Dear EMSOS Colleagues, Partners & Friends

It is my great pleasure and honour to welcome all of you on behalf of the EMSOS Board and the Secretary General, Andreas Leithner, to attend the 34th EMSOS Annual Meeting combined with the 22nd Allied Health Professionals Meeting.

Especially this year, when finally after a prolonged hiatus, we can celebrate the re-start of our scientific activities through an in-person Congress.

First of all, I wish to express my sincerest gratitude to Rob Pollock, who organised an excellent event thanks to his outstanding efforts and admirable commitment.

Despite the difficulties that our Society – like many other International Societies – has been facing in such complex times, I am definitely confident that the 34th EMSOS will be able to involve a considerable number of attendees and distinguish itself for fruitful congressional work.

Last, but not least, my warmest thanks to the Organising Secretariat and the sponsors who contribute to make this Meeting an unforgettable event.

*Enjoy EMSOS, enjoy London!*

PIETRO RUGGIERI, PRESIDENT OF EMSOS

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**INTRODUCTION**

All of us at the London Sarcoma Service look forward to warmly welcoming you to London to attend the 34th EMSOS Annual Meeting combined with the 22nd Allied Health Professionals Meeting.

The congress venue is the prestigious Queen Elizabeth II Centre set in the heart of our capital city, close to Big Ben, The Houses of Parliament, Westminster Abbey and the London Eye.

The London Sarcoma Service, based both at University College London Hospital and the Royal National Orthopaedic Hospital is the home of one of the largest dedicated sarcoma units in Europe. We share the common goal of trying to improve outcomes for sarcoma patients in both survival and quality of life. With this in mind, we have put together an exciting and stimulating programme to include scientific papers, guest lectures, the ever-popular battles, industry symposia, posters, problem solving sessions and instructional lectures. We aim to make the meetings as diverse and interactive as possible.

We also have an exciting social and partner’s programme including a gala dinner on the River Thames! *Welcome to a great city and a great meeting!*

ROB POLLOCK & THE ORGANISING COMMITTEE
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FULL PAPERS
ORAL & POSTERS
EPIDEMIOLOGICAL DISTRIBUTION OF SOFT PART TUMORS IN A TERTIARY HOSPITAL

Ms Maria Júlia Palitot de Melo, Dr Luciano Augusto Reganin, Dr Marcio Gomes de Barros, Dr Henrique Carvalho e Silva Figueiredo, Dr João Raphael Fernandes Denardí, Dr João Batista Ferreira Neto Pontifícia Universidade Católica de Campinas, Campinas, Brazil

Abstract

Objective(s): Evaluate cases of soft tissue tumors in the Orthopedic Oncology Service of Hospital PUC-Campinas and determine the epidemiological profile from February 2012 to November 2019, associating the participation of a non-referenced Hospital in the approach and treatment of the pathology. Methods: 72 patients aged between 18 and 81 years of both genders with a diagnosis of soft tissue tumor were evaluated and divided into two groups I of primary etiology and II of metastatic etiology. Exploratory data analysis was performed, being a level II prognostic study. CAAE 39067920.1.0000.5481. Results: Total of 146 patients admitted, with 22 deaths, 9 patients in Group I and 13 in Group II. For all patients with soft tissue tumors, aged between 51 and 58 years, admitted to the service in the period, the probability of survival after 46 months was 71.84%, while in Group I it was 22.7% in compared to Group II, which was 91.43%. Conclusion: Despite the scarcity of epidemiological data related to soft tissue tumors, the data analyzed in the Hospital's service, not a reference, are compatible with data presented in specialized hospitals in Brazil, thus, in confluence with the literature.

Keywords: Sarcoma; Soft Parts; Epidemiology; Neoplasms.

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Proximal left leg malignant “triton” tumor in a patient with history of left leg fracture - a case report

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Abstract

Malignant triton tumor (MTT) is a rare and aggressive subtype of malignant peripheral nerve sheath tumor (MPNST) consisting in a neurogenic tumor with rhabdomyoblastic differentiation. To date, only about 170 cases of MTT have been reported. Two thirds of the cases occur in young patients with neurofibromatosis type 1 (mostly male) and the rest presents as a sporadic tumor (mostly in older people with female predominance).

In this case report, we present a 49-year-old man with a sporadic grade 2 MTT arising in the proximal left leg, a location with a distant history of fracture. The diagnosis was made based on histology and immunohistochemistry and an above knee amputation was performed. Despite not having metastases at the time of the surgery, the disease had spread to the liver and vertebral column with spinal cord compression at 5 months following surgery and so the patient started decompressive radiation therapy followed by palliative chemotherapy.

Considering the precocious spread of the disease, we raise the question of the possible role of adjuvant chemotherapy in micrometastases eradication. Moreover, to our knowledge this is only the second case reported of a MTT arising in a site with history of previous severe trauma, even though there is no evidence of any relationship between trauma and musculoskeletal tumours.

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FLORID REACTIVE PERIOSTITIS OF TIBIAL DIAPHYSIS. AN INFREQUENT PSEUDOTUMOR IN A RARE LOCATION. CASE REPORT

Dr Fernando Linares-Yanes, Dr Ángeles Ayala-Rodrigo, Dr Javier Álvarez-Cruz, Dr Patricia Amaya-Espinosa, Dr Eduardo Morales-Pérez
Hospital Universitario de Canarias, La Laguna, Spain

Abstract

Introduction
Florid reactive periostitis is a very rare benign lesion which may simulate an aggressive bone lesion such as osteosarcoma. Anatomopathological study is essential for the differential diagnosis.
Treatment is local resection, as its course can be aggressive.

Method
We present the case of a 36-year-old woman with a lump on her right leg that had been present for 2 months. She reported a progressive growth tumor very painful. A tumor of 5 centimeters was found on the medial side of the tibia with an associated inflammatory skin reaction.
The X-ray, CT and MRI showed a lesion with associated periosteal reaction, aggressive and inflammatory changes suggestive of a malignant osteosarcoma-type bone tumor. Extension study with bone gammagraphy was indicative of malignancy. The histology of biopsy led us to a differential diagnosis of surface osteosarcoma and florid periostitis.
We decided to perform en bloc resection surgery of the lesion, only of the affected cortex, stabilization with allograft and osteosynthesis with plate.

Results
Patient progressed satisfactorily and the histology of the piece defined the a florid reactive periostitis. At 10 weeks follow-up, the patient is pain-free, with full mobility joints and almost complete integration of the graft.

Conclusions
Florid reactive periostitis is a very rare entity with very few case series reported in the current literature. We found mainly cases affecting hands bones, and in a limited number of cases, the long bones. We did not find any cases involving the tibial diaphysis.
Histological study of the lesion is essential for diagnosis, as in our case that all complementary tests indicated a malignant tumor.
Encasement of popliteal vascular bundle due local osteosarcoma recurrence treated with wide resection and vascular reconstruction - A case report

Dr João Vale\textsuperscript{1}, Dr Filipe Castelo\textsuperscript{2}, Dr Diogo Catelas\textsuperscript{1}, Dr Sara Diniz\textsuperscript{1}, Prof Vania Oliveira\textsuperscript{1}, Prof Pedro Cardoso\textsuperscript{1}

\textsuperscript{1}Centro Hospitalar e Universitário do Porto, Porto, Portugal. \textsuperscript{2}Centro Hospitalar Cova da Beira, Covilhã, Portugal

Abstract

Introduction: Osteosarcoma is the most common primary bone malignancy. Preoperative chemotherapy followed by surgery and adjuvant therapy has improved the survival rates, and allowed limb salvage in approximately 80\% of patients. Prognosis of patients after local recurrence is generally poor and management of locally recurrent disease is not well defined, especially in patients who have undergone limb-sparing surgery.

Case Report: A 23 years old male presented a local recurrence of conventional osteosarcoma at popliteal fossa with encasement of popliteal vascular bundle, after previous tumor wide resection and reconstruction with proximal tibia endoprosthesis. A posterior Trickey approach was performed and the popliteal vascular bundle involvement due local osteosarcoma recurrence was verified. A wide resection “en bloc” of the lesion included part of the popliteal artery and vein. Then, a bypass either of the popliteal vein, with polytetrafluoroethylene (PTFE) prosthesis, and popliteal artery, with contralateral saphenous vein, were performed. Histology report was compatible with extra-osseous recurrence of previously diagnosed osteosarcoma G3rpT1R0. One year after surgery, he presented a local recurrence, but preservation surgery allowed him to perform daily activities without limitations and even return to sport activities with low to moderate energy.

Conclusion: Local management of recurrent osteosarcoma in a previously reconstructed limb is highly individualized. This observation confirms that preservation of lower limb function is possible using reconstruction techniques of bone, nerves, and vessels in sarcoma of the musculoskeletal system.
Clinical Outcome Differences in the Treatment of Impending Versus Completed Pathological Long-Bone Fractures

Dr Olivier Groot¹, Mr Joseph Schwab²
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Abstract

Background: The outcome differences following surgery for an impending versus a completed pathological fracture have not been clearly defined. The purpose of the present study was to assess differences in outcomes following the surgical treatment of impending versus completed pathological fractures in patients with long-bone metastases in terms of (1) 90-day and 1-year survival and (2) intraoperative blood loss, perioperative blood transfusion, anesthesia time, duration of hospitalization, 30-day postoperative systemic complications, and reoperations.

Methods: We retrospectively performed a matched cohort study utilizing a database of 1,064 patients who had undergone operative treatment for 462 impending and 602 completed metastatic long-bone fractures. After matching on 22 variables, including primary tumor, visceral metastases, and surgical treatment, 270 impending pathological fractures were matched to 270 completed pathological fractures. The primary outcome was assessed with the Cox proportional hazard model. The secondary outcomes were assessed with the McNemar test and the Wilcoxon signed-rank test.

Results: The 90-day survival rate did not differ between the groups (HR, 1.13 [95% CI, 0.81 to 1.56]; p = 0.48), but the 1-year survival rate was worse for completed pathological fractures (46% versus 38%) (HR, 1.28 [95% CI, 1.02 to 1.61]; p = 0.03). With regard to secondary outcomes, completed pathological fractures were associated with higher intraoperative estimated blood loss (p = 0.03), a higher rate of perioperative blood transfusions (p = 0.01), longer anesthesia time (p = 0.04), and more reoperations (OR, 2.50 [95% CI, 1.92 to 7.86]; p = 0.03); no differences were found in terms of the rate of 30-day postoperative complications or the duration of hospitalization.

Conclusions: Patients undergoing surgery for impending pathological fractures had lower 1-year mortality rates and better secondary outcomes as compared with patients undergoing surgery for completed pathological fractures when accounting for 22 covariates through propensity matching. Patients with an impending pathological fracture appear to benefit from prophylactic stabilization as stabilizing a completed pathological fracture seems to be associated with increased mortality, blood loss, rate of blood transfusions, duration of surgery, and reoperation risk.
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Body composition predictors of mortality in patients undergoing surgery for long bone metastases

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Abstract

Background: Body composition measurements using computed tomography (CT) may serve as imaging biomarkers of survival in patients with and without cancer. This study assesses whether body composition measurements obtained on abdominal CTs are independently associated with 90-day and 1-year mortality in patients with long-bone metastases undergoing surgery.

Methods: This single institutional retrospective study included 212 patients who had undergone surgery for long-bone metastases and had a CT of the abdomen within 90 days before surgery. Quantification of cross-sectional areas (CSA) and CT attenuation of abdominal subcutaneous adipose tissue, visceral adipose tissue, and paraspinous and abdominal muscles were performed at L4. Multivariate Cox proportional-hazards analyses were performed.

Results: Sarcopenia was independently associated with 90-day mortality (hazard ratio [HR] = 1.87; 95% confidence interval [CI] = 1.11-3.16; p = 0.019) and 1-year mortality (HR = 1.50; 95% CI = 1.02-2.19; p = 0.038) in multivariate analysis while controlling for clinical variables such as primary tumors, comorbidities, and chemotherapy. Abdominal fat CSAs and muscle attenuation were not associated with mortality.

Conclusions: The presence of sarcopenia assessed by CT is predictive of 90-day and 1-year mortality in patients undergoing surgery for long-bone metastases. This body composition measurement can be used as novel imaging biomarker supplementing existing prognostic tools to optimize patient selection for surgery and improve shared decision making.
The preoperative machine learning algorithm for extremity metastatic disease can predict 90-day and 1-year survival: two international external validations

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Abstract

Background: The prediction of survival is valuable to optimize treatment of metastatic long-bone disease. The Skeletal Oncology Research Group (SORG) machine-learning (ML) algorithm has been previously developed and internally validated. The purpose of this study was to determine if the SORG ML algorithm accurately predicts 90-day and 1-year survival in an external metastatic long-bone disease patient cohort.

Methods: A retrospective review of 264 patients from Iowa and 356 patients from Taiwan who underwent surgery for long-bone metastases between 2003 and 2019 was performed. Variables used in the stochastic gradient boosting SORG algorithm were age, sex, primary tumor type, visceral/brain metastases, systemic therapy, and 10 preoperative laboratory values. Model performance was calculated by discrimination, calibration, and overall performance.

Results: The SORG ML algorithms retained good discriminative ability for 90-day and 1-year mortality, calibration, overall performance, and decision curve analysis.

Conclusion: The previously developed ML algorithms demonstrated good performance in both cohorts, thereby providing external validation. The models were incorporated into an accessible application (https://sorg-apps.shinyapps.io/extremitymetssurvival/) that may be freely utilized by clinicians in helping predict survival for individual patients and assist in informative decision-making discussion before operative management of long bone metastatic lesions.
Defining minimally important differences in functional outcomes for musculoskeletal oncology patients undergoing lower extremity endoprosthetic reconstruction

Dr Aaron Gazendam, Ms Patricia Schneider, Dr Mohit Bhandari, Dr Jason Busse, Dr Michelle Ghert
McMaster University, Hamilton, Canada

Abstract

Introduction: Functional outcomes are commonly reported in studies of musculoskeletal oncology patients undergoing limb salvage surgery. However, interpretation requires knowledge of the smallest amount of improvement that is important to patients – the minimally important difference (MID). We established the MIDs for the Musculoskeletal Tumor Society Rating Scale-93 (MSTS-93) and Toronto Extremity Salvage Score (TESS) in patients with bone tumors undergoing lower limb salvage surgery.

Methods: This study was a secondary analysis of the recently completed PARITY (Prophylactic Antibiotic Regimens in Tumor Surgery) study. We used MSTS-93 and TESS data from this trial to calculate: (1) the anchor-based MIDs using an overall function scale and a receiver operating curve analysis, and (2) the distribution-based MIDs based on one-half of the standard deviation of the change scores from baseline to 12-month follow-up.

Results: There were 591 patients available for analysis. The Pearson correlation coefficients for the association between changes in MSTS-93 and TESS scores and changes in the external anchor scores were 0.71 and 0.57, indicating “high” and “moderate” correlation. The anchor-based MID was 12 points for the MSTS-93, and 11 points for the TESS. Distribution-based MIDs were larger; 16-17 points for the MSTS-93, and 14 points for the TESS.

Conclusions: The current study established MIDs for the MSTS-93 and TESS, based on 591 patients with bone tumors undergoing lower extremity endoprosthetic reconstruction. These thresholds will optimize interpretation of the magnitude of treatment effects, to facilitate shared decision-making with patients in trading off desirable and undesirable outcomes of alternative management strategies.
Predictors of functional recovery among musculoskeletal oncology patients undergoing lower extremity endoprosthetic reconstruction

Dr Aaron Gazendam, Ms Patricia Schneider, Dr Mohit Bhandari, Dr Jason Busse, Dr Michelle Ghert
McMaster University, Hamilton, Canada

Abstract

Introduction: Functional outcomes are important for oncology patients undergoing lower extremity reconstruction. We characterized patient reported function after surgery and identified predictors of postoperative function in musculoskeletal oncology patients undergoing lower extremity endoprosthetic reconstruction.

Methods: We acquired functional outcome data from the Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) trial; specifically, the 100-point Toronto Extremity Salvage Score (TESS) which was administered preoperatively and at 3, 6 and 12 months postoperatively. Higher scores indicate better physical functioning, and the minimally important difference (MID) is 11-points. We calculated mean functional scores at each timepoint after surgery and developed a logistic regression model to explore predictors of failure to achieve excellent postoperative function (TESS ≥80) at 1-year after surgery.

Results: The 555 patients included in our cohort showed important functional improvement from pre-surgery to 1-year post-surgery (mean difference 14.9 points, 95% CI 12.2 to 17.6; p<0.001) and 64% achieved excellent post-operative function. Our adjusted regression model found that poor (TESS 0-39) preoperative function (odds ratio [OR] 3.3, 95%CI 1.6 to 6.6); older age (OR per decade increase, 1.32, 95%CI 1.17, 1.49) and patients undergoing reconstruction for soft-tissue sarcomas (OR 2.3, 95%CI 1.03 to 5.01) were associated with higher odds of failing to achieve an excellent functional outcome at 1-year follow-up.

Conclusions: The majority of patients with tumors of the lower extremity undergoing endoprosthetic reconstruction achieved excellent function at 1-year after surgery. Older age, poor preoperative function, and endoprosthetic reconstruction for soft tissue sarcomas were associated with worse outcomes.
Tourniquet use in patients undergoing oncologic resection and endoprosthetic reconstruction of the knee

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Abstract

Background: The aims of the current study were to determine the prevalence and impact of tourniquet use in patients undergoing limb salvage surgery and endoprosthetic reconstruction for tumors surrounding the knee.

Methods: We acquired data from the Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) trial. Differences in baseline characteristics, operative details and postoperative functional outcomes between patients who underwent surgery with the aid of a tourniquet and those who did not were explored. A linear regression model was created to evaluate the impact of tourniquet use on postoperative Toronto Extremity Salvage Scores (TESS) when controlling for confounding variables. A negative-binomial regression model was constructed to explore predictors of postoperative length of stay (LOS).

Results: There were 421 patients with tumors surrounding the knee joint and 225 (53%) undergoing surgery with the aid of a tourniquet. The tourniquet group was younger (p=0.014), more likely to undergo surgery for a tibial based tumor and had shorter operative times (p<0.001). The adjusted linear regression model found that tourniquet use, shorter operative time, higher baseline TESS and femoral based tumors independently predicted higher function at 3-month follow-up. The negative-binomial regression model demonstrated that tourniquet use, shorter operative time, younger age, and intraoperative tranexamic acid administration independently predicted shorter hospital LOS.

Conclusions: The results of the current study demonstrate that in patients undergoing oncologic resection and endoprosthetic reconstruction of knee tumors, the use of an intraoperative tourniquet was associated with reduced operative time, reduced hospital LOS and higher early functional outcomes.
A minimally invasive 4-dimensional AORIF procedure for periacetabular osteolytic metastases in a prospective cohort of 55 patients

Prof Francis Lee, Dr Christopher Dussik
Yale University, New Haven, USA

Abstract

Introduction: While aggressive adjuvant therapies are sought for GCT and microscopic cells are seriously discussed, periacetabular osteolytic metastases are treated with heavy emphasis on metal implants. AORIF (RF Ablation - Balloon Osteoplasty - Reinforcement with zoledronate-loaded PMMA bone cement - Internal Fixation) is a first-line minimally invasive percutaneous ambulatory procedure addressing 4 major dimensions of local cancer control, bone biology, biomechanical stability, and time-factors. The main advantage of AORIF is to avoid extensive open surgeries with mega-implants for periacetabular bone defects in patients with often-unpredictable remaining life. The goals of this study were twofold: 1) to analyze pain reduction and improvement of ambulatory function following minimally AORIF; and 2) to characterize short- and long-term complications within the postoperative period.

Methods: This study details a single center prospective cohort investigation of 56 patients with osteolytic peri-acetabular skeletal metastases with mean follow-up of 17 months up to 4 years or until death. The primary outcome of pain and functional ambulatory scores [Ranges: 1-2 (Bed-ridden); 3-4 (wheelchair); 5-7 (walker-cane); 8-10 (mild limp - recreational activities)] were assessed pre- and postoperatively. Secondary outcomes included infection, transfusion requirement, length of stay, 30-day readmission, mortality, subsequent acetabular fracture, and requirement for conversion into total hip arthroplasty. Visual Analogue Scale (VAS), Eastern Cooperative Oncology Group score (ECOG), and Combined Pain and Ambulatory Function Scores were compared to assess outcome.

Results: Our cohort displayed universal outcome improvement by their first postoperative appointment at 2-4 weeks. Combined Pain and Ambulatory Function Score improved from 4.3 ± 2.4 to 7.7 ± 2.2 (p<0.001) without significant deterioration in patients without cachexia. VAS pain scores improved from 8.2 ± 2.0 to 2.3 ± 2.3 (p<0.001) and ECOG scores from 3.0 ± 1.0 to 1.5 ± 1.2 (p<0.001). No disintegration of the AORIF construct was observed all patients. There were no surgical site infections, readmissions, or delays in oncologic care observed following AORIF. Two patients underwent simple hemiarthroplasty at 5 months and 22 months respectively. Two patients required additional AORIF and optional screw exchange due to progression of cancers and osteolysis in the adjacent bone. Increased bone formation in the periacetabular defects were observed in most patients who survived beyond 1 year.

Conclusion: AORIF is an effective, minimally invasive endoskeletal reconstruction method that represents a first-line alternative for the reconstruction of periacetabular metastatic bone defects with emphasis on local cancer control, improving local bone homeostasis, biomechanical stability, and time-related bone mass improvement.)
Sustained inflammation and deranged cytokine expression impair healing of pathological fractures in the presence of breast cancer cells

Prof Francis Lee, Dr Christopher Dussik
Yale University, New Haven, USA

Abstract

Introduction: Pathological fractures are devastating complications of metastatic breast cancer that afflict countless women worldwide. Intramedullary nailing with locking screw fixation provides the foundation of femoral fracture repair. However, cancer-induced changes within the local osseous environment drastically impair normal bone healing, leading to nonunion, reduced quality of life, and delays in medical oncologic care. At this time, relatively little is known about the underlying mechanisms involved in impaired pathological fracture healing.

Methods: Femoral midshaft osteotomies were induced in either BALB/cJ or BALB/c nude mice. After internal fixation with a non-locking intramedullary nail, mice were inoculated with breast cancer cell lines, including 4T1, MDA231, HCT1806, and MCF7 (5 x 10^5 cells). After surgery, mice were monitored throughout the postoperative period and sacrificed at intervals ranging from 4- to 49-days post-surgery. Radiography, x-ray microtomography, histology, immunohistochemistry, and transcriptomic analyses were employed to characterize the osseous microenvironment present throughout the pathological fracture healing. MEK/ERK activity was highly associated with impaired fracture healing. The effects of suppression of the MEK/ERK were evaluated using genetic knockouts and pharmacologic supplementation with the MEK inhibitor, trametinib (1 mg/kg).

