



O1:101

Non-metastatic osteosarcoma of the extremity. Neoadjuvant chemotherapy with methotrexate, cisplatin, doxorubicin and ifosfamide. An Italian Sarcoma Group survey.

Stefano Ferrari¹, Cristina Meazza², Franca Fagioli³, Angela Tamburini⁴, Raffaele Cozza⁵, Virginia Ferraresi⁶, Maurizio Mascarini⁷, Gianni Bisogno⁸, Piero Picci⁹

¹) Istituto Ortopedico Rizzoli ²) INT, Milano ³) OIRM, Torino ⁴) Meyer, Firenze ⁵) OPBG, Roma ⁶) IFO, Roma ⁷) CRO, Aviano ⁸) Ped. Oncol., Padova ⁹) IOR, Bologna, Italy

Background: According to the results of the ISG/OS-1 study (April 2001-December 2006), the neoadjuvant regimen MAP (Methotrexate (MTX), doxorubicin (ADM), cisplatin (CDP), and ifosfamide (IFO) postoperatively added in poor responder patients, was recommended for patients with non metastatic osteosarcoma of the extremity treated in the ISG centers.

Patients and Methods: The data of patients with non metastatic osteosarcoma of the extremity, aged ≤ 40 years, treated in the ISG centers, were prospectively collected in the ISG WEBSITE database. Compared to ISG/OS-1 (cumulative doses: ADM 420mg/m², MTX 120g/m², CDP 600 mg/m², IFO 30g/m²) the recommended regimen foresaw a reduction of the courses of MTX from 10 to 5 for a cumulative MTX dose of 60g/m².

Results: From January 2007 to June 2011, TOT patients (median age was 16 years (from 4 to 40), male TOT%) were registered. TOT (%) patients underwent limb-salvage surgery. Chemotherapy-induced necrosis was good ($\geq 90\%$) in 48% of patients. No treatment-related deaths were recorded. With a median follow-up of 39 months (4-80), 5-year OS was 80 % (95% CI, 73 to 87%) and EFS was 50% (95% CI, 39 to 59%). In ISG/OS-1 the rate of limb salvage and good histological response were 92% and 48% respectively. 5-year OS was 73% (95% CI, 65-81%) and EFS was 64% (95% CI, 56-73%).

Conclusions: While the response rate and the limb salvage rate recorded in the survey are in the same range of the previous study, the percentage of EFS is lower than that expected. This difference might be due to the observational characteristics of the survey, but we cannot exclude a possible role played by the reduction of the cumulative dose of MTX.

E-mail (main author): stefano.ferrari@ior.it



O1:102

Current indications for cryosurgery in orthopaedic oncology

Domenico Andrea Campanacci¹, Guido Scoccianti¹, Francesca Totti¹, Filippo Frenos¹, Serena Puccini¹, Giovanni Beltrami¹, Rodolfo Capanna¹

¹) Azienda Ospedaliera Universitaria Careggi, Italy

Background:

Local adjuvant treatment in aggressive benign or low grade malignant bone tumors is the traditional application of cryosurgery in orthopaedic oncology. Introduction of new cryosurgical devices using probes to deliver cryotreatment has made the technique safer in comparison to liquid nitrogen and is allowing new and expanding indications.

Methods:

Since 2000 we have used cryosurgery in 42 surgical procedures with the following indications:

A - Local adjuvant treatment in (A1) aggressive benign and low grade malignant bone tumors or metastases after intralesional surgery in selected high risk lesions (wide dimensions, iuxta-articular localization). An extended application can be sterilization of margins after at risk wide excision in high grade tumors (A2). A1 (15 patients): GCT 7, epithelioid haemangioma 3, low grade chondrosarcoma 2, chondroblastoma 1, ABC 1, renal carcinoma metastasis 1. A2 (1 patient): osteosarcoma sacroiliac region 1.

B - Bleeding control (B1) and/or solidification of mucoid/myxoid tumors (B2) + adjuvant treatment during curettage in at risk anatomical sites like pelvic or shoulder girdle. B1 (20 patients): renal or thyroid carcinoma metastasis 7, GCT 4, ABC 2, metastatic hemangiopericytoma or hemangioendothelioma 2, schwannoma 1, chordoma 1, angioma 1, chondrosarcoma 1, myeloma 1. B2 (1 patient): giant myxoid chondrosarcoma 1.

C - Post-excisional sterilization (liquid nitrogen immersion) of bone segments for reconstruction by massive autologous bone grafting. 3 patients: synovial sarcoma 2, chondrosarcoma 1.

D - Percutaneous treatment of metastases or inoperable recurrent primary bone tumors. 2 patients: metastatic chordoma 1, recurrent Ewing sarcoma 1.

Results:

No neurological or vascular damages occurred. At follow up ranging from 12 to 144 months, one deep and one superficial infection were observed. One patient developed superficial skin necrosis. In group A and B1, two recurrences occurred (GCT 1, ABC 1) in 21 patients with a follow-up longer than 12 months. No fractures of on-site treated segments were observed, may be due to a frequent use of preventive plate fixation. One fracture of a cryotreated autologous bone graft was observed.

Conclusion: Our series confirms safety and efficacy of cryosurgery and supports its application in a growing number of new indications in orthopaedic oncology.

E-mail (main author): campanaccid@gmail.com



O1:103

Exploring Multiferon Therapy in Patients with Desmoid Tumours in need of Medical Treatment where Surgery is not a Feasible Option.

Jan Peter Poulsen¹, Olga Zaikova¹, Annette Skeie¹, Bodil Bjerkehaugen¹, Jan Magnus Poulsen¹, Kirsten Sundby Hall¹

¹ Oslo University Hospital, Norway

Background:

Desmoid tumours (aggressive fibromatosis) are locally invasive, non metastatic, but have a high local recurrence rate after primary resection. The tumours can occur in all ages, but the majority of patients are women, often of childbearing age. In patients, where surgery is not an option, medical treatments may be needed. Because positive responses with INF- α therapy had been reported, supported by in-vitro and in-vivo results, we decided to investigate Multiferon as a treatment option for patients with these tumours.

Methods:

Multiferon is a multi subtype INF- α product obtained from the leukocyte fraction of human blood. The product is highly purified and contains $\alpha 1$, $\alpha 2$, $\alpha 8$, $\alpha 10$, $\alpha 14$ and $\alpha 21$. Multiferon was given sc 3 Mill IE x 6/week as a standard, but with some variations in compliance. Included were inoperable patients with progression of disease needing therapy and not candidates for RT, chemotherapy or hormone therapy for different reasons

Results:

From January 2008 to January 2013, 22 pts have been evaluated for starting Multiferon treatment, 14 women and 8 men. Of these 22pts, 4 have not yet received Multiferon. 4 pts are still on treatment. 5 pts achieved PR, 11 pts SD, 1 pt PD and 1 pt not evaluated yet. None of the pts have progressed after end of treatment. Pts have been treated from 2 -38 months. and have been observed from 0 to 30 months after ending treatment. Treatment was stopped when the pts wanted to, either due to side effects or achieving stable disease observed over several months. Side effects were as expected with Multiferon, generally tolerable, manageable and reversible. All pts were happy ending the treatment.

Conclusions:

Multiferon may be a new promising treatment option for desmoid tumours. More data are needed. The presentation will present latest new follow-up data.

E-mail (main author): jpp@ous-hf.no



01:104

Isolated Limb Perfusion – Experience at the West German Cancer Center

Georg Täger, Hans Ulrich Steinau, Lars Eric Podleska

West German Cancer Center Essen, Germany

Background:

Isolated limb perfusion (ILP) is based on the local application of recombinant TNF- α and melphalan (TM-ILP) and reported to represent one of the most effective local treatment modalities for soft tissue sarcoma (STS) of the limbs. On various papers TM-ILP has been reported to result in excellent local response rates, ranging from 45% up to more than 80% for partial and complete remissions. Hence limb salvage has become more than a realistic purpose even in those patients whose limbs were at risk by advanced and non resectable soft tissue sarcoma.

Methods:

This paper reports on TM-ILP at a tertiary cancer center reflecting more than ten years and roughly 300 procedures performed for soft tissue sarcoma. Beside the enormous response rates and limb salvage rates which are in line to the reports of other centers, the following aspects are highlighted.

Results:

Assessment of clinical response using size based WHO-criteria as well as RECIST has been shown to be insufficient as none of those criteria were able to reliably identify the extent of regression after TM-ILP. Subtypes of STS do only differ little regarding the characteristics of regression with fibrosis/sclerosis being the most upon histopathology. Interestingly, when evaluating micro-vessel density (MVD), vascularisation of STS did not significantly impact on regression despite of the fact that TNF- α does target tumor's blood supply. Undoubtedly, TM-ILP does improve the integrity of the tumor surrounding capsule as well as the width of surrounding fibrous tissue. That explains why such a high rate of regression and local control could be achieved even in marginally resected STS which were judged as non resectable prior to TM-ILP.

Conclusion:

Based on this experience, it has become clear that TM-ILP should be provided for those patients where limb salvage or preservation of limb function cannot be achieved by surgery and radiotherapy alone. More precisely, TM-ILP should be an integral part of treatment modalities in all tertiary cancer centers. The histopathologic reflection of subgroups intends to extend the indication on all those patients with advanced STS where pretreatment might reduce the extent of loss of function by effectively sparing soft-tissues and neurovascular structures.

E-mail (main author): georg.taeger@uk-essen.de



O1:105

Isolated limb perfusion for primary, locally advanced soft tissue sarcomas of the extremities - prognostic factors and outcome

Dimosthenis Andreou¹, Mathias Werner², Bjoern Jobke³, Henrike Boldt³, Frank Traub³, Daniel Pink⁴, Peter Reichardt³, Per-Ulf Tunn³

¹) University Hospital Muenster ²) HELIOS Klinikum Emil von Behring, Berlin ³) HELIOS Klinikum Berlin-Buch ⁴) HELIOS Klinikum Bad Saarow, Germany

Background: Isolating limb perfusion (ILP) with TNFa and melphalan is an effective neoadjuvant modality for locally advanced, extremity soft tissue sarcoma. The objective of this study was to evaluate the oncological outcome and identify possible prognostic factors.

Methods: The files of 63 patients with primary, locally advanced, non-metastatic extremity soft tissue sarcoma, who underwent neoadjuvant ILP followed by delayed surgical resection at our department between 2001 and 2011, were retrospectively analyzed. Mean follow-up amounted to 49 months (range, 8-138 months) for all patients and 58 months (range, 12-138 months) for survivors.

Student's t-test was used to compare means. Survival curves were calculated with the Kaplan-Meier method and compared with the log-rank test. **Results:** Mean tumor size prior to ILP was 10 cm (range, 3-34 cm), compared to 9 cm (range, 0-33 cm) after ILP ($p=0.015$). 23 patients had a good histological response, according to the Salzer-Kuntschik criteria. The mean mitotic rate prior to ILP amounted to 33 mitoses/10 high-power fields (HPF), compared to 15 mitoses/10 HPF after ILP ($p=0.077$). 32 patients underwent a PET or PET-CT prior to and 6 weeks following ILP. The mean SUVmax prior to ILP was significantly higher than after ILP (11.4 vs. 6.9, $p=0.001$).

Overall and metastasis-free survival at 5 years amounted to 62% and 56%, respectively. Histological response according to the Salzer-Kuntschik criteria, SUVmax prior to ILP and the mitotic rate prior to ILP did not correlate with overall or metastasis-free survival. However, a low mitotic rate after ILP, a low SUVmax after ILP, and a small tumor size both before and after ILP were all significantly associated with an improved overall ($p=0.033$, $p=0.006$, $p=0.015$ and $p=0.015$, respectively) and metastasis-free survival ($p=0.018$, $p=0.005$, $p=0.004$ and $p=0.002$) respectively.

Conclusion: Tumor size both before and after ILP, SUVmax following ILP and the mitotic rate in the surgical specimen could be identified as significant prognostic factors for patients with locally advanced extremity soft tissue sarcomas undergoing neoadjuvant ILP with TNFa and melphalan.

E-mail (main author): dimosthenis.andreou@ukmuenster.de



O1:106

The value of isolated limb perfusion in the treatment of differently graded liposarcomas

Lars Erik Podleska¹, Benjamin Schwindenhammer¹, Sebastian Bauer¹, Florian Grabellus¹, Georg Taeger¹

¹) University Hospital Essen, Germany

Background: Isolated limb perfusion with TNF-alpha and Melphalan has proven to be a valuable tool in the treatment of locally advanced soft tissue sarcoma. Limb salvage rates for soft tissue sarcoma range above 80% in the current literature. Liposarcomas make up for almost 20% of all STS. In recent times the understanding of the different sub entities of liposarcomas has improved greatly. This retrospective study was conducted to clarify how the different sub entities of liposarcoma respond to isolated limb perfusion.

Methods: In our ILP-database we identified 125 cases of patients with soft tissue sarcoma who received subsequent resection after ILP to allow for an analysis of histopathologic regression of the tumor. We reviewed the histopathologic results from resection specimen, addressing the question of grade of regression of the tumor and resection margins.

Results: Out of the total of 125 patients 23 (18%) suffered from liposarcomas. There were two cases of high differentiated liposarcoma (9%), 5 cases of myxoid liposarcoma (22%), another 5 cases suffered from dedifferentiated liposarcoma (22%), there were 10 cases of myxoid round cell liposarcoma (43.5%) and 1 case (4.3%) of pleomorphic liposarcoma.

In the liposarcoma collective the mean regression of the tumor after ILP was 73.7% (median: 89.0%; std. deviation: 32.1). The analysis of all other sarcomas revealed a mean regression of 77% (median: 94.6%, std. deviation: 31.8). Analysis of cross tables revealed a positive response (less than 10% of vital tumor) in 52% of liposarcomas compared to 60% positive response for all other sarcomas.

Analysis of sub groups from the liposarcomas revealed that myxoid round cell liposarcoma responded best with 70% (7 responders vs. 3 non-responders), myxoid liposarcoma responded in 60% (3 responders vs. 2 non-responders). Interestingly, dedifferentiated liposarcoma responded in only 40% (2 responders vs. 3 non-responders). The two cases of high-differentiated liposarcoma did not respond to ILP (0 responders).

Conclusion:

It appears that myxoid round cell liposarcoma and myxoid liposarcoma do respond better to isolated limb perfusion than dedifferentiated liposarcoma or pleomorphic liposarcoma. Well differentiated liposarcoma is less responsive to ILP which could be explained by its low vascularity.

E-mail (main author): lars.podleska@uk-essen.de



O1:107

Local and systemic toxicity of isolated limb perfusion

Teymuraz Kharatishvili¹, Dmitry Martynkov², Boris Narkevich², Yuri Buydenok², Alexander Fedenko², Nikolai Petrochenko², Mamed Aliev²

¹) Russian Cancer Research Center RAMS ²) RCRC RAMS, Russian Federation

Background: To estimate the toxicity using isolated limb perfusion in RCRC RAMS.

Methods: Isolated regional perfusion, according to foreign research is an effective method in treatment of soft tissue sarcoma and in-transit metastases of melanoma of the limbs. There were 20 patients treated at the RCRC in 2010-2012. Women - 17 (85%), men - 3 (15%). Mean age $47 \pm 16,7$ years, range 21 to 79 years. Perfusion of the lower limb was performed in 18 patients, upper limb - in 2 patients. Melanoma - 14 cases (stage 3B, 3C, 4), soft tissue sarcoma - 6 cases. Control of leakage in overall blood circulation was performed by dynamic radiometry. Perfusion was performed at mild hyperthermia. Overall response to treatment was recorded in 17 (85%) patients, a complete response - in 5 (25%), partial response - in 12 (60%), stabilization - in 3 patients. Limb salvage in 20 patients. Leakage during perfusion did not exceed 6% (an average of 1-2%). Evaluation of local toxicity was conducted on a Wieberdink scale. At the first two levels indicated moderate hyperemia and edema. On the third level is growing lesion deep tissue structures. At the fifth level of toxicity performed amputation. Evaluation of systemic toxicity was conducted by NCI-CTC.

Results: In our study, there was no local toxicity above level 2 (moderate redness and swelling of the limbs). None of the patients had no severe systemic toxicity due to low leakage from the isolated limb into the systemic circulation.

Conclusion: There was no significant local or systemic side effects. Thus the high treatment efficiency (up to 85% of overall response) and the ability to save the limb can be achieved without complications.

E-mail (main author): generaloncology@rambler.ru



O1:108

Isolated limb perfusion for locally advanced soft tissue sarcoma

J. Mattsson¹, R. Olofsson², P. Bergh¹, Ö. Berlin¹, K. Engström¹, B. Gunterberg¹, M. Hansson¹, P. Lindnér¹

¹ Sahlgrenska University Hospital ² Department of Surgery, Sweden

BACKGROUND: Isolated limb perfusion with Tumor Necrosis Factor alpha and Melphalan (TM-ILP) has proven to be a successful option in treating advanced soft tissue sarcomas (STS), where amputation otherwise is needed to achieve safe surgical margins.

METHODS: From 2000 to 2009, 54 patients with locally advanced STS, who all were candidates for amputation, were treated with totally 57 TM-ILP procedures and then followed prospectively. The median follow-up time was 30 months. Median tumor size was 10 cm, and 94% of the patients had high-grade tumors. TNF-alpha was administered in a dose of 3 mg in upper limbs and 4 mg in lower limbs, provided limb tissue temperature had reached 38°C. After 30 min, Melphalan (13 mg/L in upper limbs, 10 mg/L in lower limbs) was administered and the temperature increased to 40°C with a perfusion time of 90 min in total.

RESULTS: The clinical overall response after TM-ILP was 71% (including 21% CR), and 60% of the patients underwent resection of the tumor remnant after a median of 2 months. The histopathologic response rate in the resected specimens was 76%. Local recurrence/progress occurred in 37% of the patients after a median of 7 months. Thirteen patients finally underwent amputation after a median of 11 months, giving a long-term limb salvage of 76%.

CONCLUSIONS: TM-ILP of advanced soft tissue sarcoma of the extremities makes limb-sparing surgery possible in a high proportion of patients.



O1:109

New innovative treatment option of aneurysmal bone cysts with Denosumab

Tobias Lange¹, Christoph Stehling², Georg Gosheger³, Birgit Fröhlich⁴, Mark Klingenhöfer⁵, Jendrik Harges³, Heribert Jürgens⁴, Tobias Ludger Schulte³

¹) University Hospital Muenster ²) Radiology ³) Orthopedics and Tumor Orthopedics ⁴) Pediatric Hematology and Oncology ⁵) Neurosurgery, Germany

Aneurysmal bone cysts (ABC) are expansible destructive tumors which are positive for markers of osteoclasts resembling Giant Cell Tumors (GCT). The treatment of ABC implies surgical resection, curettage and cavity filling, embolisation, fibrosing agent injection or radiotherapy. These options can be unsatisfactory in children and adolescents with lesions in critical locations, e.g. in the spine, implying the need for innovative therapies.

Denosumab is a human monoclonal antibody that inhibits osteoclast function by blocking the cytokine receptor activator of NFκB ligand. Satisfying results of Denosumab in treatment of GCT and the immunohistochemical similarities justify the assumption of positive effects on ABCs.

This report is the first description of a therapeutic use of Denosumab in a patient with a spinal ABC. A case of an eight years old boy with a recurrent spinal ABC at C5 after surgery with intralesional tumor resection is described. The interdisciplinary tumor board discussed the remaining treatment options, implying revision surgery, embolisation, radiotherapy, fibrosing agents and an individualized treatment without as yet scientifically proven benefit using Denosumab. Due to relevant disadvantages of surgery (unlikelihood of wide resection, undesirable instrumented fusion in a growing child), radiotherapy (risk of radiation injury) and fibrosing agents (risk of emboli), embolisation was tried, but failed due to an absence of appropriate tumor vascularization. Finally, Denosumab therapy was initiated following extensive information and written consent by the family and approval of the health service.

Denosumab was given at a dose of 70 mg/m² BSA SC q 4 weeks, the dose being adapted from the approved adult dose of 120 mg q 4 weeks. Denosumab therapy was supplemented by appropriate daily oral substitution of calcium and vitamin D.

Since Denosumab therapy started, the patient recovered significantly from pain and neurologic symptoms and is in a healthy condition with no severe side effects. MRI checkup after 2 and 4 months and CT scan after 5 months showed regression of the cystic ABC and a replacement by solid bone marrow-like tissue. A longer follow-up and clinical studies will be needed to evaluate Denosumab for patients with ABC in critical locations.

E-mail (main author): tobias.lange@ukmuenster.de



O1:110

Efficacy of gemcitabine plus docetaxel in patients with refractory osteosarcomas and soft tissue sarcomas: results of Phase II trial

Shintaro Iwata¹, Tsukasa Yonemoto¹, Hiroto Kamoda¹, Takeshi Ishii¹

¹⁾ Chiba Cancer Center, Japan

Objective: To evaluate the efficacy and safety of gemcitabine plus docetaxel in the treatment of patients with previously treated refractory bone and soft tissue sarcomas, we conducted prospective Phase II trial.

Methods: Pediatric and adult patients with measurable solid tumors that relapsed after or were refractory to standard therapy were eligible. Gemcitabine at 675 mg/m² on days 1 and 8 plus docetaxel at 75 mg/m² on day 8 were administered every 3 or 4 weeks. The primary endpoint was the 6-month progression-free survival rate (PFSR).

Results: Thirty-one patients: 14 with malignant bone tumor (11 with osteosarcomas, 1 with angiosarcoma, chondrosarcoma, and fibrosarcoma) and 16 with soft tissue sarcoma were enrolled from January 2011 to December 2012. Median patients age was 44 years (range 8-79 years). A total of 153 courses of chemotherapy were administered (1-13 courses, median: 4 courses). The 6-month PFSR was 46.7% (95% CI, 26.6-67.9%), and median PFS was 3.3 months (0.4-15.8 months). Of 27 patients evaluable for response, there were 5 PR patients (2 UPS, 1 leiomyosarcoma, 1 osteosarcoma, and 1 fibrosarcoma) and 17 SD patients; the response rate was 18.5% and the disease control rate was 81.5%. The 6-month PFSR for osteosarcoma patients was 42.9% and that for spindle cell sarcoma of soft tissue was 59.3%; although no statistical difference was observed. The major grade 3/4 hematologic adverse event was neutropenia (70.6%). As for non-hematologic adverse event, grade 2 diarrhea was observed in 4 patients and grade 2 pneumonia and allergic reaction was observed in each 2 patients, although no treatment-related death occurred.

Conclusion: Gemcitabine plus docetaxel were associated with favorable efficacy and manageable toxicity in refractory patients with not only soft tissue sarcoma but also osteosarcoma.

E-mail (main author): siwata@chiba-cc.jp



MGL1:101

30-year experience with biological reconstruction at Kanazawa University

Hiroyuki Tsuchiya¹

¹⁾ Graduate School of Medical Science, Kanazawa University, Japan

The progress of musculoskeletal sarcoma treatment has been providing the improvement of limb-saving surgery and survival rate in patients with those tumors. Recently, limb-saving tumor surgery, which is not limited for merely saving, aims at much better functional results. The goal of limb-saving tumor surgery is normalization of the affected limbs in function and appearance.

Biological reconstruction after tumor resection is classified into two sub-types. One is reconstruction with living bone such as vascularized bone transfer and distraction osteogenesis. The other one is reconstruction with devitalized bone such as allograft, irradiated autograft, autoclaved autograft and frozen autograft treated by liquid nitrogen. Each reconstruction method has both advantages and disadvantages. Living bone can provide structure, cells, proteins and blood supply while most of devitalized bones can provide only structure and proteins. Biological healing of bone and excellent attachment between bone and soft-tissue can be specifically expected in biological reconstruction.

In this lecture, I would like to introduce reconstruction methods with distraction osteogenesis, massive frozen autograft and vascularized fibular graft, and also talk about tips how to make the best use of those methods based on our experience of 30 years.

E-mail (main author): tsuchi@med.kanazawa-u.ac.jp



02:101

Biologic reconstruction after bone tumor resections in children and adolescents

Reynaldo Jesus-Garcia¹

¹) Universidade Federal de São Paulo, Brazil

Introduction

The bone sarcomas are very frequent in small children and adolescents. The osteosarcoma and Ewing's family tumors are the most common. In this age, we have to consider the growing of the bone, the distance from the tumor to the growth plate and the intense activity of the children. We do not have many options of reconstruction and the amputation, most of the times, are the indicated technique. The purpose of this study is to present our solutions when we decide do not indicate an amputation.

Material and Method

We will present in patients with open epiphyseal plates the biologic techniques of limb preservation. We indicated the reconstruction with non-vascularized fibulae, vascularized fibulae and bone elongation with Ilizarov. The patients, a few days after the surgeries resumed the chemotherapy protocol, without interruption. In some Ewing's family tumor patients, we indicated irradiation of the site.

Results

Most of the patients were submitted to non-vascularized and vascularized fibulae reconstruction in humerus, femur and tibia tumors. The fibula was secured in to the bone with screws, special custom-made plates or Ilizarov. The time until consolidation was long but the consolidation occurred in all patients. In most of the patients there was not necessary other surgeries to get consolidation but in some, the consolidation was obtained just after additional minor surgeries, for example, grafting techniques. In others, to get the consolidation, it was necessary to change the synthesis or to use an Ilizarov. As complications, we had some fractures of the grafts but in none of them, we had infection or local recurrence.

Conclusion

Before to indicate an amputation, we have to consider a biological limb salvage procedure.

E-mail (main author): rjgarcia.ops@terra.com.br



02:102

Pedicled and free fibula grafts in primary reconstructions of the tibia: which and when?

Marco Manfrini¹, Marco Colangeli¹, Laura Campanacci¹, Massimiliano De Paolis¹, Massimo Ceruso²

¹) Istituto Ortopedico Rizzoli ²) C.T.O. Firenze, Italy

BACKGROUND: The authors report their experience with vascularised fibula autograft (VFA), either free, or ipsilateral pedicled, in large tibia defects, analysing indications and results.

METHODS: From 1994, VFA was used for tibia defects in 50 patients (median age 14ys, range 8-38) with bone sarcomas. (44 cases with neoadjuvant chemotherapy, 3 with radiotherapy).

In two patients, VFA was implanted alone, in one autografts were added. In 47 cases, VFA was associated to MBA. All cases had synthesis with plates.

Defect ranged 9-22cm, involving the diaphysis in 27 cases. In 21 cases, the resection included a proximal intraepiphyseal osteotomy; in 2 patients involved a distal intraepiphyseal osteotomy.

In 24 cases contralateralVFA was harvested as free-flap and microanastomosis performed between fibular vessels and anterior-tibialis vessels of the recipient leg.

In 26 cases ipsilateralVFA, harvested through posterolateral approach opposite to medial approach used for resection, was transposed to fill the tibia defect, maintaining the vascularity.

Implant outcome was investigated on serial radiology in 45 cases with 12 months follow-up (f-up).

Function was evaluated according MSTs.

RESULTS: At median f-up of 83months, there are 42 disease-free survivors. Two patients died for toxicity and 6 of disease.

There were 5 local recurrence: three were amputated, one revised with megaprosthesis, one patient had local radiotherapy.

There were 2 infections (one in each group) necessitating implant removal: both were reconstructed (one megaprosthesis, one Ilizarov technique).

Mechanical complications (delayed union, fracture) occurred in 14 patients. Five healed without surgery. Nine patients were revised but only 2 (one in each group) had VFA removed and substituted with new grafts. These patients were the only ones with no changes in serial radiology.

Functional analysis showed 80% Excellent and Good results (78% in freeVFA and 82% in pedicledVFA).

DISCUSSION: Both free and pedicledVFA have 95% chance to maintain viability and mechanically adapt to tibia reconstructions. PedicledVFA should be the first choice in diaphyseal defects but it's also effective in proximal intraepiphyseal reconstructions. Previous radiotherapy, fractures or leg abnormalities may force to prefer freeVFA.

AssociationVFA/MBA: Serial radiological analysis demonstrates intense remodelling suggesting biological, efficient and durable reconstructions.

E-mail (main author): marco.manfrini@ior.it



O2:103

Biological Reconstruction in high grade sarcomas – Patients under 12 years old

Eduardo Sadao Yonamine¹, Élio Consentino¹, Pedro Pércles Ribeiro Baptista¹, José Donato Próspero¹, Maria Fernanda Carriel Amary¹, Karen Voltan¹, Felipe Birriel¹, Bruna Bruscharino¹

¹) Santa Casa Medical School of Sao Paulo, Brazil

OBJECTIVES

1. Present our long term follow up of Biological Bone Reconstructions after resections of high grade sarcomas close to the growth plate.
2. Autologous bone reconstruction and long term follow up (14 - 312 months - average 173 months)
3. Safe resections and reconstructions close to the growth plate.

METHODS

- From June 1984 to June 2010, we treated 262 patients with High Grade Sarcomas (178 osteosarcomas and 84 Ewing's Sarcoma) in Santa Casa Medical School of Sao Paulo (Brazil) and The Hospital Alemão Oswaldo Cruz of Sao Paulo (Brazil)
- We exclude all cases treated in Pelvic Girdle, Pectoral Girdle, Spine, hand, forearm, foot, cases treated exclusively by radiation therapy and cases that were reconstructed by endoprostheses or don't need reconstruction (fibular cases)
- Considering 53 cases (27 Osteosarcoma and 26 Ewing's Sarcoma) in lower and upper limb submitted to resection and exclusively treated by surgery and autologous bone reconstructions.

RESULTS

- We analyse all 53 cases with limb salvage surgery and follow up from 14 - 312 months - average 173 months).
- Epidemiology: 36 males and 17 females, age: 5 to 12 years old (average 11,2), 26 cases in Femur, 17 in tibia and 10 in humerus.
- All 53 cases were treated with diaphyseal or metaepiphyseal or transphyseal resections close to the growth plate and reconstructions with autologous bone from fibula or iliac crest . 36 Non vascularized reconstructions, 13 fibular vascularized reconstructions and 4 cases of transposition from fibula to tibia.
- Complications:
 - 16 with fractures or delay of consolidations: 9 need 1 new procedures to include more iliac crest, 5 need 2 new procedures to include more iliac crest and 2 need 3 new procedures to include more iliac crest.
 - 3 case of superficial infections: treated with antibiotic therapy.
 - 2 case recidive in diaphyseal segment and were submitted to revision with endoprostheses.
 - 1 case recidive in soft tissue mass, resected and adjuvant radiation therapy.
 - 4 cases death with pulmonary metastasis, no local recurrence.
 - 1 case had cerebral metastasis after 67 months post surgery, no local recurrence.
- All 48 remaining cases still alive and had consolidations and doesn't need any kind of support.

CONCLUSION

We considering diaphyseal or metaphyseal or transphyseal resections safe even when the lesion is close to the growth plate and bone autologous reconstructions may offer long-standing reconstructions even in High Grade Sarcomas in pediatric patients (follow up: 14 to 312 months, average 173 months).

E-mail (main author): esy.pfs@gmail.com



O2:104

A new Score for the evaluation of radiographic and functional outcomes of custom made tumoral prosthesis.

Reynaldo Jesus-Garcia¹

¹⁾ Universidade Federal de São Paulo, Brazil

Introduction

Local control of tumors is achieved with resection followed by replacement by non-conventional endoprosthesis. The Literature has many publications on the best score to assess the long-term follow-up of conventional joint replacements. Each joint, among them the knee, hip and shoulder, has several scores attempting to analyze and evaluate the functional and radiographic outcomes. Despite the use of unconventional endoprosthesis for several years for treatment of bone tumors we did not find a specific index for its evaluation regarding clinical and surgery outcomes.

Objective

The objective of this study is to carry out a score for the evaluation of non-conventional endoprosthesis used for treatment of bone tumors around the shoulder, hip and knee, based on the questionnaires and scores used in conventional knee prostheses.

Methods

We review the English Literature related to the scores for assessing follow-up concerning function, complications of the prosthesis and clinical outcomes.

Results

We compared the most useful questionnaires for conventional joint replacement and proposed a new one to patients submitted to non-conventional endoprosthesis. We identified the parameters that are not addressed satisfactorily in the assessment of a patient treated surgically by means of non-conventional endoprosthesis. This will allow us to evaluate the results of the prosthesis.

Regarding the assessment rates of patients with bone tumors, the questionnaires TESS and MSTs were suitable for comparison of patients before and after treatment but not for the evaluation of endoprosthesis.

Conclusion

Current Literature do not use a specific "score" in order assessing the outcome of non-conventional endoprosthesis used for the treatment of patients with primary tumors.

E-mail (main author): rjgarcia.ops@terra.com.br



02:105

Autobiologic reconstructions with vascularized fibula grafts revisited.

Functional evaluation and a long-term follow-up (>10 years)

Örjan Berlin¹, Peter Bergh¹, Björn Gunterberg¹, Jonas Lundberg², Hans Mark²

¹⁾ Sahlgren University Hospital (1) ²⁾ Sahlgren University Hospital (2), Sweden

Background

Limb-sparing surgery with preserved joint-function in children with immature skeleton can be performed using vascularized fibula grafts (VFGs).

Material

1. A nine-year-old girl with a IIA osteosarcoma of the distal femur had chemotherapy (ISG-SSG I). In 2000-09 her distal femur was resected and dual VFGs were used for reconstruction. The cruciate-ligaments were reconstructed using the LCL and BF tendon. Functional score (FS) at 3-y-postop; 20/30. Follow-up (12 years): Epiphyseodesis was performed when leg-length-discrepancy was 4.5 cm. An anterior dislocation of the VFGs led to resection of the distal femur and a Mutars prosthesis (2007-09). FS with the original reconstruction was 20/30. Leg length discrepancy has been reduced (callusdistraction). 12-y-postop the FS is 26/30.
2. A nine-year-old girl with a IIB Ewing sarcoma of the proximal femur had chemotherapy (Euro-Ewing). In 1999-07 20 cm of her proximal femur was resected and dual VFGs were used. The hip joint-capsule was sutured like a pouch around the fibula head. Restriction of motion was maintained for 18 months postoperatively with an external orthosis. FS 4-y-postop was 23/30. Follow-up (13.5 years): The fibula head has remodeled into a œfemoral head. FS was 26/30 after leg-lengthening (callusdistraction).
3. A six-year-old girl with a IIB telangiectatic osteosarcoma of the proximal humerus had chemotherapy (ISG-SSG I). 1999-11 10 cm of her proximal humerus was resected and a VGF was used for the reconstruction. The long biceps brachi tendon was sutured to the LCL and distal end of the BF tendon. The remaining rotatorcuff was sutured like a pouch around the fibula head. She had thoracobrachial plaster for 12 weeks postoperatively. FS 2-y-postop was 26/30 and 29/30 at 5 years. 6-y-postop she presented with a soft tissue recurrence in the triceps brachi muscle. After pre-operative chemotherapy a local excision was performed (2006-05). Follow-up (13 years): there are no signs of local or distant recurrence and her FS is 26/30.

Conclusion

Autobiologic reconstructions with preserved joint function is a viable option to extendable prostheses in children with bone sarcomas of the immature skeleton. Among the large joints the functional rank order of success seem to be shoulder>hip>knee.

E-mail (main author): orjan.berlin@gmail.com



O2:106

Limb salvage surgery for malignant tumors in proximal tibia involving fibula

Xiaodong Tang¹, Wei Guo¹, Rongli Yang¹, Shun Tang¹, Sen Dong¹

¹) Peking University People's Hospital, China

A retrospective study of patients with malignant tumors in the proximal tibia involving the fibula was carried out to evaluate the effect of limb salvage surgery. The oncologic results, complications, and postoperative function were summarized.

Methods

Thirty-two patients were included in the study. There were 21 males and 11 females, with a mean age of 23.4 years old. The pathological diagnosis included 23 osteosarcomas, 5 chondrosarcomas, 1 malignant giant cell tumors, and 3 soft tissue sarcomas. During the operations, all patients had ligation of anterior tibial vessels, and 6 patients had resection and reconstruction of posterior tibial artery for direct tumor invasion or injury during resection. Among them, 3 patients had vessel anastomosis and 3 patients had vascular autograft with great saphenous vein. The common peroneal nerve in 4 patients and deep peroneal nerve in 5 patients were resected, respectively. The reconstruction methods included 25 endoprosthetic replacements, 5 allograft-prosthetic composite replacements, and 3 recycled tumor bearing bones.

Results

After a mean follow-up of 39.4 months, 6 patients (18.8%) had local recurrence, and the overall 5-year survival rate was 51.2%. Sixteen patients had no evidence of disease, fourteen patients were died of disease, and two were alive with disease. Variant complications occurred in 15 patients (46.9%), which included peroneal nerve palsy, ischemia of the lower leg, wound healing problem, deep infection and paraprosthetic fracture. The functional outcomes of a mean MSTS 93 score was 21.6 points (72%).

Conclusion

The indications of limb salvage surgery for malignant tumors in proximal tibia involving fibula should be restricted. Although complications encountered frequently, most patients have acceptable postoperative function.

E-mail (main author): bonetumor@163.com



03:101

The Role of Structural Allografts in Limb Salvage Surgery - A 22 Year Perspective

William Ward¹, Thomas Rusher¹, Fred Dorey¹

¹ Guthrie Clinic, United States

A number of studies evaluating limb salvage surgery have reported a higher complication rate with allografts compared to endoprostheses, especially as regards the rate of infections, fractures and non-unions. However unique anatomic and structural conditions continue to present themselves for which structural allografts are particularly suited. The authors therefore reviewed the senior surgeons 22+ years of personal experience in orthopedic oncologic and similar limb salvage reconstructions to compare the results of structural allografts and endoprostheses in complex reconstructions requiring structural bone restoration.

The surgical case logs of the senior surgeon over a 22+ year period was queried. There were 224 massive bone reconstructions (188 bone tumors, 36 other entities) employing massive tumor-type endoprostheses (172) or major cortical structural allografts (52). The records were reviewed to determine the ultimate outcome in these reconstructions in terms of joint preservations, reoperations, major revisions and subsequent amputations.

The reoperation rate was 50% for the allografts compared to 29% in the endoprostheses ($p=0.005$), the major revision or conversion rate was 23.1% for allografts and 7% for endoprostheses ($p=0.001$), and the amputation rate was 3.8% for massive allografts and 4.1% for massive endoprostheses. Use of allografts allowed preservation of the entire native joint in 25 (48%) the majority of the native joint (all but one condyle) in 8 joints (15%) and allowed 16 hemi joint preservations (31%) compared to 2 complete joint preservations (1%) and 99 hemi joint preservations (58%) with endoprostheses ($p=0.001$).

The revision rate for allograft reconstruction was much higher than that for endoprosthetic reconstruction: however, the allograft reconstructions in the majority of these specific cases allowed bone stock restoration and greater native joint preservation in ways that no endoprosthesis could accomplish without further bone or joint loss or compromise. The ultimate long-term limb salvage rate of 96% with either method of reconstruction confirms the applicability of allograft reconstruction in selected cases. The additional benefit of preserved growth plates was occasionally also accomplished with allograft reconstructions. Specific examples will be presented.

E-mail (main author): Ward_William@Guthrie.org



03:102

More than thirty years follow-up of first generation proximal femur reconstruction.

Björn Gunterberg¹, Örjan Berlin¹, Peter Bergh¹

¹) Sahlgrenska University Hospital, Sweden

Background: At the first meeting of what became the ISOLS (1981) Bertil Stener presented a way to reconstruct the proximal femur after tumor resection using a long-stem Moore prosthesis surrounded by a cement spacer substituting the resected part of the bone. The method was, in the hands of others, modified and changed over the years without any solid basis for doing so. This small study was initiated by the admission of a patient who following trauma had a dislocated and bent prosthesis, implanted 36 years previously, according to the original method.

Patients and methods: Eleven consecutive patients with the original reconstruction and with a follow-up of 31-38 years were reviewed. Seven had metastatic lesions and 4 primary tumors. The average age at surgery was 48 years. Six were men, 5 women. The surviving patients were interviewed and had radiographic examinations.

Results: All patients with metastatic lesions were dead, mean survival 16 months. All 4 patients with primary tumors were alive, mean follow-up 36 years. One patient with a local recurrence had hemipelvectomy. The only revision was because of trauma 36 years postoperatively. The other two patients had SMTS scores of 63 percent and 93 percent.

Conclusion: The described method for reconstruction of the proximal femur after tumor resection can be characterized as safe, simple and swift. It is very cheap and particularly suitable for metastases but has proven successful in locally aggressive lesions and low-grade malignant tumors with more than 30 years follow-up.

E-mail (main author): bjorn.gunterberg@telia.com



O3:103

Reverse shoulder prosthesis after resection of the proximal humerus for bone tumours

Anne Kaa¹, Peter Holberg Jørgensen¹, Jens Ole Søjbjerg¹, Hans Viggo Johannsen¹

¹) Aarhus University Hospital, Denmark

Background:

The purpose of the present study was to investigate/evaluate the functional outcome in patients who had a reverse shoulder prosthesis implanted after removal of a proximal humeral bone tumour. All patients operated on between 1998 and 2011 at the department of orthopaedic surgery, Aarhus University Hospital, were included.

Methods:

Registrations: age, gender, type of tumour (primary or metastatic) and classification, concomitant diseases, associated fracture, amount of humeral bone resection, surgical margins, extent of additional soft tissue resection, adjuvant treatment and surgical complications.

Examinations: Range of movement, MSTS (Musculo Skeletal Tumour Society) score and TESS (Toronto Extremity Survival Score)

Results:

From 1998 to 2011 a total of 16 patients were operated. At follow-up five patients had died and one lost to follow-up, leaving 10 patients for examination. Mean age at follow-up was 42 years (19 to 79). The mean follow-up was 46 months (12 to 136 months). Eight patients had a primary and two patients a secondary bone tumour. Two patients had superficial infections. One patient had a deep infection and the prosthesis was removed. The prosthesis loosened in two patients. One prosthesis dislocated twice. All patients had some degree of atrophy or pseudoatrophy of the deltoid muscle.

The average range of movements (ROM) was: Abduction: 78° (range 30° to 150°). Flexion: 98° (range 45° to 180°). External rotation: 32° (range 10° to 60°). Internal rotation: 51° (range 10° to 80°). The mean MSTS score was 77% (range 60 to 90%) and mean TESS score was 70 % (range 30 to 91%).

Conclusion:

Use of the reverse shoulder prosthesis in tumour patients yields acceptable results in terms of shoulder function. Patients report good active range of motion and shoulder function.

E-mail (main author): kaa.anne@gmail.com



O3:104

The Outcome of Total Humeral Endoprosthetic Reconstruction for Bone Tumours

Hazem Wafa¹, Robert Grimer¹, Simon Carter¹, Roger Tillman¹, Lee Jeys¹, Adesegun Abudu¹

¹) The Royal Orthopaedic Hospital, United Kingdom

Aim of the work: To evaluate the functional and oncological outcome of total humeral endoprosthetic reconstruction after bone tumor resection.

Material and Methods: Twenty six patients (8 males and 18 females) with a mean age of 30.4 years (range, 8.9 to 86 years) were included in this study. Histological diagnosis was osteosarcoma in eleven patients, chondrosarcoma in six, Ewing's sarcoma in four, metastatic carcinoma in three, liposarcoma in one, and giant cell tumor of bone in one remaining patient. Twenty two patients had their total humeral endoprosthetic replacement for primary reconstruction while the remaining four patients received their implants for failed other reconstructive techniques.

Results: At a mean followup of 7.4 years (range, 3 months to 25.9 years), eleven patients were alive with no evidence of disease, while eleven of the remaining fifteen died with metastatic disease. Local recurrence was seen in five patients (19.2%) and all eventually died of disease progression. Two patients (7.7%) developed deep periprosthetic infection and both elected to receive prolonged antibiotic suppression with implant retention. According to the Kaplan-Meier survival analysis, the cumulative ten-year implant survival was 91.3%. The mean MSTS functional score at the time of the latest followup was 83.3% (range, 60-93.3%).

Conclusions: Total humeral endoprosthetic replacement is a reliable method of reconstruction after tumor resection with excellent long term survival, satisfactory functional outcome, and a low complication rate.

E-mail (main author): hazem.wafa@nhs.net



O3:105

Tumor endoprosthetic replacement after extraarticular knee resection in bone and soft tissue tumors

Jendrik Hardes¹, Marcel P. Henrichs², Sebastian Bockholt², Georg Gosheger³, Wiebke Guder², Markus Nottrott², Helmut Ahrens², Dimosthenis Andreou², Arne Streitbürger²

¹⁾ University Clinic of Muenster, Germany ²⁾ ³⁾, Germany

Background: Most studies dealing with tumor prostheses around the knee describe their results after intraarticular tumor resection. The aim of this retrospective study was to report the results of tumor prostheses after extraarticular knee resection.

Methods: We evaluated the clinical results and complications after extraarticular resection of the distal femur and / or proximal tibia and reconstruction with a tumor endoprosthesis (Mutars®) used in 59 patients (mean age 33 years) with a malignant bone or soft tissue tumor.

Results: Limb survival was 80% after a mean follow-up of 53 months. Periprosthetic infection was the most common cause for secondary amputation (eight patients). Prosthetic failure was mainly caused by periprosthetic infection in 37%, aseptic loosening in 17% and periprosthetic fracture in 10% of patients. Wear of the bushings made a minor revision necessary in 20% of patients. The mean musculoskeletal tumor society score was 23 (range; 10 to 29). An active extension gap over 10° was obvious in ten patients.

Conclusion: Our results suggest that limb salvage with tumor prostheses after extraarticular resection can achieve good functional results in the majority of patients, but the complication rate and secondary amputation rate is higher compared to patients treated with an intraarticular resection.

E-mail (main author): hardes@uni-muenster.de



O3:106

Functional reconstruction of total femur with megaprotheses

Domenico Andrea Campanacci¹, Filippo Frenos¹, Antonio Vilardi¹, Giuseppe Caff¹, Marco Planta¹, Giovanni Beltrami¹, Guido Scoccianti¹, Rodolfo Capanna¹

¹) Azienda Ospedaliera Universitaria Careggi, Italy

Background: Total femur reconstruction with megaprotheses may be performed after bone tumor resections or in extensive bone loss due to multiple revisions or posttraumatic sequelae. The major concerns are infection, hip instability, due to the loss of all muscular insertions, and long term durability of the articular hinge of the knee and tibial stem, subject to high stresses due to the long lever arm. The objective of this study was a retrospective evaluation of total femur megaprosthesis, with the aim to evaluate morbidity of the procedure, implant survival and functional results.

Methods: From 2001, 20 patients underwent total femur resection and reconstruction with MegasystemC® (Waldemar Link®, Hamburg, Germany) modular prosthesis. There were 11 males and 9 females with an average age of 51 years (11-81). The diagnosis was a bone tumor in 15 cases (primary malignant 11, metastatic 3, benign 1), while in 5 the total femur replacement was performed after prosthetic failure (tumoral prosthesis 3, conventional hip and knee prosthesis 1, septic revision 1). In 3 patients an allograft-prosthesis composite was performed (proximal femur allograft 1, autograft 1, proximal tibia allograft 1). In one case with extensor apparatus insufficiency, total femur prosthesis with knee arthrodesis was performed.

Results: The average follow up was 40 months (1-126). Two major complications occurred in the same patient: wound dehiscence with superficial infection healed after a surgical debridement and hip dislocation treated with closed reduction. In 1 case a local recurrence occurred requiring a hindquarter amputation. Implant survival with surgical revision or amputation as end point was 88.7% at 5 and 10 years. The functional result of evaluable patients, according to MSTs, showed an average score of 63% (40%-86%).

Conclusion: Total femur reconstruction with Megasystem C showed to be an effective limb salvage procedure in extensive bone loss after tumor resection or prosthetic revision. Despite the concerns about infection risk reported in literature after this procedure, in our series the infection rate was 5%. In conclusion, total femur modular prostheses are a successful solution in selected clinical situation but additional long term studies are required to better define implants' durability.

E-mail (main author): campanaccid@gmail.com



O3:107

Total femur prostheses for reconstruction after resection of sarcomas.

Pietro Ruggieri¹, Gabriele Drago¹, Elisa Pala¹, Giulia Trovarelli¹, Teresa Calabrò¹, Andrea Angelini¹, Carlo Romagnoli¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background. The choices of treatment for patients with extensive tumors of the femur include total femur mega-prosthesis or large allograft-prosthetic composites. Previous reports suggest variable survival ranging from 60-70% at 1 to 2 years. However, these studies described earlier prostheses and techniques. To confirm previous reports we determined risk of local recurrence, overall survivorship and function in patients with total femur reconstructions for tumors.

Methods. We retrospectively reviewed 26 patients with total femur megaprotheses implanted between 1987 and 2010 after resection of bone tumors. Two patients lost at followup were excluded; the remaining 24 included 15 males and 9 females with a mean age of 27.2 years. The mean followup was 5.3 years (range, 5 months - 23 years). Function was assessed according to the MSTS system II.

Results. One patient developed a local recurrence during followup (4.1%). At last followup, ten patients were continuously disease free at a mean of 11.1 years, one patient had no evidence of disease after treatment of a recurrence, another patient had no evidence of disease after treatment of a pulmonary metastasis, and 12 patients died of their disease at a mean time of 1.5 years. In 21 patients evaluated with the MSTS score, the mean score was 68.41%; seven patients had over 75%, eleven from 51% to 75%, three from 26% to 50%. Four patients (16.6%) had complications requiring further surgery in absence of trauma. A fifth patient had a post-traumatic periprosthetic fracture.

Conclusions. A total femur prosthesis allows a limb-preserving procedure in tumors with extensive femoral involvement or in the presence of a skip lesion along the femur. The prognosis of these tumors requiring total femur resection is poor, but this reconstruction provides good function with a relatively low rate of major complications.

E-mail (main author): pietro.ruggieri@ior.it



O3:108

Mid-term results after MUTARS prosthesis in the distal femur and proximal tibia reconstruction: a retrospective study in 97 patients

D.T. Mensch¹, R. Mahdad¹, L. Bollen¹, M.A.J. van de Sande¹, A.H.M. Taminiau¹, P.D.S. Dijkstra¹, R.G.H.H. Nelissen¹

¹ Leiden University Medical centre, Netherlands

Background

The use of the Modular Universal Tumour And Revision System (MUTARS®) is widely accepted for limb salvage and reconstruction in which Leiden University Medical Centre (LUMC) has over 15 years of experience.

Methods

A retrospective study was conducted on all cases concerning reconstruction of the distal femur and proximal tibia, focusing on failure mechanisms and contributing factors thereof in mid- to long-term follow up after primary MUTARS implantation without silver coating. A database was compiled of all 118 patients operated in the LUMC of which 97 cases more than two years after primary MUTARS implantation were included in our current study.

Results

97 cases were included, 55% male subjects with a mean age at surgery of 40 years (14-89) and median follow-up 98 months (2-204). 76 prosthesis were implanted for distal femoral defects, 21 for proximal tibial defects. Indications for implantation included primary malignancies in 72%, mainly Osteosarcoma (47%) and chondrosarcoma (9%). Other indications included failed previous oncologic reconstructions (21%), Giant Cell Tumours (5%), Metastasis (1%) and non-union after fracture treatment (1%).

68 complications in total were recorded in 62 cases leading to one or more reoperations in 52 cases. Mechanical failure was seen in 20% of all cases, 56% (9/16) of non-hydroxyapatite coated stems versus 12% (10/81) of hydroxyapatite coated stems, demonstrating a significant preventative factor in mechanical failure with p-value Infection was seen in 13% of cases, wherein a non-significant trend toward more complications was seen concerning tibial implants, p-value = 0,32 , HR 1,8 (CI 0,6-5,9). Median time to infection for both locations combined was 6,5 months (0-131).

14 reoperations were indicated for either failure of locking mechanisms or liner-wear.

Survival function analysis demonstrated a median survival of prosthesis of 70,8 months.

Conclusion.

After MUTARS endoprosthesis reconstruction of the distal femur and proximal tibia we found a mechanical complication rate of 20% and infection rate of 13%. Hydroxyapatite coating of the stem significantly prevents mechanical failure.

E-mail (main author): dtmensch@gmail.com



O4:101

Massive Pseudotumors that Occur Around Implanted Devices.

Scott Nelson¹

¹⁾ University of California, United States

Much change and progress has occurred in the design of implanted devices used for degenerative change as well as in limb salvage surgery. In addition to aseptic loosening of components, other complications including likely hypersensitivity reactions and the formation of so-called pseudotumors are known to occur, especially with metal on metal bearings. These can be quite large and destructive, often described as being "sarcoma-like", and management can be challenging. The spectrum of changes including typical wear, hypersensitivity, and the formation of large pseudotumors is discussed.

E-mail (main author): SDNelson@mednet.ucla.edu



O4:102

A comprehensive study of 214 osteosarcomas of the jaws

Philippe Brunner¹, Daniel Baumhoer¹, Serenella Eppenberger¹, Jan Smida², Michaela Nathrath², Gernot Jundt¹

¹) University Hospital Basel, Switzerland ²) Helmholtz Zentrum Muenchen, Germany

Background:

Osteosarcomas of the jaws account for approximately 5% of all osteosarcomas and seem to represent a clinically and prognostically distinct subgroup. However, due to the rarity of the disease rather small series have been described in the literature so far.

Methods:

214 gnathic osteosarcomas, registered in the Bone Tumor Reference Center in the past 40 years, were histologically re-evaluated and graded. Additionally, the corresponding clinical files were collected and analyzed for clinico-pathological characteristics.

Results:

Our series included 136 mandibular and 78 maxillary osteosarcomas with a median patient age of 39 years and an average follow-up of 59 months. The overall survival at 5-years was 66.8% and at 10-years 59.2%, respectively. The prognosis of patients differed significantly with regard to tumor grade ($p = 0.027$), metastatic ($p < 0.0001$) and recurrent ($p < 0.0001$) disease as well as with the achievement of a complete resection (R0) at any time during the course of the disease ($p < 0.0001$, 5-year survival 79.9% vs 24.3%). Tumor size and site, however, did not prove to be of statistical significance. Interestingly, (neo-)adjuvant therapy did not prolong survival.

Conclusions:

Osteosarcomas of the jaws have distinct clinico-pathological properties compared with their counterparts in the peripheral skeleton. The mainstay of therapy seems to be the complete surgical resection of the tumor resulting in an excellent prognosis of patients.

E-mail (main author): PhBrunner@uhbs.ch



O4:103

Does amputation offer survival-benefit over limb-salvage in patients with Osteosarcoma with poor chemo-necrosis and close margins?

Krishna Reddy¹, Louie Gaston¹, Rajpal Nandra¹, Robert Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom

Introduction:

Despite advances in neo-adjuvant treatment for osteosarcoma, some patients have a poor response to chemotherapy. The prognosis in this group is considerably worse than those with a good response. Poor responders will generally have larger tumours. The dilemma that often arises is whether to do limb salvage with a narrow margin of excision or an outright amputation. If limb salvage is carried out with a close margin, does post-operative radiotherapy make any difference? This study aims to address these questions.

Material and methods:

All patients with limb osteosarcoma, poor response to chemotherapy ($\leq 90\%$ necrosis), and either inadequate margins on limb salvage (marginal or intra-lesional) or primary amputation were identified from a prospective database. This group was investigated in terms of overall survival and local control.

Results:

386 patients were included in the study (139 amputation, 206 limb salvage with marginal margins, 41 limb salvage with intralesional margins). Local recurrence (LR) developed in 16 (29%) with an intralesional margin, 42 (20%) of those with a marginal margin, and 10 (7%) with an amputation. Post-operative radiotherapy was used in 42 patients. The risk of LR in this group was 28% compared to 23% for those who did not have radiotherapy. The overall survival for the whole group was 40% at 5 years. The 5-year survival was 46% in those with marginal margins, 28% in those with an amputation, and 27% for those with an intralesional margin. In 21 patients who developed LR and synchronous metastases, none survived beyond 5 years. Patients who had limb salvage and then developed LR without metastases, had identical survival as patients who had primary amputation without subsequent LR.

Conclusion:

A marginal resection of osteosarcoma with a poor response to chemotherapy carries a poor overall prognosis. However, carrying out an amputation to avoid the risk of local recurrence offers no obvious survival benefit. The role of post-operative radiotherapy in these patients remains unclear.

E-mail (main author): k.reddy@nhs.net



O4:104

Local recurrence in Ewing's sarcoma after good response to chemotherapy: disease or treatment?

Anna Price¹, Jakub Kozdryk¹, Robert Grimer¹, Lee Jeys¹

¹) Royal Orthopaedic Hospital, United Kingdom

Introduction

Whilst Ewing's sarcoma is a rare malignancy it has attracted significant scientific attention due to its tumour specific translocations. Despite this flurry of research, survival curves for patients have plateaued over the last 10 years. In some cases, in spite of successful chemotherapy responses and aggressive surgical resection there are still local recurrences (LR). Local recurrence has a poor prognostic indication often leading to subsequent surgery and in many cases death from metastases. Recent data has highlighted a surprising high rate of LR even in good responding tumours.

Methods

We conducted a retrospective review of patients seen in our tertiary referral centre since 1971. 770 patients were identified with Ewing's sarcoma. 213 patients had necrosis greater than 90% who underwent surgery. 73 patients (9.4%) were identified with local recurrence of Ewing's sarcoma. In this sub-group 13 patients (17%) had isolated locally recurrent disease and at a mean of 34.2 months from diagnosis.

Results

There were 11 males and 2 females. The site of Ewing's sarcoma varied greatly but most were limb, (n=11) the most common site being the femur (n=3) followed by the fibula (n=2). All patients had neo-adjuvant chemotherapy and achieved greater than >90% necrosis. 9 achieved a 100% response. Only one patient diagnosed in 1986 received pre-operative radiotherapy (pelvis) and none underwent post-operative radiotherapy. Two patients had intralesional margins (one patient with Ewing's sarcoma of the pelvis and pre-op radiotherapy, one patient with an endoprosthetic replacement but >95% necrosis). Mean time to local recurrence was 34.2 months (11-150, n=13). One patient developed local recurrence after 12yrs. 6 patients subsequently developed metastases. 7 patients died, 5 with metastases, 1 of septicaemia and 1 cause of death was unknown. The mean radiographic volume at diagnosis was 240.92mls (range= 44.93-609.76) compared to a mean resection volume of 87.04ml (range=14.7-286.03).

Conclusion

Despite a good chemotherapy response, local recurrence is still occurring. We believe that residual microscopic disease is being left behind following conservative surgery and there is a role for either radical excision of pre-chemotherapy volume or adjuvant radiotherapy despite good surgical margins and 100% necrosis.

E-mail (main author): anna.price2@nhs.net



O4:105

Risk Stratification and Pattern of Cardiotoxicity in Pediatric Ewing's sarcoma

Emad Moussa¹, Manal Zamzam², Zeinab Salah², Ranin Soliman², Lina Gaber², Sameera Ezzat², Iman Attia²

¹⁾ The Children's Cancer Hospital-Egypt ²⁾ CCHE, Egypt

Background: Improved therapies for childhood cancers have increased the number of survivors; however, they are prone to adverse effects. One of the common effects of treatment is cardiac dysfunction resulting mainly from therapy with anthracyclines.

Patients & Methods: Ewing's Sarcoma patients at Children's Cancer Hospital Egypt (CCHE) from July 2007 till December 2011, were retrospectively evaluated for the incidence, pattern, and severity of cardiotoxicity. Echocardiographic findings at baseline, throughout treatment, and latest follow-up in December 2012. Severity of cardiac disorders were based on Common Toxicity Criteria, 2010. Onset was classified into, acute (developed during protocol treatment), early (within one year from end of treatment), or late (after one year from end of treatment). **Results:** One hundred and forty nine patients, were treated according to Ewing's sarcoma protocol with alternating courses of vincristine, doxorubicin, cyclophosphamide and Ifosfamide, etoposide with mean age at presentation of 10 years (2-18), 88 males (59%) and 61 were females (41%). 39 patients (26%) developed cardiotoxicity as evaluated by echocardiography based on reduced left ventricular (LV) systolic performance evidenced by reduced ejection fraction (EF%) and fraction shortening (FS%). A statistical significance between the mean EF at initial presentation (mean = 66.6%) and the mean of the lowest EF (mean = 43.6%), was found (p-value < 0.001), with a mean time to develop cardiotoxicity at 17 months (5 - 49 months). The onset of cardiotoxicity was acute in 17 patients (11.4%), early in 14 patients (9.4%), and late in 8 patients (5.4%).

According to the percentage of decline in EF based on CTC criteria, it was found that 13 patients (33%) were classified as grade I (EF drop <10% from baseline), 16 patients (41%) were grade II (EF Drop 10-19%), 9 patients (23%) were grade III (EF Drop 20-29%), and 1 patient (3%) was grade IV (EF drop >29%).

No correlation was found between the incidence of cardiotoxicity and age, gender, onset, cumulative doxorubicin dose, and follow-up duration. However, the onset of cardiotoxicity was significantly correlated with the cumulative doxorubicin dose (p-value= 0.012). Only 4 patients received mediastinal irradiation, 2 of them developed acute cardiotoxicity post-radiotherapy.

Out of 39 patients, seventeen received antifailure measures, eighteen presented with clinical manifestations, while only eleven patients (28%) showed improved LV systolic performance, while 6 patients died from cardiotoxicity. The rest remained with impaired systolic function until the latest follow-up.

Conclusion: All patients were affected by dropping their EF, but not all of them (only 26%) had cardiac toxicity, the onset of cardiac toxicity was significantly correlated with cumulative doxorubicin dose. The incidence of cardiac toxicity was not correlated to presumed risk factors. About one third of patients having cardiac toxicity can be salvaged by therapy.

E-mail (main author): moussaemad1960@yahoo.co.uk



O4:106

Creating a risk based protocol for local recurrence in soft tissue sarcomas

Robert Grimer¹, Mousumi Biswas², Lucinda Billingham², Lee Jeys¹

¹) Royal Orthopaedic Hospital ²) University of Birmingham, United Kingdom

Aim: as part of the Sarcoma Optimum Follow-up Investigation (SOFI) we have been investigating risk factors for local recurrence in patients with STS.

Method: All patients treated with curative intent for a STS were identified from a prospective database. Patients with inadequate information about the primary tumour, the treatment or follow up were excluded as were patients with metastases at diagnosis or recurrent disease at presentation.

Results: Local recurrence (LR) arose in 253 of the 1457 patients (17%) in this series. The median time to LR was 20 months for low grade tumours and 12 months for high grade tumours. Risk factors for local recurrence were found to be: high grade (HR 1.78); intralesional margin (HR 3.0); age >58 (HR 1.6) and Size >10cm (HR 1.8). Diagnosis and radiotherapy could not be shown to affect LR rates. Combining the four risk factors above produced an algorithm that predicted an incremental risk of LR from 8% (low risk) to 36% (high risk).

Of the 253 patients with LR, 173 developed it as the first event, but 80 had either pre-existing or synchronous metastatic disease. The overall 5 year survival was 14% for patients who had metastatic disease at or before LR, 51% for those with LR as first event and 60% for those who did not develop LR. When local recurrence was included in the model for overall survival, it remained a poor prognostic factor.

Conclusion: This model has helped establish risk factors for local recurrence and also suggests, like other recent analyses, that LR has a small but significant adverse outcome on survival. Data from this model will now be used to populate a cost/benefit analysis for the SOFI model.

E-mail (main author): rob.grimer@bopenworld.com



O4:107

What is the significance of necrosis following neoadjuvant chemotherapy in osteosarcoma?

Robert Grimer¹, David Peake¹, David Spooner¹, Lee Jeys¹, Simon Carter¹, Seggy Abudu¹, Sumathi Vaiyapuri²

¹, United Kingdom ² Royal Orthopaedic Hospital, Uruguay

It is generally accepted that the percentage necrosis following neoadjuvant chemotherapy in osteosarcoma is one of the most important prognostic factors for survival. A level of 90% is generally accepted as the cut off between 'good' and 'bad' response, but there is some lack of clarity as to whether this can be further refined by more accurate assessment of necrosis. The aim of this study was to investigate whether or not more accurate assessment of necrosis offered additional prognostic information.

Method: For many years our unit has recorded the actual % necrosis in patients who underwent surgical resection of osteosarcoma following neoadjuvant chemotherapy. All patients with non-metastatic limb osteosarcoma who underwent neoadjuvant chemotherapy and had >2years follow up were included in the analysis. Initially the % necrosis was scored as follows (100%, 99%, 95-98%, 91-95%; 90%, 80-89%, 50-79%, <50%). Gradually groups were merged until statistical significance was identified. 498 patients were included in the final analysis.

Results: On initial analysis it was apparent that there was a clear cut off below 90% with all patients doing worse. Patients with 90% necrosis had slightly better survival than those with 91-95% which was virtually the same as 95-98%, so these three groups were lumped together (90-98%). Patients with 99% necrosis had slightly better survival than those with 100% but these two groups were lumped together. The best classification was thus as follows - <89%, 90-98%, 99-100%. Using this criteria in a Cox model showed that the chances of survival were:

99-100% = 84% survival at 5 years (HR 0.26, CI 0.13-0.51)

90-98% = 68% survival at 5yrs (HR 0.45, CI 0.29 – 0.68)

<89% = 46% survival at 5 years (HR 1)

Conclusion: The actual % necrosis gives a useful idea of prognosis in patients with osteosarcoma.

Importantly, this study confirms the poor outcome for all patients with <90% necrosis but in this series 90% necrosis was equivalent to necrosis up to 98%. The best response was in those with 99 or 100% necrosis and these patients had nearly a four times better chance of cure than those patients with <90% necrosis.

E-mail (main author): rob.grimer@btopenworld.com



O5:101

A new implant technology: iodine-coating for infection control

Hiroyuki Tsuchiya¹, Toshiharu Shirai¹, Hideji Nishida¹

¹) Graduate School of Medical Science, Kanazawa University, Japan

Background

Post-operative infection associated with implants remains a serious complication in orthopedic surgery. For example, infection rates between 5% and 35% have been described for endoprosthetic replacement of large bone defects after tumor resection despite strict antiseptic operative procedures, including systemic prophylaxis. Several biomaterial surface treatments have been proposed for reducing the incidence of implant-associated infections. We have done a basic experiment for the iodine-supported titanium. The results indicate that iodine-supported titanium has favorable antibacterial activity, biocompatibility, and no cytotoxicity. In this study, a clinical trial was performed using iodine-supported titanium implants in orthopaedic surgery.

Patients and Methods

A total of 344 patients with post-operative infection or compromised status were treated using iodine-supported titanium implants. The mean age of the patients was 49.3 years (range, 5-86 years). The mean follow-up period was 26 months (range, 3-44 months). One hundred ninety-two patients were male and 152 were female. The diagnoses included 157 cases of tumor, 56 of degenerative disease, 35 of limb deformity, 30 of infected pseudoarthrosis, 24 of fracture, 6 of osteonecrosis, 5 of rheumatoid arthritis and one of scoliosis. Iodine-supported implants were used to prevent infection in 257 patients with compromised status (diabetes, cancer, steroid treatment, open fracture etc.), and to treat active infection for 87 patients. White blood cells (WBCs) and C-reactive protein (CRP) were measured pre- and post-operatively in all patients. To confirm whether iodine from the implant affected physiological functions, plasma thyroid hormone levels were examined. Both examinations were conducted sequentially for a year. Radiological evaluations were performed regularly after the operation. The chronological changes of the iodine amount were evaluated using half pins and screws removed after completion of treatment.

Results

The following types of implants were used: 129 spinal instrumentations, 79 plates for osteosynthesis, 71 prostheses, 56 external fixation (pins and wires), seven nails and two cannulated screws. Acute infection developed in three tumor cases and one in diabetic foot among the 257 patients on preventive therapy. In one patient, infection was cured by debridement and removing only the Marlex mesh used to reconstruct chest wall while leaving the iodine-coated implants in place. Other three infected cases were also cured by intravenous administration of antibiotics only, without removal of the implants. The 87 treatment cases that underwent one-stage or two-stage revision surgery recovered without additional surgery. Median WBC levels were in the normal range and median CRP levels returned to < 0.5 within 4 weeks after surgery. Abnormalities of thyroid gland function were not detected. None of the patients experienced loosening of the implants. There were two patients with mechanical implant failure, which was treated by re-implantation. Excellent bone ingrowth and ongrowth were found around all hip and tumor prostheses. One year later, the amount of iodine on external fixation pins remained about 30%.

Conclusions

Iodine-supported titanium implants can be very effective for preventing and treating infections after orthopaedic surgery. Cytotoxicity and adverse effects were not detected.



O5:102

Total Femur Replacement - significant differences in varying indications?

Andreas Toepfer¹, Isabel Petzschner¹, Rüdiger von Eisenhart-Rothe¹

¹) Klinikum rechts der Isar der TUM, Germany

Background: Extensive bone loss of the femur is most commonly encountered after resection of malignant bone tumors or revision arthroplasty of the hip and knee.

Total femur replacement (TFR) is a possible method of treatment and allows to restore reasonable function, albeit associated with a high risk of significant complications.

The purpose of this study was to assess the functional outcomes and the complications associated with total femur replacement used in patients for both tumor-and revision arthroplasty.

Methods: We retrospectively reviewed 36 consecutive patients with total femur megaprotheses implanted in our clinic between 1995 and 2010. 14 patients were lost for follow-up, the remaining 22 included nine TFR for malignant bone tumors (6 osteosarcomas, 2 chondrosarcomas, 1 metastasis) and 13 TFR after failure of THA or TKA. Before TFR, all patients had previously undergone surgery on the affected limb (range, 1-8).

The mean follow-up was 53m. Scores to assess function and general medical well-being included MSTS- and SF-12 score. Complications were evaluated using Henderson's failure mode classification for tumor endoprotheses.

Results: There was a significant difference in all collected parameters between tumor patients and endoprosthetic patients. The MSTS score for all 22 Patients was 43,5% (13/30), the MSTS score for the sub-group of nine tumor patients was 63,7% (19/30), whereas endoprosthetic patients reached 29,5% (9/30). Evaluation of the SF-12 showed a physical sum score for all 22 Patients of 32,3 points. Tumor patients reached 38,3 in this category and endoprosthetic patients 28.1 points.

Four cases of hip dis-articulations, caused by periprosthetic infection, were not selected for a retrospective analysis and classified as failure. We recorded 20 major complications associated with modular megaprotheses (13 Type I/soft-tissue complications, 2 Type III/mechanical failures and 5 Type IV/infections) which resulted in 37 revision surgeries in 10 patients (3 tumor- and 7 endoprosthetic-patients).

Conclusions: Younger patients have better functional results and fewer severe complications.

Although total femur replacement allows a limb-sparing procedure in patients with extensive bone loss of the femur, this treatment remains a reserve procedure and should only be considered when the alternative is hip disarticulation.

E-mail (main author): toepfer@tum.de



O5:103

Retrospective Evaluation of the Incidence of Early Periprosthetic Infection with Silver-Treated Custom Megaprotheses in High Risk Patients: Case Control Study

Hazem Wafa¹, Robert Grimer¹, Simon Carter¹, Roger Tillman¹, Adesegun Abudu¹, Lee Jeys¹

¹ The Royal Orthopaedic Hospital, United Kingdom

Objective: To compare the incidence of early periprosthetic infection in high risk patients who have undergone endoprosthetic reconstruction using the Agluna silver-treated Stanmore custom megaprotheses with a control group who received a non Agluna-treated Stanmore implants.

Methods: We conducted a case control study recruiting 85 patients with Agluna-treated implants and 85 controls. There were 106 males and 64 females with a mean age of 42.2 years (range, 18.4 to 90.4 years) at the time of implant insertion. Fifty patients (29.4%) received their implants for primary reconstruction, seventy nine (46.5%) for one-stage revision, while the remaining forty one patients (24.1%) had a two-stage revision surgery for periprosthetic infection. Endoprosthetic replacements were of the distal femur (n=63), proximal tibia (n=36), proximal femur (n=19), hemipelvis (n=16), total femur (n=6), proximal humerus (n=6), distal humerus (n=2), distal radius (n=2), intercalary (n=12), while eight patients had combined femoral and tibial implants.

