harvest month). For each of these 10 cases, an electronic folder was created with the use of specialised software in order to identify repeatable reference systems in each reconstruction and monitor the densitometric evolution in selected regions before follow up. In particular the evolution in time of density and thickness of the allograft, of the fibular autograft and of the host original

bone was performed. 6ix of these 10 patients had the implants embedded in methylmethacrilate. The slices were processed for Paragon staining and Circular Polarized Microscopy, to detect bone and soft tissues structures, and collagen orientation. The same sections used in the histological analysis were identified in the CT dataset done before the surgical harvest. On residual embedded bone, microhardness test was performed to measure bone mechanical competence.

Results: VFA was found viable in the 6 out of 7 cases harvested for LR and in the 4 infected implants. Four out of 5 cases that failed mechanically showed a necrotic VFA. In the 11 viable cases a complete fusion of MBA and VFA was observed in at least one position of the selected slices both on the CT analysis and in the histology. In the cases embedded in methylmethacrilate, In the inner boundary of the allograft the microscopic structure showed a change from mainly lamellar and transversally oriented in newly formed osteon-organized bone. At the same level, fibula loosed its structure in the region opposite to fusion area. Micro hardness in fusion area (both in allograt and VFA side) had a value comparable to the mean typical value (50HV) of a cortical diaphysis, while this value decreased sharply in the remaining part of fibula, to signify a remodeling process related to the lack of mechanical stress. The morphological changes clearly correlated on the CT dataset (figure).

Conclusion: Multimodal histological and CT analysis describes the intense remodeling between the MBA and VFA used in a concentric fashion with new osteons forming into the allograft bone and confirming the bone-inductive activity of VFA on the endosteal surface of MBA.

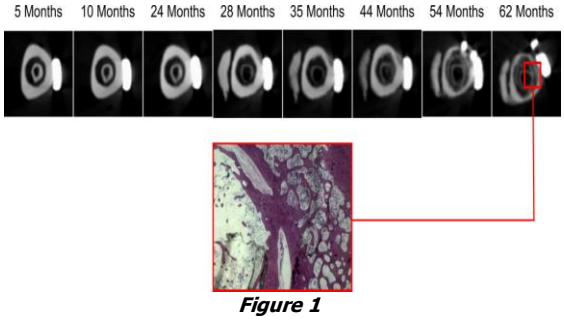

Figure 1

PP-070

In vitro study of resistance forces torsional defects in cortical femur pigs fixed with nail cephalomedullary intramedullary, plate and endoprosthesisl, associated or not to polymethylmethacrylate

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Introduction: Bon is the third most common site of metastatic disease. Metastatic tumors are common in the femur. Various types of fixations are available for prophylactic fixation of metastatic lesions. Among them nails, plates, endoprostesis. Long bones are often subjected to torsional forces.

Objective: The aim of this in vitro study is to determine the strength of femurs pigs with cortical lesion in the diaphyseal region to torsional forces, comparing the fixation with plate, interlocking nail, cephalomedullary rod, and stent segment, associated or not with polymethylmethacrylate (PMMA).

Methodology: The study of 150 femurs pre-selected pigs under morphometric criteria. As experimental model, femurs were selected 15 divided into 10 groups and allocated femurs in each group prepared from the parameters set as follows: intact femurs; femurs with diaphyseal cortical defect without fixing and femurs with diaphyseal cortical defect fixed with plate, cephalomedullary rod, intramedullary nail and stent segment, associated or not with PMMA. After preparation, underwent torsional torque. Statistical analysis was performed using ANOVA p value.

Results: The analysis showed that the intra-group attachment of PMMA plate with DCP showed the highest resistance to fatigue. When it was used the cephalomedullary and intramedullary nails, when combined with PMMA showed increased resistance to fatigue. Have segmental stents had lower fatigue resistance. When compared and related to resistance intact bone (100%), fixation methods presented: DCP with PMMA (152%), cephalomedullary rod with PMMA (107%) and HIM with PMMA (102%) until fatigue.

Discussion: In setting the specimens with or without PMMA increased resistance when subjected to torsional forces. Fixation with cephalomedullary and HIM locking nail with PMMA increased the average force to cause system failure when compared to healthy bone. The fixation with plate and PMMA can increase. The use of interlocking nail showed increased resistance with the use of PMMA, showing a resistance of 7% above the healthy bone. The prophylactic fixation of emoral neck increased the stability of the lap. Segmental stents showed low resistance to torsional loading

Conclusion: The fixation plate DCP with PMMA showed the greatest resistance to torsional forces, greater than bone strength integrate without fixation. Cephalomedullary and intramedullary fixations also associated with PMMA showed greater resistance compared to healthy bone without fixation. These attachment methods proved to be reliable to stabilization in the system in general.

PP-071

Experimental substantiation study of modular endoprosthesis diaphysal fixation

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Goal: Main tumor prosthesis complications are aseptic loosening (27%), implant failures (18,2%), periprosthetic fractures (8,1%) and infection (24,2%). Solutions of aseptic loosening and implant failures (prosthesis stems breakage) are correct choice of prosthesis stem diameter, the many-sided stems form, good adaptation of a zone of contact an endoprothesis-bone, extracortical petal system

of fixing. The main goal of this study is to research the effect of additional extracortical fixation on segmental replacement prostheses with respect to bony ingrowth and extracortical bone bridging in a murine segmental defect model.

Materials and Methods: Unilateral segmental replacement prostheses were implanted into 20 rat femurs. It was clinical modeling of diaphysial femur resection and modular prosthesis replacement with and without extracortical bone bridging for distal prosthesis stems. The bone-implants blocks were retrieved at 6 month and examined radiolographically. Biomechanical bending and expansion loadings were analyzed for bone-prosthesis specimens as well.

Results: Two animal groups (Experimental group - with extracortical bone plate fixation prosthesis, Control group - without extracortical bone bridging prosthesis) were into experimental study. Experimental group: stable proximal prosthesis stem fixation has been detected in 7 animals, stable distal prosthesis stem fixation has been detected in 10 animals, prosthesis breakage has been detected in 1 animal and total prosthesis migration has not been detected. Control group: stable proximal prosthesis stem fixation has been detected in 4 animals, stable distal prosthesis stem fixation has been detected in 6 animals, prosthesis breakage has been detected in 2 animals and total prosthesis migration has been detected in 3 animals. Biomechanical study, radiographic and histologic specimens analyses showed significant prosthesis stability advantages and bone ingrowth for animals with extracortical bone plate fixation prosthesis.

Summary: Combine type of prosthesis fixation (intramedulary stem and extracortical bone bridging) makes possible to get better clinical results and decrease implants complication level.

PP-072

Endoprosthetic reconstruction of proximal humerus after tumor resection, is it worth?

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Proximal end of the humerus is a common site for both primary and metastatic bone tumors. Limbe salvage with endoprosthetic replacement is the most common means of reconstruction but it is proved to be just a spacer with inferior shoulder function. So it can be replaced by cheaper spacers specially in poor societies.

This study included 10 patients,3 were males. With mean age of 40.4 years (range 12 to 60). Diagnosed as osteosarcomas 3 cases, chondrosarcoma one case, myeloma one case, lymphoma one case, metastatic carcinoma 2 cases of breast carcinoma, and giant cell tumor in one case. Limb salvage were successfully done to all of them with tikhof-linberg type I in 6 cases cases and type V in 4 cases. Endoprosthetic replacement were used in 4 cases . An on table fabricated cement spacer was used in 6 cases.

Follow up ranged from 6 to 75 months with mean of 22.8 months.

Functional outcome was almost comparable in both types of reconstruction, especially the item of patient satisfaction, with mean function of almost 50%.

To conclude: a relatively expensive endoprosthesis could be replaced by a much cheaper cement spacer if the fuction is comparable.

POSTER PRESENTATIONS SESSION V: Minimally Invasive Treatments

PP-073

Percutaneous CT-guided radio-frequency ablation of osteoid osteoma of the foot and ankle

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Introduction: Percutaneous radiofrequency ablation (RFA) has been considered, in recent years, the standard treatment for osteoid osteoma (OO) of the appendicular skeleton. The variable clinical presentations in the foot and ankle pose problems in diagnosis, localization and thus treatment. The aim of this study was to assess the efficacy of RFA for patients with osteoid osteoma of the foot and ankle

Materials and methods: A total of 29 patients (22 males, 7 females; mean age 16.7 years; range 8-44 years) with OO of the foot and ankle (distal tibia, n = 17; distal fibula, n = 6; talus, n = 3; calcaneus, n = 3) were enrolled in the study. A CT-guided RFA was performed, using a cool-tip electrode without the cooling system, heating the lesion up to 90_C for 4-5 min. Clinical success, assessed at a minimum follow-up of 1 year, was defined as complete or partial pain relief after RFA. Pain and clinical outcomes were scored pre-operatively and at the follow-up with a visual analogue scale (VAS) and with the American Orthopaedic Foot and Ankle Society (AOFAS) score. Complications and local recurrences were also recorded.

Results: Clinical success was achieved in 26 patients (89.6 %). After RFA, mean VAS and AOFAS score significantly improved from 8 ± 1 to 2 ± 1 (p\ 0.05) and from 60.7 ± 12.7 to 89.6 ± 7.1 (p\ 0.05), respectively. Two patients experienced partial relief of pain and underwent a second successful ablation. Local recurrences were found in three patients, always associated with pain. These underwent conventional excision through open surgery. No early or late complications were detected after RFA.

Conclusion: CT-guided RFA of foot and ankle osteoid osteoma is a safe and effective procedure, showing similar results for the rest of the appendicular skeleton.

Keywords: Osteoidosteoma; Radiofrequency ablation; Foot; Ancle; Benign tumor

PP-074

CT guided cryoablation for locally recurrent or metastatic bone and soft tissue tumor

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Background: Historically, local control of recurrent or metastatic bone and soft tissue tumor has been limited to radiotherapy when surgical resection is not feasible. Recently, cryoablation has been reported with satisfactory results in the treatment of lung and liver carcinomas. In this study, we analyzed the clinical outcome of CT guided cryoablation for malignant bone and soft tissue tumors to elucidate the problems surrounding this procedure.
Materials and Methods: Since 2011, 7 CT guided cryoablations in 6 patients were performed for locally recurrent or metastatic bone and soft tissue tumors (5 male and 1 female). The average age was 74.8 years (range 61-86) and the median follow up period was 16.1 months (range 7-34). Histological diagnosis included dedifferentiated liposarcoma (n=2), renal cell carcinoma (n=2), chordoma (n=1), myxofibrosacoma (n=1), and thyroid carcinoma (n=1). The average size of the tumors were 39.7mm (range 22-52 mm) and were localized in ilium (n=3), retroperitoneum (n=2), sacrum (n=1), and thigh (n=1). Operative methods, clinical outcomes, complications, and oncological outcomes were analyzed.
Result: There were 4 recurrent tumors and 3 metastatic tumors, and all cases were contraindicated for either chemotherapy or radiotherapy. 2 and 3 cycles of cryoablation were performed for bone and soft tissue tumors, respectively. Average length of the procedure was 117.4 minutes (range 81-187) and average number of probes utilized was 2.1. Complications included 1 case of urinary retention in a patient with sacral chordoma who underwent previous carbon ion radiotherapy and 1 minor wound complication. Oncological outcomes were 4 NED and 3 AWD.
Conclusion: Reports regarding CT guided cryoablation for musculoskeletal tumors are rare and clinical outcomes have not been extensively studied. There are several limitations to this procedure: the lesion should have adequate distance from skin, neurovascular structures and other viscera, and should not be localized in the weight-bearing bone. Nevertheless, CT guided cryoablation had analgesic efficacy and there have been no local recurrence post procedure during the follow up. Although further accumulation of data using this technique is necessary, cryoablation is a promising option in medically inoperable musculoskeletal tumors.

PP-075

Radiofrequency ablation for chondroblastomas – The emergence of a new modality of treatment

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Introduction: Chondroblastoma usually occur near a growing physis and in close proximity to articular surfaces. Conventional treatment by curettage and bone grafting, risks injury to articular surface or growth plate. Minimally invasive techniques like percutaneous radiofrequency ablation (RFA) have been attempted as an alternative to surgical interventions. The present study seeks to demonstrate the safety and efficacy of RFA as a novel alternative to surgery in chondroblastomas. We also evaluated the functional and oncological outcomes.
Methods: Between January 2010 and January 2014, we treated 8 cases of chondroblastomas with RFA. All were males with a mean age of 17.5 years (range 13-21 years). All cases were primary tumors with involvement of proximal femur in 3 cases, proximal tibia in 3 and proximal humerus & distal femur in 1 case each. The procedure was done under computed tomography guidance. Lesion was biopsied, diagnosis confirmed on frozen section and then treated with RFA in the same setting. The clinical symptoms, range of movements, radiographs and MSTS score were assessed before, 24 hours, 6 weeks and then every 3 months after the procedure.
Results: Significant relief of symptoms was noted on the immediate post procedure day in all patients after a single session of RFA. No patient required a repeat procedure or subsequent surgical curettage. All the patients had complete relief of symptoms with no need of any medical assistance at first follow up (6 weeks). All patients are available for final evaluation with a median follow up of 32 months (range, 6 to 50 months). There was no recurrence or treatment related complications. All patients returned to the pre disease activity level with average Musculo Skeletal Tumor Society Score of 29 at last follow-up.
Conclusion: Percutaneous RFA is safe, effective, less morbid and a minimally invasive alternative to surgery for the management of epiphyseal chondroblastoma of the extremity. Though longer follow up is mandated, early results are promising in the management of these locally aggressive lesions in juxta articular regions.

PP-076

The approach to the osteoblastoma

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Introduction: The osteoblastoma is a very rare benign bone tumor. It is more common in adolescents and young adults and usually occurs in the spine or in the long bones. The most common symptom is pain that, unlike osteoid osteoma does not alleviate with NSAID's and is not more common at night. On the imaging exams it usually presents as an osteolytic lesion, well circumscribed, confined by a periosteal shell of reactive bone. Sometimes there can be soft tissue changes, consequence of the exuberant inflammatory process that subsides it. All these characteristics make it hard to distinguish from the

osteosarcoma. Histologically it is very similar to osteoid osteoma, being easily distinguished from the osteosarcoma since it shows no cellular atipia.

Methods: A total of 7 cases were reviewed, with ages between 12 and 42 of which 3 represented axial tumors (1 lumbar, 1 cervical, 1 iliac) and 4 limb tumors (1 humerus, 1 fibula, 1 tibia, 1 talus). In all cases the main symptom was a continuous pain. In the cervical tumor, the patient presented with tetraparesis. On the imaging exams all presented with an osteolytic lesion with periosteal reaction and in 3 cases (fibula, cervical and iliac), there were soft tissue changes. Pre-treatment diagnosis was always possible with a percutaneous needle biopsy. All were treated with curettage and alcohol therapy, except the fibula and the talus where extended excision was applied.

Results: The histology confirmed the diagnosis of osteoblastoma in all cases. Reconstruction or sustaining procedures were applied on the lumbar tumor (2 level instrumentation because of articular destruction), on the tibial one (filling with autograft) and the tallus (calcaneotibial arthrodesis). The pain disappeared in all patients. In the patient with tetraparesis there was full recovery. All patient are disease free so far.

Discussion: Despite being histologically benign, with no cellular atipia, on the imaging exams, the inflammatory reaction that subsides this tumor can suggest local invasion. In these cases the main treatment was curettage, and it presents the advantage of being less traumatic and less invasive than the extended resection. In the more extensive osteoblastomas resection may be the best option.

Conclusion: The osteoblastoma, although being benign, may present as an imagiologically aggressive lesion, with soft tissue changes, simulating local invasion. So, a pre-treatment biopsy allows the confirmation of the diagnosis and allows for a more directed treatment.

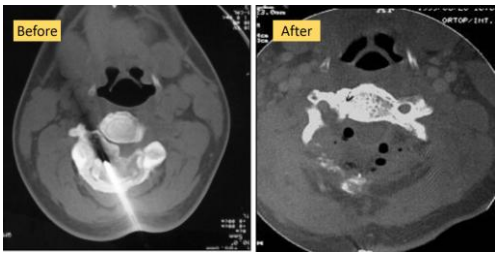

Figure 1. *Cervical*

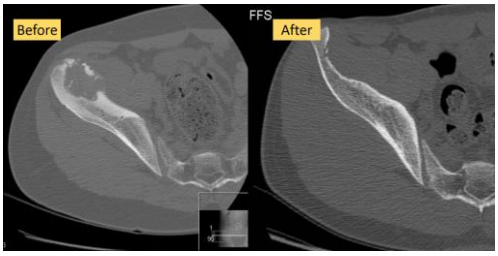

Figure 2. *Ilium*

PP-077

Curettage and alcohol therapy in low grade chrondrosarcomas – More function, less complications, same oncologic results!

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Background: The chondrosarcoma is not responsive to radio and chemotherapy, being surgery the only available option. The histological grade is relevant and predicts behavior and prognostic. Despite the histological diagnosis of high grade lesions being quite easy, in the low grade lesions, the distinction is much harder. The preconized treatment for chrondrosarcomas is the extended resection. Older studies on less radical approaches had relapse rates of 50 to 90%. However, more recently, for low grade chondrosarcomas, this approach, with curettage, has been reused along with adjuvant treatments like alcohol or cryotherapy. This new approach is presented here with two interesting and successful cases.

Methods: Case 1 - Male, 44, pain in the right hip for one year. Osteolytic lesion of the middle third of the femur, with thickening and bulging of the cortices, with MRI compatible with cartilage matrix. Core biopsy revealed well differentiated chondrosarcoma. Case 2 - Male, 23, shoulder pain for 3-4 years, with recent worsening. Imaging study revealed cartilaginous tumor in the proximal half of the humerus with invasion of the cortices without breaching it. Needle biopsy showed cartilaginous matrix with slight cellular atypia. Both treated with curettage and alcohol therapy.

Results: Histologic exam of both lesions confirmed the diagnosis of low grade chrondrosarcoma. Case 1: partial weight bearing after 1 month, and an 18/30 score on the Musculoskeletal Tumor Society scale. Full weight bearing was possible after 3 months. MSTS score of 26 at 10 months post op. No relapse after 24 months. Case 2: 23/30 on the MSTS score after 1 month, with some movement limitation and pain, but after 4 months the score was 30, with no movement limitations, no pain and full strength. No relapse after 12 months.

Discussion: If we had opted for the extended resection, it would have implied, probably, in the first case, an allograft and in the second case an arthoplasty. In both cases the functional result would have been probably much poorer. As for relapse rates, in the past argued as the curettage big handicap, new studies have shown that the results are similar for both approaches. Even so, if the intralesional approaches proves not to be enough, it does not preclude a more aggressive approach posteriorly.

Conclusion: With similar oncologic results, the intralesional approach allows for a less aggressive surgery with better functional results, always leaving the door open for a more aggressive approach if it proves necessary.

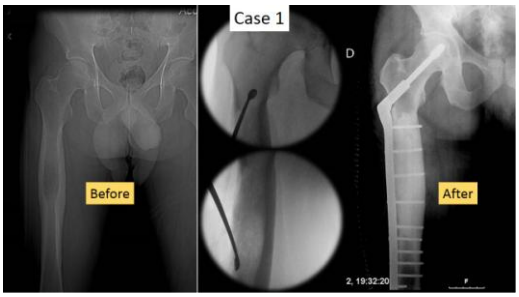

Figure 1. *Femoris*

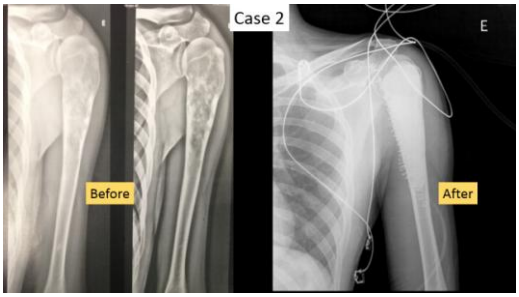

Figure 2. *Humerus*

PP-078

Microsurgery management of schwannomas: symptom resolution with low neurologic deficits

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Introduction: Schwannomas are the most common tumors of peripheral nerves. It is a tumor with a slow and non-infiltrating pattern growth that usually presents as a painless swelling for several years without any specific symptom, unless the tumor grows greater than 25 mm in diameter. Characteristically, it is an eccentric oval swelling, well encapsulated, less than 30 mm in diameter, with the attenuated nerve bundles (fascicles) of the parent nerve stretched and displaced over the dome of the mass. Microsurgery with enucleation while preserving the nerve function is the standard surgical procedure. En bloc resection should not be performed because the main purpose of schwannoma surgery is the relief of pain and tingling sensations, rather than resection of the tumor itself.

Objectives: This study was conducted to assess the management results of 18 patients with schwannomas treated with microsurgical technique.

Methods: This is a retrospective study of 18 patients treated between 2004 and 2014 with diagnosis of peripheral nervesschwannoma. The diagnosis was established based on clinical criteria and ultrasonography-guided biopsy and confirmed by histological study of the excised specimens. All tumors were located in major nervous structures, except 3: 4 in cubital nerve, 4 in median nerve, 2 in sciatic nerve, 1 in tibial nerve, 1 in superficial fibular nerve, 1 in sacral plexus and 2 in muscular branches of femoral nerve. All schwannomas were excised by careful dissection using microscope: the nerve sheath was incised longitudinally to minimize damage to the nerve fascicles and gentle dissection along the plane of the capsule and epineurium was performed using atraumatic technique allowing the enucleation of the tumor. This dissection plane was relatively easy to preserve in most cases as the central portion of the tumor was not adherent.

Results: The 18 patients presented with pain localized over a palpable mass. The Tinel sign was positive in 15 (83,3%) patients and none of them had sensory deficit, muscle weakness or palsy in the affected area. After surgical treatment, all patients were painless, without neurological deficits. There were no complications or recurrences. Furthermore, there was total concordance between the histological results from biopsy and the results of the specimens after surgery. All the tumors in this study were histological benign and there were no recurrence after the intervention.

Conclusions: A benign schwannoma is associated with a good prognosis, independently of its size. The diagnosis of a schwannoma arising from the extremities is usually straightforward, based upon physical and imaging findings. Tinel/s sign is the single most useful sign in the diagnosis of a schwannoma. However, ultrasonography-guided biopsy has impressive accuracy and it is an essential tool to pre-operative diagnosis, allowing excluding malignancy. Microsurgery with enucleation of the tumor is the standard surgical procedure that allows symptoms resolution and the establishment of definitive diagnosis of schwannoma with very low neurological deficit associated. Recurrence is not usual even when there is only partially resection.

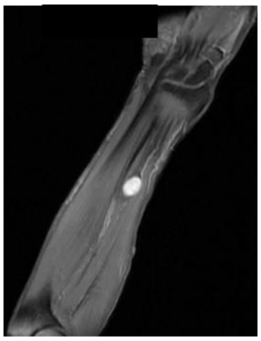

Figure 1. *Median nerve*

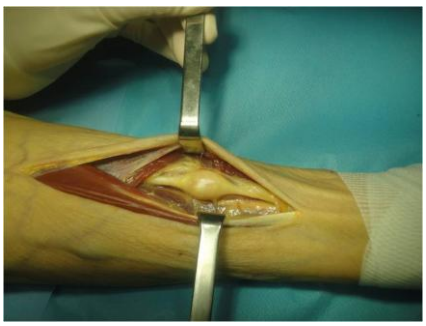

Figure 2. *Microsurgery*

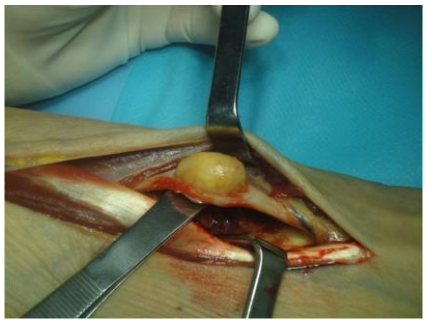

Figure 3. *Microsurgery*

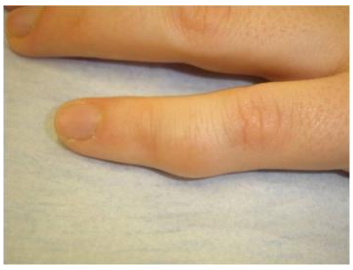

Figure 4. *Cutaneous nerve*

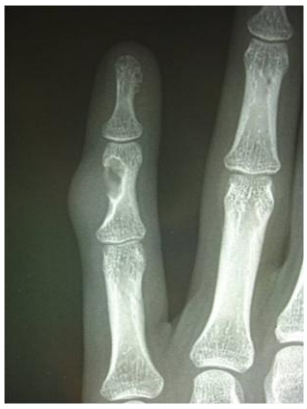

Figure 5. *Cutaneous nerve*

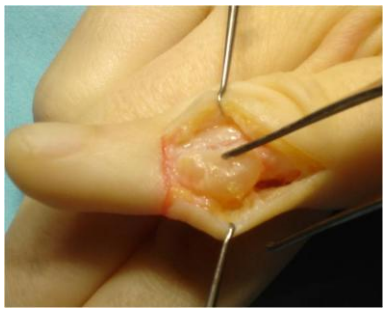

Figure 6. *Microsurgery*

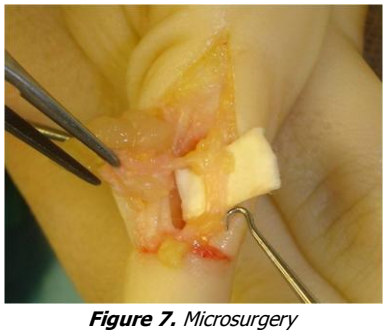

Figure 7. *Microsurgery*

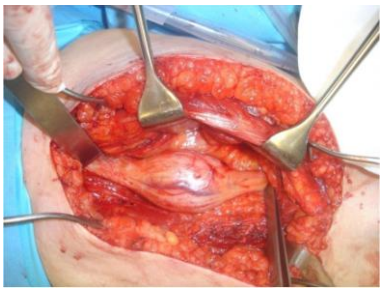

Figure 8. *Sciatic nerve*

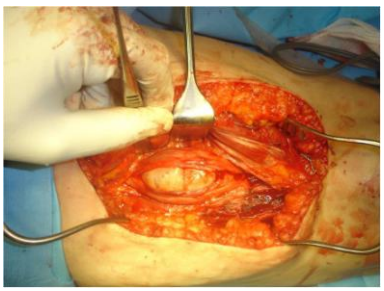

Figure 9. *Sciatic nerve*

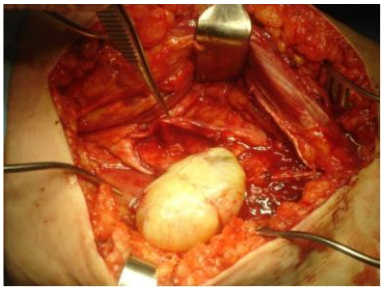

Figure 10. *Sciatic nerve*

PP-079

Surgical treatment of the patients with metastatic lesions of the proximal femur

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Vreden Russian Research Institute of Traumatology and Orthopedics, St. Petersburg, Russia

Introduction: Metastases of the proximal femur are the fourth in frequency of occurrence among the bone tumors. There are many surgical methods and techniques of treatment of this pathology. The significance of surgical treatment for such patients considering their severe somatic status is increasing due to minimally invasive techniques. Proximal femur metastases may cause significant negative influence on quality of life and functional independence. Radiofrequency ablation is among the most effective methods used for bone metastases treatment.
Objectives: We evaluated the effect of different methods of surgical treatment of metastatic lesions of the proximal femur on the dynamics of quality of life of these patients.
Methods: 92 patients with proximal femur metastases were treated in our department from 2000 to 2014. The groups were matched by gender and age composition. The percentage of primary tumor localization in both groups was also comparable. Surgical treatment of patients in the study sample was part of the main complex therapy of

oncological pathology carried out by relevant specialists. The basic group included 49 patients who underwent RF ablation combined with orthopedic treatment. The control group consisted of 43 patients who received only the surgical treatment without RF ablation. Each of the two groups was divided into three subgroups according to the method of surgical treatment.

Results: The method of orthopedic treatment was prophylactic fixation (subgroup A) in 32 cases (I-17; II-14), hip replacement with basal cervical resection level (subgroup B) in 29 patients (I-16;II-14) and hip replacement with proximal hip resection (subgroup C) in 31 patient (I-16; II-15). The level of quality of life was comprehensive performed by VAS, MSTS and SF-36 scores. The most prominent effect and most significant differences in the level of quality of life were observed in the first subgroup of the first group, in whom the pain level was 3,2 points (VAS) lower and 15,6 (SF-36) points upper than among the patients of the second group. The quality of life in specified subgroup B and C had no statistically significant differences. The rate of extended metastasis growth was lower in the first group in comparison with the control group (18% vs. 7%). Although there were no statistically significant differences in the quality of life in subgroups B and C showed a tendency to increase the index MH (SF-36) after 1 and 6 months after surgery.

Conclusions: As a result of our study we can conclude that RF ablation is a useful addition to the basic operative treatment for patients with proximal femur metastases. RF ablation with the prophylactic fixation is more applicable for the treatment of patients with threat of impending pathologic fracture and gives the option of less invasive surgical approaches for palliation and local control. Application of RF in combination with prophylactic fixation helps to restore or improve the quality of life in the early postoperative period, which contributes to the continuation of the earlier complex therapy. The most telling change in the level of quality, depending on the used the method of surgical treatment may be evaluated in terms of 1 to 6 months after surgery (before the effect of combination therapy).

Keywords: Metastases of the Proximal Femur; Radiofrequency Ablation; Orthopedic Treatment; Prophylactic Fixation

PP-080

Minimally invasive photodynamic bone stabilization system (IlluminOss®) for treatment of pathological fractures in the upper extremity

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Background: The number of pathologic fractures increases with prolonged survival time in cancer patients. Tumor patients with bone metastases often are in a reduced physical condition, are on immunosuppression medication and suffer from chronic pain. Stabilization of pathologic fractures is necessary to reduce pain and restore mobilisation. Simple and less invasive methods should be used to avoid additional treatment morbidity. The aim of our examination was to evaluate the functional outcome after osteosynthesis of pathologic fractures in the upper extremity with the IlluminOss® system.

Materials and Methods: The IlluminOss® system is based on traditional balloon catheter technology. The balloon is inflated by a biocompatible monomer that hardens through the application of visible light. The analysis included 6 patients with pathological fractures of the humerus, radius or clavicle who were surgically stabilized with the IlluminOss® intramedullary implant. The individual function was measured with the "Toronto Extremity Salvage Score" (TESS) and the "Musculoskeletal Tumor Society Rating Scale" (MSTS) pre- and postoperatively. Pain situation was evaluated with "Numeric Rating Scale" (NRS). All data were analyzed anonymously with SPSS.

Results: The mean age of the included patients was 76 years. Most of the patients (67%) were in a moderate condition despite numerous bony metastases. The mean NRS was 6.8 preoperatively. We observed a reduction in the postoperative course (NRS 1.5 at follow-up). The values for clinical function of the upper extremity improved postoperatively for both tests (TESS pre-op: mean=37, TESS post-op: mean= 68, MSTS pre-op: mean= 9, MSTS post-op: mean= 20). The mean duration of the procedure was 71 min.

Conclusions: The minimal invasive access, improvement of function after osteosynthesis and the reduction of pain postoperatively justified the use of the IlluminOss® system in the included patients.

PP-081

Benefits of early intramedullary nailing in femoral metastases

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Pathological fractures of the long bones are common complications of metastatic disease; however, the outcome of different surgical techniques for the treatment of these fractures has not been clearly defined. The aim of this study was to evaluate differences in prophylactic and therapeutic intramedullary nailing in femoral metastasic implants.

Methods: Sixty-five patients with metastasis of the femur were analysed retrospectively (37 females; 28 males) between 1997 and 2013 (follow-up 15 months). Forty-four presented with pathological fractures and 21 impending fractures (Mirel ≥7). The operative treatments used were intramedullary fixation with reamed long Gamma nails. The studied parameters were survival, radiological and analytical findings, and functional outcomes.

Results: Prophylactic nailing resulted in immediate postoperative deaths in 5 % vs. 11.4 % in therapeutic, and one technical complication was detected in each group. Among the surviving patients 75.9 % of the fractures and 100 % of impending lesions were able to walk after the operation. The mean survival time was 11 months in the therapeutic (range 1-49) and 14 in the prophylactic group

(1-34). The prophylactic intramedullary nails required a lower transfusion rate (1.4 concentrates vs. 3.0), mobilised earlier (day 4.0 vs. 9.7) and needed a shorter hospital stay (eight days vs. 16 days) compared to therapeutic nails (p<0.05).

Conclusion: Femoral intramedullary nailing of metastasic lesions provides satisfactory results both clinically and radiologically. Early treatment of the metastases prevents fractures and gives better results, improving life quality of these patients.

PP-082

A simple method of thin titanium screw and cement reconstruction of cortical windows after curettage of low grade cartilaginous tumors

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Introduction: Curettage and cementation is a widely preferred method of treatment of low grade (HUVOS Grade I) chondrosarcomas. Meticulous excision of tumour content requires sufficient visualization of the tumour mass in the bone. Unfortunately if the amount of cortical window is larger than the diameter of bone or longer than 2 cm's, avoidance of risk of pathological fracture necessitates the use of plate and screws for augmentation. Bulky metallic devices also cause a problem of MRI follow up due to image distortion. A simple method using window cortex with thin titanium screw embedded in the cement mass might be a solution for this problem.

Method: 7 patient, 3 male 4 female with a mean age of 48 (34-62) were treated with curettage, burr and cementation, between 2011-2014 with a mean follow up of 15 months. All patients had low grade chondrosarcoma. Anatomical locations were: 4 femoral shaft, 2 humerus shaft and 1 metaphysis of humerus. Length of intramedullary tumour extension was mean 6,2 cm (4-8cm), dimension of the cortical window was mean 4x1 cm (2-8cm). The cortex over the window was curetted, burred and screw installed prior to the application of bone cement. After curettage and burr, the cavity was filled with bone cement. Prior to curing, the cortex of the window pressed on the cement, anchoring the screw into the cement mass.

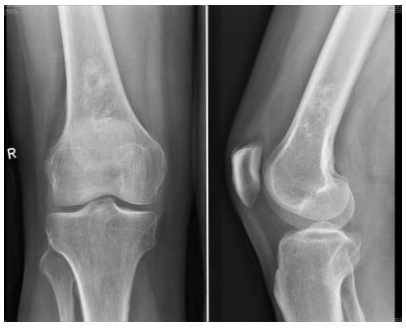

Figure 1

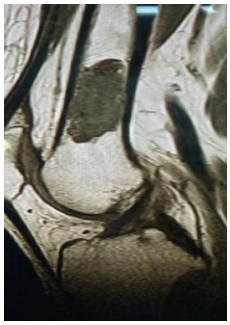

Figure 2

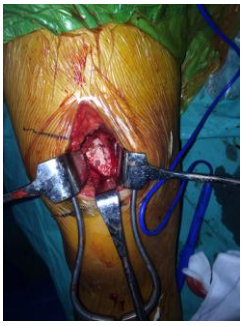

Figure 3

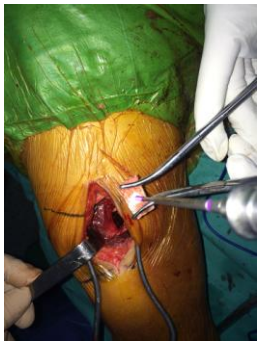

Figure 4

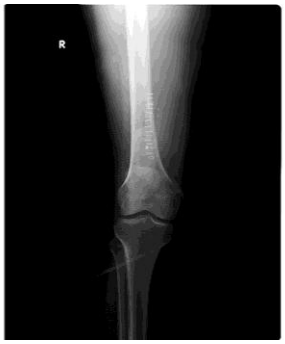

Figure 5

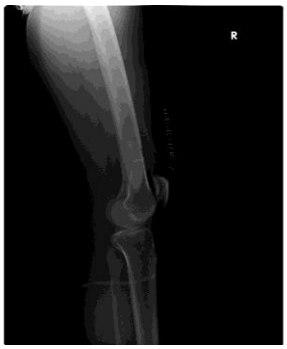

Figure 6

Femur patients were kept in a brace for 1 month with partial weight bearing with crutches. Humerus cases used upper arm sling for 3 weeks.
Results: All patients were followed by 3 monthly direct X-rays and 6 monthly MRI. No patients have developed any local recurrence yet. The image distortion due to thin titanium screw was very minimal and cement bone interface was clearly visible on MRI. All cortices united in 3 months time and no pathological fracture was observed in the follow up period.
Conclusion: Reconstruction of curettage cavity window with original cortex removed during curettage and application of a thin titanium screw embedded in the cement mass is a simple and reliable method of reconstruction without any disturbances of MRI follow up without any risk of fracture.