Results: Mice bearing human breast cancer xenograft exhibited diminished fracture healing universally compared with mice undergoing fracture healing in normal conditions. Transcriptomic analyses revealed that metastases induce a profoundly pro-inflammatory microenvironment and alter the balance between bone deposition and resorption. Suppression of MEK/ERK by pharmacologic or genetic inhibition improved osseous healing, delayed tumor progression, and restored normal transcription patterns.

Conclusion: Our study provides the first attempt to define the molecular mediators through which breast cancer disrupts healing of pathological fractures in vivo. Our results illustrate that a localized inflammatory state contributes to impaired fracture healing and that suppression of the MEK/ERK axis may improve fracture healing and reduced tumor burden. Together, these results may improve outcomes and clinical prognosis for those afflicted with metastatic breast cancer.
Neoadjuvant chemotherapy and endoprosthetic reconstruction for lower extremity sarcomas: does timing impact complication rates?

Dr Aaron Gazendam¹, Ms Patricia Schneider¹, Dr Andre Spiguel², Dr Michelle Ghert¹
¹McMaster University, Hamilton, Canada. ²University of Florida College of Medicine, Gainesville, USA

Abstract

Introduction: Sarcoma patients undergoing surgical resection and endoprosthetic reconstruction often receive neoadjuvant chemotherapy (NACT). The objective of the current study was to determine if the timing of NACT impacts the rates of surgical site infections (SSI) and reoperations.

Methods: This study was a secondary analysis of the recently published Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) trial. Patients who underwent neoadjuvant chemotherapy, tumor resection and endoprosthetic reconstruction for a bone or soft tissue sarcoma were included. Multivariate Cox proportional hazards regression models were created to evaluate if NACT timing was predictive of SSI or reoperations.

Results: 216 patients from 39 clinical sites were included in the analysis. The most common diagnosis was osteosarcoma (75%), followed by Ewing’s sarcoma (16%). The median time from completion of neoadjuvant chemotherapy to surgery was 24 days (interquartile range 15, 42 days). There were 85 (39%) patients underwent surgery within 3 weeks of completing NACT, 78 (36%) underwent surgery 3-6 weeks after completing NACT and 53 (22%) patients underwent surgery >6 weeks after completion of NACT. The timing of NACT did not impact SSI rates or reoperation rates. Longer operative time was an independent predictor of both SSI (Hazards ratio [HR] per hour of 1.21 [95% CI 1.07, 1.40], p=0.002) and reoperation rates (HR of 1.15 per hour [95%CI 1.03, 1.28], p=0.014)

Conclusions: The timing of surgery following NACT varied considerably. Chemotherapy timing did not impact SSI or reoperations in patients undergoing surgical resection and endoprosthetic reconstruction in sarcoma patients.
Tumor-like PEEK foreign body granuloma of the proximal tibia and arthroscopic treatment of a polymethylmethacrylate joint impingement

Dr Filipe Castelo, Dr Pedro Serrano, Dr Vânia Oliveira, Prof Pedro Cardoso

1Centro Hospitalar Universitário Cova da Beira, Covilhã, Portugal. 2Centro Hospitalar Universitário do Porto, Porto, Portugal

Abstract

Introduction

Foreign body granulomas can occur with any surgical implant. Rarely, they can become expansive and mimic neoplastic behavior. The authors present a case of a lytic lesion of the proximal tibia which the biopsy described a benign fibrous histiocytoma and which, after aggressive curettage and filling of the bone defect with polymethylmethacrylate (PMMA), developed a knee joint impingement.

Method

A lytic lesion of the proximal tibia was identified in a 50-year-old male with a history of anterior cruciate ligament reconstruction with a poly(ether-ether-ketone) (PEEK) interference screw. The biopsy of the lesion described a benign fibrous histiocytoma. Due to the large size of the lesion, surgical treatment with curettage, phenolization and filling of the bone defect with PMMA was chosen. In the follow-up radiographic evaluation, a PMMA invasion of the knee joint was observed. The histological result of the surgical specimen was also unexpected, translating fibrinoid deposits and histiocytic infiltrate, without suggestive findings of neoplasia. Due to significant complaints of pain and mobility limitation (range of mobility of 15-90°), the patient underwent knee arthroscopy in which the PMMA responsible for the joint impingement was removed with a bone shaver.

Results

The patient returned to low-impact sports, with a range of mobility of 0-110° and without signs of recurrence.

Conclusion

Foreign body granulomas are, in most cases, self-limiting. Likewise, these reactions to PEEK implants are also rare. Exceptionally, these granulomas can mimic neoplastic lesions both in imaging and histological exams. Joint proximity is a risk factor for complications, as both the injury and the surgical procedure can cause chondral disruptions. In the case presented, the PMMA extravasation that led to the joint conflict was amenable to arthroscopic resolution. The present case is relevant because it is a rare event, an expansive tumor-like foreign body granuloma after PEEK implantation, as well as the minimally invasive resolution of an important articular foreign body.

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Oncology - Other

Predictors of survival, local recurrence and metastasis in Leiomyosarcoma of trunk wall and extremities: A multicentre data analysis of 488 patients.

Mr Sudhir Kannan1,2, Dr Jay Dee Ferguson1, Dr Bryan Chew3, Mr Nicholas Eastley4, Mr Han Hong Chong3, Dr Nicholas Mackenzie5, Mr Viswanath Jayashankar6, Dr Maria Anna Smolle7, Mr Sanjay Gupta6, Prof Andreas Leithner8, Dr Tom McCulloch9, Dr Olga Zaikova10, Mr Jonathan Stevenson4, Mr Kenneth S Rankin1, Prof Robert U Ashford3

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Abstract

Introduction

Leiomyosarcomas are aggressive neoplasms with poorly understood pathogenesis. More importantly, accurate prediction of their behavior has proven difficult, and there are no universally accepted prognostic factors.

We aimed to identify the risk factors for early recurrence, metastases, and poor survival and build a prediction model.

Methods

We present data of 488 patients from 6 centers who had Leiomyosarcomas involving trunk wall and extremities. All tumours showing characteristic, pure smooth muscle differentiation at least focally were included. Purely cutaneous tumours with no subcutaneous extension, RP, major vessel, and uterine LMS were excluded. We collected demographic, clinical, histopathological, and imaging data. Overall survival, local recurrence, and metastasis were the outcome measures. We have used the Kaplan Mier plot and multivariate analysis for prognostication. Nomograms were built using STATA 16.

Results:

The mean survival was 56.2 months (SD 48.6). 10%(46/488) patients had local recurrence. More importantly, 37% (17/46) of these local recurrences were within 12 months of diagnosis. 37%(181/488) of patients developed metastases, 0.8% (4/488) had metastasis at presentation. 50.2% of metastasis occurred in less than 36 months.

Our analysis shows that size (p-value 0.0001), deep location (p-value 0.001), trunk site (p value 0.03), Grade (p value 0.0001), Stage (p value 0.0001) and higher mitoses> (p-value 0.019) are prognostic factors predicting survival. The multivariate analysis showed that size (p value 0.002), mitoses (p value 0.001) & stage (p value 0.01) were independent prognostic factors for poor survival.

Further, our analysis for local recurrence suggested that age(p-value 0.0001), site (p-value 0.02), deep location (p-value 0.001), necrosis (p-value 0.03) could be associated higher risk of local recurrence, but none of the factors were independently. Similarly, age (p value 0.0001), size (p value 0.004), depth (p value 0.05), grade (p value 0.002) and necrosis (p value 0.02) were predictive of metastasis. The multivariate analysis suggested that deeper location as the only factor independently prognostic of
metastasis (p value). Finally, our models has displayed a good predictive accuracy between 65-75%.

Conclusion:
The Size > 5 cms, higher mitoses and higher AJCC stage at presentation were independently prognostic of poor survival. Depth only factor independently prognostic of metastasis. Younger age of occurrence could also be predictive of higher metastasis risk. Deep location, presence of necrosis and age could be associated higher risk of local recurrence, but none of the factors were independently. The nomograms provide accurate, accessible, multivariate predictive models that will enable surgeons to estimate individual risk of mortality, local recurrence and metastasis
Abstract

Background:

Primary malignant bone and soft tissue tumours often occur in the lower extremities of active individuals, including children, teenagers and young adults. Survivors often face long-term physical disability. Participation in sports is particularly important for active young people but the impact of sarcoma treatment is not widely recognised and clinicians may be unable to provide objective advice about returning to sports. We aimed to identify and summarise the current evidence for involvement in sports following treatment of lower limb primary malignant bone and soft tissue tumours.

Methods:

A comprehensive search strategy was used to identify relevant studies combining the main concepts of interest: (1) Bone/Soft Tissue Tumour, (2) Lower Limb, (3) Surgical Interventions and (4) Sports. Studies were selected according to eligibility criteria with the consensus of three authors. Customised data extraction and quality assessment tools were used.

Results:

Twenty-two studies were selected, published between 1985 – 2020, including 1005 patients. Fifteen of the 22 studies had valid data on return to sports, with 705 participants, of which 412 (58.4%) returned to some form of sport swimming, cycling and skiing, at a mean follow-up period of 7.6 years. Four studies directly compared limb sparing surgery and amputation; none of these were able to identify a difference in sports participation or ability.

Conclusions:

Return to sports is important for patients treated for musculoskeletal tumours. However, there is insufficient published research to provide good information and support for patients. Future prospective studies are needed to collect better pre- and post-treatment data at multiple time intervals. Validated clinical and patient sports participation outcomes such as type of sports, level, frequency and a validated sports specific outcome score, such as the University of California at Los Angeles (UCLA) activity scale, should be recorded. In particular, more comparison between limb sparing surgery and amputation would be welcome.
Chemistry & oncology

Mr Wasif Javeed
BZ University, Multan, Pakistan

Abstract

Abstract: The chemistry and oncology both are active interdisciplinary field between organic chemistry and biotechnology which stimulated by natural curiosity and possible applied aspect has grown to it’s present positions during the last many decades. This area had now achieved a degree of maturity with its own journal own international society with annual meetings. The aim of the article is to provide a short introduction to the field with an emphasis on the role of chemical organisms and biotechnology for the treatment of different types of cancers. Keywords: organic chemistry, oncology, cancer treatment technology, plants behaviors, & semiochemicals.
Synovial sarcoma: A clinicopathological study

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Abstract

Introduction: Synovial sarcoma (SS) is an aggressive high-grade soft tissue sarcoma. Both diagnosis and treatment are challenging. This study aims to present a case series of 63 patients with SS to evaluate the key aspects of diagnosis, treatment, and follow-up of SS, focusing on the effects of pathologic properties and additional therapies on survival.

Methods: This is a single-center retrospective analysis of the patients with synovial sarcoma. All patients histologically diagnosed as SS, whose pathology, radiology, and surgery records are available and followed up at least 12 months are included. Presenting symptoms, location, pathology, imaging, treatment, metastasis, recurrence, and death during follow-up were investigated.

Results: The mean age was 37.57 (9-84). 49.2% were women. The average follow-up time was 64.35 months. 96.92% of the SS were in extremities. 28 (43.01%) were at joints, and 6 were intraarticular. The mean volume was 109.71 cm³ (176.25). Tumors bigger than 30 cm³ had significantly decreased survival and increased metastasis (p=0.0163, 0.0077). 38.46% were monophasic, 36.92% were biphasic, and 24.62% were poorly differentiated; the survival was significantly less for poorly differentiated forms. The most commonly positive markers were Bcl-2 (89.47%), and EMA (88.14%). TLE1 was 86.67% positive. T (18, X) was present in 8 (72.72%). 27 patients had metastases, 24 had recurrences, and 15 died.

Conclusion: SS is an intriguing disease. Determination of the predictive values such as tumor volume, unplanned excision, and poorly differentiated histologic type can guide the management. SS needs longer follow-up owing to the risk of late recurrence.
Multiplanar tibia deformities and growth disturbance in patients with expandable distal femur replacement.

Dr Ahmad Shehadeh
KHCC, Amman, Jordan

Abstract

Background:

Expandable distal femur endoprosthesis (EDFE) are commonly used to compensate for the loss of the distal femoral epiphyseal plate in skeletally immature children who have undergone surgical resection of bone malignancies. However, the effect of the passive tibial component of the EDFE on tibial growth has not been extensively studied in literature.

Materials and Methods:

A total of 20 patients, aged (7-12) years, underwent expandable distal femur replacement. Two types of implants were used, Juvenile Tumor System (JTS) noninvasive prosthesis in 14 patients, and Modular Universal Tumor And Revision System (MUTARS)® Xpand Growing Prostheses, in 6 patients. Scanogram and CT scan documented measurements of longitudinal and multiplanar growth as leg length discrepancy (LLD), femur length discrepancy (FLD), tibia length discrepancy (TLD) and to yield values of rotational, sagittal and coronal deformities of the tibia. Patients were followed up to assess the need for further management. Sex, age, size of tibial plate perforation and type of implant used, were studied for possible correlation with deformities or growth disturbance.

Results:

Patients were followed up for a mean of 3 (2-7) years. A total of 14 patients, (10 JTS, 4 Implant cast) had tibial deformity and/or growth disturbance. A single patient was found to have all deformities (growth, rotational, coronal and sagittal). Thirteen patients were found to have LLD ranging from 5.3 - 59 mm (median 21 mm), 12 had TLD from 3 - 30 mm, (median 10 mm), and 11 patients showed evidence of malrotation from 6 - 32 degrees (median 11 degrees). TLD was found to contribute entirely to LLD in 3 patients, and > 50% of LLD in 7 patients. All LLD was treated conservatively except 3 patients; 2 received contralateral tibia epiphysodesis and one received revision with new implant. A single patient had a posterior tibia slope angle (PTSA) of -2.8 degrees, 3 patients had coronal deformity, with mean medial proximal tibia angle (MPTA) 80.3 (77-83 degrees).

Conclusion:

Tibial growth disturbance and multiplanar deformities occur in the majority of patients following EDFE replacement exacerbating LLD. Yet, these disturbances may be well tolerated, managed conservatively, and rarely mandate endoprosthetic revision or subsequent corrective surgery. Age at time of surgery was found to be the only significant contributor to the development of tibia growth disturbance.
The outcome of joint sparing endoprosthesis (JSE), as a reconstructive modality for juxta-articular bone tumors.

Dr Ahmad Shehadeh
KHCC, Amman, Jordan

Abstract

Introduction:
The outcome of endoprosthetic reconstruction after joint sparing resection is not well described in literature.

Materials and Methods:
Thirty six patients received JSE and 42 joints were spared. age 4-55 year, (median 13 Year), 29 patients received surgery for primary reconstruction and 7 patients for revision of failed bone allograft or modular implant , anatomical location was 29 joints spared in the lower limbs and 13 in the upper limbs.

Flat surface HA coated custom JSE was used to spare 20 joints, and short stemmed custom JSE was used to spare 22 joints. The length of remaining bone epiphysis for JSE anchorage from the knee and ankle joints, was 25-75 mm, median=45mm.

Results:
Operative time 2.5 - 4 hr.(Avg. 3 hr.) The bone resection surface fitted the prosthesis surface with < 2mm difference. Histological examination of all resected specimens show clear bone resection margins, 2 patients had positive soft tissue margins.

At mean follow up period of 4 years(6 mo-7yrs), 6 patients developed local and systemic recurrences, three of them had pathological fracture at time of diagnosis and 4 poor response to chemotherapy(P=0.016), all recurrences occurred in the soft tissue. Implant survival at 5 year was 89% , MSTS score was 93%(86-100%).

Conclusion:
This is the biggest series in literature for joint sparing surgery in which custom JSE was used .In our series, both implants designs that we used; survived well at 5 year follow up (89%), no increased incidence of local recurrence in comparison to joint sacrificing techniques . No increased need for revision surgery in comparison with joint sacrificing approach. the early results of using custom made JSE is encouraging and functional outcome is outstanding.
Abstract

Introduction:

Traditional socket prosthesis are associated with high incidence of problems: discomfort and pain at the residual limb, problems with fitting, and skin problems in the stump, all will result in negative impact at the quality of life and mobility of the patients.

Materials and Methods:

At Khcc, we performed Osseo-integration surgery in 6 patients with above knee amputation for cancer, 3 patient with osteosarcoma, two patients with soft tissue sarcoma, and the sixth one with germ cell tumor.

In all 6 patients, surgery was done after 2-3 year history of fitting with traditional socket prosthesis, where the patient were extremely un comfortable, with persistent pain and opioids pain medicine intake.

Results:

Five out of the 6 patients did well and rehabilitated successfully and walked with no assistive aid at 1 year follow up period and stopped using all kinds of pain medicine, average MSTS score was 86%.

The sixth patient, unfortunately developed metastatic lesion at the contralateral knee which mandates contralateral above knee amputation and her rehabilitation was complicated, then she developed systemic recurrences.

Conclusion:

Our series, is small, we are the first center in the Middle East to use this technology, we obtained excellent results in 5/6 patients. One obstacle is the high cost of the implant, and difficulty to be afforded by uninsured patients.
Liquid biopsy for monitoring paediatric Ewing sarcoma patients

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Abstract

Introduction. Recent advances in molecular biological technologies allow the detection of minute amounts of cell-free specifically tumor-derived DNA (ctDNA) in the blood plasma with high validity. Given the clinical need of a sensitive and specific biomarker in the monitoring of pediatric and adolescent patients with EWS, we focused on liquid biopsy for minimal residual disease (MRD) and performed a feasibility study that resulted in the recent implementation of ctDNA quantification in the clinical routine of high-risk EWS.

Patients and Methods. After sequencing of the whole genome of tumor tissue to define the exact breakpoints of the EWS-FLI1 fusion gene and collecting peripheral blood plasma samples at many time points before, under, and after therapy, we applied digital droplet quantitative PCR in six consecutive children and young adults with EWS in samples obtained at numerous occasions from initial manifestation to remission or relapse to correlate their ctDNA content to the disease courses. The genetic changes of the tumors were defined, and inter- and intra-individual changes of the tumor DNA copy loads were noted over time.

Results. In this study we show that the detection of ctDNA in peripheral blood of EWS patients, i) is feasible in the clinical routine, and, ii) allows for a longitudinal on-line monitoring of minimal residual disease activity in children and young adults. However, although very useful longitudinally per individual, the detected abundance of ctDNA molecules did not correlate to tumor sizes or other risk factors in our study; and ctDNA concentrations were not comparable inter-individually between the six patients described here.

Conclusions. This study proves the practical feasibility in the clinical routine to detect minute amounts of fusion gene breakpoint-containing DNA molecules in peripheral blood and correlate their abundance with the clinical courses of pediatric and adolescent patients with Ewing sarcoma in real time. In some instances, such molecular detection of residual disease preceded clinically overt relapse, warranting future application of ctDNA quantification as means to support disease monitoring and treatment stratification.
The experience of the Polish Group for the treatment of primary malignant bone tumors in children and adolescents in reconstructions with the use of growing endoprostheses.

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Abstract

Introduction: Meta-analysis of patients treated in the Polish group associated with the Polish Association of Oncological Orthopedics in the last 22 years.

Method: In 2000-2022, 322 children with primary bone tumors were treated. They there were 172 boys and 150 girls. The patient's age ranged from 4 to 25 years. The median was 13 years. Treatment was started with neoadjuvant chemotherapy. After reaching regression or stabilization of the primary lesion, patients were qualified for surgery.

It was a tumor resection and reconstruction with a growing prosthesis. Then adjuvant chemotherapy with or without treatment of metastases.

Results: In this study, the authors' own experience in implantation of various types growing endoprostheses made it possible to present the advantages and disadvantages of each type of growing endoprostheses. All data was displayed as a peer analysis of patients with different types of endoprostheses.

Conclusions: In conclusion, the authors published guidelines for the operation of servicing various types of growing prostheses.

Instead of conclusions, the authors presented recommendations for non-invasive limb lengthening:

1. careful qualification for operation
2. implantation receiver in soft tissue no more than 2 cm depth
3. start with lengthening quickly after treatment
4. procedures repeated at short intervals (50 pulses)
5. Extending the procedure on an outpatient basis
6. avoiding general anesthesia
7. risk minimization of infections within the endoprosthesis
3 epochs in the use of Implantcast growing endoprosthesis - Experience of the Polish Group for the treatment of primary malignant bone tumors

Dr Andrzej Szafranski¹,², Prof Daniel Kotrych²
¹The Children’s Memorial Health Institute, Warsaw, Poland. ²Pomeranian Medical University, Szczecin, Poland

Abstract

Introduction::Metaanalysis of the patients treated in the Polish Centers for Malignant Bone Tomors Treatment in last 22 years.in chikdres, adolescents and young adults

Methods:
From 2006 to 2022 250 Implantcast growing endoprosthesis were implanted. The age of the patient was from 4 to 25 years old. Median was 13 yrs. old. The treatment was begun from neoadjuvant chemotherapy. After achievement the regression or stabilization of primary lesion, the patients were qualified to surgery procedures. It was excision of the tumor end reconstruction by the using of the growing endoprosthesis in spite of young age of the patients.

Results:
2006 - 2007: age of trial and errors related to learning
2008 - 2017: an era of analysis and drawing conclusions
2018 - 2022: an era of practical knowledge and innovation
2006 - 2007: endoprosthesis - problematic lengthening 8/25 32.0%
2008 - 2017: endoprosthesis - problematic lengthening 13/146 9.0%
2018 - 2022: endoprosthesis - problematic lengthening 2/61 3.3%
total without mechanical problem 230/250 92%

Conclusions:
Indications for using growing endoprosthesis in children and adolescents
• Predicted range of growth more than 2 cm in resected area of the bone. If less than 2 cm it is possible to use modular system.
• Resection of growth plate in children patients is indication to implantation of growing endoprosthesis. Without resection (when tumor is located in the middle part of the diaphysis of a long bone) you can use non growing solution.
• Each patient should be consulted by anthropologist with forecast of estimated length of bone growth.
• The choice of right type of growing endoprosthesis depends on the result of anthropological consultation.
• To appropriate working of electric motor in growing endoprosthesis the total body weight of patient should not exceed 75 kg (165 lbs.).
Cases of osteosarcoma in children and adolescents with primary lesions located in the thoracic region.

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Abstract

Introduction: Osteosarcoma (OS) is the most common primary bone cancer diagnosed in children and adolescents. It is more often found in children taller than the average, as well as in children who have had retinoblastoma or in the area after prior irradiation. The peak incidence is between the age of 15 and 19. Osteosarcoma occurs with the frequency of 3.1 new cases per 1 million children per year, which means that in Poland approximately 30-35 new cases are diagnosed each year. Unfortunately, metastatic changes are found in more than half of the patients at diagnosis. The lungs are the most common site of metastasis, followed by other bones and the central nervous system. Currently, the treatment of osteosarcoma (developed on the basis of previous clinical trials) is combined. This treatment includes chemotherapy (CHT) and surgery. Doing so gives the best chance of a full recovery. Currently, patients with localized disease (disease in one place) can achieve a cure rate of 65-70%, which means that 6.5-7 children out of 10 will be completely healthy. Unfortunately, in the case of coexistence of other disease foci (so-called metastatic lesions), this% is much lower. That is why it is so important to detect the disease early and treat it properly.