Results: All patients were followed up for a minimum of 6 months. Data collected during the postoperative period, and at 3, 6, 9, and 12 month post-operative visits was analyzed. The overall postoperative infection rates of the silver and control groups were 12.9% and 23.5% respectively ($p < 0.01$). Eight of the eleven infected prostheses (72.7%) in the silver group were successfully treated with debridement, antibiotics, and implant retention (DAIR) as compared to only five of the twenty infected implants (25%) in the control group ($p < 0.01$). Three patients with silver-treated implants (3.5%) and fifteen of the control group (17.6%) had chronic periprosthetic infection necessitating device removal, amputation or chronic antibiotic suppression ($p < 0.01$).

Eight of the fifteen patients (53.3%) with positive intraoperative cultures in the control group had postoperative infection versus only two of the fifteen patients (13.3%) in the silver group ($p < 0.01$). None of those eight patients in the control group had their infection resolved with DAIR procedure. The overall success rates in controlling infection with two-stage revisions in the silver and control groups were 80% and 52.4% respectively ($p < 0.01$).

Conclusions: The Agluna-treated megaprotheses are associated with lower rates of early periprosthetic infection. These silver-treated implants are particularly useful in two-stage revisions for periprosthetic infection and in those patients with incidental positive cultures at the time of implant insertion. The DAIR procedure appears to be more successful with this type of implants.

E-mail (main author): hazem.wafa@nhs.net



O5:104

Second cancers after endoprosthetic replacement: is metal bad for you?

Robert Grimer¹, Matthew Francis², Nicola Dennis², Gill Lawrence²

¹) Royal Orthopaedic NHS Foundation Trust ²) West Midlands Cancer Intelligence Unit, United Kingdom

Background: Patients who have endoprosthetic replacements have a large amount of metal placed in their bodies. With the passage of time metal ions may be leaked into the body. Concern over the association of metal ions and cancer has increased following recent reports in relation to metal on metal joint replacements. This study has therefore looked at the incidence of second cancers in patients who had an endoprosthetic replacement (for cancer) in the past.

Methods: All patients who had an endoprosthetic replacement at our centre have been followed up indefinitely. We identified all patients who had a second cancer, unrelated to the primary which they had the initial endoprosthesis for. The incidence of second cancer was confirmed by cross referencing these patients to the Central Cancer Registry which documents the incidence of all cancers arising in England.

Results: Between 1998 and 2004, 529 extremity bone sarcoma patients have had an endoprosthetic replacement. Patients were censored at the time of follow up or the time of death either due to the original cancer or natural causes. The follow up included 3000 patient prosthesis years. The mean age at insertion of the original prosthesis had been 30 (range 3 to 85). Of the 529 patients, 254 have died at a mean of 35 years of age and 275 are alive. There were 11 patients with a second cancer. The incidence was 1.5% at 5 years and 1.9% at 10 years after insertion of the endoprosthesis. The most common second cancer was breast cancer.

Conclusion: The incidence of a second cancer in patients who have had an endoprosthesis is 1.9% at 10 years. There is no evidence of an increased risk of second cancer in patients with an endoprosthetic replacement.

E-mail (main author): nicola.dennis@wmciu.nhs.uk



O5:105

Implantable venous port systems - prevention of infectious complications in children with bone tumors after the arthroplasty.

Maxim Rykov¹, Aslan Dzampaev¹

¹⁾ Institute of Pediatric Oncology, Russian Federation

Background: The treatment of bone tumors in children requires numerous courses of chemotherapy. 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.

Materials and Methods: From 2008 to 2012 we observed 175 children with bone tumors of extremities (aged 3 years to 17 years). Limb arthroplasty was performed in 167 patients (95.4%): in 2008 - 24 patients, 2009 - 34, 2010 - 28, 2011 - 44, 2012 - 37. 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, 2011 - 39 (88.6%), 2012 - 36 (97.2%). Subclavian catheters were implanted in 96 (54.8%) patients.

Results: Infectious complications developed in 18 patients with limb endoprosthesis (10.8%). 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. Two-step re-arthroplasty 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 the number of infectious complications and infections of limb prostheses (1.8 times).

E-mail (main author): wordex2006@rambler.ru



O5:106

Preliminary results of reverse total shoulder arthroplasty for tumors of proximal humerus

Pietro Ruggieri¹, Teresa Calabrò¹, Xin Sun¹, Caterina Novella Abati¹, Fernando Jorge¹, Matteo Romantini¹, Andrea Angelini¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background: Proximal humerus is the third most common site for bone tumors. The rotator cuff needs often to be sacrificed, so it is a challenge to restore good shoulder function. The reverse total shoulder arthroplasty improved active shoulder range of motion after resection of rotator cuff.

Methods: We retrospectively reviewed 11 patients who had reverse shoulder arthroplasty (RSA) for proximal humerus tumors between 2005 and 2012: 7 females and 4 males with mean age 49.6 years (32 to 69 ys). Four patients had GCT, 5 chondrosarcoma, 2 metastases. Six patients received primary RSA while the others underwent revisions after failed primary reconstruction (allograft or prosthesis).

Results: All patients were alive and disease free at mean follow up of 31.7 months. One patient developed soft tissue recurrence at five years and was treated with elettrochemoterapy. Nobody developed distant metastases. The mean functional MSTS score was 23.9. The mean active abduction was 60° (ranging 20° to 100°). Two patients had major complications requiring revision: 1 prosthetic dislocation and 1 plastic wear.

Conclusion: In our experience the use of reverse total shoulder arthroplasty for tumors of the proximal humerus is a reasonable reconstructive option at short-term follow-up. Our indication to inverse prosthesis is for resections including the rotator cuff but sparing deltoid muscle axillary nerve. If bone resection is proximal to the deltoid insertion, we use a modular inverse prosthesis; if the resection level is distal, we use a composite allograft with inverse prosthesis.

E-mail (main author): pietro.ruggieri@ior.it



O5:107

Proximal humerus reconstruction with MRS® Bioimpianti prostheses after resection of bone tumors: an analysis of 255 cases

Pietro Ruggieri¹, Teresa Calabrò¹, Andrea Angelini¹, Caterina Novella Abati¹, Elisa Pala¹, Mohammad Hassani¹, Marco Maraldi¹, Ilaria Piraino¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background. Limb salvage using endoprosthesis is considered as a treatment of choice for bone sarcoma involving the extremities with relatively low incidence of major complications. Modular prosthetic reconstructions is the most frequently used type of reconstruction after resection of the humerus. Aim of this study was to review the experience of the Rizzoli with prosthetic reconstruction after resection of bone tumor in the humerus.

Methods. Between 1975 and 2010, 255 modular prostheses (alone or in association with allografts) type MRS® of the proximal humerus were implanted. Population included 154 males and 101 females with mean age 40 yrs (range 5 to 81). In two patients tumor involves humeral diaphysis, in all others the proximal part. Histology showed 91 osteosarcomas, 52 chondrosarcomas, 61 metastatic carcinomas, 10 GCT, 10 MFH, 9 Ewing's sarcoma, 22 other diagnoses.

Results. Major complications causing implant failure were infections (19 cases – 7.4%), aseptic loosening (4 cases – 1.5%) and breakages (3 cases – 1.2%). Local recurrence occurred in 8 patients (3%). Survival in patients with primary tumors was 35% at 10 and survival in patients with metastasis was 3% at 10 years. Implant survival to all major complications was more than 80% at 10 years and 20 years.

Conclusions. This prosthesis is actually a simple spacer, therefore it is indicated for resections of tumors where it is not possible to spare the abductor apparatus (deltoid, axillary nerve, rotator cuff). Otherwise we prefer different reconstructions. This simple modular prosthesis provides satisfactory results, but not abduction.

E-mail (main author): pietro.ruggieri@ior.it



O5:108

Survival of Modern Tumor Endoprostheses: complications, functional results, and a comparative statistical analysis

Pietro Ruggieri¹, Elisa Pala¹, Eric Henderson², Giulia Trovarelli¹, Andrea Angelini¹, Matteo Romantini¹, Teresa Calabrò¹

¹) University of Bologna, Istituto Rizzoli, Italy ²) Moffitt Cancer Center, United States

Background: Lower limb is a frequent site for bone tumors. Due to their availability, modularity, uncomplicated usage, immediate fixation, and relatively low complication rates compared to alternatives, metallic endoprostheses have become the reconstruction option used most commonly. Complications and failures of these devices remain high compared to other arthroplasty procedures. Objective of this study was to retrospectively analyze results of a modular reconstructive tumor prosthesis for the lower limb (GMRS-Stryker) in primary and secondary implants.

Materials and Methods: Twohundred-nintyfive GMRS prostheses were implanted: 197 primary implants, 98 revisions in 84 failed primary reconstructions after tumor resection and 14 failed implants for non oncologic reasons. Sites of reconstruction included: 199 distal femur, 60 proximal tibia, 32 proximal femur, 4 total femur. Histologic diagnoses: 166 osteosarcomas, 22 Ewing sarcomas, 22 chondrosarcomas, 18 spindle cell sarcoma, 12 other sarcomas, 6 metastases, 35 giant cell tumors. Causes of endoprosthesis failure were classified as: soft tissues failures about the implant (Type 1), aseptic loosening of the implant (Type 2), structural fracture (Type 3), infection (Type 4), and tumor recurrence (Type 5). Functional results (MSTS system) were analyzed and Kaplan-Meier curves of implant survival defined comparing primaries and revisions.

Results: At a mean oncologic follow up of 4.2 years (range, 2 to 8 years), 195 patients are continuously NED, 43 NED after treatment of relapse, 10 AWD, 33 DWD. The overall failure rate in our series was 28.8% and failure occurred at a median of 1.7 years (range, 1 month to 7 years). There was a significant difference in implant survival of all modes of failure between primary and revision implants ($p = 0.0313$). There was also significant difference in implant survival of failure of primary and revision proximal tibial implants ($p = 0.0410$). Breakage of prosthetic components did never occur. Functional scores were obtained in 229 of 295 patients. The average overall score was 81.6% (24.5 range, 5-30).

Conclusion: Middle term results with GMRS are promising, with excellent functional results and low incidence of complications. A significant difference in implant survival was found in this series between primary and revision implants. Functional results are satisfactory.

E-mail (main author): pietro.ruggieri@ior.it



O5:109

Modular prosthesis with a silver porous surface modification for periarticular reconstruction of the lower limb

Domenico Andrea Campanacci¹, Nicola Mondanelli¹, Filippo Frenos¹, Antonio Vilardi¹, Serena Puccini¹, Giovanni Beltrami¹, Guido Scoccianti¹, Rodolfo Capanna¹

¹) Azienda Ospedaliera Universitaria Careggi, Italy

Background:

Infection in orthopedic surgery is a dreadful complication. Patients are often subjected to several surgeries with prolonged antibiotic treatment, and the risk of persistent infection and poor functional outcome is high. In most of cases, a residual massive bone defect is present, due to extensive debridement to remove necrotic or infected bone. The antimicrobial activity of silver ions has been known since ancient times (silver cups and cisterns for drinking water) and in recent years has been applied in everyday life (toothbrushes, underwear) as well as in medicine (wound dressings).

Methods:

Recently, an evolution of modular prosthesis MegasystemC® (Waldemar Link®, Hamburg, Germany) with a silver porous surface modification (PorAg) was developed. At our Institution, from 2010, 16 prostheses were implanted in 15 patients with a history of septic arthroplasty (7 cases, 3 hip and 4 knees) or septic meta-epiphyseal post-traumatic deformity or nonunion (6 cases, 2 proximal and 4 distal femur), and as primary reconstruction in 3 oncologic patients. There were 9 males and 6 females with a mean age of 54 years (30-75). One patient underwent only 1 surgery before resection and modular silver-coating prosthesis, while in all other revision cases the number of previous surgeries ranged from 3 to 8. In 12 cases the reconstruction was performed with a mobile joint prosthesis (6 proximal femur and 4 distal femur) and in 4 cases with a knee arthrodesis prosthesis.

Results:

Monitoring of inflammatory markers (ESR, C-reactive protein, fibrinogen) showed resolution of the infection in all previously infected cases. At a mean follow up of 13 months (1-27), 2 dislocations of proximal femur prosthesis occurred, treated with closed reduction in 1 case and open revision and new silver coated implant in 1 case. Functional results following MSTs evaluation system showed an average score of 60% (43%-90%).

Conclusion:

In conclusion, the preliminary results of MegasystemC PorAg are encouraging, although a larger series of patients with longer follow up is needed. Our experience suggests that modular prostheses with silver porous surface modification may be indicated in periarticular bone loss in septic failures and as primary oncologic reconstruction in selected patients.

E-mail (main author): campanaccid@gmail.com



O6:101

Chondrosarcoma of the hands and feet: When to worry?

Anna Price¹, Jakub Kozdryk², Robert Grimer², Lee Jeys²

¹) Royal Orthopaedic Hospital ²) Royal Orthopaedic Hospital, Birmingham, United Kingdom

Background

Chondrosarcoma of the small bones in the hands and feet are extremely rare. In contrast, enchondromas are common benign lesions. Differentiating between the two can be extremely challenging. Enchondromas of the hands or feet are often not treated in specialist centres, therefore the question is, when should the surgeon worry about malignant conversion? Although metastases are relatively rare in chondrosarcomas of the hands and feet, local recurrence is common. Local recurrence can be aggressive, often ungrading from the previous tumour grade.

Methods

Our database contains information on 3657 primary bone tumours treated since 1971, of these, 804 had primary chondrosarcomas. A retrospective review was taken of the 69 patients identified with chondrosarcoma of the small bones of the hands or feet (9%). During the same period 101 patients were identified with benign enchondroma of the hands or feet. A prospectively updated database, patient notes and radiology reports were reviewed for demographic details, surgery, complications, local recurrence and survival.

Results

Of the 69 patients, 23 (33%) chondrosarcomas were in the feet, with 46 (66%) being in the hands. 8 patients had known multiple enchondromas (4 patients with Olliers, 4 patients with Maffucci syndrome).

At presentation, 31 (46%) patients had grade 1 chondrosarcoma, 32 (48%) grade 2, 2 (3%) with grade 3 and one dedifferentiated chondrosarcoma. 8 patients developed a local recurrence at a mean of 32 months (range 2-110 months), with the initial grade being grade 2 in the majority (n=8/9, one patient grade 1). 4 patients developed metastases at a mean of 78 months (range 2-250) all occurring in higher grade tumours.

There was evidence of a previous enchondroma in 52% of patients prior to presentation, suggesting malignant conversion. Most patients had radiology suggesting an aggressive process with features of cortical breach, soft tissue mass or endosteal scalloping.

Conclusion

Chondrosarcoma of the hand and feet remain rare. Patients often had previous treatment for enchondromas and aggressive radiological features. Surgeons should be wary of these features and refer to a tertiary referral bone unit for biopsy if they are present.

E-mail (main author): anna.price2@nhs.net



O6:102

Metastatic potential of low-grade chondrosarcoma of bone - results of a multi-institutional study

Dimosthenis Andreou¹, Magdalena Gilg², Mathias Werner³, Jendrik Harges¹, Daniel Pink⁴, Georg Gosheger¹, Andreas Leithner⁵, Per-Ulf Tunn⁶, Arne Streitbueger¹

¹) University Hospital Muenster, Germany ²) Medical University of Graz, Austria ³) HELIOS Klinikum Emil von Behring, Berlin ⁴) HELIOS Klinikum Bad Saarow ⁵) Medical University of Graz ⁶) HELIOS Klinikum Berlin-Buch, Germany

Background: Little is known about the metastatic potential of low-grade chondrosarcoma. The objective of this study was to evaluate the rate of distant metastasis and attempt to identify possible risk factors.

Methods: The files of 211 patients with newly diagnosed, low-grade chondrosarcoma of bone treated between 1976 and 2010 were retrospectively analyzed. Mean follow-up was 99 months for survivors (range, 24-424 months). 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: Distant metastases developed in 15 patients after a mean of 56 months (range, 4-125 months). 7 of these patients have died of disease, 6 are alive with disease and 2 patients are in complete remission. Post-metastasis survival amounted to 63% after 2 years and 35% after 5 years. 12 of the 15 patients developed local recurrences prior to metastatic disease, 8 of which were grade II. Regarding risk factors, patients with metastases had a mean tumor size at diagnosis of 7.9cm, compared to 8.7cm for patients who did not develop metastases ($p=0.947$). Patients with tumors of the thoracic wall had a significantly lower 10-year metastasis-free survival of 55%, compared to patients with tumors of the upper extremity (98%, $p=0.003$), the lower extremity (91%, $p=0.028$) and the pelvis (90%, $p=0.036$). There were no significant differences in metastasis-free survival between patients treated with intralesional curettage compared to those treated with wide resection ($p=0.711$). Patients who developed local recurrences had a significantly poorer 10-year metastasis-free survival, compared to patients who developed no local recurrences (64% vs. 96%, $p<0.001$). Patients with low-grade local recurrences had a strong trend for a higher metastasis-free survival compared to patients with grade II recurrences (80% vs. 49% at 10 years, $p=0.062$).

Conclusion: Tumor localization in the thoracic wall and development of local recurrences were associated with a higher metastasis rate in this study, while tumor size and surgical treatment modality were not. Given the rarity of grade I chondrosarcoma and its low metastasis rate, further analysis of the risk of metastasis in these patients can only be achieved through large multi-institutional studies.

E-mail (main author): dimosthenis.andreou@ukmuenster.de



O6:103

How safe is curettage of low-grade cartilaginous neoplasms following radiological diagnosis alone?

Matthew Brown¹, PD Gikas¹, JS Bhamra¹, JA Skinner¹, WJS Aston¹, RC Pollock¹, A Saifuddin¹, TWR Briggs¹

¹) Royal National Orthopaedic Hospital, United Kingdom

Background: Low-grade chondrosarcomas are managed with intralesional curettage +/- adjuvant measures. Pre-operative differentiation between enchondromas, low-grade chondrosarcomas and high-grade chondrosarcomas remains a diagnostic challenge.

Aim: To ascertain the accuracy and safety of radiological grading of cartilaginous neoplasms through assessment of, (1) pre-operative radiological and post-operative histological concordance and, (2) recurrence in lesions confirmed as high-grade on surgical histology.

Method: A retrospective review of cartilaginous neoplasms managed as low-grade between 2001 and 2012 was completed at our Sarcoma Unit. Pre-operative diagnoses resulted from multi-disciplinary consensus solely following radiological review.

Results: Fifty-five patients were reviewed [mean age 47.3 years (8 - 71); 24 males, 31 females]. Neoplasms involved the femur (n=21), humerus (n=18), tibia (n=9), fibula (n=3), radius (n=3) and ulna (n=1). Surgical histology confirmed 2 enchondromas, 51 low-grade chondrosarcomas and 2 high-grade chondrosarcomas (located in the femur and tibia). A single grade 2 case underwent revision with tibial diaphyseal replacement. Three low-grade patients developed local recurrence [mean 15 months (12 - 17)], with two recurring once and one recurring twice. All recurrences were curetted. No high-grade cases, having demonstrated low-grade disease on pre-operative investigations, developed local recurrence or metastasis [mean 4.1 years (3.3 and 4.9 years)].

Conclusion: Cartilaginous neoplasms identified as low-grade on pre-operative imaging should be managed as low-grade without the need for pre-operative histology. A small proportion of these cases may demonstrate high-grade features on surgical histology but this does not appear to affect recurrence rates. Neoplasms demonstrating borderline high-grade radiographic features should be considered for pre-operative biopsy.

E-mail (main author): matthew.brown@doctors.org.uk



O6:104

LONG-TERM OUTCOME IN 64 PATIENTS AFTER CURETTAGE WITH POLYMETHYLMETHACRYLATE FOR GIANT CELL TUMOR AROUND THE KNEE: HIGHER RISK OF OSTEOARTHRITIS?

Lizz van der Heijden¹, A.C. Heineken², M. Fiocco³, R.G.H.H. Nelissen², M.A.J. van de Sande², P.D.S. Dijkstra²

¹) Leiden University Medical Center ²) Orthopedic Surgery, LUMC, Leiden ³) Medical statistics&bio-informatics, LUMC, Netherlands

BACKGROUND Standard treatment for giant cell tumors (GCT) is curettage with polymethylmethacrylate (PMMA). It has been hypothesized that hyperthermic reactions and rigid elasticity of PMMA in the subchondral area may increase the risk for degenerative changes, but a clear definition or evaluation system has not been presented. Study goals were the determination of prevalence, risk factors and clinical relevance of radiological osteoarthritis after curettage with PMMA for GCT around the knee.

METHODS In this retrospective single-center study, we included 64 patients (from 78) with GCT around the knee treated with curettage and PMMA (1987-2010). Radiological osteoarthritis was defined as Kellgren&Lawrence-grade (KL) 3-4. We determined influence of age, gender, tumor-cartilage distance, subchondral bone involvement, intra-articular fracture and number of curettages on KL3-4 progression. SF-36, MSTs and KOOS were obtained to assess functional outcome and quality of life.

RESULTS Median age at final follow-up was 42 years (19-70). There were 34 males. At a median follow-up of 79 months (24-286), eight patients (12%) had progression to KL3, two (3%) to KL4 and one had preexistent KL4 (Table 1). No patient underwent surgery for clinical osteoarthritis. Multivariate Cox regression demonstrated increased hazards of KL3-4 progression when more subchondral bone was affected (hazard ratio=5.7; 95%CI=1.1-31; p=0.042) (Figure 1). In univariate Cox regression, this risk was most apparent when >70% was affected (HR=4.7; 95%CI=1.2-18; p=0.0026) and was also increased when tumor-cartilage distance was <1mm (HR=9.4; 95%CI=1.1-82; p=0.042). Age, gender, intra-articular fracture and number of curettages did not influence KL3-4 progression. Patients with KL3-4 reported lower KOOS symptoms (62vs.82; p=0.022), but scores were similar for pain, daily activities, sports/recreation and quality of life as well as MSTs (22vs.24) and SF-36 (77vs.80) (Figure 2).

CONCLUSION 15% of patients with GCT around the knee had progression to radiological osteoarthritis (KL3-4), compared with 0.3-1.8% in the general population. No lesser function or quality of life was reported and no patient required surgery for clinical osteoarthritis, supporting the assumption that clinical relevance of radiological osteoarthritis after curettage with PMMA may be questioned. Curettage with PMMA is a good treatment option, even in the presence of risk factors for radiological osteoarthritis.

E-mail (main author): l.van_der_heijden@lumc.nl



O6:105

GIANT CELL TUMORS OF THE SMALL BONES OF HANDS AND FEET: LONGTERM RESULTS OF 30 PATIENTS AND LITERATURE REVIEW

Lizz van der Heijden¹, V.C. Oliveira², I.C.M. van der Geest³, D.A. Campanacci⁴, C.L.M.H. Gibbons⁵, M.A.J. van de Sande⁶, P.D.S. Dijkstra⁶

¹⁾ Leiden University Medical Center, Netherlands ²⁾ Orthopedic Surgery, CHP, Porto, Portugal ³⁾ Orthopedic Surgery, UMCN, Nijmegen, Netherlands ⁴⁾ Orthopedic Oncology, AOUC, Florence, Italy ⁵⁾ Oxford Sarcoma Service, NOC, Oxford, United Kingdom ⁶⁾ Orthopedic Surgery, LUMC, Leiden, Netherlands

BACKGROUND Giant cell tumors (GCT) of small bones are rare (5%) and may behave more aggressively than GCT of long bones. Only few case-series are published, mainly single case-reports. Surgical treatment varies widely in literature, with highly variable recurrence-rates (0-100%). Study aims were to perform a systematic literature review and to evaluate outcomes after different surgical techniques.

METHODS First, we included twelve papers (from 775 titles) with more than two patients. Titles, abstracts and full-text papers were reviewed by two reviewers. Average recurrence-rate was 72% (18/25; 0-100%) for curettage, 13% (2/15, 0-50%) for curettage with adjuvants and 15% (6/41; 0-50%) for resection. Second, we retrospectively reviewed 31 patients who underwent surgery for GCT of the small bones in one of five tertiary referral centers for orthopaedic oncology (1987-2010). One patient was excluded because of malignant GCT and we included 30 patients; the largest series on GCT of the small bones so far. Six patients underwent curettage, 18 curettage with phenol or liquid nitrogen, with or without polymethylmethacrylate (PMMA) and six resection. We evaluated recurrence and complication-rates, risk factors and functional outcome.

RESULTS At a median follow-up of 5 years (range 2-22) recurrence-rate was 50% (3/6) after curettage, 22% (4/18) after curettage with adjuvants and 17% (1/6) after resection. Five-years estimated recurrence-free survival (Kaplan-Meier) was 50% for curettage, 75% for curettage with adjuvants and 80% for resection (Log-rank; $p=0.423$). The only complication was pain (1/30) which resolved after surgical removal of PMMA remnants. We could not identify individual factors correlated to higher recurrence or complication risks. Mean Musculoskeletal Tumor Society (MSTS) scores were slightly higher after intralesional treatment (29 (20-30)) and resection (25 (18-30)) ($p=0.091$).

CONCLUSION In this largest series on GCT of the small bones, we report the lowest recurrence-rate for resection, followed by curettage with adjuvants. No risk factors for recurrence or complication were identified. Functional outcome may be impaired after resection but was comparable after all techniques in this series. Repeated curettage with adjuvants finally resulted in cure of all patients and is therefore a feasible treatment option in both primary and recurrent GCT of the small bones.

E-mail (main author): l.van_der_heijden@lumc.nl



O6:106

Hand Tumors - Series of 110 cases

Chetan DM¹, Kaladagi P.S²

¹⁾ MMCRI ²⁾ Dr., India

Introduction:

Hand tumors are usually rare and there is not much literature about series of cases. We have studied a series of 110 cases. Hand tumors do consists of both benign and malignant cases.

Methods:

We studied series of 110 cases at Karnataka Institute of Medical Sciences, Hubli and Mysore Medical College & Research Institute, Mysore.

We retrospectively reviewed the records of 110 patients who underwent double ray amputations at our center over few years: few had amputations of the fourth and fifth rays and others amputation of the second and third rays.

Mean age at surgery was 34 years (range, 10–45 years), and minimum follow up was 64 months (mean, 98 months; range, 64–136 months). Some patients had high-grade soft tissue sarcomas of the hand, synovial sarcomas, malignant peripheral nerve sheath tumors, and undifferentiated sarcoma. No patients had detectable metastases at surgery.

Results

All patients were completely disease-free at latest follow up. One patient was alive with lung metastases detected 32 months after surgery. No patients developed local tumor recurrence.

Functional assessment showed a mean Musculoskeletal Tumor Society score of 24 (range, 19–28) and mean grip strength 24% of the contra lateral side (range, 17%–35%).

Conclusions

The majority of osseous tumors of the hand are benign.

Ganglion cyst is the most frequently encountered comprising 50-70% of benign tumors of hand.

Enchondroma was the next common benign bone tumor followed by osteoid osteoma, osteoblastoma, aneurismal bone cyst, giant cell tumor, epidermoid cyst, and osteochondroma.

Malignant tumors of the hand are rare, although there remain many instances in which marginal excisions are performed for unsuspected malignant hand lesions. Suboptimal biopsy incisions and inadvertent contamination during these excisions may result in larger resections or amputations being necessary to ensure complete removal of the tumor with negative margins.

E-mail (main author): chetandm1987@gmail.com



O6:107

Campanacci III giant cell tumour of the knee: curettage versus primary resection

Czar Louie Gaston¹, Jose Albergo², Krishna Reddy¹, Adesegun Abudu¹, Simon Carter¹, Lee Jeys¹, Roger Tillman¹, Robert Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom ²) Hospital Italiano de Buenos Aires, Argentina

Background: Giant cell tumours of bone (GCT) are benign aggressive primary bone lesions most commonly seen around the knee (distal femur, proximal tibia). Campanacci grade III tumours have significant bone destruction and expansion into the soft tissues and although detailed curettage is the standard treatment for GCT, some authors recommend outright resection for Campanacci III tumours due to the higher risk of local recurrence. This study looks at the roles of curettage and primary resection of Campanacci III GCT of the knee.

Methods: Retrospective review of 141 patients treated at our institution from 1980 to 2010. Patients were grouped by initial surgical treatment, curettage versus resection. Local recurrence and functional outcomes were the primary endpoints investigated.

Results: Mean follow-up of 63 months (range 3 – 438 months). 73% (n = 103) were treated by detailed curettage with or without cementation while 27% had outright resection. While local recurrence for the curettage group was significantly higher (21.4% vs 5.3% p = 0.002), MSTS scores on final follow-up was lower for those treated with resection (25.1 vs 27.3, p = 0.006). 25% (n = 26) of those initially treated with curettage eventually underwent joint resection because of local recurrence or complications of curettage (osteoarthritis, fracture). Those that underwent secondary resection did not have different functional outcomes than the primary resection group (MSTS score 24.5 vs 25.1 p = 0.31). No local recurrence of GCT was seen after secondary resection.

Conclusions: Detailed curettage with or without cementation has a higher risk for local recurrence but has better functional outcomes than primary resection. Secondary resection due to failed curettage is not associated with poorer functional outcomes or local recurrence.

E-mail (main author): louie.gaston@nhs.net



O6:108

Aneurysmal bone cysts-Does simple treatment work?

Krishna Reddy¹, Louie Gaston¹, Raj Nandra¹, Friedl Sinnaeve², Robert Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom ²) University Hospital Leuven, Belgium

Background:

Aneurysmal bone cysts (ABC) are benign expansile bone lesions, with an estimated incidence of 1.5/million. Treatments include a variety of procedures including detailed curettage with or without adjuvants. We observed that a number of ABCs will, Üheal, following biopsy alone and as a result of this we changed our treatment regime.

Methods:

All patients with a radiologically presumed ABC had a biopsy to confirm the diagnosis and during the biopsy samples were taken from all areas of the lesion. Following tissue diagnosis patients were reviewed at 6 weeks with new radiographs. If the lesion showed signs of healing and patients reported symptomatic improvement, they were followed up with observation only. If the lesion or symptoms progressed, they underwent definitive treatment with detailed curettage.

Results:

Two hundred consecutive patients, diagnosed with an ABC in our unit from year 2000 to the end of 2011 were included. Eighty-eight of them underwent immediate treatment following biopsy due to the size, symptoms of the lesion and risk of fracture. Hundred and two patients had a biopsy or a curopsy (a technique not described in literature) and were then observed as per the protocol above. Nine patients presented with pathological fractures and had symptomatically improved as the fracture healed. One patient had an incidental asymptomatic lesion. Of the 102 patients who had curopsy or a biopsy, 82 (80%) required no further treatment and the lesion resolved. Twenty patients had no evidence of healing at 6 weeks and underwent definitive curettage. The overall recurrence rate in these 200 patients was 15% whilst in the 88 patients undergoing definitive curettage (with or without adjuvant therapy) it was 10% (9/88).

Conclusion:

This rate of spontaneous healing following curopsy/biopsy alone needs consideration when evaluating the results of any other treatment for ABC, suggesting simple treatment strategies work for ABC.

E-mail (main author): k.reddy@nhs.net



O6:109

Do periprosthetic seromas contribute to a third space effect after high dose Methotrexate?

Claudia Heu¹, Volker Strenger¹, Joanna Szkandera¹, Joerg Friesenbichler¹, Georg Prattes¹, Ernst-Christian Urban¹, Andreas Leithner¹

¹) Medical University of Graz, Austria

BACKGROUND Beside surgery, high dose Methotrexate is a mainstay of osteosarcoma treatment. However, it is associated with severe side effects, which partly are dose dependent. Methotrexate tends to accumulate in tissues and cavities (third spaces) leading to local toxicity and delayed elimination. In order to avoid this, considerable periprosthetic seromas are punctured in our institution, despite an increased risk of infections. The aim of our study was to analyse Methotrexate concentrations in seroma and blood to verify a potential toxic risk based on a third space effect.

METHODS In a monocentric data analysis of 53 consecutive osteosarcoma patients (5 – 46, median 15 years) who had received an endoprosthesis and who were treated with high dose Methotrexate from 1991 till 2011, we retrospectively compared Methotrexate concentrations in seromas with the corresponding (+/- 8 hours) concentrations in blood.

RESULTS 114 periprosthetic seroma punctures were performed in 18 of 53 patients (median 5 punctures per patient, range 1 - 20 punctures per patient). The amount of punctured effusions was documented in 101 punctures, ranging from 5 - 420 ml (median 150 ml). Methotrexate concentrations were determined in 61.1% of all punctures and were 249 – 4397% (median 1586%) of the corresponding blood concentration at 24 hours. 48 and 72 hours Methotrexate concentrations of seromas were 236 – 535% (median 950%) and 166 – 682% (median 366%) of the corresponding blood concentrations, respectively. Especially the 24 hours measurements of the seromas ranged up to highly toxic concentrations of 170.74 µmol/l (median 109.83 µmol/l, range 4.91 - 170.71 µmol/l) in comparison to a median value of 4.65 µmol/l in blood (range 0.68 - 44.38 µmol/l, p=0.001 (Wilcoxon test). Similar statistically significant differences indicating a third space effect were observed at 48 (p<0.001) and 72 hours (p=0.015).

CONCLUSIONS In conclusion, Methotrexate concentrations of effusions are significantly higher than corresponding blood levels indicating that periprosthetic seromas might act as a third space after high dose Methotrexate, potentially leading to severe local and systemic side effects. These effusions should therefore be punctured in order to avoid increased toxicity.

E-mail (main author): claudia.heu@stud.medunigraz.at



06:110

Intraoperative extracorporeal irradiation and reimplantation of tibial malignant sarcomas after wide resection

Andreas H Krieg¹, Leandra Schultze², Bernhard Speth², Peter Gross³, Martin Haug³

¹) University Childrens Hospital Basel ²) University Childrens Hospital ³) University Hospital Basel, Switzerland

Background:

Diaphyseal tibial sarcomas are commonly treated with a wide resection and reconstructed with allografts with or without vascularised fibula, with reconstruction over a segmental transport or with the induced membrane technique. This is the first larger series presenting an alternative inexpensive and biological method that to our knowledge has not been reported on before.

Methods:

Eight Patients with primary malignant tibial sarcomas received local treatment in form of reimplantation of extracorporeally irradiated (ECI) autografts after its wide resection. The mean age at the time of diagnosis was 29 years (range 12.2 to 60). Radiation dose for the tibial segment was 50 Gy in all cases. ECI was combined with an ipsilateral vascularised fibula (n = 5) in those cases where a partial bone stock of the tibia could not be preserved. The functional results were expressed as the Musculoskeletal Tumor Society score (MTS) and the Toronto extremity salvage score (TESS). The mean clinical and radiological follow-up was 40 months (range, 12 to 66).

Results:

All patients had clear margins after the performed wide resection and were free of disease and without evidence for local recurrence at the time of the last follow up. There were postoperative complications in 3 patients. Full weight bearing was allowed at the time of radiological consolidation of the irradiated graft which was achieved after a mean of 6 months (range 3 to 12). The vascularised fibula autografts showed a significant hypertrophy in 8 of 10 junctions. The functional results were good and excellent in 7 of 8 patients in the MTS-Score and Toronto extremity salvage score.

Conclusion:

We conclude that ECI grafting, also in combination with vascularised fibula in large defects, is a suitable method for the treatment for localised and resectable tibial sarcomas with good to excellent functional results.

E-mail (main author): andreas.krieg@ukbb.ch



07:101

"The Classics"

Björn Gunterberg¹

¹⁾ Sahlgrenska University Hospital, Sweden

Bertil Stener made Gothenburg one of the cradles of musculoskeletal tumor surgery when he already in the 1960's developed a profound interest in this area. He was a pioneer and the father of many classical works in different fields of musculoskeletal tumor surgery.

I will focus on his ingenious approaches to tumors of the spine and sacrum with special emphasis on his spinal reconstructions. Those four patients who had had total spondylectomy

and the longest follow-up will be presented in detail. Lasting, stable reconstruction of the spine was achieved with autologous bone grafts and "primitive" supporting metallic implants (AO-plates, wires, screws, Meurig-Williams plates, Harrington rods, Dwyer compression wires). Because of the questionable strength of the implants and their anchorage to the spine the patients were kept in bed rest for 2-6 months and wore plaster jackets for 8-12 months.

The long-term results (23-44 years) are extremely good. MSTS-scores ranged from 70-87 per cent. Stener's reconstructions of the spine have stood the test of time.

Also his principles and method for high amputation of the sacrum were based on analytical skill, profound knowledge and surgical ability. They are still adhered to.

Classical works will always be remembered.

E-mail (main author): bjorn.gunterberg@telia.com



07:102

Video laparoscopic approach – Technique for sacral resection

Eduardo Sadao Yonamine¹, Élio Consentino¹, Paulo Augusto Ayrosa Galvão¹, Pedro Pércles Ribeiro Baptista¹, José Donato Próspero¹, Maria Fernanda Carriel Amary¹, Karen Voltan¹, Felipe Birriel¹, Bruna Bruscharino¹

¹) Santa Casa Medical School of Sao Paulo, Brazil

OBJECTIVES

Present our long term follow up after huge sacral tumor resection without reconstruction in the last 10 years we performed resection of huge sacral tumors in two steps, first anterior approach by videolaparoscopy to tie and isolated iliac vessels and posterior open approach to resection the tumor.

METHODS

From January 1990 to July 2010, we treated 74 patients with Primary Sacral Tumor in Santa Casa Medical School of Sao Paulo (Brazil). We exclude all cases treated exclusively by radiation therapy, metastatic lesions, multiple myeloma and lesions that doesn't need anterior and posterior approach. Considering 20 cases with huge primary bone tumor that need anterior and posterior approach to resect the lesion and performed the anterior approach by Videolaparoscopy.

RESULTS

We analyse all 20 cases with primary bone tumor and follow up from 38 to 312 months (average of 185 months). Epidemiology: All 20 cases diagnosis: 8 (40,0%) Chordoma, 7 (35,0%) Giant Cell Tumor, 2 (10,0%) Ewing's Sarcoma, 2 (10,0%) Chondrosarcoma and 1 (5,0%) Osteosarcoma. Complications: 4 post operative infections, 1 necrosis and colostomy, 1 temporary colostomy, 1 local recurrence.

CONCLUSIONS

We considering anterior approach by videolaparoscopy safe and save time for Sacral Resection and give satisfactory function for our patients.

E-mail (main author): esy.pfs@gmail.com



07:103

Endoscope assisted total spondylectomy for malignant or aggressive bone tumors of the spine

Yong-Koo Kang¹

¹⁾ St. Vincent's Hospital, Republic Of Korea

Introduction: Primary malignant and aggressive bone tumors of the spine are very rare. Early diagnosis and complete removal of the tumor are essential for prevention of local recurrence and metastasis.

Purposes of the study are to show the local recurrence and final results of total spondylectomy for malignant or aggressive spinal tumors with endoscope assisted versus conventional anterior and/or posterior approaches

Materials and Methods: From 1996 to 2012, total 29 patients with malignant or aggressive bone tumors of the spine had been surgically treated and followed for minimum a year to 15 years.

Diagnoses were 10 giant cell tumors, 5 chordomas, 4 malignant lymphomas, 2 osteosarcomas, 2 chondrosarcomas, 2 MPNST, 1 Ewing's sarcoma, and 1 hemangioendothelioma and 2 metastatic cancers (1 breast, 1 cervix). All patients had been treated with total spondylectomy with anterior and/or posterior approaches. Six of them had been treated with the endoscope (2 thoracoscope, 4 laparoscope) assisted total spondylectomy. Anterior dissection was done with thoracoscope for dorsal spine, and laparoscope for lumbar and sacral spines. After surgical removal of the vertebral body, metallic cage with bone graft, strut allograft or autograft were placed, and anterior and posterior stabilization procedures were performed.

Results; Among 17 patients of primary malignant tumor, 7 were died of disease, 4 alive with disease and 6 continuous disease free. Among 10 giant cell tumors, 3 local recurrences developed. There were 1 (17%) local recurrences from 6 patients of endoscope assisted total spondylectomy and 9 (39%) recurrences from 23 patients of conventional spondylectomy.

Conclusion: Total spondylectomy with anterior and/or posterior approaches was essential to reduce local recurrence and long term clinical results for malignant or aggressive spinal tumors. Endoscope assisted surgery has been reduced the total spondylectomy related morbidity and complications.

E-mail (main author): ykang@cmcnu.or.kr



07:104

Outcome of Surgical Treatment of Pelvic

Wei Guo¹, Xin Sun¹, Tao Ji¹, Xiaodong Tang¹

¹) Peking University People's Hospital, China

Methods: 22 consecutive patients with pelvic osteosarcoma underwent surgical procedures between June 2000 and June 2009. There were 13 males and 9 females with a mean age of 29.7 years. According to Enneking and Dunham pelvic classification system, there were 3 cases with Type I, 3 cases with Type I+IV, 5 cases with Type I+II, 4 cases with Type II+III, 1 case with Type I+II+III, 1 case with Type III, and 5 cases with type I+II+IV. Twenty-one of 22 patients were diagnosed pathologically as the conventional and the other one was low-grade osteosarcoma. All the patients received en bloc resections including 17 wide or marginal margins and 5 intralesional margins. Fourteen patients underwent modular hemipelvic endoprosthesis reconstruction and 6 patients underwent rod-screw system reconstruction combined with autograft, and 2 patients with no reconstruction after resection. The mean follow-up time was 30.3 months (ranged from 4 to 89).

Results: Local recurrence rate was 31.8% (7/22), including 4 of 5 patients with intralesional margins, 3 of 16 with wide or marginal margin. The local recurrence rate was 17.6% (3/17) in patients with wide or marginal resections, and 80% in patients with intralesional surgery (4/5). At the last follow-up, lung metastasis was found in 9 of 22 (40.9%) patients, and bone metastasis was found in one patient. Among 22 patients with pelvic osteosarcoma, 8 patients died, 5 patients alive with diseases and other 9 patients with tumor-free survive. The 5-year overall survival rate was 44.3%. The average MSTS 93 score was 17.6 ± 5.4 for the 14 patients with hemipelvic endoprosthetic reconstruction and 22.5 ± 2.1 for 6 patients with rod-screw reconstruction. Wound complication was found in 7 of 22 patients (31.8%).

Conclusion: The majority of the patients with pelvic osteosarcoma can be treated with limb salvage surgery and can be preserved good function after the surgery. The long-term oncological result is still not satisfied because of anatomic location, big volume of the tumor at the surgery. Five years survival is much lower than that in osteosarcoma of the extremity.

E-mail (main author): bonetumor@163.com



O7:105

Surgical Tumor Resection in Combination with Pre-Operative Radiation for Treatment of Primary Sacral and Coccygeal Chordomas

Polina Osler¹, Kathryn Hess², Ying-Ling Chen², Thomas DeLaney², Al Ferreira², Kevin Raskin², Joseph Schwab², Francis Hornicek²

¹) Harvard Medical School ²) Massachusetts General Hospital, United States

BACKGROUND:

A combination of pre-operative radiation and surgical resection has been proposed as an alternative to surgical resection alone to reduce the rate of tumor recurrence in spine chordoma patients. To evaluate the efficacy of this treatment regimen, we conducted a retrospective cohort study of the primary sacral and coccygeal chordoma patients, who were treated at the Massachusetts General Hospital during 1999-2011.

METHODS:

38 patients treated with pre-operative radiation (20-50 Gy) and surgery for primary sacral (34) or coccygeal (4) chordoma were followed for an average of 58 months. Patients were retrospectively assigned into two groups based on the status of surgical resection margin: negative or microscopically positive. Radiographic evidence was used to evaluate the local disease recurrence status and/or presence of metastatic disease. We used Kaplan-Meier survival analysis with LogRank significance test to analyze disease-free survival in each group. Stratified Cox model was used to look for significant confounders.

RESULTS:

There were 6 deaths recorded in the series (16%); 2 were attributable to disease, and 4 to other causes. The mean overall survival time was 75 months. The mean disease-free survival was 102 months. 6 patients in the series developed metastatic disease (16%). Of those, 2 died of disease and 4 were alive with disease at the time of last follow-up in 2012 (average follow-up time was 15 months). None of the 38 patients in the series had a local disease recurrence after en bloc resection. The final surgical pathology results were available for 35 of the 38 patients. Tumor resection margin was negative in 32 patients, with 6 metastases in this group. Margins were reported positive in 3 patients. The average follow-up time in the group with positive resection margins was 91 months (range 61-138 months), with no disease-specific deaths recorded during this time. Patient age at the time of surgery was found to be a statistically significant confounding variable, with advanced age corresponding to lower post-operative survival.

CONCLUSION:

Our results indicate that en bloc resection of the primary tumor in combination with pre-operative radiation was associated with good overall and disease-free survival, and no local recurrences.

E-mail (main author): posler@partners.org



O7:106

En Bloc Resection in Combination with High Dose Radiation Improves Patient Survival in Mobile Spine Chordoma

Polina Osler¹, Kathryn Hess², Thomas DeLaney², Kevin Raskin², Ying-Ling Chen², Al Ferreira², Francis Hornicek², Joseph Schwab²

¹) Harvard Medical School ²) Massachusetts General Hospital, United States

BACKGROUND:

Surgical resection of the primary tumor is the mainstay treatment for chordoma of the mobile spine. However, control of local disease recurrence remains poor. Aggressive tumor resection in combination with high dose proton beam radiation has been proposed at our institution to improve disease-free survival by reducing recurrence rates. To evaluate the effect of this therapy, we conducted a retrospective study of 49 patients with chordoma, who were treated with combination high-dose radiation and surgical resection at the Massachusetts General Hospital during 1992-2013.

METHODS:

49 patients who received surgery and high dose radiation (>70 Gy) were retrospectively assigned into two groups based on extent of resection. 15 patients had en bloc resection; mean age was 48 years old, mean follow-up time was 42 months. 34 patients had intralesional resection; mean age was 57 years old, mean follow-up time was 63 months. We documented resection margin pathology, disease recurrence, and/or presence of metastases. We used Kaplan-Meier analysis with LogRank significance test to calculate overall survival and disease-free survival. Recurrence rates were compared using two-tailed Wilcoxon rank sum test. Stratified Cox model was used to identify confounding factors.

RESULTS:

Of the 49 patients in the series, 15 developed recurrent disease and 7 developed metastases. 15 patients had en bloc resection; 2 developed recurrent disease, and 2 developed metastases. Margins were negative in 6 patients; there were no mets or recurrences. 34 patients had intralesional resection; 13 developed recurrent disease, and 5 developed metastases. The mean overall survival was 108 ± 14 months; and 107 ± 16 months in the intralesional group. There were no deaths in the en bloc group. En bloc resection was associated with improved disease-free survival ($P = 0.033$) and overall survival ($P = 0.020$), but not the local recurrence ($P = 0.588$). Margin status did not significantly influence disease-free survival ($P = 0.100$) or rate of recurrence ($P = 0.089$).

CONCLUSION:

En bloc resection in combination with high dose radiation significantly improved disease-free survival and overall survival in our series. The frequency of local disease recurrence was 30.6% despite positive resection margins, possibly attributable to high dose radiation therapy.

E-mail (main author): posler@partners.org



07:107

Surgical resection of sacral chordoma: an update of the Rizzoli experience on 71 cases.

Pietro Ruggieri¹, Andrea Angelini¹, Gabriele Drago¹, Giulia Trovarelli¹, Fernando Jorge¹, Carlo Romagnoli¹, Andrea Ferraro¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background. The treatment of choice in sacral chordoma is surgical resection. Wide margins obtained at initial surgery are the primary factor to improve survival. Our aim was to analyze the outcome in a large series of patients with sacrococcygeal chordoma at long-term followup, in order to help to define the role of previous inadequate surgery, surgical margins and the relationship with local recurrences.

Methods. We retrospectively reviewed 71 patients with sacral chordomas treated with surgical resection. Forty-eight resections were proximal to S3, 23 below or at S3. Proximal resections required an anterior and posterior approach with the exception of the 8 patients treated with a new technique using a posterior approach only, as well as 3 cases of distal resection. Eleven received previous intralesional surgery elsewhere. Three reconstructions were performed.

Results. Margins were wide in 44 resections, wide but contaminated in 11, marginal in 9 and intralesional in 7. Patients previously treated had wide margins in 7 cases, wide but contaminated in 2, marginal and intralesional in one each. Three patients died for postoperative complications and were excluded from further analysis. Overall survival was 92%, 65% and 44% at 5, 10 and 15 years respectively. At a mean follow-up of 9.5 years (min 0.5, max 32 yrs) 37 are NED (54.4%): 27 continuously NED, 5 NED1, 1 NED2, 4 died of different disease. Twenty-three died with disease (33.8%) and 8 are alive with disease (11.7%). Relapses included 15 local recurrences, 6 distant metastases, 17 both. Local recurrence rate was strictly related with margins.

Local recurrence rate was significantly higher in patients that received previous intralesional surgery ($p=0.0217$). Factors that influence local recurrence rate were margins other than wide ($p=0.0339$) and tumor volume at different cut-offs ($p<0.01$), whereas level of resection was not significant ($p=0.5883$). Multivariate analysis confirmed the role of tumor volume. Complication rate was high (80.9%) with an infection rate of 41.2%.

Conclusion. The most prominent adverse factor for local recurrence was previous intralesional surgery. Local recurrence rate was related with inadequate margins and tumor volume. Oncologic outcome of major resections is comparable to minor.

E-mail (main author): pietro.ruggieri@ior.it



07:108

Ewing sarcoma of the sacrum: clinical outcome of 19 patients in a single institution

Pietro Ruggieri¹, Xin Sun¹, Gabriele Drago¹, Andrea Angelini¹, Carlo Romagnoli¹, Marco Maraldi¹, Mohammad Hassani¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background:

Ewing's sarcoma occurs rarely in the sacrum with incidence of 1-2%. Although overall results of treatment of Ewing's sarcoma have improved with multimodal strategies, unfortunately, in the sacrum it has worse prognosis than in other sites. A retrospective analysis describes our experience with respect to oncological outcome and neurologic function

Methods: We retrospectively reviewed 19 patients with Ewing's sarcoma of the sacrum treated between September 1980 and December 2011. Pain and neurologic impairment were the most common symptoms. The mean duration of symptoms was 7.8 months. Three patients received surgery with or without radiation and chemotherapy. One patient had radiotherapy alone. Chemotherapy was given to 18 patients, in 10 of them followed by radiation.

Results:

The mean follow-up was 7,26 years (range 6 months-27 years). In 2 cases we performed surgery, both of them developed local recurrence. Seven patients had metastases at diagnosis while other 5 patients developed metastases during follow up. Overall 13 patients died at mean of 4,72 during the follow-up. The 5-year overall survival (OS) and the 5-year event-free survival (EFS) were respectively 47,3% and 31,5%. Gender and age did not appear to influence OS or EFS statistically.

Conclusions:

The outcome of Ewing's sarcoma of the sacrum was unrelated to gender, age, metastasis at diagnosis and local treatment strategy. Our experience showed that although multimodal treatment could improve the overall survival, Ewing's sarcoma of the sacrum had a significantly worse outcome than in other primary locations

E-mail (main author): pietro.ruggieri@ior.it



O7:109

Chondrosarcoma of the mobile spine and sacrum. A clinical series with minimum 13,5 years follow-up.

Björn Gunterberg¹, Peter Bergh¹, Örjan Berlin¹

¹) Sahlgrenska University Hospital, Sweden

Background: Surgery is the primary option for treatment of chondrosarcoma. There is presently no strong evidence for the benefit of other treatments. The anatomical characteristics of the axial skeleton present difficult surgical problems in the treatment of chondrosarcoma located to the spine and sacrum. We retrospectively investigated the results of our surgical treatment of these tumors with long-term follow-up.

Patients and methods: Nineteen consecutive patients with a minimum observed follow-up of 13,5 years were reviewed. Fourteen were male, 5 female. The mean age at first surgery was 40 years. Twelve patients had tumors of the mobile spine, 7 of the sacrum. The mean tumor size was 11 cm. Tumor grades were: grade I 1, grade II 10, grade III 6 and grade IV 2 patients.

Results: Local recurrence occurred in 37 percent of the patients, metastases in 21 percent. The 5-year survival was 78 percent and 10-year survival 73 percent. The mean overall survival was 15 years (range 1,5-28,5 years). Nine patients had a tumorrelated death and 1 died with disease. Eight patients are alive with a minimum of 13,5 years tumorfree follow-up and 1 patient died of other causes 23,5 years postoperatively. Only one of the patients received radiotherapy. Out of these 9 (47 percent) cured patients 7 had spinal tumors, 2 sacral. Tumor grades were 7 grade II, 2 grade III.

Conclusions: Centralized treatment and aggressive surgical techniques may control approximately 50 percent of chondrosarcomas of the axial skeleton. Local recurrences and metastases are compatible with long survival.

E-mail (main author): bjorn.gunterberg@telia.com



07:110

Results of surgical treatment of Ewing's sarcoma of the pelvis.

Philipp Funovics¹, Madelaine Willegger¹, Stephan Puchner¹, Joannis Panotopoulos¹, Reinhard Windhager¹

¹) Medical University of Vienna, Austria

Aim of this study was to report our single-center experience with surgical resection of pelvic Ewing's sarcoma within a multimodality treatment approach.

Out of the Vienna Bone and Soft Tissue Tumor Registry we have identified 48 patients (25 females and 23 males) with a Ewing's sarcoma of the pelvic or sacral region treated between 1973 and 2012. Mean age at time of surgery was 19 years (median, 17; range 2-51). All but 3 sacral tumors and 3 gluteal soft tissue lesions occurred in the bony pelvic ring. After resection, surgery comprised additional reconstruction by endoprostheses in 15 patients and by biological means in 13 patients. Adjuvant treatment included chemotherapy in 46 patients, radiation in 32 and 31 patients received both. Overall mean follow-up was 54 months (median, 37; range 1-245).

Surgical complications occurred in 19 patients including infection in 7, mechanical disorders in 5, neurological deficits in 4 and thrombo-embolism in 3, one of them ended lethal. Three patients had to undergo secondary hemipelvectomy. Local tumor recurrence appeared in five patients, but all of them were observed before 1985. Nine patients presented with primary metastatic disease, 17 patients developed metastases throughout follow-up. Altogether, 26 patients died of disease, resulting in a median overall survival of 45 months. The respective 5-year overall survival was 42%.

The surgical treatment of pelvic Ewing's sarcoma remains challenging with a relatively high complication rate and moderate overall outcome, local tumor control rates are highly satisfying given an aggressive surgical approach.

E-mail (main author): philipp.funovics@meduniwien.ac.at



07:111

Surgical Outcome of Internal and External Hemipelvectomy in Patients above the Age of 65 years

Wiebke Guder¹, Jendrik Harges¹, Georg Gosheger¹, Marcel-Philipp Henrichs¹, Dimosthenis Andreou¹, Sebastian Bockholt¹, Arne Streitbuerger¹

¹) University Hospital Muenster, Germany

Background: Hemipelvectomy is a common treatment for primary malignant tumors of the pelvis. Due to a close proximity to internal organs and major vessels intraoperative complications can be severe. In the post surgical interval complications like infection, vascular occlusion or secondary hemorrhage can occur. Little is known of the surgical outcome in elderly patients who often have comorbidities as an aggravating factor.

Methods: We did a retrospective analysis of the surgical outcome of 37 performed hemipelvectomies in 34 patients of 65 years or older (ranging from 65 - 83 years, mean 70,6 years) at the time of surgery between 1999 and 2012. Data on tumor grading, primary versus recurrent disease, indication for and type of surgical procedure, duration of surgery, perioperative complications, resection margins, duration of stay, stage of disease at the time of surgery, primary and follow-up starting after hemipelvectomy were evaluated.

Results: Of 37 hemipelvectomies an internal hemipelvectomy was performed as primary surgery in 13 patients. 24 patients underwent external hemipelvectomy (as primary surgery in 9, in locally recurrent tumor in 9, in not manageable infection after internal hemipelvectomy in 3 and after intralesional surgery in 3 patients). Mean duration of surgery was 190 minutes (internal 313 min, external 197 min). Mean hospital stay was 54 days for external, 76 days for internal and 116 days for conversion of internal to external hemipelvectomy. Blood-loss differed greatly in between surgeries with a mean transfusion of 10 erythrocyte and 8 fresh frozen plasma banked blood products per surgery. Intraoperative complications were injury of the urethra in 3 patients and one epidural bleeding occurred. Of 21 patients with wound healing complications, 18 patients needed additional surgical approaches (mean of 2,5 surgical revisions/patient). 2 patients died during hospital stay. The mean follow-up was 47 months.

Conclusion: Internal and external hemipelvectomies in patients above the age of 65 years are surgically possible. But depending on a curative or palliative regimen, indications for major surgery have to be strictly evaluated.

E-mail (main author): wiebke.guder@ukmuenster.de



07:112

Quality of Life after Sacral Tumor Resection

Kathryn Hess¹, Polina Osler, MS¹, Yen-Lin Chen MD², Thomas DeLaney, MD¹, Al Ferreira R.N.², Kevin Raskin, MD¹, Dempsey Springfield, MD¹, Francis Hornicek, MD, PhD¹, Joseph Schwab, MD, MS¹

¹) Massachusetts General Hospital ²), United States

Background: En bloc resection remains the treatment of choice for most primary malignant tumors of the sacrum. However, the quality of life following resection of the sacrum is not well-documented in the literature. With the emergence of numerous validated Health-Related Quality of Life survey tools, the study of sacrectomies can be expanded to include the post-operative quality of life for patients.

Methods: Sacral tumor patients of the Stephen L. Harris Center for Chordoma Care were mailed surveys to complete post-operatively addressing general health, pain, bowel function, bladder function, and sexual function. The survey responses were collected and scaled on a scale from 0-100% of the best possible score, where 100% is the highest score available for a patient to indicate favorable quality of life.

Results: A total of 24 patients (13 males, 11 females, average age of 57 years and an age range of 29-76) seen at the Stephen L. Harris Center for Chordoma Care, who have been previously treated surgically with a coronal resection for a sacral tumor were included in the analysis. We collected data on the level of coronal resection cut for each patient. The HRQL scores, which were compiled for each patient-reported outcome category, showed to varying degrees a decrease in the quality of life with the increase in the number of levels involved in the resection. The linear regression for general health and pain, showed the best linear correlations.

Conclusions: Because of the limited number of patients in our data set our conclusions cannot be state with statistical significance, yet general trends can be elucidated from the data. HRQL for each of the categories general health, pain intensity and interference, bowel function, bladder function, and sexual function decreased as the levels involved in the coronal resection increased. The general trend is similar to that inferred from the accepted literature where higher sacral level involvement is associated with a decrease in patient functional outcomes. The most prominent limitation of this study is the small sample size, though data continues to be collected to improve the trend analysis.

E-mail (main author): khess2@partners.org



07:113

Ewing's Sarcoma of the Pelvic Girdle Treated with Cryoablation in Lieu of Wide Local Resection. Report of Eight Consecutive Patients.

Shlomo Dadia¹, Yair Gortzak², Suzy Ben-Eliyahu², Yehuda Kollender², Jacob Bickels²

¹) Tel-Aviv Sourasky Medical Center ²) National Unit of Orthopedic Oncology, Israel

Background

Wide resection of Ewing's sarcoma of the sacrum or periacetabular region may result in a major neurological deficit or loss of hip function and ambulation ability, respectively. The authors speculated that intralesional tumor resection with adjuvant cryoablation of the tumor cavity in lieu of wide local resection may be safely performed in patients who had Ewing's sarcoma of the pelvic girdle and in which the tumor was confined to the affected bone.

Methods

Between 2004 and 2010 the authors treated 6 patients with sacral and 2 patients with periacetabular Ewing's sarcoma. There were 5 males and 3 females who ranged in age from 10 to 41. Five patients had a stage IIA and 3 patients had a stage IIIA disease. All patients were treated with preoperative chemotherapy and following recovery from surgery, chemotherapy and radiation therapy. Surgery included intralesional tumor removal and cryoablation of the remaining tumor cavity. Patients were followed from 1 to 6.5 years.

Results

At their most recent follow-up, none of the study patients had local tumor recurrence. All patients were ambulating without assisting devices and none had neurological deficits that were attributed to the surgical procedure. One patients who had sacral disease developed radiation-induced osteosarcoma of the sacrum.

Conclusions

Intralesional tumor removal with adjuvant cryoablation in patients who have pelvic Ewing's sarcoma and in which the disease has no soft-tissue extension, provide good local control and preserve function. It should be considered as the surgical treatment of choice in these patients.

E-mail (main author): jbickels@012.net.il



07:114

Neurogenic tumors of the sacrum. 10 years experience of a single institution

Elmar Musaev¹, Denis Sofronov¹, Eugeniy Sushentsov¹, Kirill Borzov¹, Anastasia Nered¹, Igor Komarov¹, Mamed Aliev¹

¹ N.N.Blokhin RONC, Russian Federation

Introduction: According to various authors, presacral and sacral tumors account less than 5-7% of all spinal tumors. Slow growth and non-specific symptoms often do not allow for timely diagnosis of the disease.

Methods: From 2002 to 2012, 62 patients were operated with paravertebral and presacral neurogenic tumors. The study included 21 patients with lesions of the sacrum. Men-5 and 16 were women. The patients' ages ranged from 22 to 69 years, mean age 39 years. Benign tumors were observed in 17 (81%) patients, malignant 4 (19%). Schwannoma verified in 15 (71.5%) cases, neurofibroma 4 (19%), ganglioneuroma 2 (9.5%). Before surgery, all patients evaluated by Karnofsky, Frankel, Klimo scales. Pain syndrome was estimated on VAS and Watkins scale. The first step was sacral laminectomy with resection or root sparing microsurgery and the posterior mobilization of the tumor. The second stage included anterior endoscopic or open approach in cases of large intrapelvic component, for remove presacral tumor component.

Results: 21 operations were performed. Two patients underwent surgery treatment from the posterior approach, three ones with anterior and 16 with combined approach. In 8 cases the operation was performed with endoscopic stage. Follow-up was 3 to 120 months; the median time was 55 months. 2 patients died. One as a result of the progression of the underlying disease (malignant schwannoma G3, associated with neurofibromatosis type 1), and one because of early postoperative complications (wound infection, meningitis). Recurrence was observed in two cases of malignant schwannomas what were associated with nonradical surgical treatment and large tumor size. In one case after endoscopic removing of presacral tumor developed bleeding that required urgent revision surgery.

Conclusions: Surgical treatment of patients with neurogenic tumors involves the sacrum gives good functional and oncological outcome. High-grade tumors in combination with neurofibromatosis have a worse prognosis as the most of the high risk of relapse, and life expectancy. The use of two stage surgical treatment increased the possibilities of radical operation in patients with the tumor of sacrum. Using of the endoscopic technique allows decreasing a blood loss, wound complications, and improving a cosmetic effect and rehabilitation.

E-mail (main author): nisichenko@gmail.com



MGL2:101

Teamwork in Musculoskeletal Oncology

*Franklin H. Sim¹**¹ Mayo Clinic, United States*

The speciality of musculoskeletal oncology is very compelling and supports the value in reflecting on recent developments in the field including the challenges and problems encountered in order to meet the demands of a new era.

Currently efforts continue towards improving local control of the tumor while retaining function in the reconstructive limb. The major challenges include defining the adequacy of surgical margins and secondly developing biological and prosthetic reconstructions to match the improved life expectancy. Close collaboration between clinical practice, basic science, and bioengineering has expanded the range of biological and nonbiological methods to maximize function. The wealth of knowledge gleaned from physics, engineering, and metallurgy has been used to improve the manufacture and design of prosthesis. Efforts continue to develop techniques to maximize function and make the reconstruction more durable.

Much of the progress in this field is due to teamwork. From the historical perspective, the evolution of the specialty of musculoskeletal oncology has been enhanced by teamwork; all the disciplines working together to advance the science and make a real difference in the lives of our patients.

One of the most important areas where a team approach is indicated to enhance the success in achieving clear margins and to improve function is in tumors of the pelvis and sacrum. The specialization of our surgical practice mandates that we develop the best team to deal with these difficult problems. In addition to the teams' skill and preparedness, these cases require courage and a "hate to lose" attitude to have an aggressive approach to achieve a successful outcome.

E-mail (main author): Sim.Franklin@mayo.edu



08:101

Computer-Assisted Tumor Surgery (CATS) in Orthopaedic Oncology: How far have we come?

KC Wong¹¹) Prince of Wales Hospital, Chinese University of Hong Kong, China (People's Rep Of)

Conventionally, tumor surgeons analyze two-dimensional imaging information and mentally integrate and formulate a three-dimensional surgical plan. It is difficult to translate the surgical plan to the operating room for complex cases with distorted surgical anatomy. Therefore, there is always a strong clinical need for better surgical aids to guide surgeons to achieve exactly what was planned for tumor free margin and bone reconstruction.

CATS has been recently applied in Orthopaedic Oncology and the technology may enable surgeons:

- 1) 3D based planning with multi-modal fused images (anatomical imaging: CT and MR and functional imaging: PET);
- 2) Exact correlation of imaging information to the real anatomical, pathological structures at the surgery under navigation guidance;
- 3) Image-guided bone resection as planned;
- 4) Accurate matching to prosthetic or allograft reconstruction.

Early results suggested that CATS is a safe option to accurately reproduce bone tumor resection as planned. The improved accuracy in executing surgical plans may offer clinical benefits in Orthopaedic Oncology. However, not every resection warrants the use of the technology and CATS may be more useful in technically demanding operations:

- 1) in pelvic or sacral tumors with difficult pathoanatomy
- 2) in hemicortical or joint-preserving tumor resection. More conservative resection is possible with the level of precision that does not compromise oncological principles. This allows patients to retain more native bone and joint for better function.
- 3) in prefabricated custom prosthetic or preparation of allograft reconstructions that are specifically designed to match a bone defect after a preoperatively planned resection.

Comparative studies with long-term follow-up are necessary to confirm its clinical efficacy. Future areas for CATS related studies include

Technology aspects:

- optimizing software system to allow a simple, friendly, all-in-one platform for preoperative 3D planning in orthopaedic oncology;
- the best image modality for image guided navigation surgery;
- the role of patient-specific tumor cutting guides and robotic-assisted system in executing surgical planning.

Clinical impact:

- the evaluation of surgical margin and its related oncological results;
- surgical practice at low-volume tumor centers;
- surgical training in Orthopaedic Oncology.

E-mail (main author): skcwong@ort.cuhk.edu.hk



O8:102

Computer Aided Precision Surgery in MSK Oncology

Shekhar Kumta¹, KC Wong¹

¹) The Chinese University of Hong Kong, Hong Kong

The use of Computer aided planning and Navigation assistance during surgery has enabled us to achieve a precision and an accuracy that was hitherto unavailable in the realm of Orthopaedic surgery.

This has translated to an accurate orientation of bony cuts, better seating of prosthetics and perhaps better long term outcomes particularly in the case of prosthetic replacements.

With specific reference to MSK oncology, precision enabled surgery has allowed us to perform an increasing number of joint sparing surgeries, particularly in the pediatric population. This necessarily means an increasing reliance on custom rather than modular prosthesis.

With the integration of advance solid modelling and visualization programs such as MIMICS® we have been able to push the envelope much further than expected. CAOS enables the sync between the surgical plan, the custom-manufactured prosthetic device and facilitates the execution of the grand idea during surgery. Multi-planar resection extreme distal joint –sparing resections and even double-joint sparing solutions have been made possible.

This presentation provides a glimpse of what has been achieved and discusses the essential software and hardware necessary for CAOS. We also discuss the difficulties and the future developments that CAOS surgery may behold for MSK oncologic reconstruction.



O8:103

Computer navigation assisted surgery for tumors resection and allograft reconstruction in the extremities

Luis Aponte¹

¹) Hospital Italiano de Buenos Aires, Argentina

Introduction: The use of image fusion for computer-assisted bone tumor surgery seems to facilitate not only tumor resection but also bone reconstruction. The purpose of this study is to report our experience in preoperative planning, tumor resection and bone reconstruction with allografts using intraoperative navigation assistance.

Methods: We analyzed sixty-nine patients with bone tumor of the extremities treated using intraoperative navigation assistance. We excluded pelvic tumors in this series. All patients were 3D reconstructed in a virtual platform and planned determining the osteotomy position according to oncology margins in a CT-MRI image fusion. Allografts were selected from our digital bone bank and the allograft osteotomies were also planned preoperatively. Tumor resections and allograft reconstructions were performed using a computer navigation system according to previously planned cuts. Forty-three tumors were localized in the femur, 21 in tibia, 3 in humerus, 1 in cubitus and 1 foot. Reconstructions included 47 intercalary allografts, 18 osteoarticular allografts and 4 APC.

Results: In three patients (4.3%) the navigation was not carried out due to technical problems. In one the crash was secondary to software problem, and in the remaining two cases the crash was secondary to hardware problems. Of the 66 cases where the navigation was performed, the mean registration error was 0.65 mm (range 0.3-1.2). The mean time for navigation procedures including bone resection and allograft reconstruction during surgery was 35 minutes (range 18-65). Histological examinations of all specimens showed a clear tumor margin in all patients.

Conclusion: Our findings suggest that preoperative planning and tumor resection guided by navigation is accurate and useful method for bone tumor resection and reconstruction. Although navigation procedures demands time during surgery, it allows the surgeon to performed accurate cuts in bone tumor resection and allograft reconstruction that reduces the total length of the whole procedure. In our study, the navigation in tumor of the extremities could not be performed in 4.3% of series.

E-mail (main author): luis.aponte@hospitalitaliano.org.ar



O8:104

Computer navigation assisted surgery for pelvic and sacral tumours: experience of a tertiary centre

Lee Jeys¹, Gulraj Matharu¹, Rajpal Nandra¹, Rob Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom

Background

Recent reports on the use of computer navigation assisted surgery for the resection of pelvic and sacral tumours have shown promising results, however these conclusions are based on small case series and varied anatomical tumour sites. The study aims were to (1) describe our initial experience with computer navigation assisted tumour surgery, (2) determine the intralesional resection rate when using this technique for primary tumours of the pelvis and sacrum, and (3) determine the early clinical outcomes following tumour resection.

Methods

This prospective study included 23 patients (mean age 53.3 years and 57% male) in which computer navigation assisted surgery was performed for pelvic and sacral bone tumours at a single institution since 2010. Surgery was performed for 18 primary malignant bone tumours (9 chondrosarcoma, 5 sacral chordoma, 3 osteosarcoma, 1 Ewings sarcoma), 3 metastatic tumours, and 2 locally advanced rectal tumours. Preoperative CT and MRI images were fused in the navigation system (Stryker Orthomap 3D Navigation System II) to plan the surgical resection margins. In cases where reconstruction was required custom-made implants (silver coated with a hydroxyapatite collar) were used.

Results

Registration error was less than 1 mm in all cases with no complications related to navigation. Navigation allowed the preservation of sacral nerve roots (n=8), the avoidance of hindquarter amputations (n=3), and resection of otherwise inoperable disease (n=2). Mean total operation time was 260 minutes (range 131-512 minutes). The intralesional resection rate for primary pelvic and sacral tumours was 11% (n=2) with clear bone resection margins achieved in all cases. At a mean follow-up time of 12.4 months (range 1-30 months) three patients (17%) developed local recurrence. Mean time alive from diagnosis was 14.5 months (range 1-38 months).

Conclusions

The present study demonstrated that computer navigation assisted surgery was a safe technique for pelvic and sacral tumours which can reduce the intralesional resection rate (previously 29% at this centre) and provide acceptable short-term rates of local recurrence and complications. It has also allowed more complex resections and reconstructions to be performed. We recommend this technique is worthy of further appraisal in this patient group.