PP-083

Usefulness of ultrassound-guided hook wire for localization of very small and deep soft tissue tumors

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Background: Small, deep, soft tissue tumours can be a great challenge for the orthopaedic surgeon. We present three small, deep tumours with very challenging locations, where we used hook markers.
Methods: The first case was a 22 years old male with a painful periscapular leiomyoma, located in the interface of infraspinatus and teres minor muscles, proximal to the groove for the circumflex nerve and scapular vessels, and that was about 1.5cm. The second case was a recurrent synovial sarcoma of the scapula. The 56 years old female had been submitted to a Tickoff-Linberg procedure 4 years before, without reconstruction. A follow-up MRI disclosed a 13mm diameter recurrence located in the middle of the fibrotic tissue. The third case was a recurrent extra-abdominal desmoid tumour in the dorsum of a 22 years old male, with 1,9 cm. Diagnoses were established by a percutaneous biopsy.
In the operating room, we hooked the tumours under ultrasonography control. The path of the wire was thought so that the surgical approach could be executed following it.
Results: In all cases the time of surgery was dramatically reduced by the presence of the hook wire and resection was much easier. Margins were allways adequate. Marginal in the leiomyoma and wide in the others. In the first case, the noble structures of the vicinity were preserved. In the second and third cases the anatomical area had been subverted by the previous surgery and without the hook it would be difficult to find and remove the lesion.
Conclusions: With a morbidity free procedure such as the placement of a hook wire in a deep and small soft tissue tumour, an eventually difficult surgery can become much feasible and easier.

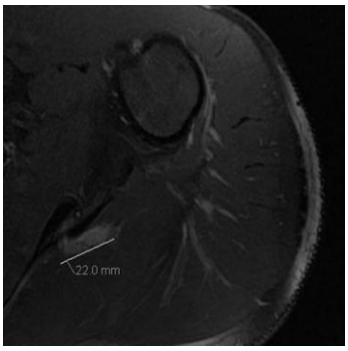

Figure 1. *MRI*

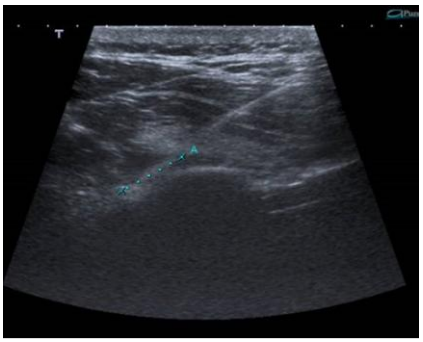

Figure 2. *US*

PP-084

Percutaneous surgical management of femur neck metastasis using hollow perforated screws for introducing bone cement in advanced lung cancer patients

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Background: The treatment of choice for femoral neck metastasis is bipolar hemiarthroplasty. However, minimally invasive surgery is needed for patients' with poor general condition to perform major surgery.
Purposes: We introduced new surgical method using percutaneous hollow perforated screws (HPS) and cementoplasty in femoral neck metastasis with impending fracture and compared its usefulness with bipolar hemiarthroplasty in advanced lung cancer patients.
Methods: Total 33 lung cancer patients who performed percutaneous HPS and cementoplasty (mean cement amount = 24.3±13.0 ml) for the femoral neck metastasis were finally included (mean age = 64.0±8.7 yr). As a control, 16 lung cancer patients who did bipolar hemiarthroplasty for the femoral neck metastasis were included and compared the results. Anesthesia, operative (op.) time, red blood cell (RBC) transfusion, pain killer use, pain score change, hospitalization, post-op. complication and ambulation status were assessed.
Tumor progression was evaluated using F-18-FDG positron emission tomography (PET)/computed tomography (CT) and/or bone scintigraphy (BS) in 12 patients.
Results: In percutaneous HPS and cementoplasty

patients, more incidence of spinal anesthesia (p=0.014), less op. time (p<0.001), less RBC transfusion (p=0.040), less pain killer use (p=0.001), early post-op. pain improvement (p=0.013), short hospitalization (p<0.001) was found than bipolar hemiarthroplasty with significance. Post-op. complication and ambulation status showed no significant results. Tumor suppression effect of percutaneous HPS and cementoplasty showed no statistical difference than bipolar hemiarthropathy.

Conclusions: Percutaneous HPS and cementoplasty for femoral neck metastasis demonstrated less invasiveness, early pain relief, immediate reliable stabilization and durable local tumor suppression in comparison with bipolar hemiarthroplasty. This minimally invasive surgical technique seems to be useful in advanced cancer patients who have hazards of open surgery for the femoral neck metastasis.

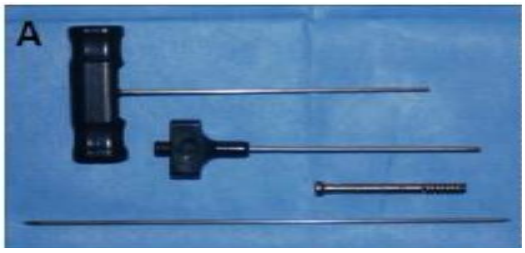

Figure 1A

Figure 1B

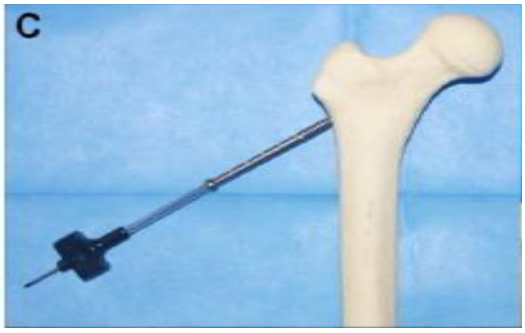

Figure 1C

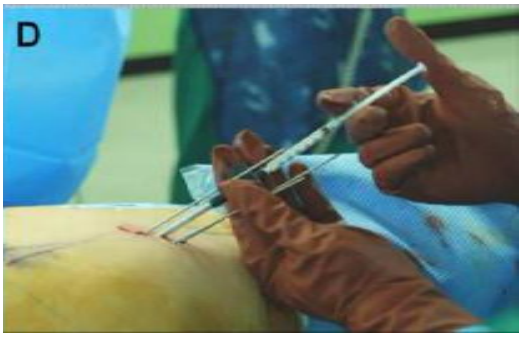

Figure 1D

PP-085

First experience of embolization for bone and soft tissue tumor using DC Bead® in Japan

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[3] *National Cancer Center, Tokyo, Japan*

Introduction: DC Bead® (DCB) is the PVA microsphere that is widely used for transcatheter arterial chemoembolization in patients with hepatocellular carcinoma. In Japan, DC Bead® is indicated for the treatment of hepatocellular carcinoma and we aim to extend this indication to include hypervascular tumor. In this study we performed three cases of bone and soft tissue tumor using DCB to assess the efficacy and safety of bland embolization using DCB in patients with refractory bone and soft tissue tumor.

Methods: Between May 2013 and Sep. 2013, two patients with metastatic bone tumor and one patient with relapsed fibromatosis were enrolled and superselective embolization with DCB was performed in a Japanese clinical trial. Efficacy, success rate of embolization in the target vessel (embolic performance) and operability were evaluated. Embolic performance was assessed with digital subtraction angiography (DSA) by a third party (Evaluation Committee). Embolic performance and operability were graded in 4 degrees. At 3 months after embolization, embolized tumors were assessed by used of computed tomography imaging. To evaluate the safety, adverse events and complaints occurred within 30 days after the embolization were collected.

Results: Patients demographics were as follows. Age range was 41 to 57 years old, Evaluated tumor size range was 35 to 57 mm. DCB size range was 100-300 μm to 300-500 μm. In the evaluation of embolic performance, all three cases were near completely embolized on DSA. In the evaluation of operability, all cases were evaluated as very easy to use. After embolization, shrinkage could not be seen in all cases. Post embolization syndrome was scarcely observed in all patients. There was no serious adverse event.

Conclusions: Embolization for bone and soft tissue using DCB was safely and successfully performed. DCB will be a useful embolic material for bone and soft tissue tumor embolization especially in relief of symptom, but less effective from the aspect of size reduction of tumors in single session.

PP-086

Soft tissue sarcomas of the foot: long-term treatment results of conservative surgery and pre-or-postoperative radiotherapy

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Introduction: The therapeutic approach and outcomes are not well established due to the rarity of the STS of the foot. The objective of the present study was to review the long term follow up results of primary STS of the foot who underwent preoperative or postoperative radiotherapy.
Methods: We performed a retrospective review of 11 patients with primary STS of the foot treated between 1980 and 2008, at a musculoskeletal tumor referral center. The tumor locations included dorsum of the foot in 8 cases and plantar aspect of the foot in 3 patients. The median tumor size was 5.5 cm (range 2 to 8 cm). Two patients had been referred us after local recurrence. Five patients had a wide local excision. Surgical margin was positive in 5 patients. The most frequent histopathologic diagnosis was synovial sarcoma in 8 cases. RT was implemented preoperatively to 3 patients and postoperatively to 8 patients. One patient with positive surgical margin treated with brachytherapy in addition to preoperative external beam radiotherapy. Six cases with high grade and large tumor received chemotherapy.
Results: The median follow-up period was 73 (11 to 224) months. The overall 5-year survival rate of all patients was 78.8%. Three of 11 patients developed a local recurrence at median of 12 (range, 6 to 13) months, resulting in a 5-year local control rate of 71%. The histopathology of the all (3) patients who relapsed was synovial sarcoma. The surgical margins were positive in only one patient. One of the 3 patients with local recurrence was salvaged by further limb sparing surgery. Two patients required amputation. Also, these 3 cases developed lung metastasis and 2 of them died due to metastatic disease. Eight (72.7%) patients without local recurrence remained disease-free at an average follow up of 73 months.
Conclusion: It is difficult to make wide excisions due to the anatomic structure of the foot. Radiotherapy may improve the local control rates in this stiuation and enables the limb preservation. Therefore, multidisiplinary approach is important as in other regional STS to get good oncologic and functional treatment outcomes in STS of the foot.

PP-087

Biopsy punch meets tube system – A new technique for biopsy and treatment of difficult accessible bone tumors

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Introduction: Biopsy taking in patients with bone tumors of uncertain dignity is a crucial step within the diagnostic cascade. Open biopsy is still considered the gold standard. However, in certain anatomical locations such as the femoral neck, intramedullary bone tumors are sometimes difficult to access. Therefore, the surgeon runs the risk of sampling errors or contamination of the surrounding soft tissue during biopsy or curettage of benign tumors. We present a new technique for the biopsy and treatment of difficult accessible bone tumors.
Methods: For the new technique a regular biopsy punch as well as a tube system are needed. The latter is usually used for the retro-/antegrade knee access in intramedullary nailing in order to avoid contamination of the knee with reaming material. The tube system is positioned over a guide wire and a special centering tool for opening the medullary cavity directly towards the bony lesion. For the following, the tube system serves as an entry portal and working channel to prevent contamination of the surrounding tissue with biopsy material. Once in the right position, rigid reamers of different sizes (for breaking the sclerotic boarders) and a regular biopsy punch can be inserted via special reduction sleeves. The bony lesion is now biopsied using the biopsy punch and/or a sharp curette. After biopsy, the medullary canal is reclosed with the previously removed punching cylinder of healthy bone in order to prevent bleeding into surrounding soft tissue structures. After the benign character of a lesion is confirmed by histopathology, the same system can be used for curettage and filling with bone graft without contamination of the surrounding tissue.
Conclusion: The use of a tube sytem as well as a biopsy punch is a helpful tool for biopsy and treatment of difficult accessible bone tumors. The described technique may help to prevent sampling errors and contamination of surrounding structures with tumor material or post-biopsy bleeding.

PP-088

Thermal conductivity of human tibia in cryoprobe freezing

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Introduction: Minimally invasive surgery utilizing ablative freezing of tissue with cryoprobes is becoming more commonplace in orthopaedic oncologic surgery for the treatment of various benign and malignant bony lesions. This technique is useful in improving outcomes while minimizing morbidity. The thermal conductivity, the intrinsic property of a materials resistance to thermal changes, of human bone is not well described in current literature. Bone is susceptible to necrosis at temperatures around 0° Celsius, considerably higher than the -40° to -60° Celsius required to cause necrosis in many tumors.[1] As such, it is important to categorize the intrinsic resistance to freezing in human bone in order to assist in surgical planning aimed at preserving as much quality bone as possible. Currently, few studies have been performed in this area and most have been investigations into the properties of animal bone.
Methods: A 2.4mm, argon-circulating cryoprobe was inserted proximally to distally into cadaveric human tibia and thermometers were placed at 0mm, 0.5mm, 1mm, and 1.5mm (Figure 1). Freezing was initiated and maintained for 10 minutes and steady state conditions were obtained before measurements were recorded. Known inputs were then combined with calculated outputs to empirically determine the thermal conductivity of human bone.
Results: The freezing profile of this probe created an

ellipsoid shape as expected. The temperature profile measured -91°C, -20°C, 2°C and 12°C at each thermometer respectively. Manipulating Fournier's Law (Figure 2), with a known cooling capacity of about 0.928 W, we were able to derive that the bone in this study had a thermal conductivity of about 0.519±0.026 W/m-K.

Conclusion: Our experiment shows that bone is highly resistant to temperature changes in a freezing system. This value is consistent with studies performed in bovine bone specimens that showed a thermal conductivity of 0.53±0.030 W/mK in the circumferential direction. [2] With a susceptibility to freezing necrosis at less extreme temperatures relative to other tissues of interest, it is important to quantify thermal conductivity of bone. However, to create a patient specific planning model, additional studies should be performed to categorize the thermal resistance of bone relative to other variables such as density and location.

References:

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[2] Davidson, Sean R.H. et al., (2000) Measurement of thermal conductivity of bovine cortical bone, Medical Engineering and Physics, 22(10), pp. 741 - 747

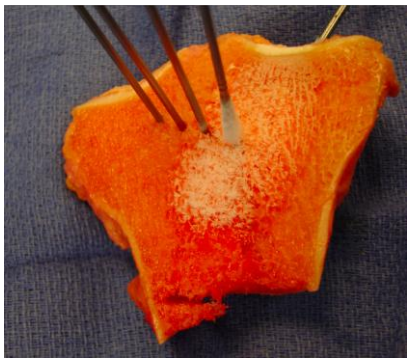

Figure 1. *Image of 2.4mm Crypoprobe inserted approximately 5cm from proximal to distal in huma tibia. The thermometers shown are placed at 0mm, 0.5mm, 1.0mm, and 1.5mm perpendicular to the axis of the cryoprobe.*

$$\dot{Q} = -kA\left(\frac{dT}{dx}\right)$$

Figure 2. *Fourier's Law. Q = heat flux (W), k = thermal conductivity (W/m-K), A = area (m2), T = temperature (K), x = distance (m)*

PP-089

Giant cell tumor of bone: modern strategy of treatment

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Purpose: To evaluate the results of various surgical interventions in tubular bone giant cell tumor treatment.

Material and Methods: Surgical treatment results of 374 patients with giant cell tumor of tubular bones were analyzed. There were 174 (46.5%) men and 200 women (53.5%). The age of patients ranged from 3 to 79 years. Tumors localized in femur in 133 (35.5%) cases, in tibial bone in 101 (27%), in humerus in 48 (12.8%) cases, in radius in 19 (5.0%) cases, in hand bones in 34 (9.0%) cases, in fibula in 12 (3.2%), in bones of foot in 10 (2.6%) and in clavicle in 7 (1.8%) cases. There were 226 (60.5%) cases of cellular-trabecular form, 62 (16.5%) osteolytic form and 86 (23.0%) mixed form. Tumor size ranged from 3cm to 13,5cm. Depending on treatment the patients were divided into the following groups: 1st group (n=18) - excochleation and marginal resection (4.8%), 2nd group (n=67) - excochleation with autoplastic operation (17.9%), 3rd group (n=17) - segmental resection (4.5%), 4th group (n=20) - segmental resection with autoplastic operation (5.3%), 5th group (n=18)- segmental resection+endoprosthetics (4.8%), 6th group (n=37)- segmental resection + compressional-distractional osteosynthesis (9.9%). 7th group (n=15) - amputation, disarticulation of limbs(4.0%), 8th group (n=127) - excochleation with cement plastics (33.9%), 9th group (n=37) - excochleation + cryodestruction +cement plastics (9.9%), 10th group (n=16) excochleation + autoplastic operation and cement plastics (4.2%).

Results: The follow-up was from 1 to 8 years. Tumor recurrence after surgery excochleation and marginal resection was observed in 9 (50%) cases, after excochleation and autoplastics in 14 (20.8%), after segmental resection (with autoplastic operation, compressional-distractional osteosynthesis and endoprosthetics) in 5 (5.4%), after amputation and disarticulation in 1 (6.6%) case, after excochleation and cement plastics in 12 (9.4%), excochleation + cryodestruction +cement plastics - in 3 (8.1%) and after excochleation + autoplastic operation and cement plastics - 3 (18.7%).

Conclusion: Excochleation + autoplastic operation and cement plastics is minimally invasive, effective surgical treatment of tubular bone giant cell tumor, maintains the integrity of bone structure, reduces time of rehabilitation.

PP-090

Results of tubular bone giant cell tumor treatment with cement plastics

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Purpose: To analyze in a comparative perspective efficiency of cement plastics and autoplastic operation in tubular bone giant cell tumor surgical treatment.

Material and Methods: 228 patients with tubular bone giant cell tumors were observed. The age of patients

ranged from 3 to 79 years, the average age was 29 years. The most frequent age period was 20-40 years. Tumor localized in femur in 38% cases, in tibial bone in 27%, and in humerus in 13% cases in forearm in 11% cases in fibula (3%) in hand bone in 6 % cases and in foot in 1% case. X-ray examination showed the predominance of patients with trabecular cellular-form (49%) compared with osteolytic (17%) or mixed (34%) forms. Tumor lesion size ranged from 3cm to 13.5 cm. For surgical volume determination the following criteria were tken into consideration: extension of tumor in lengthwise and semicircle, cortical bone and articular surface conditions. Contraindications to treatment methods were invasion to surrounding soft tissues, pathological fracture and neurovascular bundle lesion. Depending on surgical operation patients were divided into the following groups: I group - excochleation with cement plastics (127 patients), II group - excochleation + autoplastic operation (67 patients), III group - excochleation + autoplastic operation+ cement plastics (16 patients), IV group - excochleation (18 patients). Excochleation + autoplastic operation+ cement plastics was made in large sizes of bone defects. Medical cement was used for cement plastics.

Results: The follow-up was from 1 to 10 years. Tumor recurrence was observed in 38 (16.7%). The highest frequency of recurrence was revealed in IV group 9 (50%). The recurrence frequency in III group was 18.7% in II group - 20.8% in I group - 12 (9 , 4%).

Conclusion: The result of the study show, that using of medical bone cement significantly reduces the incidence of tumor recurrence improves quality of life.

PP-091

Pediatric osteoid osteoma – Treatment and follow-up

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Introduction: The osteoid osteoma is a small benign tumor, characterized by an intense pain that is worse at night. Surgical removal implies some surgical difficulties and potential complications. This motivated the emergence of new, less invasive, techniques, like the radiofrequency ablation. We reviewed the osteoid osteomas in the pediatric age treated with radiofrequency and evaluated the treatment efficacy and the patient follow-up.

Methods: We reviewed a 19 cases, 5 females and 14 males, with ages between 7 and 17 years old (mean: 13 years). The lesions were on the femur (n=12), tibia (n=2), humerus (n=2), sacrum (n=1) and lumbar vertebrae (n=2). The diagnosis was based, in all cases, on the clinical presentation, on the CT scan and on the pinhole bone scintigraphy.

No biopsy was performed.

All patients underwent CT-guided radiofrequency ablation, under general anesthesia, in an outpatient basis.

Results: The treatment was effective in all cases, with complete and sustained resolution of the pain. There were two patients who had post-operative complications.

The mean follow up was 9 months.

No patient had a recurrence of pain after discharge.

Discussion: One of the complications was on a patient with a tibial lesion, who had a skin infection in the radiofrequency needle entry point and the other one.

The other one had a lumbar lesion, and complicated after the radiofrequency with a mild aseptic meningeal syndrome. Both cases had total resolution of symptoms after appropriate medical treatment.

On the first ten cases, on follow up, we repeated the pre-operative imaging studies 6 months after the procedure. However we concluded that in most cases there were no significant imaging changes, with persistence of the nidus on the CT scan and positive bone scintigraphy, but the patient was fully asymptomatic. So on the remaining patients we decided to have only a clinical follow up and avoid radiation exposure. When we are talking about a pediatric population, this matter becomes even more relevant.

All patients were urged to come to us if there was any recurrence of pain after the discharge. We had no record of any late recurrence.

Conclusion: Radiofrequency is and safe and effective option when treating osteoid osteomas, with excellent results and few complications. Also the follow up can be short and based solely on the clinical findings, with no need to expose the patients to unnecessary radiation.

PP-092

S1 osteoid osteoma radiofrequency ablation with neural canal temperature continuous monitoring

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Introduction: Percutaneous radiofrequency ablation is the treatment of choice for osteoid osteoma of the appendicular skeleton. However, this treatment is not as popular for spinal osteoid osteoma, due to the proximity to neural structures and the danger of thermal injury.

We report a case of CT-guided radiofrequency ablation of an osteoid osteoma adjacent to the posterior wall of S1 in a pediatric patient.

Methods and Results: N.C., 8 years old, female, reported a history of 14 months of low back pain radiating to left buttock, thigh and leg, relieved by NSAIDs, impairing daily activities. CT and MRI of sacrum showed an osteoid osteoma located in the soma of S1, adjacent to the posterior wall, slightly protruding in the neural canal.

Posterior cortex was expanded but intact. Diameter of the lesion was 6 mm.

Under general anaesthesia, using CT guidance, we introduced the radiofrequency needle (Covidien Cool-tip^{TM}) into the sacrum, with the active tip just inside the nidus. In order to avoid nerve damage, we positioned a thermistor through a posterior approach in the spinal canal with the sensitive tip in the epidural space, close to L5 and S1 nerve roots on the left side. Cut-off temperature of the thermistor was set at 40°C. Radiofrequency ablation of the lesion was

performed at 80°C for 8 minutes. Final CT scan showed no significant side effects. The patient did not show any sign of neurological damage; 48 hours after the procedure, she did not report any typical osteoid osteoma pain. She is currently free of symptoms at 4 years since the procedure.
Conclusion: Radiofrequency ablation of osteoid osteoma located in the spine is an effective procedure, but concerns about neurological thermal injury remain. Temperature monitoring of the involved neural structures may help avoiding nerve damage in selected cases. Use of modified neuroprotective techniques may be mandatory in complex cases.

PP-093
Atypical locations of osteoid osteoma. Treatment by thermoablation

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Introduction: Osteoid osteoma is a benign lesion that usually occurs in young people, especially in the second decade of life, with a predominance on males. According to some data series it represents 10% of benign bone tumors. Its most common presentation involves long bones, especially tibia and femur. Its main symptom is pain that characteristically increases during the night and responds to anti-inflammatory drugs, particularly aspirin. The diagnosis is usually reached by clinical picture and radiology. Simple radiology shows a radiolucent nidus surrounded by reactive sclerosis. The CT is the most informative technique. Differential diagnosis includes: osteoblastoma, osteomyelitis, stress fracture, etc. The classic treatment has been surgery, though nowadays the treatment of first choice is TAC-guided thermoablation.
Methods: We present several cases of atypical-location osteoid osteoma, such as hand finger phalanx, elbow, distal radius, posterior vertebral arch, etc. We analyze its clinical diagnostics and imaging, treatment by thermal ablation and its results in the short and long term.
Results: We review our series of cases of atypical-site osteoid osteoma, including cases located in posterior arches and lumbar spine, finger phalanx of hand, elbow, distal radius, etc. In these locations, as it is most common, pain has been the lead symptom, although in this atypical sites the time between onset of symptoms and diagnosis is almost double as in patients with usual locations. Diagnosis was made with simple x-ray and CT. All cases underwent thermoablation treatment. Routinely biopsy in the same act but prior to thermoablation allowed histopathological confirmation. All cases except one have been resolved with a single session. None of the injuries has relapsed.
Conclusions: Osteoid osteoma is an injury to consider even if it is not presented in its usual form. Today, conventional surgery should not be the first option, but CT-guided thermal ablation with radiofrequency should be the treatment of choice, as it allows injury resolution in almost all cases. This technique has the additional advantage of not requiring admission and presenting few complications.

POSTER PRESENTATIONS SESSION VI: Pediatric Sarcomas

PP-094
Epidemiology of childhood cancer in Russia

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Introduction: Our aim was to determine current rates of childhood cancer incidence and mortality at a national level for Russia and to evaluate recent trends.
Methods: Using the Annual reports of Ministry of health and Federal State Statistics Service we calculated childhood cancer incidence and mortality rates for the 5-year period 2008-2012 and trends between 1989 and 2012 by sex, age and site. Rates were directly age-standardised to the 2000 World Standard Population, and linear regression was used to determine the magnitude and significance of trends.
Results: The age-adjusted incidence rate in children aged 0-17 years was 125 per 1,000,000 individuals per year for 2008-2012. The highest age-specific incidence (159 per 1,000,000 children/year) was observed in early childhood (0-4 years). Between 1989 and 2012, a significant increase in the cancer incidence was observed in children aged 0-14 years: average annual percent change was 1,6% [95%CI 1,5%; 1,7%]. The greatest increase for this period was observed for soft tissue sarcomas (3,7% [2,6; 4,9]), hepatic tumors (3,6% [2,6; 4,6]), thyroid carcinomas (3,7% [3,2; 4,2]), CNS neoplasms (2,9% [2,6; 3,1]), renal tumors (2,1% [1,7; 2,5]) and leukaemias (1,9% [1,7; 2,1]). The decrease of incidence was observed for Hodgkin (- 1,6% [-2,1; -1,2]) and non-Hodgkin (- 1.4% [-1,8; -1,0]) lymphomas. Childhood cancer mortality for 2008-2012 was 40 cases per 1,000,000 children/year. The highest age-specific mortality rate (52,3 per 1,000,000) was observed in infants. The significant decrease of mortality was found from 1989 (70 per million) to 2012 (37 per million). The greatest average annual decrease for this period was observed for leukaemias (-3,8% [-4,0; -3,5]) and lymphomas (-6,8%[-7,3; -6,4]). The significant decrease of mortality in 1999-2012 was found for malignant bone tumors (-5,9% [-7,4; -4,3]), renal tumors (-2,9% [-4,7; -1,1]) and CNS neoplasms (-1,1% [-1,9; -0,3]) with the only exception for soft tissue sarcomas (average annual increase was 3,2% [1,8; 4,7]).
Conclusions: significant temporal trends of childhood cancer incidence and mortality in Russia were found during the study period. Although rates of cancer mortality are generally decreasing in Russia there are still very high levels for common childhood cancer types.

PP-095
Melanotic neuroectodermal tumor of infancy, analysis of 5 cases

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Introduction: Melanotic Neuroectodermal Tumour of Infancy (MNTI) is an extremely rare fast-growing neoplasm of infants with a biphasic population of neuroblastic cells and pigmented epithelial cells. The usual site affected is the craniofacial area.
Methods: We analyzed 5 cases of MNTI from 2012 to 2014. The specimens of 2 cases were examined grossly and fixed in 10% formalin. Tissue samples from 3 patients were from other hospitals. The specimens were embedded in paraffin and stained with haematoxylin and eosin and examined histologically. Immunohistochemical evaluation was performed with HMB-45, panCK (AE1/AE3), Synaptophysin, Desmin, S-100 Protein and CD99.
Results: The male/female ratio was 4/1. One tumour was congenital, the other 4 were revealed before the age 7 months of life. Tumours of four children were localized in the craniofacial area (3 in the maxilla, 1 in the left occipital bone). In the 7-months-girl the tumour was observed in the soft tissue of the left femur without any relation to the bone. The duration of symptoms was no longer than 4 months. The maximum diameter was 5 cm (occipital bone lesion). The tumours of all 5 patients were completely surgically excised. We have no data about local recurrences in our patients. Radiographically MNTI is the expansive radiolucency lesion, usually with poorly demarcated borders, and tendency to have locally invasive growth. Grossly the tumour is poorly encapsulated, firm, whitish-gray in color with black patches insight. Histologically MNTI consists of small neuroblastic cells and larger melanin-containing epithelial cells in a vascularized dense fibrous stroma. The epithelial component was reactive with HMB-45 and panCK (AE1/AE3) antibodies. The small cells expressed Synaptophysin and focally CD99. Neoplastic cells were negative for Desmin and S-100 Protein. MNTI should be differentiated with alveolar rhabdomyosarcoma, Ewing sarcoma, lymphomas, metastatic neuroblastoma, immature teratoma, and malignant melanoma.
Conclusion: We described 5 extremely rare cases of MNTI in children, one case in an unusual site (soft tissue of the left femur). MNTI should be differentiated with others children's tumours (alveolar rhabdomyosarcoma, Ewing sarcoma, lymphomas, metastatic neuroblastoma and immature teratoma).

PP-096

Establishment of a primary orthotopic patient-derived osteosarcoma mouse model

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Introduction: Osteosarcoma (OS) is the most common primary malignant bone tumor in children. Because outcome of patients following standard treatment has not shown major improvement over almost three decades, functional preclinical models that closely reflect important clinical cancer characteristics are urgently needed to develop new treatment strategies. The objective of this study was to establish an orthotopic xenotransplanted mouse model using patient-derived tumor tissue.
Methods: Fresh tumor tissue from an adolescent female patient with osteosarcoma relapse was surgically xenografted into the right tibia of 6 immunodeficient BALB/c Nu/Nu mice as well as cultured into medium. Tumor growth was serially assessed by palpation and with magnetic resonance imaging (MRI). In parallel, a primary cell line of the same tumor was established. Histology and high-resolution array-based comparative genomic hybridization (aCGH) were used to investigate both phenotypic and genotypic characteristics of different passages of human xenografts and the cell line compared to the tissue of origin.
Results: We established a primary OS cell line and a primary patient-derived orthotopic xenotranplanted mouse model. MRI analyses and histopathology revealed the same architecture in the primary tumor and in the xenografts. Array-CGH analyses of the cell line and all xenografts showed similar patterns of genomic alterations as the primary tumor.
Conclusion: We report the first orthotopic OS mouse model established by transplantation of tumor pieces directly harvested from the patient.

PP-097

Treatment and outcome of childhood metastatic rhabdomyosarcoma: ten years' single institution experience

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Introduction: Multimodality therapy involving surgery, chemotherapy and radiotherapy is necessary in childhood RMS but the optimal use, timing and intensity of these three treatment modalities must be planned with regard to known prognostic factors including the age of the patient, site and size of the primary tumour, extent of disease, pathological subtype and the predicted consequences of treatment.
Aim: Presentation of our experience in the treatment of

children suffering from metastatic rhabdomyosarcoma.
Patients and Methods: Evaluation of seven patients with metastatic rhabdomyosarcoma (5 girls and 2 boys), treated between 2004 and 2014, according to the CWS-2002 and CWS-2009 protocol. Their age ranged between 4 and 18 years. In four patients rhabdomyosarcoma embryonale and in three patients rhabdomyosarcoma alveolare was diagnosed. All patients had primary tumor in unfavorable site. Five patients had regional pathological nodal involvement, two patients had two sites of metastatic disease, and one patient had bone marrow involvement. Chemotherapy consisted of the typical treatment scheme for primary metastatic soft tissue tumours. One patient with bone marrow involvement was underwent high dose chemotherapy with stem cell support. Six patients were irradiated and three patients underwent marginal resection.
Results: Estimated outcome for all patients, four patients died during chemotherapy (including patient who underwent high dose chemotherapy with stem cell support) because of the progression of desease, but three of seven patients are alive with median follow up of 18 months. Two of three alive patients had regional pathological nodal involvement and they were treated with chemotherapy, irradiation and surgery. The third patient had regression of pulmonary metastases during chemotherapy and local control was achieved with radiotherapy without surgery because of mutilation.
Conclusions: The results of treatment for children with metastatic RMS remain so poor and patients with very poor prognosis need new, more effective therapy strategies. Optimal treatment strategies for metastatic RMS may open many controversial issues such as duration of therapy, value of high dose chemotherapy with stem cell support, the consequences of local therapy modalities and surgery of metastases.

PP-098

Custom-made ceramic spacer for children with osteosarcoma of lower extremities: a long follow-up

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Purpose: Limb salvage surgery for malignant bone tumors may present difficult problems, especially in cases of skeletally immature patients. The aim of this study was to evaluate our surgical method of reconstruction with custom-made ceramic spacer for the highly skeletally immature patient with osteosarcoma, especially focusing on the major complications of surgery, function of salvaged limbs.
Methods: From 1996 to 2006, six children with osteosarcoma in the lower limbs underwent the limb salvage surgery with custom-made ceramic spacer and followed through January 2014. There were three males and three females, ranged in age from 6 to 11 years (median age: 8 years old) at the time of operation. They were followed up for at least 8 years after the first operation (average, 10.9 years). The location of the tumors were distal femur in one patient, proximal tibia in five. Ceramic spacers were designed about one month in advance to the operation according to the images of plain X-ray and CT scanning. All the spacers were manufactured by KYOCERA Medical Corporation, Osaka, Japan.
Results and Discussions: In all patients, tumor resections were successfully performed in radical procedure with negative margins. We have reconstructed proximal tibia with ceramic spacer varied from 120 to 150mm in length. Diameters of the stems were varied from 8 to 10mm. As for the distal femur case, we have used the ceramic spacer of 250mm in length and diameter of the stem was 12mm. Three cases were performed revision operations with expandable endoprosthesis because of the substantial limb length discrepancy and/or loosing of the spacer. One femur case was amputated at the site of the above knee, because of early loosening of the spacer followed by late deep infection of the surgical site. There are two cases under observation with soft or hard external prosthesis, waiting to undergo the revision operation with endoprosthesis. All cases are alive with complete disease free status. With the use of custom-made ceramic spacer, limb salvage surgery was safely performed in the appropriate schedule. However, there are some cases of early loosening of the implant or instability of the suffered joint.

PP-099

Nestin expression in rhabdomyosarcoma

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Introduction: Nestin is a cytoskeletal protein classified as a type VI intermediate filament (IF). During myoblast differentiation nestin is down regulated and replaced by IF protein desmin in fully differentiated myotubes. However, nestin has also been detected in various tumors, such as glioma, melanoma, RMS, gastrointestinal stromal tumor, testicular stromal tumor and adrenocortical tumors.
To identify the risk factors for poor prognosis researchers have studied many molecular markers that can be associated with prognosis of RMS.
Matherial and Method: We investigated 30 specimens with diagnosis RMS, from 1995-2012 year. The records from the Soft Tissue and Bone Registry of the Institute of pathology, Medical School, University of Belgrade, Serbia, were reviewed for all the patients. We have immunohisochemically investigated the expression of nestin and its relationship with prognosis of RMS. Immunohistochemical analysis of nestin was performed on 5 µm sections which were prepared from the paraffin blocks. All immunostained sections were independently evaluated by two authors. The results of immunohistochemical staining were scored by

semiquatitive technique: absence of staining in all tumor; positive staining involving less than 10% of cells, 10%-50% positive cel, and more than 50% positive cells. The follow-up period was 5 years, (range 10-60 months). Overall survival (OS) time was defined as the time between the date of diagnosis and the date of death. Patients still alive were censored at date of last follow-up.
Results: The majority of patients were men (63.3%), with average age 29.14 ± 25.84 years (range 0.8-77 years, median 18.5 years) and mostly with disseminated disease 18/30(60%). Upper extremity was the most frequent localization 14 (46,4%); tumor size ≥ 5cm, was observed in 12 (70%) of patients. The most common hisological subtype was emrional 12 (40,0%). The correlation of frequency among gender, localization, histological typ and existence of metastatic disease didnot show any statistical difference. The correlation of nestin expression with survival showed a significantly longer survival in a group of patients with expression in 50% or more tumor cells compared to the group without that expression
Conclusion: Immunohisochemical analysis of nestin expression might prove useful as a prognostic marker in RMS.