Method: The primary focus is most often located in long bones such as the femur, tibia, and humerus. Less commonly, a primary outbreak can be found in other locations. The paper presents 2 cases of osteosarcoma with a primary focus located in atypical locations.

Results: In a 12-year-old patient, the primary focus was located in the sternum. In a 17-year-old patient, it emerged from the 8th left rib. In both cases, the diagnosis was confirmed by open biopsy. Treatment was started with neoadjuvant chemotherapy according to Euramos program. After 10 weeks of preoperative treatment, imaging studies confirmed the regression of the neoplastic process. In the first case, the body of the sternum was resected and the chest was reconstructed using the STRATOS system. In the second case, the 8th rib was resected together with the tumor and adjacent ribs 7 and 9 in order to obtain the appropriate excision margin. The reconstruction of the chest wall was performed using a Goretex patch and muscular plastic surgery. Both patients after the procedure were circulatory and respiratory efficient, and the postoperative wounds healed flawlessly.

Conclusion: Even in atypical location of the primary osteosarcoma, there are methods of reconstruction after excision of the bone tumor based on new technologies that have found application in reconstructive surgery. Reconstruction results obtained in these two cases allowed for the normal functioning of the operated patients.

Poster upload

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Silver-coated megaprostheses (PorAg®) can be protective against reinfection in the treatment of oncologic prosthesis infection.

Dr Andrea Sambri¹, Dr Michele Fiore¹, Dr Claudio Giannini¹, Dr Riccardo Zuchini¹, Dr Matteo Filippini¹, Prof Davide Maria Donati², Dr Massimiliano De Paolis¹

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Abstract

INTRODUCTION

Silver-coated implants have shown encouraging results in reducing the reinfection rate for the treatment of endoprosthetic infections (EPR) around the knee. The aim of this study was to evaluate the use of silver-coated prostheses (PorAg®) versus titanium ones in the two-stage revision for periprosthetic infection (PJI) of knee EPR.

METHODS

68 patients with EPR PJI were included. The mean age was 30 years (range 14-83). 29 patients were re-implanted with PorAg® prostheses and 39 with titanium prostheses. Successful eradication of infection was defined by the absence of clinical/serological evidence of infection at 6 months after the second stage or at the last follow-up. Recurrence of infection/reinfection was defined according to MSIS criteria.

RESULTS

At 3 years follow-up, the estimated reinfection rate in the silver group was slightly lower than that of uncoated EPR (10.3% vs 17.5%, p = 0.104). Among reinfected patients, only one out of three patients (33%) in the silver group required an amputation compared with 80% in the non-silver group (p = 0.047).

CONCLUSIONS

Our results demonstrate the efficacy of the PorAg® in the two-stage revision of knee mega-prosthesis infections and may have possible advantages over the traditional strategy, particularly when applied to patients with a higher risk of reinfection. Furthermore, it appears that even in the case of recurrent PJI, the silver coating may lead to a greater chance of limb salvage.
INTRODUCTION

Soft tissue sarcomas (STS) of the limbs are characterized by great variability in histology, size and grade, which have all been studied as possible prognostic factors. However, the correlation between tumor closeness to major vessels and prognosis has never been analyzed in previous studies.

The aim of this study was to establish the prognostic effects of the proximity of the tumor to the main vessels in patients affected by soft tissue sarcomas (STS) of the thigh.

METHODS

529 adult patients with deeply seated STS of the thigh and popliteal fossa were included.

Vascular proximity was defined on MRI: type 1 > 5 mm; type 2 ≤ 5 mm and > 0 mm; type 3 close to the tumor; type 4 enclosed by the tumor.

The Kaplan-Meier method was used to estimate OS and LR-free survival.

RESULTS

Proximity to major vessels type 1-2 had a local recurrence (LR) rate lower than type 3-4 (p<0.001). In type 4, vascular by-pass reduced LR risk. On multivariate analysis infiltrative histotypes, high FNCLCC grade, radiotherapy administration, and type 3-4 of proximity to major vessels were found to be independent prognostic factors for LR.

CONCLUSIONS

We observed an augmented risk of recurrence but not of survival as the tumor was near to the major vessels. When major vessels were found to be surrounded by the tumor on preoperative MRI, vascular resection and bypass reconstruction offered a better local control.
Anatomical and reverse megaprosthesis in proximal humerus reconstructions after oncologic resections: a systematic review and meta-analysis

Dr Michele Fiore, Dr Andrea Sambri, Dr Claudio Giannini, Dr Riccardo Zucchini, Dr Lorenzo Morante, Dr Claudia Rondinella, Dr Matteo Filippini, Dr Massimiliano De Paolis
IRCCS Azienda Ospedaliero-Universitaria di Bologna, Bologna, Italy

Abstract

INTRODUCTION

Anatomic (AN) Endoprosthesis (EPR) reconstructions of the shoulder after intra-articular proximal humerus (Malawer type 1) resections are characterized by early recovery and low complications rate. However, shoulder instability and limited mobility can occur. Reverse shoulder (RS) EPR has been introduced to improve functional outcome. The aim of this systematic review is to evaluate shoulder reconstructions with AN or RS EPR after Malawer type 1 resection, comparing complications and functional results.

METHODS

Through an electronic systematic search of PubMed, articles concerning EPR after shoulder Malawer type 1 resections were reviewed. Complications rate, range of motion (ROM) and functional outcome (Musculoskeletal Society Tumor Society—MSTS score) of AN and RS EPR were evaluated.

RESULTS

Sixteen studies were included. A similar complication rate was observed between AN and RS EPR rate (26.4% and 22.4%, respectively, p = 0.37). Soft tissue failure was the most frequent complication and cause of revision in both groups. Mean post-operative flexion and abduction ROM and MSTS scores were significantly higher in RS EPR, particularly among patients with preserved deltoid function (p = 0.013, p = 0.025 and p = 0.005, respectively).

CONCLUSIONS

Anatomic and reverse shoulder EPR represent safe and effective implants for shoulder reconstruction, with similar implant stability and complication rates. RS EPR significantly improves post-operative ROM and functional outcomes, especially when at least a partial function of the abductor apparatus is preserved.
Comparison of different reconstruction techniques after distal tibial resection for primary bone cancer.

Dr Andrea Sambri\textsuperscript{1}, Dr Michele Fiore\textsuperscript{1}, Dr Maurizio Scoriantz\textsuperscript{2}, Dr Claudio Giannini\textsuperscript{1}, Prof Davide Maria Donati\textsuperscript{3}, Prof Domenico Andrea Campanacci\textsuperscript{2}, Dr Claudia Rondinella\textsuperscript{1}, Dr Lorenzo Morante\textsuperscript{1}, Dr Massimiliano De Paolis\textsuperscript{1}

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Abstract

INTRODUCTION

There are currently no guidelines for reconstruction of the distal tibia after resection of a primary bone tumor. The aim of this multi-center retrospective study is to compare intercalary tumor resection (ITR) with epiphysis preservation, with osteoarticular reconstruction (OA) and ankle arthrodesis (AA), both tibiotalar (TT) and with combined tibiotalar and subtalar fusion (TTC).

METHODS

73 patients were included (median age 19 years, range 7-74). DT reconstructions included ITR in 17 cases, OA in 11 and 45 AA (38 TT and 7 TTC).

RESULTS

A total of 8 (10.9\%) patients developed an LR after a median of 14 months (range 7-43). A similar incidence of LR was observed in the other two groups. Fracture of the graft was the most frequent complication requiring surgery, all occurring in cases with a homologous graft only. All patients (7) suffering non-union of the proximal osteotomy recovered after treatment with autologous bone graft. In the OA group, three patients developed severe arthritis, but only one required conversion to TTC AA. At final follow-up (median 77 months) in the ITR group, both MSTS (median 29) and AOFAS (median 85) were higher than in OA (22 and 70), TT AA (24 and 76), and TTC AA (24 and 78).

CONCLUSIONS

Preservation of the epiphysis in distal tibial tumors is a safe and effective limb salvage treatment. When sparing joint resection is not indicated, AA should be preferred over OA. Both TT AA and TTC AA showed good results, with no functional differences between them.
Prevalence and characteristics of benign cartilaginous tumours of the knee joint as identified on MRI scans.

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Abstract

Introduction

Enchondromas (EC) and atypical cartilaginous tumours (ACT) of the knee joint represent benign/intermediate chondromatous neoplasms of the bone that are most commonly discovered incidentally. Based on small to intermediate-sized cohorts, the prevalence of cartilaginous tumours of the knee as visible in MRI is estimated at 0.2% to 2.9%. This study aimed at verifying/challenging these numbers via retrospective examination of a larger, uniform patient cohort.

Method

Between 01.01.2007 and 01.03.2020, 44,762 patients had received an MRI of the knee for any indication at a radiologic centre. Of these, 697 patients had MRI reports positive for cartilaginous lesions. Forty-six patients were subsequently excluded, resulting in 651 patients eligible.

Results

Of 44,762 patients, 651 presented with at least one EC/ACT indicating a prevalence of 1.45% for benign/intermediate cartilaginous tumours of the knee joint (EC: 1.43%; ACT: 0.02%). As 21 patients showed 2 chondromatous lesions at the same time, altogether 672 tumours (663 ECs (98.7%) and 9 ACTs (1.3%)) could be analysed in terms of tumour characteristics: With a mean size of 1.6 ± 1.1 cm, the majority of lesions was located in the distal femur (72.9%), in the metaphysis of the respective bone (58.9%) and centrally in the medullary canal (57.4%).

Conclusions

This study revealed an overall prevalence of 1.45% for cartilage lesions around the knee joint. Of all cartilaginous tumours diagnosed on MRI, 1.3% exhibited features indicative of ACT. Whilst a constant increase in prevalence was found for ECs over 13.2 years, prevalence remained constant for ACTs.
The effect of implant type on re-operation rates following endoprosthetic reconstruction surgery

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McMaster University, Hamilton, Canada

Abstract

Background

Prospective evidence supporting the use of cemented or uncemented implants in endoprosthetic reconstruction is lacking. This study aims to determine the effect of cement fixation compared to cementless fixation on all-cause reoperations one year post-operatively.

Methods

The Prophylactic Antibiotic Regimens In Tumor Surgery (PARITY) trial was a multi-centre, randomized controlled trial using a parallel two-arm design. Six hundred four patients ≥12 years of age undergoing surgical excision and endoprosthetic reconstruction of a lower extremity primary bone tumor were randomized to receive either long- or short-duration post-operative prophylactic antibiotics. Participants were followed post-operatively at regular intervals for one year. This secondary analysis utilized a multivariate cox proportional hazards model to assess the independent relationship between fixation group and implant survivorship with all-cause revision as the endpoint.

Results

A total of 529 patients were included in the analysis. There were 396 cemented implants and 133 uncemented implants. Patients undergoing cement fixation were significantly older and were more likely to have a diagnosis of metastatic bone disease. There were no significant differences found in all-cause reoperation (HR:0.99, 95%CI:0.65 – 1.51, p=0.952), septic reoperation or aseptic reoperation between cemented and uncemented fixation one year post-operatively. Significant predictors of outcome were total operative time, length of incision, diagnosis of benign aggressive disease or metastatic bone disease.

Conclusions

Cement fixation compared to cementless fixation has no effect on all-cause reoperation rates in endoprosthetic reconstruction surgery. Surgeons should consider the most efficient fixation type in oncologic populations in order to reduce risk of revision.
5-ALA-dependent fluorescence of musculoskeletal tumors in a chick chorio-allantoic membrane model

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Abstract

Introduction

Protoporphyrin IX (PPIX) is an intermediate substance in hemoglobin biosynthesis that accumulates in tumor cells after exogenous addition of 5-aminolevulinic acid (5-ALA). It is fluorescent when excited using blue light. Therefore, 5-ALA has gained importance as a fluorescence-guided surgery agent (FGS). It is the purpose of this study to investigate the 5-ALA-mediated fluorescence of musculoskeletal tumors in a chick chorio-allantoic membrane (CAM) model and determine its applicability in Orthopedic Oncology.

Methods

Fertilized chick eggs (n=486) were incubated at 37.8° Celsius and a humidity of 60%. On ED 10, fresh tumor aliquots of twenty-six patients were grafted on the CAMs. On ED 16, the tumors were topically applied with 200µl of 5-ALA (2mg). After four hours of incubation, PPIX excitation (420±10nm) and fluorescence were documented. Egg embryos were sacrificed on ED 16 and tumor specimens processed for histopathological examination.

Results

Tumor fluorescence was visible in 79.8% of tumor grafts. Viable tumor was confirmed by histopathological analysis in 14.8%, partially viable in 2.9% and partially to completely regressive in 45.2% of specimens. Tumor entities with high rates of tumor fluorescence were chondroblastoma, giant cell tumor of bone, atypical chondrogenic tumor, chondrosarcoma, osteosarcoma, Ewing’s sarcoma, dedifferentiated liposarcoma, myxofibrosarcoma and undifferentiated pleomorphic soft tissue sarcoma.

Conclusion

Due to a high rate of tumor fluorescence of musculoskeletal tumors despite a high rate of partially regressive tumors, 5-ALA warrants further research as a possible FGS agent. In addition, the CAM model shows merit as an in-vivo 3R compliant alternative to rodent experiments for musculoskeletal tumors.
Artificial Intelligence Algorithm can predict the clinical course of Desmoid Tumors using Baseline MRI- A Feasibility study

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Abstract

Introduction:

Desmoid tumors (DT) are soft tissue mesenchymal neoplasms that are considered locally aggressive but non-metastasizing. When they enlarge in size they often become locally invasive and cause significant morbidity. DT has a varied pattern of clinical presentation, up to 50% to 60 % of DTs do not grow after diagnosis, and 20% to 30% may shrink or even disappear after an initial progression. Tumors that enlarge in size are considered unstable/progressive. Management of unstable disease, symptomatic and enlarging DTs, is challenging. It is primarily treated with chemotherapy. Despite wide surgical resection, DT has a high rate of local recurrence, as high as 50%. There is a consensus that contrast-enhanced MRI or alternatively CT is the preferred modality for monitoring DTs, using Response Evaluation Criteria in Solid Tumors version 1.1 (RECIST 1.1) which measures the largest diameter on axial, sagittal or coronal series, which, according to previous studies, lacks the accuracy in detecting response to therapy nor predict tumors that might progress. Therefore, the need for a more sophisticated methods are deemed a necessity. The objective is to detect unique features identified by deep learning which correlate with the future clinical course of the disease.

Methods:

Fifty-one patients (mean age 33.8 years) were included in this retrospective single center study who had a tissue diagnosis of Desmoid tumor. The study included 28 males (13 stable) and 23 females (15 stable), the age range from 19 to 84 years. Patients had at least 3 MRI examinations with a baseline (pretreatment) study and were followed for a median time of 38.8 months by orthopedic oncology specialists. Tumor segmentations were performed on T2 fat suppressed treatment-naive MRI sequence, the segmented lesion then extracted to 3D file together with its DICOM file and then run through deep learning software. Results of the algorithm were then compared to clinical data collected from the patients' medical files.

Results:

There were 23 unstable and 28 stable patients. Our model was able to independently predict clinical progression using the baseline MRI with overall accuracy of 93% (93+-0.04) and ROC of 0.89+-0.08.

Conclusion:

Artificial Intelligence may contribute to risk stratification and clinical decision-making in patients with DT, by predicting patients who are likely for progress.
MUSCULOSKELETAL ONCOLOGY: PATIENT TRIAGE AND MANAGEMENT DURING THE COVID-19 PANDEMIC.

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Abstract

Introduction.

Sarcoma treatment during the covid-19 pandemic is a new challenge. This patient population is often immunocompromised and potentially more susceptible to viral complications. Government guidelines highlight the need to minimize patient exposure to unnecessary hospital visits. However, those guidelines lack practical recommendations on ways to manage triage and diagnosis expressly for new cancer patients. Furthermore, there are no reports on guidelines efficiency. One of the main issues in treating musculoskeletal tumors is the complexity and variability of presentations.

Method.

We offer a triage model, used in a quaternary-referral musculoskeletal oncology center, that allows us to maintain an open pathway for referral of new patients while minimizing risk exposure. A multidisciplinary approach and analysis of existing investigations allows for a pre-clinic evaluation. The model identifies 3 groups of patients: 1- Patients with suspected high-grade malignancy, or benign cases with aggressive features, both in need of further evaluation in the clinic and prompt treatment. 2- Patients with low-grade malignancy, and benign cases whose treatment is not urgent, that are managed during the pandemic by telemedicine, with reassurance and information about their illness. 3- Patients who can be managed by their local medical professionals in comparison to a pre-pandemic period.

Results.

During the period between 17 March and 8 May 2020, 155 follow-ups and 96 new referrals [27 new malignancies (28%), 69 new benign conditions (72%)] received services. When comparing new clinic visits, a malignant condition was confirmed in 16 of 37 visits (43%) compared to a similar pre-pandemic period in 24 of 93 visits (26%). The ratio of malignant to benign conditions was thus higher among new patients seen in the clinic during pandemic (3:4) compared with pre-pandemic (1:3). Those data reflect the efficient redirection of resources toward prioritizing malignant cases.

Conclusion.

Managing patients with cancer during the covid-19 pandemic creates many challenges. Making sure that every patient is treated according to his or her individual needs demands rethinking and optimization of everyday routines. Obtaining diagnoses promptly, and managing and treating new patients efficiently are steps crucial for minimizing the impact of the pandemic on this already high-risk group. A triage protocol with a pre-clinic evaluation and reorientation system is an effective way to maintain an open pathway for new referrals with a malignancy. Although patients with musculoskeletal tumor are a distinct group, we believe that our systematic triage system could be applied in other fields of surgical oncology.
PROGNOSTIC FACTORS AFFECTING SURVIVAL OF PATIENTS WITH PRIMARY MUSCULOSKELETAL SARCOMAS FOLLOWING PULMONARY METASTASECTOMY

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Abstract

Introduction

As of today, pulmonary metastasectomy (PM) is the therapeutic treatment of choice to offer a curative treatment for sarcoma patients with pulmonary metastases. Unfortunately, many patients are not suitable for PM due to metastasis extent and location, ability to obtain a complete metastatic resection, pleural cavity extension or patient general health status. Even though many prognosis factors for surgical success have been identified in the literature, no consensus have been reached and patient selection modality for this procedure is still controversial. The purpose of this study is to optimize selection criteria for candidates that could benefit from a surgical procedure for sarcoma pulmonary metastases.

Method

We retrospectively collected and reviewed medical records of patients from the 3 recognized sarcoma centers of the province of Quebec diagnosed with pulmonary sarcoma metastases, who underwent a PM procedure between 01/01/2009 to 01/01/2019. The primary objective was to identify factors that may have an impact on the patients’ overall survival (OS). The secondary objective was to define factors that may have an impact on the patients’ event-free survival (EFS) after Metastasectomy PM and, by doing so, help select patient who would truly benefit from aggressive surgical removal of pulmonary metastases.

Results

Patients who develop asynchronous pulmonary metastasis had significant better OS (p=0.032) compared to synchronous pulmonary disease. The mean estimated OS for patients with synchronous metastasis was 33 months compared to 64 months for asynchronous. Significant better OS (p=0.022) was also found for unilateral vs bilateral metastasis. Recurrence of pulmonary metastasis occurred in 42 (75%) of patients, local recurrence or distant metastasis in 11 (15%) patients. A statistically significant correlation was also found between histology and EFS (p=0.003). All patients with positive margins developed an early pulmonary recurrence. Vascular involvement of resected metastasis had a significant impact on EFS.

Conclusions

The decision to perform a PM should be considered on a case-by-case basis in a multidisciplinary forum. We presented practical recommendations for patient selection for PM. Patients with asynchronous appearance, unilateral disease, less than 4 metastases, and metastasis diameter smaller than 20 mm should be considered for a PM. Repeated PM for later recurrences should be considered as they can still
lead to long lasting survival.
REFERRAL DELAYS OF QUEBEC SARCOMA POPULATION: A PROSPECTIVE COHORT STUDY.

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Abstract

Introduction.

In order to better understand the issues surrounding referral patterns and delays of all musculoskeletal tumors requiring treatment in tertiary sarcoma center a prospective cohort study was implanted in Quebec (Canada) in 2011. The primary goal of this study was to determine referral times and identify elements that contributed to unacceptable delays, particularly for the high-grade sarcoma sub-group. The second objective was to correlate delay in referral time to oncological outcomes. We hope that this would enable us to make constructive recommendations to improve sarcoma patient outcomes by implanting defined provincial referral pathways.

Method.

A analysis of a prospective cohort study was conducted in one of three sarcoma centers in Quebec, from September 2011 until March 2020. The study received institutional ethic review board approval. We included patients who were referred from any source for a suspected sarcoma that needed a follow-up appointment by our team, control imagery or surgical treatment. Patients with one of the following criteria were excluded: age < 12 years old; nononcologic final diagnosis; benign lipoma < 5 cm; estimated survival < 6 months; Inability to consent, refused to participate. After diagnosis, tumors were graded as benign or malignant, and the later as low (grade 1) or high (grade 2-3). Non oncological condition at final diagnosis, that needed musculoskeletal surgeon expertise and treatment, were included in this study and assigned as benign. All participants completed a dedicated questionnaire that included: Dates of initial symptoms, first medical consultation and first imaging study, Number of consultations with 2nd line specialists, prior treatments to referral and report of number and type of imaging studies (MRI, CT scan, ultrasound, PET scan). Clinical data were extracted from medical records. Histology subtypes and oncological status were recorded initially and for the Following 5 years. Results were categorized in two groups: a low-risk group (benign lesions and grade 1 lesions), and a high-risk group (grade 2 and 3 lesions).

Results.

Delays from first medical consultation to sarcoma center referral of >25 weeks were found in 45% of patients, >52 weeks in 26% of patients. Time from first medical consultation to first imaging study was the most important source of delay (39.7 weeks for low-grade and 36.9 weeks for high-grade tumors) representing 45% of the total delay. 67% of patients were inappropriately directed to more than one specialist before referral to the sarcoma center. Inadequate imaging had to be repeated in 51% of MRI exams and 18% of CT scans. In the high-risk group, 21% of patients were already metastatic at the initial orthopedic-oncology consultation. Another 22% developed metastases during the 5-year followup period. In 17% patients in the high-risk group, an unplanned primary excision (“Whoops” surgery) occurred. For this subgroup, revision surgery was needed in 87% of cases.
Conclusions.

This study is the first to analyze referral delays of patients with musculoskeletal tumors in Quebec. Its strengths are in its prospective nature and long (9 year) surveillance period. We were able to quantify referral times and locate sources of delays. Our findings revealed two main reasons for unacceptable delays: Time to obtain the first imaging study, and inappropriate referrals to other specialists or centers. To address these issues a Quebec sarcoma referral network was created and guidelines for patient evaluation and imaging with defined timelines were published. We expect these measures will improve patient outcomes and health care resource utilization.