E-mail (main author): lee.jeys@nhs.net



08:105

Computer-assisted planning and patient-specific instruments for bone tumor surgery within the pelvis. Clinical preliminary experience.

Francois Gouin¹, guillaume Odri², Laurent Paul³

¹) Hôtel-Dieu, Centre Hospitalier Universit ²) CHU Nantes, France ³) Visyos, Bruxelles, Belgium

Introduction

Clear margins are one of the major prognosis factors after tumor resection of the pelvis. Clear margins range only from 25 to 88% in the literature, with a high rate of local recurrence.

Computer assisted technology has been recently proposed to surgeons to improve accuracy of bone sections.

Patient specific instrumentation based on pre operative CT and MRI planning has demonstrated its accuracy to replicate preoperatively planned bone cuts on an experimental model.

In this paper, we report our preliminary clinical experience with this technology.

Materiel and methods

Five patients have been operated for a malignant bone tumor of the pelvis using a patient specific instrumentation based on 3D pre operative tumor delimitation. Bone cuts were chosen by the surgeon and cutting guides positions on bone were chosen by the engineer and surgeon together.

All resection included peri acetabular zone 2, with a posterior trans-sacral cut in 2 cases and a total iliectomy in one case.

Per-operative data and macro and microscopic margins were collected prospectively.

Results

The unique position on bone that corresponds to the patient's specific instrumentation was found very easily with no doubt in 4 cases, with some doubts in one case, and within 5 minutes in all cases.

No per operative complication can be identified as to be in relation with the instrumentation.

The accuracy of the bone cuts, especially the posterior trans sacral cut or the posterior trans iliac cut, allowed a very quick and safe mobilization of the tumor after bone cuts .

In all cases margins were clear of tumor (R0).

No patient recurred.

Discussion

This new technology based on computerized preoperative planning and patient specific instrumentation is promising in terms of per operative technical aid. Our first experience in these challenging localization such as pelvic bone tumor show that we can easily find accurate bone surfaces that support the instrumentation. Moreover the accuracy of bone cuts facilitate tumor mobilization. In all the cases of this short experience, post operative margins were clear in perfect agreement with preoperative planning. A wider experience and longer follow-up is necessary to confirm these findings.

E-mail (main author): fgouin@chu-nantes.fr



O8:106

Computer-assisted planning and patient-specific instruments for bone tumor surgery within the pelvis – an experimental study.

Laurent Paul¹, Pierre-Louis Docquier², Christian Delloye², Xavier Banse², Olivier Cartiaux¹

¹) Université catholique de Louvain ²) Cliniques universitaires Saint-Luc, Belgium

Background

Resecting bone tumors within the pelvis is highly challenging but requires good cutting accuracy to achieve sufficient margins. Computer-assisted technologies such as intraoperative navigation have been developed for pelvic bone tumor resection. Patient-specific instruments, mainly used for arthroplasty, have been transposed to tumor surgery. This experimental study investigated the accuracy of patient-specific instruments for bone cutting during simulated tumor surgeries within the pelvis.

Methods

The experimentations were conducted using synthetic hemipelvic bones (Sawbones). The hemipelvis was CT-scanned to produce a 3D model. A spherical tumor was simulated on the acetabulum. Four cutting planes have been positioned around this tumor including a 10-mm safe margin (Fig.1a). Three bone-specific instruments have been designed (Fig.1b). Their bone-specific surface permitted to fit in unique position on the pelvic model. The flat surface materializes the targeted cutting plane. The instruments were manufactured using rapid prototyping technology. Eight experienced surgeons were asked to perform the tumor resection.

Each performed cut plane was digitized using a coordinate measuring machine (Signum® SL, Mycra). The accuracy was estimated using the location (maximum distance between the performed and target planes) and the surgical margin (minimum distance between the performed plane and the tumor). The operative time required for the whole tumor resection was recorded.

Results

The location of the performed cut planes with respect to the target planes averaged 1.84 mm [1.31;2.36]. The achieved surgical margins averaged 10.23 mm [9.78;10.67]. The maximum error on achieved surgical margins was 3.12 mm. None of the resections were intralesional. The time required for the resection averaged 6.46 minutes.

Conclusion

This experimental study reports a satisfying accuracy when using patient-specific instruments during cutting of a simulated pelvic bone tumor. The location data demonstrate how patient-specific instruments may help to replicate a preoperative resection planning on a pelvic structure with a good accuracy. The time required for resection shows that this technology is easy to use and does not require a heavy set-up in the operating room. Patient-specific instruments may improve bone tumor surgery within the pelvis and other locations by providing clinically acceptable margins.

E-mail (main author): l.paul@uclouvain.be



O8:107

Applications of computer assisted surgery in orthopedic oncology; 130 cases

Paul Jutte¹, Jasper Gerbers²

¹) University Medical Center Groningen ²) MD/PhD Student, UMCG Groningen, Netherlands

The use of computer assisted surgery (CAS) in orthopedics has become more common. Application of CAS in orthopedic oncology, however, is not well described in literature.

In orthopedic oncology CAS can be applied to five types of surgeries. These are excochleations of benign and low-grade malignant tumors, resections of small surface or intra-medullary bone tumors, segmental resections in larger/malignant tumors, reconstructing defects of resections and finally in the placement of tumor prostheses.

Most of the above named types of surgeries require intra-operative imaging. All of them require control over resection margin both for recurrence prevention as to prevent unnecessary bone, and often functionality, loss. Since 2006 we have performed 130 oncological surgeries with CAS.

Most have been excochleations, 64, where CAS replaces fluoroscopy as an intra-operative imaging modality. Some of these patients have been treated with radio frequency ablation before surgery. Advantages over fluoroscopy are real time three dimensional feedback, high-res image and no use of ionizing radiation. It is especially useful in larger lesions or lesions located in the femoral head or pelvis. Currently a study is being performed on patient satisfaction, recurrence and complications.

Another application where CAS has often been used is in resections and segmental resections (36 and 13). These can be preplanned before surgery, incorporating the margin required, and checked intra-operatively. Coloration of the tumor, critical structures is useful to avoid these. Sometimes it's possible with careful planning to spare structures that otherwise probably would not confidently have spared.

With hemicortical resection (6) it's possible to use CAS to exactly copy the shape of the resected bone to an allograft. A Ct scan of one case shows an average gap between host and graft of 0.9 mm (range 0-5.4) along the 6 cm resection.

Finally in 8 cases of imageless use in placement of tumor prostheses it feels greatly helpful in reconstructing the joint line, length and correct rotation.

There were 8 failures with the system or software. Setup time was measured in 47 cases and was on average 6:50 (range 2:26-14:27). In our opinion CAS shows great promise in the field of orthopedic oncology.

E-mail (main author): p.c.jutte@umcg.nl



O8:108

The outcomes of navigation-assisted bone tumour surgery: minimum three-year follow-up

Hae Bong Park¹, Hwan Seong Cho²

¹) Seoul National University Bundang Hospita ²) Seoul National University Bundang Hospit, Republic Of Korea

BACKGROUND

Recently there have been several preliminary reports about the application of navigation to the surgery of bone tumours. It is expected that the technique should minimize unnecessary resection, preserve maximum function and achieve good oncological and functional results. However, to date there have been no reports about the longterm outcome of computer-assisted resection of bone tumours. We therefore analysed the oncological and functional outcomes of patients whose malignant bone tumour was excised with the assistance of navigation.

METHODS

We evaluated the oncological and functional outcome of 18 patients, whose malignant bone tumours were excised with the assistance of navigation, and who were followed up for more than three years. There were 11 men and seven women, with a mean age of 31.8 years (10 to 57). There were ten operations on the pelvic ring and eight joint-preserving limb salvage procedures. The resection margins were free of tumour in all specimens. The tumours, which were stage IIB in all patients, included osteosarcoma, high-grade chondrosarcoma, Ewing's sarcoma, malignant fibrous histiocytoma of bone, and adamantinoma.

RESULTS

The overall three-year survival rate of the 18 patients was 88.9% (95% confidence interval (CI) 75.4 to 100). The three-year survival rate of the patients with pelvic malignancy was 80.0% (95% CI 55.3 to 100), and of the patients with metaphyseal malignancy was 100%. The event-free survival was 66.7% (95% CI 44.9 to 88.5). Local recurrence occurred in two patients, both of whom had a pelvic malignancy. The mean Musculoskeletal Tumor Society functional score was 26.9 points at a mean follow-up of 48.2 months (22 to 79).

CONCLUSIONS

We suggest that navigation can be helpful during surgery for musculoskeletal tumours; it can maximise the accuracy of resection and minimise the unnecessary sacrifice of normal tissue by providing precise intra-operative three-dimensional radiological information.

E-mail (main author): mdchs111@snu.ac.kr



09:101

Sports activity levels of healthy long term survivors with modular tumor endoprostheses following osteosarcoma of the knee joint

Nikolaus Lang Lang¹, Gerhard Hobusch¹, Reinhard Schuh¹, Martin Dominkus¹, Reinhard Windhager¹, Jochen Hofstaetter¹

¹) Medical University of Vienna, Austria

BACKGROUND:

Little is known about participation in sports following limb-salvage surgery for osteosarcoma of the knee joint. The purpose of this study was to evaluate sports activity in long-term survivors with modular tumor endoprosthesis of the knee joint following osteosarcoma.

METHODS:

This retrospective single-center study includes 27 patients (13 m, 14 f) with osteosarcoma of the knee joint who were treated between 1995 and 2005 with an implantation of a modular tumor endoprosthesis. The average age at the time of surgery was $25,5 \pm 13,5$ (12,6 - 60,1) years and mean follow up period was $11,2 \pm 3,7$ (5,3 - 15,6) years. The tumor was located at the distal femur in 16 cases and at the proximal tibia in 11 cases. We assessed type frequency and duration of sports prior to osteosarcoma, 1, 3 and 5 years post surgery. Moreover the assessment included sports activity scores. Furthermore, the effect of complications on activity levels was assessed.

RESULTS:

Prior to osteosarcoma 89% (24/27) of the patients were regularly performing sports. At 1-, 3- and 5-years following osteosarcoma, 33%, 74% and 89% respectively were able to perform sports. There was a change from high to low impact sports. The most common types of sports postoperatively were bicycling and swimming. At five years post surgery patients reached their maximum post op levels of UCLA Activity Score (UCLA), Tegner Activity Score (TAS) and modified Weighted Activity Score (WAS). We found significant correlations between pre- and postoperative sports activity levels (UCLA: $r = 0,62$ ($p < 0,0005$); TAS $r = 0,69$ ($p < 0,0001$); WAS $r = 0,49$ ($p < 0,01$)). Fourteen patients (51%) had to undergo revision surgery. However neither oncological nor non-oncological complications had a significant effect on sports activity levels. Moreover no sports activity related complications were found.

CONCLUSION:

Long-term survivors of osteosarcoma of the knee joint who underwent limb-salvage surgery with a modular tumor endoprosthesis can achieve high levels of sports activity. However, the type of sports, duration change and recovery takes up to five years. Patients who were very active prior osteosarcoma tended to be more active postoperatively.

E-mail (main author): nikolaus_lang@hotmail.com



09:102

Sports activity levels in long-term survivors of Ewing sarcoma in spine, pelvis and lower extremity

Gerhard Hobusch¹, Nikolaus Lang², Kerstin Gruber², Martin Dominkus², Reinhard Windhager², Jochen Hofstaetter²

¹) Medical University of Vienna ²) MUW, Austria

Background:

Quality of Life and functional outcome became a field of interest in patients with Ewing sarcoma (EWS). Sports is an important part in the lives of young adults. However, currently there are no data available with regard to sports activity levels of patients with EWS.

Methods:

Sports activity levels in patients with EWS after multimodal treatment including surgical resection and radio-chemotherapy treated at a single institution with a minimum follow-up of five years were retrospectively assessed. 35 survivors (14 f/ 21 m) with an average age of 18 years and a mean follow-up time of 15,8 years following EWS were included. The tumors were located in spine (n=5), pelvis and proximal femur (n=18), knee joint and lower leg (n=12). The surgical procedures included surgical resections alone (n=16) or surgical resection with biological reconstruction (n=5) or endoprosthetic reconstruction (n=14).

Results:

One year before surgery and five years post surgery 34 out of 35 Patients (97,1%) were performing athletic activity. The most common types of sports were cycling, swimming and hiking. Depending on the location and the type of surgical procedure two different patterns of postoperative sports activity levels were found. Patients with resections in spine, pelvis and femur and biological and endoprosthetic reconstructions in the proximal femur and knee improved in UCLA Activity score from 3,9 to 6,3 points (1 year postoperative latest follow up) in Tegner activity score from 2,6-4,3 points and in modified Weighted Activity Score from 2,3-5,3 points in the course of sports activity assessments 1, 3 and 5 years postoperative. Patients who were the most active preoperatively tended to do more sports post-operatively (p=0,42). Patients with megaendoprosthetic reconstruction of the pelvis, fibula for tibia reconstructions and after resection of the fibula, sports activity remained at a low level post-operatively.

Conclusion:

Healthy long-term survivors can achieve high levels of sports activity following EWS. The localization of the tumor significantly determined the sports activity levels achieved. Preoperative sportsactivity levels significantly correlated with postoperative sports activity levels. This information will help surgeons as well as newly diagnosed patients when it comes to long-term expectations following EWS.

E-mail (main author): gerhard.hobusch@meduniwien.ac.at



O9:103

Patient Outcome Following Inpatient Rehabilitation within the London Sarcoma Service

Abigail McCarthy¹

¹) Royal National Orthopaedic Hospital, United Kingdom

Research suggests physical activity during or after cancer treatment improves physical and psychological wellbeing, reduces risks of consequence of treatment and improves survival rates, hence Macmillan launched the Move More campaign in 2011. The National Cancer Survivorship Initiative also identified a requirement for change to the care pathway of patients to offer a more holistic approach. The National Cancer Action Team have also published rehabilitation guidelines for sarcoma patients (2012).

Observing patients returning to clinic following completion of adjuvant treatment it was noted full functional potential was often not achieved. Reductions in funding of local outpatient services meant patients were often dismissed due to non-attendance or were discharged after 6 sessions. The London Sarcoma Service recognised the requirement to broaden the rehabilitation services provided to oncological orthopaedic patients and developed a focussed one week in-patient rehabilitation programme with OP follow up.

The therapy led programme includes joint initial assessment with PT and OT to address therapeutic, functional and quality of life issues. Core stability, gait re-education and cardiovascular endurance are common focus areas to achieve goals as diverse as equestrian pursuits, bathing, driving and return to work. The presence of the ASPIRE training centre on site is helpful in allowing patients to gain confidence in use of leisure facilities when returning to their local community.

The results from 10 patients who have utilised this programme will be presented including a thematic analysis of patient concerns and goals following assessment. Patient satisfaction has been high and use of the patient specific functional scale outcome measure has demonstrated a significant improvement in patient function during the week. Patients have been followed up to ensure that their progress has been maintained and continued.

E-mail (main author): Abigail.McCarthy@rnoh.nhs.uk



09:104

Functional outcome and quality of life after resection of the proximal humerus in musculoskeletal tumours

Imre Antal¹, Krisztián Szalay¹, János Kiss¹, Tamás Perlaky¹, Miklós Szendroi¹

¹ Semmelweis University, Hungary

BACKGROUND

There are several successful methods for reconstruction of the proximal humerus after tumor resections, but the function of the shoulder joint can only be restored partially. The functional outcome after proximal humeral resection depends on the type of reconstruction, but also on the resection of the rotator cuff and the deltoid muscle.

METHODS

We reviewed 84 patients who underwent proximal humerus resection in the Department of Orthopaedics at Semmelweis University (Budapest, Hungary) from 1981 to 2012. Medical records were reviewed. Functional evaluation was done according to the Musculoskeletal Tumour Society (MSTS) system, health status was assessed by the Short Form-36 questionnaire.

RESULTS

Hemiarthroplasty with tumour endoprosthesis was carried out in 43 cases, autologous fibular transposition was done in 25, reverse prostheses-allograft composite in 6 and osteoarticular allograft in 10 cases. These were done to treat primary tumours in 56 cases and metastases in 28 cases. The mean age was 32 years (range 10-73 years) in patients with a primary tumour and 65,4 years (range 30-76 years) in those with metastases. Mean follow-up was 96 months (range 6-254 months). The mean MSTS score was 84% for reverse prostheses-allograft composite, 67% for tumour endoprosthesis, 64% for osteoarticular allograft, and 70% for autologous fibular transposition. Major complications occurred in 40% of the osteoarticular allograft group, in 11% of the tumour endoprosthesis group and in 24% of the autologous fibula group. There were no complications in the group reconstructed with reverse prostheses-allograft composite.

CONCLUSION

According to both the literature data and our own results, it seems that after proximal humeral resections the best results can be achieved by reverse prostheses-allograft composite or fibular transposition, when the function of the rotator cuff was preserved and the fibula did not resolve. After humeral resection with the implantation of a tumour endoprosthesis or osteoarticular allograft the function of the shoulder remained moderate because the rotator cuff was damaged. The overall satisfaction was generally good after all types of proximal humeral reconstruction. Patients can compensate extremely well by using the preserved joints and the contralateral upper limb; therefore, patient satisfaction does not rely on shoulder function alone.

E-mail (main author): krisztian.szalay@gmail.com



09:105

Functional results of Modular Prosthesis Replacement for Malignant Tumors of the Extremities

Oleg Vyrva¹, Roman Malik¹, Victor Burlaka¹, Igor Shevchenko¹

¹⁾ Sytenko Institute, Ukraine

Background:

The objective of this study was to determine the long-term function and complications associated with segmental resections performed for malignant bone tumors reconstructed with Modular Prostheses.

Methods and Materials:

We retrospectively reviewed the records of 166 patients with Modular Prosthesis Replacement from 2002 to 2012. There were 92 males and 74 females. Mean age at the time of diagnosis was 39 years (range 7-75 years). Diagnoses included 64 osteosarcomas, 58 metastatic lesions, 38 chondrosarcomas, 4 Ewing's sarcomas, 2 synovial sarcomas. 166 primary and 24 revision Modular Prostheses were placed with 56 in the distal femur, 32 in the proximal femur, 30 in the proximal tibia, 19 in the proximal humerus, 9 in the distal radius, 5 in the femur diaphysis, 5 in the distal tibia, 5 in the distal humerus, 2 in the diaphysis humerus, 2 in the proximal ulna, 1 in the proximal radius. Mean follow-up was 5,4 years (range 1-10 years). Treatment was individualized depending on patient presentation. The MSTS and TESS scores were used to calculate functional results.

Results:

13 patients (7,8%) had died at last follow-up. 21 patients (12,7%) had had local tumor relapses. 20 patients (10,5%) had had prostheses failures and 21 patients (11,1%) had had infection complications. 11 patients (6,6%) had had amputations. The mean MSTS score for the upper extremity were (67 ± 9) %, for low extremity (76 ± 16) %. The mean TESS score for the upper extremity were (70 ± 11) %, for low extremity (79 ± 15) %.

Conclusion:

The Modular Prosthesis Replacement for malignant bone tumors has a high rate of good functional results at long-term follow-up. Patients who underwent revision surgery had worse function than patients who retained their initial Modular Prosthesis Replacement.

E-mail (main author): vyrva@online.kharkiv.com



09:106

Early rehabilitation using temporal external fixation following resection of pelvic sarcoma

Toshiyuki Kunisada¹, Yoshimi Katayama², Ken Takeda³, Joe Hasei³, Masuo Senda², Toshifumi Ozaki³

¹⁾ Okayama University Graduates Schools ²⁾ Rehabilitation, Okayama University ³⁾ Orthopaedics, Okayama University, Japan

INTRODUCTION:

Pelvic resection for sarcoma sometimes requires prolonged bed rest or immobilization postoperatively to stabilize the bone and/or soft tissue reconstruction. Massive implantation to stabilize the pelvic reconstruction may result in high risk of deep infection. We applied temporal external fixation (EF) for patients who underwent pelvic resection including P1 and/or P2 region to get early postoperative function.

PATIENTS:

8 cases with pelvic sarcoma were temporally applied with EF following tumor resection and reconstructive surgery, since 2008. There were 5 patients with P123 resection, 1 with P12 resection, 1 with P23 resection, and 1 with P1 resection. The pins were inserted into affected femur and healthy contralateral ilium. Pathologic diagnosis consisted of 3 chondrosarcoma, 2 osteosarcoma, 2 Ewing sarcoma, and 1 undifferentiated sarcoma. 7 patients underwent resection arthroplasty (hip transposition), and 1, fibula graft for P1 resection. EF was removed and weight-bearing started 6-8 weeks postoperatively. We assessed postoperative achievement of activities of daily living and MSTS score.

RESULTS:

Average limb length discrepancy was 5.5cm. Average postoperative follow-up was 23 months. Sitting on bed was possible averagely on Day 7, standing along bed on Day 8, transfer to wheel chair on Day 12, Walking exercise using parallel bars on Day 22, and walking using crutches on Day 53. At removal of EF, image intensifier assessment showed that all reconstructive procedures were stable enough to start weight-bearing. At final follow-up, 4 patients can walk without any supports, 3 with one crutch, and 1 with two crutches. There was no major complication related to EF. Average MSTS score was 69%.

DISCUSSION:

Hip transposition originally required about 4 week immobilization in bed with cast or brace to stabilize the reconstruction. Fibular graft for P1 resection also reportedly needed prolonged immobilization if there was less stable implantation. Temporal EF could stabilize bone and soft tissue reconstruction after pelvic resection, resulting in less pain for patients. Pelvic reconstruction with temporal EF can lead to early physiotherapy, and may result in better rehabilitation without major complication.

E-mail (main author): toshikunisada@gmail.com



09:107

Can Immunohistochemical characterisation of liposarcoma guide the selection for novel therapy based on the P53 – MDM interactions?

Nader Touqan¹, Rajgopal Achuthan², William Merchant², Kieran Horgan², Ian Carr¹, Rashda Anwar¹, Alexander F Markham¹

¹) University of Leeds ²) Leeds Teaching Hospitals, United Kingdom

Background

Inactivation of wild type P53 by its main cellular inhibitors (MDM2 and MDMX) is a well recognised feature of tumour formation in liposarcomas. MDM2 over-expression has been detected in approximately 80% of liposarcomas but only limited information is available about MDMX over-expression. To date, we are not aware of any study that has described the patterns of MDM2 and MDMX co-expression in liposarcomas. Such information has become more pertinent as various novel MDM2 and / or MDMX single and dual affinity antagonist compounds are emerging as an attractive means of potential targeted therapeutic strategies.

Methods

After obtaining the appropriate ethical approvals and with informed consents, we analysed a series of 61 cases of fully characterised liposarcomas of various subtypes by immunohistochemistry to assess the simultaneous expression levels of P53, MDM2 and MDMX.

Results

50 cases over-expressed MDM2 and 42 of these co-expressed MDMX at varying ratios. The relative expression levels of the two proteins with respect to one another were subtype-dependent. This directly affected the detected levels of P53 in two distinct patterns. Diminished levels of P53 were observed when MDM2 was significantly higher in relation to MDMX, suggesting a dominant role for MDM2 in the degradation of P53. Higher levels of P53 were noted with increasing MDMX levels suggesting an interaction between MDM2 and MDMX that results in a reduced MDM2 efficacy in degrading P53. Despite the different genetic alterations involved in the cancerous transformation of the different subtypes of liposarcoma, it is striking that the above patterns applied to all subtypes with a statistically significant negative correlation between MDM2:MDMX ratio and P53 expression ($p < 0.001$).

Conclusion

The results suggest that dynamic complex interactions between MDM2 and MDMX proteins may directly affect the cellular expression levels of P53. This therefore invites careful characterisation of these markers in tumours when considering in-vivo experimental evaluation of novel blocker compounds for MDM proteins as a therapeutic strategy to restore wild type P53 functions.

E-mail (main author): n.touqan@leeds.ac.uk



O9:108

Inhibition of sirtuin-1 activity as a potential therapeutic strategy for pediatric soft tissue sarcomas.

Bertha Brodin¹, Limin Ma¹, Barry Wolahan¹, Wessen Maruwge¹, Sonia Lain¹

¹) Karolinska Institutet, Sweden

Sirtuins are a NAD⁺ dependent class III histone deacetylases with a variety of histone and non histone substrates.

Seven sirtuins (sirT 1-7) have been identified in mammals. SirT1 has been implicated in the regulation of glucose and lipid metabolism during cellular stress conditions like fasting and calory restriction. In addition of its functions in cell metabolism, SirT 1 has been implicated in tumor progression since it mediates the deacetylation of several cancer associated transcription factors like p53, NFkB and FOXO proteins.

We have analyzed the expression of sirT1 and sirT2 in a serie of synovial sarcoma tumors and cell lines and evaluated the activity of the sirtuin inhibitor tenovin-6, in synovial sarcomas and rhabdomyosarcomas. We found that sirT1 was overexpressed in synovial sarcomas biopsies and cell lines in comparison to normal mesenchymal cells. Exposure of synovial sarcoma and rhabdomyosarcoma cell lines to tenovin-6, inhibited tumor cell proliferation and induced the expression of the cyclin dependent kinase inhibitor p21 independently of p53 expression and acetylation. Tenovin 6 anti-tumour activity was associated with decreased de-acetylating activity of nuclear and cytoplasmic sirtuins including sirT1.

Combination of tenovin 6 with doxorubicin had a synergistic anti-proliferative effect in synovial sarcomas. In addition, the combination of tenovin-6 with the multikinase inhibitor Sorafenib, had a significant anti-tumor growth effect on synovial sarcoma and rhabdomyosarcoma cell lines.

Rhabdomyosarcoma xenografts treated with tenovin 6 had a decreased tumour mass as compared to placebo treated controls. The treated tumors up-regulated cytoplasmic sirT2 and displayed nuclear tranlocation of p53.

Our results indicate that overexpression sirT1 can be associated with the pathogenesis of synovial sarcoma and rhabdomyosarcoma and that the pharmacological inhibition of sirtuin activity is a potential therapeutic strategy for these tumors.

E-mail (main author): bertha.brodin@ki.se



O9:109

Genomic instability and characteristic DNA methylation pattern in chordoma

Beate Rinner¹, Andreas Weinhaeuser², Birgit Lohberger¹, Pulverer Walter³, Fischer Carina¹, Scheipl Susanne¹, Meditz Katharina¹, Liegl Bernadette¹, Leithner Andreas¹

¹) Medical University of Graz ²) AIT-Austrian Institute fo Technology ³) AIT Austrian Institute of Technology, Austria

Chordomas are rare mesenchymal tumors occurring exclusively in the midline from clivus to sacrum. Early tumor detection is extremely important as these tumors are resistant to chemotherapy and irradiation. Despite continuous research efforts surgical excision remains the main treatment option. Because of the often challenging anatomic location early detection is important to enable complete tumor resection and to reduce the high incidence of local recurrences. The aim of this study was to explore whether DNA methylation, a well-known epigenetic marker, may play a role in chordoma development and if hypermethylation of specific CpG islands may serve as potential biomarkers correlated with SNP analyses in chordoma. The study was performed on tumor samples from ten chordoma patients. We found significant genomic instability, it was interesting to see that all chordomas showed a loss of 3q26.32 (PIK 3CA) and 3q27.3 (BCL6) thus underlining the potential importance of the PI3K pathway in chordoma development. By using the AITCpG360 methylation assay we elucidated 20 genes which were hyper/hypomethylated compared to normal blood. The most promising candidates were nine hyper/hypomethylated genes C3, XIST, TACSTD2, FMR1, HIC1, RARB, DLEC1, KL, and RASSF1. In summary, we have shown that chordomas are characterized by a significant genomic instability and furthermore we demonstrated a characteristic DNA methylation pattern. These findings add new insights into chordoma development, diagnosis and potential new treatment options.

E-mail (main author): beate.rinner@medunigraz.at



09:110

Gene expression of extracellular matrix proteins in lung metastases of giant cell tumour of bone: tumour or location specific?

Marusya Lieveld¹, Liesbeth Ceelen¹, Maria-Serena Benassi², Piero Picci², Gwen Sys³, Pancras Hogendoorn⁴, Ramses Forsyth¹

¹) Pathlicon, Belgium ²) IOR ³) University Ghent, Italy ⁴) LUMC, Netherlands

BACKGROUND

Giant cell tumour of bone (GCTB) is a primary bone tumour with an unpredictable clinical behavior which could sometimes be worrisome. One of these features is its ability to metastasize to the lungs. The mechanisms of this phenomenon have not been well understood. Recent studies indicate that the extracellular matrix may play a pivotal role in the primary tumor location to enhance its metastatic potential. Three of these reported genes are lumican (LUM), decorin (DCN) and tenascin which are all involved in the delicate balance between mobility and crosslinking of diverse components in the extracellular matrix.

AIMS

To investigate whether the expression of two of these ECM components - LUM and DCN as an example - are truly location specific (lung vs. bone) or tumour specific (metastasis and its primary tumour vs. non-metastasizing tumours).

METHODS

In total 31 samples of GCTB were used (5 primary, 6 lung-metastatic and 20 non-metastasizing GCTB samples). RNA extraction with cDNA synthesis and qPCR was performed in duplicate. Reference genes were selected and primers were designed against Lumican and Decorin using Primer-Blast, Oligo7 and mFold. The data were analyzed and using qBaseplus (Biogazelle). Statistical analyses were performed using the unpaired and paired t-test.

RESULTS

Comparison of the different gene expression profiles of LUM and DCN in the different GCTB-groups exhibits following results:

- no significant differential gene expression between lung meta's and their primary located tumours (DCN: $p < 0,804$. LUM: $p < 0,283$).
- A significant lower differential gene expression in the lung meta's compared to the non-metastasizing tumour samples (DCN: $p < 0,002$. LUM: $p < 0,001$)
- A significant lower differential gene expression of the metastasizing primary tumours when compared to the non-metastasizing tumour (DCN: $p < 0,003$. LUM: $p < 0,001$).

CONCLUSION

As the gene expression of both extracellular matrix proteins differs significantly between meta's and non-metastasizing tumours and between primary tumours compared with the non-metastasizing groups, proves that the expression of LUM and DCN is tumour specific. Moreover, a lower differential gene expression of these ECM genes is a potential indicator and therefore an alarm for those tumours at risk to metastasize.

E-mail (main author): r@forsyth.be



O10:101

Osseointegration: An overview

Rickard Brånemark¹

¹, Sweden

Osseointegration has been in successful clinical practice for dental applications since 1965. The method of osseointegration is also successfully used for permanently skin-penetrating applications in the head and neck area including treatment with bone-anchored hearing aids and for anchorage of prosthetic ears and eyes.

Treatment with osseointegrated amputation prostheses has been performed in Sweden since 1990. More recently centers in the United Kingdom, Australia, Spain, Hungary, France, Chile, Denmark, Belgium and Holland have started to use the treatment. In 1999, a prospective clinical investigation was started at the Sahlgrenska University Hospital in Gothenburg, Sweden on patients treated with transfemoral OI-prostheses. The patients are treated in two surgical sessions followed by rehabilitation with a total treatment period of approximately 12 months. At the first surgery a titanium implant (fixture) is inserted in the residual bone and left unloaded for about six months. At the second surgery a titanium rod (abutment) is inserted into the distal end of the fixture and is then penetrating the skin. The external prosthesis is connected to the abutment with an attachment device. After surgeries the patient undergoes a period of rehabilitation during six months with gradually increased weight bearing and prosthetic activities.

The risks with the treatment are loosening, deep infection, superficial infections, skeletal fracture and mechanical failures. The benefits are in many instances related to the removal of the socket as attachment of the prosthesis to the stump. The amputee no longer has skin sores, pain when loading, and problems with stump volume changes. Further, normal sitting comfort and normal hip range of motion is regained. All these changes lead to a significantly improved quality of life for the individual with transfemoral amputation.

E-mail (main author): rickard.branemark@orthop.gu.se



O10:102

A decade's experience with the Integral Leg Prosthesis (ILP): a case series study of design modifications to prevent infection

Horst Aschoff¹, Dora-Lis Juhnke², James Beck³

¹) Sana Clinics Lübeck, Germany ²) Norwest Advanced Orthopaedics, Norwest P, Australia ³) Department of Orthopaedics, University o, United States

Methods

Between 1999 and 2011, 54 patients with above-knee (AK) amputations were fitted with ILPs by a single surgeon. Throughout a twelve year case series different changes to improve implant design and surgical technique has been empirically driven and clinically based to reduce the technique's inherent risk of an ascending infection. We divided patient's receiving different designs and procedures in Group I and Group II to statistically compare planned and unplanned surgical interventions.

Results

The data demonstrates an initially high rate of stoma-associated infections. However, the changes made to the design as well as the surgical technique could effectively reduce this risk; between January 2009 and December 2011 no operative intervention for stomal soft tissue or deep bone infections became necessary.

Discussion

Bone-anchored prostheses have to meet the challenge of successful osseointegration as well as the risk of a stoma-associated infection. Using the ILP, formerly known as the Endo-Exo-Femurprosthesis, a stable integration into the remaining femur has been accomplished. The risk of an ascending infection could be dramatically decreased altering the implant's surface at the soft tissue-prosthesis interface and adjusting the surgical approach accordingly. We consider the ILP a safe alternative to the socket

E-mail (main author): horst.aschoff@sana.de



O10:103

Case presentations of the Integral Leg Prosthesis (ILP): achievements and pitfalls

Horst Aschoff¹, Dora-Lisa Juhnke², Munjed Al Muderis²

¹) Sana Clinics Lübeck, Germany ²) Norwest Advanced Orthopaedics, Norwest P, Australia

Methods

This osseointegrated technique involves two surgical steps and a following rehabilitation process where the patient has to learn how to mobilize and walk again freely with the bone-guided implant. In between 01/1999 and 01/2013 altogether 95 patients were treated with the ILP by two surgeons located in Lübeck, Germany and Sydney, Australia. We present special cases.

Results

To this point we performed the ILP procedure on 88 trans-femoral and 7 trans-tibial amputees. Special challenges include implant failure, fractures, particular bone conditions and amputation levels, missing osseointegration and bilateral supplies. These challenges impose the need to constantly re-evaluate patient's situations and build up a close relationship with them to have positive and satisfying results that meet reasonable expectations.

Discussion

Amputation and following rehabilitation always has a deep and life-changing impact on the affected individual and each situation has to be understood and dealt with as being a unique story, which involves unique people. Given the more than 100 patients provided with the ILP worldwide it by now seems admissible to describe some procedures as rather standard while others stand out in regards to different aspects of patient's physical, psychological, social or work-related conditions. Their clinical and follow-up stories that are linked to experiencing an ILP are inevitable to be told to think about and learn from them.

E-mail (main author): horst.aschoff@sana.de



O10:104

Bone Anchored Prosthesis with the Osseointegration Technique in Transfemoral Amputees. Results from the Prospective OPRA Study

Örjan Berlin¹, Peter Bergh², Björn Gunterberg², Kerstin Hagberg², Björn Rydevik², Rickard Brånemark²

¹) Sahlgrenska University Hospital ²) Sahlgrenska Univ Hospital, GOT, SWE, Sweden

Background. Transfemoral amputations due to trauma or tumor surgery often cause problems with conventional socket prostheses. In 1999 we initiated the prospective OPRA study (Osseointegrated Prosthesis for Rehabilitation of Amputees) using standardized surgery, equipment and rehabilitation program.

Methods. The surgery consists of a two-stage procedure. First a titanium screw (fixture) is inserted into the remaining skeleton (S1 operation). Six months later a second implant (abutment) is inserted into the first, allowing it to penetrate the skin (S2 operation). Gradual increase of loading are done over a 6-month period.

Results. The OPRA study includes 51 patients with 55 implants (1999–2010). Follow up is 2 years. Four implants have been removed due to loosening (3) or infection (1). One patient was lost to follow-up, two were excluded. The implant survival was 92 % (48/52). The patients had an average of one superficial infection every two years, successfully treated conservatively in all cases. There were 6 deep infections in 4 patients. All but one were successfully treated by conservative means. Four patients had 9 mechanical complications (bent or fractured implant parts) and 3 skeletal fractures occurred. Prosthetic use, prosthetic functions and global quality of life were all significantly improved ($p < 0.001$) and prosthetic problems were reduced ($p < 0.001$).

Conclusion. The implementation of a standardized osseointegrated surgical technique and the graded rehabilitation protocol is of importance for the promising results. The benefits are related to the removal of the socket as attachment of the prosthesis to the stump. The amputee no longer has skin ulcers, pain when loading, and problems with stump volume changes. Normal sitting comfort and normal hip range of motion can be expected. All these changes lead to a significantly improved quality of life for the individual with a transfemoral amputation.

E-mail (main author): orjan.berlin@gmail.com



O10:105

Osseointegration is a viable solution for rehabilitating patients post tumor-related amputations

Munjed Al Muderis¹, Dora-Lisa Juhnke², Horst Aschoff³, Ludger Gerdesmyer⁴

¹) Macquarie University, Australia ²) Charite ³) Lubeck ⁴) Keil, Germany

BACKGROUND

Transcutaneous osseointegration is an innovative technology that has been successfully used for amputees since the 1990s to overcome the problems associated with the conventional socket prosthesis. Between 1999 and 2011 we performed one hundred operations using this technology, 10% of these patients were amputated due to musculoskeletal tumors.

METHODS

Between 1999 and 2011 we performed one hundred osseointegration procedures in 94 patients. These surgeries were performed in two centers: Lübeck, Germany and Sydney, Australia by the two principle surgeons acquainted with this technology. It involves the insertion of a transcutaneous intramedullary implant into the remaining bone; the implant's most distal external aspect then serves as a hard point for further prosthetic attachment rather than the entire soft tissue mantle of the remaining limb.

Altogether there were 74 males and 20 females. The age range was between 17 to 76 at time of implantation. Ten of our patients had amputations due to tumors with an age range from 32 to 73 at time of implantation. Preoperative assessments included medical, psychological and radiological examinations. All patients underwent the standardized two-stage procedure with a six-week interval. All patients were allowed early mobilization and full weight bearing two weeks after the second stage surgery.

RESULTS

Overall, there was a high level of patient satisfaction. All patients except one returned to pre-amputation activities. All patients except one have retained the implant up to date. In the remaining patients gait improved. No infections to date occurred in the patients that underwent surgery after 2009 since a new implant design was used. All patients regained osseoperception and reduced phantom pain. Skin irritations due to the old socket prosthesis have completely recovered in all patients.

CONCLUSION

Osseointegrated prostheses are an excellent alternative and potentially will be the first choice for many amputees in the near future. We have demonstrated that this technology enables patients to regain much of their freedom in mobility without compromising the mechanical stability of osseointegration. The technique constitutes a versatile option for people suffering limb loss secondary to malignancy due to the relative young age of these patients at time of amputation.

E-mail (main author): munjed@me.com



O10:106

Rehabilitation in patients with conventional amputation versus patients with osseointegrated prostheses

*Kerstin Hagberg¹**¹⁾ Sahlgrenska University Hospital, Sweden*

Individuals with transfemoral amputation are conventionally supplied with a prosthesis that is suspended to the residual limb via a socket. Today prosthetic attachment can also be directly to the residual skeleton by using the method of osseointegration and in this case no prosthetic socket is needed. This presentation will describe the main differences between the two methods when it comes to the prosthetic rehabilitation in individuals with transfemoral amputation.

E-mail (main author): kerstin.hagberg@vgregion.se

O10:107

Osseointegration: The experience of the first seven patients in Leiden

*Nicolette Leijerzapf¹, Hans Arendzen¹, Dies Boonman¹, Eric Vermeulen¹, Sander Dijkstra¹**¹⁾ Dept. of Orthopedic Surgery, Leiden University Medical Center, Leiden, the Netherlands*

Introduction: Bone anchored prosthesis based on osseointegration is an innovative treatment for amputees with socket problems due to their prosthesis. Osseointegration for amputees has been performed in Sweden since 1990. The OPRA procedure, the Osseointegrated Prosthesis for the Rehabilitation of Amputees, includes two surgical stages followed by rehabilitation. The first stage (S1) is to place a titanium implant (the fixture) into the cavity of the bone. S2, the second stage, performed 6 months later; the abutment screw is inserted into the distal end of the fixture and protrudes through the skin. Also remodelling of the soft tissue must be performed. The goal of this procedure is to click the prosthetic limb directly onto the abutment screw without wearing a prosthetic socket. The rehabilitation schedule, during 6 months, is managed by the OPRA protocol and physical therapists. The rehabilitation physician and orthopaedic surgeon include the patient for the osseointegration. Contra indications are: arterial problems, diabetes, infections, obese, smoking, use of corticosteroids, recent malignant tumor, immunosuppressive therapy, renal failure and poor bone quality. Mental stability is very important.

Methods: In Leiden we started in September 2011. We treated 7 patients, 6 transfemoral and 1 transtibial amputees. The median age was 49 (31-67). Two patients had amputations due to a tumor and 5 due to trauma. The median follow up was 9,5 (2-17) months.

Results: Three patients had temporary wound problems. Two patients walk with prosthesis without any problem. They have hardly complaints, no pain, no skin problems, better walking pattern, easy click-fixation of the prosthesis and a new phenomenon: osseoperception. This leads to a better quality of life. Three are at the end of their rehabilitation period and start their mobilisation with crutches. Two patients just started with the rehabilitation.

Conclusions: The two patients, who had finished the rehabilitation period, had a spectacular outcome. A good collaboration between orthopaedic surgeon, rehabilitation physician, physical therapists, nurse practitioner and prosthetist is mandatory for the success of osseointegration.



O11:101

The use of Additive Layer Manufacturing (ALM) for the fabrication of specialized limb salvage implants

Paul Unwin¹, Sudha Shunmugam², Kirti Wagjani², Abtin Eshraghi²

¹) Stanmore Implants ²) , United Kingdom

Additive Layer Manufacturing (ALM) is becoming an important fabrication technique for orthopaedic implants and is particularly suited to specialised implants such as those used in limb salvage. ALM has already proven its capability for producing small complex components for the aerospace industry. The ALM process uses a high-powered laser or electron beam to selectively sinter fine powder such as titanium alloy in ultra-thin layers enabling complex free-form components to be built layer by layer. ALM is ideal for one off components such as ingrowth lattices that would be impossible using conventional subtractive manufacturing techniques.

This aim of this study was to describe the adoption of ALM into the design and fabrication process of titanium alloy limb salvage devices.

Prior to the clinical use of ALM, extensive metallurgical and mechanical testing was undertaken.

The first clinical application of an ALM titanium alloy implant was undertaken in November 2010. A 62 year old male with a chondrosarcoma of periacetabulum required an extensive resection of the ilium and sacro-iliac joint saving only a small part of the superior pubic ramus. A 3-dimensional model was created from CT scans from which the implant was designed. Key design features included extensive lattice structures at the SI joint and pubic ramus bone interfaces, transverse sacral bolts and a large medialised acetabular socket. The lattices were hydroxyapatite coated and the device was implanted with the aid of navigation. Following an uneventful rehabilitation, at 6 months the patient was full weight bearing with a stick. At 24 months the patient remains active and radiographically there is the appearance of bony ingrowth into the lattice structure.

To date, 7 scapula and 11 pelvic replacements have been implanted. The early use of this advanced manufacturing route for patient specific limb salvage implants has been very encouraging as it enables the engineer to produce a more anatomical conforming implant with integral 3D lattice structures for bone and soft tissue integration. It is anticipated that laser-based ALM will be a key process in the development of the next generation of limb salvage implants.

E-mail (main author): paul.unwin@stanmoreimplants.com



O11:102

Basic Sciences and Bioengineering of Microwave Hyperthermia in Limb Salvage

Edmund Y.S. Chao¹

¹) Mayo Clinic & Johns Hopkins University, United States

The use of low and deep-set heat generated by high frequency alternating current as a means to destroy cancer cells was first proposed by Nikola Tesla in 1891 termed as "Medical Diathermy". This innovative idea has gone through a long evolution in medical oncology now defined as "Hyperthermia" using different method to generate and deliver the heat to treat both resectable and un-resectable tumor. For musculoskeletal tumor, the most desirable method is the microwave dielectric heating method using pointed antenna to penetrate and reach various parts of the afflicted connective tissues. Although the scientific basis for tumor cell ablation and the technical aspects in limb salvage application are insufficiently established, QY Fan, of Xi'an, China has pioneered this method in extensive clinical trial since the early 1990s with impressive results. To assure a safe ablation margin in comparison to regular en bloc resection method, over-heating was implemented in all cases. Theoretically, hyperthermia has several major potential advantages: 1) optimal heat delivery could achieve safe and effective tumor ablation; 2) low temp treated bone, though completely devitalized, maintains greater biomechanical strength and with higher potential to regenerate; 3) the remaining osseous structure after curettage serves as biologic scaffold making reconstruction easier and with less metallic implant; 4) retain muscle-to-bone attachment to allow easier regeneration for better functional results.

However, there are several concerns that must be adequately addressed before widespread clinical trials could be safely recommended. These are: 1) assurance of tumor ablation to prevent local recurrence; 2) improvement in antenna design and surgical application; 3) ability to achieve optimal heat dispersion throughout the tumor bed with sufficient and desirable safety margin; and 4) adequate protection of normal tissue and organ surrounding and adjacent to the treatment field. These concerns could all be satisfactorily resolved through basic sciences research and bioengineering development. Using proper animal models and tissue type, different heat conduction and dispersion properties under realistic physiological conditions can be quantified and validated. Through advanced imaging techniques and simulation technology, pre-treatment planning and intraoperative execution steps can be worked out for optimal tumor cell ablation in different anatomical location and extend. Various cooling methods are available to protect the connective tissues and structure such as the cartilage, ligaments, tendon-to-bone junction etc. For the vessels, nerves, and spinal cord closely imbedded within the cancerous tissue bed may be managed by the irreversible electroporation technique currently explored by QY Fan.

Hyperthermia is a promising method to bring the current standard and success of limb salvage to a new level. To reach there, coordinated R&D effort is mandatory as no single institution can meet all the prerequisites in basic science, engineering technology and clinical trial to make this method well accepted. Musculoskeletal tumor is a relatively small field to attract major funding from available sources. Multi-institutional collaboration with foundation and industrial support may offer the opportunity to bring this practical, most important but low payback venture to reality. Thus far, it has been a dedicated effort of a single person and institution. However, their outcome we all have witnessed deserves proper consideration and support. Although the current science and technology of applying this method are limited, more clinical trials using the present method and instruments on difficult malignant cases involving the pelvis and the aggressive benign GCT in the long bones should be encouraged to solidify the theoretical advantages for the purpose of enhancing the confidence amongst the orthopaedic oncologists. This is one of the most desirable fields to harness the available high-tech in bioengineering, thus making computer-aided and robotic assisted limb salvage surgery a practical reality!



O11:103

Microwave Hyperthermia Applied to Limb-salvage Surgery for Malignant Bone Tumors

Qing-Yu Fan¹, Boan Ma¹, Yong Zhou¹, Minhua Zhang¹, Tong Tao Yang¹, Hua Long¹, Lian He Zheng¹, Zhao Li¹

¹) Tangdu Hospital, China

Background: Limb-salvage surgery has been widely used for the last several decades, and proved to be an effective way to treat malignant bone tumors. However, long-term complications of the implant and related-bone are unsolved problems. For the pelvic tumors, the situation is worse.

Methods: Instead of en bloc resection of the tumor-bearing bone, it is just dissected from surrounding normal tissues, then devitalized by hyperthermia in situ. After cleared and re-strengthening the dead bone, its mechanical property becomes strong enough to support the weight bearing.

Results : Between May 1992 and March 2010, 719 patients with malignant bone tumors of the extremities, and 252 patients with malignant pelvic tumors were treated by the novel method. The survival rate: over 3-year survival rate was 59.1% for high-grade malignancy, 88.7% for low-grade malignancy, which is nearly compared with the literature reports, but lower complication rate, better functional outcome, simplified surgical process (especially for the pelvic tumors) should be emphasized.

Conclusion: The applying of hyperthermia for treatment of bone tumors is an effective, simple, and inexpensive method. Hyperthermia should deserve more attention than it has received until now, and should be improved by high tech such as design of antenna, 3D monitoring temperature etc.

E-mail (main author): bonetm@fmmu.edu.cn



O11:104

Recycled autograft augmented with vascularised fibular graft for reconstruction of bone defects caused by tumor resection

Yong-Koo Kang¹, Yang-Guk Chung¹, Won-Jong Bahk¹, An- Hi Lee¹, Jeong-Mi Park¹

¹⁾ The Catholic University of Korea, Republic Of Korea

Recycled autograft for reconstruction of skeletal defect by wide resection for the malignant tumors has been widely used in Asian countries. It has the advantages of using the patients' own bone and providing a good skeletal fit. It has neither donor site morbidity nor risks of disease transmission, and the cost of the treatment is expected to be cheaper comparing to other modalities using mega-prosthesis or allograft.

However, recycled autograft is usually mechanically weak and brittle due to devitalizing process. Heat processing, either autoclaving or pasteurization destroys the BMPs as well, and decreases the mechanical properties. It has been reported a disadvantage of long duration of bone union and high incidences of non-union and fracture. To keep the biologic properties within the recycled bone, it is less processing, and then it increases the risk of the tumor cells survival. Actually, there are a few reports of local recurrences due to tumor cells survival within the recycled autograft in spite of devitalizing process. Thus, confident devitalizing process is mandatory.

To minimize the complications of reconstruction using recycled autograft, it may be augmented with vascularized bone graft. The vascularised fibular graft(VFG) provides the immediate restoration of a physiological blood supply and supplementary stability, and then the cellular elements of the grafts can survive to enhance the bone union and support the strength of the recycled autograft.

We evaluated the outcomes of surgical reconstruction using recycled autograft augmented with VFG for bone defects caused by tumor resections.

Twelve patients with malignant bone tumors who were managed with recycled autograft augmented with VFG and followed up minimum 2 years were evaluated for bone union, functional results and complications. The influence of various factors on bone union and functional outcomes were also analysed. Bone union were obtained at 3.7 months at metaphyseal junctions and 8 months at diaphyseal junctions ($P<0.05$). At diaphyseal junctions, younger aged group and intramedullary location group showed earlier bone union ($P<0.05$). The mean functional score was 81%. There were 3 non-unions, 4 delayed unions and 2 recycled bone resorption combined with fractures, although those complications were eventually solved with re-fixation and autogenous bone graft.

In conclusion, recycled autograft for reconstruction should be used for the cases of limited amount of bone destruction, such as tumor contamination of cortical bone due to malignant bone and soft tissue sarcomas.

To obtain excellent results, proper microvascular technique, sufficient length of VFG bridging both junctions, stable internal fixation and proper protection of reconstructed bone until union are necessary.

E-mail (main author): ykang@cmcnu.or.kr



O12:101

Longer Term Follow Up of Compress TKR Fixation

*John Healey¹**¹⁾ Memorial Sloan-Kettering Cancer Center, United States*

Background: Better, more durable prosthetic fixation is needed. Compliant, compression technology is a novel approach that is being used more frequently with high success rates. This study reports the longest prosthetic follow up to date.

Methods: We retrospectively reviewed the Compress® knee replacement prosthesis in 82 consecutive patients 2000-2008. Twenty-five patients were followed for more than 10 years.

Results: The implants retained fixation in 74 and lost fixation in 8. Kaplan-Meier analysis of the fixation showed five-year survivorship of 85% and 10-year survivorship over 80%. Fixation was lost early in four patients during chemotherapy and had poor bone ingrowth, with lack of bone ingrowth at the interface, crumbling fractures adjacent to the implant and prosthetic failure in 5 patients (Type I). Significant osteonecrosis was found in most patient at the time of autopsy. Fractures developed remote to the implant in three cases (Type IIA), and a unique intercalary fracture (Type IIB) occurred in two patients when there was partial integration of bone into prosthesis. The prostheses were retained in both cases of Type II bone failures. Intramedullary bone formation straddles the spindle mechanism in over half of the cases

Conclusion: Compress fixation has the best survivorship of uncemented distal femoral prostheses, and has unique failure mechanisms.

- Compress fixation is versatile and durable
- 10 year survivorship is 80%
- Novel failure mechanisms were found in these patients
- The significance of Intramedullary bone formation is unknown



O12:102

Reconstruction of massive bone defects using compressive osseointegration

Peter Rose¹, Adam Schwartz¹, Christopher Beauchamp¹, Franklin Sim¹

¹ Mayo Clinic, United States

Background: Extensive segmental bone loss and poor bone quality can complicate revision arthroplasty. Highly porous components, cementless fully-coated stems, and cemented techniques have been described. Unfortunately, these devices can be difficult to remove and may result in even greater bone loss if further revision is needed. Compressive osseointegration has been described as an alternative method to achieve fixation. These devices rely upon compressive initial fixation to achieve biological osseointegration over a comparatively short segment of bone. We believe that compressive osseointegration provides predictable, stable endoprosthesis fixation and that osseointegration can be evaluated radiographically.

Methods: We retrospectively reviewed a total of 34 implants in 30 patients. Procedures were performed at two institutions by six surgeons. Data recorded included patient demographics, indications, diaphyseal segment and joint reconstructed, and any complications. The ratio of total cortex width to spindle width measured at the bone-prosthesis interface on most recent followup AP radiograph was compared to the immediate post-operative ratio measured using the same method. Statistical significance was measured using student's T-test.

Results: 28 of 34 implants (82.4%) achieved stable osseointegration at a mean follow-up of 12.3 months (range 0.5-57.4). The cortex/spindle ratio of these increased from .33 (SD 0.9) postoperatively to .53 (SD 0.15) at latest follow-up ($p < .001$). All reported satisfaction and painless function of the operative limb at latest follow-up. A total of 6 implants in 5 patients failed to achieve stable osseointegration. Cortex/spindle ratio of the failures increased .09, however, this was not statistically significant ($p < .11$). 3 failures were revised using compressive osseointegration; 2 achieved stable fixation. There were no deep infections in this series.

Conclusion: Use of compressive osseointegration for reconstruction of massive diaphyseal and segmental bone defects provides reliable short term fixation, and may prove to be bone conserving in cases that require future re-revision. The cortex/spindle ratio reliably increases as osseointegration is achieved.

E-mail (main author): rose.peter@mayo.edu



O13:101

Allografts versus Iliac Crest Autografts as a Bone Void Filler

William Ward¹, Thomas Rusher¹, Fred Dorey¹

¹ Guthrie Clinic, United States

The senior author began practice in 1991 using iliac crest bone graft almost exclusively as a bone void filler; his practice subsequently evolved into utilizing allograft bone almost exclusively as a bone void filler, creating a unique opportunity to compare the rates of success for the two bone graft types.

We reviewed the surgical case registry of the senior surgeon to identify all cases of bone void filler graft for six benign bone tumors treated over a 20 year period. The charts were reviewed to determine the type of graft utilized, the rates of local recurrence and reoperations for aneurysmal bone cysts, chondroblastomas, enchondromas, non-ossifying fibromas, osteoid osteomas and unicameral bone cysts. All were treated with curettage followed by an iliac crest autograft or an allograft. Allograft types utilized included cancellous allograft (C-Allo), corticocancellous allograft (CC-Allo), or a combination of allografts with cortical strips or struts (Combo); the vast majority of allografts were supplemented with demineralized allograft bone matrix.

Preliminary results (evaluating 331 cases) indicate a tumor recurrence rate of 11.8% (26/221) with allografts compared to 14.6% (16/110, $p=n.s.$) with iliac crest autografts and a reoperation rate for allograft bone grafts of 17.2% (38/221) compared to 23.7% (25/110, $p=n.s.$) in the autograft group. Among the allograft groups, the reoperation rate was 39.1% (9/23) in the Combo group compared to 14.1% (17/121) in the cancellous allograft group and 15.6% (12/77) in the corticocancellous group ($p=0.023$). There was no statistically significant difference in the recurrence rates for the different graft types, but there was a trend for a higher recurrence rate in the Combo group (26.1%, 7/23) that was not statistically different ($p=0.136$). Unicameral bone cysts were the most persistent of the tumor types with more recurrences (24/76, 32%) than any other diagnostic group. None of the enchondromas recurred (0/104, 0%).

These findings demonstrate that for these six entities, allograft bone graft performed as well as autograft. The higher reoperation rate with the Combo allograft group is thought to simply be a reflection of the fact that Combo grafts were used primarily in larger lesions with greater bony compromise. These findings support the continued use of allograft bone graft as a bone void filler for the treatment of the six entities studied.

E-mail (main author): Ward_William@Guthrie.org



O13:102

Improving Outcomes in Soft Tissue Sarcoma with Coordinated Surgery and Intensity Modulated Radiotherapy (IMRT)

Jay Wunder¹¹) Mount Sinai Hospital, Univ. of Toronto, Canada

External-beam radiation is frequently used in the local management of soft tissue sarcomas, but preoperative or postoperative treatment differs substantially in short and long term toxic effects. We previously showed in a randomized clinical trial that preoperative radiation is associated with less long-term radiation morbidity and improved long-term functional benefits for patients with extremity soft tissue sarcoma, but compared to post-operative radiation, is also associated with a higher rate of wound healing complications. We devised a study to determine if a coordinated plan of preoperative image-guided intensity-modulated radiotherapy (IMRT) and surgical resection could reduce morbidity, including wound complications, by minimizing the radiation dose to uninvolved tissues in adults with lower extremity soft tissue sarcoma. The risk of wound healing complications was lowered through the use of IMRT, as was the need for tissue transfer for wound closure and the need for subsequent operations for wound complications. Good limb function, a low risk of long term radiation-related complications, and a low rate of local recurrence were maintained through the use of preoperative IMRT. Implementation of a coordinated plan of image guided IMRT and surgery for extremity soft tissue sarcoma may help minimize the risk and severity of complications, and thereby improve patient outcomes.

E-mail (main author): jwunder@mtsina.on.ca

O13:103

What's New in Complex Limb Salvage and Reconstructive Procedures

Nicola Fabbri¹¹) Memorial Sloan-Kettering Cancer Center, United States

Surgery remains the most effective treatment for bone and soft tissue sarcomas. Even in the context of multimodal treatment strategy of high-grade lesions, surgical management is crucial and finalized to gain local control of the disease, which remains a fundamental requirement to undertake curative treatment of sarcomas. Surgical margins directly correlate with local control and risk of recurrence. Less than optimal surgical margins and increased risk of local relapse have been historically associated with management of sacropelvic and spine tumors. Today, an integrated multi-dimension surgical imaging system, usually CT based, is available to assist the surgeon with intraoperative "navigation". While intuitively helpful for orientation in a complex three-dimensional anatomy, this exciting opportunity requires clinical validation in terms of achievement of surgical margins, incidence of local recurrence and perioperative complications, and overall cost-effectiveness. Adequate length of follow-up and scientific rigor will be crucial in order to assess these variables and refine indications to intraoperative navigation. Technology is also providing opportunities for improved bone fixation and implant longevity in a variety of different methods. In fact, new foam metal-based implants, have been associated with remarkable bone ingrowth and excellent clinical results, including a post-radiation setting. Improved manufacturing of CT-based, precise-fitting custom implants incorporating porous structure to enhance fixation in critical areas, is also today possible. Interesting appears also the availability on the market of new carbon fiber devices for fracture and prophylactic fixation as an alternative to conventional metal, either stainless steel or titanium. While offering comparable, if not superior, biomechanical properties, carbon fiber-PEEK composite implants are completely radiolucent and associated with essentially no artifacts on CT and MRI imaging. Again, adequate clinical validation is required to fully understand the real impact of these new opportunities in surgery of musculoskeletal tumors.

E-mail (main author): fabbrin@mskcc.org



PSR:101

Treatment of periprosthetic fractures in patients treated with a megaprosthesis after resection of a malignant bone tumour.

Sebastian Bockholt¹, Arne Streitbürger¹, Georg Gosheger¹, Jendrik Harges¹, Markus Nottrott¹, Marcel-Philipp Henrichs¹, Helmut Ahrens¹

¹) Münster University Hospital, Germany

Background:

While tumour endoprosthetic reconstruction is the most common treatment after large segmental bone defects after tumour resection for primary and secondary bone tumours, periprosthetic fractures are extremely rare. However, accompanying chemotherapy, local radiation and long periods of none weight bearing are compromising the bone quality significantly in a high percentage of patients. The treatment of periprosthetic fractures in tumour patients is extremely demanding. Osteosynthesis often fails due to the reduced bone quality and consolidation potential.

Methods:

During January 2000 and Dezember 2012 we analysed 31 patients with periprosthetic fractures after tumour resection followed by reconstruction with megaendoprostheses. Initial diagnosis was predominantly primary high grade sarcoma, although 4 patients had bone metastasis of carcinoma. Chemotherapy was administered in 25 and local radiotherapy in 10 patients. The average patient age was 37,0 years. Fracture site was the humerus in 6, the femur in 16 and the tibia in 9 cases.

Results:

Fracture occurred after a medium of 18.0 months after initial implantation. Cause of fracture was adequate trauma in 10 patients and inadequate in 21 patients (5x caused by tumour recurrence). Plate osteosynthesis was possible in 5 patients only. In 22 patients an exchange of the implant with an average bone loss of 7 cm (range 2-25 cm) was necessary. In 5 cases an additional joint replacement (2 x elbow joint, 3 x hip joint) was performed due to the absence of sufficient bone stock for a stem implantation. Recurrent sarcoma led to amputation in 2 cases. Complications were 2 periprosthetic infections requiring a two stage revision. One non-union after osteosynthesis was treated with an additional implant exchange.

However, finally all patients with limb salvage achieved full weight bearing in the latest follow up examinations.

Conclusion:

Periprosthetic fractures in patients treated with tumourprosthesis are demanding. The common goal of treatment should always be the preservation of as much bone as possible for further revisions and an assessment of risks and benefits.

E-mail (main author): SebastianBockholt@gmx.de



PSR:102

Malignant bone tumors of the pelvis - biological reconstruction after surgical therapy

Frank Traub¹, Dimosthenis Andreou¹, Maya Niethard¹, Carmen Tiedke¹, Mathias Werner¹, Per-Ulf Tunn¹

¹) HELIOS-Klinikum Berlin Buch, Germany

Surgical treatment of malignant pelvic bone tumors can be very challenging. The objective of this retrospective study was to evaluate the oncological as well as the clinical and functional outcome after limb salvage surgery and biological reconstruction.

Methods: The files of 27 patients with malignant pelvic bone tumors, who underwent surgical resection at our department between 2000 and 2011, were retrospectively analyzed (9Ewing's sarcoma, 7 Chondrosarcom, 4 Osteosarcoma, 1 Synovial sarcoma, 1 Malignant fibrous histiocytoma and 4 carcinoma metastases).

Results: After internal hemipelvectomy reconstruction was performed by hip transposition (n=16), using autologous non-vascularised fibular graft (n=5) or autologous iliac crest bone graft (n=2). In four patients a femoral respectively a total hip prosthesis was implanted at the time of resection. The median follow-up was 33 months. 2 and 5 year disease-specific survival rates of all patients were 86.1% and 57.7% respectively. The mean functional MSTS score was 16.5 (~55%) for all patients.

Conclusion: On the basis of the oncological as well as the clinical and functional outcome, biological reconstruction after internal hemipelvectomy seems to be a reliable technique for treating patients with malignant pelvic bone tumors.

E-mail (main author): frank.traub@helios-kliniken.de



PSR:103

Intra-abdominal and retroperitoneal metastases in patients with soft tissue sarcomas - a two-center study

Angelika Schaffler¹, Angelika Schaffler¹, Dimosthenis Andreou², Per-Ulf Tunn², Joanna Szkandera¹, Max Zacherl¹, Andreas Leithner¹

¹) Medical University Graz, Austria ²) Helios Klinikum Berlin-Buch, Germany

Background: Intra-abdominal and retroperitoneal metastases are rare in patients with soft tissue sarcomas. The objective of this study was to evaluate the incidence of metastatic disease in these locations and to determine the optimal diagnostic approach.

Methods: The files of 613 patients with soft tissue sarcomas arising outside the abdominal cavity treated with curative intent between 2000 and 2009 were retrospectively analyzed. Mean follow-up amounted to 58 months (range, 3-148 months) for all patients and 70 months (range, 24-148) for surviving patients who did not develop any metastatic disease. Fisher's exact test was used to compare unrelated samples. 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: 31 patients (5.1%) developed intra-abdominal or retroperitoneal metastases after a mean follow-up of 18 months (range, 1-100 months). 12.8% of patients with myxoid liposarcoma developed intra-abdominal or retroperitoneal metastases, compared to 4.4% of patients with other histologies, a difference which was statistically significant ($p = 0.025$). There were no significant differences in mean tumor size between patients who did and did not develop intra-abdominal or retroperitoneal metastases (9.8 vs. 8.9 cm, $p = 0.124$). The presence of metastases was discovered in routine tests in 26 of the 31 patients, while only 3 patients presented outside routine follow-up with abdominal pain, which led to the diagnosis of metastatic disease. There were no statistically significant differences in post-metastasis survival between patients who developed intra-abdominal or retroperitoneal metastases and patients who developed metastases in other localizations (25% vs. 34% at 5 years, $p = 0.297$).

Conclusion: Patients with myxoid liposarcoma appear to have a higher risk for developing intra-abdominal or retroperitoneal metastases, compared to patients with other soft tissue sarcoma subtypes. As metastatic disease in these locations appears to be usually diagnosed in routine follow-up prior to the development of specific symptoms, routine imaging of the abdominal cavity of patients with myxoid liposarcoma during follow-up seems to be justified.

E-mail (main author): a.j.schaffler@gmail.com



PSR:104

The use of modular Tumourprotheses in the Treatment of skeletal Metastases

Marcel-Philipp Henrichs¹, Arne Streitbürger², Georg Gosheger³, Sebastian Bockholt³, Wiebke Guder³, Markus Nottrott³, Jendrik Harges³

¹) University Hospital Münster ²) General Orthopaedics/ Tumourorthopaedics ³) General Orthopaedics / Tumourorthopaedics, Germany

Background:

Due to advancements in the treatment of carcinomas more patients reach the stage of bone metastases and survive several months or years in that stage. Thus the surgical treatment of bone metastases gets more important. One of the main aims of the surgical treatment is a long lasting reconstruction which survives the patient. Aim of this retrospective study was to evaluate the oncological outcome, treatment related complications and function after resection of metastases and reconstruction with modular tumourprotheses.

Methods:

All patients were traced by our tumour database. Patient files were reviewed for clinical information. Additional information has been obtained using a questionnaire including the MSTS-Score. Between 1993 and 2008 we performed resection of metastases and implantation of a tumourprotheses in 82 cases (80 patients, 30 female, 50 male).

Results:

The average age of the patients was 63 years. Most common primary tumours were renal cell carcinoma (46.7%), breast-cancer (21.3%) and lung cancer (7.5%). The proximal femur was affected in 45.1%, followed by the proximal humerus (25.6%) and the distal femur (17.1%). In 22 cases the tumourprosthesis was implanted as a revision due to local tumor recurrence or failure of the former osteosynthesis.

The mean survival after the operation was 2.9 years. The survival rate was 70% at one year, 20% at five years. The implant survival was 83% after one year and 74% at five years. The overall rate of operative revisions was 18%. Function and patients' contentment after operation is good (MSTS-score: upper extremity 67%, lower extremity 63%).

Conclusion:

We show that the implantation of modular tumourprotheses can be an appropriate treatment for bone metastases. This operation has a low complication rate, patients rapidly gain a good function. Consistent with recent literature resection of the affected bone leads to an improvement of survival, especially in single metastases. Compared to other osteosynthetic devices the event free survival of the tumourprosthesis is high. Thus, even regarding the implant related costs, implantation of modular tumourprotheses might be the better option.

E-mail (main author): marcelphilipp.henrichs@ukmuenster.de



PSR:105

COMPLICATIONS ASSOCIATED WITH THE ARTIFICIAL BONE GRAFT SUBSTITUTE €žGeneX€

Ulrike Pirker-Frühaufl, Jörg Friesenbichler¹, Patrick Sadoghi¹, Werner Maurer-Ertl¹, Christian Weger¹, Koppany Bodo¹, Andreas Leithner¹

¹) Medical University Clinic Graz, Austria

Background: Artificial bone graft substitutes like GeneX, a tricalciumphosphate-calcium - sulphate - compound, are widely used to refill bone defects after curettage of benign tumours. At our clinic we observed severe postoperative complications after initiation of GeneX.

Methods: We designed a prospective single cohort study with 40 patients with bone tumours who should receive curettage and defect filling with GeneX. Due to serious postoperative complications the study had to be stopped after inclusion of 31 patients (11 male, 20 female). Mean age at operation was 40-years (range, 6-71). The lesions were located in the proximal humerus (9), the femur (7), the tibia (3) or fibula (2) and the small bones of hand (8) or foot (2). The tumour entities included 17 enchondroma, five simple/juvenile bone cysts and nine other benign bone lesions.

Results: Five out of 31 patients (16%) developed serious complications following surgery and GeneX refilling. Three presented sterile inflammation adjacent to GeneX and two developed inflammatory cystic formations (up to 15cm) in the soft tissue with time dependant growth regression. Of those three patients with sterile inflammation, two showed delayed wound healing and local pain, and the third needed revision due to severe skin damage.

Conclusion: In the current series, GeneX caused severe soft tissue inflammation and pain. Therefore, surgeons should be warned not to place this artificial bone graft substitute next to thin walled structures (erosion!), and further, to seal fenestrated bone carefully after curettage and defect filling. We state the notion that general mandatory detailed safety testing of artificial bone graft substitutes should be performed before market launch.

E-mail (main author): pirkerfr@hotmail.com



PSR:106

Malignant Pelvic Resections - The Blood (patient's), Toil & Sweat (surgeon's): Is it worth the effort?

Ajay Puri¹, Ashish Gulia², Manish Pruthi²

¹⁾ Tata Memorial Hospital ²⁾ TMH, India

Aim: Purpose was to evaluate morbidity, oncologic results and functional outcome in patients with malignant tumors of the pelvis treated with limb sparing resection.

Methods: Between March 2002 and November 2010, 106 cases of malignant pelvic tumors were treated with limb sparing resections of pelvis. Diagnosis was chondrosarcoma in 65, Ewing's sarcoma in 25, osteogenic sarcoma in 10, synovial sarcoma in 3, malignant fibrous histiocytoma, epithelioid sarcoma, and epithelioid hemangiothelioma in 1 each. Three patients had an erroneous pre-operative diagnosis of benign tumor and underwent intralesional excision; these were excluded from analysis. Remaining 103 patients underwent limb sparing resections with intent to achieve tumor free margins. Thirty eight patients had resections which did not involve the acetabulum and 64 had resection involving acetabular dome. Reconstruction was required in only 2 patients in whom resection did not involve acetabulum. For resections involving acetabulum various methods of reconstructions were used including pseudarthrosis, arthrodesis, extra corporeal radiotherapy – reimplantation and pelvic prostheses.

Results: Surgical margins were free in 83 patients and involved in 20. There were 3 peri-operative mortalities. Most common complications were wound related. Totally, complications were seen in 51 out of 103 patients (49%). Surgical intervention for complications was required in 26 patients (25%). Ten patients (9.7%) had a permanent complication related sequel, 9 had nerve palsy and 1 patient had a persistent sinus. 89 patients were available for follow up. The follow up in all patients ranged from 0 to 117 months (median 34 months). Nineteen patients (21.3%) developed a local recurrence. Fifty-eight patients are currently alive. Median follow up of survivors was 50.5 months (17-117 months). Overall survival at 5 years was 65.9% and disease free survival was 58%. Musculo Skeletal Tumor Society functional score was better in patients with acetabular dome sparing resection (90%) as compared with dome sacrificing resections (71.6%).