PP-100
Delayed diagnosis in osteo- and Ewing's Sarcoma patients: a facebook based survey

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Introduction: Tumor size and metastases at the time of diagnosis are two of the most significant prognostic factors in patients with Osteo- and Ewing's Sarcoma. Early diagnostic workup is therefore prerequisite to avoid an unfavourable outcome. Regardless, the period until final diagnosis is still more than 3 months in both tumor entities in current literature. These data, however, were usually collected over a long time period due to the low incidence of these diseases lacking timeliness. Social networks like Facebook with their topic-based groups provide a unique potential for collecting and analyzing data of rare diseases like sarcomas. Aim of this study therefore was an internet-based survey on the time to diagnosis and treatment modalities in patients with Osteo- and Ewing's Sarcoma via Facebook.
Methods: An online questionaire with 10 items regarding gerneral information, treatment modalities and time to diagnosis was developed. A link to the survey and all necessary informations were posted in specific Facebook groups regarding Osteo- and Ewing's Sarcoma. After 1 month all surveys were closed and data was statistically analyzed.
Results: A total of 27 patients participated in our survey. The average time to diagnosis was 2,92 months in Osteo- and 3,27 months in Ewing's Sarcoma patients. Primary tumor site was the lower extremity in both entities. At the time of diagnosis 83% of Osteosarcoma and 73% of Ewing's Sarcoma patients were free of metastases. Surgical tumor resection was performed in 100% of the cases with Osteo- and 91% with Ewing's Sarcoma. Chemotherapy was applied in 92% of Osteosarcoma and 100% of Ewing's Sarcoma patients. Additional radiotherapy was administered in 55% of the Ewing's Sarcoma cases.
Conclusion: Our study could confirm the long time period from first symptoms until the final diagnosis in patients with Osteo- and Ewing's Sarcoma. Nevertheless, only a small percentage of the patients with either tumor entity showed metastases at the time of diagnosis. Therapy was performed in most cases according to international guidelines with surgical resection and chemotherapy. Additionally, a social network as a modern communication medium was successfully used for collection and analysis of epidemiologic data of rare diseases.

PP-101
Analysis of the work of the Musculo-sceletal Tumors Department of the Institute of Paediatric Oncology and Hematology for the years 2010-2013

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Actuality: Bone and soft tissue tumors are one of the most common cancers in children.
Materials and Methods: In 2011 - 2013 years. in the department of tumors of the musculoskeletal system, has 25 beds, 549 patients were treated (age 6 months - 17 years).
Results: On each bed during the analyzed period were treated 22 people. It was carried out in 1833 hospitalization, the average time of hospital stay was 18 bed-days. Was performed 408 surgeries, including 132 (32.3%) - endoprosthesis limbs and 1 - endoprosthesis blades. Patients with different localizations osteosarcomas - 246 (44.9%), Ewing's sarcoma family of tumors - 138 (25.1%), soft tissue tumors - 100 (18.2%) melanoma - 7 (1.3%), other tumor - 58 (10.5%).
Conclusion: Patients with osteosarcoma of different locations were dominated. Prolonged hospital stay was due to conduct courses of chemotherapy using high-dose methotrexate. Treatment to 40% of patients in a one day clinic can increase the fluorescent surgical activity and total separation of patients.

PP-102
Incidence, mortality and time trends of childhood soft tissue sarcomas in Russia

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Introduction: The aim of the study was to estimate patterns and trends of childhood soft tissue sarcomas (STS) in Russia with respect to incidence and mortality

data.

Materials and Methods: The analysis was based on annual reports of Ministry of Health and Federal State Statistics Service on cases, deaths and person-years by gender, age, calendar year and region. Age-specific and age-adjusted rates were calculated. Additionally, the average annual percent change (AAPC) with 95% confidence interval, derived from a Poisson regression model, was estimated. Excess or deficit of incidence rates for geographical areas were expressed as standardized incidence ratio SIR (standardized to rate of Russia as whole).

Results: STS represent 5,8% of all childhood malignancies in Russia registered during for 2008-2012 behind leukaemias, brain tumors, lymphomas and renal tumors. The age-adjusted incidence rate (ASR, world standards) of STS per 1000000 patients below the age of 15 years was 7.2 (774 incident cases). The highest age-specific incidence was observed in children aged 0-4 years (11.5 per 1000000). A significant incidence trend was shown with AAPC of 3.7% between 1989 and 2012. The largest increase was observed in children aged 0-4 years (AAPC=5.6%). There were doubling of average Russian incidence rates in some areas such as Samarskaya oblast about 15 cases per 1000000. STS accounts for 10.8% of deaths from cancer in children in Russia and thus rank third behind leukaemia and brain tumors. The age-adjusted mortality rate of STS per 1000000 patients below the age of 15 years for 2008-2012 was 4.3 (459 deaths). The highest age-specific incidence was observed in children aged 1-4 years (6.7 per 1000000). A significant increase of mortality between 1999 and 2012 was shown with AAPC of 3.2%). The geographical differences of death rates were not analysed because of small numbers.

Conclusion: Significant increase of both incidence and mortality for childhood STS were found in Russia for last decades. Further study is required to explain higher rate areas.

PP-103

Tibialization of the fibula as a limb salvage option after tibial shaft tumor resection in children

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Introduction: Limb salvage surgery in pediatric patients remains a great challenge for the orthopaedic oncologists. All means of tibia reconstruction require advanced surgical skills and come with a lot of complications. The optimal limb sparing treatment method remains unknown. The purpose of this study was to assess the outcome of 3 patients with a primary sarcoma of the tibial diaphysis who underwent limb salvage surgery and tibial reconstruction by ipsilateral fibular transposition.

Methods: The cases of two girls and one boy of a mean age of 6 years (range, 2,5-11) treated for primary bone sarcoma of the tibia were retrospectively revised. The large diaphyseal defects after the tumor excision have been reconstructed by tibializing the ipsilateral fibula. The surgical procedure included tumor resection and then proximal and distal osteotomies of the ipsilateral fibula. The limb's length has been maintained by the use of external fixation.

Results: All patients survived until the last follow-up. The mean treatment period was 20 months (range, 19-24). The tibialization of the fibula was successful in all cases and the fixation devices have been removed in a mean period of 7,5 months (range, 2,5-12). Full weight bearing was achieved after a mean period of 12 months (range, 10-14). Leg length discrepancy 3 years postoperatively was less than 2 cm. One child presented with a non-union of the distal part and was successfully treated with a flexible intramedullary nail. Hypertrophy of the transferred fibula has been observed in all of the patients reaching the diameter of the contralateral tibia. No signs of ischemia of the fibular graft have been noticed. Knee and ankle range of movement was normal 3 years postoperatively.

Conclusion: Tibialization of the fibula seems to be a promising method of extensive tibial defects' reconstruction concerning pediatric population. It is a simple, biologic and cost effective method of reconstruction with low rates of complications. At the same time, the limb's normal growth is ensured, without limiting the range of movement of the adjacent joints. However, preservation of the physis during tumor excision is necessary.

POSTER PRESENTATIONS SESSION VII: New Rankl Inhibitors for Bone Loss in MM, MBD and GCT

PP-104

Denosumab avoids amputation in recurrent stage three giant cell tumors

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Introduction: Recurrent Enneking Stage 3 giant-cell tumours pose a threat for limb salvage surgery. RANKL inhibitor "denosumab" application could stop the tumour progression and enable the surgeon to perform limb salvage surgery in appendicular skeleton locations.

Method: 22 year-old female with stage 3 giant-cell tumour of left distal radius was treated by curettage and autografting at another instutition a year ago and recurred at post operative 3rd month. The tumour had extended to

the first carpal row and soft tissues. Madelung-like deformity of wrist and marked swelling of forearm with median nerve irritation was present. The patient was offered amputation elsewhere but she refused. Instead of amputation, application of 6 cycles of denosumab (XGEVA- by AMGEN) 120 mg subcutaneous injection monthly had stopped tumour progression. The preoperative and postdenosumab X-rays and MRI investigation showed well defined calcified borders, marked fibrosis and moderate mineralisation of the tumour. Therefore, local wide excision of distal one third of left distal radius together with the first carpal row was performed satisfactorily. Arthrodesis of the wrist in anatomical grasp position with fibular shaft allograft and titanium plate and screws could be performed. Resected specimen was examined in pathology department. On macroscopic examination; tumoral mass was localized in the epiphysis and metaphysis of the distal radius. Diameter of the tumour was 4,5x4x3 cm. Tumour had extended to the articular surface. Cut surface of the tumour had showed yellow-white hard sclerotic areas. On microscopic examination; giant cells and mononuclear cells were disappeared in tumoral area and fibrosis had begun to replace mononuclear, giant cells. The patient kept on 3 more cycles of denosumab 120 mg per month postoperatively.

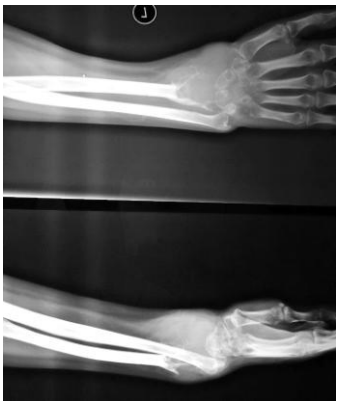

Figure 1

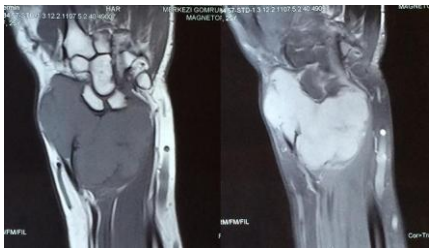

Figure 2

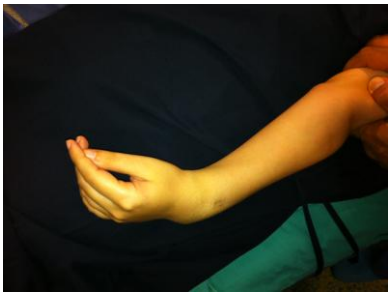

Figure 3

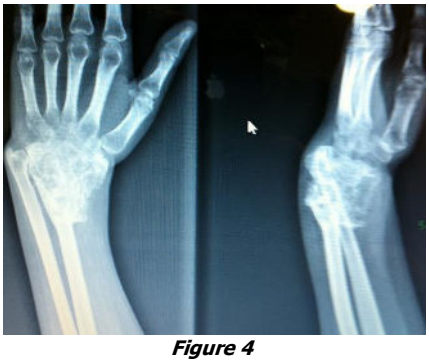

Figure 4

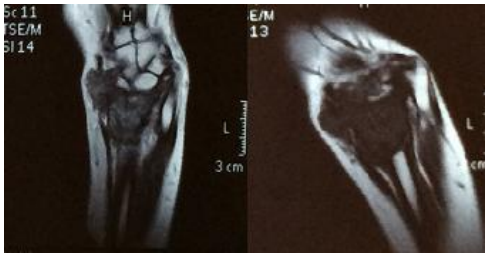

Figure 5

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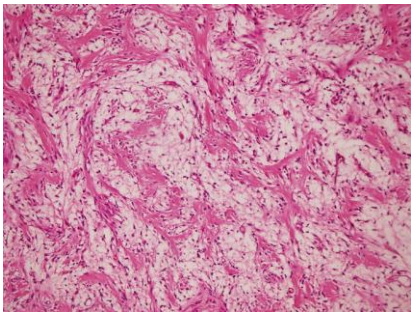

Figure 7

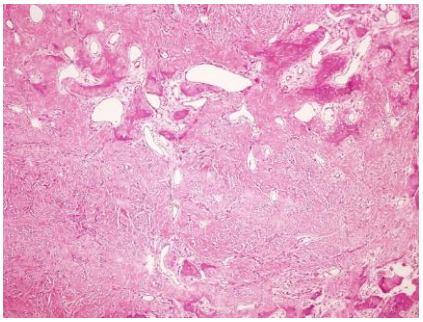

Figure 8

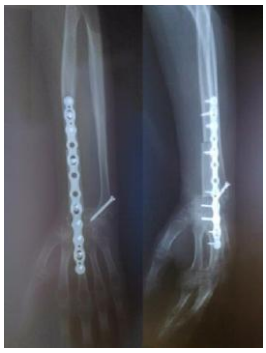

Figure 9

Results: 6 months after the operation, the graft showed union to the host and no local recurrence was present. No serious side effect of denosumab was observed in the patient. Renal functions of the patients were normal. No postoperative infection had occurred.
Conclusion: Denosumab is not only effective for difficult surgical areas at axial skeleton but also prevents unnecessary amputations in recurrent stage 3 giant-cell tumour of bone of appendicular skeleton with low morbidity.

PP-105

The use of Denosumab in Giant Cell Tumour (GCT) of bone: a review

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Giant cell tumour of bone (GCT) is a benign aggressive bone tumour that is primarily treated with surgery. Large tumours and those of the axial skeleton are associated with higher local recurrence rates and different adjuvants have been used in conjunction with detailed intra-lesional curettage to decrease the risk of tumour recurrence. GCTs of the skull and spine are particularly challenging to treat with traditional methods of surgery, radiation, and/or embolization often leading to patient morbidity or tumour progression.
Denosumab is a fully human monoclonal antibody to RANK ligand (RANKL) which inhibits the RANK-RANKL interaction needed for osteoclastic bone destruction. It has shown good response in patients with inoperable GCT in a phase 2 clinical trial. Denosumab may also be used to downstage Campanacci 3 tumours with large soft tissue extension to allow for less morbid surgery. However, important questions remain such as the optimal dosing schedule for Denosumab especially for inoperable tumours as well as the safety of the drug for long term use. We present our experience in the use of Denosumab particularly in the neo-adjuvant setting to surgery and bring forward issues with the drug's use to help define its role in the treatment of GCT.

PP-106

Sighting receptor-activator of nuclear kappaB ligand in highly active aneurysmal bone cysts

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Introduction: Aneurysmal bone cysts (ABCs) are rare benign skeletal tumors which are typically associated with a growing mass, swelling, pain and bone destruction. The current treatment option of choice for symptomatic and active ABCs is intralesional curettage followed by bone grafting. However, incomplete resectability of the lesion is a major problem resulting in recurrence in up to 20% of cases. ABCs, especially affecting the spine, sacrum or pelvis make surgical treatment crucial. Though the mechanism of bone destruction is not certain, the very recent literaure hypothetised that ABC express both RANK and RANKL similary to GCTB and that targeted RANKL therapy will mitigate ABC tumour progression. The use of Denosumab, a monoclonal antibody specifically binding receptor-activator of nuclear kappaB ligand (RANKL), which inhibits bone resorption, might be a promising treatment alternative. Our objective was to verify the target of Denosumab.
Methods: Cellular expression of RANKL and RANK was observed in freshly harvested ABC samples (n=4) in confocal laser microscopy after IRB approval. Each patient diagnosis was confirmed by an orthopaedic pathologist in combination with interpretation of radiographic imaging, histology, and cytogenetic analysis as part of a multidisciplinary musculoskeletal oncology tumor board. Formalin fixed paraffin embeded 2.5µm slides were processed to immunofluorescencestaining with monoclonal Antobodies for RANKL and RANK, additional isotype controls were included in this study.
Results: In all four ABC samples localized expression of RANK and RANKL was determined in confocal laser microscopy. Higher immunopositivity for RANKL and RANK we found in areas of stromal spindel cells, interestingly nearly no staining could be detected in osteoclast like giant cells. Overall higher RANK presence differs differentyl from lower RANKL positivity in highly active ABCs.
Conclusion: The immunofluorescence experiments in our study support the hypothesis showing expression of RANK and RANKL in stromal spindle cells in highly active ABCsbut its causal mechanisms remain to be identified in detail. These findings contribute to the idea that the RANK-RANKL signalling axis is possibly involved in ABC tumor progression and therefore denosumab might be a treatment option for ABCs- respectively more data are needed to determine ultimately its safety and efficacy to ABCs.

PP-107

Denosumab as treatment of a suspected pelvic giant cell tumor

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Introduction: Giant cell tumor of bone (GCT) is a benign tumor with highly destructive potential, rich in osteoclastic cells. The main treatment is surgical: curettage plus adjuvants or "en bloc" resection plus reconstruction. Sometimes surgery can not be performed or is mutilating. There are options as denosumab, a human monoclonal antibody wich inhibits osteoclasts' RANKL. Denosumab has a rate of stabilization or regression of the disease of 90%, and 65% of ossification.
Methods: We present the case of a 32 year old woman with pain in right hemipelvis and limb for 6 months in 2012. Radiography, MRI and CT scan showed an aggressive bone tumour in ischion and posterior acetabular wall, with large soft tissue involvement in adductors and perineum. Percutaneous needle-biopsy showed a giant cell tumor.
Given the iatrogenic potential of the surgery, other possibilities as denosumab were considered, in order to make the surgery less mutilating. The patient was treated with denosumab 120 mg / 4 weeks for 6 months with reinforcement on days 8 and 10. There was stabilization at first and regression and ossification afterwards, so a second cycle was done. Surgery was performed in 2014: resection of the ossified mass with marginal limits in the eyebrow, and wide in the rest.
Results: Hystpathological exam of the specimen showed, unexpectedly, low grade osteosarcoma. This misleading in the diagnosis was due to high quantity of osteoclastic cells and the poor rate of mitosis in biopsy. After evaluating the case in our sarcoma comitee, we decided to wait and see. At present the patient is stable with no sings of recurrence.
Conclusion: Denosumab offers an effective treatment for unresectable GCT, offering control or reduction of disease rates up to 90%, which can make them operable. Given this case, it seems also effective in other type of tumors such as low grade osteosarcoma rich in osteoclast cells. This type of osteosarcoma is difficult to diagnose and can be confused with GCT.

POSTER PRESENTATIONS SESSION VIII: Novel Therapeutics in Sarcoma: New Targets, New Agents

PP-108

Intraoperative radiotherapy in soft tissue sarcomas of the extremity. Clinical outcomes and survival rates of 39 patients after more than 10 years of follow-up

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Introduction: Intraoperative electron-beam radiation therapy (IOERT) during limb-sparing surgery has the advantage of delivering a single high boost dose to sarcoma residues and surgical bed area near to radiosensitive structures with limited toxicity. It shortens the overall radiation treatment time and allows starting external beam radiation therapy (EBRT) early. A higher local dose is expected to increase the probability of local control and to reduce toxicity rates to the healthy surrounding tissues by moving them away from the path of the radiation beam. IOERT is an excellent method to make up for dose-reduced EBRT and its adverse effects. Retrospective studies have suggested that IOERT may improve local control compared to standard radiotherapy.
Objectives: The purpose of this prospective evaluation was to show that IOERT improves local control and long-term survival rates in extremity soft tissue sarcomas and reduces radiation toxicities.
Methods: From 1995 to 2003, 39 patients with extremity soft tissue sarcomas were treated with IOERT and postoperative radiotherapy (40-60Gy). The mean following time was 11 years (0.7-19). Six patients presented with locally recurrent and 33 with primary disease. The most common histological type was undifferentiated pleomorphic sarcoma (35.9%). The surgical procedure was wide removal in 72% and marginal in 12.8%.
Results: Actuarial local control was 82%. Eighty-eight percent of the patients with primary disease and 50% with recurrent tumors were controlled (p=0.01). Patients with negative margins had a 93% local control, compared to 50% for the positive margins group (p=0.002). Extremity preservation was achieved in 82%. Thirteen patients relapsed at metastatic sites. The overall survival rate from the fifth year to the end of follow-up was 64% (primary versus recurrent tumor did not show any statistically significant influence, p=0.939) (Fig.1). Fourteen patients developed wound complications (35.9%), 3 neuropathy (7.7%) and 2 pathological fractures (5.1%). Only 13% of patients had grade <3 acute toxicity and 12% developed grade ≥3 chronic toxicity.
Conclusions: IOERT used as a boost to EBRT provides high local control and extremity preservation rates in patients with soft tissue sarcoma of the extremities, with less toxicity than EBRT alone.

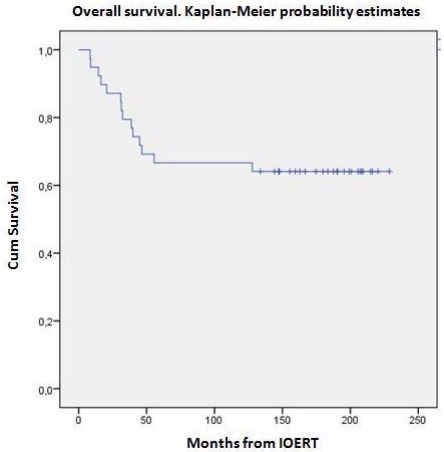

Figure 1

PP-109

Cucurbitacin F as inducer of cell cycle G2/M arrest and apoptosis in human soft tissue sarcoma cells

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Aim of the Study: Soft tissue sarcomas represent a rare group of malignant tumors that frequently exhibit chemotherapeutic resistance and increased metastatic potential. In this study, we evaluated the cytotoxic, apoptosis inducing and cell cycle arresting effects of 25-O-acetyl-23,24-dihydro-cucurbitacin F which has been isolated from leaves and twigs of Quisqualis indica. Q. indica is used in traditional Chinese medicine to treat cancer and related syndromes and also known for its anthelminthic effects.
Material and Methods: The present study investigates the effects of 25-O-acetyl-23,24-dihydro-cucurbitacin F (1) on cell viability, cell cycle distribution, and apoptotic induction of three human sarcoma cell lines of various origins by using the CellTiter 96® AQueous One Solution Cell Proliferation Assay, flow cytometrical experiments, real-time RT-PCR, Western blotting, and the Caspase-Glo® 3/7 Assay
Results: We could show that 1 reduced cell viability in a dose-dependent manner and arrested the cells at the G2/M interface. The accumulation of cells at the G2/M phase resulted in a significant decrease of the cell cycle checkpoint regulators cyclin B1, cyclin A, CDK1, and CDK2. Interestingly, 1 inhibited surviving expression significantly, which functions as a key regulator of mitosis and programmed cell death, and is overexpressed in many tumor types including sarcomas. Moreover, 1 induced apoptosis in liposarcoma and rhabdomyosarcoma cells caspase-3 dependently.
Conclusion: Our data strongly support 1 as a very interesting target for further investigation and development of novel therapeutics in sarcoma research.

PP-110

Inhibitory effects of Pazopanib during the metastatic formation in mice undifferentiated pleomorphic sarcoma and osteosarcoma

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Introduction: Pazopanib is a multi-kinase inhibitor which potently inhibits the activity of several receptor tyrosine kinases, including vascular endothelial growth factor receptor 1 (VEGFR1), VEGFR2, VEGFR3, platelet-derived growth factor receptor (PDGFR), and c-Kit. Although it is reported that pazopanib inhibits cell proliferation and survival by the regulation of tumor neoangiogenesis, there are a few reports about influences of the metastatic formation. In the present study, we investigated the anti-metastatic potential of pazopanib against undifferentiated pleomorphic sarcoma (UPS) and osteosarcoma (OS).
Methods: Tumor Cells: RCT cell: mouse spontaneous UPS and Dunn/LM8 cell: mouse spontaneous OS were used. As UPS model, high-metastatic RCT+ and low-metastatic RCT– cell clones of RCT sarcoma were obtained. As OS model, high-metastatic LM8 and low-metastatic Dunn cell clones of osteosarcoma were obtained. Endothelial Cells: Murine lung microvascular endothelial cell (MLE) was used. Reverse-transcription polymerase chain reaction (RT-PCR): Expressions of VEGFA, VEGFR1, and VEGFR2 were assessed using RT-PCR. Cell growth: To determine effect of Pazopanib, tumor cell growth was measured using MTT assay. Invasion Assay: The ability of tumor cells to invade through the MLE monolayer was measured by using a Transcell chamber with a microporous filter (pore size: 8.0 μm). The upper compartment was coated with fibronectin, and MLE monolayer was cultured. The number of tumor cells penetrating the MLE monolayer was counted by useing fluorescence microscope.
Results: In all 4 tumor cells, VEGFA was expressed, but VEGFR1 was expressed only in RCT cells, and VEGFR2 were not expressed. In RCT and Dunn cell lines, the proliferation potency was inhibited by additional pazopanib in a concentration-dependent manner. In addition, invasion ability was inhibited by additional pazopanib. The invasion ability in the high metastatic clones (RCT+ and LM8) was inhibited stronger than those in the low metastatic clones (RCT– and Dunn).
Conclusions: Metastasis is a complex process, including attachment to endothelial cells, extracellular matrix components at distant sites, and invasion into the endothelial cell monolayer and extracellular matrix components. During these processes, pazopanib inhibited the growth of tumor cells and invasiveness to the endothelial cell monolayer and extracellular matrix component.

PP-111

Targeted next-generation resequencing in pediatric osteosarcoma patients

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Background: Osteosarcoma (OS) is the most common malignant bone tumor in children and adolescents. Recent genomic analysis demonstrated that OS are characterized as a high frequency of structural variations and chromosomal copy number changes. Meanwhile, specific genomic alterations such as RB1 or TP53 have been identified, although driver gene mutation for OS tumorigenesis has yet to be found. The aim of this study is to identify specific somatic mutations in OS patients by the method of comprehensive targeted resequencing.
Patients and Methods: 13 pairs of tumor and non-tumor frozen tissues taken from the patients diagnosed as a primary conventional OS were subjected to

this study. All tumor samples were collected at the time of preoperative biopsy and confirmed pathologically the tumor cell content more than 80%. We utilized a next generation sequencing technique with the Ion AmpliSeq Comprehensive Cancer Panel (CCP) containing 409 cancer-related genes. 40 ng of DNAs were used for multiplex PCR amplification and sequencing was run on the Ion Torrent Proton loaded with PIv2 chip. Data analysis including alignment to the hg19 human reference genome and variant calling was done using the Torrent Suite Software. Obtained genomic data was validated by visualizing in Integrative Genomics Viewer and candidate mutations were annotated by wANNOVAR database.
Results: An adequate library was obtained from all samples for subsequent sequencing. Mean read length was 110 base pairs and an average coverage was approx.1500 for tumors and 400 for paired non-tumors. A total of 153 candidate non-synonymous somatic SNVs (median; 13.9 per tumor) were found with the threshold of over 5% frequency. After validation analysis and filtering process of variants, at least 12 SNVs were confirmed in 8 patients. Recurrent SNVs have not been observed among the 13 patients. There was a trend toward increased number of SNVs in dead patients comparing to alive patients (median 0 vs 1), although no significant difference was observed (P=.23, Wilcoxon test).? Pathway analysis of the candidate SNVs showed significant correlations with three gene function categories including cell cycle, ATP binding and ligand-dependent nuclear receptors ($p<0.02$). We also calculated relative copy number changes in tumors using the coverage analysis data and found at least three gene amplification on chromosome 1p, 17p and 19p.
Conclusion: We identified at least 12 non-synonymous somatic SNVs of cancer-related genes on the CCP panel in pediatric OS patients. Targeted sequencing is a useful and cost-effective tool to quickly survey known cancer-related mutations of pediatric OS.

PP-112

A rare tumor of the thigh. Inflammatory myofibroblastic tumor of the thigh

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Inflammatory myofibroblastic tumors are uncommon neoplasms; presentation of these tumors in the lower extremities is extremely rare. We present a case of a 47-year-old male with fever, fatigue and a slow-growing thigh mass. The inflammatory markers were elevated and the MR images showed a well-defined inter-muscular lesion in the inter-muscular space between the vastus medialis, the vastus intermediaus and the adductor muscles with mild heterogeneous enhancement. A CT-guided biopsy showed a moderately cellular fibroblastic / myofibroblastic lesion with features suggestive of inflammatory myofibroblastic tumor. The lesion was excised and histologic examination was consistent with an inflammatory myofibroblastic tumor.
Postoperatively, the clinical signs and symptoms regressed, while laboratory tests gradually normalized. No adjuvant treatment was given. One month later an MRI of the thigh was performed showing absence of residual tissue of the preexistent tumour. Consequently, no further treatment was considered necessary.
After 2 years of follow-up, the patient remains asymptomatic with negative laboratory and imaging tests and no signs of recurrence or metastatic disease.

PP-113

Unusual cases of extra-articular diffuse giant cell tumor of the tendon sheath

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The diffuse type of giant cell tumor of the tendon sheath or pigmented villonodular synovitis (PVNS) shows extensive involvement of the synovial membrane and capsule is often intra-articular and infiltrative. However the extra-articular diffuse type, unlike its intra-articular counterpart, is unusual and it is often misdiagnosed. The tumors are slow growing with atypical presentation, difficult differential diagnosis and higher local recurrence rate. Therefore, close follow-up is recommended after tumor excision.
We present 2 cases of extra-articular diffuse variant giant cell tumor of the tendon sheath. One was located at the elbow of a 68-year-old woman and the second at the dorsum of the foot of a 56-year-old man. The patients presented with a palpable mass. MRI showed an ill-defined extra-articular mass with low signal intensity on both T1- and T2-weighted images that may involve and erode the bone. Marginal excision was done; histological sections confirmed the diagnosis of extra-articular giant cell tumor. No adjuvant therapy was administered. At the last follow-up, 24 months after diagnosis and treatment, none of the patients experienced local recurrence of their tumors.

POSTER PRESENTATIONS SESSION IX: Spine and Sacral Tumors

PP-114

Qualitative outcome after surgical treatment of patients with spinal bone metastases a prospective study

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Study Design: This prospective cohort study describes quality of life of a single center cohort of patients who were surgically treated for spinal bone metastases.
Objective: To describe the quality of life preoperatively and at follow-up, assessed with the EQ-5D.

Summary of Background Data: The role of surgery in the treatment of spinal bone metastasis is controversial. Many papers describe neurological outcome and survival after surgical treatment of spinal bone metastases. The quality of life of these patients, however, is rarely investigated.
Methods: Prospective cohort study. Quality of life was assessed using the EQ-5D.
Results: Of 41 patients included, sixteen (53% of survivors) had complete data at their first follow-up (median 2.0 months). Eleven patients (27%) died within 3 months after surgery. The overall median survival was 5.6 months. Patient mobility was improved directly after surgery, 11 patients were no longer confined to a wheelchair or bed-ridden. Karnofsky performance status, the Frankel score, urinary sphincter control and pain intensity did not change significantly compared with the preoperative scores. Fifteen patients completed EQ-5D questionnaires both preoperatively as well as at first follow-up. The mean preoperative EQ-5D score for this subgroup was 0.69 ± 0.08; the mean EQ-5D score at follow-up was 0.69 ± 0.07 (p=0.62).
Conclusions: The survival of the majority of our cohort was limited (median 5.6 months), which reflects the prognosis ofthese often terminally-ill patients. In this respect, more emphasis on quality of life in patients withspinal bone metastases is warranted. The EQ-5D scores remained equal comparing pre-operativewith follow-up data in those patients with complete follow up. This could either mean that the quality of life did not alter or that EQ-5D is not the best assessment for this patient category.

PP-115

Primary vertebral leiomyosarcoma: double lumbar one time en bloc spondilectomy

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Introduction: Primary vertebral tumors are a rare entity that can pose diagnostic and management challenges. Diagnosis is difficult and often delay an adequate treatment, even it is not easy to perform when a curative treatment is still possible.
Methods: A sixty-four- year-old female presents low back pain irradiated to the hip and the thigh with 5-6 months of evolution without previous trauma. She only has been operated of a uterine myoma five years ago. There were not relevant injuries at simple X-rays. At the MRI, it informed about an expansive osteolytic lesion on L2, L2-L3 disc and superior plateau of L3. Biopsy of the lesion was done. A primary vertebral leiomyosarcoma moderately differentiated was described. Some slices of previous uterine myoma were reviewed excluding metastatic disease. As a surgery was initially desestimated, radiotherapy cycle was completed as cytoreductor treatment. The size of the tumour decreased on MRI, therefore we decided to operate. A total lumbar en bloc spondilectomy L2-L3 and L2 rooth resection were performed. First, we utilized a posterior lumbar standard approach to do a T12-S1 vertebral instrumentation, resection of posterior elements of the vertebra, and protection of spine cord with cortical tibial allograft. Intervertebral spaces L1-L2 and L3-L4 section were done too. Posteriorly, a left lateral lumbo-toracotomy was performed to extract L2-L3 vertebral corps together. A two level cage filled of allograft and the 10th rib of the patient reinforced by a lateral bridge plate was implanted across the lumbotoracotomy. Osteoporotic T10-T11 fractures occur 4 month after surgery. They were resolved by percutaneous cementation. One year after surgery, patient is totally independent. She can walk without any help. She has an Owestry Score for lumbar pain of 20%, and Visual Analogic Scale of 2 with daily activities. She remains free of sickness in the last clinic control.
Conclusions: Primary vertebral leiomyosarcomas are extremely rare. Vertebral tumours are a challenging entity. Double vertebral spondilectomy is a reproducible method to treat tumours affecting two lumbar vertebras with good results, even when some complications can occur.

PP-116

Treatment of spinal and sacral Ewing Sarcoma/PNET with EURO EWING 99 in adults

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Objective: To examine the efficacy of an intensified induction regimen (EURO EWING 99) in patients with Ewing's family of tumors (EFT) with spinal and pelvic localisation.
Patients and Methods: We retrospectively analyzed data from treatment records for ten male and five female patients treated between June 2007 and July 2012 .Median age was 26 years (19 to 57 years). Seven patients entered the study with low performans status (less than PS 3). Eight patients had primary tumor localized on sacrum and pelvis, seven patients had primary tumor of the spine. Five patients had metastatic disease, four lung metastases and one with the breast metastasis, at the time of diagnosis. Our plan was to treat all patients according to EURO EWING 99 protocol with six cycles of VIDE as induction therapy. All patients with achieved complete response (CR) were treated with radiotherapy of the tumor bed or at residual tumor in partial response (PR) or debulking surgery was performed. After local treatment, therapy was continued with VAI therapy, six to eight cycles.
Results: Three patients did not complete all six cycles of VIDE (one because of disease and two because of hematological toxicity) and never underwent local treatment. Response rate was 75% (nine CR and 3 PR) according to RECIST criteria. One patient had progression of disease during therapy with development of metastatic disease. Overall time to progression was 35.7 months (95% CI 18.3.1-53.3). Overall survival was 43 months

(95% CI 26.1-60.00) with six patients still alive.
Conclusion: This analysis suggests that EURO EWING 99 is an effective induction regimen in treatment of non resectable Ewing sarcoma of pelvis and spine. Inspite initially good response, most of the patients experience relaps of disease. This regimen, although effective, still cannot overcome adverse prognostic factors (axial localization and inability to perform adequate local treatment). We also need better diagnostic procedures in detecting residual disease.

PP-117

Chordoma dedifferentiated to osteosarcoma: two consecutive cases and literature review

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Introduction: Chordoma (CHO) is a rare, slowly growing, malignant neoplasm that arise from embryonic notochordal remnants. It accounts for 17.5% primary malignant tumors of the axial skeleton, arising from sacrococcygeal region (50%) and mobile spine (15%).
In less than 5% of cases, CHO contain highly malignant sarcomatous component. Little is known of their clinical feature and treatment options.
Methods: A retrospective review, out of a prospective database, found 2 patients with diagnosis of "CHO dedifferentiated to osteosarcoma (OGS)". Both the patients were submitted to exhaustive studies, and computed tomography CT-guided biopsy was done. Histopathological and immunohistochemical strains were done on the all specimens.
Results: Two cases of spinal "CHO dedifferentiated to OGS" are reported. Both patients had a first biopsy diagnostic for CHO, atypical features on MRI, showing two different areas within the lesion: a reduced signal area and a hyperintense component on T2-weighted images. Histopathological analysis on repeated CT-guided biopsy specimen (case 1) and on en bloc excised gross specimen (case 2) was diagnostic for "CHO dedifferentiated to OGS". In one case, adjuvant chemotherapy was given, followed by en bloc resection and carbon-ion therapy (case 1). Both patients are not evidence of disease (NED) at more than 30 months of follow-up.
Conclusion: Dedifferentiated CHO is distinguished from "CHO with sarcomatous transformation" because of a sharp demarcation of the sarcomatous elements and a lack of transitional features between a conventional CHO and a high-grade OGS component.
A literature review found 2 cases of "CHO dedifferentiated to OGS", both located in the sacrum. One was diagnosed as it in the primary lesion and local recurrence and metastases were composed exclusively of conventional CHO, while the other was CHO that showed metastases (pulmonary and brain) on appearance of OGS. Local control of primary tumors is important for survival in "CHO dedifferentiated to OGS". Pathological analysis remains the gold standard for definite diagnosis, and MRI and FDG-PET guided biopsy can be useful to obtain an adequate sample in suspect of a dedifferentiated disease. Treatment of "CHO dedifferentiated to OGS" must include chemotherapy first, followed by en bloc resection or carbon-ion treatment.