Poster upload

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Prognostic influence of rejection of (neo-)adjuvant sarcoma therapy

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Abstract

Introduction
Evidence-based and recommended non-surgical forms of therapy, such as radiation or chemotherapy are rejected by the patient in some cases. Aim of this monocentric retrospective study was to evaluate the rejections, the reasons for this decision of the patient and the prognostic influence on local recurrence rate and survival.

Methods
828 patients with surgically resected soft tissue (609, 74%) or bone sarcomas (219, 26%) between 2012 and 2019 were included. Median age was 55 years (2-99), typical tumor entities were Undifferentiated Pleomorphic Sarcoma (UPS) 20%, Liposarcoma 18%, Chondrosarcoma 14%, Osteosarcoma 10% and others. Evaluated factors were the recommended adjuvant therapy, whether this was carried out and, if so, why not, as well as local recurrence rate, metastasis rate and overall survival.

Results
Of 828 surviving patients, only 23 (3%) had less than 12 months of follow-up. (Neo-)adjuvant RTX was recommended in 407 (49%). 367 (90%) received these 18 (6%) patients refused. Other reasons for non-therapy were the death of the patient (n=7), wound complications (n=9), advanced disease (n=4), or unknown (n=2). With exclusion of deceased patients or those with progression prior to RTX overall survival and local recurrence-free survival were significantly reduced.
Chemotherapy was recommended neoadjuvant in 262 (32%) patients, 40 (15%) did not receive it. The main reasons were rejection by the patients or progress (n=17 each). Adjuvant CTX was advised in 72 patients without neoadjuvant CTX, 29 (40%) did not receive it. In 193 of 222 patients treated with neoadjuvant CTX, additional adjuvant CTX was advised. In 15 (8%) cases this was not performed. Reasons were in the majority (59%) refusal by the patient.
Overall survival was in case of rejection significantly reduced (p = 0.0038). Local recurrence-free survival was also worse (p=0.0324).

Conclusion
There is a small proportion of patients who decline radiation or chemotherapy in addition to surgical resection of the tumor (6% and 9%). Also disease progression or wound complications are major factors for not applying. Refusal by the patient may be triggered by general condition or age (bias of the study!). But in any case local recurrence-free and overall survival are significantly deteriorated.
In vivo massive bone allografts decellularized by a new perfusion process: preliminary results

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Abstract

Introduction:

Used for large orthopedic reconstructions, massive bone allografts show a >50% complication rate requiring surgical revision in 20% cases. Most of the problems can be related to a lack of biology within the graft. A massive bone allograft perfusion-decellularization protocol was developed and tested in a porcine model of bilateral femoral critical size bone defect. The purpose is to compare osseointegration physiology of a classic massive bone allograft versus decellularized one.

Methods:

A 2,5cm critical bone defect was performed in both femurs of 4 minipigs. Each side was implanted with either a classic or a decellularized massive bone allograft. Both grafts were paired as they came from the same donor and were precisely cut with cutting guides to fit the bone defect. Osteosynthesis consisted in an orthogonal LCP plating. CT-scans and X-rays were performed fortnightly to assess bone consolidation. The allografts were harvested at three months post-op or when the radiological consolidation was achieved.

Samples were examined macroscopically. Histology is ongoing.

Results:

2 allografts were harvested after 1 month (non-septic unknown cause of death), another two after 2 months and the four lasts after 3 months.

CT does not show clear difference between the time to fusion of both grafts. However, we qualitatively observed a better mineral consolidation on decellularized grafts. Furthermore, macroscopic observations show larger amount of osteoid matrix through the fusion plan, around and into the decellularized graft.

Conclusions:

Decellularization can improve massive bone graft osseointegration. Histological and biomechanical confirmation is ongoing.
Intercalary reconstruction with Vascularized Fibula after resection for Primary Bone Tumors of the Humerus

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Abstract

Introduction: Reconstruction with intercalary vascularized fibula grafts (VFG) after resection of the humerus may provide rapid biologic incorporation, spontaneous healing potential after fracture and the ability to hypertrophy under mechanical stress, even in compromised soft tissue area due to chemo and/or radiation therapy. The purpose of this study was to review long term results of our series of VFG reconstruction after intercalary resection of the humerus for primary bone sarcomas.

Method: Eighteen patients were treated in our Unit for primary bone tumors with intercalary resection of the humeral diaphysis and reconstruction with VFG. The mean age at the surgery was 25 (2 - 63) years.

Results: Mean Follow-Up was 156 (13 - 262) months. Mean humeral resection length was 14 (8 - 21) cm, while mean fibular resection length was 17 (12 - 23) cm. In 13 cases VFG was used alone while in 5 cases it was associated with massive allograft. Fourteen complications were reported in 11 patients, but revision surgery was required only in 7 (1 radial nerve transitory palsy, 4 non-union in three patients, 1 humeral head aseptic necrosis, 2 VFG fractures). VFG removal was needed only in one case. One patient was DOD while 17 patients were alive without evidence of disease. At last clinical control mean MSTS score was 29/30 (27 – 30).

Conclusions: Despite the high rate of mechanical complications in the first years, VFG represents a long-term durable reconstructive option with excellent functional results after humeral intercalary resection for primary bone tumors.
Incidental benign bone tumors on knee radiographs

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Abstract

Introduction

Benign bone tumours localized around the knee are common incidental findings in children and young adults during radiographic evaluation. This study aimed to investigate the prevalence and features of incidental benign bone tumours on knee radiographs in children and young adults according to age

Method

After a retrospective review of 296 patients who visited the orthopaedic outpatient clinic of our faculty hospital without a sign of a bone tumour around the knee between January and April 2022, a total of 38 patients younger than 35 years of age were included. We evaluated the knee radiographs and examined the prevalence, type of incidental benign bone tumours, and radiological features.

Results

The mean age of the 21 male and 17 female patients was 17.5 years (range, 7 years to 34 years). Thirty-eight benign bone tumours were identified including 23 non-ossifying fibromas (NOF) or cortical fibrous defects (CFD), 9 osteochondromas, 3 enostoses, 2 fibrous dysplasia, and 1 enchondroma. The prevalence of incidental benign bone tumours of the knee was 12.8%. The most common incidental benign bone tumour was NOF or CFD with a prevalence of 7.8% and was more frequent in the second decade of life, followed by osteochondroma (3%).

Conclusions

This study defines the incidental benign bone tumours on knee radiographs in children and young adults and provides useful evidence and information from a perspective of an orthopaedic doctor. We recommend considering these incidental benign bone tumours and their features around the knee if unfamiliar findings appear or when counselling patients and their families.
Post-treatment tumor necrosis in soft tissue sarcoma following neoadjuvant therapy - what is the role of chemo- and radiotherapy? What does it mean for the prognosis?

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Abstract

Background

Wide resection, with or without neoadjuvant chemo- or radiotherapy is widely accepted as the gold standard in the treatment of soft tissue and bone sarcoma. The postoperative tumor necrosis is often used as a measurement for the tumor’s response to the neoadjuvant therapy. There are many studies showing its effectiveness as a predictive factor in osteosarcoma and Ewing’s-Sarcoma, however, there is little data concerning soft tissue sarcoma. Furthermore, it’s unclear if radiotherapy or chemotherapy has the bigger impact on tumor necrosis.

Methods

Between 2012 and 2021 779 musculoskeletal sarcomas have been operatively resected at our institution with curative intention. We retrospectively evaluated these patients for diagnosis, localization of the tumor, tumor size, operative and non-operative treatment as well as histological tumor necrosis. All patients were followed up for survival, local recurrence, or metastasis. The overall-, as well as the local recurrence free survival have been calculated and tested for significance.

Results

Of the 411 men and 368 women (total n=779) 565 had a soft tissue sarcoma (STS) and 214 a bone sarcoma (BS). 229 of the patients with an STS had either neoadjuvant radiotherapy (n=80), chemotherapy (n=93) or both (n=51). 90 patients with BS had either neoadjuvant radiotherapy (n=1), chemotherapy (n=81) or both (n=8). Tumor necrosis was higher in patients with BS and STS after neoadjuvant therapy. The highest tumor necrosis was found in patients with both, radio- and chemotherapy. Patients showed higher tumor necrosis after receiving chemotherapy compared to radiotherapy. In our population there was no significant correlation between tumor necrosis and overall survival.
Conclusion

In conclusion there was a significant correlation between the patient’s tumor necrosis and the different forms of neoadjuvant therapy. However, in contrast to osteo- and Ewing’s-sarcoma, there was no significant correlation between tumor necrosis after neoadjuvant therapy and overall survival in patients with STS. Therefore, the effectiveness of the tumor necrosis as an indicator for tumor response to neoadjuvant therapy and especially as a prognostic factor could not be proven in patients with STS.
**Unplanned resections of soft tissue sarcomas - is further surgery necessary in every case?**

Dr Julian Fromm¹, Dr Alexander Klein¹, Ms Maja Kirilova¹, Prof Christof Birkenmaier¹, Prof Boris Holzapfel¹, Dr Silke Nachbichler², Prof Lars Lindner³, Dr Sophia Samira Golelr⁴, Prof Hans Roland Dürr¹

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**Abstract**

**Introduction**

Wide resection with or without (neo-) adjuvant radio- or chemotherapy is the gold standard in management of unplanned (maybe incompletely) resected soft tissue sarcomas. However, in the last years there has been a controversial debate about the necessity of surgical re-resection. Assuming that surgical interventions lower the rate of local recurrence after unplanned sarcoma resections, some studies have shown no benefit for overall survival or event-free-survival compared to radiotherapy alone or watchful waiting.

**Method**

We retrospectively analyzed all patients treated for soft tissue sarcomas between 2012 and 2021 at our institution. Included were all patients with R1-resected soft tissue sarcomas, that had a second surgery and all patients with R1-resected soft tissue sarcomas, that were treated with radio- or chemotherapy, but without further surgical resection. We analyzed diagnosis, tumor location, size and treatment. All patients were followed regarding survival, local recurrence, or metastatic disease. Overall- and local recurrence-free survival were correlated with the befomenioned parameters.

**Results**

185 patients were treated between 2012 and 2021 at our institution after an incomplete (R1) resection of a soft tissue sarcoma. Out of those 156 patients had another surgical resection (group A), 29 patients were treated with radio- and/or chemotherapy alone (group B). Mean age was 57 (group A) and 60 (group B) years, respectively. The most frequent diagnosis was Undifferentiated Pleomorphic Sarcoma in 28% of the patients (n=51), followed by myxofibrosarcoma in 16% (n=29). 8% of the patients with surgical therapy and 14% of the patients treated with radio-/chemotherapy alone developed local recurrence (p=0,2844). Both, local recurrence free survival and overall survival showed a tendency towards a worse outcome in the non-surgically group, but there was no significance for that.

**Conclusion**

While there is a tendency towards worse overall survival and a higher rate of local recurrence in patients without surgical reintervention, there was no statistical significance. This could be due to the heterogeneity of the two groups or the group size. The question whether radio-/chemotherapy alone without surgical intervention is sufficient after incomplete resections in soft tissue sarcoma patients continues to be unanswered. However, no advantage of either treatment group could be shown either.
A case report of aneurysmal bone cyst of the proximal ulna treated with allograft resection after neoadjuvant targeted therapy

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Abstract

Introduction

Aneurysmal bone cysts (ABC) are typically osteolytic, cystic lesions filled with blood. In rare instances, those cysts exhibit solid architecture, making the clinical, radiological, and histological differentiation from other bone tumors like giant cell tumor, a difficult task. This paper reports the case of an 11-year-old male affected by an aneurysmal bone cyst of the proximal ulna.

Methods

Based on the original histological examination (Giant cell tumor) and in vitro results of our previous study, neoadjuvant therapy using denosumab in combination with sunitinib was applied. Despite firstly considering amputation, a limb salvage allograft procedure was indicated. The final histology report described ABC which was confirmed using immunohistochemistry.

Results

Denosumab treatment in combination with sunitinib targeting osteoclast-like giant cells and stromal cells caused surrounding calcified rim and reduction in tumor size to facilitate en bloc resection. Clinically, the patient achieved almost full extremity activity and there were no signs of allograft failure or local recurrence of the tumor in the last follow-up radiographic results.

Conclusion

In this case, the ABC showed a good response to neoadjuvant therapy using denosumab in combination with sunitinib. Resection and replacement with bone allograft exhibited encouraging functional outcomes. Considering the patient’s age, this combination of systemic and surgical therapy seems optimal in locally advanced ABC treatment.

Poster upload

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DOES THE OSTEOSYNTHESIS AFFECTS THE COMPLICATION RATE IN INTERCALARY FEMUR ALLOGRAFT RECONSTRUCTIONS

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Abstract

Introduction: At long follow-up the main cause of failure for allografts is fracture. The purposes of this study were (1) to analyze complications of intercalary femur allografts with a minimum of ten years of follow-up; (2) to determine if location, osteosynthesis and per cent of resection is correlated with these complications.

Methods: 67 patients treated with intercalary bone allografts were reviewed. Minimum follow-up was 10 years unless death occurred earlier (mean FU 152 months). No patient was lost to follow-up. The mean resection was 16 cm (range 8-37 cm). 13 patients were stabilized with nails and 54 with plates and screws.

Results: 19 fractures were documented (28%), that occurred at mean time of 54 months (range 10-144) being the main cause of failure. We found no differences in fractures rate regarding age, gender, chemotherapy, fixation, location, or percent of resected bone. Out of 134 osteotomies analyzed, 16 presented a nonunion (12%). We found more nonunion with the use of nails (p=0.00038), and in diaphyseal osteotomies (p=0.0049).

Conclusions: The main cause of failure of massive bone femur intercalary allografts was fracture. After mid-term of follow-up, fracture begin to arise as a failure cause, that is somehow misinterpreted in short long-term studies. We found no relation with fractures with the variables analyzed. Regarding nonunion we found higher rates in diaphyseal osteotomies and when an intramedullary nail was used. We consider fixation with plate and screws the better option for intercalary allograft reconstruction.
Chondrosarcoma of the chest wall: A single-institution review of 50 cases

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Helsinki University Hospital, Helsinki, Finland

Abstract

Introduction

Chondrosarcoma (CS) is most common primary osseous tumor of the chest wall. The aim of this study was to report results from surgical procedures and evaluate clinical factors predicting survival of patients with chest wall CSs treated in a single tertiary sarcoma center.

Material and methods

50 patients with primary CS located in the ribs and sternum were included. Details of the clinical data and oncological outcomes, including local recurrence (LR) and disease-specific survival (DSS), were collected.

Results

The tumor was primarily originated in the sternum in 6 six patients (12.5%) and in ribs 2 to 11 in the remaining patients. Specimens were histologically graded 1 in 13 patients (26%), 2 in 28 (56%), 3 in 8 (16%), and 1 (2%) as mesenchymal grade 3 CS. R0 margins were obtained in all cases. Reconstruction was warranted in 47 (94%) cases. LR developed in 3 (6%) patients and the median time to LR was 17 (range, 16-68) months. Eight (16%) patients developed metastasis. Increasing tumor volume was a statistically significant factor for reduction of DSS.

Conclusion

CS of the chest wall can be treated effectively with clear margins, resulting in lower LR rate and higher DSS than CS of the extremities and pelvis. Metastasis of the chest wall mostly occurs in high-grade tumors and, the locations of the metastases differ greatly from those observed in CS of the extremities and pelvis. Metastases are commonly extra-pulmonary, indicating the need for postoperative follow-up with multiple imaging modalities to monitor recurrence and metastases.
Long-term gait analysis after a rotationplasty, a cross-sectional follow-up study

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Abstract

Background

Rotationplasty is a rare surgical procedure indicated for young patients with primary malignancies, Proximal Femoral Focal deficiency, or trauma. Little is known about the long-term functional outcome. This study compares gait biomechanics decades after a rotationplasty.

Method

All patients after rotationplasty between 1980-2002 at the ‘Academic Medical Center’ or ‘Onze Lieve Vrouwen Gasthuis’ in Amsterdam were invited to perform a 3D gait analysis using a 12-camera Vicon System. Participants walked at comfortable speed on a 12-meter force plates embedded-walkway with spherical markers placed according to the plugin-gait model. Patients with and without thigh shank discrepancies were compared. Spatio-temporal, lower limb joint angles, moments, powers, and energy cost components were analyzed using SPSS and MATLAB.

Results

29 patients, median age 47(IQR 43-51), after rotationplasty with a median follow-up of 33 (IQR 29-35) years, were included. Compared to healthy controls, significant differences were found in stride length(p=0.02), step length(p<0.01), comfortable walking speed(p<0.01), and energy cost(p<0.01). The rotationplasty leg did not show a knee flexion pattern in loading response, while hip flexion throughout stance was enlarged. No significant differences in gait and energy cost were found between rotationplasty patients with or without thigh shank length discrepancy.

Conclusion

Gait analysis of rotationplasty patients show differences in the (pseudo)knee and hip loading response compared to healthy controls. Long-term function after rotationplasty results in only small differences in walking patterns compared to healthy controls at the expense of a higher walking energy cost.
Use of tranexamic acid to reduce post-operative bleeding in orthopaedic oncology

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Abstract

INTRODUCTION: Orthopaedic oncology often causes major blood losses that may put at risk patients’ hemodynamic balance and their overall clinical stability. To this date transfusion therapy, still represents the pivotal treatment to counterbalance the reduction in hemoglobin levels which occur after surgery. Although effective, transfusions are expensive and inevitably associated with a number of complications and therefore other solutions, such as pro-coagulative drugs, could play an important role to prevent massive blood losses.

METHOD: We reviewed the clinical intercourse of 37 patients who underwent major bone resection due to malignant tumors of the lower limb. Cases were divided in two different groups: group G1 consisting of 12 patients treated intra-operatively with tranexamic acid and group G2 which was made of 25 controls.

RESULTS: On average, patients treated with tranexamic acid (G1) required transfusion of 3.9 concentrated blood cells units during surgery and 0.9 units during the postoperative course. Other patients (G2), for their part, required on average 3.1 units intra-operatively and 2.1 units post-operatively. No significant difference was found in intraoperative transfusion rate (p=0.402). Instead, postoperative transfusions were significantly less frequent patients treated with tranexamic acid (p=0.023). None of the 12 patients treated with tranexamic acid had evidence of Deep Vein Thrombosis.

CONCLUSION: Our outcomes indicate that the use of TXA was effective in reducing blood losses also for major surgical interventions in orthopedic oncology.
More than just a sciatica. Sciatic nerve schwannomas: surgical treatment and clinical outcomes in a case series.

Dr Edoardo Ipponi, Dr Alfio Damiano Ruinato, Dr Silvia De Franco, Dr Fabio Cosseddu, Prof Rodolfo Capanna, Dr Lorenzo Andreani

University of Pisa, Pisa, Italy

Abstract

INTRODUCTION: Schwannomas of the peripheral nerves are rare benign tumors. Due to their rarity, literature is still poor of studies about the clinical and functional outcomes of their surgical treatment. In order to fulfill these limitations, we carried out a retrospective study on cases with symptomatic sciatic nerve schwannomas treated with surgical enucleation, evaluating the effectiveness of this therapeutic approach.

METHOD: 8 cases of sciatic nerve schwannoma were included in our study. For each one, we analyzed patients' personal data, clinical examinations and MRI images both pre-operatively and post-operatively.

RESULTS: The mean lesion's size was 52.7 mm. Each patient showed sensitive deficits before surgery; pre-operative MRC score was 3.9. Pre-Operative MSTS and LEFS scores were 21.1 and 59.5 respectively. Surgery was successful in each case and none of our cases developed local recurrence nor major complications. Diagnostic delay, tumor size at the moment of diagnosis and functional impairment resulted to be mutually correlated. Surgery was proven to be globally successful, since it led to a marked reduction of neurological signs and functional limitations.

CONCLUSIONS: Early diagnosis and a prompt surgical treatment therefore represent a reliable and relatively safe therapeutic option for sciatic schwannomas, with high chances of good post-operative outcomes.

Poster upload

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Reconstruction of the extensor apparatus using a hybrid augment with polyethylene mesh and fascia lata allograft: report of a case with patellar Gigant Cell Tumor of the Bone (GCTB)

Dr Edoardo Ipponi, Dr Gianluca Nulvesu, Dr Federico Di Sacco, Dr Niccolò Fusari, Prof Rodolfo Capanna, Dr Lorenzo Andreani
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Abstract

INTRODUCTION: The extensor apparatus of the knee can be thought of a chain that transmits the muscular strength developed by the quadriceps muscles to the proximal tibia. This complex is essential to allow the extension of the tibia over the femur, being essential to provide knee mobility and stability. In case of lesions which irreparably damage the patella, such as a locally aggressive bone tumor, it is necessary to restore both the apparatus’ anatomical continuity and its strength.

METHOD (CASE PRESENTATION): A 67 years old Caucasian woman developed atraumatic swelling and soreness in her left knee. X rays and MRI images evidenced an osteolytic degeneration of the patella. A diagnosis of Gigant Cell Tumor of Bone was made with a needle biopsy. We performed an en-bloc resection of the patella and replaced it with a composite augment made with a polypropylene mesh and a fascia lata allograft.

RESULTS: In her latest follow-up, our patient did not have any extension lag and quadriceps strength was completely restored. The MSTS score recored in the latest outpatient visit was 30/30. No local complication was observed.

CONCLUSIONS: The combination of internal layers of polypropylene surgical mesh and a surface allogenic graft can provide good mechanical performances for patients who underwent patellectomy due to a locally aggressive tumor
Incidental finding of osteosarcoma of the distal femur in a 9-year-old boy: A Case Report

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Abstract

Introduction
Osteosarcoma is a rare, often highly malignant tumor of childhood and adolescence that commonly occurs in the knee joint. Prior to diagnosis, patients often report unspecific symptoms like prolonged atraumatic pain.

Methods
Retrospective case analysis and literature review.

Results:
A 9-year-old boy presented to an outpatient clinic with first pain of the knee joint after a trauma during a soccer game. A Xray was performed with evidence of a partial sclerotic lesion of the femoral medullary cavity with no cortical erosion. MRI showed a bone-isointense mass in T1, marginal fluid collection in STIR and a diffuse central and marginal contrast medium uptake. The CT confirmed a fuzzy, matrix-forming tumor. An open biopsy was done. The pathologist validated a high-grade osteosarcoma (G2). The staging showed no metastasis (cN0cM0). A perioperative chemotherapy was given according to the EURAMOS protocol. The complete tumor was resected (R0, Salzer-Kuntschik grade 3) and a growth tumor prosthesis implanted. At six-month of follow-up, the patient is tumor-free with satisfactory postoperative functional scores.

Conclusion:
The diagnosis of high-grade osteosarcoma as an incidental finding is scarce. The literature research has not shown any comparable case. Malignant bone tumors has to be differentiated from a variety of benign processes like NOF (non-ossifying fibroma), intraosseous hemangioma and osteoma for instant. The diversity of bone processes makes the evaluation of malignancy difficult. In case of an unclear bone lesion a co-evaluation at a specialized center should be performed.
Abstract

Introduction

Reconstruction of bone structures in young patients after bone sarcoma resection is challenging due to the smaller anatomical conditions. Standardized implants often do not fit. Prostheses have to be customized or already existing implants have to be placed off-label in an atypical location. Data on these special cases of defect reconstruction is scarce.