Conclusion: Though complex and challenging, surgery provides good local control and oncologic outcomes with acceptable function in these patients.

E-mail (main author): docpuri@gmail.com



PSR:107

Incidence and distribution of chordoma: A study analysing data from the "Surveillance, Epidemiology and End Results" program.

Stefan Gerger¹, Andreas Leithner², Regina Riedl², Bernadette Liegl-Atzwanger², Beate Rinner²

¹) Medical University of Graz ²) Med. Univ. Graz, Austria

Background:

Only a few studies exist that describe the frequency distribution and incidence of chordoma, a rare tumor originating from remnants of the notochord. Apart from single-institution case series there are two bigger population-based surveys analyzing a number of 400 (National Cancer Institute, 1973-1995) and 409 (California Cancer Registry, 1989-2007) cases. With the use of the most recent dataset from the Surveillance, Epidemiology and End Results (SEER) program of the National Cancer Institute we conducted a retrospective analysis calculating distribution and age-adjusted incidence rates for 706 cases of microscopically confirmed chordoma from 2000 to 2009.

Methods:

The Surveillance, Epidemiology and End Results program combines the information of 18 registries throughout the United States covering approximately 28% of the population. The WHO's "International Classification of Diseases for Oncology, 3rd Edition" morphological Codes for chordoma (9370/3 chordoma NOS, 9371/3 chondroid chordoma, 9372/3 dedifferentiated chordoma) were used to identify and include relevant cases. With the help from the SEER*Stat statistical software, we calculated frequencies and age-adjusted incidence rates and analyzed them by gender, age, race, and primary site of presentation.

Results:

The 706 cases are composed of 654 chordomas not otherwise specified, 46 chondroid chordomas and 6 dedifferentiated chordomas. The overall age adjusted incidence rate for chordoma is 0.09 per 100,000 and concerning gender it is higher in males (0.11/100,000) than in females (0.07/100,000; rate ratio: 0.61). The median age at diagnosis is 57 (range: 0-91) and the incidence rates increase with age. In blacks the incidence rate is with 0.03/100,000 significantly lower than in whites (0.10/100,000). Hispanics have a chordoma incidence rate of 0.08/100,000 in comparison to a rate of 0.09/100,000 in non-Hispanics. The distribution of the primary site of presentation is as follows: Cranial (42%, n=300); spinal (26%, n=182); sacral (30%, n=212); extra-axial, non categorizable and unknown site (2%, n=12).

Conclusion:

With the use of the latest Surveillance, Epidemiology and End Results data (SEER18), which has been released at the end of spring 2012, this study provides substantial and up-to-date information on distribution and incidence patterns of chordomas in the United States.

E-mail (main author): stefan.gerger@gmail.com



PSR:108

Laparoscopic assisted resection of an ileosacral chondrosarcoma

G. Ulrich Exner¹, Marc Possover², Plamen Kostov², Kurt Uehlinger¹

¹) orthopaedie zentrum zuerich ²) Possover Center Hirslanden, Switzerland

Rationale:

According to contributions of Yonamine we have begun to resect sacral tumors with video-laparoscopic exposure of the anterior structures.

Patient:

A 33year old woman 6 weeks after her second normal vaginal delivery complained of lumbosacral dysesthesia. Imaging showed a mass of the sacrum crossing the ileosacral joint suggestive of a chondrosarcoma, after biopsy graded G1, calculated volume 700 cc.

Technique:

The procedure was performed in an unstable lateral decubitus starting with the anterior laparoscopic exposure of the os sacrum and the right pelvic sidewall by passing through right pararectal space and full mobilization of the rectum from the promontorium downwards to the pelvic floor. After transection of the sacral hypogastric fascia, the medial and caudal limits of the tumor and as well as the sacral nerve roots were identified. The sacral nerve roots L5 - S2 attached on the tumor, while S3 and S4 were free. Full exposure of the pelvic ureter followed by the coagulation and transection of the internal iliac and the lateral sacral vessels. All cardinal vessels below the tumor were also transected including the pudendal and inferior gluteal vessels. The dissection of the lumbosacral space enabled the exposure of the lateral limits of the tumor and identification of both the obturator nerve and the sciatic just before it entry through the great sciatic foramen. 2 Gigli saws were inserted from anterior to posteriorly, one through foramina L5 and S1, the other through S1 and S4 for transection of the sacrum under visual endoscopic control. The resection of the ileum was performed in analogy to a Judet approach externally.

For reconstruction the defect was replaced with a massive allograft and stabilisation performed by lumbo-ischial screw and rod fixation.

The total blood loss was judged to be about 1000 cc; the total replacement were 2 units of blood.

Results:

Pathologic examination showed uncontaminated margins.

Conclusion:

We have got the impression, that the anterior video-laparoscopic approach presents several advantages by giving a superior view, higher precision and decreased blood loss for tumors in this anatomical difficult location of tumors.

E-mail (main author): guexner@gmail.com



PSR:109

Returning to life after treatment end: quality of life in survivors of osteosarcoma of developmental age

Laura Veneroni¹, Cristina Meazza², Primo Daolio³, Roberto Luksch², Carlo Alfredo Clerici², Stefano Bastoni³, Fabio Giardina³, Graziella Cefalo⁴, Maura Massimino²

¹) University of Milan ²) Fondaz IRCCS Istituto Nazionale Tumori ³) C.O.O, Istituto Ortopedico G. Pini, Mila ⁴) Ospedale San Paolo, Milano, Italy

Background

Tumors in developmental age can bring psychological development and quality of life issues. Typically osteosarcoma affects mainly adolescents at a critical stage of their mental and physical growth. When treatment ends, eventual psychosocial problems related to the experience of illness and its sequelae may remain undetected. Clinical experience suggests that some surviving patients missing important evolutive stages (i.e. relationships, working identity, planning future). Others, on the contrary, can achieve adequate adaptation level and even demonstrate a greater strength than healthy peers in proposing high goals. The factors predicting the variability of outcome are still unclear. The personality, that defines the psychological and behavioral variability between people, is stable throughout life and can be a useful indicator of long-term functioning.

This study aims to assess the quality of life and the personality features in surviving patients treated for childhood osteosarcoma.

Methods

The study enrolled patients treated at the pediatric oncology unit of the Fondazione IRCCS National Cancer Institute and Pini Hospital in Milan. Patients were at least eighteen years old and had completed treatment at least from five years. Data collection begun in September 2011. The following self-report questionnaires were delivered during the follow-up visits or sent by mail: TESS, SF-36, QOL-CS, Big Five Questionnaire, SCL-90.

Results

Until now, 19 questionnaires were completed. Results highlight that quality of life is general adequate, but 5 (26%) of these guys have dropped out of school or do not yet have a job, 3 patients were followed over the years in a course of psychotherapy and a girl, after the completion of the questionnaire, asked us psychological support.

Conclusion

The long-term adjustment of cancer survivors is an important area of clinical intervention. Preliminary results suggest that in some cases a normal life return can be complicated. Quality of life should be evaluated during follow-up to identify situations may need a support/intervention.

E-mail (main author): laura.veneroni@unimi.it



PSR:110

Elevated preoperative neutrophil/lymphocyte ratio is associated with poor prognosis in soft-tissue sarcoma patients

Joanna Szkandera¹, Gudrun Absenger¹, Bernadette Liegl-Atzwanger¹, Martin Pichler¹, Zacherl Maximilian¹, Samonigg Hellmut¹, Stojakovic Tatjana¹, Gerger Armin¹, Andreas Leithner¹

¹) Medical University of Graz, Austria

Background: Recent data indicate that tumour microenvironment, which is influenced by inflammatory cells, plays a crucial role in cancer progression and clinical outcome of patients. In the present study we investigated the prognostic relevance of preoperative neutrophil/lymphocyte (N/L) ratio on time to tumour recurrence (TTR) and overall survival (OS) in soft-tissue sarcoma (STS) patients who underwent curative surgical resection.

Methods: 260 STS patients were included in this retrospective study. Kaplan Meier curves and multivariate Cox proportional models were calculated for TTR and OS.

Results: In univariate analysis, elevated N/L ratio was significantly associated with decreased TTR (HR, 2.340; 95%CI, 1.286-4.259; p=0.005) and remained significant in the multivariate analysis (HR, 2.183; 95%CI, 1.191-4.003; p=0.012). Patients with elevated N/L ratio showed a median TTR of 78.7 months. In contrast, patients with low N/L ratio had a median TTR of 99.8 months. Regarding OS, elevated N/L ratio was also significantly associated with decreased survival in univariate analysis (HR, 2.896; 95%CI, 1.810-4.634; p=0.001) and remained significant in multivariate analysis (HR, 2.615; 95%CI, 1.616-4.231; p=0.001).

Conclusion: In conclusion, our findings suggest that an elevated preoperative N/L ratio predicts poor clinical outcome in STS patients and may serve as a cost-effective and broadly available independent prognostic biomarker.

E-mail (main author): joanna.szkandera@medunigraz.at



T1:101

The way tumor specimens get handled by pathology after the leave the operating theatre

Scott Nelson¹

¹⁾ University of California, United States

Extensive preoperative planning takes place prior to resection of bone and soft tissue tumors. After being removed from the operating theatre, what happens to the tumor often becomes a so called "black box" of unknown events occurring in the pathology laboratory. Understanding that the pathologic examination of the specimen is very important, a discussion of common inadequate as well as proper techniques are discussed, to ensure accurate diagnosis as well as evaluation of surgical margins.

E-mail (main author): SDNelson@mednet.ucla.edu



T1:102

The Molecular Biology of Neoplasms

Shekhar Kumta¹, KC Wong¹, Carol Lau¹, Linda Huang¹

¹⁾ The Chinese University of Hong Kong, Hong Kong

The underlying basis of all neoplasms is a molecular-genetic abnormality that affects the basic cell cycle regulatory mechanism. At a molecular level many sarcomas may be characterized on the basis of their specific molecular aberrations – these include somatic mutations, intergene deletions, gene amplifications, and translocations. Characterization of these tumors based on this signature is expected to improve diagnostic capabilities and provide important predictive and prognostic information.

The cell-cycle related changes that arise as a result of these molecular-genetic aberrations not only explain the patho-physiological changes that arise, but may represent opportunities for specific and targeted therapies.

Molecular markers may help to identify subsets of patient populations that are likely to benefit from a selection of therapeutic choices.

In this presentation we attempt to synthesize currently available knowledge in the context of the altered molecular signaling mechanisms at the cell cycle level that present novel and significant opportunities for understanding the prognosis, treatment choices for sarcomas.



T1:103

Updates on Classification and Grading of Bone and Soft Tissue Tumors

Scott Nelson¹

¹⁾ University of California, United States

The most recently published edition of the WHO Classification of Tumors of Bone and Soft Tissue Tumors contains several significant changes that are of importance to both pathologists and treating physicians. The most important updates are discussed.

E-mail (main author): SDNelson@mednet.ucla.edu



T2:101

TRIAL FOR OPTIMAL SURVEILLANCE IN SARCOMAAjay Puri¹, A Gulia²¹) Tata Memorial Hospital ²) TMH, India**Purpose:**

Modern multimodality therapy has improved patient survival ; hence follow-up surveillance strategies are becoming increasingly important with significant clinical and fiscal implications. However, the ideal postoperative protocol vis a vis frequency and appropriate screening modalities for bone and soft tissue sarcomas (BSTS) remains ill-defined.

A prospective randomized controlled trial to evaluate the impact on overall survival of an intensive follow-up protocol (as practiced today) against a more cost effective follow-up protocol in patients operated for extremity BSTS was conducted at our institute.

Method:

Five hundred patients non metastatic at presentation who were operated for primary or recurrent extremity sarcomas (both limb salvage and amputations) were recruited between Jan 2006 and June 2010. They were stratified as (i) Bone or soft tissue sarcomas (ii) High or low grade tumors and (iii) Size < / > 8 cm for bone and < / > 10cm for STS. They were randomised into 4 groups (1)- Intensive 3 monthly follow-up (2) - Intensive 6 monthly follow-up (3) - Cost Effective 3 monthly follow-up (4) - Cost Effective 6 monthly follow-up. The primary end point was overall survival and secondary endpoint was disease free survival (local or distant relapse).

Results:

Early results indicate that increased frequency of surveillance does not seem to significantly impact on either earlier recognition of relapse or overall survival. (DFS p= 0.676, OS p= 0.557). Though increased intensity of surveillance may identify earlier recognition of relapse in bone sarcomas it does not significantly impact on overall survival. (DFS p= 0.012, OS p= 0.555)

Conclusion:

Thus in recurrent sarcomas, it is likely that in the majority of cases the outcome and efficacy of salvage treatment is determined more by inherent tumor biology rather than the treatment itself

E-mail (main author): docpuri@gmail.com



T2:102

The clinical value of pretreatment C-reactive protein in predicting survival of patients with bone sarcoma

Tomoki Nakamura¹, Robert Grimer², Czar Gaston², Munenori Watanuki³, Akihiro Sudo¹, Lee Jeys²

¹) Mie Univ. Graduate School of Medicine, Japan ²) The Royal Orthopaedic Hospital, United Kingdom ³) Tohoku Univ. Graduate School of Medicine, Japan

Background: Elevated preoperative serum C-reactive protein (CRP) levels are found in a variety of cancers and an elevated pretreatment CRP level is an indicator of a poorer prognosis in many cancers. Elevated CRP levels have also been shown to be a poor prognostic factor in patients with soft tissue sarcoma. The purpose of this study was to determine whether serum CRP levels before treatment predicted the disease-specific survival and local tumor control in bone sarcoma patients. **Patients:** A total of 318 primary bone sarcoma patients between 2003 and 2010 were retrospectively reviewed at single institution (U.K). Patients that presented with metastases and/or local recurrence at diagnosis were excluded from this study.

Results: Elevated CRP levels were seen in 84 patients. The tumor size, tumor histological grade and tumor stage in the patients with elevated CRP levels were significantly higher than those in patients with normal CRP levels. Patients with elevated CRP levels prior to initial treatment had a poorer disease-specific survival (57% at 5 years) than patients with normal CRP levels (79% at 5 years) ($p < 0.0001$). Patients with elevated CRP levels prior to initial treatment had a poorer local recurrence-free rate (71% at 5 years) after initial treatment than patients with normal CRP levels (79% at 5 years) ($p = 0.04$). Multivariate analysis also showed the preoperative CRP level to be an independent predictor of survival and local control. Individually, pre-treatment CRP levels were prognostic factor for disease free survival in chondrosarcoma and Ewing sarcoma but not osteosarcoma and for local control in osteosarcoma.

Conclusion: Our studies suggested that elevated pretreatment CRP levels may be related to aggressive tumor behavior. We recommend routine measurement of CRP levels in patients with bone sarcoma because this test is familiar to most physicians and is readily accessible.

E-mail (main author): tomoki66@clin.medic.mie-u.ac.jp



T2:103

Post relapse survival in patients with Ewing sarcoma

Stefania Di Girolamo¹, Emanuela Palmerini², Roberto Luksch³, Franca Fagioli⁴, Angela Tamburini⁵, Marilena Cesari², Amelia Tienghi⁶, Abate Massimo², Ferrari Stefano²

¹) Istituto Ortopedico Rizzoli ²) IOR, Bologna ³) INT, Milano ⁴) OIRM, Torino ⁵) Meyer, Firenze ⁶) Oncol. Dept. Ravenna, Italy

Background: Post-relapse survival (PRS) in Ewing sarcoma (EWS) is very poor, with less than 15% probability of survival at 5 years in historical series.

The PRS was evaluated in a selected population of patients with EWS treated according ISG/SSG 3 (non metastatic EWS) and ISG/SSG 4 (metastatic EWS) protocols.

Methods:

EWS patients treated in ISG centers according to ISG/SSG 3 and 4 protocols who relapsed after complete remission (by surgery and/ or radiotherapy) were include into the analysis. Data for the analysis were in part prospectively collected and stored in the ISG database and in part were retrieved from clinical charts.

Results:

Data from 72 ISG/SSG 3 EWS patients and 21 patients who relapsed after completion of ISG/SSG 4 protocols were available for the analysis.

49 (53%) of patients had previously received high-dose chemotherapy (HDCT) with busulfan and melfalan.

Median relapse free interval (RFI) was 16 months in ISG/SSG 3 and 17 months in ISG/SSG 4.

Treatment at 1st relapse was: standard dose chemotherapy in 45 (49.5%) patients; HDCT in 24 (26%); palliative treatment in 19 (20.5%) and surgery only in 5 (5%). Three patients died of treatment-related toxicity.

With a median follow-up of 24 months (1-64), the 3-year post-relapse survival (PRS) was 21% in ISG/SSG 3 and 26% in ISG/SSG 4.

In ISG/SSG 3, 3-year PRS was better for patients with a lung only relapse (48%) and a RFI > 2 years (51%).

3-year PRS was 33% (95%CI 13-54) for patients treated with HDCT and 22% (95%CI 6-39) for those who received standard dose chemotherapy.

Conclusions: Pattern of recurrence and RFI are the main factors influencing PRS in EWS. A 3-years PRS >30% can be expected when HDCT can be given at the time of recurrence.

E-mail (main author): stefania.digirolamo@ior.it



T2:104

Treatment and outcome of soft tissue sarcomas in the elderly and the very elderly: an analysis of 282 patients

P Lechler¹, T Cosker², A Gulati², D Whitwell², H Giele², S Trent², N Athanasou², CLMH Gibbons²

¹) Nuffield Orthopaedic Centre ²) Oxford Sarcoma Service, United Kingdom

Background

Considering the global phenomenon of population aging, the oncologic treatment and outcome of malignancies in the elderly population is of epidemiological and media interest. There exists little knowledge of the clinical course of the elderly and very elderly patients following the surgical resection of soft tissue sarcomas.

Methods

We retrospectively analysed the clinico-pathologic data of 282 consecutive patients (167 male, 115 female) aged 60 years or above, who were treated operatively for soft tissue sarcomas in a single centre between January 1997 and December 2012. Detailed histological findings, tumour grade, pre-operative staging, operative and adjuvant therapeutic measures, resection margins, recurrence and complications, as well as overall survival rate were documented. Subgroup analysis for the 'elderly' (60 to 80 years, n=225) and the 'very elderly' (≥ 80 years, n=57) was also performed.

Results

The mean age of the elderly subgroup was 69.2 years compared to 84 years in the very elderly patients. At a mean follow up of 55 months (range: 2 to 193), there were no significant differences in the distribution of tumour grade/stage, applied therapeutic measures, complications or recurrence rates between the groups. The most common tumour in either of the groups was liposarcoma. Overall, there were 124 patients with grade I, 43 patients with grade II, and 115 patients with grade III tumours. A total of 33 local recurrences (11.7%) were observed with 26 cases (11.6%) in the elderly group compared to 7 cases (12.3%) in the very elderly ($p>0.05$). Surgical revision for any reason was undertaken in 17.0% patients (n=48), however elderly patients were more likely to receive revision surgery (n=41, 18.2%) compared to the very elderly (n=7, 12.3%). The mean overall survival in the very elderly patients was 64.9% compared to 81.3% in the elderly but when the survival rate was corrected for sarcoma-independent deaths, there was no significant difference between the groups ($p>0.05$).

Conclusion

The results of the present study indicate good to excellent local disease control and overall survival in surgically treated elderly and the very elderly patients with soft tissue sarcomas.

E-mail (main author): phillechler@aol.co.uk



T2:105

Negative prognostic factors in the treatment of Epithelioid Sarcoma

Davide Donati¹, Luca Cevolani¹, Tommaso Frisoni¹, Chaeronlap², Banjobe², Marco Gambarotti¹

¹) Rizzoli, Italy ²) , Thailand

Background

Epithelioid Sarcoma (EPS) is a rare malignant tumor involving the distal portion of soft tissue of the limbs. Most of the cases recur involving the nodes leading the patient to death. The aim of the study is to review the Rizzoli series outlining possible negative prognostic factor related to the course of EPS.

Methods

From 1979 to 2007, 44 patients presented with diagnosis of EPS, followed at least 3 years (mean 10, range 3-34) unless premature death. The series include 34 male and 10 female with a mean age of 35 years (range 13-82). Location was the upper limb in 27 patients and the lower in 17, in 33 patients the tumor was distal to the elbow or the popliteal fossa, while in 11 was superior. Thirty-one were classified as normal type an, 9 proximal type; in four cases the pathology material was insufficient for a further classification. The diagnosis was immunohistochemically confirmed testing INI1, vimentin, cytokeratin, CD34 and EMA. In 7 patients antineoplastic chemotherapy and in 17 radiotherapy was associated to surgery.

Results and Conclusion

The overall survival resulted 58%. Ten out of 44 patients with metastasis at presentation died of disease after 24 months average (from 6 to 127). The remaining 34 patients after a mean follow-up of 119 months (range 15-313) resulted with no evidence of disease in 21, in treatment for recurrence of disease in 3 and deceased of disease in 10. Of these 34 patients, 30 received as a first treatment inadequate excision. After the first treatment 16 patients remained free of disease, the other 18 had globally 47 recurrences (range 1-5) and 8 of them ended in amputation. The distal location in the limb had a better prognosis than proximal, while the proximal type had a bad one than the normal type. The use of adjuvant therapies and age didn't show influence for illness course. EPS is a rare soft tissue with high recurrence rate and, inadequate first surgical treatment. Patients with metastasis at presentation, with tumor located proximally in the limb and the histology proximal type resulted with worst prognosis.

E-mail (main author): davide.donati@ior.it



T2:106

Necrosis and vascular invasion identifies high-risk small soft tissue sarcomas

Emelie Styring¹, Linda Hartman¹, Mef Nilbert¹, Pehr Rissler¹, Anders Rydholm¹, Fredrik Vult von Steyern¹

¹) Lund University, Sweden

BACKGROUND:

Soft tissue sarcomas (STS) are a heterogeneous group of malignant tumors with varying propensity for metastasis. Overall, small STS (≤ 5 cm) have a good prognosis. There are, however, tumors that do metastasize. We analyzed risk-factors for metastasis in a cohort with small STS in order to investigate if high-risk tumors may be identified at diagnosis and hence may qualify for adjuvant treatment trials.

PATIENT SELECTION:

239 adult patients with ≤ 5 cm STS tumors of extremities or trunk wall were identified in our population-based register. 8 had metastatic disease at diagnosis and 1 patient with localized disease was never operated. 230 patients were included. Uni- and multivariate analysis cox regression analysis were performed to identify risk factors for metastatic disease at 5 years.

RESULTS:

24/230 cases developed metastasis; none with grade 1 or 2 tumors (4-grade system) metastasized and they were therefore excluded from further analysis. In the high grade group the presence of either necrosis or vascular invasion was associated with a 3-fold increased risk of metastatic disease (95% CI 1-7). If both risk factors were present the HR was 11 (95% CI 4-31). Nearly half (8/18) of the patients with tumors revealing both vascular invasion and necrosis developed generalized disease.

DISCUSSION & CONCLUSION:

Necrosis and intratumoral vascular invasion (which can be assessed on routine H&E stainings) have been shown to be prognostic factors in STS in general but have not been investigated specifically in small STS which are considered to have a good prognosis. We found that the presence of tumor necrosis and vascular invasion implied a high risk for metastatic disease also in small sarcomas.

E-mail (main author): emelie.styring@med.lu.se



T2:107

Is death within one year of diagnosis an indicator of delay in presentation for patients with Sarcomas?

Krishna Reddy¹, Rajpal Nandra¹, Robert Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom

The reduction in one-year mortality over the last 20 years in major cancer groups has not been seen in Sarcoma patients. There has been little improvement since the introduction of neo-adjuvant chemotherapy. It is generally considered that death within one year of cancer diagnosis is related to advanced stage at diagnosis, multiple comorbidities or complications of treatment. Sarcomas can present late with protracted duration of symptoms and large size at diagnosis. This study investigates prognostic factors and whether a delay in presentation affects one-year mortality.

4945 newly diagnosed patients identified from a prospectively recorded, single institution oncology database of which 595 (12%) died within one year. Patients alive at one year reported a longer duration of symptoms compared to those who died (median 24 weeks vs. 20 weeks; $P < 0.020$). Times from referral to diagnosis were comparable. A number of factors have been identified in both soft tissue and osteosarcomas. High histological grade (odds ratio 5.88 $P < 0.001$) and synchronous metastasis (odds ratio 4.71 $P < 0.001$) led to poorer outcomes. Using a Cox-proportional analysis model patient's age, tumour size, metastasis at diagnosis and histological grade were most influential. Where patients died within 1 year, 76% staged TNM 3 or above (HR =4.1).

One-year mortality is easy to measure and well reported. It has now become a proxy for early or late presentation and a performance indicator. It is possible to predict the risk of one-year mortality using factors available at the time of diagnosis. Death within one year does not correlate with a delay in presentation, but is associated with advanced disease at diagnosis.

E-mail (main author): k.reddy@nhs.net



T2:108

Needle biopsy for sarcomas: does local recurrence along the tract really exist?

Michele Boffano¹, Andrea Ferro¹, Ugo Albertini¹, Stefano Marone¹, Elena Boux¹, Andrea Monticelli², Raimondo Piana¹

¹) CTO Hospital ²) University of Torino, Italy

Background

Biopsy is a fundamental step for both the diagnosis and the surgical management of bone and soft tissue sarcomas. It should be performed in a reference centre, even if it is a needle biopsy, but it is unclear whether the tract needs to be excised to prevent recurrences. The aim of the study is to demonstrate the possibility of needle tract recurrence after biopsy.

Methods

Male, 72-year old. Left pelvis osteolysis with soft tissue gluteal involvement. Trephine bone needle biopsy under general anesthesia with diagnosis of G2 chondrosarcoma. En bloc resection and reconstruction with bars and screws were performed with clear wide margins. Biopsy tract was not excised. After 20 months a small subcutaneous lump below the biopsy scar was noticed. A wide excision was performed confirming the diagnosis of chondrosarcoma. A Literature review looking for current strategies in biopsy and needle tract recurrence has been performed.

Results

Considering the papers published in the last 5 years, the current accepted opinion seems to deny the possibility of local recurrence along needle biopsy tract even if the importance of the bioptic act is confirmed. Only 1 out of 5 papers remarked the importance of resecting the biopsy tract in order to prevent local recurrences.

Conclusion

Partially in contrast with recent published papers, this case report confirms the potential local recurrence along the biopsy tract and the necessity to resect it. Further studies possibly related to tumour cell tropism for soft tissues can better stratify the existing recurrence risk in different histotypes.

E-mail (main author): boffano@inwind.it



T3:101

Sarcoma awareness for Junior Doctors – A pilot study

Coonoor Chandrasekar¹, Emily Robinson², Kian Tan³, Emma Illingworth²

¹) Royal Liverpool University Hospital ²) RLBH ³) MRI, United Kingdom

Introduction and Aims: The Under-Graduate medical curriculum in the United Kingdom does not have a designated module on sarcomas. Hence awareness of sarcomas amongst Junior Doctors is low unless they study in a designated Sarcoma Centre. The aim of the pilot study was to assess the core knowledge about sarcoma amongst Junior Doctors and to assess the increase in knowledge after an online voluntary study module and subsequent questionnaire.

Methods: 105 Junior Doctors were invited to take part. They answered 50 online questions about sarcomas administered through Survey Monkey. They were then provided with four key resources regarding sarcomas to study and they were asked to complete the 50 online questions again. The questions were marked to assess the core knowledge and improvement or otherwise following the provision of sarcoma study resources.

Results: The results of the baseline knowledge test showed that the mean score was 60% [range 28% to 80%]. The results after provision of key sarcoma related resources was 76% [range 58% to 94%]. 85% showed a measureable increase in scores. The average improvement was 16.6% [range 2% to 34%]. The p-value was <0.001, indicating a significant change in score (mean change in score was 6.5 points, 95% CI 3.9pts to 9.2pts).

Conclusions: The pilot study results show that sarcoma awareness could be introduced as a voluntary study module for Junior Doctors with measureable improvement in the knowledge. Increased awareness could help in early detection, appropriate referral, reduction in unplanned excisions and better care for sarcoma patients

E-mail (main author): crc12@hotmail.com



T3:102

Surgical Training – Thinking Outside the Box

Margareta Berg¹

¹) Surgicon Foundation, Sweden

The human anatomy does not differ between countries, cultures or continents. For this simple reason the surgical profession should be the same anywhere on the globe. In reality, surgical training programs are different not only between countries but also within countries. Competition between educational models seems, from this perspective, to be contra-productive. In addition, surgical curriculums will no longer be fixed entities but eternally developing processes, due to the rapid technical development taking place.

Ongoing retirements in surgery, regulated working hours for young surgeons and technical access to surgical simulation systems have created a paradigm shift from time-based to competency-based surgical training. Transformation of a medical student into a skilled surgeon must not take 10 years, and efficient training programs with in-built checkpoints along the process are necessary. In addition, modern surgery requires consistent high quality and documentation, probably by videofilms included in the medical record as the next step.

To create a basis for a global discussion about these topics, the Surgicon Project was launched in 2010, counting the 1st Surgicon Congress in 2011 as its starting point. In three years it has grown into a global informal network engaging world leaders in surgery from the US and Canada to Australia, New Zealand, India, Africa, Turkey, and several European countries. Breaking out one single question has allowed all kinds of organisations and engaged surgeons to take active part in this work, resulting in the 2nd Surgicon Congress, Gothenburg, June 17-19, 2013. Formal decisions might in the future be replaced by more ephemeral but global agreements adopted to new scientific data, as soon as they are published. Modern surgical development requires modern surgical training.

E-mail (main author): congress@surgicon.org



T4:101

New Genetic Characteristics of Chondrosarcoma

*John Healey¹**¹⁾ Memorial Sloan-Kettering Cancer Center, United States*

Background: Heterozygous mutations of isocitrate dehydrogenase 1 (IDH1) and isocitrate dehydrogenase 2 (IDH2) have recently been identified in cartilaginous neoplasms including conventional central and periosteal cartilage neoplasms. These mutations occur at a single amino acid residue at R132 for IDH1 and R172 and R140 for IDH2. Mutations in these genes lead to impaired ability of IDH1 and IDH2 to catalyze the conversion of isocitrate to alpha ketoglutarate. This results in neomorphic enzymatic activity leading to production of the oncometabolite 2-hydroxyglutarate (2HG). In this study, we analyzed chondrosarcoma for IDH1, IDH2 and other mutations using high-throughput Sequenom-based analysis.

Methods: Chondrosarcomas were genotyped for IDH1 and 2 mutations on the Sequenom Mass Array Platform. In addition, 271 recurrent point mutations across 27 genes were tested as part of the high throughput Sequenom Mass Array Platform panel.

Results: Fifty three chondrosarcomas were selected for the study. There were 30 females and 23 males. The age range was 18 to 77 years with a median of 55 years. Histologically, twenty one (21) were classified as grade I/III, 25 as grade II-III/III and 7 as Dedifferentiated chondrosarcoma. Twenty-six of 53 (50%) patients had mutations in IDH1 or IDH2. No other mutations were detected in the rest of the gene panel (AKT1, AKT2, AKT3, ALK, BRAF, CDK4, CTNNB1, EGFR, ERBB2, FGFR2, FGR3, FLT3, GNAQ, HRAS, JAK2, KIT, KRAS, MAP2K1, MET, NOTCH1, NRAS, PDGFRA, PIK3CA, PIK3R1, PTPN11, RET, SMO) by Sequenom Mass Array spectrometry.

Conclusion:

IDH1 and IDH2 mutations appear to be genetic signatures in half of chondrosarcomas. Downstream effects of these mutations could unravel pathways which could lead to viable therapeutic options. Most common genetic mutations involving genes of the signal transduction pathways do not seem to play a role in the biology of chondrosarcoma.

- Mutations of isocitrate dehydrogenase IDH 1 and IDH 2 occur in one half of chondrosarcomas
- No other candidate genes were mutated in Sequenom analysis.
- Targeting this metabolic pathway promises to be a new strategy to treat chondrosarcoma

E-mail (main author): healeyj@mskcc.org



T4:102

Cancer Stem Cells in Sarcomas

*Jay Wunder¹**¹ Mount Sinai Hospital, Univ. of Toronto, Canada*

Solid tumors are composed of a heterogeneous population of cells with different in vitro proliferative capacities; only a minority have the ability to initiate tumor formation in immunodeficient mice. This observation led to the concept of cancer stem cells (CSC), which have the ability to self-renew and differentiate. By manipulating these characteristics, CSCs have been postulated to be responsible for driving the growth of tumors and the recurrence of neoplasms after therapy. Although many cancers are maintained by tumor initiating cells (TICs), until recently this had not been demonstrated for mesenchymal tumors, in part due to the lack of unique surface markers that identify mesenchymal progenitors. We previously identified a subpopulation of cells in sarcomas with stem-like or tumor initiating cell (TIC) capacity which can be identified based on a functional biologic assay of their exclusion of Hoechst dye. There was a positive correlation between the percentage of TICs and the grade of the tumour, suggesting a potential prognostic factor. These stem-like cells or TICs preferentially formed tumours upon serial transplantation into immunodeficient mice. Specific signaling pathways appear to be critical for tumour self-renewal as blockade decreases the proportion of stem-like cells and prevents serial transplantation of xenografts. This new data suggests that therapeutically targeting this subpopulation of TICs could be used to improve patient outcome. For undifferentiated pleomorphic sarcoma (UPS), we identified a gene expression signature for TICs that predicts clinical outcome when applied to unsorted patient tumour specimens. This data further supports the clinical relevance of the TIC concept in sarcoma.

E-mail (main author): jwunder@mtsina.on.ca



T4:103

Enhancement of Structural Bone Allograft Incorporation with Artificial Periosteum containing Autologous Mesenchymal Stem Cells

Yong-Koo Kang¹

¹⁾ St. Vincent's Hospital, Republic Of Korea

Department of Orthopaedic Surgery*, Research Institute of Medical Science+, St. Vincent's Hospital, The Catholic University of Korea.

Purpose: The Purpose of this study was to evaluate the effect of autologous mesenchymal stem cells (MSCs) on structural bone allograft healing.

Methods: Thirty New Zealand white rabbits were divided into two groups. Segmental bone defect was created on the diaphysis of femur, and the defect was reconstructed with structural bone allograft. In experimental group, structural allograft was wrapped around by artificial periosteum(Gelform) containing autologous MSCs, whereas in control group was not containing autologous MSCs. At 4th, 8th, 12th weeks, the femur of rabbits underwent radiographic studies for bone union, and histologic evaluations for bony union with various growth factors. Bone morphogenic protein-2 (BMP-2), BMP-7, vascular endothelial growth factor (VEGF) and receptor activator of nuclear factor-kappa B ligand (RANKL) were measured within the grafted artificial periosteal tissue to evaluate the influence of autologous MSCs on structural bone allograft incorporation.

Results: Bone union was not achieved in both groups at 4th and 8th weeks. At 12th weeks, three out of five femurs in experimental group were united, but no bony union was found in control group. Histologic findings were also confirmed the enhancement of the allograft incorporation in experimental group. All osteogenesis-related factors were increased in experimental group than control group, and the amount was the highest at 4th weeks.

Conclusion: Incorporation of the structural bone allograft could be enhanced if allograft is covered with artificial periosteum containing autologous mesenchymal stem cells.

Key Words: Structural allograft, autologous mesenchymal stem cells, enhancement of bone healing



T4:104

Small molecules and their effect on osteosarcoma cell proliferation

Doris Maugg¹, Jan Smida², Ina Rothenaigner³, Kenji Schorpp³, Kamyar Hadian³, Daniel Baumhoer⁴, Michaela Nathrath⁵

¹) CCG Osteosarcoma ²) CCG OS of HMGU München ³) Toxicology of HMGU München, Germany ⁴) Pathology, University Hospital Basel, Switzerland ⁵) Pediatric Oncology, Klinikum Kassel, Germany

Osteosarcoma (OS) is a pediatric tumor that develops primarily in children and young adolescents. Poor response or resistance to conventional chemotherapy is a major problem in the treatment of this disease.

We here present a screening strategy of small molecule libraries to find new therapeutic drugs that target osteosarcoma and might be applied in addition to conventional treatments. We used automated high-throughout screening to identify compounds out of 25.000s that target OS cell proliferation. Scaled down to 300 compounds that had an effect on cell proliferation, we screened ten different cell lines (osteoblastic cells, various osteosarcoma cell lines and other tumor cell lines) and compared the effects of the selected 300 compounds on cell proliferation.

We observed differences among cell lines in regard to viability after treatment. We further selected by hierarchical clustering compounds that showed the most differential effects on cell proliferation (between 100-25% viability) in the cell lines used. This could exclude non-reproducible hits and so-called frequent hitters. From this cluster, 29 compounds were chosen, that showed high bipolarity, solubility and non-toxic reactive groups. Currently, effects of these compounds are analyzed in more detail. For this, apoptosis induction and alteration of cell morphology and mitochondria are determined as well as structural prediction of potential interaction partners.

Thus, chemical, non-toxic compounds that interfere with cell proliferation in an OS specific or a cancer cell-specific manner might be promising drugs in treatment of osteosarcoma.

E-mail (main author): doris.maugg@helmholtz-muenchen.de



T4:105

Differentially expressed microRNAs in osteosarcoma

Jan Smida¹, Daniel Baumhoer², Kristian Unger³, Kathrin Poos⁴, Eberhard Korsching⁴, Michaela Nathrath⁵

¹) CCG Osteosarcoma, Germany ²) Pathology, University Hospital Basel, Switzerland ³) Rad. Cytogenetics of HMGU, München ⁴) Bioinformatics, University Münster ⁵) Pediatric Oncology, Klinikum Kassel, Germany

Osteosarcomas are genetically complex tumors with abundant structural and numerical alterations. The molecular pathogenesis of the disease is, however, still poorly understood. Besides various oncogenes and tumor suppressor genes, deregulated microRNAs (miRNAs) are known to affect osteosarcoma development and biology. MicroRNA-expression profiling has been recently established as a method to unravel the impact of miRNA-involvement in malignancies in general, whereas deregulation of a single miRNA can have major impact on a multitude of genes.

We investigated six osteosarcoma cell lines for genome-wide miRNA expression and correlated our findings with gene expression profiles to identify biologically active miRNAs. Cultured osteoblasts (hFOB 1.19) and mesenchymal stem cells (L87/4) were used as normal references.

Focussing only on miRNAs that were deregulated in the majority of osteosarcoma cell lines, we identified several miRNAs with oncogenic and tumor suppressor properties, including various members of the oncogenic miR-17-92 cluster. In addition, several genes involved in differentiation, cell cycle control and apoptosis were found to be deregulated in osteosarcoma cell lines, most likely due to altered miRNA expression patterns. In order to evaluate these results and to confirm their functional significance in vivo, we analyzed the expression levels of ca 30 miRNAs of interest in a collective of 35 osteosarcoma biopsy samples. We identified several candidate miRNAs that can be used as biomarkers to discriminate responders to chemotherapy and reflecting the metastatic potential in osteosarcoma.

Our findings indicate a crucial impact of deregulated miRNAs with consecutive changes in gene expression in osteosarcomas and strongly suggest pathogenetic and potentially therapeutic implications of miRNA expression.

E-mail (main author): smida@helmholtz-muenchen.de



T4:106

The EGFR Inhibitor Gefitinib Sensitizes Osteosarcoma Cells Against Anthracycline-Based Chemotherapy In Vitro

Florian Sevelde¹, Bernd Kubista¹, Pilipp Theodor Funovics¹, Reinhard Windhager¹, Walter Berger¹

¹) Medical University Vienna, Austria

Background:

Hyperactivation of the epidermal growth factor receptor (EGFR) by gene amplification, mutation as well as overexpression is a hallmark of multiple human carcinomas. However, in recent years data have accumulated that EGFR-mediated signals might also contribute to malignant progression and therapy resistance of human sarcomas.

Methods:

Consequently we have investigated if human osteosarcoma cell lines (n=9) express functional EGFR and its useability as therapeutic target. Cytotoxic activity was determined by MTT-assay and clonogenic assay. Changes of downstream pathway proteins were monitored by Western-blotting.

Results:

Osteosarcoma cells expressed distinctly differing level of EGFR reaching in some cases high amounts. However, even low expression levels were sufficient to mediate activation of both MAPK and PI3K pathways (determined by phosphorylation of ERK1/2 and S6, respectively) by EGF exposure in serum-starved cells. The EGFR-specific inhibitor gefitinib completely blocked EGF-mediated and attenuated serum-induced downstream signal activation. While gefitinib applied as single agent demonstrated only limited growth inhibiting activity in short term experiments (72h drug exposure), it led to reduced colony formation in long term experiments in the majority of cell lines. Importantly, gefitinib sensitized EGFR-expressing osteosarcoma cell lines against chemotherapy with doxorubicin and methotrexate, while it antagonised cisplatin-induced cell death.

Conclusion:

Summarizing, our data suggest that EGFR-mediated survival signals protect human osteosarcoma cells against the cytotoxic activity of several antineoplastic drugs. Consequently, combination approaches including EGFR inhibitors in addition to chemotherapy should be evaluated for treatment of high grade osteosarcoma patients.

E-mail (main author): florian.sevelde@meduniwien.ac.at



T5:101

Myxoinflammatory fibroblastic sarcoma: single institution experience and pooled analysis of 138 published cases

Michele Rocca¹, Raffaele Lombardi², Nicola Zanini², Mariacristina Salone², Marco Gambarotti³, Alberto Righi³, Stefania Di Girolamo⁴, Marco Colangeli⁵, Piero Picci⁶

¹) Istituto Ortopedico Rizzoli ²) General Surgery Rizzoli Orthopaedic Inst ³) Pathology Dept. Rizzoli Orthopaedic Inst ⁴) Oncology Dept. Rizzoli Orthopaedic Inst ⁵) Orthopaedic Dept Rizzoli Orthopaedic Ins ⁶) Lab of Oncology Rizzoli Orthop Inst, Italy

Myxoinflammatory fibroblastic sarcoma (MIFS) is a rare soft tissue sarcoma first recognized and named at the end of nineties. Since then, only few case reports and small series have been published. It is generally considered a low-grade sarcoma that typically arises in the extremities but large cohorts with long-term follow-up are lacking. The aim of this study is to review our experience and perform a systematic review of published cases focusing on the risk of recurrence.

Database of the Rizzoli Institute was retrospectively queried to identify all patients with a pathological diagnosis of MIFS observed from 1997 to 2012. Similarly, all literature of those years was searched to capture all MIFS reported cases.

Five patients underwent surgery for MIFS in our Institute and 133 cases were found in literature. Not all clinical and pathological data were available for every patient. There were 76 men (55%), median age was 45 years (IQR: 34-56). Median size was 3 cm (IQR: 2-5); the most common sites of presentation were hand (47%) and foot (21%). Pain was present at diagnosis in 14/82 patients (17%) with median symptoms duration before surgery of 7 months (IQR: 3-12). Initial surgery was performed for a suspected benign tumor in 88 patients (74%). Marginal or intralesional resections were reported in 45/71 cases (63%), and re-excision during same hospitalization was performed in 32/45 cases (71%). At a median follow-up of 26 months, a recurrence was observed in 26/118 patients. Median time to recurrence was 15 months (IQR: 7-26). Relapse-free survival (RFS) at 1, 3 and 5 years was 93%, 72% and 67%, respectively. Only symptoms duration less than 7 months was found to be significantly associated with a worse RFS at univariate analysis ($p=0.046$). Metastatic disease was observed in 3 patients (one patient with lymph node metastasis, one patient with metachronous lung metastasis and one patient with synchronous lung metastasis observed at our Institute). MIFS is a rare sarcoma. Clinical findings confirm the "low-grade" nature of MIFS, however, some patients could be affected by aggressive tumour with distant metastases. Extensive preoperative evaluation, wide surgical excision and follow-up are mandatory.

E-mail (main author): michele.rocce@ior.it



T5:102

INFANTILE FIBROSARCOMA - A REPORT FROM THE COOPERATIVE WEICHTEILSARKOM STUDIENGRUPPE

Tobias Dantonello¹, Ivo Leuschner², Christian Vokuhl², Stefanie Kube¹, Niklas Pal³, Felix Niggli⁴, Gustaf Ljungman⁵, Stefan Bielack¹, Ewa Koscielniak¹

¹) Olgahospital, Klinikum Stuttgart ²) Dept. of pediatric pathology, Kiel, Germany ³) Karolinska Institutet, Stockholm, Sweden ⁴) University of Zurich, Switzerland ⁵) University of Uppsala, Sweden

Background: Infantile Fibrosarcoma (iFS) is a rare tumour of young children characterized by ETV6-NTRK3 rearrangement. In contrast to fibrosarcoma of adults it carries a much more favourable prognosis. The treatment of choice is either surgical resection, mild chemotherapy or a combination of both. There are however few reports about iFS diagnosed according to current criteria and treated according to the same strategy. The largest published intergroup studies regarding iFS encompass merely 50 patients.

Patients: Fifty-six patients younger than 3 years with iFS from Germany, Sweden, and Switzerland were registered in the consecutive studies of the Cooperative Weichteilsarkom Studiengruppe (CWS) between 1996 and 2010. They were treated according to the same risk-stratification with surgery and/or chemotherapy. The tumor samples were re-reviewed for the purpose of this study.

Results: In 31 patients the diagnosis was confirmed again by immunohistochemistry (Group A) with additional detection of the characteristic rearrangement in n=23/31. All 31 individuals were younger than 6 months at diagnosis, 23/31 were male and 21/31 had their tumor located in the limbs. Merely one patient had primary metastases. Ten patients were treated with surgery alone. The remaining 21 children received chemotherapy with or without surgery. Chemotherapy consisted mainly of vincristine, dactinomycin ± alkylators. In 10 patients the diagnosis was revised at review (Group B). In 15 patients there was no sufficient tumor material available for review (Group C). After a median follow-up of 5 years merely a single child in group A died compared with 4/10 patients in Group B and 3/15 children in Group C. Actuarial 5-year overall survival (OS) for all 56 patients was 86±9%. The outcome of Group A was however significantly better compared with Group B/C (p=0.03).

Conclusion: IFS is a unique soft tissue sarcoma predominantly occurring in the extremities of male infants. Children diagnosed with iFS according to current standards have an excellent prognosis. The detection of the characteristic rearrangement can facilitate the correct diagnosis. Mutilating surgery seems to be rarely necessary. If surgical resection is not simple it can be facilitated or avoided with mild chemotherapy.

E-mail (main author): tobias.dantonello@olgahospital-stuttgart.de



T5:103

Clear Cell Sarcoma of the soft tissues. A retrospective analysis of 35 cases

Giuseppe Bianchi¹, Eric Staals¹, Silvia Campagnoni¹, Davide Donati¹

¹) Istituto Ortopedico Rizzoli, Italy

BACKGROUND: Clear cell sarcoma is a rare soft tissue tumor with a poor prognosis. This lesion shows morphologic similarities to malignant melanoma but has a distinct genetic background. Early diagnosis and initial wide excision are essential for a favourable outcome. The objective of this study is to determine the clinical, pathologic and genetic features of this tumor, in order to recognize it at an earlier stage and improve treatment and prognosis.

METHODS: A retrospective analysis was performed on 35 consecutive cases, treated at the Rizzoli Institute between 1979 and 2009.

RESULTS: There were 19 male and 16 female patients with an age ranging from 8 to 75 years (mean 40 years). Most of the tumors (24) were located in the lower extremity, 8 in the upper extremity and 3 in the trunk. Twenty-five patients (71%) had undergone previous treatments elsewhere. Thirty-one patients (89%) had localized disease at presentation, 2 had lymphnode metastases, one had lung metastases, and one had lung and bone metastases. Half of the tumors was more than 5cm in diameter. All but one patient underwent surgical excision of the tumor. Six patients (18%) underwent an amputation, 28 had limb salvage surgery performed. Surgical margins were inadequate (marginal or intralesional) in 4 cases. Mean follow-up was 64 months (range 0-311 months). Eight patients developed local recurrence, 17 patients had metastatic disease. At last follow-up, 19 patients had no evidence of disease, one patient was alive with disease and 15 patients died of disease. The overall survival rate was 58% at 5 years and 50% at 10-years.

CONCLUSIONS: Clear cell sarcomas are often unrecognized at initial presentation, causing diagnostic delay and inadequate treatments. We believe that early referral to a tertiary centre can improve outcome for patients with clear cell sarcoma. Wide surgical excision is the main treatment, radiotherapy is often used as adjuvant treatment for local control. The role of chemotherapy needs further investigation.

E-mail (main author): giuseppe.bianchi@ior.it



T5:104

Results and prognostic factors in 15 patients with peripheral dedifferentiated chondrosarcoma

Pietro Ruggieri¹, Elisa Pala¹, Eric Henderson², Mohammad Hassani¹, Marco Maraldi¹, Caterina Novella Abati¹, Eugenio Rimondi¹

¹) University of Bologna, Istituto Rizzoli, Italy ²) Moffitt Cancer Center, United States

Background: Dedifferentiated chondrosarcoma is an uncommon tumor that is known to arise from pre-existing, low-grade cartilage lesions. Peripheral dedifferentiated chondrosarcomas (PDC) arise from pre-existing exostoses, or extracortically, and may appear as a peripheral chondrosarcoma without the features of its dedifferentiated counterpart. Dedifferentiated chondrosarcoma has a very poor prognosis. Aim of this study was to evaluate the survival of patients with peripheral PDC and to evaluate possible prognostic factors.

Methods: Between 1980 and 2006, 15 patients were treated for PDC: 11 males and 4 females, mean age of 42 years. In 1 case tumor was located in the humerus, in 3 in distal femur, in 1 in emi-anterior chest, in 5 cases in ileums, in 2 in scapula, in 2 proximal femur, in 1 proximal fibula.

The dedifferentiation was in malignant fibrous histiocytoma in 9 cases, osteosarcoma in 5 cases and spindle cell sarcoma in 1 cases. 14 patients received surgery (one patients was not operable for multiple distant metastases): tumor resection in 9 cases, amputation in 5. Chemotherapy was given to 8 patients.

Results: 4 patients (26.6%) were Ned at a mean followup of 14.7 yrs and 11 patients DWD at a mean time of 2.6 yrs. The overall survival of patients was 34% at 10 years. There was not significant difference in survival between patientens with D.C. of the trunk and those with D.C. of the extremities ($p = 0.2397$).

There was no significant difference in survival with chemotherapy and surgery or with surgery only ($p = 0.6269$).

Conclusion: The prognosis for patients with D.C. remains dismal. Surgery with wide margins remains the principal treatment for this condition. There was no statistical evidence of any beneficial effect from chemotherapy.

E-mail (main author): pietro.ruggieri@ior.it



T5:105

Tumors of the foot: epidemiologic analysis and principles of treatment: the Rizzoli Institute experience

Pietro Ruggieri¹, Andrea Angelini¹, Fernando Jorge¹, Giovanni Guerra¹, Elisa Pala¹, Ilaria Piraino¹

¹) University of Bologna, Istituto Rizzoli, Italy

Background: Tumors of the foot are rare. Although most of these are benign, a failure to appreciate their presence may delay diagnosis and treatment. The knowledge of differential diagnosis and an appropriate preoperative planning are the most important factors for adequate treatment.

Aim of this study was to evaluate the incidence, histologic features and treatment strategy of the most common tumors of the foot.

Methods: From 1900 to 2009, 1.170 tumors of the foot were retrospectively analyzed. Imaging included radiographs in all patients, and CT and MRI when available. Diagnosis was established in all cases with biopsy and histologic slides were reviewed. There were 189 and 981 soft tissue and bone lesions, respectively. Localizations were phalanges (240;20%), metatarsal region (245;21%) and hindfoot (685;59%). Benign or pseudotumoral lesions were 870 (74%): multiple chondromas (168), osteoid osteoma (164), solitary osteochondroma (47), Nora disease (78), calcaneal cyst (51), aneurysmal bone cyst (45) were the most frequent lesions observed. Malignant lesions were 300 (26%): Ewing's sarcoma (44), central chondrosarcomas (29), metastatic carcinoma (24) and other more rare entities.

Results: Benign and pseudotumoral lesions are generally treated with curettage with and without bone grafting. Neoadjuvant and adjuvant chemotherapy associated with surgery, is required for responsive malignant lesions. Amputation may be required for tumors involving the hindfoot.

Conclusions: Malignant tumors are relatively rare, but a high level of attention on imaging and clinical examination is required, even when diagnosis seems straightforward. With few exceptions, a biopsy is recommended before proceeding to surgery.

E-mail (main author): pietro.ruggieri@ior.it



T5:106

Malignant bone tumors of the foot – a single-centre analysis of 29 patients

Verena Anna Stockhammer¹, Thomas M. Tiefenboeck², Joannis Panotopoulos¹, Reinhard Windhager¹, Philipp T. Funovics¹

¹) Medical University Vienna ²) KH Krems, Austria

Background:

Malignant tumors of the foot are rare and account for 4% of all musculo-skeletal tumors, including any histological tumor entity that also can affect the foot.

Methods:

We analyzed the data of 29 patients with malignant bone tumors of the foot (16 males; 13 females; mean age, 43 years; range, 10-77 years) who were registered within the Vienna Bone and Soft Tissue Tumor Registry since 1963. There were 23 (79%) primary tumors – including 10 (34%) chondrosarcomas, 5 (17%) Ewing's sarcomas, 2 (7%) osteosarcomas, and 6 (21%) others – and 6 (21%) metastases. The phalanges were affected in 7 (24%) patients, the metatarsals in 16 (55%) and the tarsus in 6 (21%) patients. The leading symptoms were swelling (48%) and pain (38%) with a mean duration of 16 months (range, 1-99 months). Surgical treatment consisted of 11 amputations, 4 en bloc resections, 2 ray resections, 2 debulking-procedures and 7 curettages. 3 patients underwent biopsy only. Adjuvant therapy included radiation in 2 patients and chemotherapy in 11 patients.

Results:

Mean follow-up of all patients was 66 months (range, 1-377 months). Surgical complications were encountered in 6 (21%) patients, of whom 3 infections (10%) required revision resulting in one secondary amputation of a toe and one secondary amputation of the foot. No patient with a primary tumor had metastases at the time of diagnosis. Two (7%) patients developed local recurrence after 5 and 10 months after surgery, respectively; both being treated with secondary amputation. One patient developed lung metastasis after 48 months. The respective 10-year overall survival rate of all patients was 63 percent.

Conclusion:

Our results confirm a potential risk for delayed diagnosis of primary malignant tumors of the foot. In case of adequate surgical and – whenever indicated – multidisciplinary treatment, however, oncological results may remain satisfying.

E-mail (main author): verena.stockhammer@meduniwien.ac.at



T6:101

Invasion and metastasis: from basics to real-time imaging

Hiroyuki Tsuchiya¹

¹) Graduate School of Medical Science, Kanazawa University, Japan

Whereas surgical resection and adjuvant therapy can cure well-confined primary tumors, metastatic disease is largely incurable because of its systemic nature and the resistance of disseminated tumor cells to existing therapeutic agents. To overcome metastatic disease, the process how tumor invasion and metastasis happen should be well understood.

Invasion and metastasis are the most insidious and life threatening aspects of cancer. Especially, lung metastasis is a serious condition of the sarcoma patients, which is difficult to treat successfully and directly affects the fate of the patients.

A cell or group of cells must be able to leave the primary tumor, invade the local host tissue, and survive at the secondary sites. This complex process requires the cells to enter into the vascular circulation, arrest at a distant vascular bed, actively extravasate into the metastatic site, and proliferate as a secondary colony. The each step of metastasis is a very complex and dynamic process during which a number of interactions between tumor cells themselves and between tumor cells and the surrounding environment take place. During the past decade, knowledge regarding the molecular and cellular processes involved in the regulation of tumor metastases has dramatically increased through the study of the migration and seeding of cancer cells, tumor–stroma interactions, vascularization of tumors, and gene expression that correlate with metastasis.

To cultivate a better understanding for tumor invasion and metastasis, we have visualized cellular behavior in primary tumors and metastatic site in vivo, using fluorescent protein expressing sarcoma cell line. For subcellular imaging, to observe cytoplasmic and nuclear dynamics in the living mouse, cancer cells were labeled in the nucleus with green fluorescent protein and with red fluorescent protein in the cytoplasm. The nuclear and cytoplasmic behavior of cancer cells in real time in blood vessels was imaged as they trafficked by various means or adhered to the vessel surface. During extravasation, real-time dual-color imaging showed that cytoplasmic processes of the cancer cells exited the vessels first, with nuclei following along the cytoplasmic projections. We also observed cancer cells seeding the lungs of live mice in real-time and follow them forming lung metastatic colonies.

Here we first summarize the current knowledge regarding tumor invasion and metastasis cascade. Then we introduce our in vivo imaging system and findings from our studies with the use of fluorescent proteins.

E-mail (main author): tsuchi@med.kanazawa-u.ac.jp



T6:102

Surgical treatment of humeral bone metastases - indications and outcome

Dimosthenis Andreou¹, Andreas Frings², Helena Gruja³, Jörg Friesenbichler², Per-Ulf Tunn³, Andreas Leithner²

¹⁾ University Hospital Muenster, Germany ²⁾ Medical University of Graz, Austria ³⁾ HELIOS Klinikum Berlin-Buch, Germany

Background: The humerus is the second most common localization of metastases in the long bones. We sought to evaluate the indications and results of various surgical treatment options.

Methods: We retrospectively analyzed the files of 135 patients with actual or impending pathological fractures of the humerus due to bone metastasis of kidney (n=40), lung (n=32), breast cancer (n=26), and other tumors (n=37), who underwent surgical treatment between 1997 and 2011. Mean follow-up was 15 months for all patients (range, 0-117 months) and 27 months for survivors (range, 1-117 months). A two-sample t-test was used to compare means. Fisher's exact test was used to compare unrelated samples. Survival curves were calculated with the Kaplan-Meier method and compared with the log-rank test.

Results: 56 patients underwent endoprosthetic replacement, 45 patients a compound osteosynthesis with a plate and bone cement and 34 patients received an intramedullary nail. There were no significant differences in the duration of surgery between the 3 groups.

Trauma surgeons used significantly more nails, compared to orthopedic oncologists (23/28 vs. 11/107, $p<0.001$). Intramedullary nailing was performed only in patients with multiple metastases, while 13 of the patients who received an endoprosthesis and 9 of the patients who underwent a compound osteosynthesis had solitary metastases. Patients with lung and breast cancers had a significantly higher probability to receive an intramedullary nail than patients with kidney cancer (12/32 and 12/26 vs. 5/40, $p=0.009$), who in turn underwent more endoprosthetic replacements (21/40 vs. 11/36 and 5/26, $p=0.009$). Overall survival amounted to 51% after 1 year and 16% after 3 years. Patients undergoing intramedullary nailing had a significantly worse overall survival after 1 year (24%), compared to those undergoing compound osteosynthesis (56%, $p=0.007$) and endoprosthetic replacement (64%, $p<0.001$), probably reflecting the differences in tumor biology and stage of disease. 8 patients suffered from failure of fixation, 4 after intramedullary nailing and 2 each after endoprosthetic replacement and compound osteosynthesis. These differences were not statistically significant.

Conclusion: All of the aforementioned surgical modalities appear to have a low failure rate, provided that the patient's stage and tumor biology are taken into consideration during treatment planning.

E-mail (main author): dimosthenis.andreou@ukmuenster.de



T6:103

A novel approach to predicting survival in patients with symptomatic spinal bone metastases.

Laurens Bollen¹, Yvette Van der Linden¹, Willem Pondaag¹, Marta Fiocco¹, Bas Pattynama¹, Wilco Peul¹, Sander Dijkstra¹

¹ LUMC, Netherlands

Background-Extent and type of treatment for symptomatic spinal bone metastases (SBM) should primarily depend on symptoms and secondarily on expected survival time. Predictive models have been developed but their use entails a risk of over- or undertreatment.

Study objective was to develop a new approach to predict survival in patients with symptomatic SBM.

Methods-All patients who were treated for symptomatic SBM between 2001 and 2010 were included in this single center retrospective study (n=1043). Treatment consisted of radiotherapy and/or surgery. Medical records were reviewed for gender (male n=542, female n=501), age (mean 64.8±12.5 years), type of primary cancer, performance status, presence of visceral, brain and bone metastases, number and location of spinal metastases and neurologic functioning. Primary cancers were classified according to Tomita in three categories: slow, medium and fast growing. Performance status was assessed with the Karnofsky performance score (KPS) and neurologic functioning was graded with the Frankel scale. The most prevalent primary tumors were those of breast (n=299), lung (n=250), prostate (n=215) and kidney (n=60). Survival time was calculated as the difference between start of treatment for SBM and date of death. Analysis was performed using the Kaplan-Meier method, univariate log-rank tests and Cox-regression models.

Results-Median follow up duration was 6.6 years and six patients were lost to follow-up. After stratification for primary tumor category, univariate log-rank tests showed an effect of KPS on survival in all three categories (p<0.001). Presence of visceral (p<0.001) and brain metastases (p=0.009) was shown to influence survival only in the slow growth category. Based on these results a flowchart was created, dividing the population in eight groups (figure 1). These groups were matched according to survival, resulting in four categories. Median survival in category A was 31.2 months, followed by 15.4 months for B, 4.8 months for C and 1.6 months for category D (figure 2). Corresponding Hazard ratios were 1.7 (95%CI 1.4-2.2, p<0.001) for B, 4.3 (95%CI 3.4-5.5, p<0.001) for C and 9.1 (95%CI 7.1-11.7, p<0.001) for D.

Conclusion-Assessing patients according to the presented model results in four categories with significantly different survival times. Extent of treatment can be adjusted accordingly.

E-mail (main author): l.bollen@lumc.nl



T6:104

Surgical Treatment of Metastatic Diaphyseal Fracture of the Humerus

Won-Jong Bahk¹, Seung-Koo Rhee¹, Yong-Koo Kang¹, An-Hi Lee¹

¹⁾ The Catholic University of Korea, Republic Of Korea

Introduction: Although there have been a few reports of pathologic fracture of diaphysis of the humerus treated with debulking and internal fixation augmented by polymethylmethacrylate (PMMA), there is only scanty documentation regarding the result of closed interlocking IM nailing. The purpose of our retrospective study is to report the clinical result of closed interlocking intramedullary (IM) nail as well as open reduction with internal fixation augmented by PMMA.

Materials & Methods: 16 cases of 13 patients with pathologic fractures of the humeral diaphysis, who treated with closed interlocking IM nail fixation (Group 1), and 10 patients, who treated with debulking with internal fixation augmented by PMMA (Group 2) between 1998 and 2002 were selected for this study. The clinical records and radiographs were retrospectively reviewed. Pain and function of the upper extremity were each graded as excellent, good, fair or poor using a modification of the rating system of Perez et al.

Results: Group 1; There were 6 male and 7 female with age ranged from 38 to 81 years (aV. 59 years). The follow-up period ranged from 10 weeks to 58 months (aV. 7 months). Main primary cancers include multiple myelomas, lung cancer and breast cancer. The average time of survival after pathologic fracture was 11.7 months. Final results were excellent or good result in 8 cases, fair in 5 cases, and poor in 3 cases. Poor results were related to local tumor progression in 2 lung cancer patients and tumor spread to 5 digits of the ipsilateral hand in a stomach cancer patient. Group 2; There were 6 male and 4 female with age ranged from 46 to 73 years (aV. 58.6 years) The follow-up period ranged from 6 weeks to 35 months (aV. 7 months). Main primary cancers include kidney cancer, lung cancers and adenocancer of unknown origin. The average time of survival after pathologic fracture was 12.6 months. Final results were excellent or good result in 7 patients, fair in 3 patients.

Conclusion; Tumor progression and distant spreading after IM nail insertion were encountered with poor result in patients with lung cancer and stomach cancer but there was no poor result in patient who treated with debulking with internal fixation augmented by PMMA. Therefore although closed interlocking IM is thought to be an excellent option for carefully selected patients particularly with multiple myeloma and breast cancer, patient's functional status before the fracture, life expectancy, type of tumor, local extent of tumor should be comprehensively considered in planning the treatment of metastatic diaphyseal fracture of the humerus.

E-mail (main author): wjbahk@cmc.acuk.ac.kr



T6:105

Surgical procedures for long bone metastases

Oleg Vyrva¹, Yanina Golovina²

¹) Sytenko Institute ²) Synenko Institute, Ukraine

Background:

The main goals of surgical procedures for long bone metastases patients are stabilization of impending or established pathological fractures. Surgeon has to decide to perform segmental resection or perform bone stabilization only. It is very important to predict a patient survival value for correct operation.

Methods and Materials:

A review of a prospectively maintained surgical database identified patients for whom surgery was done for long bone metastases. Of these 104 patients, 57 were operated for limb salvage and 47 had not have surgeries because bad general condition. We performed 28 modular endoprosthesis replacement, 16 plate or nail osteosynthesis + bone cementation, 13 palliative intramedullary fixation without segmental bone resection. The most common site of involvement included the proximal femur (41), proximal humerus (25) and distal femur (12). There were renal cell carcinoma (32), lung carcinoma (19) and breast carcinoma (16). We have used method of discriminant analysis for detect a prognostic survival rate of patient with metastatic lesions. Thanks discriminant analysis we could make right indications for different types of surgery.

Results:

Indications for surgery based on patient separation for three survival rate groups. The first group of patients (survivorship till 6 month) with 4 ASA stage (according American Anaesthesiology Scale) with or without pathologic fractures were not operated (47 cases). The first group of patients with 3 ASA stage with pathologic fracture had had an internal fixation only without resection of pathologic bone lesion (13 cases). And the patients from second (survivorship from 6 to 24 month) and third (survivorship longer 2 years) with or without pathologic fractures had had bone metastatic resection and intercalary (plate or nail osteosynthesis + bone cementation) or endoprosthesis replacement (57 cases). Site-specific function was restored and pain controlled for all patients who maintained their limbs.

Conclusion:

The final decision for a certain surgical procedure of metastatic long bone lesions bases on patients survival rate, that could be predict according data of our created computer program and ASA stage. Right selected indications and correct surgery are a low morbidity procedure that provides immediate restoration of function, pain relief, durable stability and better quality of life.

E-mail (main author): vyrva@online.kharkiv.com



T6:106

A novel patient-derived intra-femoral xenograft model of bone metastatic prostate cancer that recapitulates mixed osteolytic and osteoblastic lesions.

Anna A. Kulidjian¹, Omer Raheem¹, Christina Wu¹, Young B. Jeong¹, S. Johanna Melo-Cardenas¹, Tomonori Yamaguchi¹, Kristen M. Smith¹, Daniel Goff¹, Heather Leu¹, Sheldon R. Morris¹, Nicholas A. Cacalano¹, Koichi Masuda¹, Catriona H.M. Jamieson¹, Catriona H.M. Jamieson¹, Christopher J. Kane¹, Christina A.M. Jamieson¹

¹) University of California San Diego, United States

a) Introduction and Objective: Prostate cancer metastasizes to bone in the majority of patients with advanced disease leading to painfully debilitating fractures, spinal compression and rapid decline. Prostate cancer bone metastases often become resistant to therapies including androgen deprivation, radiation and chemotherapy. There are currently few models to elucidate mechanisms of interaction between the bone microenvironment and prostate cancer. It is, thus, essential to develop new patient-derived, orthotopic models. Here we report the development of PCSD1 (Prostate Cancer San Diego 1), a novel patient-derived intra-femoral xenograft model of prostate bone metastatic cancer that recapitulates mixed osteolytic and osteoblastic lesions.

b) Methods: A femoral bone metastasis of prostate cancer was removed during hemiarthroplasty and transplanted into Rag2-/-; μ c-/- mice either intra-femorally or sub-cutaneously. Xenograft tumors were analyzed for prostate cancer biomarker expression using RT-PCR and immunohistochemistry. Osteoblastic, osteolytic and mixed lesion formation was measured using micro-computed tomography (OCT).

c) Results: PCSD1 cells isolated directly from the patient formed tumors in all mice that were transplanted into Rag2-/-; μ c-/- mice. Xenograft tumors expressed human prostate specific antigen (PSA) in RT-PCR and immunohistochemical analyses. PCSD1 tumors also expressed AR, NKX3.1, Keratins 8 and 18, and AMACR. Histologic and microCT analyses revealed that intra-femoral PCSD1 xenograft tumors formed mixed osteolytic and osteoblastic lesions. PCSD1 tumors have been serially passaged in mice as xenografts intra-femorally or sub-cutaneously as well as grown in culture. Prostatesphere growth was characterized in 3D co-culture model of the bone niche with human bone marrow derived stromal cells. PCSD1 tumors grew in mice treated with the anti-androgen, bicalutamide, thus, demonstrating castrate resistance with standard of care therapy.

d) Conclusions: PCSD1 xenografts tumors were characterized as advanced, luminal epithelial prostate cancer from a bone metastasis. PCSD1 intra-femoral xenografts formed mixed osteoblastic/osteolytic lesions that closely resembled the bone lesions in the patient. Castration-resistant growth in the bone niche was evaluated in young and aged mice as well as in the presence and absence of novel bone signaling pathway inhibitors. PCSD1 is a new primary prostate cancer bone metastasis-derived xenograft model to study castrate-resistant metastatic disease in the bone and to develop novel therapies for inhibiting prostate cancer growth in the bone- niche.

E-mail (main author): akulidjian@mail.ucsd.edu



T7:101

Spine, sacral & pelvis resections: Reconstruction of bony defect after resection of malignant periacetabular tumor involving the sacroiliac joint

*Wei Guo¹**¹⁾ Peking University People's Hospital, China*

Objective: Reviewed the patients with malignant periacetabular tumors involving the sacroiliac joint treated surgically in our hospital to assessment of the results of local control and the function of the limb after reconstruction.

Materials and methods: We retrospectively reviewed 21 patients with malignant periacetabular tumor involving the sacrum from July 2002 to July 2010 treated at Peking University People's Hospital. There were 12 female and 9 male patients, with a mean age of 37 years old. The histopathologic diagnosis was chondrosarcoma in 7 patients, Ewing sarcoma in 1 patients, osteosarcoma in 8 patients, malignant giant cell tumor in 1 patient, melanoma in 1 patient and metastatic tumor in 3 patients.

Results: Oncology result: Adequate margins (wide or marginal) were achieved in 12 of 21 (57.1%) patients. Nine patients (9/21, 42.9%) had local relapse, including of 3 of 8 osteosarcoma, 2 of 7 chondrosarcoma, 1 malignant GCT, 1 melanoma and 2 of 3 metastatic tumor. The recurrence rate for tumor-free margins was 25% (3 of 12) and for intralesional margin was 66.7% (6/9). Eight of 9 patients with local recurrence had recurrent lesion at sacral side and 6 of them had intralesional margin at sacral side. All patients were followed up 13 to 59 months, with mean follow-up time 35 months. The lung metastases were found in 5 patients. Seven patients died of diseases, including 4 osteosarcoma, 1 chondrosarcoma, 1 melanoma and 1 metastatic tumor patients. Four patients were alive with disease. Overall survival was 66.7% (14 of 21), and disease free survival was 47.6% (10 of 21).

Functional result: Seventeen of twenty-one patients with bone graft and modular hemipelvic prosthetic reconstruction after resection of the tumor could walk with a crutch 3 months after surgery. The pelvic prosthesis was taken out 6 months after surgery in 1 patient because of deep infection. Average ISOLS function evaluation score was 17, including good in 5, fair in 12 and poor in 4 patients.

Conclusion: Bone graft with resected femoral head and neck on left sacrum and modular hemipelvic prosthetic reconstruction of the bony defect after resection of the periacetabular tumor involving of the secrum is a good method, by which a reasonable function can be restored in most of the patients.