PP-118

Surgical treatment of sacral tumors

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Background: Newly diagnosed malignant tumors of bones are localized in pelvic bones with the rate of 10-15%. Chondrosarcoma (30%), Ewing's sarcoma (21%), osteosarcoma (7-10%) and giant cell tumor (6%) are the most common morphological forms of pelvic tumors.
According to L. Whittaker, sacrum tumors are very rare. The feature of such tumors is severe clinical course of the disease. Frequently, tumor of sacrum is diagnosed in advanced stages and surgical treatment is usually performed in non-oncological clinics, which causes frequent relapses and worsens prognosis of patients. Sacral tumor resections are one of the most traumatic surgical interventions in oncological orthopedics.
Purpose: To prove the fundamental possibility of high sacral resection performance with satisfactory functional results.
Material and Methods: 6 patients with sacral tumors were examined and treated in Tashkent regional oncology center from 2010-2014. High level (S-II) sacrum resection was performed in 5 cases. 1 patient underwent sacral bone resection with cement replacement of defect. Medical examination, including X-ray, MRI, CT angiography and 3-D modeling of affected area, CT of lungs, whole skeleton bone scan, ultrasound of affected area and regional lymph nodes and morphological verification was performed for determination of tumor prevalence. Treatment tactics and surgical intervention volume were selected by multidisciplinary team. Neoadjuvant chemotherapy was used in 1 (16%) case. Chemoembolization of deep iliac vessels 48 hours prior to surgery due to large size of the tumor was done in 1 case (16%). According to generally accepted principles of sacrum resection, it was performed one sacral segment above the rostral border of tumor. All operations were performed using posterior approach.
Results: Termination of pain was observed in 32% cases, lower paraplegia in 39% cases, paraparesis in 39% cases, full recovery of motor activity and sensitivity in 21% cases and recovery of pelvic organs functions in 50% cases.
Conclusion: Resection of sacrum affected with neoplastic lesions improves the quality of life by eliminating pain. It also improves the neurological status as the operation decompresses and leads to restoration of pelvic organs functions and lower limbs, which shows the advisability of surgical treatment in this group of patients.

PP-119

Inflammatory myofibroblastic sarcoma sacrum – Case report

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Myofibroblastic tumors are tumors arising from soft tissue myofibroblasts, cells that share ubiquitous ultrastructural characteristics of muscle and fibroblastic cells. Vasudev and Harris described a malignant aspect of these benign tumors in 1978. Most of the reported cases of myofibroblastic sarcoma arose in the head and neck and soft tissues of the extremities. There are few previous reports on primary myofibroblastic sarcoma of the bone in the literature.
Case Report: Patient MN, 66, male, came to our service complaining of pain in the gluteal region left with six months of evolution, associated with ipsilateral paresthesia. Requested imaging, x-ray initially with suspicion image sacral area, and later MRI revealed solid mass lesion in the sacrococcygeal transition, obliterating virtually the entire spinal canal, extending to soft tissues. Biopsy site that showed spindle cell proliferation with collagen areas consistent with inflammatory myofibroblastic sarcoma sacral area. Sacralectomia surgery performed while maintaining root S1 and S2 to the left to the right. The patient developed wound infection and dehiscence, subject to protective colostomy and surgical dressings. Showed improvement of the local infection, and then carried to the vacuum dressing for approach lips, granulation and preparation of the wound bed, when it was performed vascularized flap of buttock rotation with complete wound closure.
Objective: The objective of surgery is effectively prolong tumor progression free survival and improve quality of life and patient function.
Discussion: We present this case by the rarity and challenge diagnosis of a pelvic mass with clinical and radiological findings mimicking malignant tumors, which, in reality, these were a benign myofibroblastic tumor and should, therefore, be considered in the differential diagnosis of tumors initially investigated is inconclusive. The ideal treatment for primary myofibroblastic sarcoma bone remains uncertain because of the rarity of this entity. Wide resection with clear margins seems desirable, but it depends on the tumor location and the local anatomy.

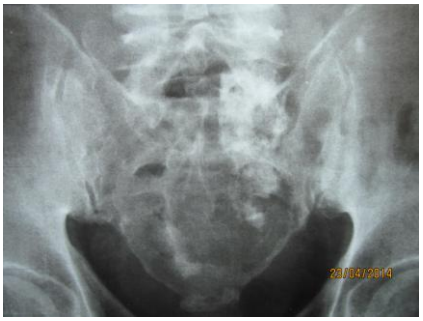

Figure 1. *X-ray*

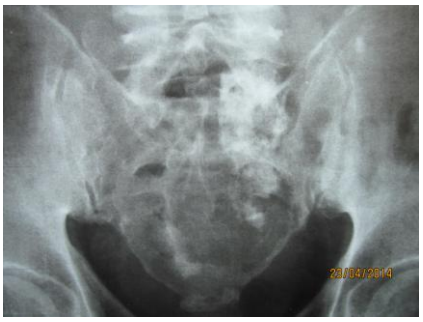

Figure 2. *MRI*

Figure 3. *T-saw*

PP-120

Langerhans cell histeocytosis (LCH) of the sacrum: report of two cases

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Introduction: Langerhans cell histiocytosis (LCH), also called eosinophilic granuloma of bone, is a relatively rare disorder of unknown etiology, probably arising from circulating myeloid dendritic cells. It is most common in children 5 to 10 years of age. LCH can involve any of body tissues. The occurrence of LCH in the sacrum is extremely rare.
Purpose: To report two cases of isolated LCH sacral lesion in pediatric patients who managed conservatively.
Materials and Methods: Two cases review.
Conclusions: Both of them are <5 years old and were managed conservatively. LCH location and number of lesions determine its mortality/morbidity potentials.

PP-121

Thermoablation in osteoid osteomas of the spine – The challenge

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Introduction: The typical pain of the Osteoid osteoma (OO), is nocturnal and often relieved by the use of salicylate analgesia. It is a self-limited disease but can persist for several weeks, months or even years. OO affects the spine in 10 to 25% of the cases and especially the posterior elements, inducing painful scoliosis and

muscle spasm.
The diagnosis may be hard, and imaging through CT scan and MRI are essential.
The exact location of the "nidus" through imaging technics is very helpful especially when considering it is often hard to identify during surgery. This particular aspect, allied with the benefits of a minimally invasive approach, have been responsible for percutaneous radiofrequency ablation under CT guidance to be used with increasing frequency.
The proximity to the neurological structures however has been seen by many as a limit to this approach. With this in mind new techniques have been described with injection of gas or a refrigerated liquid in the epidural space as a protective barrier between the nidus and the spinal cord.
Objectives: Report our experience in treating Osteoid osteomas of the spine as well as the use of new techniques to perform thermoablation near neurological structures.
Methods: Revision of the literature concerning OO of the spine. Report of 8 cases of OO of the spine treated successfully in our Hospital. 4 of the cases were treated with thermoablation (vertebral body of D8, pediculum of L2, pediculum of L4, second sacral vertebra) and 4 cases underwent surgical resection (pediculum of L2, lamina of L2, lamina of L3, superior articular facet of L4).
One of the patients that underwent thermoablation was also submitted to gas injection in the epidural space because of its proximity to neurological structures.
Post-operatively he initiated an aseptic meningitis syndrome that has solved after 4 days.
Results: All patients refer complete relief from the nocturnal pain, proving the efficacy of both methods. One of the patients was submitted to an unilateral posterior pedicular instrumentation that caused some discomfort in the late follow up. Other minor complications were solved without sequels to any of the patients.
Conclusions: Complete resection although historically considered treatment of choice for OO with very good success rates, can present complications. To minimize surgical damage a precise location of the nidus is crucial.
Percutaneous radiofrequency ablation under CT guidance is both efficient and safe being less invasive, performed under local anesthesia and allowing for a faster recovery, lower costs and shorter hospital stays.
The post operative complications are similar in both methods.
New protective techniques allow thermoablation of OO located near neurological structures with increased confidence and safety.

POSTER PRESENTATIONS SESSION X: Computer-Assisted Navigation and Musculoskeletal Tumor

PP-122

Navigated complex bone tumor resections in the hands of non-tumor surgeons – A skill translation study in sawbones

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Objective: To assess the accuracy achieved by non-tumor surgeons, of different levels of training, using navigation for the first time to aid guide a complex bone tumor resection.
Methods: Using a novel navigation system and 3-dimensional (3D) planning tool we navigated bone cuts to resect a bone tumor. The system includes a prototype mobile C-Arm for intraoperative cone-beam CT, real-time optical tool tracking (NDI Polaris), and 3D visualization software. 3D virtual views and color coded real-time guidance visual scales were utilized to guide navigation. A posterior distal femur parosteal sarcoma saw-bone model identical to actual patient scenario was used.
Fifteen non-tumor orthopaedic surgeons (5 staff surgeons, 5 fellows and 5 residents) were compared to three tumor surgeons.
Results: The mean distance from plan to actual entry into bone was 1.5mm (SD 1.4) for all users. The mean difference in pitch and roll between the plan and actual cut was 3.5 degrees (SD 2.8) and 3.7 degrees (SD 3.2) for all users. There was no significant difference between surgeons based on their levels of experience with regard to accuracy of the actual bone cuts compared to the plan. There were 2 intralesional cuts out of 144 navigated cuts in 18 resections. The mean time to complete the resection was 30 minutes (range 17-44).
Conclusion: Navigation to guide complex resection of bone tumors is accurate and feasible. 3D views andvisual scale guidance should be used for improved accuracy. The level of surgeon training did not influence the accuracy of the bone cuts when guided by navigation.
Clinical Implication: Navigated resection of bone tumors can reduce the rate of positive margin resection and lower the local recurrence rates while sparing function in surgeons of all levels of training thereby increasing safety.

PP-123

Is there a role for computer assisted skeletal reconstruction in musculoskeletal oncology?

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Introduction: In recent years there has been a significant trend towards limb salvage surgery in musculoskeletal oncology. The primary goal is always to achieve satisfactory oncological margins, however, following this achieving optimum functional outcome is also important. This can be particularly difficult following the resection of pelvic tumours and in complex diaphyseal or geometric osteotomies. The use of computer assistance in resection of musculoskeletal tumours is gaining popularity, and has been shown to improve accuracy of resection and reduce local recurrence rates. We describe a unique use of the navigation system to optimise osseous reconstruction following resection, where it can help to

optimise implant orientation and in achieving accurate limb length and alignment.
Methods: We resected musculoskeletal tumours in eight patients using commercially available computer navigation software (Orthomap 3D) and subsequently used the navigation system to aide in osseous reconstruction. The four pelvic tumours were reconstructed with 'ice cream cone' prosthesis. Four diaphyseal tumours underwent endoprosthetic or biological reconstruction.
Results: Histological examination of the resected specimens revealed tumour free margins in all cases. Post-operative radiographs and CT show reconstruction as planned in all cases. Pelvic accuracy was assessed with both hip centre and limb length, all cases within five mm of pre-operative alignment, and clinical measurement of true and apparent leg lengths also within five mm. In the diaphyseal cases limb length was comparable to the contralateral side to within five mm and clinically limb lengths were equal. Radiological assessment of alignment was accurate to within ten degrees in all planes and clinically there was no apparent rotational malalignment in any case.
Conclusion: The use of computer navigation in musculoskeletal oncology allows integration of local anatomy and osseous alignment to aide in accurate osseous reconstruction. Our experience so far has been encouraging. We would recommend its consideration for musculoskeletal oncology surgeons currently using computer assistance in tumour resection.

PP-124
CT data evaluation of proximal femur malignant tumors

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Goal: The second place of malignant bone tumors localization is proximal femur (about 15%). This is a most frequent zone for metastatic lesions (more than 25%).
The main goal of this study is analyze of CT scans bone and soft tissue changing of patients with proximal femur malignant tumors for correct surgical planning and assessment of limb salvage surgery possibility.
Materials and Methods: Researches of results CT images of 54 patients with malignant tumors of proximal femur have been conducted. Male were 32 (59,3 %) and female were 22 (40,7 %). Middle age was 50,59 ± 16,80 years. Femur pathological fracture has been noted in 27 % of cases (15 patients). Studying axial CT scans was spent at 3 levels - a top of the trochanter major, a zone of a trochanter minor and a proximal diaphysial part.
Results: The basic data of CT images which have been studied, it is volume of tumor lesion of a femur, presence of soft tissue tumor component, the size and spread of soft tissue tumor component. 3 zones of soft tissue tumor lesion - one-zone (proximal, median and distal), two-zone (proximal and distal) and three-zone (total defeats) have been allocated. In a spread direction of an extrabone tumor component the forward-lateral type, back-lateral type, medial and circular types of tumors has been defined. As 4 levels of spread soft tissue tumor component - 1 level (0 %-10 % from hip volume), 2 level (11 %-20 % from hip volume), 3 level (21 %-30 % from hip volume) and 4 level (40 %> from hip volume) have been defined. According the basis of this data working classification of spread soft tissue tumor component of proximal femur has been created.
Summary: CT examination allows to do exact estimation of tumor process spreading to the bone. The developed classification gives the chance to define surgery volume on proximal femur tumor removal, to formulate correct indications for limb salvage surgery and to improve bone and soft tissue reconstruction techniques for proximal femur lesions.

POSTER PRESENTATIONS SESSION XI: Complications in Sarcoma Treatment; How to Avoid and Treat

PP-125
Osseous integration of silver-coated orthopedic prostheses – An animal model

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Introduction: Periprosthetic infection of orthopedic (mega-) prostheses still is to be seen as a common and serious complication in orthopaedic oncology. The efficiency of silver-coated orthopaedic (mega-) prostheses in reducing these infections has been proven but is limited to surface areas exposed to soft-tissues at present. This is due to concerns regarding possible inhibition of osseous integration of cementless stems by silver ions. In this study osseous integration of silver-coated stems has been evaluated in a canine model.
Methods: Nine healthy female beagle dogs underwent unilateral total hip replacement using a custom made physical-vapor-deposition (PVD)- silver-coated titanium alloy stem in addition with a cemented polyurethane cup and a modular head each. Follow up was about 12 months including clinical assessment, blood count, blood chemistry, c-reactive protein, metal ions and x-rays. After sacrification biomechanical testing as well as histological examinations and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) of the prosthesis-bone-interface were carried out.
Results: Stable osseous integration had been achieved in four out of nine stems implanted. Silver trace elemental concentrations in serum did not exceed 1.82 parts per billion (ppb) and can be considered as non-toxic. Changes in liver and kidney functions associated to the silver-coating could be excluded by blood chemistry analysis. This was in accordance to very limited metal displacement from coated surfaces observed by laser ablation inductively coupled plasma mass spectrometry

(LA-ICP-MS) 12 months after implantation.
Conclusion: Our study reports about a PVD (physical-vapor-deposition)-silver-coated cementless stem in a canine model for the first time and proved osseous integration of a silver-coated titanium surface in-vivo in principle. The occurrence of reduced secondary stability or loosening is subject to further investigations. Our results represent a step towards complete bactericidal silver-coating of orthopaedic prostheses.

PP-126

A new safe radiotherapy induced microvascular fibrosis animal model

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Introduction: Neoadyuvant radiotherapy treatment of soft tissue sarcomas is associated with higher peroperative complication rates possibly due to fibrotic changes in local tissue microvasculature.
Objective: Create a new safe experimental model of neurovascular fibrosis induced by radiotherapy with reduced morbidity and mortality compared to previous models.
Methods: Animal model: 72 Sprague-Dawley rats of 350-400 g. Group I: control group, 24 rats clinically evaluated during six weeks. Group II: evaluation of acute side effects, 24 rats irradiated (20 Gy) clinically evaluated for two weeks. Group III: Evaluation of subacute side effects, 24 rats irradiated (20 Gy) evaluated clinically for six weeks. The variables evaluated include clinical assessment, weight, vascular permeability (arterial and venous), survival / mortality and histological studies.
Results: No statistically significant differences between groups in clinical assessment, weight and vascular permeability. Statistically significant differences between groups (I vs. II-III) in survival and histological changes.
Discussion: The designed model induces selective fibrosis by radiotherapy in the neurovascular bundle without histological changes affecting the surrounding tissues. Rat body weight showed a progressive increase in all groups and the mortality rate of the presented model is 10.4% compared to 30-40% of the previous models.
Conclusions: The model designed induces selective fibrosis by radiotherapy in the neurovascular bundle without histological changes affecting the surrounding tissues decreasing morbidity and mortality rates. This model will allow conducting new therapeutic experimental studies on the effects of radiotherapy in cervical neurovascular bundle.
Keywords: Experimental rat model; Radiotherapy; Microvascular; Fibrosis

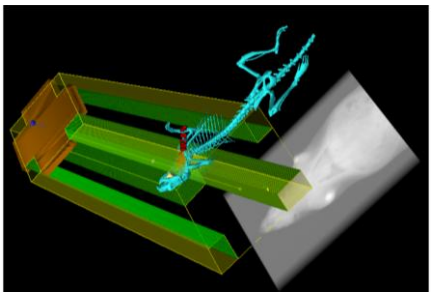

Figure 1

PP-127

Aggressive surgical approach in the treatment of pelvic girdle tumor

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Introduction: To study the treatment results of the patients with local-spread tumours of skin, bones and soft tissue of pelvic girdle, who had crippling operations.
Methods: Interiliac amputation-hemipelvectomy was performed in 51 patients with local spreading skin tumour, soft tissue and the bones of pelvic girdle. Men were 40 (72,5%), women-11 (27,5%). Patients were at the age from 16 to 53, average age-35. Tumour was localized in 21 (41,2%) patients in proximal part of thigh bone, in 20 (39,3%)-in bones and soft tissue of pelvis, in 2 (3,9%)-in soft tissue of gluteal region, in 4 (7,8%)-in soft tissue of the thigh and inguinal region and in 4 (7,8%)-in inguinal limphnodes with infiltration of pelvis. In 6 cases giantcellular tumour was malignant, 10-osteogenic sarcoma, 12-chondrosarcoma, 5-sarcoma of Yung, 4-rabdomiosarcoma, 4- fibrosarcoma, 2-polymorpcellular sarcoma, and 1-angiosarcoma, 1-leyomisarcoma, 1-sinovial sarcoma, 4-metastasis of skin cancer in lymphatic nodes and 1-metastasis in thigh bone. On the basis of complex examination, which included: clinical-rontgenological, ultrasonography with dopplergraphy, CT and MRI the tumour volume and degree of spread on the surrounding tissue were determined. The tumour volume varied from 980 to 5250 cm3. The invasion in organs of small pelvis was a contraindication to the surgical intervention. Exarticulation of lower extremities with thigh girdle was performed in all patients. The average duration of the operation-3 hrs 10 min (2 hrs 25 min-4 hrs 15 min), average blood loss -1,3 liters (0,8-2,2 liters).
Results: The patients were observed for 1-12 years. In post operative period secondary healing of wound were noted in 6 patients, hernia developed in remote term during the observation period in 1 patient. Relapse of tumour in 6 patients (11,7%), remote metastasis- in 14 patients (27,4%), relapse and metastasis in 2 patients (3,9%) were detected. Three and five year survival-44,5% and 35% respectively.
Conclusion: Therefore, the aggressive surgical approach, which includes interiliac- abdominal exarticulation, in local spreading tumours of thigh girdle is justified, relieves the patient's state, and gives the possibility for conducting further treatment and prolongation of patient's life.

PP-128

Liposarcomas: a retrospective study in an orthopaedic department

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Introduction: Liposarcoma is one of the most common types of soft tissue tumors in adulthood. The peak incidence is between fouth and sixth decade of life. Usually located on the extremities and retroperitoneum.
They are subdivided into 5 histologic types: well differentiated, myxoid, pleomorphic, dedifferentiated (mixed) and round cells.
Objectives: Retrospective study of liposarcomas treated in a single institution between 2004 and 2013, attended to the histological classification, localization, adjuvant treatments performed, survival, recurrence and average age at diagnosis.
Methods: 22 cases of liposarcomas with an average follow-up of 5.5 years (0.5 - 9.8years), having excluded 1 case (pleomorphic type) for no follow-up after surgery. The mean age was 54 years (27-78Y), with 12 male patients.
Regarding location, 11 were found in the lower limb (8 in thigh, 1 in the knee, 1 in leg and 1 in foot), 6 in the upper limb (2 in peri-scapular region, 3 in arm and 1 in forearm) and 4 in the pelvic region. 18 patients were treated with adjuvant radiotherapy.
As to histological classification, were identified 10 liposarcomas well-differentiated, 6 myxoid, 3 pleomorphic and 2 dedifferentiated.
Results: The resection margins were free of tumor in all cases, except in one, which was required reintervention for enlargement of the margin. There were 4 recurrences, which 1 led to death and another led to a limb amputation. The remaining 2 were treated successfully with new enlarged excision. No registration of infections, but 1 of the cases complicated with a pathological fracture of the proximal femur after radiotherapy treatment. No metastasis lesions registered.
The average survival was 65.4M. Musculoskeletal Tumour Society scoring system (MSTS) is 23.5.
Conclusions: About 24% of liposarcomas occur in the limbs. Histological subtype is a predictor of prognosis as well as complete surgical excision (margins). In this series the results are considered good, since there was an adequate margin excision in almost all cases, and also because there was a high percentage of lipossarcomas with a low-grade of malignancy (16 cases). In 2 of 5 cases of high-grade liposarcomas there have been recurrences (with limb amputation in one, and death in the other).
Adjuvant treatments such as radiotherapy are variable, and their benefits also discussed in the literature. Radiation is associated with high surgical wound complications, and in our study occur a pathologic fracture after radiation therapy. The use of these treatments should be discussed individually in group consultation for oncological patients. In our series 86% of patients were treated with radiotherapy.
As final conclusion the authors would like to refered that the main potential curative treatment of liposarcomas is a complete resection of the lesion. Complete resection of lesions and histological subtypes of low-grade malignancy are highly correlated with a favorable prognosis.

PP-129

Rescue treatment of soft tissue sarcomas

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Objectives: Soft tissue sarcomas are a heterogeneous group of malignant tumors that are up to 40% treated as benign tumors, so inadequate resections are performed at first. The aim of this paper is to review the experience of our center in rescue treatment of these tumors.
Material and Methods: A retrospective study (2000-2013) of patients referred to the Musculoskeletal Oncology Unit of Hospital Clinico San Carlos diagnosed of soft tissue sarcoma.
The inclusion criteria were having received initial treatment without adequate resection margins. Mean follow up was 38 months. The sample included 25 patients (64% women) of mean age 57,5 years. 18 (72%) consulted for tumoral appearance, and 7 (28%) had associated pain. 6.3 cm was the average size of initial lesions; 13 (52%) of them located in subuctaneous tissue. All of the patients, after medical decision made in multidisciplinary session, were histologically typified, studied with MRI for local disease and PET-CT for extension.
Seven leiomyosarcomas, three synovial sarcomas, three malignant fibrous histiocytomas, two myxoid chondrosarcoma, two myxoid liposarcoma and 8 others. 19 of these tumors were grade 2-3. None had metastases at start.
Results: We performed salvage surgery in all of the patients: 20 (80%) expanding edges and 5 (20%) en bloc resection. Only two did not get free edges after salvage surgery due to their negative to perform a radical removal as needed. 17 (68%) received adjuvant chemotherapy and / or radiotherapy. 6 (including two who refused amputation) developed local recurrence, requiring reoperation, two of which finally underwent amputation. 6 (24%) patients had metastases and 3 (12%) died during follow up.
Conclusion: Classically, tumors located in surface levels, <5cm and not painful, have been considered with low risk of malignancy. However, in our sample 12 patients had tumors smaller than 5 cm, 13 were subcutaneous and 18 did not associated pain. Revising those criteria may be needed. Both the diagnosis and treatment of these tumors should be carried out by reference and multidisciplinary centers, since the type of initial resection involves the long-term outcome and affects life expectancy of these complex patients.

PP-130

Elution characteristics of the Stanmore silver coated prosthesis: a preliminary study

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Introduction: Deep infection is a significant complication after endoprosthetic replacements for bone and soft tissue tumours. Silver coating of the prosthetic surface has been shown to reduce the risk of infection. Questions remain with regards to the Stanmore silver coated prosthesis; how much of the silver elutes into the joint cavity and how much silver remains after a certain period.
Methods: 40 samples of joint fluid from around silver coated endoprosthetic replacements of 21 patients were analysed for silver ion levels and correlated with time and volume of joint fluid.
Results: An average of 22ug of silver was eluted 90 hours after implantation of the silver coated prosthesis achieving levels of up to 170ppb at 96 hours.
Assuming a linear trend, a prosthesis with the maximum 6mg inventory of silver coating would exhaust this in 28 months. Joint fluid silver ion levels were extrapolated to be below 10ppb by 18 months from initial implantation. No symptoms of silver toxicity were documented in the patients analysed.
Conclusions: Analysis of joint fluid from around Stanmore silver coated prostheses has shown levels of silver ions up to 18 months from initial implantation.

PP-131

Multimodal analgesia for prevention of chronic post-surgical pain after orthopaedic oncology procedures

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Introduction: Orthopaedic oncology procedures commonly lead to chronic post-surgical pain, with a significant impact on patients' quality of life. The aim of this prospective study was to assess the efficacy of a multimodal preventive analgesic regimen applied perioperatively, as for prevention of chronic post-surgical pain and improvement in patients' quality of life and functional status.
Methods: Patients undergoing an orthopaedic oncology procedure were prospectively studied. Preventive analgesia included the administration of gabapentin 300 mg and duloxetine 30 mg the day before surgery (12 and 18 hours preoperatively), in addition to intravenous ketamine 0.25 mg/kg intravenously immediately prior incision. Regional anesthesia was additionally applied whenever possible (epidural or peripheral nerve blockade) and continued postoperatively up to the 3rd postoperative day. Gabapentin (300 mg BID) and duloxetine (30 mg OD) were continuously administered, up to the 10th postoperative day. Assessment included pain intensity (NRS 0-10), presence of neuropathic pain (S-LANSS scale) and quality of patients' life (EQ5D) preoperatively (baseline) as well as at 3 and 6 months postoperatively. Statistical analysis was performed using paired t-test ($p<0.05$).
Results: Thirty six patients were studied, aged 54±15 years. Six patients developed chronic post-surgical pain diagnosed as NRS ≥ 4/10 at 3 months, and only 4 patients at 6 months. Only 1 patient had neuropathic pain at 3 months, and 2 patients at 6 months, diagnosed with S-LANSS score >12, all with amputation procedures. A significant reduction was observed in neuropathic pain scores at 3 and 6 months postoperatively compared to the preoperative values. Quality of life was not different, but functional status slightly deteriorated at 3 and 6 months.
Conclusions: Multimodal preventive pain management of patients undergoing orthopaedic oncology procedures seems to decrease the development of chronic post-surgical pain and the presence of neuropathic pain, 3 and 6 months postoperatively.

PP-132

Long term not-site related complications for biological reconstructions in children

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Introduction: Biological reconstructions have excellent functional results in children (6-12 years) and represent a reliable alternative to megaprostheses for limb salvage in musculoskeletal tumours. Though some long-term complications (limb length discrepancy and/or deformity) are reported in Literature. No one directly reported scoliosis with related potential complications. The aim of the study is to analyze these complications in children.
Methods: A Literature review was performed looking for related complications. An analysis of the case series of a reference centre for musculoskeletal pathology was conducted. Age at diagnosis, follow up (local recurrence, survival), survival of the reconstruction, not-site related complications (type, time, solution adopted) were evaluated.
Results: 50 children (6-12 ys) have been surgically treated in an Italian reference centre (period 2008-2013). 20 biological reconstructions (allograft, allograft+free fibula, free fibula alone, allograft prosthetic composite) have been performed for benign or malignant musculoskeletal tumours (age range 6-12, mean age 9.5 ys). Two non healing at bone-allograft interface, 1 allograft fracture (treated with a new diaphyseal allograft plate and screws), 6 varus-valgus limb deformity (3 of them treated surgically: 1 minimally invasive plate and 2 external fixator corrections), 4 limb lenght discrepancy

with secondary scoliosis were observed. No infection were reported. Follow up range 24-72 months. No local recurrence or death of disease at last follow up evaluation. 1 child died for other causes.
Conclusion: Long-term site related complications of biological reconstruction are well described in Literature and should always be considered before and after surgery. Even though these complications can be considered acceptable compared to the ones of other reconstruction techniques (infection, number of surgeries, prostheses breakage or loosening, ...) they should be thoroughly discussed with the parents and the little patient. Scoliosis and other non-site related complications should be considered and managed as well. An international consensus for reconstructive techniques would be desirable.

PP-133

Preliminary results in silver-coated mega prosthesis in two-stage revision for periprosthetic joint infection in tumor reconstruction

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Introduction: Periprosthetic joint infection (PJI) in tumor reconstruction is the most serious non oncologic complication. The incidence of infection in mega prostheses has been reported 10%. Two-stage revision is practiced to treat chronic PJI. Silver-coated mega prosthesis has been introduced in the management of revision surgery due to infection and also in primary reconstruction. Evidence reduced rate of infection in Silver-coverage on medical and orthopedic implants is noted. Aim of present study is to report preliminary results in experience with silver-coated mega prosthesis.
Material and Methods: 13 consecutive patients with chronic PJI underwent two-stage revision, of which four patients had a previous surgery for PJI. The average follow-up was 10 months (6-24). Mean age was 46 years (22-74). Site of infection was distal femur (5), proximal femur (3) and proximal tibia (5). All cases were managed using uniform peri-operative protocol and underwent complete explantation. Vancomycin loaded cement spacer was used in the first stage. 8 patients underwent subsequent renovation of spacer, of which 2 patients required an additional change of spacer to control infection. Average bone defect was 173mm (60-290mm). A silver-coated LINK mega prosthesis was implanted in the second stage, arthroplasty in 8 and arthrodesis in 5.
Result: 11 patients showed no signs of infection at the latest follow up. Recurrent infection was noticed in 2 (15%) patients within 10 and 40 days of re-implantation and were successfully managed with debridement and retention of prosthesis. No episode of local argyria was observed.
Conclusion: Two-stage revision with silver-coated mega prosthesis represents a viable option for treating PJI in tumor reconstructions. Long term results in larger patient population are needed to confirm this mode of treatment.

PP-134

Preclinical study on the effect of neoadjuvant radiotherapy on microvascular anastomosis

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Introduction: Success of free flap reconstruction after sarcoma resection in patients treated with neoadyuvant radiotherapy is thought to be altered by factors including local tissue changes induced by radiotherapy that can alter the viability of the microvascular arterial or venous anastomosis.
Objectives: Assess the effect of neoadyuvant radiotherapy (20Gy) in a preclinical rat model on both venous and arterial microvascular suture.
Materials and Methods: 140 Sprague Dawley rats were distributed in 4 groups of 35 rats in the following manner: Group A, Irradiated arterial suture, Group B Irradiated venous suture, Group C control arterial suture, Group D control venous suture. Groups A and B received one dose of 20Gy neoadyuvant cervical radiotherapy. After 2 weeks we performed carotid arteriotomy or yugular venotomy and microvascular suture. Control groups C and D underwent arteriotomy or yugular venotomy and microvascular suture. All groups were followed clinically during 4 weeks. Before sacrifice surgical permeability tests were performed on all rats and histological samples harvested.
Results: In group A, irradiated arterial suture, 1 rat (3%) had a negative antegrade and retrograde permeability test due to thrombosis. In group B, irradiated venous suture, 7 rats (20%) presented altered antegrade permeability due to thrombosis and 13 rats (37%) showed aneursyms or pseudoaneurysm. Both results statistically significant when compared to non irradiated venous suture or to irradiated arterial suture. Control groups C and D had 100% permeability both antegrade and retrograde. There were no cases of thrombosis either arterial or venous.
Conclusion: Neoadjuvant radiotherapy causes higher venous thrombosis in a preclinical microvascular anastomosis model and should therefore be considered the main factor in free flap reconstruction failure in patients who had received radiotherapy.

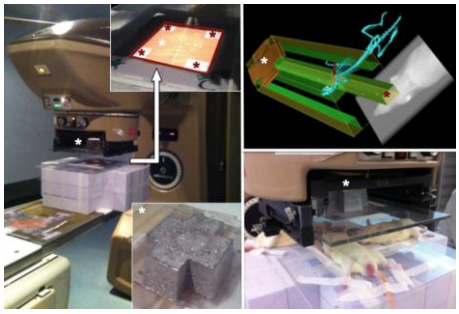

Figure 1. *Neoadjuvant radiotherapy*

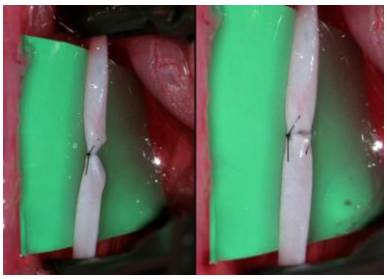

Figure 2. *Microvascular suture*

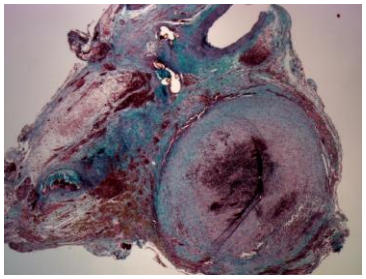

Figure 3. *Arterial thrombosis*

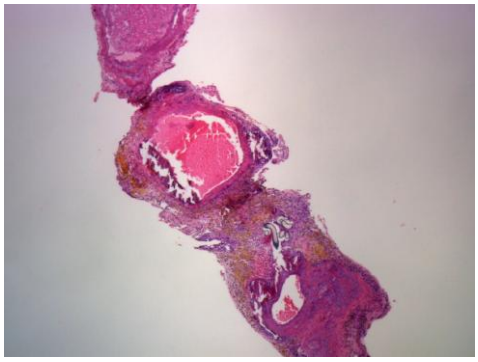

Figure 4. *Venous thrombosis*

PP-135

Renal dysfunction following chemotherapy for osteosarcoma

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Introduction: Systemic chemotherapy improved the survival of patients with osteosarcoma over the last decades, but late side effects of chemotherapy have become important problems. The aim of this study was to evaluate the renal toxicity of chemotherapy in osteosarcoma patients in our institution.
Methods: Among the patients of osteosarcoma treated in our institute from 1993 to 2011, there were 70 patients who received chemotherapy (mean age at diagnosis: 23 years). We retrospectively investigated these 70 patients for renal toxicity. Mean follow-up period was 83months. We performed standard national chemotherapy protocol using methotrexate, cisplatin, and doxorubicin, with or without ifosfamide. Fifty-one patients were treated with regimens using ifosfamide. Renal dysfunction was defined as increasing serum creatinine levels (beyond the normal limit) identified more than 1 week.
Results: Renal dysfunction was identified in 18 patients (26%), 14 of those (20%) developed renal dysfunction during chemotherapy, and 4 patients (6%) developed mean 78 months after the complete treatment. At the final follow-up, 13 patients (19%) showed chronic renal dysfunction, and 5 patients (7%) recovered. There were no patients who underwent the chronic kidney dialysis. All patients with chronic renal dysfunction had received protocol using ifosfamide. The incidence of chronic renal dysfunction at the final follow up was significantly higher in patients treated with ifosfamide (26%) compared than those without ifosfamide (0%) (p=0.0143).
Conclusions: Chronic renal dysfunction due to chemotherapy was found in 19% of osteosarcoma patients. In our country, chemotherapy for osteosarcoma patients have been traditionally performed mainly by orthopaedic surgeons. We orthopaedic surgeons might have tendency to check the postoperative limb function and local relapse or distant metastasis of tumor. The awareness of late side effects in long-term survivors of osteosarcoma should emphasize the importance of longer follow-up of blood chemistry study and urine analysis in addition to imaging study for detecting local relapse and distant metastasis. Ifosfamide could be one of important chemotherapeutic drugs, although the impact of ifosfamide on the prognosis has not been identified. Despite these side effects, the ongoing randomized study would hopefully validate the adding of ifosfamide to improve the prognosis of osteosarcoma patients.