Methods

Retrospective analysis of a case series (n=14, median age at operation 6.8 years [4 - 10 years], in which the resection of bone sarcoma (Ewing’s sarcoma [n=7] and osteosarcoma [n=7]) was followed by an individual defect reconstruction.

Results

Presentation of tumor localization and utilized customized prostheses components for reconstruction:

- proximal femur (n=5; custom-made femoral stem: n=2, humeral instead of femoral stem: n=3, 3D-printed stem: n=2)*

- distal femur (n= 6; short custom-made femoral stem: n=2, humeral instead of femoral stem: n=3, distal humeral growth prosthesis with humeral stem instead of distal femur prosthesis: n= 1, “elbow joint” instead of a knee joint: n=2)*

- proximal tibia (small proximal tibia prosthesis with humeral stem: n=2)

- proximal humerus (3D-printed humeral prosthesis, n=1).

Five patients had type 1 or 2 failure (Henderson classification). Type 4 failure occurred in three patients. Patients had a median MSTS-score of 16/30 points (n=8; [9 - 26/30]) and a median leg length discrepancy (LLD) of 1.75cm (n=8; [0 - 3.5cm]).

*revision surgeries included.

Conclusion

Individual defect reconstruction using customized implants in children and younger adolescents showed satisfactory results. Long-term studies with an analysis of increasingly used 3D-printed implants should follow.
Clinical and functional results following partial or total claviculectomy without reconstruction for malignant clavicular tumours.

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Abstract

Introduction

The clavicle is a rather uncommon location for malignant bone tumours. Due to close proximity of critical anatomical structures, wide resection with clear tumour margins of malignant tumours involving the clavicle is difficult and may result in large soft tissue and bone defects.

In the current study, clinical and functional outcome following partial or total claviculectomy without subsequent reconstruction of the defect for malignant clavicular tumours was analysed.

Method

Over a period of 24 years, 15 patients (mean age: 42.6±20.3 years, 66.7% males) had been treated at 2 tertiary sarcoma centres for malignant clavicular tumours. No reconstruction of the resulting defect was performed in any patient. Apart from oncological follow-up (n=15), functional outcome was prospectively assessed with MSTS and QuickDASH score (n=9). Median follow-up was 48 (IQR: 24.0-83.5) months.

Results

Ewing sarcoma (n=6) and osteosarcoma (n=4) were most common. Total, partial lateral and partial medial claviculectomy had been performed in 7, 5 and 3 patients, respectively. Mean resection length amounted to 10.2±3.8 cm. No postoperative complications emerged. Six patients developed metastases after a median of 18.0 (IQR: 2.5-39.5) months, and 5 of these had died of disease at final follow-up. MSTS and QuickDASH score in 9 patients was assessed at a median follow-up of 36.0 (IQR: 20.0-100.0) months. Median QuickDASH was 18.0 (IQR: 11.0-22.0) points, and median MSTS 26.0 (IQR: 24.0-29.0) points.

Conclusions

Satisfactory clinical and functional outcomes are observed following partial or total claviculectomy for malignant clavicular tumours, even without reconstruction of the resulting defect.
Functional quadriceps reconstruction by means of a neurotized gracilis transfer and spare parts management.

Dr Javier Buendia, Dr Francisco Leyva, Dr Jose Miguel Casarrubios Barrera, Dr Cristina Gómez Martínez deLecea, Dr Henar Nieto Ramos, Dr Inmaculada Masa Jurado, Dr Elena Manrique Gamo, Dr Roberto García Maroto, Dr Juan Luis Cebrián Parra  
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Abstract

INTRODUCTION

A majority of sarcomas are located in the lower limb. Anterior compartment reconstruction is usually mistreated resulting in a low-quality of life for patients. Several techniques are previously described with variable functional results.

METHOD

We describe our technique for quadriceps reconstruction by means of a gracilis transfer for knee extension connected to the crural nerve and adequate management of spare muscles if available.

RESULTS

During the last two years (2019-2021) we performed 6 reconstructions with the described technique in our referral center of sarcoma. With proper rehabilitation programs patients achieved an active walk and an improved quality of life.

CONCLUSIONS

Gracilis neurotized transfer is an easy, fast, and reliable technique for quadriceps reconstruction in sarcoma patients with good outcomes in quality of life and functional results.
Which patient needs are not adequately addressed prior to surgical treatment of Ewing sarcoma? Results of a patient advocate-led survey of UK Ewing sarcoma patients and carers.

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Abstract

The EURO EWING Consortium (EEC) brings together clinicians, researchers, patients and carers from across Europe with the aim of improving duration and quality of survival for patients with Ewing sarcoma (ES). Patient advocates are involved at all levels of the Consortium. A patient advocate member of the EEC Surgery Working Group led a consultation of patients and carers to retrospectively evaluate patients’ experience about the surgical treatment they received for ES, aiming to provide guidance for future activities of the Working Group.

Patients and carers who were members of social media-based support groups, were invited via Facebook and Instagram to take part in a survey to answer eight questions on topics including; information provision before surgery, post-operative complications, lifestyle priorities post-surgery, and pre-surgical counselling.

15 responses were received from UK patients/parents (5 male, 10 female) who underwent surgery for ES between 2002 and 2022. 14 patients had tumours of the extremities, 1 rib. Three were primary amputees, 12 had limb-sparing surgery. Patient age at surgery was 5-34 years. All patients surveyed felt they had not received enough information especially in relation to possible post-surgical complications and secondary surgeries. No patients received pre-surgical counselling and all patients had sought their own post-surgical counselling to deal with the mental health problems arising from surgery.

There was dissatisfaction with the level of information provision before surgery with a lack of surgical outcomes (pain, physical and mental health) discussed. The survey data will enable the group and other stakeholders to address this.
The Surveillance After Extremity Tumor Surgery (SAFETY) International Randomized Controlled Trial

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Abstract

Introduction

The Surveillance AFter Extremity Tumor surgerY (SAFETY) trial is an international multi-center randomized controlled trial (RCT) that aims to answer the following question: Do the frequency and mode of surveillance affect patient survival and patient-reported outcomes following extremity soft-tissue sarcoma surgery?

Methods

Trial participants are randomized to one of four surveillance groups for two years: (1) CXR every three months, (2) CT chest every three months, (3) CXR every six months, or (4) CT chest every six months. The primary outcome is overall five-year survival. Other key outcomes include patient-reported outcomes (anxiety, satisfaction, and quality of life), oncologic outcomes (local recurrence and metastasis), treatment-related complications, and healthcare costs.

Results

At the time of abstract submission, 129 soft-tissue sarcoma patients have been randomized across 23 sites in eight countries (Argentina, Australia, Austria, Brazil, Canada, Italy, Netherlands, USA). An additional 13 sites are in the active start-up phase (Belgium, Canada, Lebanon, Malaysia, Spain, Sweden, UK, USA). Successful pilot feasibility metrics (recruitment, data quality, protocol adherence and participant retention) support transition to the definitive study.

Conclusion

STS patient surveillance has been identified by consensus as a top research priority in the field. The SAFETY investigators have successfully demonstrated the ability to coordinate international RCTs through the PARITY trial and continue to do so in the SAFETY trial. Further expansion of the SAFETY collaborative network will be important for the recruitment of the SAFETY target sample size, and EMSOS members are encouraged to visit the study website www.SAFETYrct.com to register as an investigator.
External validation of the 2013-SPRING model for survival prediction in surgically treated patients with metastases to the appendicular skeleton.

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Abstract

Introduction

In bone metastasis patients with impending or pathological fractures, individualised treatment concepts, taking into consideration life expectancy, are required.

This study aimed at externally validating the 2013-SPRING model, which enables survival prediction of surgically treated patients with bone metastases to the appendicular skeleton.

Method

Altogether, 303 patients (mean age: 67.6±11.1 years; 54% females, minimum follow-up 12 months) treated surgically at a single tertiary sarcoma centre for bone metastases of the appendicular skeleton, were retrospectively included. The 2013-SPRING model was validated on this cohort with regards to survival prediction at 3, 6 and 12 months following surgery, using area under the curve receiver operator characteristic (AUC ROC) and Brier score. Separate analyses were performed for patients treated with endoprostheses (n=162) or osteosynthesis (n=141).

Results

Accuracy of survival prediction, depicted by the AUC ROC, amounted to 0.782, 0.810, and 0.802, at 3, 6 and 12 months, respectively. Correspondingly, Brier scores at 3, 6 and 12 months were 0.170, 0.178, and 0.169. Comparable predictive accuracy of the 2013-SPRING model was found in subgroup analysis, with a slightly better prediction for the osteosynthesis group.

Conclusions

According to this validation study, the 2013-SPRING model can well be used in an independent patient cohort in order to predict survival following surgery for bone metastases of the appendicular skeleton.
Proximal Tibia Reconstructions after Oncological Resection

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Abstract

Introduction: The proximal tibia (PT) is the second most frequently affected site by primary bone tumors after the distal femur. Reconstructive techniques include implantation of endoprostheses, osteoarticular allotransplants or composite prostheses (APCs). Endoprosthetic reconstructions have lower rates of reintervention and failure, although functional recovery after APC may be better. The most common causes of failure are aseptic mobilization and infections. Functionality depends on the success of the extensor mechanism reconstruction. The aim of the study was to analyze the outcomes after oncological resection in the proximal tibia.

Methods: A retrospective analysis of clinical data relating to patients undergoing proximal tibial replacement in oncological resections from 1997 to 2018 was performed.

Results: Ninety-eight patients were included in the study. 12 massive allografts, 51 APCs and 33 megaprostheses were implanted. In 23 cases (23.5%) a flap of medial gastrocnemius was used. 30 failures (30.6%) and 49 (50%) hospitalizations for post-surgery complications were identified. The survival of reconstructions at 5 years was 75.9% and 52.5% at 10 years. Allograft reconstructions were associated with 5-year survival of 66% and 11% at 10 years, APCs 84% at 5 years and 61% at 10 years, megaprostheses 67% at 5 years and 60% at 10 years. In cases where a flap of gastrocnemius was used, only one infection was recorded out of the total 14.

Conclusions: Reconstruction with megaprostheses or composite prosthesis of the proximal tibia after tumor resection is a safe and reliable technique. Massive osteoarticular grafts have a high risk of mechanical failure. Covering the implant with a flap of medial gastrocnemius reduces the risk of infection and helps to strengthen the reconstruction of the extensor apparatus.
Endoprothetetic replacement of the proximal tibia for oncological conditions

Dr Federico Sacchetti1, Mr Will Aston2, Mr Rob Pollock2, Mr Panos Gikas2, Dr Pierluigi Cuomo3, Mr Craig Gerrand2

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Abstract

Introduction The proximal tibia (PT) is the anatomical site most frequently affected by primary bone tumours after the distal femur. Reconstruction of the proximal tibia remains challenging because of the poor soft tissue cover and the need to reconstruct the extensor mechanism. Reconstructive techniques include implantation of massive endoprosthesis (megaprosthesisis), osteoarticular allografts (OA) or allograft-prosthesis composites (APC). Methods This was a retrospective analysis of clinical data relating to patients who underwent proximal tibial replacement in our regional bone tumour centre from 2010 to 2018. Results Seventy-six patients fulfilled the inclusion criteria and were included in the study. Mean age at surgery was 43.2 years (12-86, SD:21). The mean follow up period was 60.1 months. Twenty-one failures were identified, giving an overall failure rate of 27.6%. Prostheses survival at 5 years was 75.5%, and at 10 years was 59%. Mean Knee flexion was 89.8 ° extensor lag 18.1°. In univariate analysis, factors associated with better survival were a malignant or metastatic cancer diagnosis (versus benign), with a 5 and 10 years survival of 78.9% and 65.7% versus 37.5% (p:0.04), in hospital length of stay longer than 9 days was also associated with better prognosis with 5 and 10 years survival rates at 83.6% versus 60% and 16% (p<0.001). In multivariate analysis only in hospital length of stay was associated with longer survival (HR: 0.23, 95% CI: 0.08-0.66). Conclusions Proximal tibial replacement with endoprosthesis is a safe and reliable method for reconstruction in patients treated for orthopaedic oncological conditions. Either modular or custom implants in this series performed well.
Diagnostic accuracy of the biopsy of soft tissue component of bone tumour with soft tissue extension.

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Abstract

Background: Biopsy is a vital step within the diagnostic cascade in patients with suspected bone or soft tissue sarcoma. As an alternative to open biopsy, percutaneous core needle biopsy techniques have been developed. Core needle biopsy (CNB) and fine needle aspiration (FNA) have emerged as the primarily diagnostic modalities. Core needle biopsy decreases morbidity, costs and time, and results in fewer complications. There are few studies on the diagnostic accuracy of soft tissue biopsy in bone tumour with soft tissue extension.

This study evaluated the diagnostic accuracy of soft tissue biopsy in bone tumour with soft tissue extension and the pain score during the procedure.

Method: This is a prospective study in 44 patients treated at the Oncology clinic of the National orthopaedic hospital, Lagos, Nigeria with diagnosis of bone tumours and soft tissue extension. These patients had palpable masses based on clinical evaluation and radiological findings. These patients were all educated about the Visual analogue scale in the outpatient clinic. The core needle biopsy was performed using Jamshidi needles for bone and Tru-cut needles for involved soft tissue biopsy. Biopsy specimens of soft tissue and bone obtained from each patient was reviewed by the same pathologists.

Results: A total number of 44 patients completed the study with a male to female ratio of 1.1:1. The age range was 10 – 76 years (mean age 24.8 ± 16.3 years). 77.2% of the tumours were located in the lower limb while 18.2% were located in the upper limb. Osteosarcoma had the highest histologic diagnosis. The sensitivity, specificity and diagnostic accuracy of soft tissue biopsy compared to bone tissue biopsy were 95%, 100% and 96% respectively. Positive predictive and negative predictive values were 100% and 33% respectively. Mean pain scores during soft tissue and bone biopsy were 2.4 and 7.7 respectively.

Conclusion: The diagnostic accuracy of the biopsy of soft tissue component is comparable to biopsy of bone tissue. However, the mean pain score was significantly higher when biopsy of bone tissue is performed. The biopsy of only the soft tissue component of bone tumour with extraosseous spread for preliminary diagnosis of primary bone tumour should be encouraged.
The oncology orthopedist Role - where do we fit?

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Abstract

Background

Oncology Orthopedics is a fairly new medical specialty compared to more traditional ones. There are 200 active oncology orthopedists in the United States. These circumstances combined can lead to a poor understanding of the role of the oncology orthopedist in the care of patients with meagre referral rates and an exceedingly high rate of unplanned excisions.

Methods

A multicentric international survey was conducted among medical oncologists. The multiple-choice survey was conceptually divided into the following areas: referral trends, scenarios of oncology orthopedics’ scope and participants’ demographics.

The purpose of the study was to assess referral trends to the oncology orthopedics service, to evaluate and assess how it contrasts with referrals to other specialties and to compare referral trends in different countries.

Results

Responses from 76 different medical oncologists were received. Most physicians identified themselves as having a medical oncology subspecialty (63%), and only 2 respondents stated the subspecialty was sarcoma. There was a significant difference among referral trends, with radiation oncology and pain management receiving increased number of weekly and monthly referrals. When presented with an asymptomatic limb bone metastasis most providers elected other alternatives than referring to an oncology orthopedist (86.8%). For an impending femur fracture the difference was less important, however, most responses did not include referral to the oncology orthopedic service (64.4%).

Conclusion

Oncology Orthopedists are a valuable addition to any multidisciplinary treatment team caring for oncologic patients. Unfortunately, unawareness about the specialty can contribute to crucial patient treatment opportunities being missed.
Freezing in Florida - Are we ready for diversity?

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Abstract

Background

Diversity of backgrounds allows the possibility of different approaches to a particular condition, permitting the patient alternatives that could be more suitable yet not so popular in a geographic area.

Purpose

To describe the challenges faced when diversity of backgrounds is put into practice and to perform a root cause analysis of the different barriers encountered.

Patients and Methods

A 17 y.o. male with a humerus osteosarcoma was presented with different surgical alternatives along risks and benefits of each. The family and the patient elected to proceed with a recycled autograft technique. We describe the difficulties encountered and examine its root causes through an Ishikawa diagram and a PESTEL analysis.

Results

Barriers were divided into 2 subgroups: technical challenges (TC) and cultural resistance (CR). Within CR, the case was not allowed to be scheduled initially, and the scheduling surgeon requested to “ask permission” to a general surgeon (with no sarcoma experience) to proceed. Throughout the process, the OR administrative staff showed resistance to the procedure. Fear of complications never linked to the technique were expressed. Literature was shared demonstrating no immediate serious complications. For the TC, there was a preoccupation about obtaining the nitrogen, its handling and the lack of appropriate instruments.

Conclusion

Even though the benefits of diversity are well known in medicine, in practicality resistance is still encountered. The challenges presented occurred due to lack of knowledge and cultural fear of the unknow, despite the extensive literature supporting the well-known and effective technique.
Complex shoulder extra-articular resection and reconstruction - a novel design

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Abstract

Background

Approximately a fourth of the patients with a proximal humerus sarcoma will require an extra-articular resection, a procedure known to be skillfully demanding and associated with less than perfect outcomes with a considerable rate of revisions. Here we present a reconstruction technique with a novel custom-made implant and 3 patient cases with good postsurgical functional outcomes.

Methods

A novel shoulder reconstruction implant was designed for patients where both rotator cuff and deltoid function is lost. It consists of two constrained joints in serial fashion to limit transfer of forces to the glenoid component whilst still preserving a full constrained design. The implant is made of 3-D printed titanium with a diamond-like carbon surface and strong polyetheretherketone inlay. Soft tissue reconstruction was performed utilizing a polyethylene terephthalate tube.

Results

Three patients were treated with a custom-made shoulder reconstruction. All three patients required resection of the axillary nerve as well as an extra-articular resection including transection of rotator cuff tendons at the level of the scapular neck. At latest follow up all three patients had good function and an acceptable MSTS score. All patients were pain free and had a stable shoulder joint. Passive abduction was possible up to 95 degrees, after which point implant impingement was noted.

Conclusion

Reconstruction alternatives are scarce and often associated with less than perfect outcomes. The presented novel implant with a design including two constrained joints in serial fashion has shown to be a promising alternative for reconstruction in these challenging cases.
Impact of insurance status on chondrosarcoma diagnostic stage: implications for detection and outcomes

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Abstract

Background

In Chondrosarcomas an advanced stage at diagnosis is associated with poor prognosis. The purpose of this study was to evaluate the association between insurance status and the stage of chondrosarcoma at the time of diagnosis.

Methods

A retrospective comparative cross-sectional study was conducted using the Surveillance, Epidemiology and End Results database. Patients with a diagnosis of Chondrosarcoma of the limbs and pelvis between 2007 and 2016 were included. Variables of interest included insurance status, age, gender, race, ethnicity, marital status, place of residence, primary site and stage at diagnosis.

Results

A total of 2187 patients were included for statistical analysis. The majority were male (58%), between the ages of 31-50 (32%), white (85%), non-Hispanic (85%), married (60%), living in a metropolitan area (90%) and Insured (83%). Regarding stage at diagnosis, 1213 (55%) had localized disease while 974 (45%) had a later stage at presentation. The majority of the patients (1883, 86%) had a non-pelvic tumor. Variables associated with a later stage at diagnosis included being older than 65 (p<0.001), male gender (p<0.001) and pelvic location (p<0.001). The unadjusted relative risk (RR) of late stage at diagnoses for the uninsured was 1.25. After adjusting for other variables, the odds of being diagnosed at a later stage of Chondrosarcoma is increased by 77% (p=0.01) in uninsured patients.

Conclusion

Being uninsured increased the chances of a late-stage diagnosis of Chondrosarcoma by 77% when compared to insured patients. Immediate efforts are required to remediate health care access disparities in cancer care.

Poster upload

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Patient survival after resection of skeletal metastases and endoprosthetic reconstruction: A nation-wide cohort study with a single decision-making oncological institution.

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Abstract

Introduction: Reports on patient survival after wide resection of skeletal metastases are scarce. The primary aim of this study was to evaluate postoperative survival of all patients with wide resection and endoprosthetic reconstruction of skeletal solitary/oligometastases in long bones between 2009-2020 in comparison to sarcoma patients and non-oncological reconstructions. The secondary goal was to determine implant infection/removal rates in these patient groups.

Method: The retrospective nation-wide observational cohort included 138 consecutive patients with tumor endoprosthesis MUTARS® implanted. Patients were stratified into five histological subgroups and survival analyses were performed with life tables, the Kaplan-Meier method and Cox regression.

Results: Patient survival after resected skeletal metastases was considerably lower compared to sarcoma patients (2-year survival 27-65 % vs. 83-87 %, 5-year survival 20-46 % vs. 63-78 %, both p < 0.01). The Kaplan-Meier estimated postoperative survival for plasmacytoma/renal cell/breast carcinoma metastases was 5.9 years, other metastases 2.8 years, osteosarcoma 8.7 years, other sarcomas 7.8 years and for non-oncological patients 11.4 years. Predictors of worse outcome included higher age, pathologic fracture or >1 metastasis, diagnosis other metastases elevated CRP before index surgery. Cumulatively, 15 % of implants required subsequent removal for any reason.

Conclusions: Wide resection and endoprosthetic reconstruction offer a reliable solution in patients with skeletal solitary/oligometastases cases who have expected survival of several years. Higher age, metastases other than plasmacytoma/renal cell/breast carcinoma, pathologic fracture or >1 metastasis should be considered relative contraindications in this regard.
Case report of distal radius resection with ulnar transposition and trans-carpal osteosynthesis for osteosarcoma

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Abstract

Introduction: We present a case report of a 29-year-old female patient who was operated 3 years ago on the distal radius with intraliteral excocleation of histologically verified osteoblastoma. Subsequent follow-up showed tumour recurrence with several skip lesions but no distant metastases. Repeated biopsy confirmed the diagnosis of osteoblastoma-like osteosarcoma, grade 3.

Method: The oncological tumour board indicated wide resection of the distal radius. Surgical treatment followed the previously described operative technique of distal radius resection with limb-sparing reconstruction, ulnar transposition and osteosynthesis.

Results: An extended dorsal skin incision above distal radius and carpal bones was made, including the biopsy canal. The tumour and distal 7 cm of the radius with the biopsy canal were removed. Distal ulnar osteotomy and transposition was performed afterwards, followed by osteosynthesis of carpal bones to ulna and ulna to proximal radius. Twenty-four hours after the operation the patient developed a compartment syndrome of the underarm muscles and it was successfully resolved with an emergency fasciotomy. Histopathological report showed R0 resection.

Conclusions: We present a rarely-used treatment option of hand-sparing distal radius resection with local ulna transposition. The advantage of ulna transposition is to preserve some degree of pronation-supination in the underarm. Despite the risk of postoperative complications, functional outcome is superior to other options with only limited-donor site morbidity.