Key words: Pelvic Tumor, Surgical Resection, Reconstruction

E-mail (main author): bonetumor@163.com



T7:102

Proximal femur and total femur resections

Jendrik Hardes¹

¹⁾ University Clinic of Muenster, Germany

Endoprosthetic replacements of the proximal or total femur are often required in the treatment of patients with primary or secondary bone tumors. Modular tumor prostheses allow a reconstruction of the resulting bone defect. In most cases long-term limb salvage can be achieved. However, local recurrence is much more common in patients with proximal femur tumors in comparison to patients with tumors around the knee and can result in secondary amputation. Also in periprosthetic infection sometimes a secondary amputation cannot be avoided. The most common complication in proximal and total femur replacement is the dislocation of the hip. This presentation summarizes the dislocation rates depending on the different types of articulation (total hip arthroplasty, monopolar or bipolar head) and the methods of capsular reconstruction and soft tissue reattachment. Finally, the functional outcome of patients receiving a proximal or total femur replacement is mentioned.

E-mail (main author): hardes@uni-muenster.de



T7:103

Distal Femur and Proximal Tibia Resections

*Nicola Fabbri¹**¹⁾ Memorial Sloan-Kettering Cancer Center, United States*

The knee and its proximity is the most common anatomic location requiring surgery for bone sarcomas. Distal femoral and proximal tibia resections are therefore among the most commonly performed limb sparing procedures in Musculoskeletal Oncology. During the last three decades, the indication to limb salvage surgery has greatly expanded because of a favorable combination of factors including new imaging modalities such as CT and MRI scan, introduction of preoperative chemotherapy for high-grade bone sarcomas, and availability of adequate reconstructive options. Careful consideration of tumor location and extension, patient's age, functional demands and expectations, along with family and social support, are key factors to be considered in order to provide optimal treatment customized to each individual patient. The evolution of implant and hinge design, materials, and fixation has substantially improved long term durability and functional outcome of massive prosthetic replacements, while reducing at the same time the incidence of early and late complications. For adult and teen-ager patients, massive prosthesis is the preferred reconstructive technique by most surgeons following distal femoral resection; nevertheless, unicondylar osteoarticular allograft may be considered in selected circumstances after hemiarticular resection. Massive prosthetic replacement and allograft-prosthetic composite are both viable options commonly used for proximal tibia reconstruction. Newer prosthetic designs and novel bone fixation concepts in form of hybrid stemmed-collared and compliant compressive devices are currently associated with excellent mid-term results, as it is also the case for cemented fixation using the French-paradox technique. In pediatric patients, while rotationplasty remains a successful technique predictably associated with durable results, the new generation of non-invasive expandable implants appears significantly improved in both fixation and reliability of closed expansion mechanism.

E-mail (main author): fabbrin@mskcc.org



P1:101

Leading technology for in vivo fluorescent sarcoma imaging

Katsuhiro Hayashi¹, Hiroyuki Tsuchiya², Norio Yamamoto², Toshiharu Shirai², Hideji Nishida², Hiroaki Kimura², Shinji Miwa², Robert M Hoffman³, Takanobu Otsuka¹

¹) Nagoya City University ²) Kanazawa University, Japan ³) University of California, San Diego, United States

Background: Naturally fluorescent proteins have revolutionized biology by enabling what was formerly invisible to be seen clearly. The green fluorescent protein (GFP) gene is frequently used as a reporter of expression and a biosensor in living animals. However, in orthopedic research, fluorescent proteins have only been used in a limited fashion. We have developed fluorescent real-time imaging for sarcoma cells by means of multi-color fluorescent cell lines and transgenic mice. **Methods:** Sarcoma cells were labeled with GFP or red fluorescent protein (RFP). Color-coded cells were transplanted into bone, spinal cord, or lung and their dynamics were observed in live mice. Transgenic mice were also used as the host in which GFP was driven by a stem cell marker nestin. Nascent blood vessels and immature neurons expressed GFP in this model. Indocyanine green was injected into tumor bearing mice to visualize tumor mass and peritumoral vascular structure. **Results:** Fluorescence imaging readily distinguished the color-coded cell lines and their differential ability to survive at the primary sites as well as metastasizing in live mice. Imaging of sarcoma cell trafficking in vessels revealed critical steps of metastasis. In transgenic mice, nascent blood vessels in the growing tumors were visualized. Lung metastasis was observed directly under fluorescent light and a large number of cells were arrested but the cell number decreased rapidly at 24 hours. Single disseminated cells tended to die earlier than cells in aggregates. Dual colored fibrosarcoma cells were also injected into either the portal vein or abdominal aorta in nude mice. The liver and muscle were imaged to visualize the fate of the cells. The rate of sarcoma cell death was highest in the lung and lowest in the muscle. In each organ, single disseminated cells tended to die earlier than aggregated cells. Indocyanine green can image tumor angiogenesis and peritumoral lymphatic channels. This technology can be utilized fluorescent guided surgery, such as tumor imaging, avoiding vascular injuries and sentinel lymph node biopsy. **Conclusion:** Real time in vivo imaging of sarcoma cells enabled visualization of their dynamics, including cell mobility, invasion, metastasis and angiogenesis.

E-mail (main author): hayashikatsu830@aol.com



P1:102

p53-mediated apoptosis induction attenuates the resistance to oncolytic adenovirus in human osteosarcoma cells

Joe Hasei¹, Tsuyoshi Sasaki², Hiroshi Tazawa³, Shuhei Osaki⁴, Yasuaki Yamakawa⁴, Toshiyuki Kunisada⁴, Yasuo Urata⁵, Toshiyoshi Fujiwara³, Toshifumi Ozaki²

¹) Okayama University ²) Orthopedic Surg., Okayama Univ. ³) Gastroenterological Surg., Okayama Univ. ⁴) Dept. Orthopedic Surg., Okayama Univ. ⁵) Oncolys BioPharma, Inc., Japan

Background: We recently revealed that a telomerase-specific replication-competent oncolytic adenovirus, OBP-301, shows the cytopathic activity in human bone and soft tissue sarcoma cells. However, some human osteosarcoma cells were less susceptible to OBP-301. In this study, we generated OBP-702, in which a human wild-type p53 gene expression cassette was inserted into the E3 region of OBP-301, and compared the antitumor effects between OBP-702 and OBP-301 in OBP-301-sensitive and OBP-301-resistant human osteosarcoma cells.

Methods: We used three OBP-301-sensitive (U2OS, OST, HOS) and two OBP-301-resistant (SaOS-2, MNNG/HOS) human osteosarcoma cells. The difference of cytopathic activity between OBP-702 and OBP-301 was analyzed using XTT assay. The 50% inhibiting dose (ID50) value of OBP-702 and OBP-301 for each cell line was calculated using cell viability data obtained on day 5 after virus infection. Induction of apoptosis was assessed in OBP-301-resistant osteosarcoma cells infected with OBP-702, OBP-301 or Ad-p53, which is a p53-expressing replication-deficient adenovirus, by FACS analysis measuring active caspase-3 expression. The expressions of p53, p21 and cleaved PARP proteins were evaluated using western blot analysis. The in vivo antitumor effect of OBP-702, OBP-301 and Ad-p53 was studied using orthotopic human osteosarcoma MNNG/HOS tumor model with total three intratumoral injections every 2 days.

Results: OBP-702 showed more cytopathic activity than OBP-301 in both OBP-301-sensitive and OBP-301-resistant osteosarcoma cells. The ID50 value of OBP-702 was lower than that of OBP-301 in all cell lines. FACS analysis demonstrated that OBP-702 significantly increased active caspase-3 compared with Ad-p53 and OBP-301. OBP-702 induced higher expression of p53 and cleaved PARP than Ad-p53. However, p21 up-regulation was not observed in SaOS-2 and MNNG/HOS cells infected with OBP-702. These results suggested that OBP-702 could efficiently induce apoptosis in OBP-301-resistant osteosarcoma cells. In vivo intratumoral injection of OBP-702 significantly suppressed tumor growth compared with OBP-301, Ad-p53 and PBS using MNNG/HOS tumor xenograft model.

Conclusion: OBP-702 mediated p53 gene transduction remarkably induces apoptosis, resulting in the enhancement of antitumor effect. OBP-702 would be a promising treatment modality for patients with osteosarcoma.

E-mail (main author): joe@md.okayama-u.ac.jp



P1:103

Studies of Osteosarcoma Metastasis Driver Genes using Transposon Mutagenesis in Mice and TALEN-Mediated Gene Knockouts in Osteosarcoma Cell Lines

Tracy Powell¹, Branden Moriarity², Aaron Sarver², Yvonne Li³, Poul Sorensen³, David Largaespada²

¹) University of Minnesota ²) Masonic Cancer Center, University of MN, United States ³) Canada's M. Smith Genome Sciences Centre, Canada

Background: Random insertion of Sleeping Beauty (SB) transposons in somatic cells produces mutations leading to tumor development, which has successfully identified candidate genes for many types of cancer.

Methods: We created transgenic mice that develop osteosarcoma (OS) via SB transposon-mediated mutagenesis activated by an osteoblast specific Osterix-cre recombinase transgene (Osx-Cre). Tumorigenesis was accelerated with a Trp53 pathway deficient background (Trp53R270H/+). Ligation-mediated PCR, next generation DNA sequencing, and TAPDANCE software identified recurrent transposon sites in DNA isolated from primary tumors and metastatic nodules. Using transposon integration sites as molecular tags, non-supervised hierarchical clustering analysis assessed relatedness among metastatic and primary tumor sets. Copy number variation of candidate genes was evaluated in human matched normal, primary and metastases OS samples.

Results: Our quadruple transgenic mice (Osx-Cre; R26-LSL-SB11; LSL-Trp53R270H; T2/Onc) develop OS with an average latency of 10.5 months and a penetrance of 75% (n=96), compared to 17 months and 60% (n=49) in Trp53R270H/+ controls. SB tumors resemble human OS in gross anatomy, histological appearance, and presence of collagen. Over 100 metastatic nodules were collected from 16 quadruple transgenic mice. Analysis of recurrent SB integration sites revealed the well-known OS genes RB1 and CMYC in primary tumors, validating the screen, and novel genes not previously reported, including 10 genes common among metastatic nodules. Metastases from the same mice were clonal derivatives from the primary tumor and generally more related to each other than to the primary tumor, even when collected from different organs. Many of the genes identified by the SB screen mapped to regions with copy number changes in human OS tumors.

Conclusion: The SB screen revealed high clonality among metastases and identified several candidate metastatic drivers. Functional validation using published in vitro assays for migration and invasion is being conducted on cell lines derived from lung and primary tumor pairs collected from the SB mice and well-characterized human and murine OS cell lines: U2OS, HOS, MNNG/HOS, 143B, K12, and K7M2. Gene expression will be increased using over expression vectors containing cDNA and/ or silenced using transcription activator-like effector nuclease (TALENs) mediated gene knockout.

E-mail (main author): powell.tracy.ann@gmail.com



P1:104

Prospective identification of tumorigenic sarcoma cancer stem cells based on high aldehyde dehydrogenase 1 activity

Birgit Lohberger¹, Beate Rinner², Nicole Stundl³, Sonja Maria Walzer³, Reinhard Windhager³, Andreas Leithner³

¹) Medical University of Graz ²) Center for Medical Research, Medical Uni ³) Department of Orthopedic Surgery, Medica, Austria

Tumors contain a small population of cancer stem cells (CSC) proposed to be responsible for tumor maintenance and relapse. Aldehyde dehydrogenase 1 (ALDH1) activity has been used as a functional stem cell marker to isolate CSCs in different cancer types. This study used the Aldefluor® assay and fluorescence-activated cell sorting (FACS) analysis to isolate ALDH1^{high} cells from five human sarcoma cell lines and one primary chordoma cell line. ALDH1^{high} cells range from 0.3% (MUG-Chor1) to 4.1% (SW-1353) of gated cells. Immunohistochemical staining, analysis of the clone formation efficiency, and xCELLigence microelectronic sensor technology revealed that ALDH1^{high} cells from all sarcoma cell lines have an increased proliferation rate compared to ALDH1^{low} cells. By investigating of important regulators of stem cell biology, real-time RT-PCR data showed an increased expression of c-Myc, β -catenin, and SOX-2 in the ALDH1^{high} population and a significant higher level of ABCG2. Statistical analysis of data demonstrated that ALDH1^{high} cells of SW-982 and SW-1353 showed higher resistance to commonly used chemotherapeutic agents like doxorubicin, epirubicin, and cisplatin than ALDH1^{low} cells. Using a NOD/SCID mice xenograft model, ALDH1^{high} cells showed a greater tumor forming capacity compared to ALDH1^{low} cells. The ALDH1^{high} tumors were significantly larger than the ALDH1^{low} tumors after 4-6 weeks.

This study demonstrates that in different sarcoma cell lines, high ALDH1 activity can be used to identify a subpopulation of cells characterized by a significantly higher proliferation rate, increased colony forming, increased expression of ABC transporter genes and stemness markers compared to control cells. In addition, enhanced drug resistance and a greater tumor forming capacity were demonstrated.

E-mail (main author): birgit.lohberger@medunigraz.at



P1:105

Sesquiterpene lactones affect G2/M cell cycle arrest and apoptosis in human soft tissue sarcoma cell lines

Birgit Lohberger¹, Nadine Kretschmer², Beate Rinner³, Nicole Stundt⁴, Heike Kaltenegger⁴, Rudolf Bauer², Andreas Leithner⁴

¹) Medical University of Graz ²) Institute of Pharmaceutical Sciences, De ³) Center for Medical Research, Medical Uni ⁴) Department of Orthopedic Surgery, Medica, Austria

Uncontrolled proliferation, metastasis and failure in apoptosis constitute crucial elements in the development and progression of tumors. Several studies have demonstrated the efficacy of plant-derived agents in the treatment of various malignant entities. The present study investigated the anti-tumor effects of costunolide and dehydrocostus lactone isolated from *Saussurea lappa* in three human soft tissue sarcoma (STS) cell lines of various origins.

Cell proliferation was determined using the MTS assay and xCELLigence technology. Cell cycle distribution, cleaved caspase-3, and Annexin V/PI were analysed by FACS analysis. The protein expression level of PARP and cleaved-PARP, G1- and G2/M cell cycle checkpoints were analysed using western blotting.

Both compounds inhibited cell proliferation of STS cell lines at concentrations ranging from 0.5 to 100 µg/ml and incubation periods from 24 to 72 h. After costunolide treatment, no significant changes in cell cycle distribution were detected compared to untreated control groups. However, dehydrocostus lactone caused a significant reduction of the G1 phase and an increase in S and G2/M phases, as well as high levels of cleaved caspase-3 and PARP cleavage. The expression levels of CDK2, CDK1 (cdc2), cyclin B1, and p27 decreased significantly after dehydrocostus lactone treatment in a dose-dependent manner. Thus, G2/M arrest via the CDK1 down-regulation may be an important molecular mechanism by which dehydrocostus lactone inhibits cancer cell growth.

E-mail (main author): birgit.lohberger@medunigraz.at



P1:106

Histone deacetylase inhibitors as potential therapeutic targets for chordomas: an immunohistochemical and functional analysis

Susanne Scheipl¹, Birgit Lohberger¹, Elke Verena Froehlich¹, Beate Rinner¹, Johannes Haybaeck¹, Andreas Leithner¹, Peter Pal Varga¹, Franz Quehenberger¹, Bernadette Liegl¹

¹ Medical University Graz, Austria

Introduction: Chordomas are rare malignancies of the axial skeleton. Therapeutic modalities are mainly restricted to surgery and irradiation. HDAC inhibitors are tested in many clinical trials as promising new treatment options for various types of cancer.

Objectives: We intended to study whether HDAC inhibitors could be regarded as therapeutic targets for chordomas.

Materials and Methods: Fifty chordomas (34 primary tumors, 16 recurrences) from 44 patients (27 male, 17 females) were evaluated immunohistochemically for the expression of HDACs1-6. HDAC inhibitors Vorinostat (SAHA), Panobinostat (LBH-589), and Belinostat (PXD101) were tested in the chordoma cell line MUG_Chor1 for dose-dependent apoptotic effects. Apoptosis induction was investigated by caspase 3/7 activity, caspase-3 cleavage and PARP cleavage. P-values > 0.05 were considered significant.

Results: IHC: HDAC1 expressed a slight nuclear positivity (n = 5; 10%). Expression of HDAC2 was positive in the majority of cases (n = 36; 72%). HDACs 3 to 6 stained positive in all specimens available (n = 43; 86%). The strongest expression was observed for HDAC6.

Cell line: Caspase 3/7 activity was measured by the Caspase-Glo® 3/7 Assay in MUG-Chor1 cells after 3, 6, 24, 48, and 72 h treatment with the IC50 of SAHA, LBH-589, and PXD101. It peaked after 48 and 72 h in SAHA and LBH-589 treated cells. PXD101 treatment did not lead to caspase 3/7 activity. Cleaved caspase-3 was detected in 54.5±7.4% of SAHA treated, and in 63.1±13.2% of LBH-589 treated cells. In contrast, the control and PXD101 treated cells showed almost no cleaved caspase-3 (2.7±1.5% and 8.2±3.4% of gated cells, respectively). The percentage of cleaved caspase-3 positive cells increased significantly over time (p=0.0003 for SAHA, and p=0.0014 for LBH-589 after 72h).

Discussion: HDACs were detectable by IHC in our series, with HDAC1 showing the weakest, and HDAC6 showing the strongest staining. SAHA and LBH-589 significantly increased apoptosis of chordoma cells. Although sufficient data from chordomas is still lacking, the efficacy of various HDAC inhibitors has been shown in several types of sarcomas, particularly in combination with other anticancer therapeutics. Our results provide evidence to support further research on HDACs as potential therapeutic targets for chordoma therapy.

E-mail (main author): susanne.scheipl@gmx.at



P1:107

Gene expression of extracellular matrix proteins in lung metastases of giant cell tumour of bone: tumour or location specific?

Marusya Lieveld¹, Liesbeth Ceelen¹, Maria-Serena Benassi², Piero Picci², Gwen Sys³, Pancras Hogendoorn⁴, Ramses Forsyth¹

¹) Pathlicon, Belgium ²) IOR ³) University Ghent, Italy ⁴) LUMC, Netherlands

BACKGROUND

Giant cell tumour of bone (GCTB) is a primary bone tumour with an unpredictable clinical behavior which could sometimes be worrisome. One of these features is its ability to metastasize to the lungs. The mechanisms of this phenomenon have not been well understood. Recent studies indicate that the extracellular matrix may play a pivotal role in the primary tumor location to enhance its metastatic potential. Three of these reported genes are lumican (LUM), decorin (DCN) and tenascin which are all involved in the delicate balance between mobility and crosslinking of diverse components in the extracellular matrix.

AIMS

To investigate whether the expression of two of these ECM components - LUM and DCN as an example - are truly location specific (lung vs. bone) or tumour specific (metastasis and its primary tumour vs. non-metastasizing tumours).

METHODS

In total 31 samples of GCTB were used (5 primary, 6 lung-metastatic and 20 non-metastasizing GCTB samples). RNA extraction with cDNA synthesis and qPCR was performed in duplicate. Reference genes were selected and primers were designed against Lumican and Decorin using Primer-Blast, Oligo7 and mFold. The data were analyzed using qBaseplus (Biogazelle). Statistical analyses were performed using the unpaired and paired t-test.

RESULTS

Comparison of the different gene expression profiles of LUM and DCN in the different GCTB-groups exhibits following results:

- no significant differential gene expression between lung meta's and their primary located tumours (DCN: $p < 0,804$. LUM: $p < 0,283$).
- A significant lower differential gene expression in the lung meta's compared to the non-metastasizing tumour samples (DCN: $p < 0,002$. LUM: $p < 0,001$)
- A significant lower differential gene expression of the metastasizing primary tumours when compared to the non-metastasizing tumour (DCN: $p < 0,003$. LUM: $p < 0,001$).

CONCLUSION

As the gene expression of both extracellular matrix proteins differs significantly between meta's and non-metastasizing tumours and between primary tumours compared with the non-metastasizing groups, proves that the expression of LUM and DCN is tumour specific. Moreover, a lower differential gene expression of these ECM genes is a potential indicator and therefore an alarm for those tumours at risk to metastasize.

E-mail (main author): r@forsyth.be



P1:108

Possible roles of osteosarcoma-derived exosomes in promoting pre-metastatic niche in the lung

Tomohiro Fujiwara¹, Takeshi Katsuda¹, Nobuyoshi Kosaka¹, Akira Kawai¹, Toshifumi Ozaki², Takahiro Ochiya¹

¹) National Cancer Center ²) Okayama University, Japan

Background

Recent studies have shown the involvement of tumor-derived exosomes in tumor progression. Exosomes are nanometer-sized vesicles secreted by diverse cell types that play complex roles in intercellular communication. They comprise a ceramide- and cholesterol-rich lipid bilayer membrane, and contain both mRNA and microRNA, which can be delivered to another cells. Furthermore, neutral sphingomyelinase 2 (nSMase2), regulating the biogenesis of ceramide, were found to trigger secretion of exosomes. In this study, we investigated the role of OS-derived exosomes in lung metastasis through the regulation of ceramide signaling pathway.

Methods

We used a highly metastatic human OS cell line 143B cells expressing firefly luciferase (143B F-luc) and established a derivative cell line with shRNA knockdown of neutral sphingomyelinase 2 (143B-F-luc-KD-nSMase2). Exosomes derived from 143B F-luc were isolated by ultracentrifugation. Original 143B F-luc cells were orthotopically transplanted to the right tibia of nude mice at 1.5×10^6 cells/mouse (group 1). Mice similarly transplanted with 143B-F-luc-KD-nSMase2 cells were divided into 2 groups, and were intravenously administered 200 μ L PBS (group 2) or 5 μ g-exosomes/200 μ L PBS (group 3) twice a week for 3 weeks. Lung metastases were monitored by IVIS system.

Results

Lung metastases were observed in 7/10 mice in group 1 at 3 weeks after orthotopic transplantation. In contrast, only 3/10 mice showed lung metastases in group 2, indicating the decreased metastases following the inhibition of exosome secretion. Remarkably, however, 7/10 mice showed metastases in group 3, indicating that systemically administered exosomes restored the metastatic ability. Histopathological examination of the lungs confirmed that the numbers of metastatic foci were dramatically reduced in group 2 compared with group 1, whereas that in group 3 was comparable to group 1.

Conclusion

We demonstrated that exosomes secreted by highly metastatic osteosarcoma cell line into the circulation promoted lung metastasis in vivo. Given the accessibility of exosomes to distant organs, we hypothesize roles of exosomes in pre-metastatic niche formation in the lung, and are now exploring the underlying molecular mechanisms.

E-mail (main author): tofujiwa@ncc.go.jp



P2:101

Insulin-like growth factors (IGF) I and II, and IGF binding proteins 1, 3 levels in bone tumor patients blood serum

Nikolay Kushlinskiy¹, Yury Timofeev², Irina Babkina¹, Elena Gershtein¹, Evgeny Solovykh²

¹) Rus. N.N.Blokhin Cancer Research Center ²) Moscow St.Medico-Stomatologic University, Russian Federation

Objectives: Bone tumors are a group of musculo-skeletal diseases that are extremely difficult to diagnose. The difficulty of biopsy and a large percent of non-informative punctures impose necessity to introduce serum biomarkers determination in patients with bone neoplasms for facilitating diagnostics. The objective of this study was to measure some insuline-like growth factor system components in blood serum of malignant and benign bone tumor patients and practically healthy persons in order to assess their associations with the key tumor characteristics.

Methods: 162 persons aged 14 - 69 years were involved in the study: 113 bone tumor patients (25 with osteogenic sarcoma, 21 - chondrosarcoma, 18 Ewing sarcoma, 5 - malignant fibrous histiocytoma, 14 - giant cell bone tumor, and 30 with various benign tumors) and 49 practically healthy people as a control. IGF-I, IGF-II, IGFBP-1, and IGFBP-3 levels were measured in blood serum with standard ELISA Assay Kits (DSL Inc, USA).

Results: Serum IGF-I levels were significantly higher in patients with malignant bone tumors than in those with benign lesions, and IGF-I level in benign bone tumor patients' sera was significantly higher than in control group. Serum IGF-II in malignant bone tumor patients was higher than in both benign bone tumor patients, and control persons. Serum IGF-I in patients with chondrosarcoma was significantly lower than in Ewing sarcoma and osteogenic sarcoma groups. IGFBP-1 levels did not differ between the whole group of bone tumor patients and controls. And serum IGFBP-3 was the highest in benign bone tumor patients, lower in patients with malignant tumors, and the lowest level of this protein was observed in control group. No significant associations of IGFs/IGFBPs serum levels with tumor localization, its size and type of affected bone were revealed.

Conclusions: IGF-I and IGF-II serum levels in patients with malignant bone tumors are elevated as compared to persons with benign bone lesions and practically healthy people, while serum IGFBP-3 level is the highest in benign bone tumor group. These results allow to suggest that IGF-I and IGF-II could be involved in pathogenesis of bone tumors, and IGFBP-3 might play a protective role in this process.

E-mail (main author): esgershtein@gmail.com



P2:102

Associations of single nucleotide polymorphisms IGF1.rs7956547, GNRH2.rs3761243 and FGFR3.rs6599400 with bone tumors in Russian population

Nikolay Kushlinskiy¹, Yury Timofeev², E.V. Generozov³, V.A. Naumov³, Yu.N. Soloviyev¹

¹) Rus. N.N.Blokhin Cancer Research Center ²) Moscow St.Medico-Stomatologic University ³) Res.Inst. of Phys.-Chem. Medicine, Russian Federation

Objectives: Bone tumors are a rather rare, but difficult in diagnostics and treatment group of oncological diseases. This investigation continues our earlier study of associations of single nucleotide polymorphisms revealed by osteosarcoma group [Mirabello et al., BMC Cancer 11:209, 2011] with bone tumors in Russian population [Naumov et al., Bull Exp Biol Med. 53(6), 2012]. The aim of present study was to detect meaningful changes in genes that are responsible for bone growth and development: insulin-like growth factor 1 (IGF1) gene, growth hormone 1 (GH1) gene, gonadotropin-releasing hormone 2 (GNRH2) gene, fibroblast growth factor 2 (FGF2) gene, fibroblast growth factor receptor 3 (FGFR3) gene, p53 binding protein homolog (MDM2) gene.

Methods: 119 patients with various bone neoplasms (osteogenic sarcoma 43, Ewing Sarcoma - 6, chondrosarcoma - 40, malignant fibrous histiocytoma - 2, fibrosarcoma - 1, bone lymphoma - 1, chordoma - 1, giant cell bone tumor 25) undergoing examination and treatment in the department of General Oncology of the Russian N.N. Blokhin Cancer Research Center were included in this study. The control group comprised 93 people without oncological diseases. Genomic DNA was extracted from leukocyte fraction of peripheral blood. The determination of polymorphisms alleles rs7921(GH1), rs7956547(IGF1), rs3761243(GNRH2), rs11737764(FGF2), rs6599400(FGFR3), rs1690916(MDM2) was performed during the reaction of mini-sequencing with following mass-spectrometry measuring of reaction products in time-of-flight mass-spectrometer AutoFlex-III (MALDI-TOF).

Results: 3 of 6 polymorphisms showed significant associations with bone neoplasms: IGF1.rs7956547 (risk allele T, OR = 3,28[1,42-7,54], p=0,003), GNRH2.rs3761243 (protective allele C, OR = 0,54[0,3-0,99], p=0,04), FGFR3.rs6599400 (risk allele A, OR = 2,15[1,06-4,34], p=0,03).

Conclusions: The studied polymorphisms are located in genes which products are responsible for growth and formation of bone, and they also are involved in tumor progression. It allows to suggest that these polymorphisms might be involved not only in the development of osteosarcoma, but also in the origin of bone tumors as a whole. Our results confirm our recent data on a larger group of patients and detect new significant associations.

E-mail (main author): esgershtein@gmail.com



P2:103

Diffuse Large B-Cell Lymphoma Presented as Bone Lesions. A study of cases

Irena Boulytcheva¹, Nikolay Kushlinskiy², Yuriy Soloviev³, Mamed Aliev²

¹⁾ N.N.Blokchin's Central Research Oncology ²⁾ N.N.Blokchin's Center ³⁾ N.N.Blochins's Center, Russian Federation

Irena V. Boulytcheva ., Nicolay E. Kushlinskiy.,Yuriy N. Soloviev., Mamed D. Aliev.

N.N.Blokhin Cancer Research Center, Moscow, Russian Federation

Introduction: Diffuse large B-cell lymphoma is the most common lymphoma worldwide. Both morphologically and prognostically it represents a diverse spectrum of disease. Primary bone lymphoma is suggested when the patient remains free of extraskkeletal disease for 6 months after diagnosis. Primary B-cell lymphomas has been lately classified as 3 distinct subtypes, which reflect different stages of B-cell differentiation.

Materials and Methods : Twenty-eight patients with primary diffuse large B-cell lymphoma of bone were studied. The tumors were subclassified according to the criteria of the WHO standards and evaluated by immunohistochemistry . The spectrum of antigens including bcl-6, CD10, MUM-1, CD 138, bcl-2 (DAKO corporation) helps to investigate the possible relationship of PBDLBCL of bone to stages of normal B-cell differentiation.This review focuses solely on de novo DLBCL presenting with bone involvement without evidence of extraskkeletal disease.

Results and Conclusions We report a series of 28 primary bone lymphoma cases with female predominance (10/18), the median age of the patients (48,2), the femur was the most common site of involvement and axial skeleton the second most common location. Most tumors were centroblastic, or centroblastic with multilobated nuclei (20/71%). The majority of tumors (17/62%) were bcl-6 positive, and 15/53% of cases coexpressed CD10. The combination of positive CD10 and bcl-6 markers is currently widely accepted as an immunophenotypic signature for germinal center (GC) –like phenotype. The absence of both markers, 10/37% of cases , were interpreted as indicative of a post germinal center phenotype. The coexpression of MUM-1 and bcl-6, that is exclusive in normal GC B-cells, has been reported in 9/29% of the cases and possibly suggests a late stage of GC differentiation for those MUM1+ cases.

Several clinical studies indicate that patients with primary bone lymphomas have a favorable prognosis. Overall, the outcome in CD10 and bcl-6 positive cases after combined modality therapy was better, than in other groups of the patients. Most tumors showed neither morphologic nor phenotypic evidence for plasmacytic differentiation, suggesting a biologic difference from plasma cell tumors of bone. The expression of CD10 was associated with improved survival.

E-mail (main author): irena@boulytcheva.com



P2:104

Cytokine spectrum of patients with osteosarcoma

*Djamilya Polatova¹**¹⁾ National Cancer Center of Uzbekistan, Uzbekistan*

Background: To study the spectrum of patients with osteosarcoma.

Methods: 42 patients with histological, verified osteosarcoma were examined, who have been treated at National Cancer Center from 2009 to 2011, male patients predominated – 55.4%, female – 44.6%, correspondingly. Average of patients made up 19.5. For study serumal concentration of cytokines was used test – systems of «Vector-Best», Novosibirsk, 2011. Studied cytokine spectrum was presented IL-1 β , TNF- α , IL-2, IL-6, IL-10 and VEGF.

Results: Serum concentration of IL-1 beta, TFN-alpha and IL-2 in the group of patients with osteosarcoma were increased in 2; 2.4 and 1.5 times correspondingly relative significance of control group. Investigations showed, that serum concentration of IL-1 and IL-6 were increased in 1.3 and 23 times correspondingly, than significance of control group (pConclusion: Thus, obtained data show significant changes in cytokine spectrum of patients' blood with osteosarcoma, which have important significance in forming and progressing of malignant process. Detected disbalance in the contents of main cytokine of immune system in patients with osteosarcoma serves important diagnostic and prognostic criteria in determination further treatment tactics in patients with osteosarcoma.

E-mail (main author): polatova.dj@gmail.com



P2:105

Immunolocalization and Expression of Afadin-6 in Plexiform Neurofibromas

Mohammed Sulaiman¹, Andrew Dodson², Timothy Helliwell², Caleb Kudi³, Ibrahim Hussaini³, Joseph Hambolu³

¹) Ahmadu Bello University Zaria, Nigeria ²) University of Liverpool, United Kingdom ³) Ahmadu Bello University, Nigeria

Background

Neurofibromatosis type 1 (NF1) is a frequent single-gene disorder that affects the musculoskeletal system and the nervous system. Neurofibromatosis type-1 is inherited in an autosomal dominant manner with an incidence of about 1 in 3000. Tight junctions are specialized cell-cell point of adhesion at the apical region of epithelial and endothelial cells that creates cellular barrier. The Afadin-6 protein is a protein that contains two potential Ras binding domains. The Afadin-6 functionally links the cytoskeleton, through cellular signalling pathways and the cell-cell junctions. This study was carried out to demonstrate the relative expression and cellular localization of Afadin-6 in Plexiform neurofibroma by immunohistochemistry.

Methods

Informed patient consent was obtained two weeks before surgery and the study has an ethical approval (06/1505/137) of Liverpool Research Ethics Committee. Standard Operating Procedure of the department of Pathology, University of Liverpool was used in the immunohistochemistry technique. Both the test and control tissues were immunostained with Rabbit Anti-AF-6 polyclonal antibody diluted at 1:100-1:200 at (pH 7.0) (Catalogue No. 433280, Invitrogen). Slides were visualised under light microscopy.

Results

The Afadin-6 immunoreactivity on the perineurial fibroblast cell-cell junction was observed to be weak and localised at the cell-cell junction of the perineurial fibroblast of all the familial. Furthermore, moderate membranous and nuclei immunolocalization of the AF-6 were observed in endothelial and Schwann cells of all the Plexiform Neurofibromas.

Conclusion

The study suggests that Afadin-6 may be involved in cell proliferation and survival of the neurofibroma cells and therefore becomes a target protein in the management of plexiform neurofibroma which has the potential of transforming to Malignant Peripheral Nerve Sheath Tumour.

E-mail (main author): m.h.sulaiman@liv.ac.uk



P2:106

Extra-axial Chordoma of bone and soft tissues: report of two case.*Antonina Parafioriti¹, Elisabetta Armiraglio², Andrea Di Bernardo², Primo Andrea Daolio³, Roberto Zorzi³, Anna Concetta Berardi²**¹⁾ Orthopaedic Institute Gaetano Pini ²⁾ Pathology Dept, Orthop.Institute G. Pini ³⁾ Orthopaedic Surgery, Orthop.Inst.G. Pini, Italy*

Chordoma is a rare low-to-intermediate grade malignant bone tumor usually affecting the axial spine of adult patients that shows a distinctive immunophenotype (cytokeratins, S100 and brachyury).

Very few cases of chordoma-like lesions have been described in extra-axial sites where, despite their rarity, they pose problems of differential diagnosis with primary or metastatic epithelioid tumors of soft tissue and bone, in particular with the mixed tumor/myepithelioma/parachordoma family of tumors.

Here we described two cases of extra-axial soft-tissue chordomas.

The first case was a 39 year old woman with a history of swelling and pain of the right arm that, at radiological examination, showed a juxta-osseous mass of 5 cm involving the humerus shaft and consequently underwent mid-humerus resection. The second case was a 58 year old woman with symptoms of knee joint monoarthritis and synovial hyperplasia at the imaging investigations which underwent diagnostic biopsy of the synovial membrane. On histological evaluation both cases showed an epithelioid morphology with mixo-chondroid pattern and a phenotype consistent with chordoma, in particular cytokeratin 19 and brachyury positive reactivity were observed.

The latter is the first case described in intrarticular localization within the synovial membrane to the best of our knowledge. Remarkably both cases were characterized by co-expression of CK 19 and brachyury which is considered highly specific of classic chordoma.

The diagnosis of extra-axial chordoma can be challenging, especially in biopsy specimen, because of the rarity of this entity and the immunomorphological features largely overlapping with other tumors (i.e. epithelioid features, Cytokeratins, S100). However, the recognition of extra-axial chordoma is important given its prognostic and therapeutic implications which are different from those of the other entities that could be mistaken for it.

E-mail (main author): antonina.parafioriti@gpini.it



P2:107

Immunohistochemical evaluation of prognostic markers in giant cell tumors of bone: Tenascin and Periostin as predictor of recurrence and metastasis.

Antonina Parafioriti¹, Elisabetta Armiraglio², Andrea Di Bernardo², Primo Andrea Daolio³, Stefano Bastoni³, Anna Concetta Berardi²

¹) Orthopaedic Institute Gaetano Pini ²) Pathology Dept., Orthop.Institute G.Pini ³) Orthop. Surgery, Orthop.Institute G.Pini, Italy

AIMS:

Giant cell tumours (GCTs) of bone are lytic neoplasm with variable biological aggressiveness and high recurrence rate that occur mainly in the epiphysis of long bones of young adults. These neoplasms can occasionally metastasize to the lung, but malignant transformation into sarcoma is rare. According to the current state of knowledge, histological features are not considered a valid predictor of recurrence and/or metastasis risk. The aim of this study is to investigate the expression of different markers in classic primary GCT, including some components of the extracellular matrix, P63 and P53 that may help to differentiate patients with increased risk of local recurrence and/or distant metastasis.

METHODS AND RESULTS:

40 cases of GCT were selected and immunohistochemical analysis of the expression of P63, P53, Tenascin C (TNC) and Periostin (Pn) was performed. A correlation was found between different expression patterns and clinical outcome identifying Tenascin C (TNC) and Pn as the most promising prognostic biological markers.

TNC and Pn immunoreactivity evaluation may complete and integrate the morphologic data, that alone are insufficient to risk-stratify patients, and may lead to a more accurate classification and identification of subgroups with different outcome.

CONCLUSIONS:

Our study provides encouraging results in the search for potential biomarkers with relevant clinical impact in GCT, suggesting the possible prognostic value of TNC and Pn expression in the identification of those GCT patients with a higher risk of relapse which, consequently, require a closer follow-up and, possibly, an adjuvant medical therapy.

E-mail (main author): antonina.parafioriti@gpini.it



P2:108

Reactive Bone Lesions in Postchemotherapy Pediatric Bone Tumor Specimens: Implications on Surgical Planning by Preoperative MRI

Iman Gouda¹, Iman Zaki¹, Ahmed El Ghoneimy¹, Magdy El Sherbiny¹, Ranin Soliman¹, Manal Zamzam¹

¹) Children's Cancer Hospital Egypt, Egypt

Background: Therapy-associated changes in bone tumor specimens include changes in tumour volume and reactive changes associated with tumor necrosis as well as marrow changes and periosteal reaction.

Aim: This study analyzed the accuracy of pre-operative MRI images in determining the local tumor extent before surgery in patients with high-grade osteosarcoma and Ewings sarcoma after neo-adjuvant chemotherapy.

Methods: From January 2009 till January 2011, a total number of 75 pediatric patients presented at the Children Cancer Hospital Egypt with malignant tumors in long bones; High-grade osteosarcoma (n=56) and Ewing sarcoma (n=19) patients treated with neo-adjuvant chemotherapy and definitive surgery were analyzed. We compared the accuracy of the intra-osseous extent of the tumor as measured by pre-operative MRI, with the actual extent of the tumor as assessed by gross and microscopic examination of the resected specimens. Difference in measurements of more than 1 cm was considered as discrepancy.

Results. The extent of intra-osseous tumor was defined accurately by preoperative MRI in 50 (89%) osteosarcoma cases and 15 Ewings sarcoma cases (78%). The mean overestimation between definitive histopathology and MRI measurements in Osteosarcomas was 3.2 (median = 2.5). In Ewings sarcoma, the mean overestimation by MRI was 2 cm (median = 2.5). In osteosarcoma, the correlation coefficient between maximum radiological dimension determined by pre-operative MRI and by pathology was 0.967 (p-value < 0.001). In Ewing's sarcoma, the correlation coefficient between maximum radiological dimension and pathology was 0.973 (p-value < 0.001). Important causes for inaccurate measurements from MRI included bone marrow changes as edema or focal necrosis, and false positive epiphyseal infiltration.

Conclusions. Preoperative evaluation of tumor extent using MRI is a reliable method to assess the local extent of bone tumors in children. These findings are useful in planning surgical limb salvage procedures and stress the ineffectiveness of the "therapy-associated changes" in bone specimens on preoperative radiological estimation of tumor extent. Intra-operative frozen section examination of the margins should be considered as part of the assessment in limb-sparing procedures. More consideration should be given to distinguishing treatment-related reactive changes.

E-mail (main author): imangouda@gmail.com



P2:109

Correlation of proliferation index Ki67 with grade and time to recurrence of soft tissue sarcoma

Dmitry Martynkov¹, Yana Vishnevskaya², Teymuraz Kharatishvili², Benjamin Bohyan²

¹) Russian Cancer Research Center RAMS ²) RCRC RAMS, Russian Federation

Background: Analysis of correlation of proliferation index Ki67 with grade and time to recurrence of soft tissue sarcomas.

Methods: We reviewed 34 patients treated in RCRC RAMS. 53% patients were female, 47% - male. Adult patients - 97%, children - 3%. Soft tissue tumors localized on lower extremities in 47% cases (hip, shank), on upper extremities in 20% cases (shoulder, forearm, hand), on trunk in 24% cases, on head and neck in 9% patients. Histological subtypes were monophasic synovial sarcoma - 32%, malignant fibrous histiocytoma - 23%, liposarcoma - 18%, malignant schwannoma - 6%, and other types in isolated instances. Synovial sarcoma more often observed in young and middle age women, malignant fibrous histiocytoma - in old men, liposarcoma - equally often in middle and old men and women. We observed soft tissue sarcoma grade 2 (FNCLCC) more frequently.

Results: Local recurrence development in 35% cases, number of recurrences was from 1 to 6. Distant metastases were in 8 patients (in lungs, bones). We used monoclonal antibody Ki67 (clone MIB-1). Proliferation index Ki67 evaluated in the following way: low level - less than 25% of tumor cells, middle level - 25-50%, high level - more than 50% of tumor cells.

Conclusion: Proliferation activity Ki67 increase in cases with high grade soft tissue sarcoma (in grade 1 tumors - low and middle proliferation activity, in grade 2 tumors - middle and high proliferation activity, in grade 3 tumors - only high proliferation activity). Proliferation activity Ki67 increase in recurrent tumors (2-3 times more in comparison with primary tumors). In cases with low level of proliferation index Ki67 were observed long interval to local recurrence and distant metastases. If level of Ki67 was high, time interval to local recurrence was short, lethal outcome occurred often.

E-mail (main author): generaloncology@rambler.ru



P2:110

The significance of the minimal residual disease detection in Ewing sarcoma and primitive neuroectodermal tumor

Aleksandra Bonevski¹, Marija Mišić², Jasminka Stepan¹, Gordana Jakovljević¹, Sven Seiwerth³

¹) Children's Hospital Zagreb ²) Pathology Department, Medical School Zag ³) Pathology department, Medical School Zag, Croatia

Background: The Ewing sarcoma and primitive neuroectodermal tumor are bone and soft tissue malignant tumors which occur mainly in children and young adults. A reciprocal translocation resulting in fusion of the EWS gene with a member of the ETS family of transcription factors is highly specific marker for this group of tumors.

Method: During the 5 year period, from 2004 to 2008, we have analysed 24 patients, tumor tissue, peripheral blood and bone marrow for the EWS FLI 1 type 1 and type 2. The samples were analyzed with reverse transcriptase polymerase chain reaction method (RT-PCR)

Results: 24 tumor samples were analysed at the time of diagnosis. 19 (79,2%) were positive for type 1, 2 (8,3%) were positive for type 2 and 3 (12,5%) were negative. At the same time, 4 (16,6%) blood samples were positive for type 1, 1 (4,2%) was positive for type 2, and 16 (66,7%) were negative for EWS-FLI1 translocation. During the intensive chemotherapy treatment (Vincristine, Doxorubicin, ifosfamide, Etoposide), all the blood and bone marrow specimens were negative. During the follow-up 2(8,3%) patients had positive type 1, 1(4,2%) had positive type 2, 16 (66,7%) had negative blood samples, and due the technical error 5(20,8%) specimens were excluded. In the bone marrow, type 1 were positive in 2 samples, and type 2 in 2 samples. Overall distribution of the bone marrow samples was: 5(20,8%) type 1, 2 (8,3%) type 2.

Conclusions: EWS-FLI1 type 1, isolated from tumor tissue, showed to be prognostic factor for better outcome. The bone marrow positive translocation was more valuable prognostic marker than one in the peripheral blood. During our follow-up, all patients who had positive EWS-FLI1 fusion in the bone marrow had been detected with clinical progression or recurrence in the period of 2 to 11 months. Some patients with positive EWS-FLI1 in the blood, after follow-up of even several years hadn't got the recurrence of the disease. EWS-FLI1 positive fusion in the peripheral blood therefore couldn't be reliable prognostic factor for the clinical outcome, and positive bone marrow would definitely be the strong predictive factor for the recurrence or disease progression.

E-mail (main author): a.bonevski@gmail.com



P2:111

Centrosome amplification in primary sarcoma cultures and its association with malignant behavior in tumor

Valter Penna¹, Marjori Camparoto¹, Rui Reis¹, Jeremy Squire², Sandra Morini¹, Adhemar Longatto¹, Isabela Carvalho¹, Carla Pinheiro¹, Maicon Zanon¹

¹) Barretos Cancer Hospital, Brazil ²) University of Toronto, Canada

Background - Recent studies have reported that centrosome amplification occurs in various types of malignant and borderline malignant sarcomas. In these tumours, aneuploid karyotypes are strongly associated with centrosome alterations. New evidence on centrosome clustering mechanisms has provided insights on how cancer cells survive with supernumerary centrosomes. We investigated the frequencies of centrosome clustering in primary sarcomas in association with clinical aspects.

Objective – The aim of the present study was to standardize the method for isolation and cultivation of tumor cells from samples of sarcoma tissue biopsies for centrosome analysis. and to compare findings in centrosome amplification frequency between different sarcoma subtypes.

Methods – 12 samples of sarcomas were collected from 11 patients of the Orthopedics Department at the Barretos Cancer Hospital, Barretos-SP-Brazil between January and September 2012. Primary tumor specimens were finely minced, trypsin treated and cultured in DMEM supplemented with 10% fetal bovine serum and 1% antibiotics. Cells were cultured on coverslips for 3 to 4 days, washed with phosphate-buffered saline (PBS), fixed with 4% paraformaldehyde, and then permeabilized with Triton-X100. The UltraVision Plus detection system was used for centrosome immunostaining and analysis. The cells were incubated overnight with mouse monoclonal anti-γ-tubulin following blockade with Ultra-V-Block. After DAB exposure, the slides were subsequently stained with hematoxylin. Centrosome signals were evaluated in 100 cells to determine centrosome number frequencies.

Results – Tumors cell centrosomes were present in variable numbers, located in clusters and/or in isolated points within the nucleus. Quantitative analysis demonstrated differences in centrosome amplification frequency between the different subtypes of sarcomas. Grade I chondrosarcomas presented centrosome amplification in 48% of cells, where as Grade III or recurrent tumors presented 76% of cells with amplification and demonstrated a of 3.5-fold increase in the frequency of cluster formation. For pleomorphic, synovial and myxoid sarcoma the frequencies of clusters was the highest, ranging from 26 to 58.

Conclusion – These data related to centrosome amplification were relevant and could contribute to the understanding of the pathological diagnosis and prognosis of bone and soft tissue sarcomas.

E-mail (main author): valter_penna@terra.com.br



P2:112

The expression of Tissue Factor mRNA in bone and soft tissue sarcoma patients

Kunihiro Asanuma¹, Akihiko Matsumine¹, Takao Matsubara¹, Tomoki Nakamura¹, Toru Ooi¹, Yumiko Asanuma¹, Akihiro Sudo¹

¹Mie University, Japan

Background:

Many tumor cells elicit procoagulant activity by transmembrane tissue factor (TF) leading to the generation of factor Xa, thrombin and fibrin. TF-FactorVIIa complex, FactorXa, and thrombin can promotes tumor cell invasion, adhesion, proliferation and cytokine, MMPs and VEGF production. It is reported that TF expressed by tumors is demonstrated to be an independent prognostic indicator for overall survival (OS) in carcinoma. As shown above, there are considerable evidences that coagulation factors play a critical role in tumor malignancy. However, there is no report about correlation between TF and bone sarcoma (BS) and soft tissue sarcoma (STS). The purpose of this study is to elucidate the correlation between TF mRNA expression level and clinicopathological parameters and to predict the prognosis of BS and STS patients.

Methods:

This study was performed on tumor tissue samples with histologically verified BS (30 patients) and STS (68 patients). The median age of patients was 47.2 years (range 2-85 years). The median follow-up time of patients was 81 months (range 8-159 months). cDNA were synthesized and TF mRNA expression levels was quantified using a endogenous gene (GAPDH). The relation of TF expression levels with clinicopathological parameters and OS was evaluated.

Results:

TF expression level was enhanced in high grade group than low grade group. TF expression level was higher in the metastatic patients than no-metastatic patients in histological high grade group of STS. In Kaplan Meier analysis, OS were worse for patients with high TF expression group compared with low TF expression group in histological high grade group of STS. However, TF expression level and OS of BS came out of the opposite of STS. These data cannot show statistical significant differences.

Conclusion:

In this study, we reported that high TF expression is thought to be associated with tumor malignancy in STS. This may have a possibility that the measurement of TF expression contribute to not only prediction of tumor malignancy of STS. These need further study.

E-mail (main author): kasanum@gmail.com



P4:101

Features of central venous catheterization in patients with Askin tumor

Maxim Rykov¹, Elena Gyokova¹

¹) Institute of Pediatric Oncology, Russian Federation

Background: Treatment of Askin tumor in children - PNET thoraco-pulmonary zone - in the first stage involves holding at least five cycles of chemotherapy requiring the central vein catheterization in the first hours after the diagnosis. In this case, the anatomy of the chest is often changed because of the prevalence of tumor, making the subclavian vein puncture even more dangerous. Implanted venous port is often not possible due to contraindications for general anesthesia. The optimal choice - catheterization of the internal jugular vein on the affected side, it is easier and safer to the femoral vein catheterization.

Materials and Methods: From 2010 to 2012, we observed 15 patients with Askin tumor at the age of 6 to 17 years. In 7 (46.6%) of these tumor-induced processes that use mediastinal shift, sprouting dome diaphragm, pushed aside and squeezed the subclavian artery and vein. These patients were performed catheterization of the internal jugular vein on the affected side after the preliminary layout with ultrasound. As a solution to close the catheters between their uses, we use a product containing taurolidine, prevents the formation of biofilm on the inner surface of the catheter. After the 2 courses of chemotherapy (including combinations of Doxorubicin, Vincristine, Cyclophosphamide and Etoposide with

Ifosfamide) the significant regression process and the stabilization of the state were achieved providing these patients with long-term vascular access.

Results: no cases of hemo-pneumothorax, trauma adjacent common carotid artery and other anatomical structures, catheter-related infections were observed. In 3 (20%) patients developed catheter thrombosis, which was successfully resolved by adding to it 3 ml of urokinase with exposure of 15 minutes.

Conclusion: the internal jugular vein catheterization in patients with contraindications to implantation of subcutaneous venous ports and a high risk of complications when trying to subclavian vein allows to initiate neoadjuvant chemotherapy in minor time. With virtually no risk of complications that can delay the performance of significant treatment. The use of taurolidine between using a catheter allows to avoid infection. However, the presence of an external central venous catheter requires permanent location of children in hospital.

E-mail (main author): wordex2006@rambler.ru



P4:102

Common gene variants in RAD51, XRCC2 and XPD are not associated with clinical outcome in soft-tissue sarcoma patients

Joanna Szkandera¹, Gudrun Absenger¹, Bernadette Liegl-Atzwanger¹, Martin Pichler¹, Michael Stotz¹, Maximilian Zacherl¹, Wilfried Renner¹, Andreas Leithner¹, Armin Gerger¹

¹) Medical University of Graz, Austria

Background: DNA repair mechanisms play a major role in cancer risk and progression. Germline variants in DNA repair genes may result in altered gene function and/or activity, thereby causing interindividual differences in a patient's tumor recurrence capacity. In genes of the DNA repair pathway the gene variants RAD51 rs1801320 G>C, XRCC2 rs3218536 G>A and XPD rs13181 A>C have been previously related to genetic predisposition and prognosis of various cancer entities. Therefore, we investigated the association between RAD51 rs1801320 G>C, XRCC2 rs3218536 G>A and XPD rs13181 A>C polymorphisms and time to tumor recurrence (TTR) and overall survival (OS) in soft-tissue sarcoma (STS) patients after curative surgery.

Methods: A total of 260 patients were included in this retrospective study. Germline DNA was genotyped by 5'-exonuclease (TaqMan) technology. Genotypes of each polymorphism were tested for association with TTR and OS using univariate and multivariate Cox-regression analysis.

Results: A statistically significant association was observed between tumor grade and adjuvant radiotherapy and TTR and between tumor grade and OS. However, no association was found between RAD51 rs1801320 G>C, XRCC2 rs3218536 G>A and XPD rs13181 A>C and TTR and OS in univariate and multivariate analysis including tumor grade and adjuvant radiotherapy.

Conclusion: In conclusion, our results underline a prognostic effect of tumor grade and adjuvant radiotherapy in STS patients but indicate no association between RAD51 rs1801320 G>C, XRCC2 rs3218536 G>A and XPD rs13181 A>C and clinical outcome in STS patients after curative surgery.

E-mail (main author): joanna.szkandera@medunigraz.at



P4:103

Activation of peroxisome proliferator-activated receptor gamma is a novel therapeutic means for giant cell tumor

Akihiko Takeuchi¹, Norio Yamamoto¹, Hideji Nishida¹, Katsuhiro Hayashi¹, Hiroaki Kimura¹, Takashi Kato¹, Yasuhiko Yamamoto¹, Hiroyuki Tsuchiya¹

¹) Kanazawa University, Japan

Introduction:

Peroxisome proliferator-activated receptor gamma (PPAR γ) is a ligand-activated transcription factor that belongs to the nuclear hormone receptor superfamily. PPAR γ plays a central role in the differentiation of adipocytes from precursor cells and is reported to exhibit anti-tumorigenic effects on a certain malignancy. Giant cell tumor of bone (GCTB) is a common primary benign tumor, but in some cases behaves aggressively, resulting in tumor recurrence. It is known that stromal cells of GCTB has a key role in the pathogenesis of the tumor rather than the multinucleated giant cell. However, effective therapies against GCTB have not been established to target the stromal cells. Moreover, the therapeutic effects of PPAR γ activation on GCTB have not been fully clarified.

Methods:

We established primary cell lines of GCTB stromal tumor cells from fresh GCTB specimens surgically resected from two patients. These cell lines were treated with zaltoprofen, a nonsteroidal anti-inflammatory drug possessing an ability of activation of PPAR γ , or troglitazone, a high-affinity agonist for PPAR γ , at different concentrations and then subjected to WST-1 cell proliferation and TUNEL assays. The expression of PPAR γ was assessed by immunofluorescent cytochemistry. The adipocytic differentiation of tumor cells was also examined using LipidTOX green neutral-lipid staining.

Results:

The treatment of 100 μ M or 200 μ M zaltoprofen significantly inhibited a cell proliferation of GCTB cells in a dose-dependent manner ($p < 0.001$). The apoptotic indices in TUNEL labeling were approximately 0% in control, 21.9% in 100 μ M ($p < 0.001$) and 48.1% in 200 μ M ($p < 0.001$) of zaltoprofen treatment. The labeling indices of PPAR γ -positive cells were significantly higher than those in control after 24 hour of zaltoprofen treatment. Troglitazone treatment also demonstrated an inhibition of the cellular proliferation. Moreover, zaltoprofen treatment significantly increased labeling indices of LipidTOX Green neutral-lipid staining.

Conclusions:

These findings demonstrated that zaltoprofen could induce anti-tumor effects on GCTB cells, and also promoted the differentiation into an adipocytic lineage in remained tumor cells via an activation of PPAR γ . This is the first study, to our knowledge, that activation of PPAR γ could be a novel therapeutic tool against GCTB.

E-mail (main author): a_take@med.kanazawa-u.ac.jp



P5:101

Epidemiological data of patients presenting to a Tertiary Cancer Centre

Ajay Puri¹, Ashish Gulia²

¹) Tata Memorial Hospital ²) TMH, India

Introduction: The study was conducted to know the frequency and spectrum of number of bone and soft tissue (BST) tumours presenting to our institute and analyze the incidence and stage of these at presentation.

Material and methods: This prospective observational study included all new patients seen in BST-Disease Management Group (DMG) from 01/01/2010 to 31/12/2010. An audit form was devised to capture all the relevant information.

Results: Out of total 31951 new patients registered at our institute, 1627 (5%) were registered primarily in the BST-DMG and 380 patients were referred from other services. Of a total 2007 patients, 60% (n=1203) were bone tumors, 36 % (n=723) were soft tissue tumors. Details of primary site of affection were not known in 4% (n=81) patients. In bone tumors, 66% were malignant, 15% were benign and 19% were lesions of non-neoplastic etiology. Amongst malignant tumors, osteosarcoma (43%) was commonest followed by PNET/Ewing's (27%) and chondrosarcoma (11%). Giant cell tumor was the most common benign bone tumor. Of soft tissue lesions 81% (n=587) were malignant of which 75% (n=413) were of mesenchymal origin and 25% (n=138) were of cutaneous origin. Synovial sarcoma (22.5%) was most common mesenchymal tumor. 29% of bone tumors and 32 % of soft tissue tumors had metastasized at presentation.

Conclusion: The study has a limitation of being a hospital based census and thus may not give the exact reflection of incidence in general population. This study will help assess the gap between the number of patients and infrastructure available and guide us optimally utilize resources to provide best possible care. It can help the institute frame and implement disease specific protocols. Continued data collection and follow up can provide valuable information on long term survival, treatment related toxicities and incidence of second malignancies. This data can be extrapolated to national level to identify the need of infrastructure and human resources.

E-mail (main author): docpuri@gmail.com



P5:102

Returning to life after treatment end: quality of life in survivors of osteosarcoma of developmental age

Laura Veneroni¹, Cristina Meazza², Primo Daolio³, Roberto Luksch², Carlo Alfredo Clerici², Stefano Bastoni³, Fabio Giardina³, Graziella Cefalo⁴, Maura Massimino²

¹) University of Milan ²) Fondaz IRCCS Istituto Nazionale Tumori ³) C.O.O, Istituto Ortopedico G. Pini, Mila ⁴) Ospedale San Paolo, Milano, Italy

Background

Tumors in developmental age can bring psychological development and quality of life issues. Typically osteosarcoma affects mainly adolescents at a critical stage of their mental and physical growth. When treatment ends, eventual psychosocial problems related to the experience of illness and its sequelae may remain undetected. Clinical experience suggests that some surviving patients missing important evolutive stages (i.e. relationships, working identity, planning future). Others, on the contrary, can achieve adequate adaptation level and even demonstrate a greater strength than healthy peers in proposing high goals. The factors predicting the variability of outcome are still unclear. The personality, that defines the psychological and behavioral variability between people, is stable throughout life and can be a useful indicator of long-term functioning.

This study aims to assess the quality of life and the personality features in surviving patients treated for childhood osteosarcoma.

Methods

The study enrolled patients treated at the pediatric oncology unit of the Fondazione IRCCS National Cancer Institute and Pini Hospital in Milan. Patients were at least eighteen years old and had completed treatment at least from five years. Data collection begun in September 2011. The following self-report questionnaires were delivered during the follow-up visits or sent by mail: TESS, SF-36, QOL-CS, Big Five Questionnaire, SCL-90.

Results

Until now, 19 questionnaires were completed. Results highlight that quality of life is general adequate, but 5 (26%) of these guys have dropped out of school or do not yet have a job, 3 patients were followed over the years in a course of psychotherapy and a girl, after the completion of the questionnaire, asked us psychological support.

Conclusion

The long-term adjustment of cancer survivors is an important area of clinical intervention. Preliminary results suggest that in some cases a normal life return can be complicated. Quality of life should be evaluated during follow-up to identify situations may need a support/intervention.

E-mail (main author): laura.veneroni@unimi.it



P5:103

Bone Giant Cell Tumor: p53 and ki-67 expression correlation between the presence of lung metastasis and biological behavior.

Andre Stellet¹, Valter Penna²

¹) Hospital Pitangueiras ²) Hospital de cancer de Barretos, Brazil

Retrospectively, the authors have the objective to show the results on the correlation between the p53 and ki-67 expression and the presence of lung metastasis and the biological behavior of the giant cell tumors. The expression graduation was made by immunohistochemical study. As a secondary objective, to find an epidemiological face of the giant cell tumors, from 2003 to 2006 at the authors hospital.

From 46 patients, 21(45.65%) were female and 25(54.35%) were male, age variety from 13 to 75 years (average 33.9 years) and average follow up was 22 months.

The results show that p53 was negative in 54.5% cases, and had poor expression(+/-) in 31.08% cases. Ki-67 was positive in 68.02% cases.

The authors conclude that the giant cell tumors have a high range of cellular proliferation and had bad expression on the prognostic marker

Key words

Giant cell tumors, tumor markers, lung metastasis

Introduction

The Giant Cell Tumor(GCT) is considered a aggressive benign bone tumor, with a inert biological behavior. Histological is typically seen with fusiforms cells and by the presence of numerous giant cells multinucleated(gigantócitos), around the connective stroma(?) in the tumor.

Radiografically, the GCT in it's classic shown, as a epiphysis lesion, litic, insuflativa, excentric, sometimes breaking the bone cortical

E-mail (main author): andrewsstellet@hotmail.com



P5:104

Non-diagnostic biopsies in an oncology unit. Incidence and consequences.

Kirsten Lafferty¹, Robert Grimer²

¹) Royal Orthopaedic Hospital ²) Royal Orthopaedic Hospital, Birmingham, United Kingdom

Background:

Obtaining an accurate diagnosis is the aim of any biopsy of a musculo-skeletal lesion. This study investigated the accuracy of biopsies carried out at our unit over a three month period and also identified the consequences of a non-diagnostic biopsies.

Method: All patients undergoing a biopsy were identified from our MDT records over a three month period. The biopsy diagnosis was correlated with the eventual diagnosis and in those in whom there was a discrepancy the effects of the initial non-diagnostic biopsy was investigated.

Results: 222 patients had a biopsy over a three month period, 94 Jamshidi bone biopsies, 59 Trucut biopsies, 28 image guided (CT or U/S) and 41 open biopsies. There were 27 non-diagnostic biopsies but in 16 cases the MDT agreed a diagnosis and management and no further biopsy was required. There were thus 11 non-diagnostic biopsies (5%) and on average these led to a delay in reaching a diagnosis of 3 weeks which was usually reached through one or more further biopsies, mostly image guided. The non-diagnostic rate was highest for needle biopsies (5%) and open biopsies (5%). In terms of eventual diagnosis the initial failure rate was lowest for malignant bone and soft tissue sarcomas (3 of 50, 6%) and highest for lymphomas (15%) and for non-oncological lesions eg haemangiomas. Of the patients with non-diagnostic biopsies, there was the anxiety of waiting for a confirmed diagnosis (and 7 of the 11 turned out to have a malignancy). One patient still does not have a definite diagnosis. In no case was there any significant difference in treatment as a result of a non-diagnostic biopsy.

Conclusion:

Patients need to be warned that whatever method of biopsy is used there will be a possible failure to obtain a diagnosis. Whilst a non-diagnostic biopsy may rule out malignancy and be accepted by the MDT, repeat biopsy is required in 60% of those cases. In no case was a patients management or outcome significantly altered by a non-diagnostic initial biopsy in this cohort.

E-mail (main author): kd1856@bham.ac.uk



P5:105

Ultrasonography in the diagnosis of tumours of the hand

Evgeny Varganov¹, Nataliya Situnova¹

¹) City clinical hospital # 5, Russian Federation

Introduction: One of the basic methods for diagnosing pathological processes that occur in the hand is ultrasonography.

Materials and Methods: The study carried out using the ultrasound system LOGIQ-3 PRO supplied with an ultrasound scanner of high quality class and multipower sensor 8L (period between 2001 and 2012). Longitudinal and transverse scanning was performed before surgery, after wound healing and at long-term follow-ups. Tumours were detected, their size, structure and contours were estimated, and topical diagnosis was performed. The study was conducted in 143 patients with tumours of the hand.

Results: In cases of tumour-like diseases of hand tendons, a discontinuity of their contours can be detected with appearing hyperechogenic defect zone. In a number of cases, lesions to nerve trunks and their shift due to a tumour can be clearly identified. If the joint is involved, the changes in width and uniformity of the joint space, lytic alterations of the articular surfaces are revealed. In cases of malignant tumours of hand bones (chondrosarcoma), thickening of the cortical layer round the tumour, usuration and collapse (fibrosarcoma and osteosarcoma) of the latter can be noted. In peripheral types, there is destruction focus, bone lysis and the exit into soft tissues. Diagnostic ultrasound enables observation of the reparation process in the postoperative rehabilitation period, in particular after suturing tendons and nerves, and osteoplasty (organ salvage surgeries).

E-mail (main author): varganovdoc@rambler.ru



P5:106

Ultrasound-guided biopsy in bone lesions: how and when it can be done. Preliminary results.

Simona Pozza¹, Armanda De Marchi¹, Ginevra Biino², Michele Boffano¹, Paola De Petro¹, Paolo Balocco¹, Alessandra Linari³, Raimondo Piana¹, Carlo Faletti¹

¹) CTO Hospital ²) National Research Council of Italy ³) OIRM/S. Anna Hospital, Italy

BACKGROUND

Bone biopsy is usually under CT guidance. Compared to US guided biopsy, this technique is extremely precise but it takes more time in execution and in some geographic areas is less available. The aim of this study is to propose US guided biopsy in specified bone lesions with cortex interruption but without soft tissue involvement.

METHODS

From January to December 2012, eleven patients (7 males, average age 57 years old, range 28-81) underwent an US guided biopsy for a bone lesion. The lesions, always characterized by a cortex interruption, were located in the lower limb (3 cases), in the upper limb (4), in the chest (3), and in the pelvis (1). MyLab Twice sonography (Esaote, Genova, Italy) with multifrequency probes and sterilizable biopsy kit was used. In 9 patients only a tru-cut needle had been used, whilst in 2 cases was necessary to take same samples also with a trephine bone needle. To assess the diagnostic accuracy we evaluated agreement between the diagnosis made on bone tissue specimens from needle biopsy and either the final diagnosis or the clinical evolution (whether not further surgically treated) by means of Cohen's kappa. This coefficient is a statistical measure of inter-rater agreement for qualitative (categorical) items.

RESULTS

In 9 cases out of 11 the diagnosis was obtained correctly. The diagnosis were myeloma (3 cases), metastases of carcinoma (2), metastases of sarcoma (1), giant cell of the bone (2), Tietze's disease (1), not diagnostic biopsy (2). On 11 patients 5 tumors types were diagnosed, so that 5 items were considered for Kappa coefficient calculation. In two patients insufficient material was obtained to allow a histological diagnosis. In the remainder 9 patients a perfect agreement was observed ($k=1$, p).

CONCLUSION

In accurately selected cases the biopsy of bone lesions can be performed under US guide. This technique is eventually more time effective and does not use ionizing radiation. Further studies are needed to confirm our results.

E-mail (main author): simona.pozza@tin.it



P5:107

Can trauma lead or mislead to the diagnosis of soft tissue sarcomas?

Michele Boffano¹, Federica Cristina Verga², Ugo Albertini¹, Alessandra Linari³, Enrico Pira², Alessandra Tavani⁴, Alessandro Comandone⁵, Raimondo Piana¹

¹) CTO Hospital ²) University of Torino ³) OIRM/S.Anna Hospital ⁴) Mario Negri Institute ⁵) Gradenigo Hospital, Italy

Background

Clinical symptoms in soft tissue sarcomas (STS) are quite easy to investigate but often misleading. The main reason of misdiagnosis is the high frequency of benign or not-tumoural diagnosis comparing to malignant lesions. To date still many patients are initially treated for "hematomas" or "cysts" and then referred to a Sarcoma Unit worsening the prognosis. Many patients remind a trauma and consider it as a possible cause of sarcoma developing. The aim of the study is to determine whether a trauma can represent an alert for the diagnosis of a STS.

Methods

Fifty-one patients (26 males, 61 years old average, range 24-84 years) with a diagnosis of STS have been investigated according to the presence or not of a direct/indirect trauma in the same anatomical site of the STS referring to the previous medical history. Furthermore patients have been asked for the presence or not of a subcutaneous hematoma.

Results

Eighteen patients remembered a trauma. Nine were direct trauma and 9 indirect (muscle elongation, repetitive microtrauma, physical effort). Hematoma was present only in 4 cases: in 2 cases referred by the patient but not evaluated by a physician after a trauma (1 direct and 1 indirect), in 2 cases without a previous trauma (2 superficial STS with superficial veins involvement). No statistically significant association between trauma and hematoma was demonstrated ($p > 0,05$, Fisher exact test)

Conclusion

Despite clinical symptoms of STS are not specific, only an objectivable subcutaneous hematoma is to be considered an obvious sign of a relevant trauma. Hematoma should not be considered a possible diagnosis if there is no trauma and no "blood-thinning" therapy. On the other side a trauma can often represent an alert to make the patient notice the presence of a lump. The effect of a direct trauma in the developing of a STS is not demonstrated. Further studies can help in favouring the early diagnosis of STS and the correct referral to a Sarcoma Unit.

E-mail (main author): boffano@inwind.it



P5:108

TREATMENT MODALITIES AND FOLLOW UP OF CHILDREN WITH PERIPHERAL NERVE SHEET TUMOR 15 YEARS SINGLE INSTITUTION EXPERIENCE

Vesna Ilic¹, Vesna Ilic¹, Zoran Bekic¹, Jelena Bokun¹, Ivana Tufegdžić¹, Vucinic Zoran², Jelena Sopta³, Lejla Paripovic¹

¹⁾ Institute for Oncology and Radiology ²⁾ Institute for Orthopedic surgery Banjica ³⁾ Institute for Pathology, Belgrade, Serbia

Background : The objective of the study was to analyze the treatment modalities in cases of malignant peripheral nerve sheet tumor (MPNST) in children treated during a 15 year period in the Pediatric Department of the Institute for Oncology and Radiology, Serbia.

Methods: During the period of 1996-2011 there were 9 children (6 male and 3 female) with a median age of 14 years (age range of 4 years to 17 years) treated using a multimodal therapeutic approach that included surgery, chemotherapy and radiotherapy. The patients presented with primary tumor sites as follows: 5 on the extremities, 1 in the sacrum, 2 in the head and neck and one localized in the shoulder. The majority of the patients (8 out of the 9 patients) had large tumors (>5cm). Two of the patients were affected by neurofibromatosis 1.

Results: Treatment commenced in 5 patients with a gross total tumor resection and they were classified as IRS group I (histologically free margins found on biopsy). Another 4 patients were classified as IRS group III and surgery was delayed till after a neoadjuvant chemotherapy treatment (of between 3 and 5 cycles). Two patients had amputations and 2 conservative resections with macroscopic residual tumor.

Chemotherapy was administered to all patients, neoadjuvant in 4 of the patients. A response to chemotherapy was seen in 2 patients in the IRS group III and 2 patients experienced a progression of disease.

The chemotherapy regimens used were VACA in 4 patients, CEVAIE in 3 patients, 1 patient was treated according to EE99 protocol and 1 according to EpSSG NRSTS 2005 protocol.

Seven of the patients had radiotherapy concomitantly with the chemotherapy. The total dose ranged from 55 to 60 Gy.

Eight of the patients are now in the follow-up period with no evidence of disease for between 1 and 14 years.

Conclusion: Multimodal treatment is effective in children with MPNST. According to our study the time of diagnosis, IRS group, site and absence of metastasis are important predictors of survival.

E-mail (main author): vesnam@ncrc.ac.rs



P5:109

Myositis ossificans: keep the scalpel away!