PP-136

Surgical strategies for infected megaprostheses

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Introduction: Infection is the most common and, besides recurrence of tumor, the most serious complication occurring after implantation of megaprostheses. Due to new technical solutions of the joint mechanisms mechanical failure rate decreased over the last years. Valuable algorithms exist for management of conventional endoprostheses, while the situation is more difficult in megaprostheses, as removal especially of well-integrated anchorage systems may cause surgical problems. Several studies (Holzer et al., 1997; Hardes et al, 2014) as well as experience of our group suggest that retention of the stem of the infected megaprosthesis may not affect the rate of infection control.
Methods: We report on a case of an early infection of a megaprosthesis of the proximal femur with Streptococcus faecalis. 6 weeks after the initial operation debridement of the proximal femur was performed. 2 months later the same bacteria could again be cultivated. As the patient presented with no clinical symptoms we attempted a conservative treatment with repeated instillation of Teicoplanin into the periprosthetic space combined with orally applied Amoxicillin. Streptococcus faecalis was again cultivated 4 months later. One-stage procedure including debridement and exchange of all prosthetic material to a silver-plated proximal femur replacement was applied.

Removal of the well fixed stem caused surgical difficulties including the necessity of strut-graft augmentation of the remaining distal femur.
Results: 6 months after the implant-exchange the patient presents free from infection. Weight bearing still causes limited pain, the reconstructed area of the distal femur is stable.
Conclusion: It is extremely difficult to establish an algorithm for treatment of infected megaprostheses as the individual situations widely vary. In infected conventional arthroplasties highest rates of infection control are received if all implants are removed. Infection control is highest in 2-stage procedures. But as the removal of well integrated stems of megaprostheses may cause severe loss of bone-stock, there may be indications to retain the anchorage system. At the moment no statistical evaluation concerning this procedure is available. Multi-center evaluation could give some more hints, in which situation the well-integrated stem can be retained. Antibiotic instillation into the periprosthetic space seems to be insufficient concerning infection control.

PP-137

Sports activity levels in survivors of soft-tissue sarcoma of the lower extremity

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Introduction: Little is known about sports activities in patients with soft-tissue sarcomas and if these patients can perform any sports postoperatively. The aim of the study was to assess sports activity levels in long-term survivors of soft-tissue sarcomas after multimodal treatment including limb salvaging surgical resection and radio-chemotherapy.
Methods: 32 patients (14 f/ 21 m) with a mean age of 29 (range 10-44) years at the time of diagnosis and a mean follow-up time of 9 (range 3-21) years following sarcoma were included. 11 patients had diagnosed liposarcoma, 7 synovialsarcoma, 3 myxofibrosarcoma and 12 other different soft-tissue sarcoma entities. 24 (75%) were located in the thigh, 8 (25%) in the lower leg. 12 tumors were located epifascial, 24 in deeper tissue layers. Sports activity was measured by UCLA and Tegner Activity Score.
Results: One year before and at least 3 years post treatment 29 patients (90%) were performing athletic activity regularly. They were performing 5.4 h/week prior to sarcomas and 4.1 h/week 3 years postoperative. The most common types of sports were aerobic/gymnastics, swimming and jogging. The mean UCLA score and Tegner Activity score were 8.0 and 4.2 respectively, when resection of deep sarcomas was performed. In contrast Scores were 9.2 and 4.8 when tumor-site was epifascial ($p<0.05$). UCLA scores after deep sarcoma resection 3 years postoperative were still below preoperative UCLA levels ($p<0.05$) whereas patients after superficial tumor resection had no losses of sports activity. No relation between complications and postoperative sports activity level was found.
Conclusions: Healthy long-term survivors can achieve high levels of sports activity following the treatment of limb salvage of soft-tissue sarcomas. This knowledge may be of high value for physicians and orthopaedists treating patients, as well as for patients themselves who want to be informed about what they will be able to do after treatment.

PP-138

Periprosthetic joint infection after tumor endoprosthesis reconstruction

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Introduction: In the last decades limb-saving surgery with prosthesis reconstruction has become the dominating treatment in musculoskeletal tumor surgery. Despite the excellent life quality and functional results, periprosthetic joint infection remains a devastating complication.
The **aim** of our study was to analyze the results of our treatment of infection after tumor prosthesis implantation.
Material and Method: Between 2004 and 2014 twenty-six patients were treated in our department because of septic complication after tumor prosthesis implantation. In 6 cases the humerus, in 14 cases the femur and in 6 patients the tibia was affected. The average size of the resected bone was 10 cm, the most common tumor type was osteosarcoma (10 cases) followed by chondrosarcoma (7 cases) and Ewing sarcoma (2 cases). Average age of the patients was 38 years, the follow-up time was 60 months. Average time between primary surgery and the onset of the septic complication was 12 months. The infection was treated by one or two-stage revision in 19 cases, in 5 cases debridement was performed. 3 patients had amputation due to uncontrolled infection.
Results: Nineteen patients were free of any sign of infection at the time of the follow-up. Three patients had ongoing periprosthetic infection, while 4 patients died by the time of the follow-up. No significant correlation was observed between the outcome of the septic complication and the type of treatment, the type of infective organism, the time span between primary surgery and the onset of the infection, the site or size of the tumor.
Conclusion: Based on our study, no special risk factor could be identified for periprosthetic joint infection after tumor prosthesis reconstruction. Regardless of the examined factors, the risk for septic complication and the recurrence of infection is higher after tumor prosthesis implantation than in osteoarthritic cases.

POSTER PRESENTATIONS SESSION XII: Vascular, Lipomatous and Desmoid Tumors

PP-139

Hemangioma of the knee joint left untreated for 10 years: a case report

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A 26-year-old otherwise healthy female presented with a 10-year history of right knee pain. At the age of 16, she noticed painful swelling on the lateral aspect of the right knee, which was diagnosed as hemangioma from the MRI findings at another hospital. At that time resection of the tumor was attempted arthroscopically but failed since it could not be identified during the surgery, reportedly. For ten years after the initial surgery her pain continued and increased gradually while the quadriceps muscle atrophied and the range of motion of the joint decreased to 30-90 degrees due to pain. The MRI, examined with and without enhancement, showed a vascular tumor in the Hoffa's fat pad and between the lateral collateral ligament and lateral meniscus.

Under arthroscopy the synovium hindered the sight of the tumor but we observed damage of the cartilage of the lateral femoral condyle and, moving the knee, confirmed the tumor and the overlying synovium impinged between the condyle and the lateral meniscus. After partial synovectomy, we were able to identify the tumor clearly and resect the most of it, while the rest was so close to the lateral collateral ligament that we had to resect it through an open incision.

Soon after the surgery, her pain was relieved and the range of motion regained to 0-120 degrees and, 6 months post-op, to 0-140 degrees. The pathological diagnosis was cavernous hemangioma with no malignancy and imaging studies have shown no signs of recurrence.

Synovial hemangioma is a rare benign vascular tumor mostly occurring in the knee. Symptoms are pain, swelling, limitation of the range of motion etc. MRI with enhancement aids the diagnosis. Although natural course of the synovial hemangioma of the knee is not known well, resection seems to be necessary to relieve the symptoms. In this case, the tumor existed adjacent to the synovium, which made it difficult to detect it arthroscopically, and impingement of the tumor with overlying synovium between the femoral condyle and the meniscus could have caused the damage to the cartilage and the pain she had suffered.

PP-140

The role of radiation therapy in the treatment of desmoid tumors

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Purpose: To investigate the role of radiation therapy for the desmoids tumors.

Methods: Five patients with desmoids tumors treated with radiation therapy between 2011 and 2013 in our department. Three was males and two females. The tumor site was in upper extremity in one patient and four in lower extremity. Radiation therapy was delivered postoperatively in 4 patients (incomplete resection or positive margins) and one received preoperative radiation therapy. The total tumor dose was 50Gy in 25 daily fractions. We used 3-D conformal treatment. All the patients conclude the treatment with low toxicity according the RTOG -scoring criteria.

Results: After twenty months only one patient had local recurrence and the cosmetics results were sufficient.

Conclusion: Radiation therapy is an effective treatment after incomplete resection of the desmoids tumor.

PP-141

The correlations between (18)F-FDG-PET/CT and histopathological findings in liposarcomas

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Introduction: 18F-fluorodeoxyglucose (FDG)-positron emission tomography/computed tomography (PET/CT) imaging is useful for biopsy guidance, staging, and response assessments for treatments in soft tissue sarcoma. However, the correlation between the level of 18F-FDG uptake imaged on PET/CT scan and histopathological findings is unclear. The purpose of this study is to evaluate the correlations between the maximum standardized uptake value (SUVmax) on PET/CT and histopathological findings in liposarcomas (LPS).

Methods: A total of 15 patients (7 male and 8 female; mean age, 65.7 years; range, 44-82 years) with LPS were enrolled in this study. All patients were performed PET/CT examination before needle biopsy or operation, and measured SUVmax of tumors. We evaluated the correlations between SUVmax and histological subtype, tumor size, MIB-1 labeling index: index of the cell proliferation, microvessel density (MVD): representation for tumor angiogenesis and clinical outcome.

Results: The histological subtypes were 4 atypical lipomatous tumor/well differentiated type (ALT), 4 myxoid type (MLPS), 6 dedifferentiated type (DLPS) and 1 pleomorphic type (PLPS). The SUVmax of all patients had a range of 0-53.1 (mean; 7.2). The mean values of SUVmax were 1.5 in ALT, 3.2 in MLPS, 4.4 in PLPS, 14.0 in DLPS. The mean of SUVmax in DLPS was significantly higher than those in ALT or MLPS. Although there was not the correlation between the SUVmax and tumor size, the higher SUVmax value significantly related to the higher

MIB-1 index and MVD. The SUVmax was related to the prognosis. Two cases with SUVmax over 7 at the first examination of PET/CT were dead of disease within 2 years.

Conclusions: SUVmax in DLPS significantly shows higher than those in ALT, MLPS and PLPS, and the difference of FDG accumulation might be reflected to the histopathological subtype. Furthermore, the value of SUVmax in LPS is correlated to the tumor angiogenesis and proliferation activity as malignancy marker. The survival of patients with LPS can be predicted by evaluating their SUVmax using FDG-PET/CT. It has potency as an "imaging biomarker" to provide helpful information for the clinical decision-making.

PP-142

Solitary hydatid disease: an uncommon cause of soft tissue mass of the extremities. Report of 2 cases

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Introduction: Cystic echinococcosis (CE) or hydatid disease is a zoonosis caused by Echinococcus granulosus. Its natural cycle is as a cyst in sheep and as a tapeworm in dogs. Humans become infected by ingesting food or water contaminated with dog's faeces containing the eggs of the parasite or when they handle infected dogs. In Austria CE is a rare disease with only sporadic occurrence (2009-2013: 6,4 reported cases per year). Most infections are diagnosed in immigrants from countries where CE is endemic such as the Mediterranean region. The most frequently affected organs are the lung and liver, whereas solitary involvement of muscles and skin (2,2%) or bone (0,6%) is very uncommon1. We report two cases of solitary hydatid disease of the extremities treated at our institution in 2007 and 2014.

Case 1A: 56-year old woman originating from rural Turkey presented with a slow growing mass of the gluteal region, noticed first 12 months ago and recently causing pain. MRI revealed a multi-cystic subcutaneous lesion involving the gluteus maximus muscle measuring 20 cm. CE was confirmed by open biopsy, the patient underwent resection of the cysts two weeks later.

Case 2A: 44-year old man who had recently immigrated to Austria from eastern Turkey presented with a painful soft tissue mass of the lateral thigh with inflammation of the overlying skin and imminent perforation. X-ray and MRI showed an abscess-like formation with involvement of the greater trochanter. Aspirate culture was negative. However resection of the lesion and high speed burring of the affected bone were performed suspecting a chronic bacterial infection. Histology of the specimen revealed CE. In both cases staging with CT scan of chest and abdomen showed no further lesions. Adjuvant medical treatment consisted of Albendazole administered orally for a minimum of three months. MRI scan and serological tests at last follow up showed no evidence of recurrence.

Conclusion: Solitary hydatid disease adds to the broad spectrum of differential diagnoses in examining soft tissue masses.

References: Eckert J, Deplazes P. Biological, epidemiological, and clinical aspects of echinococcosis, a zoonosis of increasing concern. Clin Microbiol Rev. 2004 Jan;17(1):107-35.

PP-143

Aggressive fibromatosis in children – Single institution experience

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Introduction: Aggressive fibromatosis (AF) is a rare tumor of intermediate malignancy that has the strong potential for local invasiveness and recurrence.

Methods: The objective of the study was to present the treatment modalities in children who had extra-abdominal AF treated over an 11 year period at the Pediatric Department of the Institute for Oncology and Radiology of Serbia.

Results: The patients were drawn from a period of time between 2004 and 2014. There were 9 children (7 male and 2 female) with a median age of 12,5 years (age range from 10 to 14 years). The primary tumor sites in patients were found as follows: extremities (7 patients) and head and neck region (2 patients).

All the patients studied had surgery as the first line of treatment. Only one patient had microscopically negative margins and received no further treatment. Five out of eight patients with marginal surgery received chemotherapy and radiotherapy along with surgery as the primary treatment. Chemotherapy was administered to patients who had surgery with positive margins and macroscopically incomplete surgery and those with recurrent disease. Regimens administered were VACA, VAIA, VAC, IVA and low dose MTX/VBL.Two patients with tumor progression received second line therapy followed by a second surgery. One patient with macroscopically incomplete surgery was on watchful-waiting strategy and had a 6 year follow up that showed stable disease. One patient did not respond to any of the administered lines of chemotherapy and underwent amputation.One patient with localized head and neck tumor who underwent 5 marginal surgical interventions received radiotherapy and low dose MTX/VBL and is currently still in a 6 year follow-up. Median follow-up was 3 years.

Conclusion: Adequate surgical procedure with negative margins is a successful primary treatment modality for children with AF. The aim of chemotherapy is tumor reduction that can permit surgical resection. Mutilating surgery and highly toxic chemotherapy regimens should be avoided.Positive margins after surgery indicates high risk for local recurrence but local recurrence didn't affect patients' chance to respond to chemotherapy.

PP-144

Surgery for acquired ankle equinus in multifocal pseudomyogenic hemangioendothelioma of the lower limb

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Multifocal pseudomyogenic hemangioendothelioma (PHE) is a very rare, recently described morphologic entity among soft tissue tumors. Currently no literature exists concerning tumor reaction to non-oncologic surgery. In particular, it is not known whether these procedures can lead to tumor activation, as seen with desmoid tumors, and whether surgery in these patients has the same outcome as it does in healthy individuals.

We report on a 21-years-old man with PHE of the left lower limb presenting a progressive irreducible left ankle equinus. Muscle retraction was equally localized in the soleus and gastrocnemius muscles, and led to severe functional impairment. An MRI showed multiple small lesions (<1cm) affecting the skin, the muscles and the bones of the lower leg, but no single large lesion explaining the muscular shortening. Intensive physiotherapy was unsuccessful.

We performed a posterior chain lengthening combining a Strayer gastroc-soleus recession with a Hoke Achilles lengthening. Following the procedure, a 10 degrees dorsiflexion of the ankle was obtained. After 6 weeks of cast immobilization retaining this position, the patient began intensive reeducation and progressive strengthening. At four months follow-up, ankle range of motion is normal and the strength recovery is good. There is no sign of tumor growth around the surgical site.

PHE can lead to muscle retractions causing functional impairment. So far, our very limited experience suggests that this tumor does not react to surgical interventions of the muscles. Thus we believe that a surgical procedure aimed at treating the symptoms of muscle shortening can be undertaken with promising results. Nevertheless, a longer follow-up and a better understanding of this very rare condition are needed.

PP-145

The utility of chromosome analysis in patients with the adipocytic tumors of extremities

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Objective: The diagnosis of adipocytic tumors is based on clinical and histologic features. However, atypical lipomatous tumor/well-differentiated liposarcoma (ALT) and dedifferentiated liposarcoma (DLPS) are often difficult to distinguish morphologically from benign adipocytic tumors and other high-grade sarcomas, respectively. The purpose of this study is to evaluate the utility of the chromosomal analysis in the diagnosis of adipocytic tumors.

Methods: A total of 80 patients (32 males and 48 females; mean age, 58.5 years) with adipocytic tumors arising from extremities were enrolled in this study. The histological subtypes were lipoma in 50, ALT in 12, myxoid liposarcoma in 9, DLPS in 7, pleomorphic liposarcoma in 1, and hibernoma in 1. In those cases, we performed the chromosomal analysis by the G-band method. We evaluated the success rate of the chromosomal analysis and the rate of concordance with chromosome analysis and a histopathological diagnosis. When the karyotype abnormality is consistent with the karyotype described in text book of WHO, we defined them as "concordance type". When the karyotype abnormality is not consistent with the karyotype abnormality described in text book of WHO, we defined them as "other type".

Results: Of all 80 patients, it is impossible in 18 cases (23%), normal in 5 (6%), concordance in 37 (46%), and other in 20 (25%). Of 50 patients with lipoma, it is impossible in 10 cases (20%), normal in 4 (8%), concordance in 24 (48%), and other in 12 (24%). Of 29 patients with ALT and liposarcoma, it is impossible in 6 cases (21%), normal in 2 (7%), concordance in 13 (45%), and other in 8 (27%).

Conclusions: The current WHO classification of adipocytic tumors includes benign, intermediate, and malignant subtypes. Thus, adipocytic tumors represent the largest group of soft tissue tumors that have been studied by cytogenetic analysis. In this study, about half cases showed karyotype abnormality reported to date. Whereas we showed the karyotype abnormality that has not been reported previously in 25%. Understanding of the molecular biology of adipocytic tumors will undoubtedly lead to the development of novel diagnostic strategies.

PP-146

Hemoglobin, alkalic phosphatase, and C-reactive protein predict the outcome in patients with liposarcoma

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Introduction: Data on prognostic biomarkers in soft tissue sarcomas are scarce. The objective of the study was to define prognostic markers in patients with a liposarcoma, a subtype of sarcoma derived from adipose tissue.

Methods: We restrospectively reviewed 85 patients with liposarcoma treated at our department from May 1994 to October 2011. Kaplan-Meier curves, uni- and multivariable viariable Cox proportional hazard models and competing risk analysis were performed to evaluate the association between putative biomarkers with disease-specific and overall survival.
Results: A significant association between both alcalic phosphatase (subhazard ratio [SHR] per 1 unit increase: 1.35; 95% CI 1.10-1.65; p=0.005) and C-reactive protein (CRP; SHR per 1 mg/dl increase: 2,57; 95% CI 1.36-4,86; p= 0.004) with disease-specific survival. Haemoglobin (HR per 1 g/dl increase: 065; 95% CI 0.48-0.87; p=0.003) was associated with overall survival. These associations prevailed after multivariable adjustment for AJCC tumor stage.
Conclusion: This study identifies CRP and alkalic phosphatase as novel independent predictors of disease-specific survival in patients with liposarcoma. These biomarkers could be exploited for individual risk estimation and integrated in existing prognostic models for soft tissue sarcoma in future.

PP-147

Serum creatinine and albumin predict the outcome in patients with liposarcoma

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Introduction: Growing evidence emerged that low serum albumin levels and decreased kidney function are associated with decreased survival in cancer patients, though the exact mechanism remains still unknown. The objective of this study was to investigate the influence of renal function and albumin on prognosis in patients with liposarcoma.
Methods: We restrospectively reviewed 85 patients with liposarcoma treated at our department from May 1994 to October 2011. Kaplan-Meier curves, uni- and multivariable viariable Cox proportional hazard models and competing risk analysis were performed to evaluate the association between putative biomarkers with disease-specific and overall survival.
Results: In multivariable analysis adjusted for AJCC tumor stage, Creatinine is highly associated with disease-specific survival (SHR=2.94; 95% CI 1.39-6.23; p=0.005). In both overall and disease-specific survival, albumin is associated with both outcomes. (HR=0.50; 95% CI 0.26-0.95; p=0.033 and SHR=0.64; 95% CI 0.42-1.00; p=0.049).
Conclusion: Our data gave strong evidence for a tumor-stage-independent prognostic association between higher creatinine and worse disease-specific survival, and only minimal evidence for a tumor-stage-independent association with overall survival. This work identifies a novel prognostic biomarker for survival in liposarcoma.

PP-148

A case of hemangioma of frontal bone in a female-teenager

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Introduction: The hemangiomas of bone are very rare entity accounting less then 1% of all bone tumours.
Methods: We present an unusual case of hemangioma of the frontal bone in 15 y.o. female-teenager. The specimen was examined grossly, cuted, decalcifyed and fixed in 10% formalin. Then material was embedded in paraffin, stained with haematoxylin and eosin and examined histologically. Immunohistochemical evaluation was performed with CD31, CD34, Podoplanin and Ki-67 antibodies.
Results: Approximately 1 year ago before hospitalization the complaints of headache and swelling in the frontal area were appear. Radiographically (x-ray and CT investigation) well-defined tumour of frontal bone was found, 38x13x26 mm in size. The lesion was permeate to the left camera of the frontal sinus. The surgery was performed (complete resection with autograft). Grossly the tumour looks like poorly defined tuberosity of the frontal bone, whitish-gray in color with small dark patches. On the serial gross sections the tumour was well-circumscribed, lobulated and cherry in color. Histologically the tumour is consist of the multiple different sized blood vessels between the bony trabeculae. The vessels lined by flat endothelial cells which positive for CD31 and CD34 by immunostaining. Podoplanin was negative. Proliferative activity (Ki-67) was very low.
Conclusion: We described a rare case of hemangioma of the frontal bone in 15 y.o. female-teenager. It should be differentiated with fibrous dysplasia and other benign fibro-osseous lesions occurring in this location.

PP-149

Kimura's disease in a Caucasian female: case report and review of the literature

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Introduction: Kimura's disease is a rare, male-predominant, benign, chronic inflammatory disorder of unknown etiology. It is characterized by painless subcutaneous tumor-like lesions, mostly in the head and neck area. Regional lymphadenopathy, peripheral eosinophilia and elevated serum IgE levels can be

associated with Kimura's disease. As Kimura's disease is almost endemic to Asia, case reports in other continents are very uncommon.

Case Presentation: A 61 year old Caucasian female patient was presented with a painless expansion in her right occipital region, as well as recurrent cervicalgia and neuropathic pruritus in both upper extremities. Magnetic resonance imaging showed two separate intermusculous lesions, 2.8 and 2 centimeters in diameter. Immunohistological analysis after incision biopsy showed proliferation of small blood vessels and inflammatory infiltrate, consisting of eosinophilic granulocytes and lymphocytic aggregates with germinal centers. After exclusion of malignancy and any other rheumatic disorder the patient was diagnosed with Kimura's disease. Without any specific treatment the patient showed no further progression of the lesions in a one year follow up.

Discussion: Due to its clinical presentation, Kimura's disease can easily be mistaken for a malignant process or a variant of rheumatic disorder. Further, a differentiation to angiolymphoid hyperplasia with eosinophilia can only be performed immunohistologically. Even though Kimura's disease is a very rare disorder outside of Asia, it should be considered as a differential diagnosis for subcutaneous tumor-like lesions, especially in the head and neck regions.

PP-150

Giant lipoma of the upper extremity at an unexpected location

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Purpose: Giant lipomas of the extremities are very rare. Their hugeness leads to development of fearfulness in patient as well as in the treating surgeon. This can lead to delay in the treatment of the patient. In the literature, the tumor is defined as a giant lipoma when its size reaches larger than 5 cm in any dimension. Although there are reported cases of benign lipomas of the upper extremity, lipomas of the forearm which invaded double compartement and axillary placed lipomas are very rare in the related literature. In this study, we examined lipomas of the upper extremity, included axillary area and forearm lipomas with double compartement. In this report, we present a case of a giant lipoma of the arm, which is accompanied by nerve compression, and discuss relevant literature to the case. Eight cases with upper extremity located lipoma were included in the study.

1. (40Y.F) Right axillary area lipoma MR:70*60*55 mm ,
2. (52Y. M) Right axillary area lipoma MR:75*65*50 mm
3. (8 M) Left forearm volar and dorsal compartement MR; 70*22*20-25 mm
4. (50Y. M) Right forearm volar and dorsal compartement MR; 50*4.5*20-35 mm
5. (48Y.M) Right arm volar compartement MR;70*40*30mm
6. (53 Y. M) Left scapular dorsal area lipoma MR;80*60*20mm
7. (52Y M) Left lateral brachial area lipoma MR;110*70*40 mm
8. (36Y F) Right hand thenar area lipoma MR; 40*35*12 mm

Discussion: Lipomas are subfascial benign tumors of mesenchymal origin. They usually represent well-circumscribed, encapsulated masses that are freely mobile beneath the skin. Deep soft tissue lipomas are less common than superficial lipomas; they can be found intermuscularly, intramuscularly or intraosseously associated with viscera or sites of trauma. They are usually painless, growing slowly, reaching large sizes, especially when located in deep subfascial planes. The lipoma should be treated by adequate open surgical removal of the tumor, followed by careful monitoring of the patient by ultrasonography. Proper evaluation of large masses in the upper extremity includes the use of imaging techniques, such as MRI, CT and US as radiological options. To prevent the recurrence of giant lipomas, masses must be removed completely. Surgery can be difficult, as the nerves and other anatomical structures must be protected. Double insicion is performed to avoid neurovascular complications and to obtain a better exposure, in two cases of forearm lipomas with double compartement. Since the brachial plexus is near the exposure area of axillary lipomas, wide surgical insicions must be provided in these cases.

Result: In conclusion, all giant lipomas of the upper extremity must be removed completely because of the potential for malignancy. Preoperative assessments with radiological imaging is making surgical procedures easier. We recommend careful dissection with duble exposure which are volar and dorsal insision in forearm.

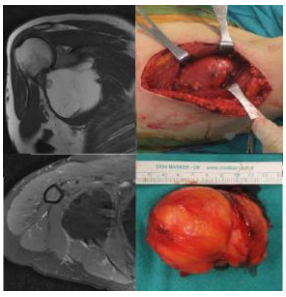

Figure 1

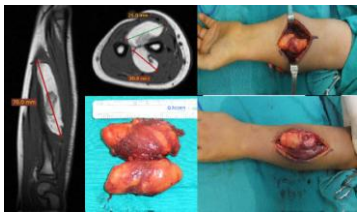

Figure 2

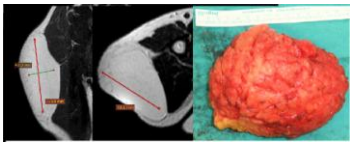

Figure 3

PP-151

15-year experience on vascular sarcomas: a retrospective study from a single institution

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Introduction: Vascular sarcomas (VS) represent a rare group of soft-tissue border-line or malignant tumors that arise from blood vessels. Because of their low incidence, data on their treatment and prognosis are scarce. We aimed to evaluate the features, management and outcome patterns of this rare entity at a tertiary medical centre.

Methods: A retrospective cohort study was performed. All the files from patients with histological confirmation of intermediate or malignant VS, according to the WHO classification, treated at our institution from January 1999 to December 2014 were reviewed. Kaposi sarcoma pts were analyzed separately due to their distinctive etiopathogenesis. Demographic and histological characteristics were collected. Data on management, disease free survival (DFS) and overall survival (OS) were analyzed, and histological subtypes were compared.

Results: Data from 30 pts were collected. Median age at diagnosis was 63 years, (range 26-90). 50% were men (15/30). Histologic subtypes included: angiosarcoma (80%) and hemangioendothelioma (20%). The most common locations in both subtypes were: liver, lower limb and trunk with 27%(8/30), 23%(7/30) and 10%(3/30) pts respectively. Metastatic disease was present in 6/30 (20%) pts at diagnosis; 50%(3/6) angiosarcoma and 50% (3/6) hemangioendothelioma. Vimentin, CD31 and CD34 were the most common immunohistochemical markers, expressed in 81%, 86% and 50% of samples respectively. Main treatment was surgery, performed in 96% (23/24) of non-metastatic pts. R0 resection was achieved in 74% (17/23) of cases. Adjuvant radiotherapy and chemotherapy were administered in 29% (7/24) and 8%(2/24) of pts respectively. Only 2/30 (6.7%) pts received neoadjuvant treatment. Recurrence occurred in 37.5% (9/24) pts and was local in 55% of them. 70% of non-resectable pts received at least one line of chemotherapy. Bevacizumab alone or in combination with taxanes was the most frequent drug used in 57% (4/7) pts. Median OS was 6.5 years (95%CI 3.1- 9.9) for hemangioendothelioma and 3.5 years (95%CI 2.5-5.1) for angiosarcoma.

Conclusions: Surgery was the main treatment in VS. Despite high rates of R0 surgery recurrence was frequent. Therefore, additional treatment may be needed. Further studies on the role of adjuvant therapy are warranted.

PP-152

Pazopanib as treatment for aggressive refractory disseminated familial classical Kaposi sarcoma – Case report

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Metropolitan Hospital, Athens, Greece

A case report of a male patient diagnosed in March 2011 with aggressive familial classical Kaposi sarcoma (cKs), was recently published in the journal.[1]

First-line chemotherapy with liposomal doxorubicin was administered with significant improvement. Four weeks after receiving the fifth cycle, the local sarcoma symptoms, i.e. lymphedema, pain and redness of the left thigh, relapsed. Then, second-line chemotherapy with weekly paclitaxel was applied. After that treatment, the local disease was almost healed for approximately eight months. Thus, due to reappearance of the sarcoma on the same area, paclitaxel weekly was reinitiated as third-line chemotherapy, followed by radiotherapy, result in excellent response. New local relapse with new infiltrations on the left area four months later was treated with per os vinorelbine, but it resulted in mixed response, with decrease of the edema of the left thigh but worsening of the redness on the shin area. The patient received fourth-line chemotherapy with paclitaxel weekly with substantial improvement.

Four months after remaining asymptomatic, the patient developed disease progression on the dorsal area of the left foot. Local radiotherapy was applied. A new relapse occurred and pazopanib, 800mg per day, was prescribed. The patient received this dosage for about forty days, with dramatic response to treatment, but then it was reduced to 400mg per day due to hepatic toxicity (fig. 1). The dosage increased up to 800mg per day a month ago. He remains disease-free to present, sixteen months later.

Chemotherapy with liposomal doxorubicin or taxanes are mainly preferred as systematic treatment for aggressive or refractory cases of cKs.[2,3] Generally, no optimal treatment has been developed for cKs.

Pazopanib is a tyrosine kinase inhibitor, which is approved for treatment of advanced soft tissue sarcomas. PALETTE, a phase III study, demonstrated the efficacy of pazopanib in patients with metastatic non-adipocytic soft tissue sarcomas after previous chemotherapy.[4] In this study, the participants, with 2:1 randomization, received either pazopanib, 800mg per day orally or placebo. There was statistically significant median progression-free survival for pazopanib (4.6 months, compared to 1.6 months for placebo), but it was not found superior to placebo in overall survival (12.5 months for pazopanib, compared to 10.7 months for placebo).

The PALETTE study resulted in the inception of many relevant trials, including analysis of various adipocytic sarcomas subtypes receiving pazopanib, as possible extension of the PALETTE study results. Moreover, studies including gemcitabine, with or without pazopanib, for treating refractory soft tissue sarcomas or pazopanib as neoadjuvant therapy of sarcomas, with or without chemotherapy, are in progress, as well.[5] However, the data about sarcomas treatment could be further expanded, including rare sarcomas such as cKs to benefit from applying antiangiogenic agents such as pazopanib.

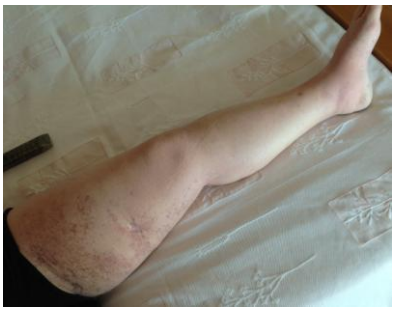

Figure 1. *Left lower extremity after pazopanib admission*

References:

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[4] van der Graaf WT, Blay JY, Chawla SP, Kim DW,et al. Pazopanib for metastatic soft-tissue sarcoma (PALETTE): a randomised, double-blind, placebo-controlled phase 3 trial. Lancet 2012; 379(9829):1879-86.

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PP-153

Extranodal soft tissue lymphomas of extremities can mimic soft tissue sarcomas: a case report

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Introduction: Malign lyphomas can originate from any part of the body.Even though lymph nodeas are accepted as main source, it can affect the other tissues as well. The involvement other than lymph nodes is described as extranodal disease. Soft tissue lymphomas of the extremities are seen rarely.

Case Report: A 57-year-old male referred to emergency outpatient clinic with malaise and a hemorrhagic mass in left thigh which disrupt the skin integrity. Patient's anamnesis revealed that the mass has been existed in anterior side of the left thigh for last six years, during this period it was in dimension of a nut, but 3 months ago, it has started growing aggressively. The hematocrit and hemoglobin values were low at the time of presentation (Hct:17,2 Hgb:5,5). At initial step, three units erytrocyte replacement was made and the hemodynamic of the patient was stabilized. The patient was evaluated by interventional radiologists and 50% of vessels feeding the tumour has been embolized. MR evaluation was made for the mass in left thigh. A mass, localized anteriorly under the skin, deplacing the anterior muscle groups, 84x106 mm sized, in a hetorogen structure and showing enhacement in postcontrast images, was detected. PET test was made with malign tumour suspicion. PET revealed a mass in left thigh, primarily compatible with slow progressing soft tissue malignity. The preperations for the surgery was started. The pathologic evaluation of fine needle aspiration biopsy material revealed diffuse large B - Cell Non Hodgkin Lymphoma.

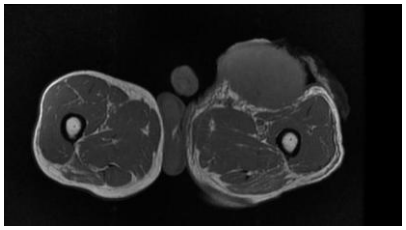

Figure 1. *T2 weighted MRI*

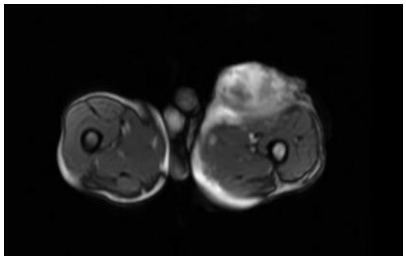

Figure 2. *T1 weighted MRI*

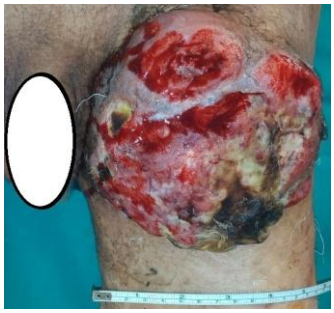

Figure 3. *Mass view*

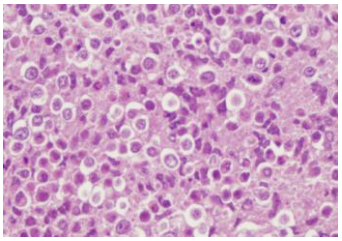

Figure 4. *Hematoxylin*

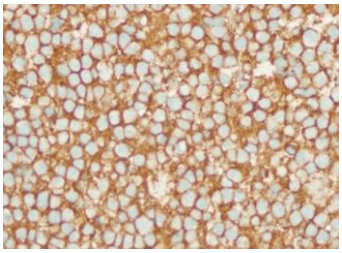

Figure 5. *Cd-20 positive*

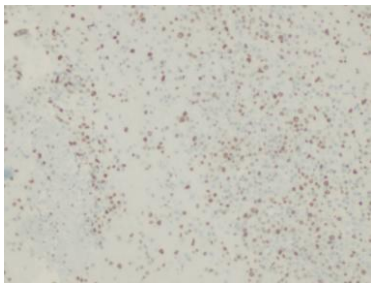

Figure 6. *ki 67*

Results: Consequently the patient was referred to the hematologic oncology department and underwent chemotherapy.

Conclusion: Especially in patients without systemic symptoms of lymphoma like fever, night sweat and weight loss, the lymphoma diagnosis can be overlooked and during the evaluation period, these patients are consulted with radiologists, pathologists and nuclear medicine specialists, only in terms of soft tissue sarcomas. This situation can lead to a late diagnosis and delay in the treatment period. Soft tissue sarcomas and lymphomas have different type of treatment courses. In middle or old-aged patients, if there is a fast-growing extremity mass, lymphoma should be kept in mind in differential diagnosis.

PP-154

Primary hyperparathyroidism in a patient with multiple Brown tumors and pathologic femur fracture mimicking malignancy: a case report

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Introduction: In this article we report a case of multiple brown tumors with a pathologic fracture of femoral shaft caused by a parathyroid adenoma.