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Bilateral chronic tenosynovial giant cell tumour (PVNS) around both ankles in a child with the Noonan syndrome

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Abstract

Introduction: A 10-year-old male patient with the Noonan syndrome (SOS1 mutation) and bilateral chronic tenosynovitis of tendon sheaths around both ankles has had repeated episodes of bleeding with swelling and painful reactive synovitis.

Method: Orthopaedic, radiological, rheumatological, haematological and genetic diagnostic methods were employed. Initial biopsies caused extensive unstoppable local bleeding and showed only chronic non-specific synovitis, typical of recurrent bleeding. The diagnosis of suspected tenosynovial giant cell tumour PVNS has been confirmed only after the third attempt of histological biopsy. A clinical presentation of this child seems similar to the previous case report in Pediatr Radiol 2017;47(3):361-365.

Results: The boy can only walk for short distances with foot-ankle orthoses and then gets pain in his flat feet and swelling of ankles. He suffers from repeated acute worsening of swelling in tendon sheaths around his ankles, the ankle joints have not been affected so far. Haematologists found factor XIII concentration 0.74 E/mL just below the lower end of normal range. With NGS testing of 31 genes related to coagulation disorders, none was found to explain any bleeding disorder. Arteriography of lower limbs showed somewhat pathologically increased blood supply and partial embolization was performed bilaterally without any considerable clinical benefit.

Conclusions: Treatment of extensive multifocal tenosynovial giant cell tumor as a part of Noonan syndrome represents a big challenge. Treatment with imatinib in children has not been registered for such non-oncological diagnoses. All published case-reports on this topic so far included extensive synovectomy.

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Different techniques for unicondylar reconstruction around knee: comparative study between osteoarticular bone grafts VS custom-made prostheses.

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Abstract

Introduction
Distal femur and proximal tibia could be affected by common but different pathological conditions. When only one half of the distal femur or proximal tibia are involved, deep-frozen unicondilar bone grafts (UBG) were used for many years as the best reconstructive solution at Rizzoli Institute.

Method
From 1989 to 2003, nine cases were treated with UBG in our Institute; medium follow up was 20,2 years (8 - 30). The diagnosis was osteosarcoma (2), chondrosarcoma (2), giant cell tumour (3), failure of a previous bone graft (1) and fracture (1). The recent advent of 3D printing technology, particularly after the developments of additive manufacturing, give us the chance to reconstruct the same type of unicondylar defect, using a custom-made implant. We choose polycaprolactone (PCL) for articular coating. Between 2015 to 2020, 6 cases were performed.

Results
Eight on nine with UBG developed arthritis in a medium time of 6,4 years (2 -11) after surgery. One failed within two years because of fracture of the graft. Four cases had revision surgery in a medium time of 9 years (2 - 15) after surgery, three had a total knee replacement (TKR). Five had severe osteoarthritis: they are waiting for THR. Among six with PCL, two had arthroscopy as revision surgery and three had a TKR at a medium time of 35 months (28 – 42); the site was MFC in two; the last was LT in rheumatoid arthritis.

Conclusions
All cases with UBG resulted in a fracture of the graft; consequently, revision surgery was mandatory at some point, depending on pain. On the other hand, PCL showed a too fast reabsorption in our series: resorption was the reason of revision, despite a satisfactory bone integration and stability of the prostheses. Therefore, we believe PE will be more suitable as a joint lining.
What is the impact of treatment delays on the outcome of patient with high-grade osteosarcoma? A retrospective analysis of data from the EURAMOS-1 trial

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Abstract

Introduction: The logistics of multidisciplinary treatment of high-grade osteosarcoma may sometimes lead to treatment delays. The aim of this study was to evaluate the impact of such delays on patient prognosis.

Methods: Data from 1671 patients with localized, high-grade osteosarcoma recruited in the EURAMOS-1 trial (NCT00134030) and undergoing surgical treatment after induction chemotherapy were analyzed. The optimal cut-off values for survival analyses were calculated with receiver operating characteristics curves. Hazard ratios (HR) were estimated with their respective 95% confidence intervals (CI) in multivariate Cox regression models.

Results: The median duration of symptoms amounted to 8 (interquartile range (IQR), 4-13) weeks, while the median interval between the beginning of induction chemotherapy and surgery was 82 (IQR, 76-90) days. The median time between surgery and the beginning of consolidation chemotherapy was 19 (IQR, 14-24) days. A longer duration of symptoms was associated with a higher tumor volume at diagnosis (234ml vs. 134ml, p=0.003), but not with a higher risk for death (HR 1.43, 95%CI 0.82-2.49; p=0.212). On the other hand, both delays between the beginning of induction chemotherapy and surgery (HR 1.87, 95%CI 1.10-3.21; p=0.022) and delays between surgery and consolidation chemotherapy (HR 1.46, 95%CI 1.02-2.08; p=0.037) were associated with a higher risk for death.

Conclusions: Delays during induction chemotherapy and a delayed start of consolidation chemotherapy after surgery are independently associated with a poorer survival in patients with localized osteosarcoma. Our results underscore the need to optimize referral pathways between different departments and hospitals in order to avoid unnecessary treatment delays.
Which variables should be evaluated in Surgical Case Report Forms of prospective randomized trials in Ewing Sarcoma? A proposal of the Euro Ewing Consortium (EEC) Surgical Working Group

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Abstract

Introduction: Although surgery is an important treatment modality in patients with Ewing Sarcoma (EwS), current and previous international trials have not included prospective questions regarding the optimization of surgical treatment. As such, most recent evidence has been produced through retrospective analyses of the surgical data gathered in these trials. Our aim was to develop a uniform, standardized surgical Case Report Form (CRF) for future trials.

Methods: After analyzing the surgical CRFs of previous European EwS trials and current literature on local surgical treatment of EwS, focusing on the unanswered questions and areas of controversy, possible variables were identified. These variables were then defined, prioritized, and discussed within the EEC Surgical Working Group, taking into consideration the need to avoid an excessive collection of unnecessary data.

Results: The resulting CRF proposal contains 28 variables divided in 4 sections. The first section was designed to be completed by study nurses and includes data on the place and time of surgical treatment. The second section should be completed by the surgeon and involves the aim of surgical treatment, the type of surgery and reconstruction, the surgeon’s assessment of surgical margins, and possible complications requiring additional surgery or delaying consolidation chemotherapy. The third section details the data that should be provided by the pathologist, including the width of surgical margins in bone and soft tissue and the histological response to induction chemotherapy. Details on the surgical treatment of pulmonary and extrapulmonary metastases are documented in the fourth section.

Conclusions: The proposed surgical CRF allows for a structured reporting of those surgical data, that are necessary to address controversial topics and open surgical questions in patients with EwS.
Bulky malignant peripheral nerve sheath tumor of the left thigh in a pregnant woman presenting with a pathologic fracture of the proximal femur

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Abstract

Malignant peripheral nerve sheath tumor (MPNST) is an aggressive soft tissue sarcoma with poor prognosis, affecting most commonly the extremities. The lungs constitute the most frequent location for distant metastases. Half of all MPNSTs arise in neurofibromatosis type 1 patients, while approximately 10% are radiation-induced and the rest is sporadic.

The authors present a pregnant woman in the 40-44 age range with a sporadic MPNST of the lower limb and with lung metastases at diagnosis. Treatment consisted of hemipelvectomy with limb amputation, followed by adjuvant chemotherapy. A partial response and disease stabilization were achieved with chemotherapy.

A surgical resection with negative margins is the only potentially curative therapy, while radiation therapy and chemotherapy might be useful in the neoadjuvant or adjuvant setting, but their advantage in survival is not demonstrated. Here the authors report a case where chemotherapy permitted to achieve partial response and stabilization of the disease.

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Development of a scoring system for survival following surgery in metastatic bone disease

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Abstract

Bone metastases have an incidence of between 20-75% depending on the type of cancer and with improving treatments, the number of patients presenting for surgical intervention is increasing. Identifying patients with a shorter life expectancy would allow appropriate surgical intervention with more durable reconstructions to be targeted to those most likely to benefit. Prior scoring systems have focused on surgical and oncological factors, there is a need to consider the comorbidities and physiological state of the patient as these will also adversely affect outcomes. The primary aim was to create a scoring system to estimate survival time in patients with bony metastases and to examine which factors may adversely affect this.

This was a retrospective study including all patients presenting for surgery with metastatic bone disease. Data collected included patient, surgical and oncological variables. Univariable and multivariable analysis identified which factors were associated with a survival time of less than 6 months and less than 1 year. A model to predict survival based on these factors was developed using Cox regression.

164 patients were included with median survival time of 1.6 years following surgery. On multivariable analysis higher ASA grade (p < 0.001), high white cell count (p = 0.002), hyponatraemia (0.001), a pre-operative resting heart rate of >100bpm (0.05) and the type of primary cancer (0.03) remained significant predictors of reduced survival time. The predictive model developed showed good discrimination and calibration to predict both 6- and 12-month survival in patients with metastatic bone disease.

In addition to surgical and oncological factors, the level of co-morbidity and physiological state of the patients has a significant impact on survival in patients with metastatic bone disease and should be considered when assessing the appropriateness of surgical intervention. This is the first study to examine patient factors alongside surgical and oncological data and identify a relationship between these and survival.
Opioid use in musculoskeletal oncology

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Abstract

Introduction

Opioid prescribing in the context of orthopaedic surgery has been recognized as a critical area in the ongoing opioid epidemic. However, musculoskeletal oncology patients represent a unique subset of patients and there is a paucity of data evaluating perioperative opioid consumption and the risk for chronic use. The objectives of the current study were to describe opioid consumption patterns and evaluate predictors of chronic opioid use in patients undergoing limb-salvage surgery.

Methods

This study was a secondary analysis of the recently completed PARITY trial. Patient opioid consumption collected preoperatively and at 3, 6 and 12 months postoperatively was presented descriptively. A multivariate logistic regression model was created to explore predictors of chronic opioid consumption at 12 months postoperatively.

Results

604 patients were included. Preoperatively, 34% (193/575) of patients were consuming opioids compared to 16.7% (82/492) at 3 months postoperatively, 8% (37/460) at 6 months postoperatively and 6.6% (28/425) at 12 months postoperatively. The adjusted regression model found that metastases at initial presentation (Odds Ratio 3.05 [95% Confidence Interval 1.27, 7.51], p=0.014) was predictive of chronic opioid use. Preoperative opioid consumption, age, sex, longer surgical times, reoperation rates, and country of origin were not predictive of chronic use.

Conclusions

Despite a high prevalence of preoperative opioid use, invasive surgery and high rates of reoperations, few patients continued to consume opioids at 1-year postoperatively. These results are a substantial departure from the existing orthopaedic literature evaluating other patient populations and suggest that specific prescribing guidelines are warranted for musculoskeletal oncology patients.

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A 6-Point Protocol In Management Of Pelvic Bone And Soft Tissue Tumors - A Single Institute Outcome From India

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Abstract

Aim: To evaluate the functional outcomes and morbidity in patients with malignant tumors of the pelvis treated with limb salvage surgeries using a 6-point protocol in our institute.

Methods: A retrospective study was performed between January 2011 and January 2021 on 117 patients with malignant tumors of the pelvis, undergoing limb sparing resections of the pelvis. Both metastatic and non-metastatic cases were included which warranted resection. The mean follow-up was 12 months. 67 patients were diagnosed to have chondrosarcoma, 20 with Ewing’s sarcoma, 23 with osteosarcoma and remaining having high grade sarcoma. These patients underwent tumor resection using all or some of the 6-point protocol dictated for pelvic tumors. 2 cases underwent primary reconstruction of the tumor. The protocol observed were - 1) Preoperative embolization, 2) Use of 3D printed model and jigs, 3) Use of vessel-sealing devices, 4) Hydrogen Peroxide mops, 5) Hypotensive anesthesia and 6) Use of Robotic/laparoscopy for anterior dissection

Results: In the following series, 3D printed models and jigs were used in 20 cases and navigation and robotics used in 10 cases. 15 patients were lost to follow-up, with average follow-up duration being 60 months and mean age being 32 years. The mean blood loss was 1300ml with the average surgical time being 320 minutes. Average hospital stay was 6 days. Forty-one patients experienced complications. 31 patients (26%) of the patients had local recurrence with 27 patients with distant metastasis (23%). Currently, 75 patients are alive and 50 continue to be disease-free. Overall survival was 65% at 5-years. The mean MSTS score was observed to be 26 in these patients.

Conclusion: The use of these simple 6-point protocols can be advantageous in faster recovery of the patients with shortened postoperative morbidity and quick mobilization. It leads to a better functional outcome of the patients.
Epidemiology of surgically treated spinal tumors according to the German Society for Spine Surgery (DWG) registry

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Abstract

Background context: Tumors of the spine are rare but challenging in terms of diagnoses and interdisciplinary treatment. To counteract scarcity of recent data and studies reporting on epidemiology and treatment procedures in this specific field this study was conducted.

Methods: The German Spine Society (DWG) registry was used to evaluate all cases that underwent spine surgery for treatment of spinal tumors between 2017 and 2021. Cases were grouped by entity into ‘primary malignant’, ‘primary benign’, ‘secondary malignant’, ‘tumor like lesions’, and ‘other’. Subgroups were analyzed for localization, height of most severely affected segments, surgical treatment, and demographical parameters.

Results: There were 6,747 ‘malignant’, 1,942 ‘primary benign’, 180 ‘tumor like lesions’ and 488 ‘other’ spinal tumors. Subgroups showed differences in number of affected segments as well as localization. There were further significant differences in surgical complication rates (p = 0.003), age (p < 0.001), morbidity (p < 0.001), and duration of surgery (p = 0.004).

Conclusion: This is a representative study on spinal tumors from a nationwide spine registry and allows for epidemiological characterization of tumor subgroups.
Intralesional curettage and bone graft for the treatment of bone GCT. Experience in a single institution since 1982.

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Abstract

Introduction: Describe our series of patients with giant cell tumor of bone (GCT) affecting lower extremities treated by curettage and filling by allograft bone.

Method: A total of 145 GCT of bone affecting lower extremities were treated with curettage and allograft in our center between 1982 and 2019. The series consisted of 54.6% women and 45.4% men, median age of 36.4 years (18-73 years). The data collected was focused on the location, recurrences and complications.

Results. Bone GCT cases were located in: 10 proximal femur, 79 distal femur, 39 proximal tibia, 11 distal tibia, 3 talus, 3 calcaneus. In the surgical time, all of the cases were grade I or II based on the Campanacci’s radiologic classification. From them, nineteen cases where grade III at the diagnosis, and they received preoperative denosumab, so they become grade I-II and we could performed an intralesional excision with high velocity drilling and filling with a graft. Total weight-bearing was forbidden during minimum 60 days in all cases. The mean follow-up period was minimum 2 years. An overall recurrence rate of around 18.6% was observed. There were 8 patients with bone fracture presented at the time of diagnosis. Seven cases (4.8%) presented with a recurrence of the malignancy. The death rate at the end of follow-up was 1.3% (2 cases).

Conclusions: Curettage with bone graft filling in GCT of bone obtain good results after long-term follow-up in Campanacci grades I and II. When grade III occurs, preoperative denosumab treatment can improve the quality of bone and allows to perform an intralesional surgery. In our experience, allograft filling don’t show and increased ratio of recurrence compared to cement, preserve the biology of epiphyseal cartilage, and recover the bone stock with low ratio of mechanical complications.
What treatment modality is associated with a better prognosis in patients with localized/metastatic clear cell sarcoma? A population-based study

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Abstract

Introduction
Clear cell sarcoma (CCS) of tendons and aponeuroses is a rare melanocytic soft tissue sarcoma. The aim of this study was to determine the clinical features, prognostic factors and optimal treatment policy according to the tumor stage.

Patient
One hundred and seventeen patients with histologically confirmed CCS between 2006 and 2017, registered to the Bone and Soft-Tissue Tumor Registry Database in Japan, were analyzed retrospectively.

Results
The 5- and 10-year overall survival (OS) for all patients were 41% and 37%, respectively. On multivariable analysis, larger tumor size (p=0.008), lymph node (p=0.012) and distant metastasis at diagnosis (p=0.002), no surgery of the primary tumor (p=0.001), receipt of chemotherapy (p=0.034) were associated with worse OS. For localized CCS (n=68), development of distant metastasis (HR 23.57; p=0.003) was an only prognostic factor. The 5-year cumulative LR incidence was 16%; larger tumor size was associated with an increased LR rate (p=0.002). For N1M0 CCS (n=18), a reduced mortality risk was seen in patients who underwent surgery of both primary tumor and lymph node metastasis (HR 0.13; p=0.024). For M1 CCS (n=31), surgery of the primary tumor was independently associated with higher OS (HR, 0.27; p=0.014) whereas chemotherapy was not. No significant difference in OS was observed according to the type of systemic treatment (p=0.523).

Conclusion
The national study identified poor prognosis despite the modern multidisciplinary treatments. Among treatment modalities, surgical treatments reduce mortality risk irrespective of the tumor stage. The efficacy of systemic therapy was not proven, urging an immediate development of novel systemic agents.
Endometriosis-like Mullerian cyst of deep soft tissue

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Abstract

Introduction:
Although endometriosis is a relatively common condition in women of reproductive age, skeletal endometriosis is rare and diagnosis and management can be extremely challenging.

Method / Case Report:
A 40-year old mother of two healthy children presented with 4-months of pain in the hamstring muscles in our outpatient clinic. No trauma could be remembered, cyclic pain was not reported. There was some tenderness on palpation in the middle third of the hamstrings but no tumour was palpable.

There were no pre-existing illnesses and the only medication was oral contraceptive.

External MRI showed a homogeneous, deep seated, intramuscular 1,8x1,4x1,5 cm hyperintense T1 and isointense T2 lesion.

Schwannoma was suspected and we performed a primary resection biopsy in a lesion smaller than 2cm.

Results:
The lesion was completely removed. Histophathological examination revealed large cysts composed of cytologically bland epithelia surrounded by a specific spindled stroma. Expression of cytokeratins, PAX8, estrogen and progesterone receptors and CD10 confirmed Mullerian differentiation. Histological signs of invasion or malignancy were not seen.

The patient was referred to gynaecological examination but no endometriosis was revealed. Other mucinous cystic illnesses incl. mucinous cystic neoplasms were excluded. In the follow up the patient is pain free and without recurrence of disease.

Conclusion:
Mullerian cysts and endometriosis in extra-abdominal distant sites mimicking a soft-tissue tumor remains a rare and potentially under-recognized diagnostic pitfall.

Patients presenting with an infiltrative soft-tissue mass without any knowledge of a prior history of endometriosis, could be mistaken for soft-tissue neoplasms, possibly resulting in unnecessary aggressive management.

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Health-Related Quality of Life of bone and soft-tissue tumor patients around the time of diagnosis.

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Abstract

Introduction: Bone and soft tissue tumor patients experience physical and psychosocial challenges. However, it is unknown which health-related quality of life (HRQoL) challenges patients already experience around the time of diagnosis. Therefore, this study aimed to compare HRQoL scores of patients suspected of having a bone or soft tissue tumor to the scores in the general population.

Methods: All Dutch patients visiting the Leiden University Medical Center between 2016-2020 with a suspected bone or soft tissue tumor were invited to complete the Patient-Reported Outcomes Measurement Information System (PROMIS) 29-item profile questionnaire. Mean scores of all included patients, and of patients in the diagnosis groups ‘benign bone tumor (BT)’, ‘malignant BT’, ‘benign soft tissue tumor (STT)’ and ‘malignant soft tissue sarcoma (STS)’ (based on patients’ diagnosis after their diagnostic trajectory), were compared to general population scores (obtained from the literature) using one-sample t-tests. A clinically relevant difference was defined as three point difference on T-score.

Results: 637 patients completed the questionnaire: 32 (5%) malignant STS, 81 (13%) malignant BT, 125 (19%) benign STT, 399 (62%) benign BT. Bone and soft tissue tumor patients reported statistically significantly worse HRQoL scores on anxiety (51.3±9.6), pain interference (55.3±10.1), physical (46.0±9.7) -and social functioning (48.1±10.8) compared with the general population (p<.05). Malignant BT and STS patients scored statistically significant and clinically meaningful higher on anxiety (BT 55.4±9.7, STS 57.0±8.6) in comparison with the general population (p<.05), in contrast to benign tumor patients.

Conclusion: Our results demonstrate that patients visiting the outpatient clinic with a suspected bone or soft tissue tumor reported worse HRQoL scores around the time of diagnosis compared to the general population. Future research should focus on changes in HRQoL scores during follow up.
Comparison of Carbon Fiber and Titanium Intramedullary Nails In Orthopaedic Oncology

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Abstract

Introduction: Carbon fiber implants offer immense imaging advantages over titanium implants due to minimal scatter or susceptibility artifact on CT or MRI, respectively. This is relevant in orthopaedic oncology as radiolucency allows for improved visualization of bone healing, post-operative surveillance for local disease recurrence or progression, and improved capability for radiation planning. There is a paucity of literature describing the use of these implants for pathologic fracture fixation. This study investigated surgical characteristics and short-term results of patients with bony metastatic disease who underwent prophylactic or therapeutic fixation with a carbon-fiber implant for treatment of pathologic fracture.

Methods: This tertiary institutional, retrospectively matched case-control study included patients who underwent prophylactic or therapeutic fixation for pathological humeral, femoral, or tibial fracture with either a titanium (n=36) or carbon fiber (n=36) intramedullary nail between 2016-2020 by one of three surgeons. Patients were 18 or older and matched for demographic characteristics, histologic diagnosis, and fracture location. Patients were excluded if intramedullary fixation was combined with any other surgical procedure/fixation method. Outcomes included operative time, blood loss, fluoroscopic time, and complications. Fisher exact and Mann-Whitney U analyses were categorical and continuous outcome analysis, respectively.

Results: 72 patients were included with 36 patients each in the carbon fiber nail and titanium nail group. Patients with carbon fiber nails had a lower median BMI (24 [interquartile range (IQR):22-26] vs. 27 [23-30]). No other baseline differences were noted between groups. Median follow-up in months was 14 (IQR:2.3-38) in the titanium group and 9.5 (2.4-18.8) in the carbon fiber group. Patients receiving carbon fiber nails compared to titanium nails sustained higher blood loss (150ml [IQR:100-250]) vs. 100ml [50-150]; p=0.042) and longer fluoroscopic time (150 seconds [114-182]) vs. 94 seconds [58-124]; p=0.001). No differences in operative time was noted. There were no differences between groups with regard to implant rejection, fatigue, exchange, or complication, surgical wound infection, and mortality. Implant exchange was required in 4 patients in the titanium group (2 for non-union; 2 for local disease progression leading to conversion to endoprosthetic reconstruction) as compared with 0 in the carbon fiber group (p=0.115). Complications with implants neared statistical significance with 7 patients (19%) in the titanium group, including 4 periprosthetic complications, versus 1 patient (3%) in the carbon fiber group (p=0.055).