Inês Balacó¹, Olíana Tarquini², Cristina Alves², Pedro Sá Cardoso², Tah Pu Ling², Gabriel Matos²

¹) CHUC - Hospital Pediátrico de Coimbra ²) CHUC, EPE - Hospital Pediátrico Coimbra, Portugal

Background: Myositis ossificans is a rare benign disease. The ectopic bone formation within muscle and soft tissues that characterizes Myositis Ossificans, follows, in most cases, a traumatic event. Differential diagnosis includes osteosarcoma, soft tissue sarcoma and osteomyelitis. The purpose of this study is to characterize a series of patients with Myositis Ossificans, treated in a Pediatric Orthopaedics Department.

Methods: Retrospective analysis of all pediatric patients treated in our institution for Myositis ossificans, between 2008 and 2012. Data was collected regarding age, sex, history of trauma, clinical presentation, imaging features, treatment options and follow-up.

Results: 7 patients were identified with Myositis Ossificans: 4 males and 3 females, aged between 7 and 15 years. Five patients were referred due to a soft tissue mass and 2 patients had the diagnosis made prior to referral. A previous traumatic event was identified in all cases. The anatomic distribution of the lesions was diverse: 4 in the thigh, 2 in the shoulder and 1 in the calf. Radiologically, all lesions showed a peripheral mature ossification and radiolucent center; 4 lesions were adjacent to cortical bone, with a marked periosteal reaction. Biopsy was needed in one case, to confirm the diagnosis in a patient with worsening pain. Conservative treatment was undertaken in 6 patients, with spontaneous regression of the lesions. One patient had surgical excision of the lesion.

Conclusion: All cases in our series had a traumatic etiology. The diagnosis of Myositis Ossificans is based upon clinical presentation and imagiologic features. In most cases, biopsy is not needed and treatment should be conservative, as spontaneous regression is the rule. Surgical treatment is reserved to persistent painful situations and should be performed after the maturation of the lesion, usually after 6 months.

We present an important case series of Myositis Ossificans in the pediatric population. Care should be taken to avoid unnecessary and harmful interventions in these patients.

E-mail (main author): inesbalaco@gmail.com



P6:101

Elevated preoperative neutrophil/lymphocyte ratio is associated with poor prognosis in soft-tissue sarcoma patients

Joanna Szkandera¹, Gudrun Absenger¹, Bernadette Liegl-Atzwanger¹, Martin Pichler¹, Zacherl Maximilian¹, Samonigg Hellmut¹, Stojakovic Tatjana¹, Gerger Armin¹, Andreas Leithner¹

¹) Medical University of Graz, Austria

Background: Recent data indicate that tumour microenvironment, which is influenced by inflammatory cells, plays a crucial role in cancer progression and clinical outcome of patients. In the present study we investigated the prognostic relevance of preoperative neutrophil/lymphocyte (N/L) ratio on time to tumour recurrence (TTR) and overall survival (OS) in soft-tissue sarcoma (STS) patients who underwent curative surgical resection.

Methods: 260 STS patients were included in this retrospective study. Kaplan Meier curves and multivariate Cox proportional models were calculated for TTR and OS.

Results: In univariate analysis, elevated N/L ratio was significantly associated with decreased TTR (HR, 2.340; 95%CI, 1.286-4.259; p=0.005) and remained significant in the multivariate analysis (HR, 2.183; 95%CI, 1.191-4.003; p=0.012). Patients with elevated N/L ratio showed a median TTR of 78.7 months. In contrast, patients with low N/L ratio had a median TTR of 99.8 months. Regarding OS, elevated N/L ratio was also significantly associated with decreased survival in univariate analysis (HR, 2.896; 95%CI, 1.810-4.634; p=0.001) and remained significant in multivariate analysis (HR, 2.615; 95%CI, 1.616-4.231; p=0.001).

Conclusion: In conclusion, our findings suggest that an elevated preoperative N/L ratio predicts poor clinical outcome in STS patients and may serve as a cost-effective and broadly available independent prognostic biomarker.

E-mail (main author): joanna.szkandera@medunigraz.at



P6:102

Oncological outcomes of soft tissue sarcomas in the distal extremities

Anup Pradhan¹, Robert Grimer¹, Adesegun Abudu¹, Roger Tillman¹, Simon Carter¹, Lee Jays¹

¹) Royal Orthopaedic Hospital, United Kingdom

Background

Management of soft tissue sarcomas in the distal extremities can be challenging with patients presenting late and a high proportion of lesions inadvertently excised. Few studies have assessed the outcomes of sarcomas in this location. This study looks at the oncological outcomes of patients with soft-tissue sarcomas in the distal extremities managed at a regional tumour centre in the United Kingdom.

Methods

The centre database was used to identify all patients with distal extremity soft tissue sarcomas between 1985 and 2012. Patient, tumour, treatment and outcome data was collected from the database and medical records.

Results

800 patients were included in this study. Of 2667 soft tissue sarcomas seen at the unit, 244 (9%) were located below the elbow while 556 (21%) patients had sarcomas below the knee. There were 432 males and 368 females with a mean age of 49.9 years (2 to 92). The three most common diagnoses were synovial sarcoma (18%), myxofibrosarcoma (8%) and clear cell sarcoma (4%). 38% of the sarcomas were superficial while 40% of them had inadvertent excision carried out elsewhere and presented late. Local excision was carried out in 496 patients (74.7%) and amputation in 156 (23.5%).

The overall risk of local recurrence was 13.7% in this series with risk increased by an involved margin, type of tumour or an inadvertent biopsy. The overall survival rate at five years was 58% and was related to the grade, size, type and depth of the tumour and patient age.

Conclusion

This large series has shown that the oncological outcomes of soft tissue sarcomas of the distal extremities are similar to other sites. It highlights that a clear margin of excision is essential to achieve local control and that inadvertent excision can increase the risk of local recurrence.

E-mail (main author): anup925@hotmail.com



P6:103

OSTEOSARCOMA IN PATIENTS WITH ROTHMUND-THOMSON SYNDROME

Katja Zils¹, Beate Kempf-Bielack¹, Thomas Klingebiel², Wolfgang Behnisch³, Hermann Mueller⁴, Paul-Gerhardt Schlegel⁵, Michael Fruehwald⁶, Mathias Werner⁷, Stefan Bielack¹

¹) Klinikum Stuttgart, Olgahospital ²) University Children's Hospital Frankfurt ³) University Children's Hospital Heidelberg ⁴) Klinikum Oldenburg ⁵) University Children's Hospital Wuerzburg, Germany ⁶) Klinikum Augsburg, Georgia ⁷) HELIOS Klinikum Berlin Zehlendorf, Germany

Background: Rothmund-Thomson syndrome (RTS) is associated with an increased risk of osteosarcoma, but information about affected patients is limited. This retrospective analysis explored the clinical features of high-grade osteosarcomas in patients with RTS and outcome after multimodal therapy.

Methods: The Cooperative Osteosarcoma Study Group (COSS) database was searched for eligible patients. Seven patients with high-grade osteosarcoma had a diagnosis of RTS and their patient-, tumor- and treatment-related variables and outcome were reviewed.

Results: Median age at diagnosis was 13 years (range 7-16), 5 were female, 2 male. Tumors involved proximal tibia (4), distal tibia (1), distal fibula (1) and proximal ulna (1). Most frequent subtypes were osteoblastic (3) and malignant fibrous-histiocytoma-like osteosarcoma (2). Three patients had metastatic disease at diagnosis. All patients were treated with surgery and chemotherapy according to COSS-protocols. All but one were underweight at start of treatment, at least four needed nutrition as support during therapy. Four patients received chemotherapy as scheduled, the other three required dose modifications and terminated treatment prematurely. A wide resection of the primary tumor was achieved in all individuals. Two of three patients failed to achieve surgical clearance of their primary metastases and died, the third relapsed with multiple metastases and also died. Two of the four patients with localized disease remained alive in 1st complete remission (CR), 10.5 and 17.6 years after diagnosis, a third patient was in 2nd CR after surgery and chemotherapy for recurrence (solitary lung metastasis), with a follow-up of 13.0 years. The fourth patient, for whom osteosarcoma was already the third primary malignancy, died of acute leukemia, 7.0 years after diagnosis and while still in 1st CR of osteosarcoma.

Conclusion: Patients with osteosarcoma in RTS may be cured with appropriate multimodal therapy. They should be treated like other osteosarcoma patients but individual features and special support have to be considered.

E-mail (main author): katja.zils@olgahospital-stuttgart.de



P6:104

Difficulties of morphological diagnosis of telangiectatic osteosarcomas.

Gennady Berchenko¹, Olga Shugaeva²

¹⁾ CITO ²⁾, Russian Federation

Has been analyzed the biopsy and surgical material of patients who had been operated in clinic CITO as well as consulting cases with the diagnosis telangiectatic osteosarcoma (TOS) for the last 12 years. The analysis of the data has shown that for the investigated period of time TOS was found in 71 cases. TOS most commonly affects the femur (31%), tibia (26,8%) and humerus (15,5%). Lesions were centered around the knee in 46,5% (n=33) of cases.

Most of the lesions were located in the metaphyseal region, but usually they extended into the epiphysis. The lesions were poorly marginated and usually characterized by essentially pure lytic destruction without any significant sclerosis. There were seen extensive cortical expansion or destruction and often a soft tissue mass.

Conventional TOS is a high-grade lesion with easily recognizable sarcomatous septa. Usually there is a high degree of nuclear atypia, cellular pleomorphism, and numerous atypical mitoses.

These areas, although only focally present, are easily recognized as malignant and can almost always be found. However, well known significant difficulties in the differential diagnosis between low-grade TOS and benign aneurismal bone cyst. Microscopic examination shows similarity of histological structure of low-grade TOS and aneurysmal bone cyst. Areas of stroma look like as benign aneurysmal bone cyst are present. It should be noted that the atypical cells can be determined only on the periphery of the tumor cavity, malignant cells have a high degree of differentiation, the number of tumor osteoid are minimal, there are areas of tissue in which the cellular elements and osteoid have not signs of atypia, osteoclast-like cells located in the edges of the cysts and cavities tumor.

TOS should be distinguished principally from aneurysmal bone cyst. The weak signs of cellular atypia are especially revealed in the study of cytological preparations.

If in biopsies had been detected the TOS-LG, then were performed surgery in the form of extended marginal bone resection, the removal of abnormal tissue, electrocoagulation, alloplastica of defects. Later patients were observed in specialized hospitals.

E-mail (main author): berchenko@cito-bone.ru



P6:105

Oncological outcomes of osteosarcomas in the upper distal extremity

Anup Pradhan¹, Robert Grimer¹, Adesegun Abudu¹, Roger Tillman¹, Simon Carter¹, Lee Jeys¹

¹) Royal Orthopaedic Hospital, United Kingdom

Background

Osteosarcomas rarely arise in the upper distal extremity. Few studies have assessed the outcomes of osteosarcomas in this location and there are considerable challenges in surgical management. This study looks at the oncological outcomes of patients with osteosarcomas in the upper distal extremity managed at a regional tumour centre in the United Kingdom.

Methods

The centre database was used to identify all patients with osteosarcomas in the elbow or distally between 1985 to 2012. Patient, tumour, treatment and outcome data was collected from the database and medical records.

Results

30 patients were included in this study. There were 14 males and 16 females with a mean age of 36.4 years (9 to 90). 18 osteosarcomas were located in the forearm bones (60%), 9 in the elbow (30%) and 3 (10%) in the hand. The two most common sub-diagnoses were parosteal (28%) and osteoblastic osteosarcomas (16%). Local excision was carried out in 15 patients (51.7%), 4 patients underwent endoprosthetic replacement (13.8%) and 9 amputation (31%).

The overall risk of local recurrence was 14.4% in this series with risk increased by older age, grade and type of tumour. The overall survival rate at five years was 67% and was related to the grade, type of the tumour, type of surgery and patient age.

Conclusion

This series has shown that patients with osteosarcomas of the upper distal extremities have favorable outcomes with current treatment methods. It highlights that tumour characteristics and patient age impact both on local control and overall survival.

E-mail (main author): anup925@hotmail.com



P6:106

Clinical outcomes in the oldest old patients (85 years or older) with musculoskeletal sarcomas.

Toru Oi¹, Akihiko Matsumine¹, Mikinobu Goto¹, Tomoki Nakamura¹, Takao Matsubara¹, Kunihiro Asanuma¹, Akihiro Sudo¹

¹⁾ Mie Univ. Graduate School of Medicine, Japan

Purpose

The number of sarcoma patient diagnosed in the oldest old population supposed to increase due to the increasing life expectancy in Japan. The purpose of this study was to evaluate the clinical outcomes in the oldest old patients (85 years or older) with musculoskeletal sarcomas.

Patients and Methods

Between 1988 and 2012, 17 patients were treated at our institution. 3 male and 14 female were studied. The mean age at presentation was 89 years (85-97). There were one malignant bone tumors and 16 soft tissue sarcomas. The tumors were histologically diagnosed as follows: 7 malignant fibrous histiocytomas, 4 liposarcomas, 2 extra-skeletal chondrosarcomas, 2 myxofibrosarcomas, one chondrosarcoma and one malignant peripheral nerve sheath tumor. Overall survival (OS) time was taken from the date of diagnosis for the primary tumor to the date when the patients were documented to be alive or the date when the patients passed away. Disease-specific survival (DSS) time was taken from the date of diagnosis for the primary tumor to the date when the patients were documented to be alive or the date when the patients passed away from sarcoma.

Result

Thirteen of 17 patients underwent surgery for the primary tumors. The remaining 4 patients were treated with radiotherapy for severe comorbidity. At the time of review, 5 patients were alive and disease free. 6 patients died of sarcomas, and 6 patients died of other causes. OS in all patients was 70% at 1 year and 37% at 2 years, respectively. DSS in all patients was 82% at 1 year and 73% at 2 years. Age (85-90 vs. 90-97) and treatment (surgery vs. radiation) were not significantly related to OS and DSS.

Conclusion

The oldest old sarcoma patients are supposed to increase in the developed nation because of increasing life expectancy. 2-years-OS in the oldest old sarcoma patients was 37%. The poor prognosis was mainly due to the fact that the half of dead patients died of other disease. In the treatment of them, post-operative careful management concerning the patients complication are warrant.

E-mail (main author): toruoi@clin.medic.mie-u.ac.jp



P6:107

Circulating Transforming Growth Factor-Beta1 Levels in Pediatric Bone Sarcoma Patients

Neriman Sari¹, Çigdem Sonmez Atay², Nilgun Kurucu², Inci Ergurhan Ilhan²

¹) Ankara Oncology Hospital ²), Turkey

Background

Transforming growth factor-Beta (TGF-B1) has an important role in wound healing, angiogenesis, immunoregulation and cancer. TGF-beta plays a major role in cancer by suppressing tumor growth in the early phase of neoplasia, while promoting tumor progression and metastasis in later phases. We aimed to identify the clinical significance of circulating levels of TGF-beta1 as a tumor marker in bone sarcomas.

Methods

Serum TGF-B1 levels were measured by ELISA in sera of 31 patients with osteosarcoma, 14 patients with Ewing sarcoma before and after treatment and 22 healthy controls.

Results

Pretreatment mean serum TGF-beta 1 levels were 44,8 ng/ml in osteosarcoma, 46,2 ng/ml in ewing sarcoma and 45.4 ng/ml in control groups. Posttreatment mean serum TGF-beta 1 levels were 42,2 ng/ml in osteosarcoma, 41,2 ng/ml in ewing sarcoma group. Serum TGF-beta 1 level in metastatic disease was 48.1 ng/ml, in non metastatic disease 44,5 ng/ml. The differences between groups and pre and post treatment levels were not significant statistically.

Conclusion

We could not find any diagnostic and prognostic value of TGF beta 1 in pediatric bone sarcomas.

E-mail (main author): neriman@meddata.com.tr



P6:108

Primary malignant bone tumors of the scapula - A retrospective single-center study of 27 consecutive cases

Stephan Puchner¹, Joannis Panotopoulos², Martin Dominkus², Reinhard Windhager², Philipp Funovics²

¹) Medical University of Vienna ²) Medical University of Vienna, Department, Austria

Primary malignant bone tumors of the scapula are very rare. Apart from limited case reports international literature on flat bone sarcoma is exiguous and not much is known about the oncological outcome.

By database analysis of the Vienna Bone and Soft Tissue Tumor Registry, we retrospectively identified 27 patients diagnosed with a primary malignant bone tumor of the scapula treated between 1954 and 2011. This included 15 males and 12 females with a mean age of 39.1 years (range, 7.5-79.3 years). The most frequent tumors were chondrosarcoma (40%), Ewing's Sarcoma/PNET (19%), Osteosarcoma (11%) and Hemangiopericytoma (7%). The average time of follow-up was 36 months (± 21 month).

Eleven patients received chemotherapy and 12 had radiotherapy. Wide resection was performed in 18 patients (67%). In five patients (19%) no further resection of the tumor was performed after biopsy due to multiple metastasis or inoperability. Postoperative complications comprised two nerve lesions, one seroma, one wound necrosis, and one thrombosis of the arm. Five patients (19%) were diagnosed with metastasis after a mean time of 8 months post surgery, while two patients (7%) suffered local recurrence at an average of 8 months post surgery. The overall patient survival was 58% at one year and 24% at five years. The corresponding median survival was 17 months.

The overall prognosis of primary malignant bone tumors of the scapula remains to be inferior compared to extremity sarcoma. Large-scale studies on these rare entities will be required to identify successful adjuvant treatment regimens.

E-mail (main author): stephan.puchner@meduniwien.ac.at



P6:109

Axial osteosarcoma: a 25 year monoinstitutional experience in patients younger than 19 years.

Cristina Meazza¹, Roberto Luksch¹, Primo Daolio², Marta Podda¹, Antonina Parafioriti², Roberto Zorzi², Veronica Biassoni¹, Lorenza Gandola¹, Maura Massimino¹

¹) Fond IRCCS Istituto Nazionale dei Tumori ²) Istituto Ortopedico G. Pini, Italy

Cristina Meazza¹, Roberto Luksch¹, Primo Daolio², Marta Podda¹, Antonina Parafioriti³, Roberto Zorzi², Veronica Biassoni¹, Lorenza Gandola⁴, Maura Massimino¹. 1 Pediatric Oncology Unit, Fondazione IRCCS Istituto Nazionale dei Tumori, Milano

2 C.O.O, Istituto Ortopedico G. Pini, Milano

3 Pathology

Department, Istituto Ortopedico G. Pini, Milano

4 Radiotherapy Department,

Fondazione IRCCS Istituto Nazionale dei Tumori, Milano

Background. The survival of patients with pelvic or axial osteosarcoma (OS) remains poor and the management of these patients is particularly challenging.

Patients and methods. Object of this study is a cohort of unselected patients aged Results. Twenty patients between 3-19 years (median age 14) were included. Five patients were metastatic. The most frequent histological subtype was chondroblastic OS (45%) followed by osteoblastic OS (30%). Eight patients had pelvic OS, 8 axial OS and 4 mandible/maxilla OS. All patients received chemotherapy. Necrosis post chemotherapy was evaluable in 9 patients ($\geq 90\%$ in 3 cases). Surgery was performed in 12 patients (3 amputations). Radiotherapy was delivered in 7 patients (total dose 24-60 Gy). Median follow-up was 35 months (8-276), 5-year overall survival was 40% and 5-year event free survival was 37%.

Six patients are alive: 2 with pelvic OS (both had a good response to chemotherapy, one underwent hemipelvectomy and the other received radiotherapy); 1 with axial and multicentric OS (good histological response and radical surgery); 3 with mandible/maxilla OS (a fourth patient died of sepsis during chemotherapy). One patient with axial OS died because of a second bone tumor and another one for breast cancer. We highlight that 6 patients had a p53 mutation: 2 are alive, 2 died for OS, 1 for breast cancer, 1 for glioblastoma.

Conclusion. Adequate local treatment and good pathological response are relevant for prognosis of axial OS, that remains dismal. An impressive number of p53 mutations are reported in our series.

E-mail (main author): cristina.meazza@istitutotumori.mi.it



P6:110

Risk of amputation after unplanned excision

Chigusa Sawamura¹, Seiichi Matsumoto², Takashi Shimoji³, Keisuke Ae³, Atsushi Okawa³

¹⁾ Tokyo Medical and Dental University, Japan ²⁾ , Jamaica ³⁾

Background: Unplanned excisions of soft tissue sarcoma may adversely affect local recurrence and overall survival. Tumor bed excisions are recommended after most cases of unplanned excision, although these procedures may be more extensive compared to planned excisions and skin grafting, muscle flaps or even amputation are applied for those patients. We compared patients who had tumor bed excision after unplanned excisions to those who had initial procedures in our institution. The type of surgical procedure was assessed. We expected a higher incidence of amputation and flap/skin grafts for those who had unplanned excisions.

Methods: Patients diagnosed with soft tissue sarcomas and who underwent surgical excision of tumor at the Cancer Institute Hospital in Tokyo between 1978 to 2009 were retrospectively reviewed. Age, histologic diagnosis, grade, tumor location, size, adjuvant treatments, surgical procedure (amputation, limb-sparing procedure) and flap or skin graft procedures were reviewed for each patient. We excised the tumor bed with 2cm of margins for high grade tumors and 1cm margins for low grade tumors. Muscle fascia was considered as a barrier when we excised a tumor. We used radiation only when a positive margin was detected after tumor bed excision. All variables were analyzed with Chi square test.

Results: 917 patients with a median age at diagnosis of 52-years were eligible for analysis. 76 % of patients had initial surgical excision in our hospital and 24 % of patients had tumor bed excision after unplanned excision elsewhere. Those who had unplanned excisions did not have an increased risk of having an amputation, but were more likely to require additional soft tissue coverage with muscle flaps or skin grafting ($p < 0.001$).

Conclusions: Unplanned excisions did not increase the risk of amputation probably because patients with larger tumors are more likely to be referred to cancer centers before intervention than smaller ones. Wounds following unplanned excisions were more likely to require additional soft tissue coverage with muscle flap or skin grafting than were those done as an initial tumor resection.

E-mail (main author): sawaorth@tmd.ac.jp



P6:111

Chondrosarcoma: Does a pathological fracture of the femur have prognostic importance?

Czar Louie Gaston¹, Jose Albergo², Calogero Graci³, Adesegun Abudu¹, Simon Carter¹, Lee Jeys¹, Roger Tillman¹, Robert Grimer¹

¹) Royal Orthopaedic Hospital, United Kingdom ²) Hospital Italiano de Buenos Aires, Argentina ³) Policlinico Universitario Agostino Gemelli, Italy

Background: The incidence and implication of a pathological fracture in patients with chondrosarcoma of the femur is not clear. The aim of this study is to report overall survival, local recurrence and development of metastasis in a group of patients with chondrosarcoma that suffered a pathological fracture of their femur.

Methods: We performed a retrospective review of 182 patients with chondrosarcoma of the femur treated by oncologic surgery. Mean age at diagnosis was 50.5 year old (range 8-90) and mean follow-up was 110 months (range: 3-216). Patients were divided into two groups whether they presented with or without a pathological fracture of the femur. Cancer specific overall survival, development of metastasis, and local recurrence were analyzed. A subgroup comparative analysis of both groups by histologic grade was done.

Results: Thirty-nine patients suffered a pathological fracture of the femur. Seventy-two percent of these fractures occurred in the proximal femur and 79% were grade 2, 3 or dedifferentiated tumors. The local recurrence rate of pathological fracture group was 33% and 24% for control group ($p=0.14$). For grade 3 and dedifferentiated, a pathological fracture significantly increased the risk of local recurrence ($p=0.002$). Pathological fracture group developed metastasis in 59% of the patients versus 27% for control group ($p=0.0003$). Five and ten year overall survival in the fracture group were 52% and 35%, lower than in the control group (77% and 67%) ($p=0.0004$). Subgroup analysis by histologic grade revealed that a pathologic fracture in grade 1 & 2 tumours was significantly associated with lower survival (84% vs 73% 5year survival, $p=0.03$) while it only approached significance for grade 3 & de-differentiated tumours (35% vs 10% 5year survival, $p=0.09$).

Conclusion: A pathological fracture of the femur has a negative prognostic influence in patients with chondrosarcoma.

E-mail (main author): louie.gaston@nhs.net



P6:112

Transosseous osteosynthesis in the complex treatment tumours of the hand bones

Evgeny Varganov¹

¹) City clinical hospital # 5, Russian Federation

Introduction: Limb salvage treatment of the patients with oncological pathology is considered to be difficult due to the necessity to restore not only anatomical integrity but also hand function.

Materials and Methods: The material for the analysis were 204 medical records of the patients who underwent treatment between 1992 and 2012 in the center of hand surgery with application of the apparatuses of external fixation for hand bones tumours. Primary reconstruction procedures considerably reduce the treatment period. The fixator for transosseous osteosynthesis was applied after bone resection due to tumour. That aimed preservation of the operated ray anatomical length. In cases of small bone defects the grafts were placed into the defect area followed by mild compression in the fixator to accelerate the reparative process. In extensive defects, graft was mandatory fixed through additional wires to the fixator. Application of the apparatuses enables stable fixation and the possibility to train motion to restore the functioning of tendons and joints.

Results: Long-term follow-ups were studied in 174 patients in the period from 1 to 20 years. Tumour recurrence observed in 22 cases (15 of them were malignant tumours). All these patients were reoperated after thorough examination.

Conclusion: The use of external fixators in the treatment of short tubular bones tumours of the hand is a new perspective trend in hand surgery and oncology.

E-mail (main author): varganovdoc@rambler.ru



P6:113

Clinical Outcome of Recurrent Myxofibrosarcoma

ROBERT NAKAYAMA¹, Kazutaka Kikuta², Michiro Susa¹, Eisuke Kobayashi³, Fumihiko Nakatani³, Akira Kawai³, Hirokazu Chuman³, Yoshiaki Toyama¹, Hideo Morioka¹

¹) Keio University ²) Kyosai Tachikawa Hospital ³) National Cancer Center Hospital, Japan

Objectives

Myxofibrosarcoma typically affects the elderly. It is notorious for its extreme invasiveness and high local recurrence rate, however, little has been known about the clinical course of patients with recurrent tumor. We retrospectively analyzed the clinical data of patients with recurrent myxofibrosarcoma to elucidate the clinical outcome.

Methods

Since 1999, there were a total of 141 cases of myxofibrosarcoma treated in our hospitals and 36 patients developed local recurrences during their clinical course. Factors that may affect the clinical outcome were investigated.

Results

There were 25 males and 11 females, and the age at diagnosis ranged from 48 to 90 years old (avg. 67.9). The follow-up period ranged from 5 to 210 months (avg. 61.2). Ten patients (27.8%) had their initial tumors in the trunk, and 26 patients (72.2%) in the extremities. The overall average time interval between the initial surgical treatment and the first local recurrence was 31.9 months. Although the difference was not statistically significant, the average interval was 29.4 months for 26 patients treated by surgery alone, while the combination of surgery and radiotherapy prolonged the interval to 38.6 months. Among 34 patients who underwent surgical treatment for their recurrent tumors, 20 cases developed second local recurrence, and the 3-year local recurrence free survival was only 10.9%. Patients with local recurrence underwent multiple surgical treatments for their local control, up to 8 times in our series (avg. 2.9). 11 patients eventually had amputation at the proximal part of their limbs. The oncological outcomes were 18 NED, 6 AWD, 9 DOD, and 3 DOOD.

Conclusion

This study highlighted the difficulty in the management of local control for patients with myxofibrosarcoma. We cannot cure the patient by radiotherapy alone, however, we did observe a slight prolongation of the local recurrence free survival after radiotherapy, which led us to reaffirm the significance of the initial wide resection for the tumor. Furthermore, novel multidisciplinary treatment is needed to reduce the recurrence as well as to treat the recurrent tumors.

E-mail (main author): robert@a2.keio.jp



P6:114

Oncologic Outcome of Chondrosarcoma

Jeong Won Ju¹, Il Hyung Park¹, Michael Limquico Marfori²

¹) Kyungpook National University Hospital, Republic Of Korea ²) De La Salle University Medical Center, Philippines

Introduction: Chondrosarcoma is the second most common primary malignant bone tumor, yet proper diagnosis, surgical staging and management continue to present a dilemma to many orthopaedic oncologist. Surgery is the main treatment for these cartilaginous tumors.

Materials and Methods: Forty four patients of Kyungpook National University Hospital over a period of 1992 to 2011 who were diagnosed with chondrosarcoma of both axial and appendicular bones and treated surgically and a minimum of 18 months follow-up were retrospectively reviewed.

Results: Twenty four patients with either graded 1 or grade 2 conventional intramedullary chondrosarcoma were treated with extended curettage and adjuvant cryosurgery. One (4.2%) had local recurrence necessitating resection and endoprosthesis reconstruction. Four clear cell chondrosarcoma of the proximal femur were also treated with resection and joint arthroplasty with no local recurrence or distant metastasis. Twenty other cases of both pelvic and extra-pelvic lesions were treated with wide resection and several reconstruction procedures. Four cases had local recurrences and pulmonary metastases. The overall survival in this series was 90.9%.

Conclusion: Our experience is similar to other reports in the literature. Grade 1 and less aggressive form of Grade 2 chondrosarcoma can safely be managed with extended curettage. Wide resection and reconstruction, often entails a possibility of function loss, should be reserve for more aggressive lesions. The fate of Grade 3 chondrosarcoma consistently shows a very dismal result with high rate of distant metastases, ultimately leading to the patient's demise.

E-mail (main author): wjjeong@knu.ac.kr



P6:115

TREATMENT OF PULMONARY METASTASIS OF OSTEOSARCOMA*Pavlo Kovalchuk¹, Anatoliy Diedkov², Grigoriy Klymnyuk², Sergiy Bojchuk², Victor Kostyuk²**¹⁾ National cancer institute ²⁾, Ukraine*

Background: Using up-to-date schemes of chemotherapy allows to achieve 60-75% survival rate in patients with localized osteosarcoma. 25-40 % of patients develop metastasis (95% of them are pulmonary) during first 3 years. Metastasis treatment consists of second line chemotherapy and surgical or radiation treatment.

Methods: 260 patients with localized osteosarcoma, 10 to 21 years old (median age 16.8), treated in National cancer institute (Kiev, Ukraine) between 2003 and 2010 were identified. 89 patients had pulmonary metastasis after the treatment. Metastasis were detected between 6 and 38 months after the treatment (median - 22.3 months). All these patients received chemotherapy including carboplatin 600 mg/m², etoposide 300 mg/ m² by the scheme: 3 neoadjuvant courses and 3 adjuvant courses with 21 day interval. Stabilization of the process was achieved in 61 patients (68.5%). 29 (33%) of them underwent metastasectomy, 60 (67%) patients were considered inoperable and underwent palliative radiation therapy (15 Gray on each lung). Metastasectomy was not performed because of the tumor progression despite chemotherapy or impossibility to remove all of the pulmonary metastasis. In 1 group 3 (3,4%) patients had one lung affected, 26 (29%) patients had bilateral metastatic affection (from 2 to 22 metastasis on each side). The single-step bilateral pulmonary resection was performed in 3 patients with bilateral metastatic affection, in 23 other patients metastasectomy was performed with the 10-14 day interval.

Results: 5 years overall survival was 12.4%. In surgical treatment group 5 years survival was 35.6%, in conservative treatment group – 1.7% (pConclusion: Prognosis in metastasis relapse of osteosarcoma depends on the response to chemotherapy and the possibility to perform surgical removal of the metastasis.

E-mail (main author): kovalpasha@ukr.net



P6:116

Intra-abdominal and retroperitoneal metastases in patients with soft tissue sarcomas - a two-center study

Angelika Schaffler¹, Angelika Schaffler¹, Dimosthenis Andreou², Per-Ulf Tunn², Joanna Szkandera¹, Max Zacherl¹, Andreas Leithner¹

¹) Medical University Graz, Austria ²) Helios Klinikum Berlin-Buch, Germany

Background: Intra-abdominal and retroperitoneal metastases are rare in patients with soft tissue sarcomas. The objective of this study was to evaluate the incidence of metastatic disease in these locations and to determine the optimal diagnostic approach.

Methods: The files of 613 patients with soft tissue sarcomas arising outside the abdominal cavity treated with curative intent between 2000 and 2009 were retrospectively analyzed. Mean follow-up amounted to 58 months (range, 3-148 months) for all patients and 70 months (range, 24-148) for surviving patients who did not develop any metastatic disease. Fisher's exact test was used to compare unrelated samples. 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:** 31 patients (5.1%) developed intra-abdominal or retroperitoneal metastases after a mean follow-up of 18 months (range, 1-100 months). 12.8% of patients with myxoid liposarcoma developed intra-abdominal or retroperitoneal metastases, compared to 4.4% of patients with other histologies, a difference which was statistically significant ($p = 0.025$). There were no significant differences in mean tumor size between patients who did and did not develop intra-abdominal or retroperitoneal metastases (9.8 vs. 8.9 cm, $p = 0.124$). The presence of metastases was discovered in routine tests in 26 of the 31 patients, while only 3 patients presented outside routine follow-up with abdominal pain, which led to the diagnosis of metastatic disease. There were no statistically significant differences in post-metastasis survival between patients who developed intra-abdominal or retroperitoneal metastases and patients who developed metastases in other localizations (25% vs. 34% at 5 years, $p = 0.297$).

Conclusion: Patients with myxoid liposarcoma appear to have a higher risk for developing intra-abdominal or retroperitoneal metastases, compared to patients with other soft tissue sarcoma subtypes. As metastatic disease in these locations appears to be usually diagnosed in routine follow-up prior to the development of specific symptoms, routine imaging of the abdominal cavity of patients with myxoid liposarcoma during follow-up seems to be justified.

E-mail (main author): a.j.schaffler@gmail.com



P6:117

Chondrosarcoma: Correlation between radiological findings and histopathological diagnosis concerning the grade of malignancy.

Margarita Marinou¹, Barbro Danielsson¹

¹⁾ Sahlgrenska Universitetssjukhuset, Sweden

BACKGROUND:

Chondrosarcoma (CS) is a malignant tumor that produces cartilage matrix. It is a very heterogeneous tumor with areas of different grade of malignancy within the same tumor.

CS can be classified into the following 3 histological grades:

I: low cellularity, prominent chondroid matrix

II: increased cellularity, prominent myxoid matrix

III: high cellularity, atypia, mitosis.

METHODS AND MATERIAL:

A list with all the patients with the diagnosis of CS between 2004-2011 was provided by the archive of the Pathology Department at Sahlgrenska University Hospital in Gothenburg, Sweden. Patients with uncertain diagnosis or incorrect initial diagnosis of CS as well as cases with incomplete radiological imaging were excluded. Since CS is a very heterogeneous tumor and a needle biopsy may not localize the area of highest grade, only cases where open biopsy was performed, were included.

42 patients fulfilled the criteria for this study and their MRI and if available CT examinations were studied by a senior resident in general radiology and an experienced musculoskeletal radiologist. The location of the tumor, the size, the tumor borders, the signal on T1 and T2, the contrast enhancement as well as the presence of surrounding edema, bone destruction or bone expansion, periosteal reaction, cortical bone changes, calcifications, intralesional bleeding, necrosis, metastases, pathologic fracture, progress in size and recurrence were recorded.

According to the radiological appearance and with no knowledge of the histological grade, each tumor was classified as low-grade, intermediate-grade and high-grade malignant tumor in order to correspond to the histological grading mentioned above. The radiological grading of each tumor was then compared to its histological grading.

RESULTS:

The results from the comparison will be presented.

E-mail (main author): margarita.marinou@yahoo.com



P6:118

Surgical treatment of the liposarcoma: a single centre experience

Joannis Panotopoulos¹, Benjamin Alici¹, Philipp Funovics¹, Reinhard Windhager¹

¹) Medical University of Vienna, Austria

Liposarcomas are rare and diversify from well-differentiated to myxoid and dedifferentiated liposarcoma. We retrospectively reviewed all patients with a liposarcoma out of the Vienna Bone and Soft Tissue Tumour Registry from 1970 to 2010. One hundred and fifty two cases were identified. For 110 patients complete clinical data and follow up were available. Of these 110 entities, 33 were graded as G1, 40 as G2, 28 as G3 and 9 other. The mean age at surgical treatment was 51,8 (range 19-77) years. Twenty three (20,1%) patients died after a mean follow up period of 3,6 (range 0,07 to 13,3) years. Sixteen patients developed metastasis (9 lung, 2 liver, 5 other). When death was considered to be the endpoint, the cumulative probability of ten year survival was 76,3%. The wide range in the survival analysis is expression of the subdifferentiation with different prognoses and requirement of different therapeutic strategies. Prognostic factors have to be identified in further studies.

E-mail (main author): joannis.panotopoulos@meduniwien.ac.at



P7:101

Aneurysmal bone cysts treated non operatively with sclerosant injections

Ajay Puri¹, Ashish Gulia¹, Manish Pruthi¹, R Vishnu¹

¹) TMH, India

Injections

Methods: Between February 2010 and February 2012 we decided to treat all primary aneurysmal bone cysts presenting to our institution with serial intralesional sclerosant injections. Twelve such lesions were treated (femur/2, tibia/2, pelvis/4, fibula/2, humerus and ulna/1 each. All cases had a diagnostic biopsy. There were 7 males and 5 females. Age ranged from 1 – 35 years (median 13 years). Polidocanol was injected percutaneously into the lesion under image guidance as an outpatient procedure. Healing was assessed by serial radiographs and symptomatic improvement as observed by the patient. Opacification of the lesion with an increase in cortical thickening was taken as evidence of healing. Injections were repeated (maximum 4) at an interval of 6 to 8 weeks if the lesion did not show evidence of healing. If radiographs started to demonstrate evidence of healing and patient experienced symptomatic relief no further injections were given.

Results: All but one of the lesions showed evidence of healing. One lesion in the periacetabular area showed no evidence of healing after 3 injections and was operated with curettage and bone grafting. A 1 year old child needed surgery subsequently because of a progressive varus deformity developing at the site of the lesion. Four cases healed with a single injection, 2 had 2 injections, 3 had 5 injections and 1 had 4 injections. The first evidence of radiologic healing was seen from 6 to 24 weeks (median 12 weeks). There were no complications.

Conclusion: Though a longer follow up is mandated to rule out development of recurrence, early results for this inexpensive non invasive method of managing aneurysmal bone cysts are promising.

E-mail (main author): docpuri@gmail.com



P7:102

Osteoid Osteoma of the Pisiform, Leading to Misdiagnosis

Gokhan KAYNAK¹, Mehmet Fatih GUVEN¹, Ozan Ali ERDAL¹, Muharrem BABACAN¹, Sergulen DERVISOGLU¹

¹) ISTANBUL UNIVERSITY CERRAHPASA MED. FAC., Turkey

Background:

Osteoid osteoma (OO) is an uncommon benign bone-forming tumor of the musculoskeletal system with uncertain etiology but it is the most common primary bone tumor of the carpal region, although much less frequently seen in the upper extremity. The most commonly involved carpal bones are scaphoid and capitate. OO of the pisiform has been reported only twice in literature. In this paper we present a rare case of OO of the pisiform which had not been detected in all diagnostic studies before the ultimate diagnosis was made 8 months later with the same diagnostic modalities and similar clinical signs.

Case:

Our case is a 19 year-old male who had admitted to our institution with wrist pain. He had been evaluated clinically with imaging studies like MRI, CT scans and radiographies for 8 months before the diagnosis was made with the same imaging modalities for the second time. During the 8 months period he received conservative treatment for several provisional diagnoses like triangular fibrocartilage complex injury and arthritis, meanwhile none of the imaging studies showed a mass in the pisiform apart from medullary edema.

Conclusion:

We presented a case of OO with absence of any detectable mass apart from medullary edema in the pisiform for about 8 months. After 8 months of follow-up, diagnosis of a newly formed OO in the pisiform was made as the source of complaints. Therefore, in cases with long standing ulnar wrist pain, even if diagnostic studies are inconclusive, one should consider osteoid osteoma in differential diagnosis and continue following the patient regularly in case an osteoid osteoma may become visible in the carpal region.

E-mail (main author): kaynak95@hotmail.com



P7:103

Granular cell tumors of soft tissue :A report of five cases

Goto Mikinobu¹, Matsumine Akihiko², Asanuma Kunihiro², Matsubara Takao², Nakamura Tomoki², Oi Toru², Sudo Akihiro²

¹⁾ Mie Univ. Graduate School of medicine ²⁾ Mie university, Japan

Introduction

Granular cell tumor (GCT) is a neural tumor characterized by large granular-appearing eosinophilic cells. Malignant GCT is an extremely rare, constituting 1-2% of all granular cell tumors. In 1998, Fanburg-Smith et al. proposed six histologic criteria for selection of benign, atypical or malignant. In this study, we classified our five cases according to Fanburg-Smith criteria. We also studied oncological outcome in these patients.

Patients and Methods

Between 2000 and 2009, a total of five cases, who were finally histopathologically diagnosed as GCTs, were treated at our institution. The mean follow-up time was 77 months (32 to 162).

Results

The mean age at diagnosis was 57 years (38 to 73). There were three male and two female. Of five patients, primary tumor sites were the forearm (n=3), the chest wall (n=1), and the thigh (n=1). All cases were treated by wide resection. According to Fanburg-Smith criteria, two cases were classified into benign, one atypical, and the remaining two cases were malignant. At the time of review, two cases with benign GCT developed no recurrence and no metastasis. The patients with atypical GCT developed local recurrence. One patient with malignant GCT developed no local recurrence and no metastasis but died from colon cancer and the other patient with malignant GCT developed local recurrence and metastasis, and died of malignant GCT.

Conclusions

In our study, the clinical outcomes in our patients were related to prediction based on Fanburg-Smith criteria. However, some authors described that this criteria do not define all features of the disease in detail and evaluation of the positive features depends on each pathologist. We suggest that patients with GCT should be followed carefully, even if the patients were diagnosed as benign or atypical GCT histopathologically.

E-mail (main author): m-goto@clin.medic.mie-u.ac.jp



P7:104

FIBRO-CHONDRODYSPLASIA OF PROXIMAL FIBULA. A BENIGN ENTITY TO CONSIDER IN THE DIFFERENTIAL DIAGNOSIS OF CHONDROSARCOMA.

Laura Trullols¹, Ana Peiró¹, Silvia Bagué¹, Jaume Llauger¹, Jaume Palmer¹, Luis Gerardo Natera¹, Dianora Martinez¹, Oscar Buezo¹, Isidre Gracia¹

¹) Hospital Santa Creu i Sant Pau, Spain

Background

Fibro-chondrodysplasia or fibrocartilaginous dysplasia(FCD) is a variant of fibrous dysplasia(FD) in which extensive cartilaginous differentiation is identified. The amount of cartilage varies from case to case, however, no percentage has been proposed to consider this diagnosis.

In radiologic as well as macroscopic appearance, FCD is similar to a low-grade chondrosarcoma, but the key to a correct diagnosis is the histologic identification of the classical component of FD among of large lobules of cartilage, sometimes with increased cellularity and atypical chondrocytes.

We present an unusual pathology as FCD in an unusual location, proximal fibula.

Methods

Seventeen-year-old boy with one-year history of growing mass in lateral site of the right knee and loss of External Popliteal Sciatic nerve (EPS) function. In another hospital they performed radiographs (Fig.1) that showed a huge lucent lesion in the proximal fibula with popcorn densities and thin but defined cortex. MRI (Fig.2) reported a 80x70x80mm lesion in proximal fibula, suggestive of chondrosarcoma, confirmed in a preliminary histological report of an incisional biopsy.

Results

The patient was referred to our center for management and definitive treatment. The Sarcoma Committee reviewed the images and the histology, and the definitive diagnosis was FCD.

Due to complete paralysis of EPS nerve because of the tumor, we performed a resection of proximal fibula and reconstruction with calcaneus allograft screwed to proximal tibial and plasty of achilles tendon allograft for reinforcing the lateral ligament and avoid residual instability of the knee.

Currently, 4 months after surgery, the patient has a complete articular balance, and he recovered at the moment 1/5 of muscle strength in motor evaluation of EPS nerve.

Discussion

First description of FCD was made by Pelzmann et al in 1980s. Series in literature reports few cases of FCD. More than 60% of the cases are in patients with polyostotic FD, and 27% of FCD cases had associated McCune-Albright syndrome.

Radiologically, FCD is well-demarcated and shows ground-glass opacity, stippled or ring-like calcifications suggesting cartilaginous malignant lesion. The cortex is always intact in spite of cortical expansion. The age of presentation ranged from 4 to 53 years. The proximal femur is the most common site of FCD. The differential diagnosis of FCD includes: enchondroma, chondrosarcoma, well-differentiated intramedullary osteosarcoma and fibrocartilaginous mesenchymoma.

E-mail (main author): laura.trullols@gmail.com



P7:105

Langerhans cell histiocytosis presenting spinal compression injury following vertebral fracture.

Toshinori Omori¹, Toshiyuki Kunisada², Ken Takeda², Tomoyuki Takigawa², Masato Tanaka², Toshifumi Ozaki²

¹) Okayama University ²) Orthopaedics, Okayama University, Japan

INTRODUCTION:

We report a rare case of multiple spinal Langerhans cell histiocytosis (LCH) with neurological deficits following vertebral fracture.

CASE:

15-year-old boy had developing low back pain 2 months ago. He went to nearby orthopedic clinic and was seen conservatively. He could hardly walk with sensory disturbance of lower limbs 1 week ago. His neurological symptom was deteriorating rapidly. He was referred to our hospital by ambulance. He suffered from Frankel C neurological deficit of both lower leg with bladder and rectal disturbance. Plain X ray revealed vertebra plana of T4 due to compression fracture. CT showed osteolytic lesions in the T3-5 vertebra. MRI demonstrated extraskelatal tumor anterior to T3-5 vertebra and posterior protrusion of T4 which developed spinal cord compression. He underwent emergency laminectomy of T2-5, and partial tumor resection followed by posterior fixation using instrumentation of T1-7. His neurological symptom dramatically improved after the operation. Histological diagnosis was confirmed as LCH. Systemic examination revealed no other LCH except thoracic spine. As a result, he did not have lesion except for thoracic vertebra. He left our hospital 4 weeks after the operation. Systemic chemotherapy (VBL, PSL, 6-MP, MTX) was given. The patient shows no neurological symptom and no limitation of daily life, and imaging assessment demonstrates complete remission 1 year postoperatively.

DISCUSSION:

LCH is a comparatively rare tumor and the annual incidence is reported at approximately 6 per million children per year. Multiple spinal LCH has been reported in only 55 cases in the literature review published in 2011, demonstrating that about 30% showed neurological symptoms. However, few had neurological deficits which required emergency surgical decompression as we reported here. Although the use of chemotherapy to treat LCH is still controversial, chemotherapy is commonly advocated for multiple spinal LCH. Radiation should not be used as first choice, especially in children, because of secondary malignancy and growth arrest.

E-mail (main author): sooseizi0402@yahoo.co.jp



P7:106

Beware the ingrowing toenail: it could kill!

Carl Green¹, Jessica Daniels², Ashok Paul¹

¹) Manchester Royal Infirmary ²) Manchester University, United Kingdom

Background: Pleomorphic liposarcoma, which accounts for 5% of all liposarcoma diagnoses, is an uncommon subtype of soft tissue sarcoma. Although this has been well described as occurring in the thigh, to our knowledge a high grade pleomorphic liposarcoma of the great toe has never been described in the literature.

Patient and Method: A 57 year old lady presented with a persistent, painless swelling of the left great toe which her general practitioner had been treating as an in-growing toenail for 5 years. Clinically, the mass encapsulated the great toe and invaded the first webspace and second toe. A diagnosis of grade two pleomorphic liposarcoma was made following assessment by magnetic resonance imaging and biopsy. The patient has since been treated with pre-operative radiotherapy and first ray amputation, with sparing of the second ray. A second resection showed no evidence of residual tumour within the foot.

Conclusions: Soft tissue sarcoma is a rare diagnosis, accounting for approximately 1% of all adult malignancies. As a result, an atypical history involving a growing soft tissue mass should alert the health professional to a potential diagnosis of soft tissue sarcoma. A high index of suspicion is required by clinicians when presented with a soft tissue mass in order to promptly diagnose and treat such a potentially fatal lesion.

E-mail (main author): c_m_green@hotmail.co.uk



P7:107

Tenosynovial Giant Cell Tumour of the Knee - An Unusual Presentation

Carl Green¹, Clare Cullen¹

¹) North Manchester General Hospital, United Kingdom

Background: Tenosynovial giant cell tumours are classified as part of a set of rare proliferative tumours which arise from the synovium. These tumours are further divided by growth characteristic into Giant Cell Tumours of the Tendon Sheath (GCTTS) and Pigmented Villonodular Synovitis (PVNS), which have a combined incidence of 1.8 people per million. Pigmented villonodular synovitis is a diffuse tumour which more commonly affects the synovium of large weight bearing joints. Giant cell tumours of the tendon sheath, a localised tumour which forms a discrete nodule, involves the large joints including the elbow, hip, knee and ankle in only 12% of cases.

Patient and Method: A fit and well 27 year old female patient presented with a two year history of a popping sensation on kneeling or twisting her left knee, leading to patellar subluxation. After investigation using MRI and dynamic ultrasound a provisional diagnosis of a ganglion underlying the medial patello-femoral ligament (MPFL) was made. The patient developed an acutely locked knee and underwent an arthroscopic resection of the mass, which on histological analysis was found to be a giant cell tumour of the tendon sheath.

Conclusion: The authors have therefore demonstrated that the rarer variant of tenosynovial giant cell tumour is a differential diagnosis in patients with a solid mass within the knee joint. Any solid mass within the knee joint or atypical history should alert the surgeon to a possible soft tissue tumour.

E-mail (main author): c_m_green@hotmail.co.uk



P7:108

Incidence and distribution of chordoma: A study analysing data from the "Surveillance, Epidemiology and End Results" program.

Stefan Gerger¹, Andreas Leithner², Regina Riedl², Bernadette Liegl-Atzwanger², Beate Rinner²

¹) Medical University of Graz ²) Med. Univ. Graz, Austria

Background:

Only a few studies exist that describe the frequency distribution and incidence of chordoma, a rare tumor originating from remnants of the notochord. Apart from single-institution case series there are two bigger population-based surveys analyzing a number of 400 (National Cancer Institute, 1973-1995) and 409 (California Cancer Registry, 1989-2007) cases. With the use of the most recent dataset from the Surveillance, Epidemiology and End Results (SEER) program of the National Cancer Institute we conducted a retrospective analysis calculating distribution and age-adjusted incidence rates for 706 cases of microscopically confirmed chordoma from 2000 to 2009.

Methods:

The Surveillance, Epidemiology and End Results program combines the information of 18 registries throughout the United States covering approximately 28% of the population. The WHO's "International Classification of Diseases for Oncology, 3rd Edition" morphological Codes for chordoma (9370/3 chordoma NOS, 9371/3 chondroid chordoma, 9372/3 dedifferentiated chordoma) were used to identify and include relevant cases. With the help from the SEER*Stat statistical software, we calculated frequencies and age-adjusted incidence rates and analyzed them by gender, age, race, and primary site of presentation.

Results:

The 706 cases are composed of 654 chordomas not otherwise specified, 46 chondroid chordomas and 6 dedifferentiated chordomas. The overall age adjusted incidence rate for chordoma is 0.09 per 100,000 and concerning gender it is higher in males (0.11/100,000) than in females (0.07/100,000; rate ratio: 0.61). The median age at diagnosis is 57 (range: 0-91) and the incidence rates increase with age. In blacks the incidence rate is with 0.03/100,000 significantly lower than in whites (0.10/100,000). Hispanics have a chordoma incidence rate of 0.08/100,000 in comparison to a rate of 0.09/100,000 in non-Hispanics. The distribution of the primary site of presentation is as follows: Cranial (42%, n=300); spinal (26%, n=182); sacral (30%, n=212); extra-axial, non categorizable and unknown site (2%, n=12).

Conclusion:

With the use of the latest Surveillance, Epidemiology and End Results data (SEER18), which has been released at the end of spring 2012, this study provides substantial and up-to-date information on distribution and incidence patterns of chordomas in the United States.

E-mail (main author): stefan.gerger@gmail.com



P7:109

Clinical and functional outcome of chondroblastoma of the bone - a single-centre experience with 44 patients

Funovics Philipp¹, Thomas Tiefenböck¹, Verena Stockhammer¹, Joannis Panotopoulos¹, Reinhard Windhager¹

¹ Medical University of Vienna, Austria

Chondroblastoma is an uncommon benign bone tumour accounting for 1-2% of all primary bone tumours. 75% of chondroblastomas affect the long bones. Most lesions arise in adolescent patients between 10 and 25 years during epiphyseal growth. The main symptom leading to diagnosis is pain and local tenderness followed by swelling and limitation of motion. Treatment of chondroblastoma consists of curettage and bone grafting and provides local control in up to 82% of patients. The local recurrence rate after curettage has been reported with 10-35%.

We have retrospectively analysed our single-centre experience with 44 patients suffering from chondroblastoma of the bone (32 men; 12 women; mean age, 21 years; range, 11-58 years), affecting the femur in 17 patients (39%), the humerus in 12 patients (27%), the tibia in 5 patients (11%), (7%) the talus in 3 patients, the calcaneus in 2 patients (5%), and the os ischium, the os naviculare, the radius, the patella and the fourth toe in 1 patient each (2%). Pain was the most frequent symptom (66%). All but 2 patients were initially treated intralesionally by curettage and defect filling of the cavity. The mean age of surgery was 21 years (median, 18 years; range, 11 to 58 years).

Mean follow-up of all patients was 64 months (median, 26 months; range, 1-480 months). 4 patients were lost of follow up. In 3 patients (7%) minor complications occurred after surgery, consisting of wound healing disturbance, granuloma and haematoma. None of the patients developed a local recurrence. Functional outcome was assessed by the MSTS Score. The mean MSTS score of the upper limb was 99% with only one patient having a functional deficit. The mean MSTS score of the lower limb was 99% (median, 100%, range, 92% - 100%). 80% of patients had no functional deficit. We conclude that chondroblastoma can be cured in up to 100% with aggressive curettage and defect filling. This technique leads to excellent functional outcome and long-term control. Therefore we may conclude that surgery more aggressive than curettage is not warranted for the treatment of chondroblastoma.

E-mail (main author): philipp.funovics@meduniwien.ac.at



P7:110

Ewing's sarcoma- regression grade I, but viable pulmonary tumor embolus. A case report.

Daniela Hirzberger¹, Koppany Bodo¹, Martin Benesch¹, Jörg Friesenbichler¹, Andreas Leithner¹

¹Medical University of Graz, Austria

Introduction:

According to the literature, a regression grade I after neoadjuvant chemotherapy for Ewing's sarcoma has a strong correlation with a better survival rate. Nevertheless, even in this group metastases occasionally occur. We report a unique case of a 16-year-old male patient with a viable pulmonary tumor embolus despite a regression grade I after chemotherapy and resection of a Ewing's sarcoma of the chest wall (Askin's tumor).

Case presentation:

At diagnosis, the Ewing's sarcoma showed a size of 7x5.9x6.9 cm in the MRI. The patient received six cycles of induction chemotherapy according to EWING 2008 protocol, leading to a massive reduction in tumor size (3.3 x 1.8 x 2.8 cm) in the MRI, followed by a wide resection of the tumor. During surgery, the surgeon felt a part of suspicious coarse consistency in the pulmonary lower lobe with less than 1 mm in diameter that he removed too. The histological examination of the surgical specimen of the thoracic wall revealed that there was no viable tumor tissue, according to regression grade I after Salzer- Kuntschik. But in the resected lung specimen, a small arterial vessel with a microscopic accumulation of viable immature, highly atypical cells in the lumen was found. Based on immunohistochemistry (FISH did not work) the diagnosis of a tumor embolism with vital Ewing's sarcoma cells was made.

Discussion:

This puzzling finding led us to the question, how tumor cells could survive despite the excellent response of the primary tumor to chemotherapy. We speculate that a different microenvironment could be a possible cause. Other similar observations could lead to a better understanding of the tumor's metastatic potential.

E-mail (main author): daniela.hirzberger@stud.medunigraz.at



P7:111

Rare primary vertebral epithelioid angiosarcoma: a case report

Vânia Oliveira¹, Luis Costa², Daniel Soares², Luciana Leite², Pedro Leite², Paulo Costa², Joaquim Seabra-Lopes², Rafael González-Díaz³, Pedro Cardoso²

¹) Centro Hospitalar do Porto ²) Centro Hosp. Porto, Portugal ³) Hosp. Univ. Fundación Alcorcón Madrid, Spain

Background

Primary malignant vascular tumors of bone are very rare. The epithelioid angiosarcoma is a high-grade sarcoma that is extremely rare in spine location and presents unpredictable clinical course. Frequently it is delayed or misdiagnosis, and presents a high metastatic rate and poor prognosis. In literature, metastatic bone angiosarcoma is invariably fatal.

The diagnosis is histological and immunohistochemical confirmation is important.

There are only few cases described of vertebral angiosarcoma. The main treatment is surgical wide en-bloc resection with or without adjuvants.

Case Report

A 68-years-old male presented insidious low back pain in association to motor and sensitivity deficits, neurological gait claudication and weight loss.

An osteolytic lesion at the third lumbar vertebral body was analysed and characterized.

The PET scan showed an intense uptake at L3 and a slight uptake at the joint of the sixth dorsal vertebra with the rib that presented no tumor characteristics at the MRI.

A Tru-cut needle biopsy CT-guided revealed inflammatory tissue at the sixth dorsal vertebra and was compatible with primary epithelioid angiosarcoma of L3.

It was a type 5 of Tomita spine bone tumors classification, with paravertebral extension.

Tumor resection with total vertebrectomy of L3 was performed posteriorly. The surgical reconstruction consisted in posterior pedicle screw instrumentation of L1-L2-L4-L5 and interposition of a titanium expandable cage filled with iliac bone allograft and added a cross-link.

The histopathology and immunohistochemistry of the resected tumor confirmed a high-grade epithelioid angiosarcoma.

The prognostic was extremely poor due to the paravertebral extension of this malignant aggressive tumor. He recovered sensitivity deficits but persisted paraparesia. Then, he presented a

Pseudomonas Aeruginosa nosocomial sepsis with urinary tract starting point. The patient died within 1 month postoperatively.

Discussion

In literature, few bone epithelioid angiosarcomas are described and in spine location are extremely rare. They are a diagnostic and surgical challenge.

Although the total vertebrectomy performed the en-bloc resection was not possible due to paravertebral tumor extension. It showed an aggressive behaviour in association to morbidity and mortality.

Survival rate of these tumors is unknown but is essential an early diagnosis to allow a successful surgical wide resection.

E-mail (main author): vaniacoliveira@gmail.com



P7:112

MULTIFOCAL, METACHRONOUS GIANT CELL TUMOUR WITH RARE LOCALISATION AND METASTATIC SPREAD: A CASE REPORT

Maximilian Mächler¹, Jörg Friesenbichler², Ulrike Pirker-Frühau³, Werner Maurer-Ertl³, Patrick Sadoghi³, Leithner Andreas³

¹) Medical University of Graz, Austria ²) Department of Orthopaedic Surgery ³) Department of Orthopaedic Surgery Graz, Austria

Background: Giant cell tumour (GCT) of bone represents about 5% of primary bone tumours, but occurrence of multifocal GCT is rare. Herein, we present a case of a 59-year old male patient, who suffered from multifocal, metachronous GCT, which involved skull, os sacrum, lung and abdomen. **Case presentation:** A 59-year-old patient presented at our department with an osteolytic lesion in os sacrum in February 2012. In 2007 a lung tumour was found, suspected to be a carcinoma and treated by lobectomy. Further, in 2009 he was diagnosed for an osteolytic lesion in os frontale, which came out to be a GCT. After MRT and CT-scans of the sacrum it was decided to perform a biopsy at our department. The histological diagnosis from biopsy revealed a GCT. Therefore, the specimen of the lung from 2007 was questioned again and the differential diagnosis of metastatic GCT, due to a masked primary lesion, was brought up. Because of the patient's history it was decided to start systemic therapy with RANKL-inhibitor Denosumab. A few months after diagnosing GCT at the sacrum, a routine CT-scan of the abdomen revealed another lesion. Excision revealed the diagnosis of GCT. During a follow-up period of 6 months there was no progression of disease during therapy with Denosumab.

Discussion: GCTs of bone are classified as benign or intermediate neoplasm and mostly affect long bones. Multifocal GCTs occur in less than 1% of all patients and additionally metastatic spread is very uncommon. In our case the patient developed GCT in the skull and spine with an interval of 3 years and he also showed metastatic spread to lung and abdomen. Metastatic lesions of a masked primary GCT could be mistaken and could lead to other/wrong ways of therapy.

Conclusion: The present case report emphasizes the possibility of a multifocal GCT of bone as a possible differential diagnosis for multiple osteolytic lesions with metastatic spread to lungs, abdomen or other regions.

E-mail (main author): maxmaechler@hotmail.com



P7:113

Recurrences and Functional Outcome after Therapy of Aneurysmal Bone Cysts

Yasmin Bakhshai¹, Thomas Knösel¹, Andrea Baur-Melnyk¹, Volkmar Jansson¹, Hans Roland Dürr¹

¹) University Hospital of Munich (LMU), Germany

Background:

Aneurysmal bone cysts (ABC) are rare benign lesions, growing locally destructive, with a known tendency to recur. To cure the lesion an operation has to be performed. The aim of our study was to determine the rate of recurrences and the functional outcome of our patients.

Methods:

Between 1981 and 2012 we treated 49 histologically diagnosed ABCs in 48 patients (22 female vs. 27 male). We performed 65 operations to cure the lesions. The patients were reviewed in regards to age, gender, size, localisation, the presence or absence of symptoms and fractures, number of operations, the applied operative procedures, the outcome and the rate of recurrences. The mean follow up was 36 months.

Results:

Patients' age was at an average of 23 years. The average maximum diameter of the cysts was 4,95 cm. The lesions were mostly located in the lower extremities (48,98%) followed by the upper extremities (22,45%), the pelvis (14,29%), the spine (10,2%) and the stem (2,04%). We saw ABCs of the soft tissue in 3 patients, 3 of all lesions were secondary ABCs. Almost all of the patients were symptomatic at diagnosis (93,88%), another 4,1% presented with fracture. 17 operations on recurrences were performed in 14 patients (28,57% rate of recurrences), 4 of those patients had undergone a previous curative operation at another hospital. Multiple recurrences were seen in only 3 patients (6,12%), none of them had to undergo more than 3 operations to achieve healing or stable disease. Patients with recurrences were slightly younger than the average (20 vs 23 years). The biggest functional deficit seen was one patient with extensions deficit of 5 degrees in the hip joint, another patient had a minor hypaesthesia of the lower limb.

Conclusion:

Even though ABCs are a locally destructive growing lesion, mostly of the lower limb, with a high tendency to recur and need for further operations, especially in younger patients, outcome is good and functional deficits are very rare.

E-mail (main author): yasmin.bakhshai@med.uni-muenchen.de



P7:114

Intraneural ganglion cyst of the ulnar nerve: A rare localisation

Huseyin Botanlioglu¹, Mahmut Kursat Ozsahin¹, Gokhan Kaynak¹, Mehmet Fatih Guven¹, Zengin Gokhan¹, Muharrem Babacan¹, Mehmet Rifat Erginer¹

¹I.U. Cerrahpasa Medical Faculty, Turkey

Background: Intraneural ganglion cysts are very rare benign tumors. They also called nerve ganglion, intraneural synovial cyst, intraneural cyst, nerve sheath ganglion, intraneural mucoid cyst, intraneural mucoid pseudocyst or intraneural ganglion. These cysts are most commonly seen in the common peroneal nerve near the head of the fibula. They are less common in the ulnar nerve. These cysts can cause pain, swelling, different variations of sensory or motor deficit at the affected nerve territory.

Methods: Our case is 58 years old female who complained from pain, progressive numbness, tingling and weakness at the left hand. She denied having trauma to her left hand. During our physical examination we found that muscle atrophy, swelling at the lesion side. She has positive Froment's sign. She had no provocative signs of nerve compression at his elbow or wrist. Preoperative electromyogram findings suggested that acute - subacute almost complete denervation of the muscles innervated by ulnar nerve distal to the lesion. magnetic resonance imaging showed us 9.5X7 millimeters ulnar nerve sheath tumor. Ulnar nerve seemed thicker. Surgery was performed two months after the complaints onset. During the surgery ganglion cyst was carefully excised while avoiding any damage to the surrounding nerve fibers. Gelatinous material was encountered. Gelatinous material and wall of the cyst was sent to the laboratory for pathological examination. Pathological findings were consistent with ganglion cyst.

Results: After surgery her complaints; especially pain recovered rapidly. 8 weeks later physical therapy and rehabilitation has been started and continued for 15 days. Electromyogram was repeated 12 weeks after the surgery. Electromyogram findings were compatible with regeneration of ulnar nerve distal to the lesion and partial axonal damage.

Conclusions: The English literature on intraneural ganglions are limited to only a few case reports, making it difficult for us to diagnose and plan a treatment algorithm for intraneural ganglions. We suggest surgically nerve decompression and ganglion excision for intraneural ganglion cyst. Especially in patients who's presented with pain and rapidly progressive denervation findings at nerve territory, intraneural ganglion cysts should be considered instead of entrapment neuropathy.

E-mail (main author): drmkursatozsahin@yahoo.com



P7:115

Cortical Desmoid – Distal femur cortical irregularities mimicking Malignancies

Luís Tavares¹, Pedro Cardoso¹, Inês Balacó¹, Cristina Alves¹, Gabriel Matos¹

¹) Hospital Pediátrico de Coimbra, Portugal

Background

Cortical Desmoid are self-limiting reactive fibroosseous lesions, considered to be a variant of fibrous cortical dysplasia, which has benign biological and clinical behaviour.

These lesions have highly characteristic locations and radiologic pattern, which corresponds to a focal intracortical defect located at the posteromedial aspect of the distal femoral metaphysis, at the site of muscle insertion of the medial gastrocnemius or adductor longus. The radiological findings of this entity range from a slight loss of cortical definition, to a ragged spiculation with ill-defined borders, suggestive of malignancy (surface osteosarcoma).

It has been observed in active children between the ages of 3 and 17 (most commonly among 10-15 years old). It has been reported to occur in 11.5% of males and in 3.6% of females, 35% being bilateral cases.

Most patients are asymptomatic and don't have palpable masses, reason for which most cases are accidentally discovered in a knee radiograph performed for other reasons.

The authors aim to present two clinical cases of Cortical Desmoid lesions.

Case Report

A 10 years old male and a 14 years old female were observed in the emergency department after knee trauma during sport activities.

Clinical examination showed a physical pasting on inner side of distal thigh, tender to pressure.

Radiologically, spiculated lesions were observed at the distal femoral metaphysis, proximal to the growth plate.

The cases were discussed in a multidisciplinary meeting between Orthopaedics and Radiology. To distinguish between benign and malignant disease, further imaging was done: contralateral knee Xray and bilateral knee MRI/CT scan showed very similar images at the end of both distal femoral knees; bone scan was normal.

The correlation of imaging with clinical findings allowed to diagnose desmoid cortical lesions and no biopsy was performed.

Conclusion

Cortical desmoid is observed in children and adolescents at posteromedial metaphysis of distal femur, and has a highly characteristic location and radiologic pattern.

It is important to diagnose cortical desmoid as a variant of normal and thus avoid the need to perform invasive diagnostic procedures to exclude malignancy.

This entity doesn't need treatment, just clinical and radiological follow-up.

The prognosis is excellent and lesion disappears upon reaching adulthood.

E-mail (main author): lmigueltavares@hotmail.com



P7:116

Extraskkeletal osteosarcoma: a single-center experience with 15 consecutive cases

Christian Hipfl¹, Martin Dominkus², Joannis Panotopoulos², Reinhard Windhager², Philipp Funovics²

¹) Medical University Vienna ²) MUW, Austria

Background: Extraskkeletal osteosarcoma represents an unusual soft-tissue sarcoma that historically is reported to be associated with very poor prognosis. The objective of this study was to use a prospectively gathered database to describe the characteristics and outcome of patients with this rare malignancy.

Methods: From a large sarcoma database at a single institution, 15 patients with histopathologically confirmed extraskkeletal osteosarcoma, who were treated between 2002 and 2012, were analysed.

Results: The lesion usually presented as a deep, enlarging soft-tissue mass. The thigh (6 cases), the lower leg (5 cases) and the shoulder girdle (3 cases) were the most common anatomic sites. The mean age at the time of diagnosis was 52.3 years (range, 15.0 ,–œ 79.0 years). There was a slight female predominance (female-to-male ratio 1,3:1). Histologically, all were high-grade osteosarcomas. In 14 cases (93.3%) wide resection margins were achieved, whereas amputation was necessary in two cases. In one case intralesional resection was performed due to the unfavourable site in the paravertebral musculature. In our series, only one tumour (6.7%) recurred locally and one metastasized within one year; five patients (33.3%) had distant metastases at presentation. The preferred metastatic site was the lung. Overall and disease-specific survival at 5 years was 61.9%, with a mean follow-up of 17.3 months (range, 0.6 ,–œ 98.8 months).

Conclusion: Extraskkeletal osteosarcoma is an uncommon, high-grade malignant tumour, associated with high risk of recurrence and potential metastases. However, in our series the survival rate was exceptionally higher compared with those reported in literature. The treatment should follow established guidelines for treatment of soft-tissue sarcomas with radical resection appears to be the best option for local control. Along with aggressive resection of pulmonary metastases cure can be achieved.

E-mail (main author): christianhipfl@hotmail.com



P7:117

Primary solitary amyloidoma of the sacrum - a case report and review of the literature.

Frank M. Klenke¹, Christian Wirtz¹, Yara Banz¹, Lorin M. Benneker¹

¹) Inselspital, Bern University Hospital, Switzerland

Background:

Primary solitary amyloidoma of the axial skeleton is rare. This tumor-like lesion may have a particularly aggressive appearance characterized by local deposition of amyloid and bone destruction that can result in segmental instability. The thoracic spine is most commonly involved, followed by the cervical spine. Here we report the case of a primary, solitary amyloidoma of the sacrum, its diagnosis, treatment, and outcome.

Methods:

Case description and systematic review of the literature.

Results:

A 64-year-old female with a history of several years of back pain presented with recent exacerbation of local pain, weakness and paraesthesia of the right leg and increasing difficulties in bladder control. Imaging studies revealed an osteolytic tumor of the sacrum with extradural extension and obliteration of the spinal canal. Histopathological diagnosis of a plasmacytoid amyloidoma was made by CT-guided needle biopsy. Intralesional resection, lumbo-pelvic stabilization and postoperative radiotherapy resulted in complete resolution of neurologic symptoms. One year after surgery the patient is free of local disease. Literature review yielded less than 30 cases of primary amyloidoma of the spine. Only two previous reports of amyloidoma of the sacrum were identified. To our knowledge, this is the first case of solitary amyloidoma of the sacrum treated with surgical resection, stabilization and radiotherapy.

Conclusion:

Primary amyloidoma of the sacrum is extremely rare. Clinical presentation may be nonspecific. Imaging features are variable and can mimic malignant tumor growth. Definitive diagnosis requires histopathologic examination and immunohistochemic specification. Systemic affection must be excluded with cardiac MRI as well as colon and kidney biopsies. At the level of the spine and the sacrum resection is recommended in cases with extensive bone destruction and neurological symptoms. Intralesional resection with postoperative radiotherapy is associated with significant improvement of clinical symptoms and good local tumor control.