Case Report: A 71-year-old female was admitted to our emergency center for dizziness and fatigue and pain in left thigh without any trauma history. In our initial examinations she complained of pain and tenderness in left thigh. There were no swelling or overlying skin changes. There were no palpable inguinal, axillary or cervical lymph node. Plain radiographs showed left femoral shaft fracture with multiple lytic lesions in pelvis and both femurs, ribs, right humerus, right tibia and left ulna

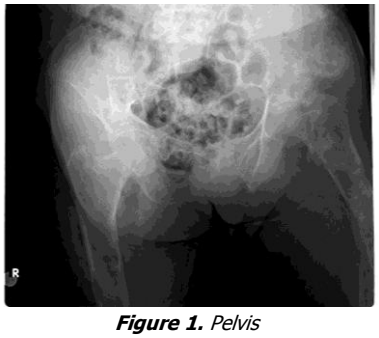

Figure 1. *Pelvis*

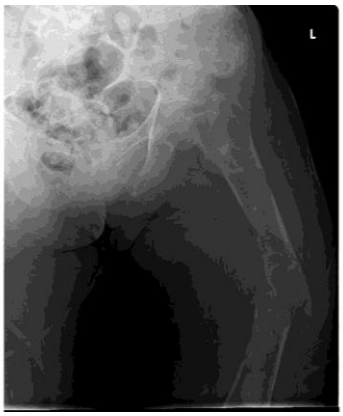

Figure 2. *Left femur*

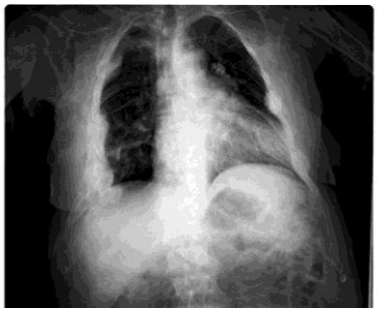

Figure 3. *Ribs*

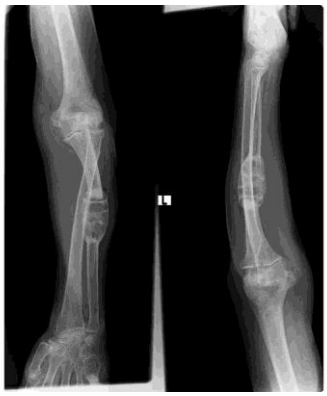

Figure 4. *Left ulna*

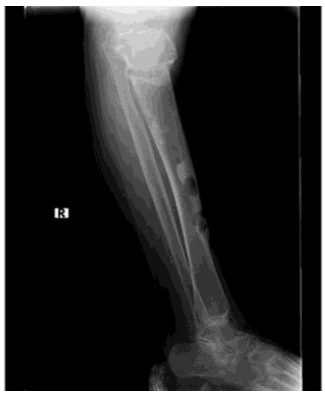

Figure 5. *Right tibia*

MRI revealed multiple lesions in both femur and pelvis with contrast enhancement suggesting metastatic bone lesions

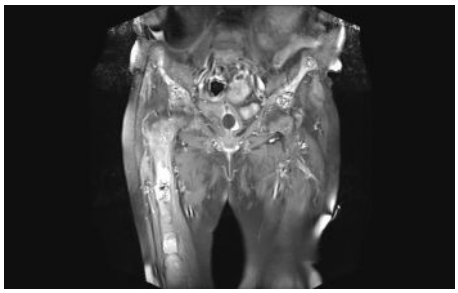

Figure 6. *MRI*

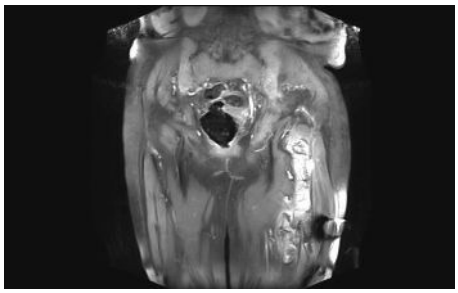

Figure 7. *MRI*

On laboratory evaluation serum calcium, serum alkaline phosphatase and serum parathyroid hormone level was high and serum phosphate level was decreased.
The diagnosis of hyperparathyroidism was definitive. An ultrasound examination of neck showed a homogenous mass in upper left pole of thyroid gland. Tc-99m scan of parathyroid revealed a well-defined mass with axial diameter of 3.8 cm in left upper parathyroid suggesting parathyroid adenoma.Whole-body scintigraphy showed multiple lesions in skeletal system.

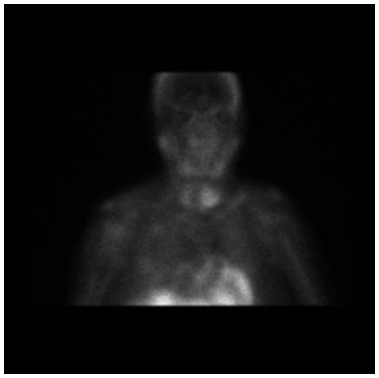

Figure 8. *Tc-99m scan*

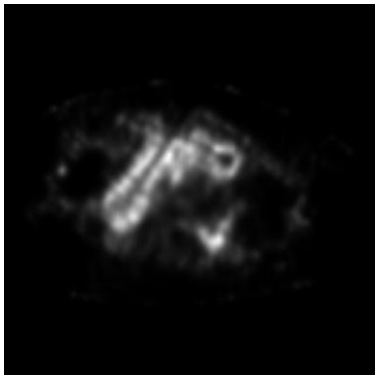

Figure 9. *Tc-99m scan*

Figure 10. *Whole body*

These findings together with clinical examination was suggestive for multiple brown tumors. Initially we ruled out malignancy using imaging and laboratory but definitive diagnosis needs histopathological examination. At the same time the patient's pathologic fracture of femur was impending so we provided an internal fixation.
Result: Consequently the patient was referred to our endocrinology and general surgery departments for further treatments.
Discussion: In modern times multiple brown tumors are rare because of routine health screening panels including blood calcium levels so primary hyperparathyroidism is often recognized before development of serious bone disorders. Multiple brown tumors can mimic multiple skeletal metastases and cause pathologic fractures. In the case of multiple lytic bone lesions and increased blood calcium levels, hyperparathyroidism should always be kept in mind in addition to malignancies. In order to avoid unnecessary treatments such as chemotherapy, early diagnosis is important.

PP-155

Radiofrequency ablation in aggressive fibromatosis: four case reports

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Introduction: Aggressive or desmoid fibromatosis is a histologically benign but locally aggressive entity with high rate of recurrence after surgery. Radiofrequency (RF) ablation is an image-guided technique that has become increasingly important in the treatment of these tumors. It uses heat generated by RF to coagulate and destroy the tumor.
Methods: Four cases of fibromatosis are presented. The first case is located in gluteal region and is initially treated with wide surgery. A few months later a local recurrence occurs, wich is successfully treated with RF ablation. The second case is a lesion in inguinal region, also previously treated with wide surgery and an early recurrence. The other two cases are popliteal tumours initially treated by thermoablation. In all patients there was a hitopathological confirmation. Ablation is CT-guided and performed with thermal resistance mode. All patients needed 2 sessions to achieve the entire tumor ablation.

Results: The radiological evolution of all cases is very satisfactory, showing necrosis of almost all of the tumor. Clinical outcome is favourable in all of them. In one of the popliteal tumors there was a skin burn as a complicaction that was resolved, and a paresia of external popliteal sciatic nerve that is recovering satisfactorily.
Conclusion: Aggressive fibromatosis has a high recurrence rate after surgery so the main treatment is "wait and see". In case you need to treat it, alternative therapies to surgery must be considered. Radiofrequency ablation should be regarded as a highly effective therapy with little aggression and morbidity.

PP-156
Vascular leiomyosarcomas of the lower extremity

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Aim of the Work: Vascular leiomyosarcomas are rare. There are only few reports in the literature on the treatment and prognosis of these aggressive tumours. The aim of this study is to evaluate the current treatment protocols and the oncological outcome of the lower extremity leiomyosarcomas of vascular origin.
Methods: Between 1998 and 2014, 142 patients with leiomyosarcomas were treated at our institution. Seven patients (4.9%) with primary vascular leiomyosarcomas of the extremities were identified. There were 3 males and 4 females with a mean age of 72.6 years (range, 46 to 82 years). Three leiomyosarcomas arose from the femoral vein, 2 great saphenous vein, 1 anterior tibial vein, and one from the posterior tibial vein. Three patients (43%) had metastasis at presentation, while another patient developed metastasis at 3.5 months from diagnosis. Two patients had amputation, three patients had excision without vascular reconstruction followed by radiotherapy, while the remaining two patients had no surgery because of disseminated metastatic disease at diagnosis.
Results: At a mean followup of 38 months (range, 7 to 64 months), two patients were free from disease, three had died with metastatic disease, while two patients were alive with pulmonary metastases. The overall survival at 5 years was 44% as compared to 62% in those patients with leiomyosarcomas of non-vascular origin ($p < 0.01$).
Conclusions: Vascular leiomyosarcomas are rare but aggressive tumours with high rate of early metastasis and poor survival.

POSTER PRESENTATIONS SESSION XIII: What's New in Musculoskeletal Oncology

PP-157
Shoulder girdle resection, modification in the surgical techniques and introduction of a new classification system

A. Shehadeh
King Hussein Cancer Center, Amman, Jordan

Background: Surgical techniques for resection of tumors at proximal humerus and scapula has been described in literature along with different classification systems, however, these techniques have not been revised for a while and the classification systems didn't respect the difference between bone and soft tissue tumors, or humerus vs scapula locations.
Material and Methods: The author operated on 27 patients with shoulder girdle tumors, all are bone tumors, Ewings sarcoma (n=10), Osteosarcoma (n=6), Metastatic tumors (n=5), GCT (n=3), Chondrosarcoma (n=3). We assigned two separate classifications to humerus and scapula resection, since surgical techniques, mechanics and reconstruction is totally different for the both sites. Resection of the humerus classified into: Type I to Type IV, A: is added to the type when the majority of Deltoid is preserved, and B: when it is sacrificed.
Type I: Intra articular proximal humerus resection (Fig 1)
Type II: Extra articular proximal humerus resection (Fig 2)
Type III: Intra articular total humerurs resection (Fig 3)
Type IV: Extra articular total humerus resection (Fig 4)
And we classify the scapula resection into: Type I to Type III
Type I: Partial Scapular Resection (Fig 5)
Type II: Intra articular Total Scapular Resection (Fig 6)
Type III: Extra articular Scapular Resection (Fig 7)
In extra articular humerus resection, we found that sacrificing the acromion and coracoid process is not needed as a routine part of the extra articular resection of the proximal humerus and preservation of these structures can improve the cosmetic outcome of the shoulder, and for all tumors with no huge medial component, in our techniques there is no need to detach the muscle attachment from the coracoid process and so post operatively elbow extension as tolerated can be started immediately. Endoprosthesis was used in 23 patients for reconstruction, osteoarticular allograft was used in 2 patients, and Tichoff Lindberg technique for 2 patients.
Results: At 30 month mean follow up period, 2 patients developed local recurrence (osteosarcoma n=1, Ewing Sarcoma n=1), and 2 patients infection, one patient stem loosening, the average MSTS functional score for all patient was 83%.
Conclusion: The modification of surgical techniques saved structures which were unnecessarily resected, and kept the integrity of more muscular tissue and attachments which were detached in previous described techniques with no obvious advantage leading to less restriction during the rehabilitation process. The new classification system is realistic, easy to be recalled and applicable to all patients.

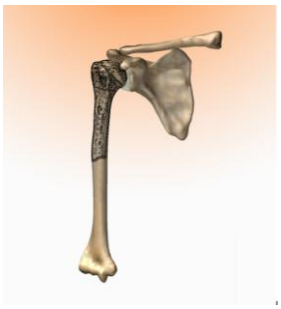

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

PP-158

Proximal humerus reconstruction after tumor resection comparative analysis of different types of implants

I. Mikailov, P. Zasulskiy, P. Grigorev
Vreden Russian Research Institute of Traumatology and Orthopedics, St.Petersburg, Russia

Introduction: Ablative surgery for tumors of the proximal humerus has a special place in oncology and orthopedics. Currently, surgery is the leading method of treatment, aimed at preserving not only the life of the patient, but also the recovery of limb function. This method allows us to extend and improve the quality of life while maintaining a satisfactory limb function.

Purpose: The purpose of the study was to evaluate the results of surgical reconstructions of the proximal humerus after transarticular tumor resection, compare the functional results with the results of arthroplasty of the shoulder joint in patients with extensive damage of the proximal humerus not tumor genesis.

Material and Methods: Between 2001 and 2013, 38 proximal humeral reconstructions using unipolar endoprostheses - 26 (68%), and modular systems with inverse head -12 (32%) were performed in our clinic. The age of patients ranged from 15 to 71 years (38,5 ± 3.34). Male 10 (26.3%) female 28 (73.7%). (F:M = 3:1).

Nosology: Chondrosarcomas 5 (13.2%), GCT 10 (26.3%), osteosarcomas 3 (7.9%), Ewing's sarcoma 1 (2.6%), plasmacytoma 1 (2.6%), lymphoma of bone 1 (2.6%), gemangiendotelioma 1 (2.6%), bone metastases 10 (26.3%); benign tumors 6 (15,8%). The control group was formed from 46 patients with extensive lesions of the proximal humerus non-neoplastic genesis, operated in our clinic in the period from 2006 to 2012. The functional outcome of treatment was assessed using Musculoskeletal

Tumour Society (MSTS) and NEER functional scores. Term follow-up of patients ranged from six months to seven years. Assessment of functional results was carried out in a period from six months to three years.

The Results of the Study: According to the results of our research in the study group, the value of functional outcome MSTS score was 87.6% using reverse prosthesis, and 67.7% when using the single-pole implants, average 77.7%. Unipolar prosthesis showed bad results, both in the control (61,3% MSTS, 60,7 NEER), and in the main (67,7% MSTS, 61,1 NEER) study groups.

Conclusion: We believe that today, the method of choice, for these patients is the modular shoulder prosthesis with inverse head in combination with additional means of fixation of soft tissue.

PP-159

Like or dislike? Ewing sarcoma on Facebook

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[2] *LKH Medical University Clinic, Graz, Austria*

[3] *UKH Vienna/Meidling Trauma Center, Vienna, Austria*

Background: Increasing numbers of patients are raising their voice in online forums via social media platforms to exchange health related information. With more than one billion members all over the world Facebook.com is the leading social media platform including medical related issues. Ewing sarcoma mainly affects teenagers and young adults and a large part of this age group uses Facebook. However little is known about the impact of this form of communication via online platforms on Ewing sarcoma patients.

Objective: The aim of this study is to analyze Ewing sarcoma patient's and relative's behavior on Facebook.

Methods: We examined a Facebook group named "Ewing sarcoma awareness" that is used to exchange information for both, patients and relatives regarding Ewing sarcoma. A self-designed questionnaire was used to compare patient's and relative's results. Sixty-five members of the Facebook group (26 patients, 39 relatives) out of 2.227 international group members participated in our study. We also analyzed all processes (posts, likes, threads, links) in the group during 6 months.

Results: More than seventy percent of all participants reported that they use the group "Ewing sarcoma awareness" as a source of information about Ewing sarcoma. Eighty-nine percent agreed a little or a lot, that being in contact with other people affected via the group makes it easier to handle the diagnosis. Twenty percent of participants reported that the group affected their choice of treatment and in fifteen percent participants were influenced in the selection of their specialist. Over all no significant difference was found comparing patient's and relative's results. Only regarding the recommendation of the Facebook group patients achieved significant higher results. During the last 6 months most activities in the group dealt about sharing destiny and handling the diagnosis. Fundraising played a minor role.

Conclusion: The Facebook group "Ewing Sarcoma Awareness" seems to have a relevant impact for group members regarding their choice of treatment. Moreover, participants turn to the group to receive support in everyday life. Statements made in the group are in part questionable from a medical point of view and their impact on patient's care, need further evaluation.

Keywords: Social media; Facebook; Ewing sarcoma; Social media networking

PP-160

Coexistence of a chondrosarcoma and a lung Ca metastasis in humerus of a patient with Ollier's disease: is it possible?

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[2] *Department of Research, Istituto Ortopedico Rizzoli, Bologna, Italy*

[3] *Department of Pathology, Istituto Ortopedico Rizzoli, Bologna, Italy*

Tumor-to-tumor metastasis in the same bone is extremely rare occasion. Limited number of case reports exists for benign to benign and benign to malignant association but none for malignant to malignant metastasis. Occurrence of several individual malignancies in the same patient may eventually cause such coexistences. We report an Ollier's disease patient with malignant transformation to chondrosarcoma complicated by a pathologic fracture and eventually whose pathological examination revealed that the lesion was not only the chondrosarcoma but an accompanying metastasis from existing lung adenocarcinoma. This report includes clinical, radiological, histological diagnostic challenges that we have experienced.

Keywords: Tumor-to-tumor metastasis; Ollier's disease; Chondrosarcoma; Lung adenoacarcinoma metastasis.

PP-161

Ewing sarcoma: an observational study of 65 patients. Treatment, follow up and clinical prognostic factors

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Introduction: Ewing's Sarcoma is a primary bone cancer which affects mainly children and young adults. Because of its unspecific clinical development it has been difficult to identify those clues that would drive us into a correct diagnosis, treatment and follow up. The purpose of this study is to assess the outcome of patients with Ewing Sarcoma (EWS), to analyse their treatment and to identify prognostic factors.

Methods: We reviewed 65 patients diagnosed with EWS at our institution between 1991 and 2013. We described

our population differentiating: sex, age, tumoral size, location and possible metastasis, LDH rates at diagnosis, chemotherapy regimen, surgical and radiotherapic treatment, clinical development. The prognostic significance and relative risk for various characteristics were assessed by a proportional hazards regression model. We estimated the overall survival (OS) and progression-free survival (PFS) by the Kaplan-Meier method and compared risk across groups using the log-rank test.

Results: Population characteristics were: median age 19,24 years (0,3-76), male 41p (63.1%). Median tumor size 8 cm (2-30). Commonly affected primary sites: extremity (41.5%), pelvis (23.1%), chest wall (9.2%) . 42 (65.6%) had localized disease, and 22 (34.4%) had metastatic disease.

Treatment Approach: 45 p (76.3%) underwent surgical resection, 48p (75%) external beam radiotherapy (EBRT). Chemotherapy regimens were 15p (33%) VAIA/EVAIA, 15p (33%) VAC/IE, 10p (16%) VIAE. After a mean follow-up of 40.7 months (P25-75; 13.3-86.16), the 5-year actuarial OS and PFS were 67.4% and 49.2%. Median of OS and PFS were 156.54 months (121-192 IC95%) and 49.8 months (20-168 IC95%). Recurrence or progression was documented in 36p (55.4%). The mean time to failure was 19.5 months (3-181). In the univariate analysis, the OS was significantly affected by stage (Pr chi2 0.0141) and chemotherapy treatment (P= 0.036). Factors not correlated with outcome were: sex, age, LDH increase, primary tumor location, tumor size and surgical or radiotherapy treatment. In the multivariate model, only stage remained significant (P< 0.010)l.

Conclusions: Although we didn't find statistically significant results, we know that outcome of EWS is influenced by many clinical and treatment variables. Future EWS trials should include all the variables that have known prognostic significance.

PP-162

Bilateral Kimura's disease of the both elbows: positron emission tomography/computed tomography findings

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Kimura's disease is a very rare, benign, lymphoproliferative inflammatory disorder of unknown etiology. A 38 year-old woman had soft tissue masses in her both elbow with multiple lymphadenopathy, which was diagnosed as Kimura's disease accompanied with multiple lymphadenopathies by histopathologic evaluation. We report the imaging finding with fluorine-18 fluorodeoxyglucose positron emission tomography/ computed tomography (18F-FDG PET/CT) and MRI, clinical findings and histopathologic features with a review of the literature.

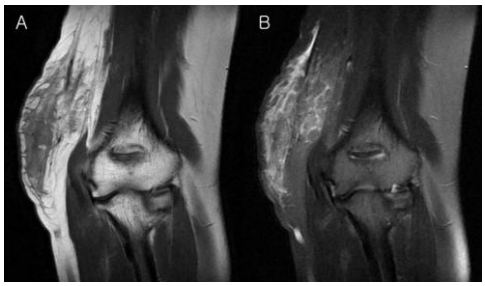

Figure 1

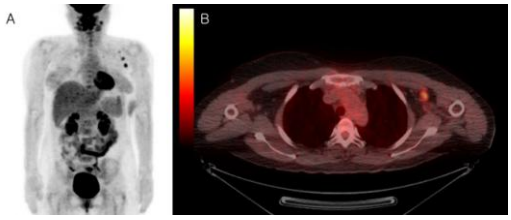

Figure 2

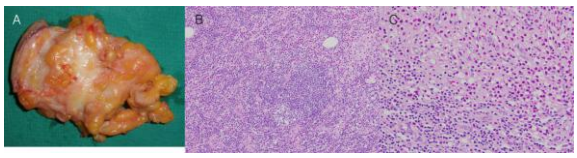

Figure 3

PP-163

The immunostainings of apoptosis-related antigens for the giant cell tumors of bone

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Introduction: Recent studies have suggested that apoptosis is one of the pathogenetic mechanisms in giant cell tumors (GCT). For further identification of apoptosis-related proteins appearing in GCT, we approached the mechanism of apoptotic process.

Methods: Immunohistochemical stainings for the proliferative markers were performed on separate formalin-fixed, paraffin-embedded, 5-mm serial sections cut onto coated slides. Thirteen surgical specimens from 11 patients with GCT were obtained at the time of surgical resection. For indirect immunostainig, the sections were exposed to the primary antibodies: bcl-2, PCNA, cyclin D1, p53 and p21.

Results: There was a significant increase of bcl-2 in multinucleated cells, compared with stromal cells, but no significant difference of P53 expression was detected. The majority of those cells with positive bcl-2 was mainly infiltrating lymphocytes (mononuclear cells) located in perivascular areas (Table). Stromal cells strongly showed the PCNA expression. Moreover, Bcl-2 expression in giant cell might contribute to the aggressiveness of GCT.

Discussion: In GCT, These results indicate that apoptosis in GCT is strongly associated with the expression of bcl-2, but not PCNA, cyclin D1, P53 nor p21.

PP-164

Immunohistological evaluation of apoptosis-related antigen for the giant cell tumor of bone

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Introduction: Recent studies have suggested that apoptosis is one of the pathogenetic mechanisms in giant cell tumors (GCT). For further identification of apoptosis-related proteins appearing in GCT, we approached the mechanism of apoptotic process.
Methods: Immunohistochemical stainings for the proliferative markers were performed on separate formalin-fixed, paraffin-embedded, 5-mm serial sections cut onto coated slides. Thirteen surgical specimens from 11 patients with GCT were obtained at the time of surgical resection. For indirect immunostainig, the sections were exposed to the primary antibodies: bcl-2, PCNA, cyclin D1, p53 and p21.
Results: There was a significant increase of bcl-2 in multinucleated cells, compared with stromal cells, but no significant difference of P53 expression was detected. The majority of those cells with positive bcl-2 was mainly infiltrating lymphocytes (mononuclear cells) located in perivascular areas (Table). Stromal cells strongly showed the PCNA expression. Moreover, Bcl-2 expression in giant cell might contribute to the aggressiveness of GCT.
Discussion: In GCT, These results indicate that apoptosis in GCT is strongly associated with the expression of bcl-2, but not PCNA, cyclin D1, P53 nor p21.

PP-165

Osteoid osteoma in the fourth metatarsal. A previously undescribed cause of forefoot pain

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Introduction: Osteoid osteomas are small, benign, bone tumours and it is estimated that between 2% and 11% occur in the foot. However, there are no documented cases in the medical literature of isolated lesions in the fourth metatarsal. We present the case of a 26 year old man with persistent pain in his left foot. Despite previous consultation and investigation, the cause of his symptoms had remained elusive for over six years.
Methods: A magnetic resonance imaging scan (MRI) was performed. This showed oedema in the head of the fourth metatarsal which correlated closely with the origin of the pain. Following the advice of our specialist radiology colleagues, a computer tomography (CT) scan with fine slices was then undertaken which identified the 3mm lesion. The management options were duly considered. Image guided radiofrequency or cryoablation were discounted due to the risk of damage to the very proximate chondral surface. Similarly, arthroscopic resection was precluded due to the dimensions of the joint involved. The small size and superficial position of the lesion favoured an open resection.
Results: The macro and microscopic appearances of the excised lesion supported the clinical and radiological diagnosis of osteoid osteoma. This was confirmed by a complete resolution of symptoms following removal of the offending lesion.
Conclusion: We believe this to be the first case of an isolated osteoid osteoma in the fourth metatarsal ever described in the orthopaedic literature. This case highlights the importance of pursuing a diagnosis with the aid of multiple imaging modalities, and MRI has again proved its use in the resolution of orthopaedic clinical conundrums. In addition, it highlights the pros and cons of the three most commonly used surgical management options for osteoid osteoma.

PP-166

Tumors of the patella: our experience

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Introduction: Tumors of the patella are rare; the literature indicates that most primary tumors of the patella are benign, with giant cell tumor and chondroblastoma being the two most frequent. Reported cases of patellar metastases are extremely rare.
Matherial and Method: We report a total of eight cases of patellar tumors from Bone and soft tissue tumor registery at the referent center- Institute of pathology, Medical faculty, University of Belgrade in the past 50 years.
Results: Seven of those were benign primary bone tumors: 2 osteochondromas, chondroblastoma, enchondroma, osteoblastoma and cavernous hemangioma; the only malignant tumor was a metastasis of urothelial carcinoma. Interestingly, all the patients in our series were males, the youngest being a nine-years old boy with osteochondroma, and the oldest a sixty-three-years old man with solitary metastasis of urinary bladder urothelial carcinoma. The main clinical manifestation were pain and swelling. In metastatic carcinoma pathological fracture was detected. The therapy was surgical, with two cases of total patellectomy (chondroblastoma and metastatic urothelial carcinoma).
Conclusion: Although very rare, tumors of the patella should a clinical consideration, because early diagnosis and therapy provide excellent prognosis.

PP-167

Langerhans cell sarcoma: case report and literature review

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Introduction: Langerhans cell sarcoma (LCS) is an extremely rare neoplasm of Langerhans cells with malignant cytological features, which is highly aggressive with >50% mortality from progressive disease. According to the most recent WHO Classification of Tumours it belongs to the category of histiocytic and dendritic cell neoplasms. Herein we report a case of a 62-year-old patient with an osteo-destructive lesion of the left scapular.
Case Presentation: We present the case of a 62-year-old male patient, who was advised to our department with a three-month history of pain in the left shoulder. Plain radiographs and magnetic resonance imaging of the scapular showed a destructed bone with multiple osteolysis. For diagnostic reasons an incisional biopsy was performed. Based on histopathological and immunohistochemical investigations a Langerhans cell sarcoma was diagnosed. Further staging including bone scan and computed tomography of chest, abdomen and pelvis revealed loco-regional metastases in the left shoulder, lymph nodes as well as multiple metastases in the liver. Therefore, a palliative treatment was introduced. At three-months of follow-up the patient was alive with disease.
Conclusion: Tumours of histiozytes are among the rarest of tumours affecting the lymphoid tissues. Histopathology and immunohistochemistry are necessary for diagnosis. The immunophenotype of the LCS is identical to that of Langerhans cell histiocytosis (LCH) and can be distinguished from LCH by malignant cytological features, such as high mitotic rate with atypia. The prognosis in patients with experienced multi-organ involvement is bad, solitary lesions showed favourable outcome. The therapy includes: surgery, chemotherapy as well as radiation and has to be adapted from case to case. To achieve the correct diagnosis of this rare high grade entity and thereby the adequate treatment, a multidisciplinary approach is essential.

PP-168

Extra-abdominal desmoid tumors. Medical treatment or surgery?

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Background: Extra-abdominal desmoid tumor is a rare benign neoplasm. The etiology is unknown although some studies associate mutations of the APC (adenomatous polyposis coli) gene and the regulation of β-catenin. Its treatment has varied from simple clinical and imaging surveillance to surgery and adjuvant therapies. Enlarged excision has been the treatment of choice but, as it is benign, mutilating interventions are not justified to achieve tumor-free margins. Presently there have been outlined various therapies as an alternative to surgical treatment.
Methods: 4 women and 1 man, aged between 21 and 69 years old, operated in the following anatomical locations: cervical, distal posterior thigh, paravertebral lumbar, dorsal and periescapular. Diagnoses were made by percutaneous biopsy. Margins were considered R1 only in periescapular tumor and so was the only one proposed for adjuvant radiotherapy.
Results: After an average follow-up of 23.6 months (4-40) all are free of disease. The tumor of the thigh recurred one year later and was treated with surgery and radiation, without new recurrence. Functional outcomes were good, except for periescapular case with a poor outcome (16/30 MSTS).
Discussion/Conclusions: Characteristically this tumor spans between muscle fibers, invades nerve structures and doesn't form a pseudocapsule, and therefore is a challenge for the enlarged excision. Most recent literature claims good results in the control and monitoring of these tumors with radiotherapy alone. Some cytotoxic molecules are also able to control the disease: vincristine, methotrexate, vinorelbine, anthracyclines, dacarbazine and pegylated liposomal doxorubicin. Imatinib and sorafenib also have promising results. Cryoablation is also an option, particularly if they are small and distant from important anatomical structures. Although wide tumor excision is still the safest treatment, there are recurrences. Besides, if there is involvement of important neurologic structures, the expected poor functional outcome should make us think in medical treatment

PP-169

Coffin-Lowry syndrome in a patient with osteosarcoma: cause or coincidence?

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Introduction: Osteosarcomas constitute a rare tumour entity, accounting for only 1% of all cancers diagnosed. The highest incidence can be found in children and around the 7th decade. Many hereditary syndromes are associated with development of osteosarcomas, as the Rothmund-Thomson syndrome, Bloom syndrome and Li-Fraumeni syndrome. Some hereditary syndromes follow the x-chromosomal pattern, from which the fragile X syndrome is most common, causing mental retardation.
Case Presentation: We herein present the case of a 22-year-old male patient with microcephaly, mental retardation and skeletal deformities. He was admitted to our department with severe knee pain caused by an osteosarcoma G3 of his right distal femur with involvement of the knee joint. Neoadjuvant chemotherapy was followed by overknee-amputation and adjuvant chemotherapy. One year later, there was no evidence of local or systemic recurrence. The patient's 8-year-old half brother presented with the same neurological impairments and growth delay. Moreover, the family history revealed multiple cancerous diseases as breast cancer, melanoma and laryngeal cancer. Therefore, the X-linked hereditary Coffin-Lowry syndrome (CLS) is supposed in both patients and a cancer syndrome may be present.

Discussion: The loss-of-function in the RSK2-gene is the cause for CLS, leading to mental retardation and growth disturbances. Affected females are rather asymptomatic, whereas males present with typical neurological deficits and bone deformities, as pseudoepiphyses and massively ossified fissures of the skull. As RKS2 plays a role in correct osteoblast function and is important for development of c-fos positive osteosarcoma, a relationship between our patient's disease and his mental retardation was supposed. However, this could not be approved, as deficient RSK2 seems to decrease the risk of developing an osteosarcoma.
Conclusion: To our knowledge, this is the very first case in literature of a patient with Coffin-Lowry syndrome developing an osteosarcoma. At the moment, genetic testing for p53 mutations is carried out in order to find out whether an additional hereditary cancer syndrome is present.

PP-170

The role of surgery in the modern multimodal therapy of malignant musculoskeletal tumors

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Introduction: Surgery and associated radiation therapy has been the mainstay of treatment for malignant musculoskeletal tumors for the past decades, but are they still actual in the rapidly developing field? What are the implications of genetic typing, targeted therapy, markers, new chemotherapic drugs and radiation regimens for the curative surgery of sarcomas?
Methods: We review the most recent reported data on available diagnostic procedures, preoperatory workup, radical excision of primary and secondary tumors, limbsparing surgery indications, complex soft tissue reconstructions, the utility of prognostic and diagnostic markers, advances in chemotherapy and radiation therapy protocols and the results of targeted therapy in selected cases and their influence on the surgical therapy of sarcomas.
Results: Our goal is to propose an actual treatment algorythm for malignant musculoskeletal tumors, taking all new breakthroughs into account. Surgery confirms its lifesaving role in patients with malignant musculoskeletal tumors. All new developments in the field of imaging studies, adjuvant/neoadjuvant therapy increase overall survival and decrease disease related morbitity by allowing more conservative surgery.
Conclusion: Surgeons must keep up with latest news in musculoskeletal oncology in order to provide their patients with the best individualised therapy.
Keywords: New therapeutic methods; Surgical therapy; Treatment algorytm

PP-171

Biomarkers of malignant growth of cells used for osteosarcoma prediction assessment

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Introduction: Complex study of molecular-genetic path morphological and clinical characteristics of patients with osteosarcoma for early diagnostics, to increase the treatment efficacy and prophylaxes of early progression of osteosarcoma.
Methods: Assessment of immune marker characteristics of tumour cells of 212 patients with osteosarcoma was conducted. The results of reactions with antibodies to ki-67, bel-2, mtp-53 (mutant gene) localized in nuclear and mitochondrial matrix expressed in % with considering the amount of dyed cells in 100 patients.
Results: The results showed that expressive profile (molecular-genetic phenotype) mtp53+, bel-2-, Ki-67+ for 34, 9% (74/212) patients with osteosarcoma is predictive unfavourable factor of early metastasis (4-6 months) and appearance of early relapses (8 months), progression of tumour process (III and IV stages 60-80% patients), low degree of pathomorphizm (1 and 2), relative life interval of the patients (up to 3 years), it is connected with low degree of differentiation (G3 80-90% patients), increase the size of tumour to 550 cm3, with chondroblastic version of osteosarcoma.
Conclusion: It is necessary to consider these data in searching and dividing the groups of the most perspective molecular-genetic markers, which have predictive value in clinic while monitoring the treatment of patients with osteosarcoma.
The set of data allows to divide the groups of patients with high risk of unfovourable course of this disease during the examination at this stage. Thus, obviously the clinical medicine for introduction and enlargement of molecular-testing for effective decision making and the solution about creation of new strategy of molecular-directed therapy of patients with osteosarcoma simultaneously affecting on certain molecule and processes are needed. All of these significantly contribute to the improvement of molecular-genetic diagnostics in oncology.

PP-172

Immunohistochemical investigations of expression gene p53 in osteosarcoma

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Introduction: Our research was devoted to study the expression of molecular-biological markers of differentiation, proliferation and apoptosis in osteosarcoma, determining by immunohistochemical methods.
Methods: Research on expression mtp53 was conducted in 215 patients with osteosarcoma by immune-histochemical methods with using the sets of the firm Dako.
Results: The analysis allowed to establish that hyper expression mtp53+ occurs in OS patients with low stage of tumour differentiation (G_3) 13 times more often than with

high level tumour differentiation (90,1±2,0% and 9,9±2,0%; p<0,05). It is observed that the tendency of connection of positive expression mtp53 with prevalence of process (T2-3). However, with 3-4 clinical stages of osteosarcoma associative connection was reliable, the frequency of occurrence in patients with these stages was higher than 4 times in comparison with 1-2 stages (70,5% and 85,7% in comparison with 20,0% and 47,8%; p<0,05).

The patients with big volume of tumour (more than 500sm3) positive expression mtp53 occurred 1,5 times more often than in patients with less size of tumour (260sm in patients with the absence of this gene expression). Chondroblastic histological version (41,4%) and osteolytic rontgenological form (43%),which proceeds with more malignant phenotypes and also more (p<0,05) often occurred in patients with positive expression mtp53. It is known, that the low level of spontaneous or induced apoptosis of tumour cells may be the base of the development of resistance to anticancer therapy.

Thus, in systematic chemotherapy tumour decrease was observed to 75% only in 38,9% patients with positive expression gene mtp53 in comparison with 61,1% patients with the absence of this mutation (p<0,05). Pathomorphism at I and II stages also more often occurred in patients with positive expression gene mtp53, but at III-IV stages more occurred in patients with absence of this mutation (71,4±4,1 and 81,3±3,5; p<0,05). Total regression of osteosarcoma was observed in 13, 7% patients, among them more than half (58, 8%) were with negative mtp53-phenotype (p<0,05). Partial regression of tumour was detected in majority (52,4%),to the presence of expression gene mtp53. Among these patients in 47,7% high and mean expression of mutant gene was detected. Without effect to conducted treatment and progression of tumour cells was established in 25% patients. Among them in 80,6% mutant form of gene53existed.