Conclusions: Use of carbon fiber nails for fixation of pathologic long bone fractures was non-inferior to titanium nails with respect to radiographic union, implant failure, and complications after matching patient population demographics and tissue histology, and demonstrated a low rate of complications in both groups without statistically significant difference. This represents the largest cohort to date assessing oncologic applications of carbon fiber implants, with similar or more extensive follow-up duration and tracked patient metrics.
Prospective Evaluation of Tranexamic Acid in Metastatic Cancer Patients with Pathologic Fractures Treated with Total Hip Arthroplasty or Hemiarthroplasty

Dr Caleb Yeung, Dr Nikolas Baksh, Dr Anthony Bozzo, Dr John Healey, Dr Nicola Fabbri
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Abstract

Introduction: Tranexamic acid (TXA), an anti-fibrinolytic, has gained popularity in orthopaedics due to reduction in blood loss and need for transfusion post-operatively without increased venous thromboembolic event (VTE) risk. More recent studies across oncologic surgical specialties have shown TXA can be safely used in the general cancer population, a group previously excluded from studies on TXA. No data currently exists on the safety and outcomes of TXA use in the treatment of pathologic hip fracture with hip hemiarthroplasty (HHA) or total hip arthroplasty (THA) secondary to metastatic disease, which is assessed in this study.

Methods: This is a prospective cohort study at a single tertiary care center. Patients undergoing HHA or THA for impending or completed pathologic hip fracture for metastatic disease above the age of 18 were enrolled. Patients were excluded if additional surgical procedures were combined with these procedures. 1000mg of TXA was administered intravenously at incision. Primary outcomes included decrease in hemoglobin from pre-surgical values to post-operative day 1 (POD1), units transfused, and VTE and mortality events with minimum follow-up of 90 days. The independent t-test or the Chi-squared test was used for continuous and categorical variables, respectively.

Results: 37 patients were prospectively enrolled. 19 received THA and 18 received HHA. Distribution of gender, primary malignancy, pre-operative hemoglobin, and patient age did not statistically differ between those receiving TXA vs. not.

In the HHA group, post-operative decrease in hemoglobin in the TXA group was significantly less (1.1 g/dL [standard deviation (SD) 1.0] vs. 2.3 [1.0], p=0.018). No transfusions occurred in the TXA group vs. a mean of 0.2 (SD 0.4) units transfused post-operatively in the control group; this trended toward significance (p=0.08). There were no DVT/PE events in the TXA group and one in the control group, which was not significantly different between groups; there were no instances of mortality at 90 days.

In the THA group, post-operative decrease in hemoglobin in the TXA group was significantly less (1.1 g/dL [SD 1.2] vs. 2.0 [1.0], p=0.048). A significantly lower transfusion requirement was noted in the TXA group compared to the control group (no transfusions vs. a mean of 0.4 [SD 0.7] units, p=0.027). No DVT/PE events occurred in the TXA group vs. one in the control group, which was not significantly different between groups; there were no instances of mortality at 90 days.

Conclusions: TXA administration reduced blood loss and transfusion requirement post-operatively in both the HHA and THA groups. No increase in VTE or mortality events were observed. This data is the first to our knowledge to support the utility of TXA in HHA or THA for treatment of pathologic hip fractures in metastatic disease.
An Update Of Technical Tips Of Microwave Ablation And Ct-Guided Radiofrequency Ablation As A Part Of Minimally Invasive Techniques In Orthopedic Oncology - A Review Of 70 Cases From A Tertiary Care Center In India

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Abstract

Introduction : Osteoid Osteoma though being benign is a very painful lesion of the bone in children and young adults, usually leading to severe night pains. It typically presents with a radiolucent nidus on radiology. Traditionally open surgery for removing the nidus was considered gold standard in the treatment. CT-guided Radiofrequency ablation, has emerged to be a successful alternative to surgery, which bears the complications of recurrence. The aim is to evaluate the clinical efficacy of this technique as minimally invasive therapy for osteoid osteoma in our institution.

Materials and Methods : A retrospective analysis was carried out on 55 patients between 2010 and 2021 diagnosed to have symptomatic osteoid osteoma radiologically and Microwave Ablation was carried out for 15 patients with a solitary metastatic lesion.. Out of these patients 7 cases were recurrence after surgical excision and rest were primary osteoid osteoma. The diagnosis was made clinically and was followed with X-Ray and MRI. The Visual Analogue Score was documented post-operatively. Patients were followed up after 1 week, at 6 months and at one year for assessment. MRI was repeated at the 6 month interval. We also describe the intraoperative sign for confirmation of the needle positioning into the lesion.

Results : 3 patients of these had incomplete ablation and were taken up the following day for repeat ablation and were successfully ablated. The primary success rate measured was 96.3% with secondary success rate being 100% with 2 patients presenting after 2 and 3 years respectively for recurrence, after which they underwent a second radiofrequency ablation. The mean VAS score was 0.6 with a mean follow-up period of 48 months. No procedure related complications were noticed nor any local complications and no case was converted into open surgical excision.
A Single Institution Experience Of Bone Allograft In Musculoskeletal Oncology - A Review Of 135 Cases

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Abstract

Purpose: Most of the procedures in Musculoskeletal oncology involve removal of large quantities of native bone which results in massive voids which have to be filled with either bone grafts or bone substitutes to preserve limb length and obtain a functional limb. There are several methods to achieve this goal which include non-biological methods like the use of megaprostheses, bone substitutes, bone cement, etc; biological methods like bone allograft and also allograft-prosthetic composite. The purpose of this study was to share our experience with various types of bone allografts in our institution.

Methods: 127 patients diagnosed with various bone tumors (74 Giant cell tumor of bone, 23 osteosarcoma, 11 fibrous dysplasia, 8 Ewings sarcoma, 6 Chondrosarcoma, 13 other benign tumors) who needed allograft for the surgery were evaluated in the study. Freeze dried bone and fresh frozen allograft were used which were obtained from certified tissue banks. Cortical strut grafts for structural support, morcellized bone grafts to fill up bone voids, peri-articular allografts were using along with prostheses as composites, cortico-cancellous grafts for large curreted cavities with or without bone cement were used. Operative site wound was inspected for signs of reactive inflammation or infection. On serial follow up stability and joint range of motion were documented, plain radiographs were taken for evaluating bony union and also look for other bony changes, if any, attributable to the bone allografts. CT scan and MRI scans were obtained as and when regular follow-up warranted for individual tumour. The massive allografts needed for the procedure were acquired from the Rizzoli Bone Bank, Italy.

Results: At final follow up graft incorporation was noticed in all our patients. Most of the patients with allografts in periartricular region had functional range of motion. 27% of the patients had prolonged serous discharge from the operated site which was treated by regular exsanguination and dressing. 3% of the patients had purulent discharge from the operated site, which were managed with intravenous antibiotics and regular dressing and one patient needed debridement of the operated site followed by VAC dressing and subsequent split skin grafting. Post operative fracture was evidenced in two patients which were treated surgically and fractures subsequently healed.

Conclusion: Bone allograft is an excellent modality of treatment, especially in conditions and regions where prosthetic reconstruction is not feasible and the quantity of autograft is not sufficient. A thorough review of literature suggested that our study is one of the largest series in our country and our good long term goal oriented results can be attributed to following stringent perioperative protocols for procuring (maintaining cold chain, appropriate thawing), preparing (serial antibiotic wash, bone mill morcellization) and surgical technique (struts along lines of compression, adequate tensioning of cancellous grafts, respecting surrounding soft tissue). We emphasize on the need of more facilities to cater the demands of allografts as its availability is of concern and a major setback for its use.
Hemiarthroplasty of pedicle frozen proximal tibia for primary malignant bone tumours - A case report

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Abstract

The proximal tibia is one of the most common locations for primary malignant bone tumours and is usually seen in a population that has not attained skeletal maturity. Most of the surgical techniques for resection and reconstruction of the proximal tibia in children involves sacrificing the distal femoral epiphysis, which leads to a significant limb length discrepancy. Hemiarthroplasty is a relatively lesser-known technique for knee joint reconstruction that preserves one of the epiphyses around the knee joint. Pedicle freezing is a sterilization technique used to treat malignant bone tumours, without performing an osteotomy of the diaphysis, thereby preventing non-union which is the most common complication of biological reconstruction techniques. We describe the surgical technique of Hemiarthroplasty of the pedicle frozen proximal tibia for malignant bone tumours of the proximal tibia. This is a novel, safe and effective reconstructive method in children, resulting in reduced limb length discrepancy and excellent functional outcomes.

Keywords

Limb salvage, pedicle freezing, hemiarthroplasty of knee, osteosarcoma, bone tumour.

Poster upload

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OUTCOMES OF INTERCALARY ENDOPROSTHESES AS A TREATMENT FOR METASTASES IN THE DIAPHYSIS OF FEMUR AND HUMERUS

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Abstract

Introduction: The purpose of this study was to evaluate functional score and complications of intercalary endoprostheses implanted for metastatic involvement of the femoral and humeral diaphysis.

Method: Patients with bone metastases of long bones who were surgically treated with intercalary endoprosthesis between 2012 and 2021 have been identified. The functional outcome was evaluated by the Musculoskeletal Tumor Society (MSTS) scoring system and complications using the failure classification for prosthetics designed by Henderson.

Results: The mean follow-up was 29.8 months. In our group of 25 patients with 27 intercalary endoprostheses (18 femurs, 9 humerus) there were 7 implant-related complications (25.9%), which were more common on the humerus (4 cases, 44.4%) than on the femur (3 cases, 16.7%). Only type II failure (5 cases, 18.5%) and type III failure (2 cases, 7.4%) occurred. There was statistically significantly (OR 13.79, 95% CI 1.22-151.05, p=0.0297) higher risk of aseptic loosening of endoprosthesis in the humerus compared to the femur. The cumulative overall survival at one year after surgery was 92% and after 5 years 72%. The average MSTS score was 82%. Statistically significantly (95% CI 23.69–25.48, p=0.008) the MSTS score was lower in the humerus (75.9%) than in the femur (84.8%)

Conclusions: Resection of bone metastases and replacement with intercalary endoprosthesis has excellent immediate functional results with an acceptable level of complications in prognostically favorable patients.
A Review of 1884 Core Biopsies In Orthopedic Oncology - A Single Institute Experience

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Abstract

Biopsy as a procedure is technically simple but conceptually a challenge. The principles of biopsy have remained more or less the same for 3 decades. With the advent of imaging, facilities, and pathology modalities, we feel it's important that these principles are revisited. Uncertainties are spread across the literature regarding this very important first step in the care of an oncology patient. A surgeon planning the biopsy should be equipped with an MRI for planning. A biopsy has to be considered even for a benign-looking lesion. Even though literature is not clear on what kind of biopsy a surgeon should undertake, it is, without doubt, core biopsy has the edge that fine needle biopsies fail to reproduce. Image guidance for a biopsy is paramount for the accuracy of the sample. Pre-biopsy embolization has to be an option in the toolbox of a surgeon. Biopsy samples from an open biopsy or expensive or difficult radiology-assisted biopsy should undergo a rapid assessment to reduce the error of sample collection and thereby avoid subjecting the patient to a repeat procedure. Even though clean procedures do not require antibiotic prophylaxis, in view of major endoprosthetic implantations in the future, antibiotic use may be justified.
How accurate is measurement on radiological images for resection and reconstruction in Orthopedic Oncology?

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Abstract

Study Design: Prospective study.

Purpose: The main purpose of this study was to clarify the range of magnification errors on digital plain radiographs, and MRI scans while planning for resection and 3D printed implants and prosthesis.

Methods: We used plain digital radiography and magnetic resonance imaging (MRI) to acquire images of an object with known dimension to standardize the magnification error and incorporate it into the measurement. The magnification error (ME) was then calculated: ME=(length on radiograph/MRI- known length of the object)/known length of the object ×100 (%). Correlation analysis is done to see if change in distance of the object from the radiation source also changes magnification.

Results: Average magnification errors in plain radiograph were approximately 11\%±1\% There was no correlation between distance from the source and the magnification error. There was negligible magnification in MRI.

Conclusions: There were magnification errors on the digital plain radiographs, and but no magnification was found in MRI scans.
**Reconstruction of Proximal Humerus Resections With Mesh Cone-Nail-Cement Spacer Construct**

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**Abstract**

Cement spacer as a reconstruction technique in proximal humerus resections in malignant and benign conditions is well established. Functional outcome of any reconstruction is decided by how well soft tissue reconstruction has been carried out. Cement spacer technique allows soft tissue reattachment at any site required as compared to prosthetic reconstruction, but such reattachment sites have to be decided before setting of the cement. Here we describe a technique in which a prolene mesh is used as a mould for the cement. The outer prolene mesh gives the surgeon opportunity to anchor soft tissues during closure at any area desired. The mesh creates a porous surface over the stem which will aid in better healing by fibrosis for the muscle as compared to healing over smooth cement. The mesh fibrosis is another added point of stability at the bone-construct junction. Post-operative shoulder range of motion was easier to achieve in such patients.
Unusual Recurrence in a Case of Distal Radius GCTB

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Abstract

Abstract Case: A 45 year old woman, who had previously undergone curettage of GCT distal radius, presented with recurrence of lesion which was managed initially with resection and non-vascularised fibular autograft reconstruction. Tumour again recurred in the autografted fibula which was managed by curettage and cementing. Due to progressive collapse of the carpus, resection of the autograft and wrist arthrodesis was carried out. Conclusion: Recurrence of GCT is a challenging problem. Wide resections may not always avoid recurrences. Patients should be made aware of the extend of recurrence that can happen in spite of the best efforts.
Isolated limb perfusion and tumour endoprosthesis: a perfect combination for bone-associated sarcomas, or have we gone completely bonkers?

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Abstract

Introduction

The aim of this study was to evaluate the outcome after TNF and Melphalan based isolated limb perfusion (TM-ILP) and subsequent implantation of a modular tumour endoprosthesis in bone-associated sarcomas.

Method

We matched our ILP-database with our clinical database for patients who received TM-ILP and an implantation of a tumour endoprosthesis during the planned tumour resection. All cases files were drawn from the digital archive and reviewed accordingly.

Results

From July 2004 until January 2020, we identified 14 cases of patients having received TM-ILP and a tumour endoprosthesis due to a high-grade sarcoma with bone involvement. There were 4 cases affecting the humerus, 7 cases of a femur and 3 cases of a tibia. The mean follow-up was 58 months. Three cases were lost to follow up.

For OS and DSS: 6 patients died during the follow-up period, 4 from metastatic disease, 2 from other causes (mean DSS 102 months; 58%). Concerning implant survival there were 3 losses of a prosthesis leading to amputation; however, there were no cases of local recurrences. Histopathologic response to ILP was good, with a median of vital tumour after ILP of 9.5 %.

Conclusions

We conclude that the combination of TM-ILP and tumour prosthesis is safe and feasible in selected cases of bone sarcoma, or STS with involvement of bone. The complication rate seems comparable to non-ILP tumour endoprosthesis. The effect on local tumour control however, seems rather promising.
Risk factors for all-cause early re-operations in patients undergoing tumor resection and endoprosthetic reconstruction: a secondary analysis from the PARITY trial

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Abstract

Background: Oncologic resection and endoprosthetic reconstruction of lower extremity musculoskeletal tumours are complex procedures fraught with multiple modes of failure. The aim of this study was to assess risk factors for early re-operation in patients undergoing tumor excision and endoprosthetic reconstruction based on the PARITY prospective trial data.

Methods: A secondary analysis of the PARITY data assessing risk factors for early (within 1 year) re-operation was performed. Baseline characteristics and surgery-specific factors were selected a priori. Univariate analysis explored differences in patients who did or did not undergo an early re-operation. Multivariate Cox proportional hazards regression analysis explored predictors of early re-operations.

Results: 155 of 604 (25.7%) patients experienced re-operation. In univariate analysis, tumor type (p < 0.001), operative time (p < 0.001), use of topical vancomycin (p = 0.026), use of negative pressure wound therapy (NPWT) (p = 0.010), and hospital length of stay (p < 0.001) were associated with re-operation. Upon multivariate assessment, bone tumor type (benign aggressive vs. primary malignancy, HR 0.15, p = 0.008), operative time (HR 1.14, p < 0.001), and use of NPWT (HR 1.60, p = 0.029) remained significant predictors of early re-operation.

Conclusions: Independent predictors of re-operation at 1 year in patients undergoing tumor resection and endoprosthetic reconstruction included: bone tumor type (benign aggressive vs. primary malignancy), operative time and use of NPWT. These results will help inform patients and surgeons about risk of re-operation, and support further investigation into the use of NPWT at the time of surgery in this patient population.
Cancer ablation and focal fixation for focal osteolytic metastatic lesions in the proximal or distal femur: One long-implant fits all? or Personalized focal AORIF oncologic fixation?

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Abstract

Introduction: Osteolytic metastases in the femur have been managed by intramedullary nailing, tumor implants, or plate & screws. All these treatment methods are implant-centric with emphasis on arthroplasty or trauma surgery techniques for normal bone. Open surgical techniques may either delay or even preclude life-saving chemotherapy when there are complications. This study aims to determine ambulatory functional outcomes of patients who underwent percutaneous focal radiofrequency ablation-balloon osteoplasty-PMMA bone cement reinforcement-cannulated screw fixation (AORIF) for focal osteolytic metastases in the femur.

Materials and Methods: 27 femoral lesions in 24 patients (3 bilateral femoral lesions) were treated with AORIF at the single cancer center and then followed up to 25 months or until death.10 patients presented with ipsilateral acetabular lesions and proximal focal femoral lesions that were separately treated by AORIF instead of open hip implant reconstructive surgeries. Pain and functional improvement was documented by using combined pain (VAS) and functional ambulatory score, and ECOG score. Two patients with painful renal cell cancer metastases patients has concurrent one-stage angiography, embolization, and AORIF under one anesthesia.

Results: There were no complications such as infection, blood loss, or prolonged hospitalization. All patients showed improved pain and functional ambulatory scores along with ECOG and Karnofsky performance scores (follow-up range:6 - 22 months). 10 patients died of disease but did not develop fractures. Among 14 patients alive with cancer, 4 patients required conversion surgeries due to atypical fracture-like subtrochanteric fractures (n=2), an existing femoral neck fracture, and progressive bone loss (n=1). Overall fracture rate excluding 2 established fractures is 8% (2 fractures/25 femur).

Conclusion: AORIF is a safe and effective alternative minimally invasive percutaneous procedures for a focal periarticular osteolytic metastases in patients with advanced cancers before extensive open reconstructive surgeries are contemplated.
A patient-specific fracture risk assessment tool for femoral bone metastases; using the BOne Strength (BOS) score in clinical practice

Dr Florieke Eggermont¹, Prof Yvette van der Linden², Dr Edwin Dierselhuis³, Tom Rozema⁴, Dr Janine van Nes⁵, Prof Nico Verdonschot¹,⁶, Steven Ligthert¹, Dr Paulien Westhoff⁷, Prof Esther Tanck¹

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Abstract

Introduction

To help assessing pathological fracture risk of patients with femoral bone metastases, we developed the BOne Strength (BOS) score: an easy-to-use objective score based on patient-specific finite element (FE) computer models. Previously the BOS score showed to be more accurate compared to clinical guidelines (30 mm cortical involvement; sensitivity:100% vs. 86%, specificity:74% vs. 42%, PPV:39% vs. 19%, and NPV:100% vs. 95%). In this study, we explored the added value of the BOS score for patients and physicians.

Methods

Four Dutch radiotherapy departments included sixty-seven patients with predominantly lytic femoral bone metastases. Patient-specific FE models were generated using radiotherapy planning QCT scans and patient data. The calculated BOS score and corresponding fracture risk were returned to the physician, who subsequently completed a short questionnaire about the treatment decision and the use of the BOS score. Physicians’ assessed fracture risk was then compared to BOS score outcomes.

Results

The first results indicate that the BOS score is of added value for both physicians and patients, mainly because it gives an objective insight in the fracture risk. If the BOS score did not match the physician’s initial fracture risk estimation (66%), treatment plans were adapted in approximately 2/3 of these cases. Furthermore, the use of the BOS score resulted in more multidisciplinary consultation and shared decision making with the patient.

Conclusions

The BOS score is a promising tool for fracture risk assessment of patients with femoral bone metastases. It helps physicians and patients to make more informed decisions regarding the treatment.

Poster upload
Patient engagement in sarcoma research: benefits, challenges, importance, and implications

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Abstract

Introduction

Patient engagement is the active participation of patients in research in collaboration with a research team with the aim of maximizing patient-centred results. This study addresses current knowledge gaps surrounding benefits, challenges, and importance of engagement in sarcoma research.

Methods

This study utilized a mixed model design comprised of a focus group discussion and survey. Focus group participants were sarcoma patients serving as advisors in a Patient-Centered Research Advisory Group which assists with components of the Surveillance AAfter Extremity Tumor surgeryY (SAFETY) trial. The survey was distributed to the Centre for Evidence-Based Orthopaedics Musculoskeletal Oncology team at McMaster University. Each component prompted the evaluation of the current SAFETY engagement plan and general benefits, challenges, and implications of patient engagement.

Results

Results showed that patients value the opportunity to contribute to research and support future patients. Patients noted that one challenge is their lack of background in scientific research resulting in confusion surrounding the engagement plan. Members of the research team emphasized that engagement is essential for the study of patient-relevant topics and insight into the improvement of patient care. An added challenge is the lack of guidance surrounding effective engagement.

Conclusion

In conclusion, patient engagement is valuable to sarcoma patients and researchers. This approach aims to emphasize the patient’s journey by involving patients in each step of the research continuum which enhances the study design and increases the relevancy of findings. This study also highlights the need for further research into best practices for the implementation of patient engagement.
Dedifferentiated central chondrosarcoma

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Abstract

Dedifferentiated chondrosarcoma (DDCS) is a high-grade CS with the appearance of a conventional CS with an abrupt transition to non-cartilaginous sarcoma.

We identified 88 patients (12% out of 722 central CS) from ROH between 1996 and 2020 with pelvis or extremities DDCS. 52 (58%) were males and 35 (40%) had a pathologic fracture. 30 (34%) had LR, 66 (75%) had metastases and 68 (74%) died of the disease.

In 64 (72%) patients, the high grade component was spindle cell sarcoma, in 21 (24%) osteosarcoma and leiomyosarcoma, epithelial sarcoma, and fibrosarcoma one each. Median age was 65 years. Chemotherapy (CT) was given to 16 (18%) patients and radiotherapy (RT) 22 (25%). CT did not have any effect on disease-specific survival (DSS). DSS was 51.2% at 1-year, 25.3% at 3-years and 16.4% at 5-years. Pathologic fracture (HR 1.79, 95%CI 1.1-2.9, p=0.21), and metastases (HR 7.33, 95%CI 2.9-18.6, p<0.001) were the only statistically significant factors for DSS. Patients with pathologic fractures treated with amputation had better margins when compared to limb salvage surgery. However, amputation did not improve LRFS (p=0.988) or DSS (p=0.890).