E-mail (main author): frank.klenke@insel.ch



P7:118

Rare, benign, angiomatous lesions

Björn Gunterberg¹, Peter Bergh¹, Rune Hedlund¹, Örjan Berlin¹

¹) Sahlgrenska University Hospital, Sweden

Background:

Benign, vascular lesions most frequently occur in the skin. However, some entities may involve deeper layers and all kinds of tissues and may develop in a disabling or life-threatening way. Three very rare conditions requiring challenging surgery are presented.

Patients:

1. Mixed Type Vascular Malformation of the Right Lower Extremity and Pelvis. A 22-year-old female was seen in a poor condition with extensive swelling and bulging deformities of the right lower extremity. There were necrotic, infected ulcers of the foot. When the leg was lowered extensive bleeding would occur and when the leg was elevated pulmonary oedema would occur. The extremity was calculated to contain 6 liters of blood, important coagulation factors were continuously consumed in the lesion. An extended hemipelvectomy including the rectum was performed. At 17 years follow-up the patient had good quality of life and full-time work.
2. Multifocal Intraosseous Epithelioid Hemangioma. A 35-year-old man had an osteolytic lesion of the right distal radius diagnosed as giant cell tumor of bone. A resection arthrodesis was performed. At follow-up one year later an osteolytic lesion was detected in the second metacarpal bone and further surveys including PET-CT disclosed altogether 6 osteolytic lesions in the right upper extremity and right second rib. All lesions were excised or curetted and cemented. Three years later a lesion of the left side of the sacrum was diagnosed and excised. PET-CT proved to be the best imaging tool and is done at regular intervals.
3. Gorham's Disease (Disappearing Bone Disease) of the Thoracic Spine. A 37-year-old man had MRI because of back pain. An extensive osteolytic lesion of the T7 vertebral body was seen. Repeated transpedicular and finally open biopsies yielded considerable bleeding but no abnormal cells. Angiography showed no hyper-vascularity and no vessels to embolize. At this stage there was total absence of T7 and considerable osteolysis of T6 and T8. The diagnosis was clear. The patient had stabilizing surgery with an extendable titanium cage and anterolateral fixation with rods and screws. He is on Alendronat medication and the condition is stable at 2 years follow-up.

Conclusion:

Benign angiomatous lesions may cause as challenging diagnostic and surgical problems as any sarcoma. The variety of orthopaedic tumor surgery and the need to learn about rare conditions is substantial.

E-mail (main author): bjorn.gunterberg@telia.com



P9:101

Radiological Evaluation of the Hip Joint Following Endoprosthetic Replacement of the Proximal Femur

Shlomo Dadia¹, Yair Gortzak², Rada Treiberg², Yehuda Kollender², Jacob Bickels²

¹) Tel-Aviv Sourasky Medical Center ²) National Unit of Orthopedic Oncology, Israel

Background

Endoprosthetic replacement of the proximal femur with a bipolar implant is associated with an excessive load on the remaining acetabulum. In order to alleviate the extent of potential future damage to the hip joint as a result of this load, some surgeons routinely place an acetabular cup, an approach that considerably extends the time of surgery.

We evaluated the long-term postoperative radiological changes occurring around the affected hip joint in patients in whom an acetabular cup was not placed.

Methods

Follow-up imaging studies of 26 consecutive patients who underwent proximal femur endoprosthetic replacement without acetabular cup placement and were followed for more than 2 years were retrospectively reviewed. Plain radiographs were evaluated for the extent of acetabular protrusion, degenerative changes, and heterotopic bone formation around the prosthetic hip joint.

Results

Protrusion of the prosthetic head was documented in 6 patients (23%), degenerative acetabular changes in 4 (15.3%), and heterotopic bone formation in 8 (30.7%). However, only 4 patients (15.3%) had symptoms associated with these findings that required surgery.

Conclusions

There is radiological evidence of some protrusion, articular degeneration, and heterotopic bone formation in patients who undergo endoprosthetic replacement of their proximal femur, but the extent of these changes and the lack of clinical symptoms do not justify the routine placement of an acetabular cup.

E-mail (main author): jbickels@012.net.il



P9:102

Doppler sonography from children with osteosarcoma and Ewing sarcoma

Igor Begun¹, Irina Papkevich¹, Rita Tarasevich¹, Marina Gorovikova¹

¹) Research Center for Pediatric Oncology, Belarus

PURPOSE

To study of capabilities of ultrasonic method in the diagnosis of osteosarcoma and Ewing sarcoma in children.

METHOD AND MATERIALS

Were analyzed the results of Doppler investigation of 28 children aged 9-17 years with malignant tumors: Ewing sarcoma (13 children) and osteosarcoma (15 children) located in the lower extremities. All cases were prospectively verified morphologically. X-ray, computed tomography and ultrasonography was performed in 100% of cases. To assess of the regional hemodynamics, the degree of vascularization of tumor and the state of major vessels we used color Doppler ultrasonography, power Doppler and spectral wave analysis.

RESULTS

A comparison study of indicators of children with osteosarcoma and Ewing sarcoma did not reveal significant differences ($p=0,07-0,40$), that at this stage allowed them to unite in one group. Blood flow in the common femoral arteries (CFA) affected and healthy limbs in these groups have been varied in quantitative characteristics. The curves Doppler of blood flow for CFA of the affected limbs in most cases have been with high amplitude and above zero line during the pulse cycle (Pict.). The volume blood flow of the CFA to the affected limb was 885 ± 324 ml / min, and for a healthy limb - 424 ± 138 ml / min (p

CONCLUSION

Were obtained the doppler symptoms for osteosarcoma and Ewing sarcoma in children. The data obtained by using Doppler technique at the initial stage of diagnosis together with by X-ray methods will permit better identify patients with signs of malignant lesions of the lower limbs.

E-mail (main author): [begun_igor@mail.ru](mailto: begun_igor@mail.ru)



P10:101

Less Radical Resection for Soft Tissue Sarcomas Combined with Chemotherapy and Acridine Orange Photodynamic Therapy Produced Excellent Local Control

Takao Matsubara¹, Katsuyuki Kusuzaki², Akihiko Matsumine¹, Kunihiro Asanuma¹, Tomoki Nakamura¹, Atsumasa Uchida¹, Akihiro Sudo¹

¹) Mie University ²) Kyoto Kujo Hospital, Japan

Background:

A wide resection is an effective method to inhibit local recurrence and poor prognosis for soft tissue sarcoma (STS). But if tumors are in close to major nerves, vessels, it's sometimes difficult to resect with wide margin. We established a new surgical therapy as acridine orange(AO) therapy which is supported by photodynamic surgery(PDS) and radiodynamic treatment(RDT) to reduce the surgical margin. We performed AO therapy(AOT) to STS patients, and analyzed the clinical outcome of AOT.

Methods:

69 high-grade STS patients were treated with AOT. We selected the patients for AOT by following criteria; 1) Tumors contacted with major nerve, vessels or joint; 2) MRI showed less invasiveness to normal tissues. Procedure of AOT is that; 1) less radical resection (marginal or intralesional resection) is performed; 2) additional microscopic curettage with ultrasonic knife under tumor visualization with green fluorescence is performed(AO-PDS); 3) after closure of surgical wound, 5Gy of X-ray is immediately irradiated(AO-RDT).

Results:

The details were shown in Table 1. 10-year overall survival(OS) and local recurrence free survival(LRFS) was 64%vs.68%. The average of ISOLS/MSTS limb function score was 93%, which indicates excellent limb function. In univariate-analysis, the following parameters influenced the OS: tumor size>5cm (Hazard-Ratio (HR)=1.12) and AJCC IV(HR=24.2). The LRFS was influenced by tumor size>5cm(HR=1.12) and effectiveness to preoperative chemotherapy(P-chemo) (HR=5.45). Intralesional margin status wasn't influenced for OS and LRFS. 10-year LRFS with or without P-chemo was 80% and 57%. Of 35 P-chemo patients, 17 showed the good response, and 10-year OS and LRFS of P-chemo responders were 91% and 92%. The factor of P-chemo response influenced the OS and LRFS significantly.

Conclusion:

Although AOT has several limitations, AOT showed acceptable results in local control, prognosis, and limb function. Furthermore, the combination with effective P-chemo and AOT produced excellent results of OS and LRFS, even if the tumor resected with intralesional margin. All patients received AOT displayed excellent function, since AOT allows preservation of normal tissues. Based on the clinical outcome, we believe that AOT is useful for preserving excellent limb function with low risk of local recurrence, especially in chemo sensitive STS as rhabdomyosarcomas or synovial sarcomas.

E-mail (main author): takao-m@clin.medic.mie-u.ac.jp



P10:102

The Feasibility of Irreversible Electroporation for the Treatment of Bone Tumor

Zhao Li¹, Kui Xu², Xiaoxiang Li², Qingyu Fan²

¹) Tangdu Hospital ²) Orthopedics Oncology Institute, China

Background

Irreversible Electroporation (IRE) is short wave of electric pulses can ablate undesirable tissues by generating nanopores on the cell membrane. Cells of the targeted area were ablated while preserve the vital structure like blood vessels and nerves. The non-thermal characteristic of IRE has been shown to exhibit numerous benefits over other traditional ablation technique and has been tested in humans for lung, prostate, kidney, and liver cancers. The effects of IRE are primarily dependent on the local electric field to which the tissue is exposed. Most of the tested tumors are homogeneous, for which the local electric field can be easily predicted. The effect on heterogeneous tissue such as bone tumor remains uncertain. In order to verify the effectiveness of irreversible electroporation's ablation on osteosarcoma, we evaluated the feasibility of IRE against bone tumor both In vitro and in vivo.

Methods

In vitro : The osteosarcoma cell line SOSP-9607 were cultured, collected and then resuspended in normal saline solution was placed in a 4mm gaps parallel aluminum plated Gene Pulser Cuvette. IRE was performed on the cell suspension at voltage of 100 to 1500V, pulse duration of 100 μ s. Cell suspension was collected and Cell viability was determined with CCK-8 assay, LDH assay and typan blue stain.

In vivo : We established an osteosarcoma rat model, when the diameter of the tumors reached nearly 1.0 centimeters, IRE was applied to ablate the tumor. Rats were killed immediately, 3 days, and 1 week after IRE. The tumor tissues were processed for gross morphology and histological analysis.

Results and Conclusion

In vitro : IRE can completely destroy osteosarcoma cell SOSP-9607. There was no tumor cell proliferation after continuous incubation 24 hours.

In vivo : Tissue histological examination post-IRE treatment revealed an extensive necrotic area. The sarcoma tumor cells got complete ablation.

In conclusion, our preclinical study shows the feasibility of IRE as a therapeutic modality to treat bone tumors.

E-mail (main author): leelieber@gmail.com



P10:103

Bone substitutes and growth factors in the treatment of simple bone cysts: literature analysis and clinical experience

Carlo Perisano¹, Giulio Maccauro¹

¹) Catholic University of Sacred Heart, Rome, Italy

INTRODUCTION: The solitary bone cyst is a tumor like lesion typical of the immature skeleton whose etiology and

pathogenesis is unclear. Treatment depends on symptoms if they are present, the presence of a fracture, the size, the

location and the presence of cysts in an active phase.

OBJECTIVES: The literature shows many treatment options, often conflicting with each others. The purpose of this study is to perform a literature review focusing on the possible role of platelet gel to heal the lesion.

METHODS: The injection of substances such as methylprednisolone, autologous bone marrow, demineralized bone

matrix and calcium sulfate are the most used, but due to the high failure rate, often we use more aggressive surgical

techniques such as curettage, resection, associated with bone graft and, possibly, the intramedullary nailing.

RESULTS: We report two cases of lesions not responsive to injections of steroids treated with curettage and bone

marrow, platelet gel and bone substitutes.

CONCLUSION: In the bone cysts non responsive to minimally invasive treatment, curettage associated with platelet gel and bone substitutes represent a valid therapeutic option.

E-mail (main author): carloperisano@hotmail.it



P10:104

Can VAC therapy spread tumour cells all over the wound? The "buckshot" pathological pattern.

Andrea Ferro¹, Michele Boffano¹, Ugo Albertini¹, Elena Boux¹, Stefano Marone¹, Alessandra Linari², Raimondo Piana¹

¹) CTO Hospital ²) OIRM/ S. Anna Hospital, Italy

BACKGROUND

Soft tissue sarcomas represents a group of relatively rare neoplasms with a high number of histological subtypes. Still many difficulties exist in referring patients to a reference centre in order to have an appropriate and standardized treatment plan. The aim of this study is to present a case of incorrect clinical management with its pathological consequences.

METHODS (CASE REPORT)

Female 79-year-old patient. Previous treatment (St Elsewhere Hospital): "hematoma" (without a proved hip trauma) aspiration in the trochanteric region, pathology report of high grade leiomyosarcoma, consequent open marginal-intralesional debridement without complete local and systemic stadiation, wound dehiscence treated with VAC therapy before final pathology report. The final report confirmed the diagnosis of high grade leiomyosarcoma with positive intralesional margins. After 2 months the patient was referred to the reference centre with a still open wound. A pelvis and lower limb MRI and a chest-abdomen CT were performed. Imaging showed no metastasis and a lesion extended 360° around femoral shaft along all the thigh and involving femoral neuro-vascular bundle and the cortical bone. The only possible surgical intervention was a hip disarticulation.

RESULTS

The pathologist reported a multifocal "buckshot" dissemination of neoplastic cell clusters comparable to miliar diffusion in secondary tuberculosis. Considering the pathological examination the VAC therapy had spread cells in the anterior, posterior and medial compartments of thigh. Unfortunately CT chest after 3 months showed multiple lung metastasis.

CONCLUSION

Many authors confirm that the use of negative pressure wound therapy after resection of musculoskeletal tumours is a safe and effective pathway to achieve wound healing after complications such as dehiscence, infection, or large soft tissue defect. This management is currently worldwide accepted. This experience confirms the strong suggestion to apply VAC therapy only after the pathological confirmation of clear marginal/wide margins. This case report unfortunately demonstrates that VAC therapy has the potentiality to spread malignant cells all over the open wound and that it must not be used in presence of active tumour tissue.

E-mail (main author): ferroandrea.82@libero.it



P11:101

Restoring function after excision of the femur/humerus in primary bone tumors - Results with a “low cost” total bone prosthesis

Ajay Puri¹, Ashish Gulia²

¹⁾ Tata Memorial Hospital ²⁾ TMH, India

Objectives: Rarely, extent of tumor may necessitate resection of the complete bone to achieve adequate oncologic clearance in bone sarcomas. We present our experience with reconstruction in such cases using an indigenously manufactured low cost total femoral prostheses (TFP) and total humerus prostheses (THP). We assessed the complications of the procedure, the oncologic and functional outcomes and implant survival.

Methods: Twenty six patients, fourteen males and 12 females with a mean age of 26 years operated between June 2001 and October 2009 had a total bone replacement (8 TFP and 18 THP). The diagnosis included osteogenic sarcoma (12), Ewing's sarcoma (9), chondrosarcoma (5). Mean follow-up was 39 months (9 to 120 months) for all and 51 months (24 to 120 months) in survivors.

Results: There were 6 local recurrences and fifteen patients are currently alive at time of last follow up. The Musculoskeletal Tumor Society score for patients ranged from 16 to 25 with a mean of 23 (77%). The implant survival was 92% at 5 years with one TFP needing removal because of infection and one THP because of local recurrence.

Conclusions: A total bone prosthesis in appropriately indicated patients with malignant bone tumors is oncologically safe. Functional outcome is good using an implant that provides consistent and predictable results with low complication rates after excision of the total femur or humerus.

E-mail (main author): docpuri@gmail.com



P11:102

Intraoperative Photodynamic Detection of Desmoid Tumor Using 5-ALA

Shlomo Dadia¹, Yair Gortzak², Suzy Ben-Eliyahu², Yehuda Kollender², Jacob Bickels²

¹) Tel-Aviv Sourasky Medical Center ²) National Unit of Orthopedic Oncology, Israel

Background

Desmoid tumor is a locally aggressive benign lesion. High rates of local recurrence are attributed to difficulty in defining appropriate margins of resection during surgery. The authors hypothesized that uptake of a photosensitizing agent by the tumor cells would allow detection of remaining tumoral tissue in the surgical field.

Methods

Between 2009 and 2010 the authors operated on 5 patients who had desmoid tumor. Patients were preoperatively orally given 5-ALA (20mg/kg). Following tumor resection, blue light was used to detect the presence of PPIX, the photoactive product of intracellular 5-ALA biosynthesis, in the resected tumor and within the surgical field.

Results

All resected tumors demonstrated strong and positive fluorescence light, reflecting the presence of bioactive PPIX. However, such fluorescence was not present in the surgical fields.

Conclusions

Residual tumor in the surgical probably cannot be directly viewed with the assistance of 5-ALA. However, assuming that microscopic disease is present in the surgical field, activation of the photosensitizing agent with a red light may induce tumor kill via formation of oxygen radicals and improve local tumor control following surgical resection.

E-mail (main author): jbickels@012.net.il



P11:103

BISPHOSPHONATES IN PREVENTING ASEPTIC LOOSENING OF MEGAPROSTHESIS

*Anatolii Diedkov¹*¹⁾ National Cancer Institute, Ukraine

Background: Aseptic loosening of megaprosthesis is the most common late complication of joint replacement and the reason of revision surgery. Instability arises in consequences of the absences of osseointegration at the contact between bone and implant surface with increased activity of osteoclasts. In this context the particular interest is the bisphosphonates drugs as inhibitors of bone resorption. Experimental studies have confirmed the impact of bisphosphonates on bone density around the implants, and the ability to initiate osseointegration in the area of direct contact of bone and implant surface.

The aim: To determine the impact of bisphosphonates on osseointegration of endoprosthesis legs at the clinical practice.

Materials and methods: 76 patients treated between 2006 and 2009 in Ukrainian National Cancer Institute underwent megaprosthetics with cement fixation. These patients were randomized into two groups depending on using bisphosphonates. The main group consisted of 36 patients and the control group of 40 patients, respectively. The following reconstructions were performed: distal femur - 27, proximal tibia - 22, proximal femur - 17, proximal humerus - 6, distal tibia - 4. The follow-up period ranged from 36 to 84 months (median follow-up period: 49.2 months). The mean age was 31.2 years. The analysis of the radiological signs of aseptic loosening of implant was conducted. Radiographic examination and evaluation of the following early radiographic signs: 1) the appearance of enlightenment site between stem and the inner surface of the cortex; 2) density decreasing of cortical bone; 3) dislocation of prosthetic legs. Bisphosphonates (pamidron acid 60 mg or zoledronic acid 4 mg) were administered once every two months after the operation for one year.

Results: In the control group the radiographic signs of aseptic loosening of prosthesis were observed in 5 (12.5 %) of 40 patients. One of them underwent endoprosthesis proximal femur replacement, other 4 patients with distal femur replacement. 4 patients demonstrated appearance of radiographic signs of aseptic loosening of prosthesis legs in the first year of follow-up, and 1 patient in the second year follow-up, respectively. In the experimental group the radiographic signs of aseptic loosening were observed in one case (2.8%) in the second year follow-up.

Conclusion: These results lead to a preliminary conclusion about the ability of bisphosphonates to decrease incidence of aseptic loosening of megaprosthesis with cement fixation. (This study is ongoing).

E-mail (main author): an.dedkov@gmail.com



P12:101

Histological Assessment of Pelvic Osteosarcoma after Heavy Ion Radiotherapy—report of two cases

Takashi Kato¹, Norio Yamamoto¹, Hideji Nishida¹, Hiroaki Kimura¹, Akihiko Takeuchi¹, Kentaro Igarashi¹, Shingo Shimozaki¹, Hiroyuki Tsuchiya¹, Takeshi Imaizumi²

¹) Kanazawa university hospital ²) National Institute of Radiological Sciences, Japan

Background

Surgical treatment of pelvic osteosarcoma is difficult. We present 2 cases in which time-dependent histological assessment of pelvic osteosarcoma was performed after heavy ion radiotherapy.

Cases

Case 1 was of a 14-year-old girl and Case 2 was of a 30-year-old woman. Both the patients presented with sacral osteosarcoma. They were diagnosed on the basis of the findings of needle biopsy. After chemotherapy, they underwent heavy ion radiotherapy. Thereafter, histological observation was performed using needle biopsy.

Result

Case 1

Four months after heavy ion radiotherapy, extensive necrosis was still observed on histological examination, and the osteosarcoma was classified as Grade III/IV according to Rosen & Huvoys classification. The observation further revealed lung metastasis, and thus, chemotherapy and lung tumor excision were enforced. Histological analysis of the lung tumor revealed viable tumor cells, and the tumor was classified as Grade II/IV according to Rosen & Huvoys classification. Fifteen months after heavy ion radiotherapy, viable tumor cells were still observed, suggesting a recurrence. Twenty-one months later, the patient died of respiratory failure due to increasing pulmonary metastasis.

Case 2

Three months after heavy ion radiotherapy, fibrosis with scattered atypical cells was observed on histological examination. Even this patient showed lung metastasis, and thus, underwent chemotherapy and lung tumor excision. Viable tumor cells were observed on histological examination of the lung tumor. Twenty months after heavy ion radiotherapy, viable tumor cells persisted. However, imaging studies showed no increase in the volume of the pelvic tumor. The patient progress is being continuously monitored.

Conclusion

We have presented 2 cases in which that heavy ion radiotherapy was believed to have good prognosis for pelvic osteosarcoma. We believe that heavy ion radiotherapy may be effective for treating pelvic osteosarcomas that are difficult to treat surgically.

E-mail (main author): katouhideji@yahoo.co.jp



P13:101

The Impact Of Methotrexate and Tumor Necrosis On The Outcome Of Patients With Osteosarcoma.

Ahmad Shehadeh¹, Sameh Hashem¹, Ahmad Badeeb¹, Iyad Sultan¹

¹) KHCC, Jordan

Background:

Osteosarcoma (OS) is the most common non-hematologic primary malignant bone tumor. There are conflicting reports about the role of Methotrexate in the treatment and the role of histologic tumor necrosis as a predictor of survival.

We aim to show the benefit of Methotrexate in pediatric protocols, and the significance of tumor necrosis in predicting patient's survival.

Methods:

Retrospective Chart review of all patients diagnosed with osteosarcoma from Jan 2003 to Dec 2009. Multiagent chemotherapy is used in all patients, while methotrexate is used only for pediatric patients. Results: Fifty-six patients with osteosarcoma were treated at our center during the study period. The median age of patients was 17.2 years (range, 6 to 51 years). A majority of the pediatric group (68%) and approximately half of the adult group (52%) received neoadjuvant chemotherapy as part of their therapy. One-fifth of tumors demonstrated greater than 90% necrosis with chemotherapy. Most resections (n=42, 75%) yielded adequate margins in both groups while the margins were involved in 3 patients and close in 11 patients. In the first 4 years, 29% of the patients with extremity tumors underwent LSS; while in the last period, 79% underwent LSS (chi-square test for trend, $P=0.0001$). For non-metastatic patients with extremity tumors, the 3-year EFS for children and adults were $67\% \pm 16\%$ and $64\% \pm 20\%$ ($P=0.92$), and for metastatic patients with extremity tumors, the 3-year EFS for children and adults were $32\% \pm 13\%$ and $57\% \pm 16\%$ ($P=0.99$). Necrosis ($>90\%$) was a favorable prognostic feature with no events occurring in patients with good response ($P=0.079$). The 3-year EFS for patients with necrosis $>70\%$ was $83\% \pm 11\%$ vs. $37\% \pm 10\%$ ($P=0.01$).

Conclusion:

Children did not have better outcome despite the addition of methotrexate. We found a marginal survival advantage at 90% necrosis; however, our study suggests that necrosis rates above 70% after neoadjuvant chemotherapy may be sufficient to indicate significantly better outcome.

E-mail (main author): ahmadmd2003@yahoo.com



P13:102

Prevention of catheter-related infections in children with tumors of the musculoskeletal system

Maxim Rykov¹, Elena Gyokova¹

¹) Institute of Pediatric Oncology, Russian Federation

Background: The treatment of musculoskeletal tumors in children requires numerous courses of chemotherapy that necessitate adequate vascular access. Implantable venous port-systems are free from many of the disadvantages associated with the use of external central venous catheters. Our goal was to reduce the occurrence of infectious and thrombotic complications in children with central venous systems.

Materials and Methods: From 2008 to 2012 we observed 281 patients with tumors of the musculoskeletal system aged 6 months to 17 years, for 147 (52.3%) of which implanted venous port systems were used and for 134 (47.6%) with external subclavian catheters. Estimated criteria: the development of catheter-related bloodstream infections and cases of catheter thrombosis. In cases of thrombosis, we injected the system with a 25,000 IU dose of urokinase with an exposure of 15 minutes. To seal the catheter between the usages, we used heparin or a solution containing taurolidin (no catheter-related infections were noted).

Results: Periportal tissue infection was observed in 3 cases (2.0%) of the patients with implanted venous ports, while the children with subclavian catheters puncture site infection was noted in 89 cases (66.4%). No catheter-related bloodstream infections were noted at children with venous ports. Thrombosis of venous ports was observed in 7 cases (4.7%), which caused by incorrect exploitation. The development of catheter-related bloodstream infections was noted in 18 cases (13.4%) at children with subclavian catheters. Subclavian catheter thrombosis was observed in 47 cases (35.0%). The treatment of complications caused in exploitation of a subclavian catheter required its replacement in 29 cases (21.6%), with the necessity of another general anesthesia. All venous ports worked satisfactorily. All cases of thrombosis were successfully treated.

Conclusion: The use of taurolidin solution to close the venous system in the intervals between treatments prevents infection. The treatment of catheter-related infections is more effective with a combination of taurolidin and urokinase, which provides lysis of the thrombus as a source of bacteria. The local use of a gel containing taurolidin at endoprosthesis infecting is possible. The number of complications is significantly higher in patients with subclavian catheters, which rises the risk of limb endoprosthesis infection.

E-mail (main author): wordex2006@rambler.ru



P13:103

CONSERVATIVE TREATMENT OF INOPERABLE GIANT CELL BONE TUMOR OF PELVIS AND SACRUM USING BONE RESORPTION INHIBITORS

Anatolii Diedkov¹, Pavel Kovalchuk², Sergey Bojchuk²

¹⁾ National Cancer Institute ²⁾, Ukraine

Background: Giant cell tumor is aggressive bone tumor. Surgical treatment is considered to be the only effective method of treatment of these tumors. The problem of primary inoperable patients with giant cell tumors is a challenge.

Methods: Between 2009 and 2012, a total of 5 patients had inoperable giant cell bone tumors of pelvis and sacrum at the National cancer institute in Kiev, Ukraine. Among them were 2 males and 3 females at the age from 19 to 32 years. Mean follow-up was 18 months (range, 5 to 38). 3 patients underwent bisphosphonates administration (zoledronic acid or ibandronic acid), radiation therapy and embolization of tumor-nutrient arteries; 2 patients received denosumab (monoclonal antibody blocking RANKL/RANK bond) by the scheme: 120 mg on 1, 8 and 15 day, then 120 mg once a month. The efficiency was assessed by clinical data: pain syndrome intensity, Brief Pain Inventory (BPI) questionnaire and CT scans comparison (volume and density of tumor).

Results: All 5 patients had pain syndrome intensity decrease after 1 week of study. Treatment with denosumab demonstrated more than 30% tumor regression. All of the patients are in remission status. 4 of them had tumor capsule density increase.

Conclusion: Administration of bisphosphonates and denosumab in patients with inoperable giant cell tumors of pelvis and sacrum is perspective, allows to achieve remission and to increase the quality of life by decreasing pain syndrome intensity.

E-mail (main author): an.dedkov@gmail.com



P14:101

Immunotherapy based on dendritic cells is feasible for patients with malignant bone and soft tissue tumours

Hideji Nishida¹, Norio Yamamoto², Akihiko Takeuchi², Yoshikazu Tanzawa², Munetomo Takata², Isei Nomura², Shinji Miwa², Takashi Kato², Hiroyuki Tsuchiya²

¹) Kanazawa University ²) Kanazawa Univ., Japan

Background

Dendritic cells (DCs) are the most potent antigen-presenting cells of the immune system. They play an important role in the induction of a tumour-specific immune response and they may represent a promising tool in therapeutic vaccination against cancer. DCs immunotherapy was reported in some carcinomas, such as B-cell lymphoma, melanoma, prostate cancer, renal cell carcinoma and malignant glioma. But there are a few reports of DCs immunotherapy for malignant bone and soft tissue tumours in orthopaedics. To evaluate the safety and feasibility of autologous tumour lysate-dendritic cell (DCs) immunotherapy for patients with malignant bone and soft tissue tumours who failed other standard treatments.

Methods

Twenty-five patients were enrolled and immunized with DCs. Patient tumours comprised seventeen bone tumours (osteosarcoma [10], chondrosarcoma [2], fibrosarcoma [1], angiosarcoma [1], metastatic bone tumour [3]) and eight soft tissue tumours (clear cell sarcoma [3], leiomyosarcoma [2], ependymoma [1], alveolar soft part sarcoma [1], MPNST[1]). Autologous DCs were generated ex vivo in the presence of granulocyte-macrophage colony-stimulating factor and interleukin-4. Solutions containing equal quantities of DCs pulsed with original tumour lysate (TL) and DCs pulsed with OK-432 were injected intradermally. Each patient received 2-5 x 10⁶ cells one time a week for 6 weeks.

Results

Immunizations were well tolerated by patients with only local redness and swelling at the injection site in four cases. Levels of interferon-gamma and interleukin-12 cytokines were increased after DC immunotherapy in seventeen patients, nine of whom subsequently developed delayed-type hypersensitivity against the tumour lysate or OK-432. At the final follow-up, four patients had stable disease and nineteen patients had progressive disease.

Conclusions

Although improvement of clinical efficacy requires further research, toxicity-free immunization by tumour lysate- or OK-432-pulsed DCs is safe and feasible in patients with malignant bone and soft tissue tumours who failed standard therapy.

E-mail (main author): hideji0511@yahoo.co.jp



P15:101

Standardized Rehabilitation After Limb Salvage Surgery Improves Patients' Outcome

Ahmad Shehadeh¹, Ahmad Shehadeh²

¹) King Hussein Cancer Center ²) KHCC, Jordan

Background:

Limb salvage surgery (LSS) has become the treatment of choice for the vast majority of patients with primary sarcomas of the bone in lieu of amputation ; however, no published rehabilitation protocols are available for these patients, which can be important for improvement of function and decrease hospital stay as the case for hip and knee arthroplasty.

We have undertaken a pilot study to assess the feasibility of establishing a standardized postoperative rehabilitation protocol in the treatment of patients with primary bone sarcoma for the 5 major anatomical locations. (Distal femur, Proximal tibia, Proximal and total femur, Humerus and shoulder girdle resections and Pelvic resections) , and show the applicability of this protocol.

Methods:

All LSSs performed by orthopedic oncology surgeon and rehabilitation of all patients was based on a standardized rehabilitation protocol. Fifty nine patients received LSS in the above mentioned locations: endoprosthesis (n=49), bone allograft (n=5), or No replacement (n=5). Patients received limb salvage surgery for other locations were not included in this study.

Patient outcomes were measured using the modified Musculoskeletal Tumor Society International Symposium on Limb Salvage (MSTS/ISOLS) scoring system.

Result:

The mean modified MSTS/ISOLS score for all patients was 87% (95% CI, 0.85,0.89), at a mean follow up of 24 months. The highest scores were for patients with distal femur =93% (95% CI ,0.91,0.95). Seven patients had interruption of more than 6 weeks in their rehabilitation and had a mean score of 71% (95%CI,0.64,0.82).

Conclusion: The proposed rehabilitation protocol is a comprehensive, organized, and applicable guide to be used after performing LSS at mentioned anatomical locations. Standardized rehabilitation resulted in improved patient functional outcome.

E-mail (main author): ahmadmd2003@yahoo.com



P15:102

Novel Use of a Hip Spacer to Perform Reconstruction Following Extra-Articular Scapula Resection for Sarcoma

Steven Kyriacou¹, Michael T. R. Parratt¹, Robin C. Pollock¹

¹) Royal National Orthopaedic Hospital, United Kingdom

Background

Patients with high-grade scapula and peri-scapular sarcomas may be treated with either an extra-articular scapula resection (Tikhoff-Linberg procedure) or an intra-articular total scapulectomy. After such a resection, reconstruction of the remaining shoulder girdle must be performed. We present a case in which a hip spacer is used to perform the reconstruction following an extra-articular scapula resection for high grade spindle cell sarcoma.

Methods

A 79 year old female presented with a mass increasing in size on the posterior aspect of her right shoulder. Computed tomography scanning demonstrated an expansile tumour in the region of the right scapula that had destroyed most of the blade. Ultra-sound guided biopsy indicated the lesion was a high-grade spindle cell sarcoma. There was no evidence of metastases on further imaging.

A Tikhoff-Linberg procedure of the right shoulder was subsequently conducted with en-bloc resection of the scapula, distal clavicle and proximal humerus. In order to reconstruct the shoulder girdle, a hip spacer (Spacer G by Orthodynamics) was cemented into the proximal humerus with the soft tissues tensioned appropriately. A synthetic mesh (LARS ligament by Corin) was then sutured over the prosthesis and secured to the osteotomised clavicular remnant and chest wall with non-absorbable sutures.

Results

The patient made an uneventful post-operative recovery. The histopathological report confirmed a high-grade spindle cell sarcoma that had been completely excised with 2mm margins. Her wounds healed well with no complications and she retained very good hand, elbow and wrist function but no active motion of her shoulder.

Over three years following surgery she is alive and well, having been continuously disease free with no evidence of local or distant recurrence. Currently her Musculoskeletal Tumour Society Score (MSTS) score is 63 % and her Toronto Extremity Salvage Score (TESS) is 49 %.

Conclusion

This case demonstrates that a comparatively inexpensive, readily available non-custom made hip spacer used in a novel way may serve to augment a definitive humeral suspension following a Tikhoff-Linberg procedure with a satisfactory result in terms of cosmesis, acceptance, distal upper limb function and disease free survival.

E-mail (main author): drstevenkyriacou@hotmail.co.uk



P15:103

Serum metal ion concentrations following total knee arthroplasty using megaprotheses for tumour indications: Is there a matter of concern?

Joerg Friesenbichler¹, Werner Maurer-Ertl², Patrick Sadoghi², Joanna Szkandera³, Ulrike Pirker-Fruehauf², Christian Weger², Andreas Leithner²

¹) Medical University of Graz ²) Department of Orthopaedic Surgery ³) Department of Oncology, Austria

Background: Metallic wear following endoprosthetic reconstruction is a continuing matter of concern in the literature. The aim of the study was to determine the values of cobalt (Co), chromium (Cr), and molybdenum (Mo) in the serum of paediatric patients following reconstruction of the knee using fixed hinge megaprotheses after tumour resection. Further, these metal ion levels were compared with pre-operative controls as well as metal ion levels following metal on metal (MoM) total hip arthroplasty (THA) and rotating hinge total knee arthroplasty with standard devices and megaprotheses.

Methods:

Fixed hinge group: There were ten patients with a distal femoral or proximal tibial device (Howmedica Modular Resection System/HMRS®). The mean follow-up was 109 months (range, 67 to 163).

Rotating Hinge Knee groups (RHK): There were 17 megaprotheses (Limb Preservation System; LPS/M.B.T.) and eight standard rotating hinge devices (S-ROM Noiles). The mean follow-up was 35 months (range, 9-67 months).

Total Hip Arthroplasty group (THA): Thirty-two patients underwent metal-on-metal large diameter total hip arthroplasty (ASR XL Head). For this study, the preoperative, the 12-months, and the 24-months data were regarded as controls.

Metal ion analysis: The concentrations of Co, Cr, and Mo were determined using electrothermal graphite furnace atomic absorption spectrometry (ET ASS).

Results: In the fixed hinge megaprotheses group the mean concentration for Co, Cr and Mo were 0,51 µg/dl (range, 0,04-1,28 µg/dl), 0,420 µg/dl (range, 0,148-0,891 µg/dl), and 0,06 µg/dl (range, 0,01-0,09 µg/dl). The values for Co and Cr were tenfold and twofold, respectively, increased compared to the upper values from the reference laboratory, while Mo was within the limits.

The serum concentrations of Co and Cr were significantly higher compared to the rotating hinge group with the standard device ($p < 0.001$), and the preoperative controls ($p < 0.001$), while the serum concentrations of patients following MoM THA were higher at one and two years of follow-up.

Conclusion: Determining the concentrations of metal ions following fixed hinge and rotating hinge total knee arthroplasty revealed significant increments for Co and Cr. Thus, periodic long-term follow-ups are recommended. Upon the occurrence of adverse reactions to metal debris or intoxications, the revision of the hinge implant to a rotating hinge device or another reconstruction method should be considered.

E-mail (main author): joerg.friesenbichler@medunigraz.at



P15:104

Tumors around the Hip Joint Treated with Resection Without Reconstruction. Report of 18 Consecutive Patients.

Shlomo Dadia¹, Yair Gortzak², Rada Treiberg², Yehuda Kollender², Jacob Bickels²

¹) Tel-Aviv Sourasky Medical Center ²) National Unit of Orthopedic Oncology, Israel

Background

Wide resection of large tumors of the proximal femur and acetabulum may require enbloc removal of the hip joint, which create a large bony defect associated with a considerable loss of function.

Reconstruction of such defects usually requires the use of large metal implants. The authors chose not to reconstruct that defect selected group of patients and report their outcome.

Methods

Between 1998 and 2007, 18 patients who had malignant tumors of the proximal femur and acetabulum underwent enbloc resection of their tumor with the hip joint. Reconstruction of the bone defect was not done because of either poor overall oncological or medical status. Following surgery, the operated extremity was put in a skeletal traction for a period of 3 weeks after which gradual weight bearing was allowed.

Results

Compared with surgeries in which reconstruction with a megaprosthesis was done, the procedure done in the study patients was associated with a shorter operative time and less wound complications. Although a considerable limb-length discrepancy of 4-6 cm was documented in all study patients, all were able to ambulate with the use of assisting devices.

Conclusion

Wide resection of the hip joint without reconstruction provides reasonable function and is associated with a lesser amount of surgical complications. It may be considered in patients who have a poor oncological prognosis or have an expected high risk of medical complications following a major operation.

E-mail (main author): jbickels@012.net.il



P15:105

Bilateral fibula graft - Biological reconstruction with after resection of primary malignant bone tumors of the lower limb

Per-Ulf Tunn¹, Dimosthenis Andreou¹, Carmen Tiedke¹, Frank Traub¹, Mario Kuhnert¹, Maya Niethard¹

¹) HELIOS Klinikum Berlin-Buch, Germany

Background: Biological reconstruction of osseous defects due to resection of lower limb malignant bone tumors aims at a permanent solution. This paper deals with bilateral vascularized fibular grafts (BVFG) as a method for reconstruction of metadiaphyseal defects of the femur and tibia in young patients suffering from malignant bone tumors of the lower limb.

Methods: This reconstruction technique was used in 11 patients (5 female, 6 male, mean age 14.0 years, femur n=5, tibia n=6) undergoing metadiaphyseal resection of lower limb malignant bone tumors between November 2000 and December 2011. The median length of the defect to be bridged was 16.0 cm (range 8-24.5 cm). In the six cases of tibial reconstruction, the ipsilateral and contralateral fibula was swivelled into the osseous defect. The fixation of the fibular grafts was achieved by standard plating. For the reconstruction of femoral defects, two free vascularized fibular grafts were used. All patients with an Ewing's sarcoma and an osteosarcoma had multimodal treatment according to the EURO-E.W.I.N.G 99 or COSS-96 protocol. Median follow-up was 63 months.

Results: R0 status was achieved in 10 cases. One resection of an adamantinoma resulted in an R1-resection showing no evidence of disease at follow-up of 12 months. None of the patients experienced local recurrence during follow-up. 2 patients died due to distant disease during follow-up. Full weight-bearing on the affected leg was permitted after a mean of 8 months (range 4–18 months). Complications occurred in five patients (bleeding from anastomosis n=1; fibular graft fracture (conservative treatment) n=1; infection and non-union n=1; plate failure and delayed union n=2). None of the complications led to failure of the biological reconstruction or to amputation. The MSTS scores was provided with a mean of 87% (range 67-100%).

Conclusion: Biological reconstruction of osseous defects is always desirable when possible. Good functional and durable results can be obtained using BVFG for the reconstruction of metadiaphyseal defects of the femur and tibia.

E-mail (main author): per-ulf.tunn@helios-kliniken.de



P15:106

COMPLICATIONS ASSOCIATED WITH THE ARTIFICIAL BONE GRAFT SUBSTITUTE €žGeneX€

Ulrike Pirker-Frühau^f, Jörg Friesenbichler¹, Patrick Sadoghi¹, Werner Maurer-Ertl¹, Christian Weger¹, Koppány Bodo¹, Andreas Leithner¹

¹) Medical University Clinic Graz, Austria

Background: Artificial bone graft substitutes like GeneX, a tricalciumphosphate-calcium - sulphate - compound, are widely used to refill bone defects after curettage of benign tumours. At our clinic we observed severe postoperative complications after initiation of GeneX.

Methods: We designed a prospective single cohort study with 40 patients with bone tumours who should receive curettage and defect filling with GeneX. Due to serious postoperative complications the study had to be stopped after inclusion of 31 patients (11 male, 20 female). Mean age at operation was 40-years (range, 6-71). The lesions were located in the proximal humerus (9), the femur (7), the tibia (3) or fibula (2) and the small bones of hand (8) or foot (2). The tumour entities included 17 enchondroma, five simple/juvenile bone cysts and nine other benign bone lesions.

Results: Five out of 31 patients (16%) developed serious complications following surgery and GeneX refilling. Three presented sterile inflammation adjacent to GeneX and two developed inflammatory cystic formations (up to 15cm) in the soft tissue with time dependant growth regression. Of those three patients with sterile inflammation, two showed delayed wound healing and local pain, and the third needed revision due to severe skin damage.

Conclusion: In the current series, GeneX caused severe soft tissue inflammation and pain. Therefore, surgeons should be warned not to place this artificial bone graft substitute next to thin walled structures (erosion!), and further, to seal fenestrated bone carefully after curettage and defect filling. We state the notion that general mandatory detailed safety testing of artificial bone graft substitutes should be performed before market launch.

E-mail (main author): pirkerfr@hotmail.com



P15:107

Resection of Malignant Chest Wall Tumors

Kaoru Aoki¹, Yasuo Yoshimura², Kenichi Isobe², Takashige Momose², Munehisa Kito², Hiroyuki Kato²

¹) Shinshu University, School of Medicine ²) Shinshu University, Japan

Background; We report about malignant bone and soft tissue tumors that performed chest wall resection.

Methods; Between 2005 and 2011, we performed chest wall resection on 9 patients (7males and 2 females) for malignant bone and soft tissue tumors. The average age at the time of operation was 58.6 (25-85) years old. Three cases were chondrosarcoma, two cases were MFH of soft part. Ewing's sarcoma, leiomyosarcoma, myxofibrosarcoma and MPNST were one case each. We investigated surgical methods, complications and prognosis about these cases.

Results; The average follow-up period were 32.0 (4-79) months. The number of resected ribs was one in one case, two in 3 cases, three in 3 cases, five in one case and seven in one case. For the case resected one rib and a case resected two ribs, we didn't reconstruct the chest wall and closed the wounds directly. For the other 7 cases, we performed reconstruction of chest wall with the expanded-polytetrafluoroethylene (ePTFE) mesh. Postoperative complications were aspiration in one case (resected 3 ribs), reinsertion of thoracic cavity drain in one case (resected 5 ribs), deferment of extubation and scoliosis in one case (resected 7 ribs). There was no case of infection to mesh. Local recurrences occurred in 2 cases postoperatively. The 5 years survival rate of the patients was 48.6%.

Conclusions; Operations for malignant chest wall tumors are very invasive with open chest and unilateral intubation. In our study, postoperative complications didn't occur in the cases resected few ribs, and their postoperative course were good. In cases that resected a lot of ribs, we should pay attention to complications.

E-mail (main author): kin29men@shinshu-u.ac.jp



P15:108

Functional outcomes after scapulectomy and reconstruction

Katsuhiro Hayashi¹, Hiroyuki Tsuchiya², Shintaro Iwata³, Akira Kawai⁴, Takafumi Ueda⁵, Takanobu Otsuka¹

¹) Nagoya City University ²) Kanazawa University ³) Chiba Cancer Center ⁴) National Cancer Center Hospital ⁵) National Hospital Organization Osaka, Japan

Background:

Scapulectomy requires not only joint resection but also wide resection of the shoulder girdle muscles. Even the significance of reconstruction has not yet been determined because of the difficulties in comparing the different conditions. The purpose of this study was to investigate factors to influence functional outcomes after scapulectomy in multicenter study.

Methods:

This retrospective study comprised 48 patients who underwent total or subtotal scapulectomy and followed at least one year after surgery. Patients were registered at Japanese Musculoskeletal Oncology Group affiliated hospitals. Soft tissue reconstruction for joint stabilization was performed when there were enough remaining tissue for reconstruction such as rotator cuff and tendons. In 23 cases, humeral suspension was performed. The average follow-up period was 61.9 months. Multivariate analysis was performed to patient's background to determine which factors influence Enneking functional score or active range of motion.

Results:

The average functional score was 21.1 out of 30. Active shoulder range of motion was flexion 42.7, abduction 39.7, internal rotation 49.6 and external rotation 16.8. The amount of remaining bone influenced functional outcome, which means that preserving glenoid or acromion lead better function compared to total scapulectomy ($p < 0.01$). Factors that influenced functional outcome include amount of remaining bone, soft tissue reconstruction, length of resected humerus, nerve resection, follow-up period, male, number of resected muscles, age, amount of bleeding ($p < 0.05$).

Conclusion:

Although shoulder function was almost eliminated following total or subtotal scapulectomy, minimal resection of bone and soft tissue reconstruction should lead to better function.

E-mail (main author): hayashikatsu830@aol.com



P15:109

Shoulder arthrodesis reconstruction with a pedicled musculo-scapular crest graft after resection for bone tumor

Francois Gouin¹, giovani Padiolleau², Guillaume Odri², Antoine Hamel²

¹) Hôtel-Dieu, Centre Hospitalier Universit ²) CHU Nantes, France

Purpose of the study

En-bloc resection of proximal humerus leads to poor functional results when both deltoid muscle or axillary nerve and rotator cuff tendons have to be resected.

When stability and strength is preferred, arthrodesis might be proposed. We report a surgical technique for reconstruction of bone defect and shoulder arthrodesis with an homolateral pedicled musculo-scapular crest graft and its midterm functional results.

Material and methods

Twelve patients underwent shoulder arthrodesis with this technique in order to reconstruct a proximal humerus bone defect. The aetiologies were malignant bone tumor resection for 11 patients (4 extra articular and 7 intra articular resections) and one extensive bone destruction after total shoulder arthrodesis. The mean length of the bony defect was 11.6 cm (6-15), and the graft bridged it in all cases, with an internal fixation by a plate. Function was evaluated according to MusculoSkeletal Tumor Society and Tess scoring system.

Results

5 patients died from the disease 9 to 35 months after surgery. One patient recurred locally 11 months after resection and was amputated. Mean follow-up is 5.9 year (12 to 144 months). 9 patients healed without any further surgery. Three patients presented a non-union, with a local infection in one case. None of them healed after bone grafting, one patient is still alive with a distal non union. MSTS mean score was 71 % (63 to 80%) and mean Tess score was 70 (50 to 81). All young patients have a professional activity. No patients have sustained a decrease of functional performance after 1 year of follow-up.

Discussion

This pedicled graft associated with internal fixation by plate leads to a similar or better rate of bone healing and functional performance compared to other techniques. Furthermore, it doesn't need microsurgical vascular sutures as when a vascularised fibular graft is chosen. Stability of clinical and radiological results with time is attractive for young patients. The limitation of proximal humerus resection is 15 cm in our experience. The patient must be informed of the poor cosmetic results even when augmentation of the graft by latissimus dorsi muscular flap is done.

E-mail (main author): fgouin@chu-nantes.fr



P15:110

Endoprostheses of proximal part of humerus after tumor resection

KHurshidjon Abdikarimov¹, Mirza Ali Gafur-Akhunov¹, Ulugbek Islamov¹, Djamilya Polatova¹, Sundr Urunbaev¹, Rasulbek Davletov¹

¹⁾ National Oncology Research Centre, Uzbekistan

Background. The replacement efficiency estimation of proximal part of humerus with metal endoprosthesis.

Material and methods. 30 patients with tumors of proximal part of humerus after resection are carried out replacement of humeral joint with endoprosthesis of an own design. Men - 17, women - 13. The age of patients varied from 16 till 55, on average - 25, 4 years old. All patients had a lesion of epimetadiaphyseal part by extent ion from 5 to 12 sm with scope from 1/3 to 2/3 semi-circles, with destruction of cortex. The presence of pathological crisis was not with contra-indications. Giant cellular tumor is revealed of 21 patients, 6 - chondrosarcoma, 1 - osteogenic sarcoma, 1 - angiogenic sarcoma and in 1 –metastatic lesions of the bone.

Results: the patients were observed from 4 months till 9 years. The functional condition of humeral joint was appreciated in 60 % patients as good, in 32 % satisfactory, at 8 % unsatisfactory. In observation term from 1to 6 months in 8 (26,6 %) were developed various type of complication: festering of postoperative wounds (4), postoperative osteomyelites (2) and formation of fistula (2). In observation term from 4 months till 3 years in 5 patients (16,6 %) the relapse of tumor, in 7 (23,3 %) - metastasis in remote organs (lungs - 6, cerebrum - 1) is revealed. From 30 patients 4 (13,3 %) died from progressing of disease.

Conclusions: Reliable, ideal method of replacement of bone defect after resection of humerus is endoprosthesis. The application of individual endoprosthesis for replacement of defect formed after resection of humerus, allows achieving preservation of operated extremity function.

E-mail (main author): akhg13@mail.ru



P15:111

Replacement of large joints in treatment of bone tumors

KHurshidjon Abdikarimov¹, Mirza Ali Gafur-Akhunov¹, Ulugbek Islamov¹, Djamilya Polatova¹, Sundr Urunbaev¹, Rasulbek Davletov¹, Bakhridil Sultanov¹

¹) National Oncology Research Centre, Uzbekistan

Background: the analysis of results endoprosthesis of large joints in treatment of tubular bones tumors.

Material and methods: the analysis of results of surgical treatment in 154 patients who have been carried out by endoprostheses of large joints. 149 patients were with primary tumors and 5 with metastatic lesions, average age was 25 years. Men were 91, women - 63. By localization of tumor: in 21 case there was a lesion of proximal part of thigh bone, in 70 – distal part of femoral, in 28 – proximal part of shin-bone and in 35 – proximal part of humeral bone. By morphological structure, in 48 patients is revealed osteosarcoma, in 28 – chondrosarcoma in 1 – paraostal sarcoma, in 1 - reticulosarcoma, in 1 – angiosarcoma, in 1 – sarcoma of Ewing, in 68 – giant cellular tumor, in 6 – metastatic lesion.

Length of bone resection was from 8 to 24 sm.

Results. The complications have appeared in 32 patients (20,7 %), from them in 18 infections of lodge in prosthesis, in 14 instability endo prostheses, in 4 cases these complications were combined. In 11 cases infectious complications were stopped conservatively. Crippling operations in 4 patients, re – endoprostheses in-2, endoprosthesesectomy with imposition of compression-destruction osteosynthesis in 1 patient are performed.

The reason of instability in 5 cases was loosening of endoprostheses legs in the marrowy channel, in 7 - destruction of design, in 1- reduction of construction (screw of articulated part), in 1- dislocations of the head of coxal prostheses. In 5 patients crippling operations, in 7 cases reendoprostheses, in 2 – reconstruction of endoprostheses are performed. A functional condition by scale MSTs: a knee joint - 76 % after resection of proximal part of shin bone and 91 % after resection of distal part of thigh bone, humeral joint - 75 %, coxal - 84 %.

Conclusion. Endoprostheses of large joints is an ideal and reliable method in surgical treatment of bone tumor provides the local control and allows receiving satisfactory functional results.

E-mail (main author): akhg13@mail.ru



P15:112

Risk of infection in oncological megaprosthetic reconstruction

Primo Daolio¹, Roberto Zorzi¹, Stefano Bastoni¹, Alessio Maione¹, Silvia Bronzin², Paola Navone³, Marta Nobile⁴, Francesco Auxilia⁵, et GISIO⁶

¹) Orthopedic Institute, G. Pini- Center of ²) Post Graduated School of Public Health , ³) Orthopedic Institute, G. Pini- Health Ma ⁴) PhD program in Public Health, Universit ⁵) Department of Biomedical Sciences for He ⁶) Italian Study Group of Hospital Hygiene, Italy

BACKGROUND

Literature reports an incidence of Surgical Site Infections (SSI) in oncological patients undergoing prosthetic replacement, between 8% and 35% after implantation and 43% after revision.

The frequency of SSI has gradually decreased after the introduction of antibiotic prophylaxis, however the appropriateness of perioperative prophylaxis for these patients is still controversial.

The purpose of this retrospective study, conducted at the oncologic orthopedic Unit of G.Pini Institute in Milan, was to evaluate:

- the number of SSI in oncological megaprosthetic reconstruction between 2009 and 2011,
- possible risk factors associated to the onset of SSI,
- the antibiotic prophylaxis applied.

METHODS

We reviewed medical records of patients who underwent clean megaprosthetic reconstruction and collected hospitalization and follow up data, focusing on possible risk factors implied in the onset of SSI: patient characteristics, duration of surgery, number of persons in the operating room, size of resection, blood losses, antibiotic prophylaxis, etc. We registered every SSI meeting the criteria set by the European protocol HELICS.

PRELIMINARY RESULTS

86 surgeries were evaluated, 37 women (43%) and 49 men (67%) whose mean age was 48 years and mostly ASA 2 (43%) and 3 (39%). Administration of prophylaxis was usually recorded (95%) and continued postoperatively (96%) for an average of 8 days, often related to the length of postsurgical stay. Mean duration of surgery was 256 minutes with a mean of 7 persons attending the operating room. We recorded 6 SSI on 86 surgeries evaluated (7%): 4 deep and 2 superficial, 4 occurring after one month and 2 after one year from surgery. Statistical analysis will be completed by integrating data from year 2008, whose collection is in progress.

CONCLUSIONS

The criteria for inclusion or exclusion set in this study, SSI definition and data collection forms, could be used in a prospective surveillance program, to be planned having made sure to be able to implement a follow up. Afterwards, the protocol could be improved and proposed for adoption in a prospective multicenter surveillance system.

E-mail (main author): primoandrea.daolio@gpini.it



P15:113

Complications Following the Use of Megaprosthesis in Limb Salvage Surgery in Osteosarcoma; The Experience Of CCHE

Ahmed El Ghoneimy¹, Magdy EL Sherbiny¹, Ahmed Salah¹, Manal Zamzam¹, Ahmed Kamel¹, Iman Gouda¹, Iman Zaki¹, Ranin Soliman¹

¹) Children's Cancer Hospital Egypt, Egypt

Methods: Starting in 2007 and till 2012, 178 cases of pediatric Osteosarcomas were treated at the CCHE. Among these, 57 (32%) patients were locally treated by limb salvage and reconstruction by megaprosthesis.

Results: The average age at presentation was 15 years (8-18) and the average follow-up period was 24 months (6 months-56 months). 34 tumors were located in the distal femur, 15 in the proximal tibia, 5 in the proximal femur and 3 in the humerus. 7 prostheses were of the expandable type. A total number of 18 (31.5%) complications were recorded at the latest follow-up. Complications included limited flexion and/or extension in 7 cases, 4 stem loosening, 3 cases of periprosthetic fractures, 2 cases of infection, 1 case of bushing failure and a final case of stem breakage. Five (27.7%) complications were treated conservatively and these included 2 periprosthetic fractures and 3 cases with limited range of motion. The remaining 13 complications required revision surgeries. No amputation was needed to manage complications. Both cases of infection were treated successfully with an average of 2 years of follow-up since last evidence of infection. Two patients who had loosening of their prosthesis returned to their daily activity with no further evidence of loosening or pain. The third patient died before treating her loosening. All cases of fracture healed completely and resumed full weight bearing and normal daily activity. Four patients with limited range of motion required admission to operative room. Two were treated by manipulation under anesthesia, one patient was treated by shortening of his prosthesis, and another, required revision of her entire prosthesis. Only this last patient remained stiff after surgery. The one case with bushing failure was treated by replacement with a new bushing and a case with stem breakage was treated by revision with a new prosthesis. At the latest follow-up, the average MSTS functional score was good (73.3%) with a minimum of fair and a maximum of excellent score.

Conclusion: Although the incidence of complications was high following megaprosthesis implantation and most complications required surgical intervention, management of such complications was usually successful and amputation was not needed.

E-mail (main author): aghoneimy@me.com



P15:114

Latissimus dorsi flap: old solution for coverage, new option to restore function

Michele Boffano¹, Ugo Albertini¹, Elena Boux¹, Stefano Marone¹, Andrea Ferro¹, Davide Ciclamini¹, Pierluigi Tos¹, Giancarlo Gino¹, Raimondo Piana¹

¹) CTO Hospital, Italy

BACKGROUND

Latissimus dorsi flap (LDF) is a valid option to fill in big tissue defects after the excision of bone and soft tissue sarcomas of the upper limb. To substitute the function of a resected muscle is still challenging. The aim of this study is to evaluate the possible indications for a LDF either pedicled or free.

METHODS

Fourteen LDFs have been performed from 2006 to 2012 at Orthopaedic Oncology Department CTO Hospital (Torino, Italy) in 14 patients (7 males; average age 52,5 years old, range 17-78 ys). The purpose of the flap (either coverage or functional), the characteristics of the flap (pedicled or free), the grafted area (upper or lower limb) have been evaluated. The function was measured comparing the function of the opposite limb.

RESULTS

Six coverage LDFs (5 pedicled flap in the upper limb, 1 free flap in the lower limb) and 8 functional LDFs (6 in the upper and 2 in the lower limb) were performed. Functional LDFs substituted the deltoid muscle in 5 cases, the triceps, the quadriceps, the glutei in 1 case. The function was good in the upper limb except for the cases of associated bone resection and reconstruction; it was only fair in the lower limbs.

CONCLUSION:

LDFs are characterized by low morbidity in the donor area, large amount of available tissue, easy harvesting with a trustworthy bundle. This study confirms the reliability of LDF as a coverage flap either pedicled or free. Even if good functional results were obtained in the upper limb, the possibility of using free LDFs to substitute a lower limb muscle (gluteus, quadriceps) is still debated. Where no other surgical options are available LDFs offer a strong and widespread reconstructive solution. Further studies are needed to clarify the use of functional flaps in reference centres.

E-mail (main author): boffano@inwind.it



P15:115

Treatment of periprosthetic fractures in patients treated with a megaprosthesis after resection of a malignant bone tumour.

Sebastian Bockholt¹, Arne Streitbürger¹, Georg Gosheger¹, Jendrik Harges¹, Markus Nottrott¹, Marcel-Philipp Henrichs¹, Helmut Ahrens¹

¹) Münster University Hospital, Germany

Background:

While tumour endoprosthetic reconstruction is the most common treatment after large segmental bone defects after tumour resection for primary and secondary bone tumours, periprosthetic fractures are extremely rare. However, accompanying chemotherapy, local radiation and long periods of none weight bearing are compromising the bone quality significantly in a high percentage of patients. The treatment of periprosthetic fractures in tumour patients is extremely demanding. Osteosynthesis often fails due to the reduced bone quality and consolidation potential.

Methods:

During January 2000 and Dezember 2012 we analysed 31 patients with periprosthetic fractures after tumour resection followed by reconstruction with megaendoprostheses. Initial diagnosis was predominantly primary high grade sarcoma, although 4 patients had bone metastasis of carcinoma. Chemotherapy was administered in 25 and local radiotherapy in 10 patients. The average patient age was 37,0 years. Fracture site was the humerus in 6, the femur in 16 and the tibia in 9 cases.

Results:

Fracture occurred after a medium of 18.0 months after initial implantation. Cause of fracture was adequate trauma in 10 patients and inadequate in 21 patients (5x caused by tumour recurrence). Plate osteosynthesis was possible in 5 patients only. In 22 patients an exchange of the implant with an average bone loss of 7 cm (range 2-25 cm) was necessary. In 5 cases an additional joint replacement (2 x elbow joint, 3 x hip joint) was performed due to the absence of sufficient bone stock for a stem implantation. Recurrent sarcoma led to amputation in 2 cases. Complications were 2 periprosthetic infections requiring a two stage revision. One non-union after osteosynthesis was treated with an additional implant exchange.

However, finally all patients with limb salvage achieved full weight bearing in the latest follow up examinations.

Conclusion:

Periprosthetic fractures in patients treated with tumourprosthesis are demanding. The common goal of treatment should always be the preservation of as much bone as possible for further revisions and an assessment of risks and benefits.

E-mail (main author): SebastianBockholt@gmx.de



P15:116

Complications Following The Use Of Megaprosthesis In Limb Salvage Surgery In Osteosarcoma; The Experience Of Children Cancer Hospital Egypt

Ahmed El Ghoneimy¹, magdy el sherbiny², ahmed salah², manal zamzam², ahmed kamel², imane gouda², imane zaki², ranin soliman²

¹) children cancer hospital egypt ²) CCHE, Egypt

Starting in 2007 and till 2012, 178 cases of pediatric Osteosarcomas were treated at the CCHE. Among these, 57 (32%) patients were locally treated by limb salvage and reconstruction by megaprosthesis.

The average age at presentation was 15 years (8-18) and the average follow-up period was 24 months (6 months-56 months). 34 tumors were located in the distal femur, 15 in the proximal tibia, 5 in the proximal femur and 3 in the humerus. 7 prostheses were of the expandable type. A total number of 18 (31.5%) complications were recorded at the latest follow-up. Complications included limited flexion and/or extension in 7 cases, 4 stem loosening, 3 cases of periprosthetic fractures, 2 cases of infection, 1 case of bushing failure and a final case of stem breakage. Five (27.7%) complications were treated conservatively and these included 2 periprosthetic fractures and 3 cases with limited range of motion. The remaining 13 complications required revision surgeries. No amputation was needed to manage complications. Both cases of infection were treated successfully with an average of 2 years of follow-up since last evidence of infection. Two patients who had loosening of their prosthesis returned to their daily activity with no further evidence of loosening or pain. The third patient died before treating her loosening. All cases of fracture healed completely and resumed full weight bearing and normal daily activity. Four patients with limited range of motion required admission to operative room. Two were treated by manipulation under anesthesia, one patient was treated by shortening of his prosthesis, and another, required revision of her entire prosthesis. Only this last patient remained stiff after surgery. The one case with bushing failure was treated by replacement with a new bushing and a case with stem breakage was treated by revision with a new prosthesis. At the latest follow-up, the average MSTS functional score was good (73.3%) with a minimum of fair and a maximum of excellent score.

Although the incidence of complications was high following megaprosthesis implantation and most complications required surgical intervention, management of such complications was usually successful and amputation was not needed.

E-mail (main author): aghoneimy@me.com



P15:117

Does VAC therapy really promotes local recurrence of musculoskeletal tumors?

Radmila Treiberg¹, Solomon Dadia², Shula Lev², Alexander Nirkin², Jacob Bickels², yair Gortzak², Suzi Ben Abraham², Yehuda Kollender²

¹) Tel-Aviv "Sourasky" medical center ²) Tel-Aviv medical center, Israel

Background: Vac therapy is widely used for treating open wounds in orthopedic oncology for better healing and to minimize the necessity for complex surgical interventions as free flap surgery or other prolonged plastic reconstructions.

We believe that the use of VAC therapy do not promote local recurrences.

Methods: From May 2004 to December 2012 we treated 30 patients with VAC therapy for open wounds .

in some case the wound was left open after primary surgery and in other group the treatment was for reopened wounds after infections or other soft tissue problems.

Results: The average treatment time was 10 days (7-22 days). In 15 patients the wound healed primarily with the VAC therapy and with no need for any further surgical treatment.

13 patients needed a simple skin graft for closure and 2 patients needed a muscle flap after the VAC treatment.

There were 3 local recurrences one after 2 month and the other two after more than one year.

Conclusion: According to our experience VAC therapy is safe to use in Orthopedic-Oncology patients. It does not promote local recurrence and recommended as adjuvant therapy for better wound healing and less extensive surgery.

E-mail (main author): yehuda5360@gmail.com



P15:118

SURVIVAL OF TUMOR ENDOPROSTHESIS

Wonju Jeong¹, IL Hyung Park¹, Michael Limquico Marfori², Hwan Seong Cho³

¹) Kyungpook National University Hospital, Republic Of Korea ²) De La Salle University Medical Center, Philippines ³) Seoul National University Budang Hospita, Republic Of Korea

Background and Objectives: Limb-salvage surgery has become the preferred surgical procedure for both aggressive and malignant tumors, as well some metastatic bone tumors of the extremities. Endoprosthetic replacement played a major role. The aim of this study was to evaluate the risk factors that may influence the survival outcome of the tumor endoprosthesis.

Study Design: Retrospective cohort study

Methods: Forty seven patients of Kyungpook National University Hospital over the period of 1991-2010 who had undergone tumor resection and endoprosthetic reconstruction, excluding pelvic tumor cases and a minimum of 2 years follow-up were retrospectively reviewed.

Results: Eleven patients had post-operative complications requiring endoprosthetic revision. Five had metal failure. Three had aseptic loosening. Two had periprosthetic fracture, while the last case had recurrent implant dislocation. One patient had infection but was controlled. We found statistical significance for extraarticular resection and proximal tibial resection as risk factors for subsequent revision. Kaplan-Meier survival analysis revealed significant differences in the survival curves in each variable. The overall 3 and 5 year survival rate for this series was 94% and 74%.

Conclusion: Our experience is similar to the other endoprosthesis survivorship reports in the literature. The long term survival of tumor endoprosthesis will depend on our understanding of the risk factors that may affect the outcome.

E-mail (main author): wjeong@knu.ac.kr



P15:119

Venous thromboembolism prophylaxis in major sarcoma survey – Current Practice

Chandrasekar Coonoor¹, Mohammed Al Mutani², Illingworth Emma²

¹) Royal Liverpool University Hospital ²) RLBUHT, United Kingdom

Aims: The risk of deep vein thrombosis and pulmonary embolism following major sarcoma surgery is not clear from the literature. Moreover some surgeons consider the use of chemical thromboprophylaxis causes major bleeding risk. The aim of this study was to assess the current practice of VTE prophylaxis worldwide.

Methods: A 5-question online survey was sent worldwide mainly to oncologists and orthopaedic oncology surgeons regarding their practice of VTE prophylaxis. Questions were designed to target ambiguous areas of VTE prophylaxis.

Results: Survey responses were received from many centers around the world. 85% used VTE prophylaxis while 15% used no prophylaxis. 42% used mechanical VTE prophylaxis while 82% used low molecular weight heparin. 30% used both mechanical and chemical VTE prophylaxis. The duration of the prophylaxis varied widely from few days to 10 weeks. Two thirds of the respondents felt that VTE prophylaxis benefit is more than the risk while one third felt otherwise. 10% felt that chemical VTE prophylaxis is a major bleeding risk for major sarcoma surgery.

Conclusions: The survey indicates wide variations in the current usage of VTE prophylaxis from major tumour centers around the world. It is important to identify that there is wide variation in the current practice before any consensus could be achieved. The findings of the study may also have medico legal implications for the justification of VTE prophylaxis.

E-mail (main author): crc12@hotmail.com



P15:120

Long term outcome of Endoprosthetic Replacement of the Proximal Humerus

Tom Cosker¹, Phil Lechler¹, Chris Taylor¹, Lee Bayliss¹, Duncan Whitwell¹, CLM Gibbons¹

¹) Nuffield Orthopaedic Centre, United Kingdom

Background

The proximal humerus is commonly affected by primary and secondary bone tumours. Developments in oncologic treatment strategies have resulted in a substantial increase in life expectancy and associated functional demands. The present study reports on the clinical outcome of proximal humeral endoprosthetic replacement using a modular implant.

Methods

20 patients (male 6, female 14) were included in the study. We examined clinical outcome, patient and implant survival in patients with primary or secondary bone tumours. Patients were treated between November 2001 and December 2012 in a high volume sarcoma unit. Preoperative staging, tumour histology and grade as well as operative and adjuvant treatment was assessed. Postoperative complications, recurrence rates, and revision surgery were documented, as well as shoulder function was assessed.

Results

Mean age at operation was 53 years (19-84). Histology revealed high grade osteosarcoma (n=4), low/intermediate grade chondrosarcoma (n=8), metastatic disease (n=5) and three cases of high grade soft tissue sarcomas affecting the proximal humerus. At final follow up, mean overall survival was 75%. In eight patients a gore-tex sleeve was applied to optimize soft tissue management. In four patients plastic reconstructive measures with free or local flaps were performed. Local tumour recurrence was noted in 3 cases, two of which were re-excised. Superficial infection appeared in one case, one patient developed deep infection which was controlled by single stage debridement and lavage. Furthermore, one case of revision surgery was performed because of recurrent glenohumeral subluxation. Functional outcome revealed mean forward active flexion of 23 degrees, abduction of 27 degrees and active external rotation of 33 degrees.

Conclusions

The present oncologic cohort showed reasonable functional results after endoprosthetic replacement of the proximal humerus. Risk analysis showed acceptable overall and implant related revision rates. There are opportunities both at implantation in terms of surgical strategy, and moving forwards, in terms of implant design, for improved outcome in these difficult cases.

E-mail (main author): tomcosker@gmail.com



P15:121

Strategies for Achieving Long-Term Stability of Proximal Humeral Reconstruction in Sarcoma Surgery

Tom Cosker¹, Christopher Taylor¹, Phil Lechler¹, Henk Giele¹, Paul Critchley¹, Duncan Whitwell¹, Max Gibbons¹

¹) Nuffield Orthopaedic Centre, United Kingdom

Aims: Bony sarcomas of the proximal humerus often require complete resection of the humeral head as well as the rotator cuff apparatus. Options for reconstruction include free fibula with physis transfer and proximal humeral endoprostheses. Historically, dislocation has been the predominant problem with such operations. There are various surgical strategies which can be employed to stabilise the endoprosthesis. This paper critically appraises the surgical options available.

Methods: Twelve cases of bone sarcoma of the proximal humerus are presented in which various strategies have been used to stabilise the endoprosthesis. Patients were recruited sequentially into this observational study.

Results: Using a combination of these surgical strategies we have significantly reduced our endoprosthesis dislocations and have had an improved outcome in terms of patients TESS scores and functional outcome measures. We present the residual complications we have experienced, revision surgery where required, long-term stability and overall functional outcome.

Conclusions: Stabilising the proximal humeral replacement remains surgically challenging. There are, however, several strategies which can be employed to minimise the chance of dislocation. The relative pros and cons of the various methods including use of the MUTARS tube, pedicled muscle transfer, vascularised 1st rib transfer, coracoid interposition and glenoidplasty are discussed along with the relevant surgical techniques.

E-mail (main author): tomcosker@gmail.com



P15:122

The successful use of a biologic graft for closure of anterior abdominal wall defect following excision of soft tissue tumour.

Coonoor Chandrasekar¹, Emma Illingworth², Paul Rooney², Richard Heath²

¹) Royal Liverpool University Hospital ²) RLBUHT, United Kingdom

Introduction and Aims

Primary soft tissue tumours arising from the abdominal wall are uncommon. There are many surgical techniques available for abdominal wall repair following excision of the tumour, each having its own benefits. The options range from direct closure, to the use of tissue flap reconstructions and/or prosthetic meshes. Synthetic material like polypropylene mesh is a common choice for closure of the abdominal wall defect. This report outlines two successful cases of abdominal wall repair using the Cook Medical™ Biodesign® porcine intestinal submucosa biologic prosthesis.