It is observed that the tendency to decrease the term of appearance of relapses and remote metastasis in patients with hyper expression of gene53. In this way up to one year relapses appeared in 9,7% patients , the presence or absence of mutant gene mtp53had not an associative relation. Median occurrence of relapse in this and in other group of patients was 9,5 months. But occurrence of relapses in the course of the following years was detected in 23,4% patients.

The period of relapses occurrence in patients with positive reactions to the presence of mtp53made up 19,6 months in comparison with 40,5 months in patients with positive expressions of mutant gene p53.

The appearance of remote metastasis up to one year was detected in 36,3% patients and following year in 63,7%. Occurrence median of remote metastasis up to one year had not reliable difference in groups with the presence and absence of mutant genep53expression. In subsequent period the median was 2, 2 times lower than in patients with the presence of positive mutant gene p53 expression than in patients who did not have the median (p<0,05). Life interval of the patients with the presence of mutant gene mtp53 was also lower 2 times than in patients with absence of this gene (28,8 months by comparison with 57,7 months correspondingly; median-28 and 52 months correspondingly).

Conclusion: Thus, the data showed that high and mean expression of mutant gene p53 in patients with osteosarcoma has associative relation with low degree of differentiation (G_3) tumour, 3 and 4 stages of tumour process, the size of tumour with low degree of pathomorphism (1 and 2), with chondroblastic histological versions and osteolytic rontgenological form, which proceed with more malignant phenotypes. We detected the decrease of the appearance term of relapses, remote metastasis and life interval in patients with hyper expression of gene mtp53.

PP-173

Study of cytogenetic changes in lymphocytes of peripheral blood of patients with osteosarcoma

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Introduction: Registration of aberration of chromosome in lymphatic peripheral blood of the patients with osteosarcoma for the assessment of conducting treatment efficacy.

Methods: The research was carried out in the specimen of peripheral blood of 198 patients with osteosarcoma aged from 10 to 45. Primary cytogenetic investigation of patients was conducted before their clinical examinations (background). Cytogenetic value, which was taken in background investigation, may be one of the criteria for determination of the following treatment efficacy. All the patients were divided into 3 age groups, fourth group consisted of healthy volunteers of appropriate age.

Results: Cytogenetic analysis showed that the frequency change of genome were 1,2 times higher in children and adolescents than in patients under 30 years (10,3±0,9% and 8,4±1,0%, p<0,05), 1,7 times higher in comparison with patients elder than 30 and 6,1 times higher than in healthy people (1,7±0,3). It was established, that chromosome instability frequency in healthy people of different population (historical control) is within 5%, that we accepted this size to discriminatory level. We compared the level of aberration of chromosome in patients of higher discriminatory and lower with different indexes of tumour process in osteosarcoma (OS). It was shown that the connection of frequency in patients with various levels of aberration of chromosome with degree of differentiation of OS, prevalence of tumour process by system TNM and with clinical stages of this given disease. The data after the analysis showed that in majority (76,7%) patients with the level of frequency of aberration of chromosome lower than 5%; high level of differentiation of tumour (G1) average in 12,7±2,4%(G_2) and low in 11,0±2,3% (G_3) were observed. These patients had IB and II A-B clinical stages of OS.

Consequently, the increase of chromosome aberration was higher than discriminatory (P> 0, 05%) caused the

decrease of differentiation of tumour (G_3) in 70,8% patients. The prevalence of tumour process by scheme TNM did not depend on the changes of chromosome aberration level. The number of patients with OS did not differ as in group patients with high level of aberration of chromosome and low level as well.
However, III and IV A clinical stages of OS were interconnected with high chromosome aberration level ($p<0,05$). So, in detection of big tumour, the increase of chromosome aberration level is observed relatively to discriminatory. In this median of tumour volume the patients with high instability of genome had 2 times (545,8±46,0 sm3 and 273,2±24,8 sm3; $p<0,05$) higher volume of tumour than in patients with low level of chromosome aberration. Chondroblast histological version of OS occurred 3.4 times more often in patients with high level of chromosome aberration, but periosteal OS -was 2.5 times more. In other histological versions of this disease, the reliable difference in frequency was not observed.
The investigation results showed that the decrease of tumour up to 50% occurred 1,4 times more often in patients with low level of chromosome aberration (30,5±3,3% and 15,0±2,5%; $p<0,05$), but the growth of tumour was observed 2,6 times more often in patients with high chromosomal instability (22,5±3,0 and 8,5±2,0; $p<0,05$).
Pathomorphism of I stage was 4,4 times more often in patients with high level of chromosome aberration (46,3±3,5% and 11,9±2,5%; $p<0,05$), but III and IV stages were 2,8 and 6,4 times more often in patients with low chromosomal instability, total regression was observed 2,1 times more often in the same patients with tumour (21,2±2,9% and 10,0±2,1%; $p<0,05$).
There were not reliable differences in the periods of appearance of relapses and remote metastasis up to one year, but their occurrence in the period -over one year was 1,5 times earlier in patients with high level of chromosomal instability (20,5±2,9 months and 32,7±3,3% months; $p<0,05$).
Life interval was shorter by 1, 8 times in OS patients with high instability chromosome, median of life interval in these patients compiled from 28 months in comparison with 46 months in patients with low level of chromosome aberration.
Conclusion: Thus, the level of chromosomal instability of higher discriminatory is prognostic unfavourable factor and is connected with growth of tumour process, low level of pathomorphism and differentiation of tumour, increase of the size of tumour and chondroblastic histological version and also with comparative-life interval of the patients.

PP-174

Aneurysmal bone cyst of the spine: an alternative treatment with mesenchymal stem cells injection

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Introduction: As being a dysplasia rather than a true tumor, spinal primary aneurysmal bone cysts (ABC) are treated more conservatively then in the past. The relative inaccessibility of spinal ABCs forced to find best cost-to-benefit solutions; the current trend is repeated selective arterial embolization (SAE) until healing. Recently, bone marrow derived mononuclear cell injection has been introduced for simple bone with promising results. In this report, we present our preliminary experience in the use of derived mesenchymal stem cells (MSCs) in spinal ABC treatment.
Methods: Two young people aged 15 (a male) and 14 (a female) years old presented with C2 osteolityc large lesion with a radiological diagnosis of ABC, Histologically confirmed. At admission, one was asymptomatic and the girl suffered from neck pain. In one case SAE was not executable due to the origin, from the vertebral artery, of ABC blood supply; the second case resulted refractory to repeated SAE. Both cases presented no significant sign of ossification but high pathological vascularization. Patients were finally submitted to direct intralesional injection of autologous MSCs after iliac crest bone marrow needle aspiration and concentration.
Results: Consecutive clinical and radiological FU was performed. F.U. is 6,5 months in the first case and 2 months in the second; subtotal consolidation with large bone tissue deposit is an obvious healing sign in the first treated ABC; initial ossification and clinical recovery are initial sign of healing in the second case.
Conclusion: Serial SAE proved to be effective in the treatment of ABC. However, it's not purely a safe procedure, it may lead to ischemia of main structures and, aside of the limits of the procedure, a certain percentage of patients result resistant to such process. Recently, MSCs therapy has been introduced to stimulate osteoblastic regeneration with promising results in simple bone cyst and in long bone ABC. Taking advantage of the fact that ABC first cases MSCs injections treated are giving unexpected results, we suggest this procedure as a good alternative for the treatment of such lesions.

PP-175

Multiple bone myeloma and amyloid-like protein formation. A spectroscopic study

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Introduction: Multiple myeloma is a blood cancer disease and the most common primary tumor of bones while 90% of patients develop bone lesions. In the present work we used infrared spectroscopy (IR) in combination with Scanning Electron microscopy (SEM-EDX) to study the changes of the molecular structure of blood and bones of patients due to diseases.

Methods: Blood and bone marrow samples were taken from 10 patients (age 50-67 years) who suffered from multiple bones myeloma. Two of them had a pathological fracture due to their disease and specimens from the fracture area were collected.
The FT-IR spectra were recorded with a Nicolet 6700 thermoscientific spectrometer (USA), equipped with an ATR-FT-IR apparatus. Each plot consisted of 120 co-added spectra at a spectral resolution of 4 cm^{-1} and the OMNIC 7.1 software was (from Nicolet 6700) used for data analysis. The advantage of IR spectroscopy is that it requires only few micrograms of samples.
Results: The IR spectra showed considerable changes in band intensities and shape between healthy and diseased samples in all spectral regions. It was found that the proteins change their structure from α-helix to random coil. Furthermore, in the bones it was found that amyloid-like proteins were produced due to the cancer, while the hydroxyapatite changed its biological structure to amorphous one. The amorphous structure is one of the risk factors for bone lesions and fractures.
In the spectra of all patients it was noticed from the bands at the region 850-800 cm-1 that the DNA changed its structure from the normal B-DNA to cancerous Z-DNA. SEM-EDX analysis showed the increase of total copper concentration in the serum and this was analogous to clinical data.
Conclusion: It was found that in multiple myeloma in the blood as well as in bones the molecular structure of proteins changes from α-helix to random coil, while in the bones amyloid-like proteins were produced. The native B-DNA form changed to Z-DNA. From the concentration of copper it was established that copper proteins are linked to DNA and protein damage due to electron transfer and free radical reactions.

PP-176

Identification of adult knee primary bone tumor symptom presentation: a qualitative study

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Introduction: Delays in diagnosis of primary bone tumours (PBTs) are common, contributing to poor patient outcomes. Professional delay is a key contributing factor and could be improved by recognising signs and symptoms earlier. NICE guidelines regarding malignant PBT symptoms frequently do not correlate with clinical presentation, possibly due to variety of skeletal location and methodologies. Investigating the symptom presentation of one PBT location, at onset through to Consultant diagnosis (Cd), may provide greater depth and consistency of information. The aim of this study was to identify the symptom presentation of adult knee PBTs from onset to Cd, from combined patient and Health Care Professional (HCP) perspectives.
Methods: Following ethical approval, a qualitative study using in-depth semi-structured interviews recruited a purposive sample. Following informed consent, interviews informed by a piloted topic guide developed from existing literature, explored participants' experiences of symptom presentation. Interviews were recorded and transcribed verbatim. A grounded theory approach was employed whereby data were coded, categorised and triangulated to produce key themes. Rigour and trustworthiness were enhanced through data verification and an audit trail. Recruitment continued until data saturation.
Results: Fourteen adult participants from a UK specialist centre (n=8 patients with a knee PBT; 6 HCPs with expertise in orthopaedic oncology) were recruited. Five key themes were established: 1] Symptoms started with intermittent pain of low-moderate severity which became worse, more constant and present at night; 2] Pain was mechanical in nature but became more difficult to ease; 3] The history of onset was unusual with a protracted symptom duration (mean 22 months), failing to improve with conservative treatment; 4] Swelling was common; 5] Systemic signs were unusual. More similarities between HCPs and patients perceptions were found at Cd compared to onset.
Conclusion: New insights of symptom presentation, particularly in the early stages have been provided. Although starting similarly to routine musculoskeletal presentations, a number of distinctive features may enable early diagnosis. Greater similarity in symptomology between patients and HCPs at Cd is consistent with NICE guidelines. Lack of awareness of early symptoms could be contributing to diagnostic delay, attuning HCPs to these findings could identify PBTs earlier.

PP-177

A case report: osteochondroma-associated with the Carney-complex?

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Introduction: The Carney Complex (CNC) is an autosomal dominant multiple neoplasia syndrome.
Almost 60% of patients have a germline inactivating mutation in the Prkar1a gene. The various components of this complex include pigmented skin spots, myxomas (cardiac, cutaneous, ...), endocrine overactivity (the Cushing syndrome, acromegaly and sexual precocity), schwannomas and osteochondromyxomas. Osteochondroma is not known to be associated with the complex, so this is supposedly the first described case, where these two entities occur in one person.
Case Description: A 17-year-old Caucasian man (weighing 115 kg; 191 cm tall) was presented with osteochondroma of the humerus and several cutaneous myxomas on his chest. X-rays showed an exophytic chondro-osseus lesion at the proximal diaphysis. MRI, scintigraphy and immunohistological analysis after marginal ablation confirmed the diagnosis of osteochondroma. Due to the multiple cutaneous myxomas precise evaluation with relation to Carney-Complex followed. His Medical history revealed multiple angiomyxomas and calcifications of the testicular parenchyma. Furthermore the patient showed

multiple narrow based papules on the chest, the right lower eyelid, the scrotum and the ventral surface of the tongue. The serum levels of IGF-I and of IGF-BP 3 were increased. In family history, his mother showed typical symptoms of CNC (cardiac myxomas). Although neither the mother, nor the presented man were positively tested for the two known associated loci of CNC.

Discussion: According to international classification criteria, the presented man can be diagnosed of CNC due to the appearance of multiple myxomas, a first-degree affected relative, calcification in testicular ultrasound and elevated serum levels of IGF. Prkar1a is a tumor suppressor gene with specific importance to cAMP responsive tissue and enhanced bone tumorgenesis. Myxomatous, cartilaginous and bony differentiation, like osteochondromyxomas are typical. In contrast, the appearance of osteochondroma is usually linked to tumor suppressor genes and differs in patient age and tissue composition. This presented case however displays the first manifestation of CNC and osteochondroma in one person. An association between these two entities cannot be excluded.

PP-178

Bone defect reconstruction with an antibiotic-eluding bone substitute in a large uncontained partial distal femoral defect

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Introduction: Most existing options for reconstruction of larger bone defects after tumor resection are unfortunately associated with a substantial risk of infection. Recently, CERAMENTTM|G, a biphasic antibiotic eluding bone substitute has been shown to be highly successful for treatment of chronic osteomyelitis1. The ultra-high local antibiotic concentrations achieved with this product, make it an attractive option for all clinical situations where local co-delivery of a bone substitute and high dose Gentamycin are desired with either prophylactic or therapeutic intention.

Methods: We report a unique case of a 35-year-old man who underwent wide resection of a low-grade surface chondrosarcoma from his right posterior distal femur in October 2013. Joint preserving multi-planar femoral osteotomies and placement of a lateral locked plate (LISS, Synthes), to augment the anterior cortical remnant, were performed with help of intra-operative 3-D CT based computer navigation. The bone defect was then reconstructed using 20ml of demineralised bone matrix (20ml, DBX, Synthes), fashioned into a shallow wall around the entire circumference of the resection area, followed by implantation of 30ml CeramentTM |G and 36 ml of CeramentTM |BVF into the remaining bone defect.

Results: Immediate post-op X-rays showed incomplete filling of the defect, which had developed into a large radio-dense regenerate with a sclerotic rim surrounding a central lucency at 6 weeks post-operatively. Gradual reduction in its overall size could then be observed at each subsequent follow-up X-ray, while the sclerotic rim intensified up to the 3 month mark, before slowly regressing again. CT-scans at 3, 5 and 10 months post-operatively showed increasing remodelling, most prominently in the distal and medial femur. The patient revovered full ambulatory and unrestricted knee function and xrays showed near complete defect remodelling at 14months.

Conclusion: Antibiotic-eluding bone substitutes may represent an valuable addition to the established reconstruction options for bone defects in general. Further research is needed to better understand the optimal indications, implantation technique and radiological remodelling pattens.

Reference: M McNally, J Ferguson, R Giordamaina, N Jacobs, M Sutherland, D Stubbs, A Woodhouse. A pro-spective clinical outcome study of a new biphasic absorbable composite carrier with Gentamicin in the treatment of chronic osteomyelitis. Abstract F093, 33rd EBJIS Annual Meeting, Utrecht, 2014

PP-179

A facebook based survey on psychosocial distress levels in patients with osteo-, Ewing- and lipo-sarcoma

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Introduction: Psychosocial distress is an important problem in cancer patients. Routinely applied screenings can help to identify vulnerable patients and provide them with an appropriate therapy. However, differences between distress levels in orthopaedic patients with different sarcoma entities are hard to identify due to the low incidence of these diseases. Social networks like Facebook with their topic-based groups provide a unique potential for collecting and analyzing data of rare diseases like sarcomas. Aim of this study therefore was an internet-based survey on psychosocial distress levels in patients with Osteo-, Ewing- and Liposarcoma with a self-assessment screening via Facebook.

Methods: A psychometrically tested questionaire with 10 items (answer categories: 0 = no distress to 5 = high level of distress) for self-assessment of psychosocial distress (QSC-R10) (Book et al., Psychooncology, 2011) was compiled to an online survey. A result above 14 points indicates a relevant level of distress requiring psychooncological treatment. A link to the survey and all necessary informations were posted in specific Facebook groups regarding Osteo-, Ewing- and Liposarcoma.
After 1 month all surveys were closed and data was statistically analyzed according to distress levels in different sacoma entities and psychooncological therapy offered.

Results: A total of 43 patients with Osteo-, Ewing and Liposarcoma participated in our study. In either group a high amount of patients suffered from psychosocial distress (Liposarcoma: 78%; Osteosarcoma 91%; Ewing Sarcoma: 100%). In patients with Liposarcoma the results of the questionaire averaged 24,5 points. Patients with Osteo- or Ewing Sarcoma attained an increased but

statistically narrowly not significant average value of 30,4 (p=0,14) and 32,0 (p=0,07) compared to patients with Liposarcoma. Psychooncological treatment was offered in 34% of the cases. 41,7% were satisfied with the psychooncological treatment when offered.
Conclusion: Our study could confirm the high demand of additional psychooncological treatment of sarcoma patients as previously experienced in daily clinical routine. In this context a correlation between psychosocial distress and the mortality associated with the different sarcoma entities could be shown. However, to date no sufficient psychooncological treatment is offered to orthopaedic tumor patients. Additionally, a social network as a modern communication medium was successfully used for collection and analysis of epidemiologic data of rare diseases.

PP-180

Oral CSF1-receptor inhibition with PLX3397 for tenosynovial giant cell tumor/pigmented villonodular synovitis: MRI assessment using novel modified RECIST, tumor volume scoring, and tissue damage scoring

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Introduction: Tenosynovial giant cell tumor (TGCT) is a rare locally aggressive neoplasm of the synovium sometimes requiring joint replacement or amputation. Measuring treatment response with Response Evaluation Criteria In Solid Tumors (RECIST 1.1) in clinical trials of TGCT is challenging and doesn't consider local tissue damage, a major cause of morbidity. We compared conventional RECIST to two novel methods, modified RECIST (mRECIST) and tumor volume scoring (TVS), and added a scoring method for local tissue damage (TDS) in a longitudinal trial of PLX3397, an oral inhibitor of colony stimulating factor (CSF)1 receptor kinase.
Methods: Fourteen patients with progressive or relapsing TGCT from an ongoing, single-arm, multi-center phase 1 trial of PLX3397 (1000 mg daily total dose) had MRI at baseline and every 2 months for up to 24 months. Two patients also had serial FDG-PET. Images were assessed centrally, blinded to visit order, by two independent radiologists using RECIST (based on longest tumor dimensions), mRECIST (short-axis dimensions), and TVS (10% increments of maximally distended normal synovial cavity or tendon sheath). For TVS, Partial Response (PR) was ≥ 50% decrease, and Progressive Disease (PD) was ≥ 30% increase over the lowest score. TDS, adapted from Whole-Organ MRI Score (WORMS) for osteoarthritis, assessed multiple features, including bone erosion, marrow edema and joint effusion. Baseline CSF1 expression was assayed by in situ hybridization staining and reviewed by an expert pathologist.
Results: CSF1 expression was confirmed in all (n=12) qualified samples. Conventional RECIST showed a majority of the patients as responders (64% PR, 36% stable disease (SD), none progressed) and median tumor decrease of 39%. mRECIST and TVS showed higher proportions of responders (both 79% PR, 21% SD, none progressed) and greater median tumor decrease (48%, 61%). Both patients with FDG-PET showed response to treatment. TDS showed 71% had bone erosions; none progressed; 71% had marrow edema; 80% improved. 78% had joint effusion; 57% improved.
Conclusions: Treatment with PLX3397 resulted in sustained tumor regression in the majority of patients based on conventional RECIST. mRECIST, TVS and TDS provided superior assessment of TGCT than RECIST did, will be studied further in a Phase 3 TGCT trial.

PP-181

Long-term biomechanical adaptation in a biologically-reconstructed femur after Ewing sarcoma

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Introduction and Objectives: Biological reconstruction of the femur using massive bone allograft (MBA) is a worldwide solution for limb-salvage surgery after bone sarcoma. Because of the risk of MBA mechanical failure and size limitations of vascularised fibula autografts (VFA), a combination of VFA placed inside a MBA represents an original solution. [1] However, the remodelling and long-term survival of the reconstruction are not consistent,[2] and there is limited knowledge about functional outcomes after surgery based on quantitative data. Our aim is to study the long-term biomechanical adaptation in a paediatric oncology case of biologically reconstructed femur, by analyzing: (i) musculoskeletal forces and muscle compensation strategies in different motor tasks through image-based musculoskeletal modeling; (ii) mechanical stress in the reconstruction during the motor tasks through finite element analysis, also including potential revision surgery scenarios.
Methods: The patient (male, 8 years old) underwent a biological reconstruction of the proximal right femur, and

was then continuously disease free. CT scans of the lower limbs were acquired post-operatively and during follow-ups at every 6 months for routine controls. The evolution of bone morphology and density was quantitatively evaluated. After 7 years, the patient underwent gait analysis (walking, chair rise/sit, stair ascent/descent, squat) and CT scanning after being instrumented with the same reflective marker setup.[3] A 9-body segment, 12 degree-of-freedom articulated 3D linkage actuated by 85 musculotendon actuators was created from these images (Figure) using a previously developed framework[4], and a typical inverse dynamics and static optimization approach was then applied to calculate muscle and joint contact forces during each motor task. Subject-specific finite element models of both femurs were built using a validated procedure.[5] The subject-specific muscle and joint contact forces were applied as loading conditions onto the corresponding nodes, and physiologically-oriented constraints were used.[6] Plate and screws safety was tested in terms of von Mises stresses against fatigue limit. Bone principal strains and strain energy density were computed to assess risk of fracture[5] and remodeling stimulus,[7] respectively. In the operated femur, the finite element analyses were repeated simulating different screw-removal configurations to reduce the expected stress-shielding.

Results: Overall, joint contact forces were larger in the contralateral limb during all motor tasks, except for walking. Knee and ankle loads were markedly higher (up to 3 body-weight difference), particularly in double-support tasks (chair rise/sit and squat). Muscle compensation strategies showed large forces of the vasti and gastrocnemius muscles of the contralateral limb, while gluteii and biarticular hip muscle forces of the operated leg were marked. Plate and screws stresses were below critical values for titanium alloy fatigue in all motor tasks. While maximum strains were not critical in both femurs (safety factor of 3 or above) in the non-demanding motor tasks, the average strains in the operated femur were lower than in the intact contralateral. A marked regional variation in strains and strain energy density was observed within the allograft: normal levels in medial compartment, extremely low values in anterior and posterior compartments. Despite the allograft thinning already observed during follow-up, the mechanical condition in the anterior and posterior compartments appears compatible with a further bone resorption. When simulating different patterns of proximal screws removal, we found that their complete removal would be needed to restore a more physiological bone strain configuration.

Conclusion: This study presents a successful integration of subject-specific musculoskeletal modeling and finite element analysis of a long-term biomechanical reconstruction after Ewing sarcoma. The predicted musculoskeletal forces and muscle compensation strategies can provide advice for rehabilitation therapy in specific clinical scenarios. The results from finite element analysis allow interpretation of the complex bone remodeling mechanism, and seems not to imply a high risk for the remaining screws and plate, nor for bone in the medial compartment, but suggests caution in the postoperative phase due to reduced bone thickness and density in the lateral compartment.

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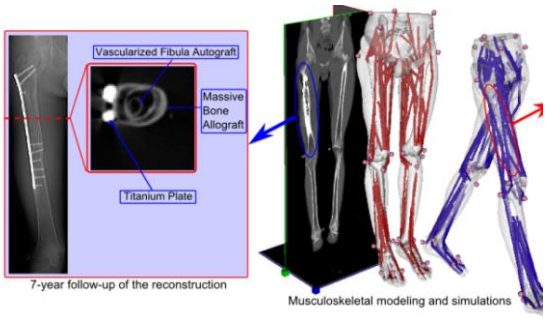

Figure 1. *Workflow of subject-specific musculoskeletal modeling and simulations of the motor tasks and finite element analysis of the femurs*

PP-182

The role of core needle biopsy in the diagnosis of bone and soft tissue tumors

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Background: In the management of bone and soft tissue tumors, accurate diagnosis is critical to optimize outcome. On occasion, diagnosis may be made by careful history, physical examination and images alone; however, open incisional biopsy for tissue diagnosis is still the gold standard for accurate diagnosis in most of the cases.
Imaging-guided core needle biopsy is another well established technique for the diagnosis of bone and soft tissue tumors and tumor-like lesions in specialized orthopedic oncology centers. A few studies have compared the results of CT-guided core needle biopsy with open incisional biopsy. In these studies the samples numbers were less than 300 biopsies with high accuracy rate in most of them, the safety of the procedure was also demonstrated in most of the cases.

Objective: To present our results of computed tomography-guided core needle biopsy with assessment of the accuracy and complication rates of the technique.

Methods: About 2000 CT-guided core needle biopsy have been performed between July 1998 and December 2014 in the national oncology center, Tel Aviv Sourasky Medical center, Israel. All of the cases were managed by the same radiology, pathology and orthopedic oncology teams.
In this retrospective study, the accuracy of this procedure wil be determined by comparing the CT-guided core

needle biopsy diagnosis to the final diagnosis achieved by definitive surgery if available, we will also compare the complications rate between the two procedures.

PP-183

Self-service software for identification of sarcoma patients with psychosocial distress

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Introduction: Psychosocial distress develops frequently in patients suffering from malignant diseases. The implementation of psychosocial distress screenings might help to identify and treat vulnerable patients at an early stage. However, clinical implementation of psychosocial screenings have been limited because they are time consuming and require dedicated personnel. To overcome these hurdles, the aim of the present study was to establish a self-service software that permits distress screening of sarcoma patients while integrating seemingly into the work flow of a musculoskeletal cancer center.
Methods: All Patients with or with history of malignant musculoskeletal tumors, who presented in 2014 at the musculoskeletal cancer center were screened for psychosocial distress in a standardised fashion using a novel self-service software in combination with a simple tablet computer as screening terminal. The software was developed on a well-established and psychometrically validated questionnaire. The latter was answered by the patients using the screening terminal which was located within a dedicated space of the outpatient clinic. All results were securely stored using a personalized registration card and were retrievable for the treating physician. Patients exceeding a defined critical cut-off value were expected to require psychosocial support and a psychosocial treatment was initiated.
Results: The self-service software based distress screening was successfully integrated into the daily routine of the musculoskeletal cancer center. Hereby, the acceptance was rather high due to the intuitive software design and convenience of the setting of the screening terminal. A comparison of the self-service software based approach to conventional paper questionnaires, revealed improved feasibility. Furthermore, cooperation and integration of physicians and nursing staff was markedly enhanced. A high number of patients with malignant musculoskeletal tumors was suffering from psychosocial distress.
Conclusion: A self-service based software for distress screening in sarcoma patients was successfully implemented into a screening terminal within an outpatient cancer center. This setup integrated into the clinical work flow and was well received by physicians, nursing staff, and most importantly patients. Data suggests that the software efficiently and reliably detects distress pattern in sarcoma patients and that it holds great potential for extended screening of psychosocial distress in oncology.

PP-184

Ewing's sarcoma of prostate

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Introduction: Ewing's sarcoma (ES) and primitive neuroectodermal tumor (PNET) are rare tumours with origin in bones and soft tissue. Rarely this tumour occur in genitourinary organs, particularly on prostate (there is only seven cases in literature). Usually this disease arises on young patients and has aggressive presentation. We report the eight case of a primary prostate ES.
Case Report: A twenty eight years old male presented at our hospital with a history of rigth testis and anal pain and tenesmus with evolution of four months. In the digital rectal examination was identified polilobulada mass anterior to the rectum, painful to touch. In imaging evaluation by abdominal and pelvic MRI presence of heterogeneous solid prostate lesion, 7 cm long axis, with invasion of adjacent muscles without cleavage plane, and lymph node involvement. Thoracic assessment without suspicious lesions. Lesion biopsy was taken (26/02/2014) with histology compatible with small cell neuroendocrine tumor of the prostate, cannot be excluded Ewing / PNET. The EWS gene rearrangement (3'EWS and 5'EWS) was positive. So, the patient started VIDE protocol (vincristine, ifosfamide, doxorubicin and etoposide – six cycles) followed by pelvic exenteration, whose histology revealed R0 surgery, with only two ES foci and the presence of microscopic focus of adenocarcinoma of the prostate (ypT2aN0). He completed adjuvante chemotherapy with 1 cycle of VAI protocol (vincristine, dactinomycin, ifosfamide) and 7 cycles of VAC protocol (vincristine, dactinomycin, cyclophosphamide), without complications. Currently is on surveillance with MRI pelvic and abdominal post therapy without evidence of disease.
Conclusion: Although primary ES/PNET of the prostate is an extremely rare soft-tissue sarcoma, it should be considered in the differential diagnosis of a prostate tumor. Several approaches, including cytogenetics methods, are important for an early, accurate diagnosis of ES/PNET. Because the disease is highly aggressive the treatment must be equally aggressive in order to achieve success.

PP-185

Osteochondroma originating from sacroiliac joint: a rare localization

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Introduction: Osteochondroma is the most common primary benign bone tumor and it usually develops at the

metaphysis of long bones. Pelvic and vertebral bones are very rare locations for osteochondroma .To our knowledge, en bloc excision of a solitary osteochondroma of the iliac bone has not been previously reported. We planned to present a case of osteochondroma located in right sacroiliac joint who was treated surgically.

Case: 16-year-old female patient refered to our clinic with the complaints of pain and tenderness in her right sacroiliac region. Her complaints started 6 months ago and increased during the last 2 months. MRI and BT imaging showed a right sacroiliac mass protruding into sacroiliac joint from the right iliac bone at the level of S2 vertebra: osteochondroma? Excisional biopsy is planned for diagnostic puposes, pain relief and the local tumor control.

Under general anesthesia, the patient placed in prone position. By using an incision parallel to the posterior margin of iliac spine, the posterior border of the iliac bone adjacent to S2 vertebra was exposed. Right iliac bone drilized to create multiple holes to make a safe osteotomy. A portion of right iliac crest was removed to improve the visulation and also to resect the lesion from the inner side of the bone. The tumor was removed en bloc through the use of osteotomes and roungeurs. The degenerative region of the sacrum is also currated. The iliac bone was repositioned and fixed by 2 cannulated screws. There were no intraoperative and postoperative complications. Microscopic evaluation of tumor confirmed the diagnosis of an osteochondroma. There was no evidence of malignancy. The patient's pain, tenderness and disability complaints resolved following the surgery. 14 months later she remained asymptomatic without evidence of sacroiliac instability or limitation in her lower extremity function.

Conclusion: Güner et al.[1] reported an video assisted endoscopic anterior sacroiliac fusion case due to the osteochondroma lesion. To the best of our knowledge this is the second case of sacroiliac joint lesion diagnosed osteochondroma and the first case which the lesion was en bloc resected using a posterior exposure by a safe osteotomy technique.

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PP-186

Orthoplastic treatment of a giant-cell tumor invading the femoral condyles and the surrounded tissues – Case presentation

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Abstract: We present you the case of a 34 years old male patient that was first diagnosed in our emergency department with a fracture of the distal femur and important soft-tissue changes visible on the X-ray examination. After further examinations we discovered an aggressive giant-cell tumor vascularized by three major arterial pedicles starting directly from the femoral artery. The patient felt the local deformation a few years earlier but had never been for a medical consult. The onset of his problems was the fracture and the important changes of the soft-tissue he observed with this occasion, including the changes on the major vessels, muscles and nerves.

Material and Methods: First we immobilized the fracture with a cast and set up the initial biopsy for a histopathology examination. We also did an MRI examination, an arteriography and a scintigraphy test as well. All the results highlighted an aggressive giant-cell tumor looking like an aneurysmal cyst that invaded the both femoral condyles and extended on the anterior part of the knee and thigh. Even if this kind of tumor is generally classified as benign, the fast growing rhythm and the aggressive soft-tissue invasion demonstrate a malign potential of the tumor.

After an interdisciplinary approach of the patient and a meticulous preoperative planning we decided to make an extensive total resection of the tumor followed by a complex reconstruction surgery for the bone. The skeletal instability was first resolved with a condylar LCP plate and the bone defect was measured and filled with PMMA cement in order to create a biomembrane. After two months we've done the final surgery of the patient removing the cement and using a vascularized fibular graft that was fixed in good alignment with the femur.

Results: The patient started partial weight-bearing motion 3 months after the last surgery when the radiological aspect showed thicken of the fibular bone graft. A very stable fixation of the vascularized graft allowed the bone to heal even if the surrounded soft-tissue was almost completely destroyed by the tumor and removed during the excision.

Discussions: After we diagnosed the tumor the options for the surgical type of treatment were: the middle thigh amputation, the tumoral prosthesis or the oncological resection with soft tissue and bone reconstruction.

Conclusions: The follow up of this case demonstrated that using an interdisciplinary approach of the patient with the Plastic Surgery team we manage to remove the tumor within oncologic limits and achieved bone healing with good stability of the distal femur.

This way the patient could walk again and after 1-year follow-up we didn't see no signs of tumor recurrence.

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POSTER PRESENTATIONS SESSION XIV: New WHO Classification of Bone and Soft Tissue

PP-187

Primary osseous tumours of the elbow: 60 years registry experience

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Introduction: We present the largest series of surgically treated primary bone tumours of the elbow in the English literature (75 cases). We sought to identify characteristics specific to these lesions and recommend an investigatory protocol.
Methods: The national registry and case notes were reviewed between 1954 -2014. Tumours were classified according to Enneking's spectrum.
Results: There were no benign latent cases in this series as these were managed locally. All patients presented with persistent rest pain, with or without swelling. The distal humerus, in contrast to the proximal radius and ulna, was responsible for the majority and the more aggressive cases. Misdiagnosis was evident in 13% of cases; most of which were attributed to simple bone cysts. All patients that were referred required surgical intervention to either establish the diagnosis or for treatment. Benign tumours had a 19% recurrence rate, with giant cell tumour the most aggressive. Malignant tumours carried 39% local recurrence rate and a 5-year mortality of 61%.
Conclusion: The suspicion of a tumour should be raised in the patient with unremitting, unexplained, non-mechanical bony elbow pain. These echo the NICE recommendations and we recommend prompt specialist referral. With high rates of local recurrence, we recommend close postoperative monitoring.

PP-188

Unusual case of transformation of an ABC (aneurismal bone cyst) into leiomyosarcoma

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Introduction: Aneurismal Bone Cyst (ABC) transformation into malignant lesions has never been demonstrated. Often cases of misdiagnosis or misinterpretation of teleangectatic osteosarcoma have been reported in Literature. The aim of the study is to report a case of malignant transformation of on ABC with pathological fracture into a soft tissue leiomyosarcoma.
Methods: Girl, 19 years old, pathological fracture of the right distal femur while stepping up stairs. No comorbidities and no previous pain at the right knee. X-ray and CT and subsequent fracture stabilisation with external fixator were performed at the local hospital. The patient was referred and transferred to a National reference centre. An ABC was diagnosed with an open biopsy. An accurate curettage of the lesion followed by bone grafting and plating was performed and a regular follow up was set up after diagnosis confirmation
Results: A regular radiological evolution was observed till 9 months postop. After 9 months an asymptomatic reabsorption of the bone grafts was revealed at the follow up Xray and the MRI showed a mass in the soft tissue surrounding the plate and invading the distal femur. An open biopsy was performed revealing a low grade leiomyosarcoma. Pathology was also revised by an international reference centre and a resection of the distal femur with the surrounding soft tissues and the reconstruction with a modular prostheses were performed.
Conclusion: This case report could demonstrate a never described malignant transformation of the vessels supplying the ABC. Further studies and an international pathologists consensus are mandatory to hypothesize the cytogenetic process occurred and potentially extend it to other malignant lesions.

PP-189

Multifocal pseudomyogenic haemangioendothelioma of bone: a case report of a young man with lung metastases

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Introduction: Pseudomyogenic haemangioendothelioma (also called epitheliod sarcoma-like haemangioendothelioma) is a new entity firstly described in 2011 by Fletcher and Hornick. It is a rare intermediate vascular tumor which can be multicentric, rarely metastasizing. It predominantly occurs in lower and upper limb of young male patients.
Case: We report the case of a 22-years-old male patient who referred to his doctor with swelling and pain 20 days after a trauma on his right foot. The X-Ray (Figure 1), MRI and CT examinations detected multiple aggressive osteolytic lesions in several bones of the foot (distal phalanx of first and second finger, head of fourth and fifth metatarsal bones). Open biopsy of the fifth metatarsus showed pseudomyogenic haemangioendothelioma. Immunohistochemically the tumor cells expressed ERG, CK AE1/AE3, CK CAM5.2, INI1, Smooth M Actin, CD31 whereas MS Actin, Desmin and Podoplanin were negative. Bone scan and chest CT showed asymptomatic intramedullary lesions in the right posterior acetabular column and in D10 and multiple lung nodules (Figures 2-4). The treatment has been different in the different anatomic sites: we performed amputation of the fifth finger and of the first and second distal phalanges, and curettage of the fourth metatarsus (Figure 5). In agreement with the oncologist we decided to follow-up the lung lesions and the other bone lesions and to

treat the patient with denosumab (120 mg sc per month).
Conclusion: Pseudomyogenic haemangioendothelioma of bone is an unpredictable lesion and the treatment, still unclear, requires a multidisciplinary approach.

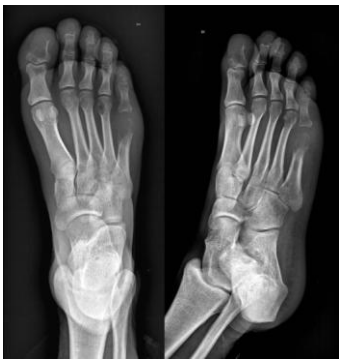

Figure 1

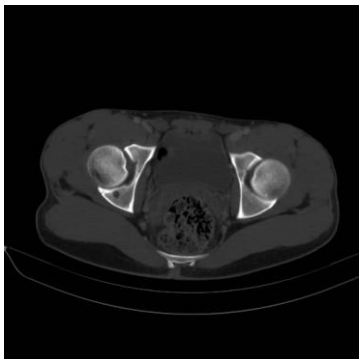

Figure 2

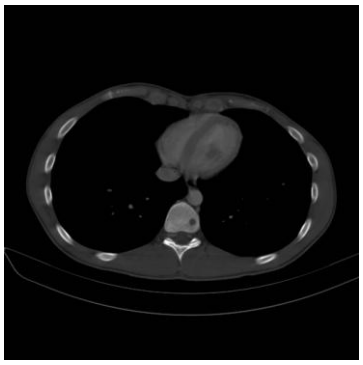

Figure 3

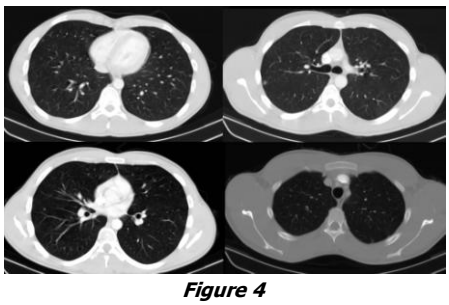

Figure 4

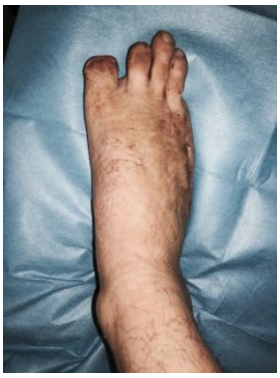

Figure 5

PP-190

Stages of humerus development in rabbit embryos and neonates

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Long bone development occurs through endochondral ossification, which is proceeded by three major events; chondrogenesis, growth cartilage formation and replacement by bone. The aim of the current work was to describe the main histological stages in long bone development. Bone samples collected from rabbit embryos during prenatal (12, 14, 15, 16, 18, 21, 24, 27) and postnatal (3 and 7) development were processed for microscopical examination. Limb buds appeared at the 12th day. Cartilage perimordia was formed at the 14th day. At the 15th day of gestation, cartilage template was developed and acquired the shape and position of the future humerus. At the 16th day, chondrocytes were organized into 3 distinct zones; resting, proliferating and hypertrophic zones. Epiphyseal physeal growth cartilage (EPGC) elongated, chondrocytes became more organized and Bone collar was formed at the 18th day. At the 21st day was characterized by the onset of the vascular invasion, formation of the medullary cavity and separation of proximal and distal extremities. Cartilage canals appeared at 21- day and continue with progress of the age. Primary ossification centre (POC) was detected for first time at the 24th day and EPGC became well define and more organized. Secondary ossification centre (SOC) could be observed at the 3th day and 7th day postnatal. The current results should be considered in molecular studies of endochondral ossification.

PP-191

Evidences of existence of two different populations of hypertrophic chondrocytes in equine growth cartilage

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Osteochondrosis is a developmental orthopedic pathological condition results from a failure in the normal process of endochondral ossification and associated with retention of cartilage foci within the subchondral bone. A better understanding of endochondral ossification is important for understanding the pathogenesis of osteochondrosis. In the process of endochondral ossification, chondrocytes in growth cartilage undergoes proliferation, hypertrophy and death. Early ultrastructural studies described two morphologically different types of hypertrophic chondrocytes, dark and light. The subsequent publications have ignored the observations of diversity of hypertrophic chondrocytes, and assumed chondrocytes are homogenous cell population. Few recent studies described dark (but not light) chondrocytes. The current study was undertaken to investigate whether light and dark chondrocytes represent different stages of differentiation or two different populations of hypertrophic chondrocytes. Growth cartilage from foetal and postnatal foals was examined with light and electron microscopy. Chondrocytes were isolated from the growth cartilage of foetal foals and cultured as 3-dimesntional (3-D) pellets with 10% foetal calf serum (FCS) or triiodothyronine (T3) for 25 days. The pellets were examined by light and electron microscopy and quantitative real time polymerase chain reaction (Q-PCR). Electron microscopic studies of the equine growth cartilage revealed the existence of dark and light chondrocytes in all samples examined. The proportion of each cell type was similar at the late proliferative and late hypertrophic zones. In pellet culture, the two types of cells were observed. In 10% FCS, the majority of cells were dark, however, in T3 many light cells were found. Pellets with a higher proportion of dark chondrocytes expressed significantly higher levels of VEGF and MP-13 mRNA, but collagen type II and Runx2 mRNA expression was higher in pellets with a higher proportion of light chondrocytes. These observations suggest that hypertrophic dark and light chondrocytes are different cell populations not only morphologically but also at the molecular level. The culture system may be used for further studies on dark and light chondrocytes.

POSTER PRESENTATIONS SESSION XV: Various

PP-192

Pelvic chondrosarcoma – Case report

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Introduction: Chondrosarcoma is the second most frequent malignant bone tumour after osteosarcoma. It most often occurs in the pelvis. These tumours can arise *de novo* or in previously existing benign cartilaginous tumours such as osteochondromas and enchondromas.

Treatment of pelvic chondrosarcoma is a difficult problem for the musculoskeletal oncologist Chondrosarcoma requires surgical excision; radiation therapy and chemotherapy have not been shown to be reliably effective. Poor rates of survival and high rates of local recurrence after surgical treatment have been reported in previous studies. Clinically usually presents with pain and or swelling and radiologically erosion, destruction, and cortical thickening, with a radiolucent area with a variable distribution of punctuate opacities or ring. The CT and MRI may also be useful in diagnosis. We present a case of successful treatment of a pelvic chondrosarcoma in a young woman.

Methods: Female, 41, pain in the suprapubic region with 2 years of evolution, with recent emergence of swelling in the same area. Physical examination revealed a hard and painful palpable mass in the hypogastric region CT revealed 10.5x8.5x7.5cm chondroid tumor originating in the left pubic ramus. Bone needle biopsy was preformed and histology revealed grade 2 chondrosarcoma.

Staging with chest CT scan and bone scan revealed no evidence of metastases. Oncological group decided for "en---bloc" tumour excision and was performed wide surgical resection including both left ilio and pubic ramus with, requiring partial cystectomy by adherence of the injury to the bladder.

Result: The pathology confirmed the diagnosis of chondrosarcoma, grade 2, with free margins.

The patient is currently, 2 years after surgery, free of disease. Clinically patient presents with no pain, no urinary disorders and without functional limitations.

Discussion: Since chondrosarcomas are unresponsive to chemotherapy or radiotherapy, surgical resection was the only therapeutic solution for this patient. The tumor was large, 10cm long axis, which forced a wide excision in order to maintain free margins and was necessary to perform partial cystectomy with collaboration of general surgeon. The recovery of the patient is up to date complete.

Conclusion: The case we report due to its location, size, tumour type and necessity of free margins for effective treatment represented an huge but interesting challenge for the surgical team. It also reinforce the need of a correct diagnose and collaboration between specialities in the treatment of oncological patients.

PP-193

Bone tumors mimicking skeletal infections on imaging

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Objectives: Atypical appearances of common bone tumors may rarely mimic bone infections both clinically and radiologically resulting in delay in diagnosis and treatment with disastrous consequences. We aim to illustrate three cases of bone tumors initially misdiagnosed as bone infections.

Materials and Methods / Results: We retrospectively reviewed the medical records and imaging studies of three patients with bone tumors initially misdiagnosed as bone infections:

Case A: a 18-yr-old woman with left-sided low back pain and fever underwent MR imaging that was interpreted as unilateral infectious sacroilitis and received antibiotic treatment. MR imaging was repeated after two months because of deterioration of symptoms and showed a juxtacortical lytic process of the left sacroiliac joint and foci of abnormal signal scattered in pelvic bone marrow. Bone biopsy revealed Ewing sarcoma.

Case B: a 62-yr-old woman with mitral valve replacement complaining for mild pain in her left humerus underwent radiograph of the humerus that showed a sclerotic lesion . The lesion had no substantial change during a two- yr follow up. Bone biopsy showed non specific, mild inflammatory changes. After 2 ½ years, humeral pain worsened and imaging studies were repeated. Radiography and CT demonstrated more prominent thick periosteal reaction of the lesion whereas on MR imaging the lesion was hypointense on T1 and mixed on T2- weighted images. PET-CT was recommended and revealed moderate FDG uptake of the lesion, two additional similar lesions in her femurs and an hypermetabolic pulmonary lesion. The pulmonary lesion proved to be a lung carcinoid tumor on biopsy, whereas bone lesions were attributed to bone metastases.

Case C: a 12-yr-old girl presenting with pain and swelling in her left arm and systematic symptoms. Radiography showed a lytic area of left humerus, with vague margins and lamelar periosteal reaction. On MR imaging the lesion resembled acute osteomyelitis. Bone biopsy and histology revealed histiocytosis.

Conclusion: Awareness of rare manifestations of bone tumors that mimic skeletal infections is crucial for patients' prompt diagnosis and treatment.

PP-194

The many aspects of desmoids tumors on MR imaging

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Objectives: To illustrate the MRI appearance in different types of desmoid tumors, describing imaging characteristics that can contribute to specific diagnosis.

Materials and Methods: The MR imaging studies of six patients, 14-77 yr-old with a final diagnosis of desmoid tumor were retrospectively reviewed. The diagnosis of desmoid tumor was suggested preoperatively and verified on surgery and histopathology in all cases. All MR imaging studies were performed in a 3-yr period in the MR imaging Unit of our hospital, on a 1.5 magnet, using T1 with and without fat suppression before and after iv administration of gadolinium, and T2 with and without fat suppression, weighted images.

Results: The tumor located within the anterior abdominal wall muscles in three patients, in right psoas muscle in one patient and in the posterolateral compartment of the knee in one patient. On T1-weighted images, the tumor appeared isointense to hypointense to muscle, whereas T2 sequences revealed variable signal intensity, predominantly increased, homogeneous or inhomogeneous, containing low-intensity areas, corresponding to dense fibrous tissue. Notable gradual enhancement, accentuated in the fibrous parts, was present. In one patient the lesion was markedly and homogenously hypointense.

Indiscrete lesion margins and adjacent tissue infiltration was seen in three patients implied local invasion. The tumor was well defined in the remaining three patients. Recurrence was denoted in two out of four follow-up studies.

Conclusion: MR imaging is the key imaging technique for initial preoperative diagnosis of desmoids tumors. Characteristic location, T2 hypointensity and intense and delayed contrast enhancement may lead to specific diagnosis.

PP-195

Comparison of whole-body low-dose computed tomography (WBLDCT) and x-ray skeletal survey in the detection of bone lesions in patients with multiple myeloma

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Objective: To compare whole-body low-dose 64-slice multidetector computed tomography (WBLDCT) with conventional radiography in the detection of bone lesions in patients with Multiple Myeloma.

Material and Methods: A total of 20 patients with known Multiple Myeloma (15), Smoldering Myeloma (2), MGUS (1) and Solitary Plasmatocytoma (2) underwent WBLDCT and conventional skeletal survey in a seven-month period. Scanning parameters were based on reference data (tube voltage 120- 140 kV; tube current 40 mAs) which allow significant reduction of effective radiation dose , estimated less than two fold higher than the mean radiation dose of conventional x-ray skeletal survey. Two experienced radiologists evaluated in

consensus the skeletal surveys while another group of two experienced radiologists evaluated blindly WBLDCT scans for bone lesions in axial and multiplanar reformatted images. Extra-osseous findings were also recorded.
Results: WBLDCT showed 38 bone lesions in 8 patients, while 21bone lesions in 5 patients were seen in skeletal survey. WBLDCT showed a total of 17 lesions more than x-rays, all of them were <1 cm in diameter and located in posterior vertebral elements, clavicles, scapulae and iliac bones. Both CT and x-rays showed the same number of lesions in skull and upper and lower extremities. WBLDCT allowed early diagnosis in two asymptomatic and one symptomatic patients with negative skeletal survey. WBLDCT showed spinal and foraminal stenosis due to space occupying lesions in 3 patients; the degree of stenoses could not be estimated on x-rays. In addition, WBLDCT demonstrated extra-osseous findings in 3 patients (pulmonary infections, nephrolithiasis).
Conclusion: WBLDCT reveals more lesions compared with skeletal survey, with significantly lower radiation exposure compared to conventional MDCT. WBLDCT seems to be more sensitive in detecting small (<1cm) osteolytic lesions , especially in parts of skeleton that are difficult to visualize on conventional radiographs, such as clavicles, spine, pelvis whereas related extra-skeletal pathologies, such as nephrolithisis, can be shown. Improved sensitivity in the detection of bone involvement may lead to more accurate staging and prompt treatment planning in patients with multiple myeloma.

PP-196

Decreased periprosthetic infection rate using silver-coated megaprostheses

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Introduction: Infection of megaprosthetic reconstructions is a major concern. Silver coating of prostheses can decrease infection or reinfection rate due to release of silver ions. We performed this study to present the outcome of 20 patients who were treated with silver-coated megaprostheses, aiming to provide useful insights into the antimicrobial effects of this kind of implants.
Methods: We prospectively studied 20 patients (5 men and 15 women; mean age, 56.2 years; range, 26-78 years) admitted and treated at our institution for reconstruction of large bone defects with silver-coated megapostheses over a 2-year period (2013-2015). Indications for the use of these megaprostheses were primary reconstruction after tumor resection (9 patients) and revision surgery after infected total hip (7 patients), total knee (3 patients) arthroplasty or osteosynthesis (1 patient). Reconstruction sites involved the total femur (4 patients), proximal femur (9 patients), distal femur (4 patients), proximal tibia (1 patient) and proximal humerus (2 patients). Mean length of rection/bone defects was 18.3 cm (range, 6-42 cm). Mean follow-up was 13.8 months (range, 4-24 months).
Results: Infection rate was 10%. Local or systemic silver-associated side-effects were not observed. Two patients (10%) experienced infection of their silver-coated megaprosthetic reconstruction. A female patient with multiple unsuccessful revision operations for *Staphylococcus warneri* infected total hip arthroplasty was initially treated with a proximal femoral silver-coated megaprosthesis after two-stage revision. She experienced infection recurrence and was finally treated successfully with a silver-coated total femoral megaprosthesis after another two-stage revision. A second female patient presented with multidrug resistant *Klebsiella pneumoniae* infection after a third revision of total hip arthroplasty. She was treated with a silver-coated proximal femoral megaprosthesis; however, she died from septicemia**.**
Conclusion: Silver-coating of megaprostheses seems promising. Reduced rates of infection and revision surgery are expected by using these prostheses.

PP-197

Reconstruction of critical tibial defects after limb salvage procedures for musculoskeletal sarcomas: presentation of surgical techniques

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Introduction: Reconstruction of tibial defects after limb salvage procedures at the leg is a challenge for orthopaedic surgeons. Even though there are a lot of different choices regarding reconstructive surgical techniques, all of them require advanced surgical skills and are fraught with complications. Therefore, every case requires personalization and thorough planning of the surgical technique about to be applied.
Methods: The cases of 16 patients treated for bone sarcomas of the tibia were retrospectively reviewed. All patients underwent limb salvage procedures requiring reconstruction of large tibial defects. 3 patients were children (2,5 - 11 years old) and 13 adults (22 - 80 years old). The reconstruction techniques performed included tibialization of the fibula with external fixation stabilization (n= 6), diaphyseal megaprostheses (n= 4), diaphyseal allograft (n= 3), combination of diaphyseal allograft and vascularized fibular graft reconstruction (n= 1), distraction osteogenesis (n= 1), and cementation with internal fixation stabilization (n= 1). Mean follow-up was 8 years.
Results: One child experienced non-union of the distal part of the tibialization of the fibula, and was revised with

a flexible intramedullary nail. An adult treated with a vascularized fibular graft experienced breakage of the internal fixation plate, and the osteosynthesis w revised successfully. Another adult treated with tibialization of the fibula with external fixation was finally amputated because of osteomyelitis. The remaining fibular tibializations were successfully completed. A reoperation for union of the docking site was necessary for the patient with distraction osteogenesis. One patient treated with megaprosthesis and one with allograft reconstruction experienced osteomyelitis that was treated with surgical debridement, 2-stage revision of the megaprosthesis and intravenous antibiotics, without recurrence of the infection.

Conclusion: Tibialization of the fibula seems to be effective in children. However, preservation of the epiphysis is required, if normal growth should be expected. External fixation devices present increased rate of complications. Infection is the most common complication when allografts or megaprostheses are applied.

PP-198

Secondary chondrosarcoma in metachondromatosis: a case report

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Introduction: Metachondromatosis is a rare, autosomal dominant, incompletely penetrant combined exostosis and enchondromatosis tumor syndrome. We present a patient with metachondromatosis in whom a chondrosarcoma was diagnosed at the site of an enchondroma. This is the only first documented case of secondary malignant transformation of a metachondromatosis enchondromatous lesion to chondrosarcoma.

Methods: A 29-year-old woman presented with pain localized at her right knee over 1 year. Radiography showed skeletal osteochondromas and enchondromas of the right femur and tibia, and an osteolytic lesion at the lateral tibial condyle. CT scan showed a cystic osteolytic lesion at the right proximal tibial metaphysis with erosion of the anterior and lateral cortex, and an adjacent proximal tibial enchondroma. MRI showed a destructive lesion, with erosion of the anterior and lateral cortex, without an associated soft tissue mass. Bone scan showed increased radioisotope uptake in the right proximal tibia and at the region of the right proximal femur, probably in the lesser trochanter. Based on the synchronous occurrence of skeletal osteochondromas and enchondromas, the diagnosis of metachondromatosis was established.

Results: CT-guided biopsy of the lesion was done; histology showed grade 1 chondrosarcoma. Complete curettage of the lesion using a high-speed burr, and application of phenol and bone cement as bone void filler was done; histology showed evidence of grade 2 chondrosarcoma. The patient was informed regarding immediate reoperation, and agreed to close follow-up evaluation using MRI; in case of local recurrence, wide surgical excision will be performed. Five years postoperatively, the patient is alive with no evidence of local recurrence or distant metastases.

Conclusion: We acknowledge that the treatment of grade 2 chondrosarcoma with intralesional surgery is inappropriate. However, the purpose of this study is not to present the treatment and prognosis of primary or secondary chondrosarcomas but to emphasize on metachondromatosis and present the malignant transformation of a metachondromatosis associated enchondroma to chondrosarcoma.

PP-199

Hydatid cyst of the knee mimicking a tumor: a case report

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Introduction: Hydatid disease is a rare and endemic disease and two species of the tapeworm Echinococcus are mostly responsible: E. granulosus and E. multilocularis. Osseous hydatidosis accounts for 0,2-4% of all cases and the spine is affected in almost half of the cases. We present an interesting case of knee hydatidosis, which was initially considered to be a local malignancy.

Methods: A 57-aged male patient, presented with left knee tenderness and ipsilateral knee-thigh oedema, weight loss, cachexia and night fever. There was no history of trauma. However, the patient sustained a dog bite in the medial mid-third side of the left thigh 7 years ago and 2 years later he reported local erythema which was self-limited. Blood tests and radiological findings were non-specific (CRP =11,2mg/L and knee arthritis) and the patient was admitted to our hospital. An MRI was performed and the dominant findings were multiple cysts, synovial thickening and bone edema. The differential included PVNS, synovial sarcoma, lymphoma, brucellosis and hydatidosis. The staging was negative and an open biopsy was performed. Most of the cysts were removed and biopsies were taken, followed by extensive washing. The cysts were found to contain transparent fluid, while histology confirmed the diagnosis of hydatid cysts.

Results: The clinical image of the patient improved, oral albendazole and praziquantel were administrated and the patient was discharged 7 days post-op. During the follow-up the patient relapsed at five, six and 6,5 years post-operative. Each time surgical debridement was performed followed by an oral course of antiparasitic agents. During the last follow-up (8 years post-operative) the patient was disease free.

Conclusion: Osseous hydatidosis is an extremely rare disease with non-pathognomonic clinical signs and radiological findings. For patients who live in endemic

areas or those with known hydatid disease, echinococcal infection must be included in differential diagnosis of knee swelling, even in the absence of adjacent bony involvement. The prognosis is often poor, the mortality and complication rate is high and many cases recur, as it is often impossible to radically excise the pathologic tissue.

PP-200

Leishmania infection of a knee megaprosthesis: a case report

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Introduction: Deep infection represents one of the most common threats after limb salvage surgery and megaprosthetic reconstruction. The most common pathogens are Staphylococcus and Streptococcus species. However, atypical pathogens shouldn't be excluded, because of the fact that most patients undergoing these procedures are immunocompromised due to previous chemotherapy sessions or due to the disease itself. Therefore, we present a case of bone leishmaniasis after a distal femoral megaprosthetic reconstruction.
Methods: A 19-year-old man was referred for a stage IV left distal femoral osteosarcoma. The patient responded favourably to neo-adjuvant chemotherapy and underwent distal femoral resection and reconstruction with the use of a distal femoral megaprosthesis. Adjuvant chemotherapy was administered. Four months postoperatively, the patient presented with a painful knee joint, accompanied with fever up to 39°C. His knee was swelled and had decreased range of motion, while his spleen was enlarged. Radiographic evaluation was not helpful and laboratory tests showed pancytopenia. The patient did not respond to treatment with wide spectrum antibiotics. A technetium-99m methyldiphosphonate bone scan and a sulesomab-monoclonal antibody leukoscan were conducted, showing increased uptake at the lateral femoral condyle. Needle biopsy of the condyle revealed Leishman – Donovan bodies confirming the diagnosis of bone leishmaniasis.
Results: The patient received treatment with amphotericin B for 10 days and gradually became afebrile. One month later, the patient was asymptomatic and iliac crest bone marrow aspiration was negative. However, 9 months postoperatively, the patient died because of osteosarcoma lung metastases.
Conclusion: Although periprosthetic infections of megaprostheses are common complications of limb salvage surgery, the pathogens aren't always that common. Immunosuppresion and cancer itself predispose to rare opportunistic infections, such as leishmaniasis in our case. The physician should be aware of the possibility of an uncommon infection, especially when the clinical, radiological and laboratory evaluation seem uncommon.

PP-201

The "3 Cs" surgical treatment of giant cell tumor of bone

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Introduction: Giant cell tumor of bone (GCTB) is an intermediate, locally aggressive, primary bone tumor. Ideally, all patients should be treated with intralesional excision with local adjuvant treatment We report 26 cases treated at our institution with curettage, cauterization and cementation ("3 Cs") aiming to provide useful insights into the effectiveness of this intralesional treatment approach.
Methods: We retrospectively reviewed the files of 22 patients who presented with 26 histologically benign GCTBs. There were 5 male and 17 female patients with a mean age of 30 years (range, 13-62 years). Seven lesions were located at the distal radius, 1 at the proximal femur, 4 at the medial and 6 at the lateral femoral condyle, 3 at the proximal and 2 at the distal tibia, 1 at the proximal fibula, 1 at the talus and 1 at the lumbosacral region. One patient presented multifocal involvement. All patients were treated with the "3 Cs" technique. Follow-up ranged from 6 to 37 years.
Results: Recurrence rate was 9%. Recurrences occurred from 6 months to 2 years after treatment with the "3 Cs" technique. Recurrences were treated by resection. One patient presented recurrence of a lesion at the distal radius 6 months after initial treatment. A second patient experienced recurrence at the proximal femur. A third patient experienced recurrence twice in a two year period at the distal tibia. No secondary sarcoma was detected and none of the patients developed local or distant metastases.
Conclusion: Treatment of patients with GCTBs with the "3 Cs" technique seems to be simple and effective, associated with an acceptable rate of local recurrence.

PP-202

Brachytherapy and free vascularized myocutaneus flap transfer for soft tissue sarcomas of the extremities

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Introduction: Successful treatment of soft tissue sarcomas (STS) is highly dependent on radical tumor resection coupled with adjuvant radiation therapy. The purpose of this study was to present the clinical outcome of patients who underwent tumor resection and

reconstruction with free myocutaneous flap transfer followed by brachytherpy (BRT), with emphasis on the role of combined treatment.

Methods: We retrospectively reviewed the medical records of 9 patients (4 men-5 women; mean age 53,6 years; range, 20-75 years) with localized STSs treated with surgical resection and BRT over an 8-year period. Diagnosis involved extraskeletal OGS (n=1), MFH (n=3), myxoid liposarcoma (n=1), liposarcoma (n=1), synovial sarcoma (n=2) and high grade STS (n=1). 6 patients were staged as IIB according to MSTS, one patient as IA, one as IB and one as IIA. Reconstruction of the surgical defect and hardware protection was achieved with free vascularized myocutaneous flap of latisimus dorsi in 4 patients, of gracilis in 4 patients and free radio-volar flap was used in one patient. Computerized, after-loading of the implant with iridium-192, HDR was applied postoperatively in all patients. The BRT dose varied from 12 to 24 Gy. Perioperative external beam radiation was administered to a total dose (BRT and external beam radiation) of 60-76 Gy. The mean follow-up period was 38 months (range, 12-84 months).

Results: Wide surgical excision was achieved in 6 patients while marginal in 3. One patient diagnosed with extraskeletal OGS experienced local recurrence and died from distant metastases 12 months postoperatively. Another patient diagnosed with high grade STS developed distant metastases 12 months postoperatively. Complications related to the free vascularized myocutaneous flap transfer or radiation induced complications were not observed. One patient underwent prophylactic intramedullary nailing. All patients had good cosmetic and functional outcome.

Conclusion: Perioperative focalized radiation delivered as BRT via catheters after extremity STS resection results in acceptable local control rates. This combined treatment has low complication rates offering to the patients good cosmetic and functional outcomes.

PP-203

Sacral chordomas with aggressive clinical course: a report of two cases

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Introduction: Sacral chordomas in adults are generally slow-growing tumors associated with a relatively prolonged course. We describe two rare aggressive clinical cases of sacral chordomas who developed early multiple distant metastases.

Methods: A 60-year-old man was admitted to our institution complaining for pain of the sacral region and bowel dysfunction. Rectal examination revealed a large mass overlying the sacrum. Neurological assessment was normal. Radiographs showed an osteolytic lesion of the sacrum. MRI revealed a large tumor of the sacrum compressing the rectum. A second 58-year-old patient was presented with lower back pain and severe coccydynia. Imaging showed a lesion of 5cm x 7cm infiltrating S2, S3 and S4 spinal vertebrates. No evidence of local or distant metastasis was recorded in preoperative staging in any of the patients. Diagnosis of chordoma was established by a core needle biopsy in both of the patients.

Results: The first patient underwent wide tumor resection and total sacrectomy followed by spinopelvic reconstruction via spinoiliac arthrodesis. A vertical rectus abdominis myocutaneous flap was used for the reconstruction of the surgical defect. Histopathological examination showed clear wide surgical margins. 1 year and 6 months postoperatively the patient experienced local recurrence and multiple metastases were detected to the spine and lungs. He died 2 years after initial presentation. The second patient underwent partial sacrectomy involving S2 vertebra. Histopatological examination showed positive surgical margins and the patient received adjuvant radiation therapy. 1 year and 4 months postoperatively the patient presented micronodular lung infiltrations bilaterally.

Conclusion: Chordomas in adults are generally considered as low-grade malignancies with high 10-year survival rates. These lesions tend to recur locally but they metastasize late and in low rates. However, in rare cases rapid disease progression is observed, which is associated with poor prognosis and decreased survivorship.

PP-204

Biopsy alone for a symptomatic eosinophilic granuloma of the sternum

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Introduction: We present a boy with a painful solitary eosinophilic granuloma of the sternum treated successfully with biopsy alone and observation.

Methods: A 12-year-old boy was admitted with fever and a painful osteolytic lesion of the sternum. His pain progressively worsened over the previous 6 weeks. At presentation, he had constant and severe pain (8/10 points at VAS scale). On physical examination, the proximal sternum and left sterno-clavicular joint was prominent and painful on palpation. Chest radiograph was normal. Chest CT scan showed an osteolytic lesion at the malnubrium of the sternum with irregular margins, erosion of the anterior and posterior cortex, and periosteal reaction; the maximum diameter of the lesion was 4 cm. MR imaging showed a low signal lesion in T1 and a high signal lesion in T2 sequences. Bone scan was negative. Core needle biopsy was done.

Results: Histology showed eosinophilic granuloma. After the biopsy procedure, the patient experienced progressive

resolution of his pain; 2 days after biopsy the patient experienced complete pain relief; fever was absent. Two weeks later, the swelling at the site of the lesion was significantly reduced. Six weeks later, chest CT scan showed reconstitution of the lesion. Because of the clinical and imaging improvement, no medical treatment was given; close follow-up including clinical examination and radiographs of the chest and sternum every 6 months was recommended. At 4-year follow-up, the patient is asymptomatic; radiographs show no evidence of local recurrence.

Conclusion: Eosinophilic granulomas, even if solitary often show aggressive imaging features. Their treatment is challenging, especially in children with symptomatic lesions. Although a biopsy is a diagnostic procedure, spontaneous resolution of clinical symptoms and healing of the lesion may occur after biopsy alone.

PP-205

Reconstruction with STANMORE megaprostheses after limb salvage surgery

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Introduction: In musculoskeletal oncology modular megaprostheses are the most common method of reconstruction segmental or total bone resection in the extremities. The purpose of this study was to investigate the clinical and radiological outcome of limb salvage surgery after reconstruction with the STANMORE megaprostheses.

Methods: We retrospectively studied 47 patients (28 men, 19 women; mean age, 52.7 years; range, 15-80 years) that underwent limb salvage surgery after musculoskeletal tumor excision and reconstruction with STANMORE megaprostheses. Histological diagnoses included primary and metastatic bone tumors, as well as bone invading soft-tissue tumors. Endoprosthetic reconstruction involved distal femoral replacement (16 patients), proximal femoral replacement (13 patients), total femoral replacement (4 patients), megaprosthetic knee reconstruction (3 patients), proximal tibial replacement (3 patients), total scapular replacement and reverse constrained humeral arthroplasty (4 patients) and proximal humeral replacement (4 patients). Mean length of bone resection was 22.3cm (range, 9.5-37cm). The Enneking's system and the Toronto Extremity Salvage Score were used for the evaluation of the clinical outcome. Radiological evaluation was performed using the International Society of Limb Salvage score.

Results: At a mean follow-up of 35 months (range, 6 months-7 years) 29 patients were alive with no evidence of local or distant recurrence, while 3 patients were alive experiencing metastatic disease; 13 patients died of metastatic disease and 2 patients of causes unrelated to the primary tumor. Local recurrence was not observed in any of the patients. The mean Enneking score was 71% (range, 50-100%), while TESS score was 84% (range, 66-100%). The ISOLS score was excellent or good in 43 cases for bone remodelling, 43 cases for the interface, in 43 cases for anchorage, in 44 cases for the implant body, and in 45 cases for the articulation. Extracortical bone bridging greater than 25% was observed in 15 megaprostheses. Mechanical survival of the megaprostheses was 96% (n=45). Complications included seroma and hematoma formation (13%), skin necrosis and dehiscence at the knee wound (15%), aseptic loosening and infection (13%), quadriceps tendon rupture (2%) and peroneal nerve palsy (2%).

Conclusion: The local recurrence-free survival in this series highlights the effectiveness of limb salvage surgery. Furthermore, the 96% survival rate of the megaprostheses suggests that the STANMORE modular megaprostheses are valuable for reconstruction of bone defects after tumor resection.

PP-206

Quality-of-life and functional outcomes in patients with internal and external hemipelvectomies for tumor

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Introduction: We evaluated the quality-of-life and functional outcomes of patients following internal or external hemipelvectomies.

Materials and Methods: We reviewed the cases of 12 patients who had undergone either internal or external hemipelvectomy for tumor. Twelve patients who were previously treated operatively with either a type II periacetabular internal (n = 5) or external (n = 7) hemipelvectomy were evaluated using the Toronto Extremity Salvage Score (TESS), Musculoskeletal Tumor Society (MSTS), and the Linear Analog Self-Assessment tool (LASA). There were 8 (66.3%) men and 4 (33.3%) women in the study, with a mean age at operation of 47.4 years (range, 18-65 years).

Results: Follow-up was 33.41 months. Overall mean MSTS score was 43.2, and TESS score was 58.4. TESS and MSTS were all positively correlated to physical component score. There were no significant influences of postsurgery time on MSTS, TESS, or physical component score. Physical function was worst in older patients relative to younger patients. Overall quality-of-life parameters were similar between the groups.

Conclusions: Quality-of-life and long-term functional outcome were significantly reduced for patients with internal and external hemipelvectomies on the TESS, MSTS, and the Linear Analog Self-Assessment tool (LASA).

PP-207

Modular intramedullary diaphyseal endoprostheses for segmental defect reconstruction

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Introduction: Limb salvage surgery followed by endoprosthetic replacement or biological reconstruction techniques is the recomended treatment after diaphyseal bone tumor resection. Each technique has method-specific advantages and disadvantages. The purpose of this study was to present midterm results of the outcome of modular intramedulary diaphyseal endoprostheses, aiming to provide useful insights into the effectiveness of this means of reconstruction.
Methods: We retrospectively studied 6 patients (4 men, 2 women; mean age, 62 years; range 40-77 years) who underwent limb salvage surgery as a means of treatment of primary or metastatic tumors of the diaphysis and reconstruction with modular diaphyseal endoprostheses. Reconstruction sites involved femur (n=1), tibia (n=2) and humerus (n=3). Mean length of bone resection was 10cm (range, 4-15cm). Histological diagnosis of primary tumors included adamantinoma, myeloma, dedifferentiated synovial sarcoma and metastatic lesions included renal cell, thyroid and stomach carcinoma. The Enneking's System was used to evaluate the midterm functional outcome of these patients. Mean follow-up period was 17 months (range 11-28 months).
Results: Mean operation time was recorded to be 132min (range, 90-240 min). All patients progressively loaded the limb 4-6 weeks postoperatively. Postoperatively, mean Enneking's Score was 88% (range, 87-92%) and it was weakly correlated with the reconstruction length. Aseptic loosening was recorded in one patient. Another patient experienced delayed wound healing while a third patient presented prolonged serous wound drainage. Furthermore, in one patient leg length discrepancy was recorded, while another patient experienced ankle stiffness. At last follow up 5 patients had no evidence of local or distant recurrence, while one patient died from distant metastases.
Conclusion: Limb salvage surgery after diaphyseal defects can be achieved successfully by endoprostetic reconstruction. Intramedullary diaphyseal endoprosteses for segmental defect reconstruction after bone tumor resection consist a viable option with acceptable oncological and functional outcomes. This means of reconstruction provides quick immobilization but sometimes may present complications. Larger osseous defects are associated with lower functional outcomes and higher complication rates.

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