Methods

Two patients had excision of soft tissue tumours from the anterior abdominal wall. The soft tissue defect following the tumour excision was about 10x10 cm. The defect was primarily closed using a Biodesign® biologic graft.

Results

The first case illustrates the closure of a 10x10cm defect secondary to excision of borderline myofibroblastic tumour of the anterior abdominal wall. The second demonstrates successful utilisation of the biologic graft in a patient with a BMI>30 who had undergone a previous right sided hernia mesh repair, presenting with aggressive fibromatosis measuring 7x7cm from the right iliac fossa. Both patients had an uneventful postoperative period with good wound healing and no infection. At the time of latest clinical review there is no evidence of recurrence of the tumour, seroma or hernia.

Conclusion

Following excision of soft tissue tumours of the abdominal wall biologic reconstructions can be successfully used to bridge the defect with minimal morbidity.

E-mail (main author): crc12@hotmail.com



P15:123

Is Daptomycin a new key to solving the problem of Prosthetic Joint Infection?

Dmitry Nisichenko¹, Zlata Grigorevskaya¹, Vladimir Sokolovskiy¹, Maxim Kubirov¹, Petr Sergeev¹, Mamed Aliev¹

¹) N.N.Blokhin RONC, Russian Federation

The aim: The aim of our study is to evaluate the possibility of using daptomycin in children and adults after implantation endoprosthesis.

Materials: There were 30 patients with cancer of bone, who underwent primary or repeat implant's replacement from 03.2010 to 05. Min. age 10, max. 48 years. Children under 14 used a dose 8-10mg/kg/day. Adults – 10-12mg/kg/day. Duration of the course in prevention of infection (due to the high risk of infection) varied introduction of 5 to 16 days. In the treatment of infection rate ranged from 14 days to 36. At high risk of infection, we mean: the patients with resection of the proximal tibia, with a deficit of soft tissue to cover the endoprosthesis, an extensive skin necrosis in the postoperative scar, reimplantation. At 1/30 (0.3%) patient developed an allergic reaction in the form of urticaria. For the treatment infection of the endoprosthesis bed daptomycin was used in 11 patients. Only in 8 out of 11 cases we had bacteriological seeding. In others cases – only indirect signs. In 6 out of 8 MRSE flora was detected, in 2 out of 8 - MSSA. Ineffectiveness of daptomycin revealed only one out of 8 patients - 12% with the agent of MSSA. In this patient during surgery revealed osteomyelitis-spoke - MSSA, for a long time to receive preventive therapy daptomycin 500mg/day - without effect, the patient was removed implant, the defect is replaced by a spacer from the bone cement with gentamicin - pus from the wound continues to stand out; bacteriological crops - without any flora.

Result: In all cases, the use of daptomycin for the prevention of infectious complications in high-risk after implantation, we have not received manifestation of any complications. In the case of the treatment of established infectious complications - efficiency was 10 of 11.

Conclusion: The use of the drug daptomycin in children and adults after using of tumor endoprosthesis, as a preventive antibiotic treatment is justified only for a group of patients at high risk of possible complications. Treatment of infections implant bed with daptomycin - effective, but requires further careful observation and analysis.

E-mail (main author): nisichenko@gmail.com



P15:124

Successful reconstruction of total tibia and ankle joint with endoprosthesis. Experience for children and adults in East-European Sarcoma Group

Vladimir Sokolovskiy¹, Dmitry Nisichenko¹, Petr Sergeev¹, Aslan Dzampaev¹, Maxim Kubirov¹, Mamed Aliev¹

¹) N.N.Blokhin RONG, Russian Federation

Goal: To this day, amputation is most widespread operation at distal tibia tumors. The purpose of our research is standardization of surgical treatment at such tumors for children and adults.

Materials: We report the clinical and functional outcome of limb preserving surgery and endoprosthetic reconstruction of the total tibia and ankle joint in twelve treated between 2008 and 2012 two of whom are children 12 and 15 years, respectively. Two patients underwent total replacement of the tibia: one for primary tumor, another for revision surgery. A mean age of 23 years, the most young patient was 12 years old.

We have used custom-made endoprosthesis of MUTARS® (Implantcast) and ProSpon. All stems of endoprosthesis have been fixed by bone cement with Gentamicin-3. All patients carried ankle joint orthosis from 2 till 6 months.

Results: Three patients developed a local recurrence and no patients – metastasis. We have not received any significant complications, such wound dehiscence or infection. MSTS score after 3 months was above 70%. MSTS score after 6 months was 78-82%. All were pain free and able to perform most daily activities. One patient with total tibia endoprosthesis still alive.

Conclusion: A custom-made endoprosthetic replacement of the total tibia and ankle joint is good treatment for patients with a primary bone tumour in quality to alternative of amputation. Now requires the development of new design prosthesis to restore the good function of the foot.

E-mail (main author): nisichenko@gmail.com



P15:125

Demanding limb salvage surgery operations in two «special» patients suffered of bone and soft tissue non Hodgkin lymphomas correspondingly

Konstantinos Tsanidis¹

¹) "Saint Luke" Private Hospital, Greece

Background:

Two «special» patients were diagnosed suffering of bone and soft tissue non Hodgkin lymphoma correspondingly were diagnosed on 2005 and 2011. The first patient (A), 37 years old man, single, very active, worker, presented a non Hodgkin Lymphoma in his tibia. He received treatment on 1989 for Ewing's sarcoma in his femoral bone. On 1991 he received chemotherapy together with radiotherapy for non Hodgkin bone lymphoma in his tibia. On 2001 recurrence in his tibia was diagnosed and treated with chemotherapy together with radiotherapy again. On 2005 he continued suffering of limited bone lymphoma and additionally of avascular necrosis of the tibia and of the supratant skin, pathological fracture and osteomyelitis.

The second patient (B), 93 years old man, incredibly active -runner and jumper – at this age, diagnosed on 2011 with soft tissue non Hodgkin lymphoma of his right popliteal fossa.

Method:

To the patient A chemotherapy was given followed by surgery. A vascular musculocutaneous graft from latissimus dorsi was developed and covered the skin necrosis. After the evaluation showed a vital skin graft, limb salvage surgery was performed in two stages. At the first stage the contaminated part of the tibia was excised, and cement spacer enriched with antibiotics was placed. Antibiosis for three months was given. At the second stage the cement spacer was removed and a long custom made joint sparing prosthesis was implanted.

To the second patient (B) because of his advanced age, light chemotherapy for 4 months offered after surgery and it was not easy to deal with the 93 years old neurovascular bundle of his popliteal fossa.

Result: The results five and two years post-op correspondingly are excellent according to MSTS and TESS scores and both patients are today very active without any recurrence or metastasis.

Conclusion:

Limb salvage surgery is very demanding procedure and takes faith and knowledge from both the surgeon and the patient but really can change people's life. The patient A is today married and a very happy father with three children and the patient B continues running and jumping.

E-mail (main author): constantine.s.tsanidis@gmail.com



P16:101

Malignant Pelvic Resections - The Blood (patient's), Toil & Sweat (surgeon's): Is it worth the effort?

Ajay Puri¹, Ashish Gulia², Manish Pruthi²

¹⁾ Tata Memorial Hospital ²⁾ TMH, India

Aim: Purpose was to evaluate morbidity, oncologic results and functional outcome in patients with malignant tumors of the pelvis treated with limb sparing resection.

Methods: Between March 2002 and November 2010, 106 cases of malignant pelvic tumors were treated with limb sparing resections of pelvis. Diagnosis was chondrosarcoma in 65, Ewing's sarcoma in 25, osteogenic sarcoma in 10, synovial sarcoma in 3, malignant fibrous histiocytoma, epitheloid sarcoma, and epitheloid hemangiothelioma in 1 each. Three patients had an erroneous pre-operative diagnosis of benign tumor and underwent intralesional excision; these were excluded from analysis. Remaining 103 patients underwent limb sparing resections with intent to achieve tumor free margins. Thirty eight patients had resections which did not involve the acetabulum and 64 had resection involving acetabular dome. Reconstruction was required in only 2 patients in whom resection did not involve acetabulum. For resections involving acetabulum various methods of reconstructions were used including pseudarthrosis, arthrodesis, extra corporeal radiotherapy – reimplantation and pelvic prostheses.

Results: Surgical margins were free in 83 patients and involved in 20. There were 3 peri-operative mortalities. Most common complications were wound related. Totally, complications were seen in 51 out of 103 patients (49%). Surgical intervention for complications was required in 26 patients (25%). Ten patients (9.7%) had a permanent complication related sequel, 9 had nerve palsy and 1 patient had a persistent sinus. 89 patients were available for follow up. The follow up in all patients ranged from 0 to 117 months (median 34 months). Nineteen patients (21.3%) developed a local recurrence. Fifty-eight patients are currently alive. Median follow up of survivors was 50.5 months (17-117 months). Overall survival at 5 years was 65.9% and disease free survival was 58%. Musculo Skeletal Tumor Society functional score was better in patients with acetabular dome sparing resection (90%) as compared with dome sacrificing resections (71.6%).

Conclusion: Though complex and challenging, surgery provides good local control and oncologic outcomes with acceptable function in these patients.

E-mail (main author): docpuri@gmail.com



P16:102

Laparoscopic assisted resection of an ileosacral chondrosarcoma

G. Ulrich Exner¹, Marc Possover², Plamen Kostov², Kurt Uehlinger¹

¹) orthopaedie zentrum zuerich ²) Possover Center Hirslanden, Switzerland

Rationale:

According to contributions of Yonamine we have begun to resect sacral tumors with video-laparoscopic exposure of the anterior structures.

Patient:

A 33year old woman 6 weeks after her second normal vaginal delivery complained of lumbosacral dysesthesia. Imaging showed a mass of the sacrum crossing the ileosacral joint suggestive of a chondrosarcoma, after biopsy graded G1, calculated volume 700 cc.

Technique:

The procedure was performed in an unstable lateral decubitus starting with the anterior laparoscopic exposure of the os sacrum and the right pelvic sidewall by passing through right pararectal space and full mobilization of the rectum from the promontorium downwards to the pelvic floor. After transection of the sacral hypogastric fascia, the medial and caudal limits of the tumor and as well as the sacral nerve roots were identified. The sacral nerve roots L5 - S2 attached on the tumor, while S3 and S4 were free. Full exposure of the pelvic ureter followed by the coagulation and transection of the internal iliac and the lateral sacral vessels. All cardinal vessels below the tumor were also transected including the pudendal and inferior gluteal vessels. The dissection of the lumbosacral space enabled the exposure of the lateral limits of the tumor and identification of both the obturator nerve and the sciatic just before it entry through the great sciatic foramen. 2 Gigli saws were inserted from anterior to posteriorly, one through foramina L5 and S1, the other through S1 and S4 for transection of the sacrum under visual endoscopic control. The resection of the ileum was performed in analogy to a Judet approach externally.

For reconstruction the defect was replaced with a massive allograft and stabilisation performed by lumbo-ischial screw and rod fixation.

The total blood loss was judged to be about 1000 cc; the total replacement were 2 units of blood.

Results:

Pathologic examination showed uncontaminated margins.

Conclusion:

We have got the impression, that the anterior video-laparoscopic approach presents several advantages by giving a superior view, higher precision and decreased blood loss for tumors in this anatomical difficult location of tumors.

E-mail (main author): guexner@gmail.com



P16:103

Malignant bone tumors of the pelvis - biological reconstruction after surgical therapy

Frank Traub¹, Dimosthenis Andreou¹, Maya Niethard¹, Carmen Tiedke¹, Mathias Werner¹, Per-Ulf Tunn¹

¹) HELIOS-Klinikum Berlin Buch, Germany

Surgical treatment of malignant pelvic bone tumors can be very challenging. The objective of this retrospective study was to evaluate the oncological as well as the clinical and functional outcome after limb salvage surgery and biological reconstruction.

Methods: The files of 27 patients with malignant pelvic bone tumors, who underwent surgical resection at our department between 2000 and 2011, were retrospectively analyzed (9 Ewing's sarcoma, 7 Chondrosarcoma, 4 Osteosarcoma, 1 Synovial sarcoma, 1 Malignant fibrous histiocytoma and 4 carcinoma metastases).

Results: After internal hemipelvectomy reconstruction was performed by hip transposition (n=16), using autologous non-vascularised fibular graft (n=5) or autologous iliac crest bone graft (n=2). In four patients a femoral respectively a total hip prosthesis was implanted at the time of resection. The median follow-up was 33 months. 2 and 5 year disease-specific survival rates of all patients were 86.1% and 57.7% respectively. The mean functional MSTS score was 16.5 (~55%) for all patients.

Conclusion: On the basis of the oncological as well as the clinical and functional outcome, biological reconstruction after internal hemipelvectomy seems to be a reliable technique for treating patients with malignant pelvic bone tumors.

E-mail (main author): frank.traub@helios-kliniken.de



P16:104

A Novel Approach in Endoprosthetic Pelvic Reconstruction

Harzem Ozger¹, Bugra Alpan²

¹⁾ Istanbul Univ. Istanbul Faculty of Med. ²⁾ Aile Hospital Bahcelievler, Istanbul, Turkey

Introduction:

Mobile and durable reconstruction of the coxofemoral joint while avoiding limb-length discrepancy is a major challenge after periacetabular tumor resections. Massive allograft and megaendoprosthetic reconstruction procedures are being performed with usually unsatisfactory long-term results. We propose a new endoprosthetic reconstruction technique for internal hemipelvectomy, in which the ground reaction force is transferred to the spine through the shortest route possible.

Methods:

We present our experience with 5 patients (M/F : 2/3) who underwent internal hemipelvectomy between 2005-2012. The mean age of patients was 29.4 (16-40) years. The mean follow-up period was 22 (3-52) months. The pathology was GII or GI-II chondrosarcoma in 3 patients, classical osteosarcoma in 1 patient and low-grade fibroblastic osteosarcoma in 1 patient. The pelvic resection was type I+II in two patients, I+III in two patients and II+IV in one patient.

The reconstruction was planned practically as a total endoprosthetic hip replacement. The acetabular components were implanted cementless with screw fixation at the proximal osteotomy site: sacroiliac joint in three patients, wing of sacrum in one patient and body of S1 vertebra in 1 patient. The leg length discrepancy was compensated with proximal femur replacement prostheses implanted cementless into the upper ends of femora through femoral neck osteotomy. Size 22 femoral head components were used. Capsular reconstruction was done with prolene mesh.

Results:

Three patients were complicated by hematoma and prolonged drainage and one of them developed wound necrosis in the early postoperative period. These complications were managed successfully with debridement, vacuum-assisted closure and antibiotherapy. No prosthetic dislocation or loosening occurred. None of the patients required revision. One patient has radiographic finding of polyethylene wear. Mean MSTS score was 70%(50-80). One patient died of disease. Two patients underwent metastasectomy for pulmonary nodules. Two patients currently have no evidence of disease.

Conclusion:

Although only short-term results are available, this technique has yielded outcomes comparable to those of other reconstruction methods. We believe this reconstruction to be biomechanically superior. However long-term results will be necessary to justify this assumption.

E-mail (main author): harzemo@yahoo.com



P16:105

Possibility of using existing prognostic spinal scoring systems at patients with multiple myeloma and plasmacytoma

Anatoly Sokolovsky¹, Elmar Musaev¹, Aslan Valiev¹, Mamed Aliev¹

¹) N.N.Blokhin RONC, Russian Federation

Introduction:

The aim was analysis of possibility of modern oncological prognostic scoring systems application at patients with multiple myeloma and plasmacytoma spinal column lesion.

Materials: Based on the comparative statistical analysis of the actual and expected survival rate at patients with multiple myeloma and plasmacytoma spinal lesions there was conducted the estimation of oncological Tokuhashi and Bauer prognostic scoring systems use possibility. In the Tokuhashi prognostic scoring system multiple myeloma and plasmacytoma was included in our study in the column oethers. Feature of the lymphoproliferative disorders is diffuse plasmacytic infiltration. Owing to what at a degree of metastatic assessment it was designated as absence. In analysis were included 48 patients with the diagnosis of multiple myeloma and plasmacytoma which were underwent with vertebroplasty and surgical treatment between January 2001 and December 2011.

Results:

All patients having at the time of surgical treatment total score on a scale of Tokuhashi in the range of 12-15 that corresponds to life expectancy more than a year, endured this term. In group of patients who had a score before operation in the range of 9-11 and life expectancy more than 6 months $88 \pm 5,64\%$ of patients endured this term. In group of patients with estimated life expectancy less than 6 months $50 \pm 3,54\%$ patients achieve this term. Reliability of a scoring system made $79,3 \pm 4,69\%$. In the real research all patients had an assessment on prognostic scoring system of Baur equal 3-4 middle term local control. Among 48 patients, 2 with the diagnosis of plasmacytoma was executed surgical treatment in volume of vertebrectomy and 11 (22,9%) palliative operations. In 73% of patients was carried mini-invasive surgery. This prognostic scoring system corresponds for 4,2% for the necessary volume of surgical treatment.

Conclusion:

The received statistical results, allows to use Tokuhashi scoring system for prognosis of estimated term of life and volume of surgical treatment. Owing to absence in a scale of Bauer the column defining possibility to carrying out mini-invasive surgery and low it correspondence, the using it in a group of patients with spinal lesion by multiple myeloma and plasmacytoma isn't possible

E-mail (main author): nisichenko@gmail.com



P16:106

En bloc vertebrectomy for the treatment of a spinal metastasis

Augusto Cunha Martins¹, Pedro Sá Cardoso¹, Inês Balacó¹, Cristina Alves¹, Gabriel Matos¹, Tah Pu Ling¹

¹) CHUC - Hospital Pediátrico de Coimbra, Portugal

Spinal tumours account for 5% of all bone tumours. The spine is one of the most frequent sites of metastases.

Conventionally, curettage or piecemeal excision of vertebral tumors has been commonly practiced. However, clear disadvantages of these approaches include a high risk of tumor cell contamination of the surrounding structures and residual tumor tissue at the site due to the difficulty of distinguishing tumor from healthy tissue.

These factors contribute to incomplete resection of the tumor as well as high local recurrence rates of spinal malignant tumors.

According to Tomita et al, in the spine, one vertebra could be regarded as a single oncologic compartment.

The rationale of en bloc vertebrectomy is to allow a resection of the tumor in one piece together with a layer of healthy tissue (marginal or wide resection) and thus to reduce local recurrence rate and to improve long-term survival of the patients.

We present a case of a 16 year old female diagnosed with a spinal metastasis (T11), 2 years after having a resection and knee prosthesis for treatment of Ewing sarcoma of the left distal femur.

We performed a en bloc vertebrectomy of T11 using a single posterior approach, instrumentation from T9 to L1 with pedicle screws and reconstruction of the anterior column with an expandable cage.

Three months after surgery, the patient is doing chemotherapy. She has no pain or neurological deficit.

We present this case due to the rarity of a spinal metastasis from a Ewing sarcoma in the paediatric age, and because the procedure that was performed is a very demanding technique.

Until recently, the aims of surgical treatment were to reduce the neurological symptoms and improve the patient's quality of life. Total en bloc spondylectomy will not affect general metastases or extend survival, but if patients are carefully selected and if the operation is part of a total programme of management, this procedure may achieve local control of metastases and extend the patient's survival.

E-mail (main author): ajbcam@gmail.com



P17:101

Image based computer assisted surgery in curettage of bone tumors.

Jasper Gerbers¹, Paul Jutte²

¹) University Medical Center Groningen ²) Orthopedic Surgeon, UMCG, Groningen, Netherlands

Introduction:

Intra-lesional treatment is a widely used surgical approach to benign and low grade malignant lesions like giant cell tumor, aneurysmal bone cyst, fibrous dysplasia and grade one chondrosarcoma.

Recurrence control is excellent with adjuvant therapy: either phenol/ethanol or cryotherapy. Intra-operative image assistance is usually proved with fluoroscopes.

Method:

We have used images-based computer assisted surgery (CAS) as an alternative to fluoroscopes in 64 surgeries. Advantages of CAS are real time three dimensional feedback, higher resolution and better quality image datasets and no ionizing radiation. An instrument tracker is attached to the curette and registered during the CAS setup procedure. CT and/or MRI data is uploaded to the CAS system and fused if necessary, combining the characteristics of CT and MRI.

Fluoroscopy is still used for smaller lesions located in the diaphysis. CAS is also used for curettage after RFA, these have not been included. 26 cases have been analyzed where CAS was used in grade 1 chondrosarcoma without additional RFA therapy or with fibrous dysplasia. These cases had either large lesions (> 5 cm in diameter) or lesions located in a difficult anatomical location like the femoral head and pelvis. These lesions are often treated with segmental resections. All lesions were treated with phenol/ethanol, most reconstructions were done with PMMA.

Results:

Average follow-up for the chondrosarcoma group of 21 lesions is 22,6 months (range 1-55), with 17 patients above one year of follow-up. In one cases there was a non complete curettage. MRI follow-up showed residue along the border of the resection. Pathological examination after re-do showed vital chondrosarcoma. For the fibrous dysplasia group follow-up is 28 months (range 6-58). There were no recurrences in this group.

Average lesion diameter was 7,6 centimeters (range 2,9-16,1). Locations were humerus (2), femur (20), tibia (2) and pelvis (2). There were five lesions in the femoral head/neck and two in the humeral head. There were two pathological fractures and one fracture after adequate trauma.

Conclusion:

CAS can be an adequate replacement for fluoroscopes, especially in large or anatomically difficult locations. MRI before/after assessment and patient scoring is currently under analysis.

E-mail (main author): j.g.gerbers@umcg.nl



P17:102

The first experience of intraoperational navigating system application at the resections of pelvic bones

Sergei Shihpakhin¹, Elmar Musaev¹, Aslan Valiev¹, Yana Zamagilnaya¹, Kirill Borzov¹, Mamed Aliev¹

¹) N.N.Blokhin RONC, Russian Federation

N.N. Blokhin Russian Cancer Research Center, Moscow, Russian Federation

Now operations in the field of bones and pelvic joints are still insufficiently widely made. Difficult anatomo-topographical links of the pelvic bones and surrounding fabrics complicate the performance of radical operative intervention.. The first experience of the application of intraoperational navigating system in surgical treatment of patients with tumors of bones of a pelvic is presented in the country. The purpose: the introduction of highly technological methods of treatment at tumors of the pelvic bones.

Materials and methods: we represent the experience of the treatment of 20 patients with the use of intraoperational navigating system BrainLab from December, 2010 till December, 2012 in the clinic of general oncology 'The Russian oncological center of science of N.N.Blohin' of the Russian Academy of Medical Science. Age of patients is from 21 till 68 years (average – 37,2 years). There are 11 women and 9 men in the given group. The following resections are executed: 3 resections of the sacroiliac joint with combined bone grafting, 5 resections of iliac bone, 4 resections of pubic bone, 3 internal hemipelvicectomy, 5 resections of a sacrum. Histologically presented: 7 patients with giant cell tumor, 9 patients with chondrosarcoma of the II degree of malignancy, 1 patient with osteosarcoma and 3 patients with chordoma.

Radical operations according to the preoperative planning which were confirmed histologically were executed to all the patients. The accuracy of the resection performance varied from 1,2 to 1,8 mm. All the patients are alive without any disease signs through the given period of time. The duration of the operations was from 2,5 to 6,5 o'clock. The blood loss was from 700 ml to 3,5 liters (average - 2,5 liters).

Conclusions. The application of intraoperational navigating system raises radicalism of the treatment, considerably expands indications to the performance of safe operations on functionally significant zones, improving the results of the treatment and the quality of life

E-mail (main author): nisichenko@gmail.com



P18:101

New hyperthermic treatment with magnetic materials for metastatic bone tumors

Akihiko Matsumine¹, Akihiko Matsumine², Takao Matsubara², Kunihiro Asanuma², Tomoki Nakamura², Kenji Takegami², Akihiro Sudo²

¹) Mie University Graduate School of Medicine ²) Mie University Graduate School of Medicine, Japan

Background

Patients with bone metastasis in the extremities sometimes require surgical intervention to prevent deterioration of quality of life due to a pathological fracture. We have developed a new hyperthermic treatment modality using magnetic materials. The purpose of this study is to show the results of new hyperthermia for metastatic bone tumors.

Methods

This new hyperthermic treatment modality was applied for 25 patients with 27 metastatic bone lesions. The age of the patients ranged from 27 to 80 years of age (median, 63 years), and the follow-up period ranged from 3 to 63 months (median, 11 months). The primary lesions included 5 lung cancers, 4 renal cell carcinomas, 3 hepatocellular carcinomas, sarcomas and breast cancer and others. Regarding the operation sites, 11 were the femur, 10 the humerus, 5 the tibia and 1 the fibula. In 10 lesions, after curettage of the metastatic lesion, calcium phosphate cement containing powdery Fe₃O₄ was implanted into the cavity. For the 17 lesions, metal intramedullary nails were inserted into the affected bone. Hyperthermic treatment was performed postoperatively on days 8, 10, 12, 15, 17, 19, 22, 24, 26 and 29, using the newly developed electromagnetic field generator. The exposure time was 15 minutes per day. The radiographic outcome was evaluated at 3 months after surgery. The radiographic outcome was assessed according to following criteria. "Excellent" means a reduction of the lesion with visible bone formation. "Good" means no progression of the lesion for more than three months. "Poor" means a progression of the lesion. To evaluate the effectiveness of hyperthermia on radiographic findings, a univariate analysis was performed using the Mann-Whitney U test for non-parametric data.

Results

On radiographs, 10 lesions (37%) showed an excellent outcome, while 16 lesions (59%) showed a good outcome and one lesion (4%) showed a poor outcome. No serious adverse effects were observed during the follow-up period.

Conclusions

Our novel clinical hyperthermia modality using magnetic materials was thus found to achieve a good local control of metastatic bone lesions. Further investigations are needed before this technique can be employed as a standard therapy for metastatic bone tumors.

E-mail (main author): matsumin@clin.medic.mie-u.ac.jp



P18:102

The use of modular Tumourprotheses in the Treatment of skeletal Metastases

Marcel-Philipp Henrichs¹, Arne Streitbürger², Georg Gosheger³, Sebastian Bockholt³, Wiebke Guder³, Markus Nottrott³, Jendrik Harges³

¹) University Hospital Münster ²) General Orthopaedics/ Tumourorthopaedics ³) General Orthopaedics / Tumourorthopaedics, Germany

Background:

Due to advancements in the treatment of carcinomas more patients reach the stage of bone metastases and survive several months or years in that stage. Thus the surgical treatment of bone metastases gets more important. One of the main aims of the surgical treatment is a long lasting reconstruction which survives the patient. Aim of this retrospective study was to evaluate the oncological outcome, treatment related complications and function after resection of metastases and reconstruction with modular tumourprotheses.

Methods:

All patients were traced by our tumour database. Patient files were reviewed for clinical information. Additional information has been obtained using a questionnaire including the MSTs-Score. Between 1993 and 2008 we performed resection of metastases and implantation of a tumourprotheses in 82 cases (80 patients, 30 female, 50 male).

Results:

The average age of the patients was 63 years. Most common primary tumours were renal cell carcinoma (46.7%), breast-cancer (21.3%) and lung cancer (7.5%). The proximal femur was affected in 45.1%, followed by the proximal humerus (25.6%) and the distal femur (17.1%). In 22 cases the tumourprothesis was implanted as a revision due to local tumor recurrence or failure of the former osteosynthesis.

The mean survival after the operation was 2.9 years. The survival rate was 70% at one year, 20% at five years. The implant survival was 83% after one year and 74% at five years. The overall rate of operative revisions was 18%. Function and patients' contentment after operation is good (MSTS-score: upper extremity 67%, lower extremity 63%).

Conclusion:

We show that the implantation of modular tumourprotheses can be an appropriate treatment for bone metastases. This operation has a low complication rate, patients rapidly gain a good function.

Consistent with recent literature resection of the affected bone leads to an improvement of survival, especially in single metastases. Compared to other osteosynthetic devices the event free survival of the tumourprothesis is high. Thus, even regarding the implant related costs, implantation of modular tumourprotheses might be the better option.

E-mail (main author): marcelphilipp.henrichs@ukmuenster.de



P18:103

Scapular metastasis of a rectal gastrointestinal stromal tumor: a case report

Veli Muzaffer Murat Hiz¹, GÖKHAN KAYNAK², HÜSEYİN BOTANLIOĞLU², ENİS YILDIRIM³, ATAKAN KARABİBER², SERGÜLEN DERVISOĞLU²

¹⁾ Istanbul University Cerrahpasa Medical ²⁾ ISTANBUL UNIVERSITY CERRAHPASA MEDICAL F ³⁾ SIRNAK GOVERNMENT HOSPITAL, Turkey

Background: Gastrointestinal stromal tumors are the most common mesenchymal cell originated neoplasms of the gastrointestinal tract with an annual incidence of 15-20 per million. Synchronous bone metastasis may be found with liver and peritoneal metastasis. However, based on our current knowledge isolated bone metastasis under Imatinib treatment has not been reported previously in the literature up to date.

Methods: A 53 year old male presented with a 2 month history of right shoulder pain that was not associated with a trauma. His physical examination revealed a palpable, painless solid mass that was not mobile at his right scapula and restriction of shoulder movements. He had a history of rectal GIST which had been subtotally resected nine years ago and postoperatively treated with radiotherapy and chemotherapy (Imatinib). Case was thought to be a distant bone metastasis and direct X-ray, Magnetic Resonance Imaging, Whole Body Dynamic Bone Scan and Positron Emission Tomography studies were done. WBDBS and PET/CT failed to show any evidence of skeletal or visceral metastases. After all these studies scapular metastasis of the GIST diagnosis was thought. Then this mass was excised totally (total scapulectomy) in the operating room by preserving axillary nerve. Pathologic findings of the material with the knowledge of the prior colonic malignant Gastrointestinal stromal tumor supported the diagnosis of Gastrointestinal stromal tumor metastasis. Treatment protocol of the patient changed to sunitinib therapy as the condition was accepted to be Imatinib resistant metastatic GIST. On the last control of patient there was no major side effect and an evidence of recurrence or metastasis.

Results and Conclusion: Up to date isolated bone metastasis of GIST under Imatinib treatment and after local control have not been reported in the literature. Regardless of the follow-up period, skeletal pain should be considered important and bone metastasis should be kept in mind for a GIST patient. Histopathologically, GIST bone metastases may be mixed with primary spindle cell bone sarcomas and differential diagnosis must be made by the demonstration of c-kit mutation with immunohistochemical methods. As in this case, metastasis may be at a rare location and mimic primary bone tumors.

E-mail (main author): vmmhiz@yahoo.com



P18:104

A Review of the surgical Management of Appendicular Skeletal Metastases and outcomes from a teaching hospital from the Mersey region.

Coonoor Chandrasekar¹, Qi Yin¹, Jason Chan¹

¹) RLBUHT, United Kingdom

Introduction and Aims

The incidence of metastatic bone disease (MBD) is increasing. The aim of our study was to review the patients with Appendicular Skeletal Metastases who needed orthopaedic surgical management and their outcomes following the surgery.

Methods

Between October 2009 and November 2012, we have identified retrospectively from our Trauma Database, 39 patients, who have undergone a total of 45 procedures on the appendicular skeleton. Variables investigated include: primary tumour; location of metastases; presence of pathological fracture; surgical treatment and outcome (survival).

Results

There were 17 females and 22 males with an average age of 71.4 years at presentation. 38% (17/45 operations) of surgery was for a pathological fracture. The most common primary tumour was breast (12/45 operations) followed by lung and renal (both 7/45 operations). The femur was the most common site of metastasis (26/45 operations). Intramedullary nailing was the most commonly performed procedure (33/45 operations). 26 patients died with a median survival of 82 days (range 3 – 567 days). A subgroup analysis of patients with breast or prostate metastases showed that their median survival was only 81.5 days (range 5 – 441 days). A second subgroup analysis showed that a higher proportion of patients with pathological fractures died (81% vs 58% for prophylactic treatment) but the median survival was similar in both groups (81 days for pathological fractures, 82 days for prophylactic treatment).

Conclusions

Our results suggest that absence of a pathological fracture or the primary tumours known to have good prognosis [breast, prostate] had no influence on the survival and the overall survival is poorer than expected.

E-mail (main author): crc12@hotmail.com



P19:101

PERCUTANEOUS TREATMENT OF UNICAMERAL BONE CYSTS WITH DEMINERALIZED BONE MATRIX, SINGLE NEEDLE TECHNIQUE

Ahmad Shehadeh¹, Robert Henshaw²

¹) KHCC, Jordan ²) Gerogetown University, United States

Background:

Optimal treatment for unicameral bone cysts remains unclear. Several treatments options evolved since the seventies of last century including; open curettage and grafting, steroid injection, bone marrow injection and finally demineralized bone matrix grafting.

This study evaluates the outcome of patients treated with percutaneous aspiration and injection with steroids and demineralized bone matrix.

Materials and Methods:

Twenty four consecutive patients treated for UBCs since 1998 were eligible for inclusion; Median age was 10 year (range 4-41). Diagnosis was made radiographically, Seventeen patients received percutaneous treatment: Following aspiration with an 8 gauge bone needle, high pressure injection with contrast was performed, completely filling the cyst. After re-aspiration, depomedrol and demineralized bone matrix (DBX, Synthes, USA) were injected. While 7 patients underwent open curettage ,biopsy and grafting with DBX. Length of time to outcomes of complete/ incomplete healing or recurrence, were determined by radiographic analysis.

Results:

Five patients who treated percutaneously recurred, and 2 who treated by open technique recurred; All 7 patients were treated percutaneously, two recurred and were treated with curettage and DBX grafting. Two patients (ages 4 and 6), recurred twice and healed after the 3rd treatment. Cyst location included 13 proximal humerus, 6 proximal femur, 4 calcaneus and one proximal fibula. 17 patients show new bone filling the cyst after a single treatment (median time of 2.5 months); 7 patients needed one or 2 more procedures to heal completely.

Conclusion:

Demineralized bone matrix significantly improved healing following percutaneous treatment of UBC. Reossification was seen in most patients, unlike patients treated with steroid injection alone. This technique was simple and well tolerated and suggests that double needle and open techniques are unnecessary.

E-mail (main author): ahmadmd2003@yahoo.com



P19:102

Progress in the Treatment of osteosarcoma.A Population-Based Study of 3089 Patients Diagnosed over 33 Years

Ahmad Shehadeh¹, Iyad Sultan¹

¹⁾ KHCC, Jordan

Background:

The 1970s and 1980s saw great progress in the treatment of osteosarcoma, but subsequent trials have failed to improve the survival of patients with this disease.

Methods:

We searched the Surveillance, Epidemiology and End Results (SEER) database for cases of osteosarcoma diagnosed between 1973 and 2005. Three eras were defined: era 1 (1973-1985), era 2 (1986-1995), and era 3 (1996-2005).

Results:

We identified 3089 patients (median age, 19 years; 56% males) with osteosarcoma. Primary tumor sites were mainly the lower limbs (66%), upper limbs (11%), head and neck (8.8%), and pelvis (7.6%). Older patients had a higher proportion of axial tumors and a lower survival estimate. Survival improved significantly after 1986 ($P < 0.0001$) but not after 1996 ($P = 0.29$). A Cox proportional hazards regression model identified age, primary site, and stage as significant predictors of survival throughout the study period. Age > 45 years at diagnosis, tumor sites other than head and neck and lower limbs, and metastatic tumors were significant adverse prognostic factors.

Conclusion:

Despite early advances, more than a third of patients with osteosarcoma have continued to die for the past 2 decades. The worst outcomes occur in older patients, patients with primary tumors in unfavorable sites, and those with metastatic disease. There is an urgent need for more collaborative and basic research.

E-mail (main author): ahmadmd2003@yahoo.com



P19:103

THE OUTCOME OF LIMB SALVAGE SURGERY IN A DEVELOPING COUNTRY, KHCC EXPERIENCE

Ahmad Shehadeh¹, Iyad Sultan¹, Sameer Yaser¹, Abedlatif Al mosa¹, Hani Al Ali¹

¹) KHCC, Jordan

Background: Limb salvage surgery (LSS) became the standard surgical treatment for bone sarcomas since the late 1970s; however, LSS has high cost and numerous complications that make it less applicable in developing countries.

Objectives:

To Show that LSS in developing countries, can be compared to developed countries, when; team work, expert surgeon and enough resources are available.

Methods:

Since July 2006, a multidisciplinary team of sarcoma was established. This team consisted of pediatric and medical oncologists, radiation oncologists, radiologist, nurse coordinator and a full-time orthopedic oncology surgeon. The team was supported by a service for physical therapy. Clinical practice guidelines were established and a special protocol for rehabilitation following surgery was applied.

Results: Seventy patients with malignant or benign aggressive bone tumors presented at the study period, 5 patients received primary amputation, 65 patients received LSS (93% of all patients) included in our analysis, with mean follow up of 25 months (range, 6-53 months). Tumors were located in the extremities (n=59), in the scapula (n=3) and the pelvis (n=3). Histological diagnosis was: Osteosarcoma (n=29), Ewing's sarcoma (n=16), Chondrosarcoma (n=7), Giant Cell Tumor (n=5), Bone metastasis (n=5) and others (n=3). Endoprosthetic reconstruction used in 52 patients (47 modular, 3 expandable, 2 custom prosthesis), biological reconstruction in 7 patients, and no skeletal reconstruction in 6 patients. Local tumor control was achieved in 57 patients (88%). Among the complications encountered were: periprosthetic infection (n=5, 8%), traumatic dislocation (n=1, 1.6%), superficial skin necrosis (n=2, 3%), and radiation-induced stem loosening (n=1, 1.6%). Eight patients (12%) developed local recurrence. Limb survival was 95.4% at study end; three limbs had secondary amputation (one for local recurrence and 2 for persistent periprosthetic infection). All other types of complications were managed successfully. The average MSTS functional score for the 62 survived limbs was 87%.

Conclusions:

Our early results are encouraging. Patients with sarcoma are managed better within a multidisciplinary team that is familiar with highly specialized procedures including LSS. The early outcomes of our cases are comparable to that in developed countries in term of local control and prosthesis related complications.

E-mail (main author): ahmadmd2003@yahoo.com



P19:104

FEMORAL HEAD DECOMPRESSION AND BONE GRAFT INJECTION USING NEW KIT

Ahmad Shehadeh¹

¹⁾ KHCC, Jordan

Background:

Avascular necrosis (AVN) of the femoral head is a pathologic process resulting from interruption of blood supply to bone. It can result from chemotherapeutic agents used for treatment of different cancer especially leukemia.

Material and Methods:

16 patients and 21 Femoral head AVN, (Ficat stage I to early III) were treated using the Core decompression kit followed by injection with bone graft material Cortoss or Hydroset, 8 hips were stage III, 9 stage II and 4 stage I. All cases were done as day case surgeries with average operative time of 25 mins.

Results:

16 hips had almost complete pain relief that persist at mean follow up of 3 years, 5 hips the pain persisted, all patients who had clinical response show radiological stabilization of the disease stage.

Conclusion;

Femur head decompression using the Core decompression kit followed by bone substitute injection resulted in long term pain relief and prevention of AVN progression in 3/4 of patients. Core decompression when appropriately done, is safe, simple and effective way for pain relief and prevention of femur head AVN progression.

E-mail (main author): ahmadmd2003@yahoo.com



P19:105

Shaped Graft for Aneurysmal Bone Cyst of Upper Limb Bones

Mohamed Mostafa¹, Yasser Abed¹

¹) Mansoura University Hospital, Egypt

The optimal treatment of aneurysmal bone cyst remains challenging. We here present the results of using bone grafts shaped to the defects caused by aneurysmal bone cysts of upper limb bones. Fifteen patients (12 males & 3 females) with an average age of 12 years (range 6-16 years) were treated for aneurysmal bone cysts of upper limb bones by intra-lesional resection, argon beam coagulation and shaped bone graft. The grafts were harvested from 14 patients (11 fibulas & 3 iliac bones) and from the mother of one patient (proximal fibula). Osteosynthesis was required to stabilize the graft in four cases. The modified Enneking's scoring system was used for functional evaluation. One patient developed partial recurrence at 6 months and required reoperation. Superficial wound infection was encountered in one patient. Shortening of the humeral segment was seen in two patients (1 & 1.5 cm) but without angular deformity. After a mean follow-up of 43 months (range 20-64 months), the mean functional score was 97.3 %.

This technique is reliable to obtain a well reconstructed and growing bone with no or minimal deformity and good function.

E-mail (main author): thabetortho20032003@yahoo.com



P19:106

Assection of neoadjuvant chemotherapy on volume surgical intervention in osteosarcoma of lower extremity

KHurshidjon Abdikarimov¹, Sundr Urunbaev¹, Mirza Ali Gafur-Akhunov¹, Djamilya Polatova¹

¹) National Oncology Research Centre, Uzbekistan

Background. To estimate efficiency of neoadjuvant chemotherapy and its influence on volume of surgical intervention in osteosarcoma of lower extremity.

Material and methods. Treatment results of 122 patients with osteogenic sarcoma of tubular bones of lower extremity were studied. 34 patients (I group) are carried out system introduction antitumor preparations cyclophosphan 800 mg/m², doxorubicin 60 mg/m², cyplatin 100 mg/m². 54 (II the group) - is carried out long intra arterial regional chemotherapy by scheme: doxorubicin 60 mg/m² 48 hours intra arterial (i/a) infusion, ciplatinin 100 mg/m² 6 hours (i/a) infusion and cyclophosphan 800 mg/m² (i/m). Long intra arterial regional chemotherapy under the similar scheme on the background of short-term hyperglycemia and local hyperthermia is carried out in 36 (III the group). Depending on efficiency from 1 to 4 courses of chemotherapy is carried out.

Results. 20 (58, 8 %) patients I group are made crippling operation (amputation or exarticulation), 14 (41, 2 %) - organ reserving operations (11-segmental resection with compression-destructed osteogenesis (CDO) by the device Ilizarev, 3-segmental resection of splint-bone). In II group, 30 patients (57, 7 %) are made crippling operations, 22 (42, 3 %) - reserved (10-segmental resection with CDO, 7-segmental resection of splint-bone, 5-segmental resection of bone with endoposthesis of the knee joint). In III group, 9 patients (25 %) are executed crippling operations, 27 (75 %) - preserving (20-sesection of bone with endoposthesis, 3-segmental resection with CDO, 4-segmental resection of splint-bone).

Conclusion. The application of long intra arterial chemotherapy on the background of local hyperthermia and short-term hyperglycemia increases the treatment efficiency of osteosarcoma of lower extremity bones and accordingly results in increase of quantity of organ reserving operations.

E-mail (main author): akhg13@mail.ru



P19:107

Selective arterial embolization of bone tumors

Dmitry Martynkov¹, Boris Dolgushin², Igor Trofimov², Andrey Kukushkin², Eugene Sushentsov²

¹) Russian Cancer Research Center RAMS ²) RCRC RAMS, Russian Federation

Background: To assess the efficacy of selective arterial embolization for primary and metastatic bone tumors.

Methods: 18 patients with primary and metastatic bone were treated at RCRC RAMS in 2000-2011 years. Men - 10 (55.6%), women - 8 (44.4%). The average age $47,28 \pm 14,42$ years, range 21-68 years. Primary lesion of bone - in 7 patients, metastatic - in 11 patients (mainly metastatic kidney cancer). Distribution by site of lesion: the spine - 12 cases, other departments - 6 cases. If it affects the spine, embolization was performed in corresponding segments (with the exception an Adamkiewicz artery). The goal of embolization: palliative care, sometimes in combined schemes - 10 cases, preoperative embolization of the arteries feeding the tumor to decrease intraoperative blood loss - 8 cases. Most often performed one embolization - in 16 patients, 2 patients - performed twice due to extensive network of collateral vessels. Used material: beads - in 10 cases (particle sizes ranged from 100 to 500), a spiral - in 8 cases.

Results: In 100% of cases, embolization was technically successful. In 6 (33.3%) cases a residual blood remained within 5-30%. Clinical response after palliative embolization obtained in 90% of cases in the form of pain relief, improvement of limb function. In 75% of cases of preoperative embolization it was possible to achieve significant decrease intraoperative bleeding during subsequent operation. Postembolization syndrome was present in most patients, paresthesias were observed in 27.8% of cases. Severe complications of embolization was not noted.

Conclusion: Selective embolization of the arteries - the impact of an effective option in the treatment of primary and metastatic bone tumors for palliation or as part of combination therapy, as well as preoperative treatment for reducing the risk of surgery and blood loss. Careful feeding artery embolization, especially if you have many collaterals, is necessary to achieve an adequate effect.

E-mail (main author): generaloncology@rambler.ru



P19:108

Indication to the osteosynthesis associated with curettage in benign and malignant bone tumors

Carlo Perisano¹, Giulio Maccauro¹

¹) Catholic University of Sacred Heart, Italy

INTRODUCTION: The bone cavity remaining after the curettage of the neoplastic lesion often requires the use of filling systems able to ensure mechanical stability to the system. The literature analysis shows that the routine filling of curetted bone lesions does not appear to be necessary from a mechanical point of view and no biomechanical testing has been done to assess fixation techniques in pathological fractures.

OBJECTIVES: Evaluate according to the size of the bone defect, the region of the injury, the need to use with acrylic cement and bone substitutes an additional systems such as osteosynthesis to guarantee a mechanical stability of the bone.

METHODS: We analyzed twenty bone lesions localized in femur or humerus treated with curettage associated to the osteosynthesis

RESULTS: The malignant lesions were treated with extended curettage with use of high speed cutters and liquid nitrogen filled with acrylic cement while the benign lesions were treated with curettage filled with synthetic bone or acrylic cement associated with osteosynthesis with plate and locked screws. The analysis showed no recurrence of the lesion, no infection, two cases of stiffness of the knee. Three patients treated with only curettage had a fracture and therefore they underwent to osteosynthesis with plate.

CONCLUSION: The curettage with bone grafting or bone replacement or cement is not always recommended in the treatment of bone tumors. The loss of bone mass after curettage requires to fill this lesion to give stability to the bone.

There are no data in the literature that demonstrate the extent of the size of a lesion that require the osteosynthesis. PMMA is recommended in benign aggressive and malignant lesions of low grade. In our opinion, the filling is essential in the large lesion to ensure a mechanical support. In our opinion an adequate exposure and an accurate curettage is essential but required an osteosynthesis in large lesions (> 5 cm), in lesions localized in distal femur, in lesion in loading areas, in obese patients, in case of use of adjuvants local, in case of a very large windows bone to do the curettage and if the patient needs of an high functional requirements

E-mail (main author): carloperisano@hotmail.it



P19:109

Tumor reconstructive surgery using recycled autobone Anticipating the complications

Jeong Won Ju¹, Il Hyung Park¹, Hwan Seong Cho², Michael Limquico Marfori³

¹) Kyungpook National University Hospital ²) Seoul National University Budang Hospita, Republic Of Korea ³) De La Salle University Medical Center, Philippines

Background: Joint-saving surgery is the current trend in musculoskeletal tumor surgery. A very important method is reconstruction using recycled autobone. It is readily accessible, facilitating easy reconstruction due to its size and shape specific to the host bone defect and is acceptable in many developing countries with very delicate social and religious beliefs

Purpose: The aim of this study is to evaluate the outcome of reconstructive surgery using either pasteurized or irradiated autograft bone and presenting the possible complications.

Patients and Methods: Sixteen patients of Kyungpook national university hospital over the period of 1995-2010 who had undergone tumor resection and bone reconstruction using pasteurization or irradiation method and a minimum of 2 years follow-up were retrospectively reviewed.

Results: Our graft survival rate is 83.3% and infection rate is 6.3%. There were no local tumor recurrence and graft nonunion in this series. Five patients developed limb length complications necessitating additional surgical procedures.

Conclusion: Our experience is similar to the other reports on reconstructive surgery using recycled autobone. Effective delivery of neoadjuvant chemotherapy, better intraoperative imaging, and the surgeon's surgical skills and mastery of the concepts in both musculoskeletal surgery and osteosynthesis are prerequisite for a successful surgery. Anticipating the potential complications is also very important to maximize the patient's benefits in such procedure.

E-mail (main author): wjjeong@knu.ac.kr



P19:110

Long-term results of endoprosthesis replacement of large joints in patients with bone tumors

Vladimir Sokolovskiy¹, Petr Sergeev², Dmitriy Nisichenko², Evgeniy Kovalevskiy², Anatoliy Sokolovskiy², Mamed Aliev²

¹) N.N.Blokhin Russian Cancer Research Cent ²) , Russian Federation

Background: We evaluated the long-term clinical results and the survival of the prostheses of patients who had a limb-sparing procedure by means of the implantation of a large-segment prosthesis. Function was evaluated with the revised 30-point classification system of the Musculoskeletal Tumor Society. The survival of the prostheses was analyzed with regard to several variables with use of Kaplan-Meier survival estimates.

Methods: During the period from 1979 to 2010 year in RCRC 1181 primary operations performed in the volume of replacement of large joints of various locations, among the interventions were resected bones forming the shoulder (n = 134), elbow (n = 10), hip (n = 167), knee (n = 786), and ankle joints (n = 8). Endoprosthesis with total hip replacement n = 50, humerus, n = 16, tibia n = 1. The defect is replaced by the individual and modular endoprosthesis. The defeat of the bones were due to primary tumors in 92% of patients, metastatic - 8%. The average age of patients was 28 ± 14 years (from 10 to 80 years), 53.5% were men, women - 46.5%. Osteosarcoma predominated (46%) in the remaining cases were diagnosed chondrosarcoma (10%), Ewing's sarcoma (5%), giant cell tumor (14%), other morphological forms consisted of 25%.

Results and Conclusion: The average follow-up was 10 years old. Overall survival is 61%. The recurrence rate was 12%. Among the complications of infection are marked (11%), instability of the prosthesis (13.7%). The prosthesis survival corresponded to 54%. Functional evaluation of MSTS score was 70% for operations on the shoulder joint endoprosthesis, 80% - for the hip. MSTS after arthroplasty of the femur consistent 58% - with its total replacement and 92% - of the distal resection, evaluation after resection of the proximal tibia - 75% and 72% at the distal.

Conclusion: Endoprosthetic reconstruction gave satisfying functional and oncological results and low rate of complications in most patients after long-term survival. Limb salvage surgery is the gold standard of modern onco-orthopedics

E-mail (main author): ps_sergeev@list.ru



P19:111

Minimal invasive surgery for unicameral bone cyst using demineralized bone matrix: a case series

Hwan Seong Cho¹, Hae Bong Park¹

¹) Seoul National University Bundang Hospit, Republic Of Korea

Background: Various treatments for unicameral bone cyst have been proposed. Recent concern focuses on the effectiveness of closed methods. This study evaluated the effectiveness of demineralized bone matrix as a graft material after intramedullary decompression for the treatment of unicameral bone cysts.

Methods: Between October 2008 and June 2010, twenty-five patients with a unicameral bone cyst were treated with intramedullary decompression followed by grafting of demineralized bone matrix. There were 21 males and 4 female patients with mean age of 11.1 years (range, 3–19 years). The proximal metaphysis of the humerus was affected in 12 patients, the proximal femur in five, the calcaneum in three, the distal femur in two, the tibia in two, and the radius in one. There were 17 active cysts and 8 latent cysts. Radiologic change was evaluated according to a modified Neer classification. Time to healing was defined as the period required achieving cortical thickening on the anteroposterior and lateral plain radiographs, as well as consolidation of the cyst. The patients were followed up for mean period of 23.9 months (range, 15–36 months).

Results: Nineteen of 25 cysts had completely consolidated after a single procedure. The mean time to healing was 6.6 months (range, 3–12 months). Four had incomplete healing radiographically but had no clinical symptom with enough cortical thickness to prevent fracture. None of these four cysts needed a second intervention until the last follow-up. Two of 25 patients required a second intervention because of cyst recurrence. All of the two had a radiographical healing of cyst after mean of 10 additional months of follow-up.

Conclusions: A minimal invasive technique including the injection of DBM could serve as an excellent treatment method for unicameral bone cysts.

E-mail (main author): mdchs111@snu.ac.kr



P20:101

Soft Tissue Sarcoma Abutting The Bone, What Surgery Is The Most Appropriate?

Ahmad Shehadeh¹

¹) KHCC, Jordan

Back ground:

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 abuts the bone.

Material and Methods:

From July 2006 till Dec. 2010, 55 patients with STS treated with Limb Salvage Surgery (LSS), at King Hussein Cancer Center. Seventeen patients (31%) the tumor were abutting the bone, 15 patients as first presentation and 2 as recurrent disease, age 15-65 year, Median age 49 years.

Tumor location includes: thigh (n=8), arm (n=2), forearm (n=2), leg (n=3), low back and chest wall one patient each. Synovial Sarcoma was the commonest histological diagnosis (n=6), 12/17 patients received bone surface burring after resection of the mass with the periosteum and 10 of them followed by post operative radiation therapy; 5/17 patients in whom signs of cortical invasion and early destruction seen in MRI, we resect the adjacent cortex en-bloc with the tumor, none of them received adjuvant radiation.

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 2 patients developed local recurrence (12%), one with leg disease received en-bloc resection of the cortex and other with per sacral tumor received bone surface burring). One patient developed radiation related femur fracture. 3 years event free survival was 53% and overall survival 76%.

Conclusion:

This is a retrospective pilot study with small group; the results show that STS abutting bone probably do not lead to worse outcome, bone surface burring or uni-cortical resection is sufficient, and maybe there is no need to do bi-cortical bone resection. Multicenter cooperation is needed to recruit more patients to have statistically significant number.

E-mail (main author): ahmadmd2003@yahoo.com



P20:102

Clinical outcome following marginal resection of atypical lipomatous tumor/well-differentiated liposarcoma of the extremities and trunk wall

Munehisa Kito¹, Yasuo Yoshimura¹, Ken'ichi Isobe¹, Kaoru Aoki¹, Takshige Momose¹

¹) Shinshu University School of Medicine, Japan

Background: The consensus of the best surgical procedure for atypical lipomatous tumor/well-differentiated liposarcoma (ALT/WDLS) still remained unclear. The wide resection may cause a serious functional disorder, otherwise the marginal resection may increase the risk of local recurrence. This study describes our experience with this tumor of the extremities and trunk wall when treated by marginal resection. **Methods:** We retrospectively reviewed 40 ALT/WDLS patients treated by a marginal resection between 1997 and 2011. There were 20 men and 20 women, with an average age of 60.1 years. The average size of the tumor was 15.4cm. The most common site was the lower extremities (24 patients), followed by the trunk (10 patients), and upper extremities (6 patients). Intermuscular tumors were founded in 21 patients, intramuscular tumors in 16 patients, and subcutaneous tumors in 3 patients. The mean follow-up duration was 4.7 years. **Results:** Three patients (7.5%) had a local recurrence at an average of 6.8 years after initial resection. One of these tumors was founded in the lower limb and two in the trunk. Two patients had local recurrences more than two times. The first CT scan or MRI at 4 months after initial surgery revealed residual tumor in other three patients (7.5%) after initial surgery. All of these tumors were intermuscular. Serious functional loss did not occur in all patient of this series. There was no case of metastasis or dedifferentiation. **Conclusion:** Our findings suggested that a marginal resection for ALT/WDLS of extremities and trunk wall seem to be adequate treatment as they have a slight tendency to recur but do not metastasize; however, long-term follow-up is recommended for early diagnosis and treatment of any local recurrence. In case of intermucular tumor, a careful excision may reduce the risk of leaving tumor.

E-mail (main author): mune0527@yahoo.co.jp



P20:103

The use of neo-adjuvant radiotherapy in the management of peri-articular soft tissue sarcoma

Carl Green¹, Nam Nguyen¹, James Wylie², Ananya Choudhury², Jonathan Gregory¹

¹) Manchester Royal Infirmary ²) Christie's Hospital, United Kingdom

Background: Optimising post-operative joint function is challenging when treating peri-articular soft tissue sarcoma. Radiotherapy minimises local recurrence rates in management of soft tissue sarcoma. Differences in risks and benefits depend on adjuvant or neo-adjuvant use. The lower doses and smaller treatment volumes achieved with pre-operative radiotherapy have potential benefits for the management of peri-articular sarcomas. This study therefore aims to assess short-term outcome measures and complications after treatment with neo-adjuvant radiotherapy and surgery for patients with soft tissue sarcoma

Patients and Methods: 17 patients with soft tissue sarcoma were identified as being treated with pre-operative radiotherapy. 3D conformal radiotherapy was delivered at a single centre with a dose of 50Gy in 25 fractions over 5 weeks. Patients were assessed weekly for adverse effects. Resection was planned 4-6 weeks after radiotherapy.

Results: Medial follow-up was 13 months (range 5-44 months). No patients had significant adverse effects during radiotherapy. One patient had surgery delayed due to local reaction. Histology demonstrated 50-100% tumour necrosis in all tumours except one patient with pleomorphic liposarcoma, showing no detectable necrosis. Major complications occurred in one patient (persistent foot drop) and six patients had minor complications (three superficial infections, two seromas, one transient neuropraxia). One patient required further surgery due to incomplete margins. TESS scores for upper and lower limb patients were 86.1 and 78.1 respectively. No local recurrences to date have been recorded. One patient developed metastatic lymphadenopathy and another has developed lung metastases.

Conclusions: This work has demonstrated that major complications are minimal and early function and local control rates are excellent. Long term follow-up is required to demonstrate final functional outcome and local control rates.

E-mail (main author): c_m_green@hotmail.co.uk



P20:104

Early results of the treatment of lower limb myxoid liposarcoma using neo-adjuvant or adjuvant radiotherapy at a single centre

Carl Green¹, Nam Nguyen¹, James Wylie², Anthony Freemont¹, Jeremy Jenkins¹, Ananya Choudhury², Jonathan Gregory¹

¹) Manchester Royal Infirmary ²) Christie's Hospital, United Kingdom

Background: Liposarcoma accounts for approximately 17% of all soft tissue sarcomas, with 45-55% being diagnosed as the myxoid variant. Neo-adjuvant radiotherapy has potential benefits to adjuvant radiotherapy in soft tissue sarcoma management due to lower dosage and reduced treatment volume, but has a theoretical increased risk of wound healing complications. We have adopted neo-adjuvant radiotherapy as a standard treatment in the management of myxoid liposarcoma, with the initial results being compared to patients treated with conventional post-operative radiotherapy.

Patients and Methods: 14 patients who received operative intervention for a diagnosis of myxoid liposarcoma between June 2006 – June 2012 were identified, with six receiving neo-adjuvant radiotherapy and eight receiving adjuvant radiotherapy. Mean follow-up was 21 months (range 5-75 months).

Results: Patients treated with neo-adjuvant radiotherapy demonstrated a reduction in largest tumour dimension from 93.8mm to 69.4mm on MRI scan, and all had negative margins on resection. Two of the eight patients treated conventionally with surgery had positive resection margins, with negative margins obtained after further resection prior to radiotherapy. The neo-adjuvant group had one major complication (persistent foot drop) and three minor complications (two seromas and one wound infection). The adjuvant group showed two major complications (persistent post-operative pain) and one minor complication (wound infection). TESS scores were similar between neo-adjuvant and adjuvant patients (80.6 vs 78.5).

Conclusions: Initial results suggest that neo-adjuvant radiotherapy may confer benefits over adjuvant radiotherapy without adversely affecting complication rate. A larger sample size and longer follow-up will identify if the benefits demonstrated in this study are significant with comparable local control rates.

E-mail (main author): c_m_green@hotmail.co.uk



P20:105

Management of Myxofibrosarcoma in a Single Specialist Centre

Carl Green¹, Jessica Daniels², Anthony Freemont¹, Ashok Paul¹

¹) Manchester Royal Infirmary ²) Manchester University, United Kingdom

Background: Although soft tissue sarcoma is a rare malignancy, myxofibrosarcoma is a common form diagnosed. Myxofibrosarcoma is complicated by a high local recurrence rate (18-54%) and significant morbidity following treatment, hence management can be challenging.

Patients and Methods: Patients treated between 2003 – 2012 were identified via a database within the histopathology department and case notes were retrospectively assessed. All histology samples were reviewed by a senior histopathologist to ensure a correct diagnosis.

Results: 29 patients (12 male, 17 female) with an average age of 61 years (range 19-89 years) underwent surgery at a single centre, with 24 patients receiving adjuvant and two receiving neo-adjuvant radiotherapy. 22 patients had lower limb and 7 had upper limb tumours. 3 were treated for secondary recurrence after having primary surgery elsewhere. 21 patients had Trojani Grade 2 or 3 tumours. All underwent limb-sparing surgery initially but six patients (20.7%) suffered local recurrence after an average follow-up of 28 months and all ultimately required above knee amputation. Four patients developed wound infection, with one requiring VAC therapy. One patient required a flap repair of the forearm. 5-year survival rate was 87.5%.

Conclusions: Our results compare favourably against results published so far in the literature with a low local recurrence rate and mortality. Limb-sparing surgery aims to reduce morbidity and disability following treatment but more research is required in adjuvant treatments to further reduce the risk of local recurrence of tumour.

E-mail (main author): c_m_green@hotmail.co.uk



P20:106

FUNCTIONAL RESULTS AND QUALITY OF LIFE AFTER OPEN SYNOVECTOMY FOR GIANT CELL TUMORS OF SYNOVIUM IN THE KNEE

MJL Mastboom, BSc¹, L van der Heijden, MSc², PDS Dijkstra, MD PhD², MAJ van de Sande, MD PhD²

¹) Leiden University Medical Center ²) Orthopedic Surgery, LUMC, Netherlands

BACKGROUND Diffuse-type giant cell tumors(Dt-GCT) are benign but locally aggressive synovial lesions. Although arthroscopic synovectomy(AS) is advocated as alternative to open synovectomy(OS) to minimise surgical morbidity, recurrence-rates after AS remain unacceptably high. Our study aim was to evaluate the influence of (multiple) synovectomies on functional outcome and quality of life(QOL) of patients with Dt-GCT in the knee treated in a tertiary center(1980-2010).

METHODS We retrospectively reviewed 36 patients, eight were excluded with <1.5 year follow-up and 8 without functional and QOL data. Twenty patients were included: 12 referred with recurrence and eight primarily treated at our center. Median follow-up was 7.7years (1.6-15.9). Eleven patients were male. Mean age at final follow-up was 45.9years (11-77). We evaluated recurrence rates, Knee-injury and Osteoarthritis-Outcome-Score(KOOS), Musculoskeletal Tumor Society(MSTS), Toronto Extremity Salvage Score(TESS) and Short Form(SF)-36.

RESULTS Eleven patients underwent AS and one OS before referral to our center, where OS was performed for recurrent Dt-GCT. Five of these 12 patients developed further recurrences (42%) and were treated with repeated OS. Three of the referred patients had severe recurrent disease and finally underwent distal femur resection and prosthetic reconstruction (one revision surgery for prosthetic loosening). Eight other patients underwent primary OS in our hospital; two developed local recurrence (25%), one treated with repeated OS and one with AS. No severe complications were noted in this group (one urinary tract infection and one haemarthros).

Overall, patients primarily treated at our center with OS with no subsequent recurrence had higher mean KOOS, MSTS, TESS and SF-36, after mean 6.6years follow-up (Figure1). Multiple synovectomies resulted in significant lower KOOS-Pain ($p=0.024$), KOOS-Symptoms ($p=0.041$), KOOS-QOL ($p=0.032$) and TESS ($p=0.016$), after mean 7.1years follow-up.

CONCLUSION As the majority of patients were referred to our center with recurrent disease, we had the opportunity to evaluate the influence of (multiple) synovectomies on functional outcome and QOL. After primary OS, recurrence rate was acceptable and functional outcome and QOL were good. Functional and QOL-scores were significantly lower in patients with multiple synovectomies. In our opinion, centralized primary radical OS is advocated, in order to decrease local recurrence-rates and improve postoperative functional outcome and QOL.

E-mail (main author): m_mastboom@hotmail.com



P20:107

Surgical management of soft tissue sarcoma with reconstruction in patients aged over 80 years

Eisuke Kobayashi¹, Shinpei Miyamoto², Tanzawa Yoshikazu², Fumihiko Nakatani², Hirokazu Chuman², Akira Kawai²

¹) National Cancer Center Hospital ²), Japan

Background

The use of a local rotational flap as well as a free vascularized flap may be necessary for closure of large defects after resection of primary soft tissue sarcomas (STSs). However, it is often difficult to offer these procedures for markedly aged patients because of the generalized concept that such patients have low tolerance for them. The aim of this study was to evaluate the oncological and functional outcomes of flaps in patients over 80 years of age with STSs.

Methods

From our database (since 1998) of all patients with STSs, those aged over 80 years who underwent surgical resection with reconstructive procedures were identified and reviewed.

Results

Six patients (3 males and 3 females) were treated for STSs with reconstructive surgery after primary resection. Median age at presentation was 84 years. The average tumor size was 7.9 cm. The site of the tumor was the lower leg in 2 patients, chest wall in 2, and back and buttock one patient each. Three patients were diagnosed as having undifferentiated pleomorphic sarcoma (all high grade) and the others were diagnosed as having myxofibrosarcoma (1 low grade and 2 high grade). The tumor stage was IIB in 2 patients, III in 2, IB in 1, and IIA in 1. Three patients underwent wide surgical resection with a free latissimus dorsi (LD) flap, and in the others a local rotational flap was used (2 LDs and 1 rectus abdominis). Although one of the patients with a local rotational LD flap suffered wound infection as a postoperative complication, the flap was a success in 5 patients. No patients suffered local recurrence, while 3 patients developed distant metastases during their clinical course. The median follow-up period was 20 months (range, 3-43 months). Among the 6 patients, 3 were CDF, 2 were AWD and 1 was NED.

Conclusions

Flap outcome in patients aged over 80 years was comparable with that in younger patients. The present findings suggest that even extremely aged patients (over 80 years old) can tolerate not only rotational but also free flap reconstruction well with low rates of acceptable postoperative complications.

E-mail (main author): eisuke-k@pb3.so-net.ne.jp



P20:108

Atypical Lipomatous Tumour /Well Differentiated Liposarcoma: A Plea for Clarity

Emma Illingworth¹, Mohammed Al Mutani², Coonoor R Chandrasekar.²

¹) Royal Liverpool University Hospital ²) Royal Liverpool Hospital, United Kingdom

Background:

Atypical Lipomatous Tumour /Well Differentiated Liposarcoma (ALT/WDL) is a common tumour with very low metastatic potential. However, the terminology, diagnosis and treatment of patients with ALT/WDL are currently not standardised. The aim of this study was firstly to collate data on the management of ALT/WDL; and secondly to utilise this data to produce a consensus statement for the management of ALT/WDL.

Methods:

A 15-question online survey was sent worldwide mainly to oncologists, pathologists and orthopaedic oncology surgeons. Questions were designed to target ambiguous areas of the diagnosis and management of ALT/WDL.

Results:

Survey responses were received from many centers around the world. With regards to initial investigation(s) for ALT/WDL, 36.8% undertake MRI in all patients, regardless of tumour size/anatomical location, whilst a further 36.8% use MRI in patients with a suspected tumour size ≥ 5 cm, and 7.0% with a suspected size ≥ 10 cm. In addition, 45.3% of respondent's biopsy suspected ALT/WDL prior to resection, whilst 54.7% do not. Interestingly, 26.2% of respondents perform a wide local excision for ALT/WDL, whilst 73.8% undertake marginal resections. 45% of the respondents would organize a staging CT scan of chest and 42% would obtain follow up chest radiographs despite the fact that more than 95% have never come across metastases from ALT/WDL.

Conclusions:

As anticipated, this survey indicates that the current clinical management of ALT/WDL is extremely variable. It is suggested that a consistent nomenclature would facilitate the appropriate management of ALT/WDL. In addition, a consensus document based on the survey data for ALT/WDL is proposed.

E-mail (main author): em.illingworth@doctors.org.uk



P20:109

Nodular fasciitis: clinical characteristics and natural course

Hwan Seong Cho¹, Hae Bone Park¹, Hyo Jin Park¹

¹) Seoul National University Bundang Hospit, Republic Of Korea

INTRODUCTION

Nodular fasciitis is a benign tumefaction of myofibroblasts. Because of similarity of clinical presentation with sarcoma, it is also called as pseudosarcoma fasciitis and pseudosarcoma fibromatosis. The concern about possibility of a sarcoma leads to surgical excision as a mainstay of treatment.

Therefore, understanding of clinical characteristics and course can prevent a clinician from performing unnecessary procedures including surgical excision or even biopsy for this small and self-limiting lesion.

In this retrospective review, we asked 1) demographic findings 2) clinical characteristics and 3) natural course of nodular fasciitis.

METHODS

This study included thirty-one patients who were pathologically confirmed with nodular fasciitis between January 2008 and June 2012. There were 14 males and 17 female patients with mean age of 34.5 years (range, 9-57years). Eleven lesions were located in the forearm, seven in the upper arm, five in the thigh, four in the lower leg, two in the neck area and two in the hand. The mean size of the lesion at the initial visit was 1.5cm (range, 0.5-4.5cm). Seventeen patients had memory of pain on the lesion during the initial presentation. The duration of symptom ranged from 3 days to 1 month.

RESULTS

Nineteen lesions were surgically removed. None of them recurred at the last follow-up. Twelve patients were periodically followed-up after confirmation of nodular fasciitis by core needle biopsy. Ten of the 12 lesions were spontaneously resolved. The time interval between diagnosis and resolution ranged from 1 month to 7 months. In the other two, the lesions were involuting but still remained until 8 and 9 months follow-up.

CONCLUSIONS

Characteristic clinical findings are important to confirm the diagnosis of nodular fasciitis. Most of nodular fasciitis spontaneously resolved. After ruling out a sarcoma by clinical suspicion or core needle biopsy, periodical observation would be recommendable for this self-limiting lesion.

E-mail (main author): mdchs111@snu.ac.kr



P20:110

Ray of light -Neo-adjuvant chemotherapy for primary high-grade extremity soft tissue sarcoma

Dusan Ristic¹, Nenad Milanovic², Zoran Tomasevic², Mila Puric², Jelena Sopta³

¹⁾ Institute of Oncology of Serbia ²⁾ Medical Oncologist ³⁾ Pathologist, Serbia

Background: The aim of this study was to retrospectively analyze the relationship between neo-adjuvant chemotherapy and outcome in patients with high-grade extremity soft tissue sarcomas (STS). **Patients and methods:** Inclusion criteria were high-grade, deep, >5 cm extremity soft tissue sarcomas. Twelve patients (seven male and five female patients) diagnosed between 2006 and 2012 were. Median age was 51 years (21 to 67 years). Three patients had malignant fibrous histiocytoma, four patients had MPNST, two patients had rhabdomyosarcoma, one patient had liposarcoma, one had myxofibrosarcoma and one had malignant mesenchimoma. All patients were treated with three cycles of neoadjuvant chemotherapy. Patients with malignant fibrous histiocytoma were treated with doxorubicin/cisplatin/metotrexate and patients with all other STS were treated with doxorubicin/ifosfamide/mesna. After neoadjuvant therapy all patients with control of disease were treated with surgery and adjuvant chemotherapy.

Results: Response rate was 42% (five patients achieved partial response) registered according to RECIST criteria. Control of disease (partial response, minor response and stable disease) was 83%. Two patients (17%) experienced progression of disease during therapy with local progression of disease. Limb sparing surgery was performed at ten patients (83%). Overall survival was 33 months (range 6 to 79 months, 95% CI) with nine patients still alive, seven without progression of disease. **Conclusion:** Our result suggests that neoadjuvant chemotherapy is an effective regimen in treatment of advanced STS. These data emphasize the need for further prospective clinical studies of neo-adjuvant or adjuvant chemotherapy for patients with large high-grade extremity sarcomas.

E-mail (main author): cardusan73@yahoo.com