Our results show, that DDCS is a very aggressive sarcoma. In our study, CT did not improve DSS and RT did not improve LRFS. Pathologic fracture was a statistically significant factor for decreased DSS. Treating patients with pathologic fracture aggressively with amputation may improve margin but it did not translate into improved LRFS or DSS, therefore limb salvage surgery should be the primary target also in patients with pathologic fracture.
Extraosseous tumour component predicts disease specific survival better than the grade in conventional central chondrosarcoma of the proximal femur

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Abstract

Chondrosarcoma (CS) is the second most common primary malignant bone tumour and is largely considered to be a surgical disease. The location, in accordance with grade, has an impact on survival. The aim of this study was to investigate the role of extraosseous tumour component in local recurrence (LR), LR free survival (LRFS) and disease specific survival (DSS) in conventional central CS arising from the proximal femur.

We retrospectively reviewed data from ROH between 1/1995 and 10/2020 and identified 112 patients. Resection specimens were examined, for grade, margins and tumour location is respect to cortical out breach in superior aspect of the greater trochanter or anywhere in the specimen. 18 patients (16%) had grade 1 tumours, 58 (52%) grade 2, and 36 (32%) grade 3 CS. The median age was 59 years and the median follow-up time was 77 months.

55 patients had an extraosseous tumour component of which 22 were in the superior aspect of the proximal femur. Factors statistically significant for LRFS were extraosseous tumour component (p=0.006), extraosseous tumour component in the superior aspect of the greater trochanter (p<0.001), and surgical margin (p<0.001). Significant factors to DSS were LR (p<0.001), extraosseous tumour component (p<0.001) and tumour grade (p<0.002).

In conventional central CS of the proximal femur, the presence of an extraosseous tumour component has a very predictive role in survival, as none of the patients with an intraosseous tumour died of the disease. The role of the extraosseous tumour component was more predictive in DSS than grade.
Patient and Surgical Risk Factors for Surgical Site Infection in Lower Extremity Oncologic Endoprosthetic Reconstruction: A Secondary Analysis of the PARITY Trial Data

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Abstract

Background

The specific risk factors for surgical site infection (SSI) in orthopaedic oncology patients undergoing endoprosthetic reconstruction have not previously been evaluated in a large prospective cohort. The current study aims to define patient and procedure-specific risk factors for SSI in patients undergoing endoprosthetic reconstruction using the prospectively collected data of the Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) trial.

Methods

In this secondary analysis of the PARITY data, a multivariate Cox proportional hazards regression model was constructed to explore predictors of SSI within one year postoperatively. The variables selected for inclusion in the regression model were age, sex, tumor location (femur vs. tibia) and type (primary bone vs. soft tissue sarcoma invading bone vs. oligometastatic bone disease), soft tissue mass, preoperative neutropenia, neoadjuvant chemotherapy, operative time, total muscle excised, intraoperative vancomycin powder use, silver coated prosthesis, prosthesis betadine soak, arthroplasty helmet use, operative laminar flow, postoperative suction drain, urinary catheter, postoperative negative pressure wound therapy, hospital length of stay (LOS) and adjuvant chemotherapy.

Results

A total of 96 of 604 patients (15.9%) experienced an SSI. Of the 22 variables analysed in the univariate analysis, four variables achieved statistical significance: tumor type, operative time, volume of muscle excised and hospital LOS. However, only hospital LOS was found to be independently predictive of SSI in the multivariate regression analysis.

Conclusions

This secondary analysis of the PARITY study data found that among the potential risk factors for SSI following endoprosthetic reconstruction, the only independent risk factor on multivariate analysis was hospital LOS.
Clinical and imaging features affecting the necessity of tissue biopsy in pathological long bone fractures

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Abstract

Introduction: Tissue biopsy in pathological fracture of bone tumor remains the gold standard. Tissue biopsy might be opted out in some circumstances to reduce the preoperative waiting time and cost of treatment. This study evaluated and identified the factors affecting the necessity of tissue biopsy in pathological long bone fractures.

Method: Ninety patients with 102 actual pathological fractures who underwent definite surgery with histopathological confirmation in our institute were enrolled. The final histopathological results included 78 metastatic bone diseases, 10 benign bone lesions, 10 multiple myelomas and 4 primary bone sarcomas. The affected clinical and radiographic factors were analyzed.

Results: Only 26 (26%) pathological fractures had tissue biopsy to confirm diagnosis before definite surgery. A history of known primary cancer were 8/26 (31%) and 70/76 (92%) in biopsy and non-biopsy group sequentially. While multiple lesions from bone scan or bone survey required tissue biopsy in 1/68 (1.5%) versus 25/34 (74%) in single lesion. All 4 primary bone sarcoma with pathological fractures had preoperative tissue biopsy which mineralized tumor matrix and periosteal reaction were the important parameters to guide the provisional diagnosis. Four out of 10 (40%) benign bone lesions underwent definite surgery without prior tissue biopsy.

Conclusions: History of known primary cancer, Mineralized tumor matrix, periosteal reaction, and number of lesions were the important factors affecting the necessity of tissue biopsy in pathological long bone fractures. However, tissue biopsy remains the gold standard and must be perform in equivocal circumstance to prevent the unplanned surgery.
Soft tissue solitary fibrous tumor: is histopathological pattern sufficient for defining prognosis or do we need further biomolecular insights and markers?

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Abstract

Introduction

Soft tissue solitary fibrous tumor is still a challenging entity, due to the difficulty in defining the degree of aggressiveness and consequently the most adequate treatment and follow-up regimen. Few wide series were reported. In the era of biomolecular characterization of tumors, is histopathological analysis sufficient to define prognosis or do we need new biomolecular markers?

Methods

A series of 28 soft tissue solitary fibrous tumors treated from 2002 to 2020 was analyzed. Two patients were excluded as early lost at follow-up. Clinical and radiological follow-up was performed. Histopathological analysis included evaluation of tumor necrosis, mitotic activity, cellular atypia.

Results

18 tumors were located in the lower limb, 6 in the upper limb, 2 in the trunk. All the tumors were subfascial. Dimension was <5 cm in 7 patients, > 5 cm in 19. Four patients were histologically defined as malignant at presentation; three of them died of disease, one is alive with disease (pulmonary). At a follow-up ranging from 24 to 176 months (average 90) only two more patients developed distant metastases. Both of them showed at presentation a high risk histological pattern.

Conclusions

Traditional histopathological analysis seems to be able to adequately identify the majority of solitary fibrous tumors with malignant behaviour or at high risk for distant failure. Nonetheless it is still difficult to decide which case need adjuvant treatment and more strict follow-up schedules. Further research should be addressed to the investigation of potential new biomolecular markers able to strengthen our current evaluation criteria.
Phosphaturic mesenchymal tumour in the thigh causing paraneoplastic tumour-induced osteomalacia without FGF-23 being positive in blood samples

Dr Christian Spiegel, Dr Thomas Winkens, Dr Philipp Seifert, Prof Gunther Hofmann, Dr Wolfram Weschenfelder
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Abstract

Introduction

Tumour-induced osteomalacia is a paraneoplastic syndrome. In phosphaturic mesenchymal tumours it is typically caused by secretion of fibroblast growth factor 23 (FGF-23) causing hypophosphatemia due to decreased tubular reabsorption of phosphate.

Case presentation

We present the case of a 46-year-old male patient who was presented to our hospital with chronic diffuse shoulder and back pain for more than 2 years. A finally caused insufficiency fracture of the left femoral neck causing referral for rheumatological and osteological workup. This revealed generalised osteoporosis with increased alkaline phosphatase, ostase and decreased phosphate in the bloods. FGF-23 was normal. To exclude a neuroendocrine tumour as the cause, a Ga-68-DOTATOC-PET-CT was performed, which showed a small lesion with increased tracer uptake in the left thigh.

Preoperative radionuclide labelling was performed with Ga-67-DOTATOC-SPECT for intraoperative detection with a gamma probe. The tumour could then be adequately localised and thus resected. Postoperatively, the calcium and phosphate levels showed normalisation within 3 days. Interestingly, the FGF-23 level in the blood showed no relevant change compared to the preoperative level. The histological work-up showed a benign phosphaturic mesenchymal tumour. The patient's generalised pain symptoms and mobilization improved rapidly.

Conclusion

This case shows the complex diagnosis and treatment of a patient with tumour-induced osteomalacia in phosphaturic mesenchymal tumour. It is remarkable that the measurement of FGF-23 blood levels could not confirm or exclude the diagnosis and that the very small tumour became visible in the course of a DOTATOC-PET-CT, i.e. labelling with an analogue of somatostatin.

Poster upload

Download file
Early experiences with the SIGNUS SACRONAIL in the treatment of pathological sacral fractures

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Abstract

Introduction

The bony pelvis and spine are often affected in patients with diffuse osseous metastasis of tumours. The sacrum has a high biomechanical load and a pathological fracture is therefore associated with persistent pain and impending permanent immobility. Traditionally, spinopelvic fixation has been used in the sacral region, unfortunately having a high risk of wound healing problems. The use of the ©SACRONAIL decreases this issue. Additionally, the implant with screws in the ilium has increased rotational stability compared to conventional bars or SI screws.

Methods

Illustrated is the workflow for 2 representative tumour cases. Case 1 displays a transalar sacral fracture in a 71-year-old patient with metastatic gastric cancer. Case 2 displays a transforaminal sacral fracture in a 47-year-old patient with metastatic breast cancer. The workflow comprises: 1) planning of trajectory and length of ©Sacronail with navigation; 2) percutaneous placement of tracker; 3) Intraoperative Imaging and CT fluoro-matching; 4) placement of guidewire; 5) application of ©Sacronail; 6) placement of locking iliac screws using targeting device.

Results

The workflow of the cases presented displays a step-by-step guide for navigated placement of a ©Sacronail for the treatment of pathological fractures of the sacrum. The postoperative CT-scans confirm very good placement. The outcome after 3 months showed sufficient wound healing, reduction of pain and return to normal mobility.

Conclusion

The early results of treating pathological sacral fractures with the ©Sacronail are promising. The procedure is similar to conventional bars or SI screws and easy to integrate into everyday clinical practice.

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Download file
Primitive Study on a 3D Preoperative Planning System for Bone and Soft Tissue Tumors Using a Virtual Reality Game Console.

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Abstract

Introduction: 3D preoperative planning with specialized software is widely used in general orthopedics. However, the location and the extent of resection of bone and soft tissue tumors vary from case to case, and the number of cases is small, which greatly limits the use of planning software specialized for each joint. In recent years, virtual reality (VR) headsets have become more sophisticated and less expensive. We tried to build a 3D-VR preoperative planning system for orthopedic oncology with a budget of fewer than 1000 euros.

Methods: CT volume data was imported into a gaming PC (with GTX 1660 super), and 3D models were created using the open-source software "3D Slicer". The VR headset "Meta QUEST 2" was connected to the PC, and the 3D model was loaded into the VR modeling free software "medium by Adobe" to simulate tumor resection and plate fixation.

Results: The tumor model was displayed in the VR space and could be seen from all directions. Tumor resection and reconstruction could be simulated by marking the bone with the "paint tool" shaving the tumor and bone with the "clay tool" and moving the bone divided into multiple segments. 3D templating could be easily performed by loading 3D models of the plate created from another CT data.

Conclusions: A versatile 3D preoperative planning system for orthopedic oncology with intuitive operation could be constructed by combining a gaming PC with a mid-range graphics board (from 699 euro) and a VR game console (from 299 euro).
Have those tumours not crossing the physis a different outcome? A Reassessment of the Barrier Effect of the Physis against Metaphyseal Osteosarcoma

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Abstract

Introduction: Osteosarcoma is a primary malignant bone tumor usually arising at the metaphysis of long bones, particularly around the knee. The physis has been regarded as a barrier capable of blocking tumor extension, thus allowing it to preserve their epiphysis and therefore improve functional results. With the objective of clarifying how effective the physis is as a barrier to tumor spread, a large series of skeletally immature patients with osteosarcoma were reviewed.

Method: From 452 metaphyseal osteosarcomas a selection of 282 cases in which the tumor was close or crossing the physis were carried out. This sub-sample was split into two groups according to the surgical treatment (epiphyseal preservation (n=132) or not (n=152)). The specimens obtained by resection were studied, and the physeal and metaphyseal areas were studied by multiple sections. Immunostaining against VEGF of physis was obtained in selected cases.

Results: Three sequential invasive growth patterns of an osteosarcoma in its relationship with the physis could be distinguished. An intense angiogenesis and osteoclastic reaction could be observed in the growth plate in the free zone between the tumor and the physis. The crossing of the physis, therefore, is a matter of time. The local recurrence incidence was lower in the epiphyseal preservation treated patients than it was in those whose epiphysis needed to be sacrificed (8% vs. 12%). Most local recurrences appeared in the first 2 years. The overall survival of patients treated with epiphyseal preservation was better than that of the patients treated without preserving the epiphysis (73% vs. 59%; $p = 0.03$) at a mean follow-up of 18 years. We have described an angiogenic and osteoclastic reaction in the base of the growth plate in the proximity of the advance front of the tumor, which could facilitate the osteosarcoma invasion. It is also shown that the preoperative imaging method for examination is a valid approach for the decision to carry out epiphyseal preservation.

Conclusions: These results can be related not only to a lower aggressivity of those tumors not crossing the physis, but also to an earlier diagnosis and start of treatment. Epiphyseal preservation combined with adjuvant chemotherapy is an excellent clinical approach for selected patients with metaphyseal osteosarcoma. Survival of bone sarcomas is now more or less the same as 40 years ago. It is time to focus on earlier diagnosis and start of treatment to improve our results.
Preoperative imaging determines necessity of tissue biopsy in extraperitoneal lipomatous tumor.

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Abstract

Introduction

Tissue biopsy is mandatory in most of soft tissue tumor before the definite surgery but not for extraperitoneal lipomatous tumor which provisional diagnosis can be mostly made by imaging study.

Method

Retrospective study was performed by collecting all data from 2010 to 2020 including all new extraperitoneal lipomatous tumor patients who underwent definite surgery with a minimum of 1-year follow-up. One hundred patients with 104 lesions were included consisting of 57 lipomas, 26 atypical lipomatous tumors (ALT), and 21 high-grade liposarcomas. Provisional diagnosis of lipomas and ALTs were marginal resected while high-grade liposarcoma were attempted for wide resection.

Results

Preoperative tissue biopsy was performed when imaging suggested of high-grade liposarcoma in 18/28 (64%) lesions and 1/40 (3%) in ALT. Twenty-six out of 27 (96%) superficial lesions also with 83/86 (97%) lesions contain higher than 75% of fat component had definite surgery without prior biopsy. Five out of 19 (26%) biopsy results did not exhibit malignant features which turn out to be 3 high-grade liposarcomas, 1 ALT and 1 lipoma from whole specimen study, while 4 lesions from those 5 biopsies achieved free margin from whole specimen study.

Conclusions

Provisional diagnosis from imaging of high-grade liposarcoma was preferred by surgeon for preoperative tissue biopsy event though inconclusive result might be exhibited. Moreover, superficial lesions and lesions with higher than 75% fat component from imaging regardless of diagnosis would undergo definite surgery without biopsy. Accurate imaging interpretation is the key success to determine proper management of extraperitoneal lipomatous tumor.
Reduced dose intensity protocol of denosumab in treating advanced/unresectable giant cell tumour of the bone

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Abstract

Introduction: The role of reduced dose intensity of denosumab to treat GCTB has not been analyzed so far. We report our findings in patients receiving “reduced dose intensity” of denosumab in our institution for advanced/unresectable or metastatic GCTB.

Methods: Among 216 patients with GCTB receiving denosumab for various indications between November 2010 and April 2022, 33 patients on prolonged denosumab therapy for advanced GCTB were considered for the analysis. In our adopted “reduced dose intensity” protocol, 120mg of subcutaneous denosumab is administered bi-monthly for the first three months (6 doses), followed by once in three months for one year, and once in six months thereafter.

Results: The median number of denosumab doses administered was 17 (range: 9 – 28). The median period of follow-up from initiation of denosumab therapy was 58 months (range: 12 – 116). Among the 33 patients, 85% (28 of 33) had radiologic objective tumour response and 15% (five of 33) had progression of the tumour during the therapy. The Kaplan-Meier survivorship free from tumour progression at 5 years was 82% (95% confidence interval, 77 to 86). The overall incidence of complications (CTCAE v5.0) was 15% (five of 33), with none Grade 3 and above.

Conclusion: In patients with advanced/unresectable or metastatic GCTB treated with denosumab, we found that gradually reducing the dose intensity to once in 6 months instead of monthly doses can maintain the tumour response in most of the patients, thereby reducing the financial burden and complication rates.
**Does vascularized on-lay fibula graft provide additional benefit in the biological reconstruction of large segment intercalary femur defects?**

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HCG Hospital, Bangalore, India

**Abstract**

**Introduction:** The use of an allograft or a recycled autograft alone for the biological reconstruction of the femur can lead to complications that can be prevented by augmenting the construct with a vascularized fibula graft (VFG). However, the procedure of augmenting the construct is challenging that can lead to intra- and postoperative complications, and its benefits are not well documented.

**Methods:** A retrospective analysis was conducted on 33 patients operated on for primary malignant bone tumours of the femur, undergoing intercalary resection and biological reconstruction (recycled autograft or allograft) from 2011 to 2022. The patients meeting the inclusion criteria were divided into two groups: with (VFG+, n=12) and without (VFG-, n=16) free medial on-lay VFG. The following factors were compared between the two groups: duration of surgery, blood loss, perioperative complications, time to union of the intercalary construct, functional outcome (MSTS score), graft survival, and local recurrence-free survival (LRFS) and overall survival (OS).

**Results:** The mean duration of surgery (312±26 minutes in VFG+ vs. 228±41 in VFG-, p=0.023) and mean blood loss during surgery (980±65 ml in VFG+ vs. 640±81 ml in VFG-, p=0.015) was significantly higher in the VFG group. MSTS scores at the end of one year following surgery were similar between the two groups (22.3±3.3 vs. 21.0±4.6, p=0.224). On Kaplan-Meier analysis, graft survival at 2 years postoperatively was significantly better in the VFG+ group (100%) compared to that in the VFG- group (92%) (log-rank, P=0.042).

**Conclusion:** The medial on-lay VFG augmentation reduced the time to union of the allograft or a recycled (sterilized) autograft used to reconstruct large segment femur defects, without increasing the perioperative morbidity.
Pazopanib in advanced bone and soft tissue tumours: Is it worth it when there is nothing else to offer?

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Abstract

Introduction: Though multiple recent studies have shown satisfactory disease control in patients with advanced STS on pazopanib, there is a poor understanding of its response, indications and rationale for use. We aimed to evaluate the off-label use of pazopanib in select patients with bone and STS, and report our clinical experience.

Methods: As a part of an institutional clinical trial, pazopanib was used in patients with high-grade bone and soft tissue tumours following completion of standard treatment with no evidence of disease but a high probability of local recurrence or distant metastasis(Cohort 1). In another group of patients(Cohort2), pazopanib was used as second-line or third-line therapy in patients with advanced bone and soft tissue tumours.

Results: As of June 2022, eleven patients were enrolled in cohort1; synovial sarcoma(45%,5/11), osteosarcoma(27%,3/11), Ewings sarcoma(9%,1/11) and UPS(18%,2/11) are the diagnoses. Six out of eleven patients in cohort1 have completed one year of maintenance therapy and two(18%) had disease relapse(distant metastasis). In cohort2, synovial sarcoma is the most common diagnosis(35%,n=6) among the 17patients enrolled. 35%(6/17) had a partial response to therapy, 24%(4/17) had stable disease and 41%(7/17) had progressive disease. The median progression-free survival was 5.4months(95%CI:2.4-8.0).

Conclusion: Although histologic specific large group studies are warranted to estimate the efficacy of maintenance pazopanib therapy, low dose pazopanib can be considered in patients with a high risk of relapse following standard treatment of malignant bone and soft tissue tumours, instead of offering nothing during follow-up.
Outcomes of Brachytherapy in soft tissue sarcoma of the extremities: Tips to burn the tumour and not our fingers with experience of 58 cases from a single institute.

Dr Suraj Hindiskere, Dr Pramod Chinder, Dr Belliappa MS
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Abstract

Introduction: We report our institutional results with Brachytherapy (BT) for STS and technical tips for intraoperative cable application that can minimize complications and enhance radiation delivery.

Methods: From December 2010 to April 2022, 58 patients undergoing BT for advanced STS were considered for the study. The mean age of the study population was 46±11 years with most of the tumours in the lower extremity (74%, n=43). Synovial sarcoma was the most common histological type (55%, n=32). BT consisted of a high dose rate Iridium-192 interstitial implant with a range of 3 to 6 Gy per fraction delivered between three to ten sessions. 85% (n=49) of patients underwent combined BT & EBRT. BT was started once the wound condition was found to be satisfactory, on examination usually on the third postoperative day. The mean follow-up was 38±11 months.

Results: Mean time taken for the placement of the BT cables was 45±20 minutes. Primary closure was achieved in 46 patients (79%) and a free flap or local flap was used in the remaining patients. Local complications (radiation-induced skin toxicities) rate was 21% (None>Grade3(CTCAE v5.0)) at final follow-up, none of them requiring additional surgical procedures. The 5-year local recurrence-free survival, disease-free survival and overall survival were 92% (95%CI:88-94), 79% (95%CI:73-85) and 71% (95%CI:66-76) respectively.

Conclusions: BT is an effective integral component of managing complex sarcomas that is underutilized. With adequate planning and technical consideration, the method can be used to deliver doses higher than conventional EBRT with minimal local complications. BT provides excellent local control of the disease, in patients being contemplated for radical procedures.
2b or not 2b: The periosteum is the question

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Abstract

Primary osteosarcomas have been historically classified by the Enneking classification, depending on the compartmental involvement. We attempted to correlate the pre-operative compartmental involvement according to the Enneking with the final histo-pathological exam evaluating periosteal breeching.

This is a retrospective study including the patients younger than 50 years with high-grade osteosarcomas without metastasis at diagnosis during 15 years accrual with at least 24 months follow-up for survivors. Further sub-classification was made depending on the breach of periosteum by tumour cells.

According to the Enneking classification, 15 patients (4%) were classified as stage II, 53 (14%) as stage IIa and 305 (82%) as stage IIb. However, when the final surgical margins were analysed, 30/53 (57%) patients were labelled as “true IIa” because of intact periosteum, while 185/305 (61%) patients pre-operatively classified as IIb effectively had a breeched periosteum, thus being sub-classified as “true IIb”.

Patients with tumour breaching the periosteum had worse overall survival (p = 0.041) when compared to patients with intact periosteum. Periosteum breach did not have significance in LRFS.

In this study we have shown, that periosteum breach is an important factor in survival. Enneking 2b should be defined by periosteum, not bone. Tumours penetrating periosteum are more aggressive with decreased survival. In the future, research on tumour mechanism which allows destruction of periosteum may prove interesting, especially the biological behaviour of osteosarcoma and micro environment.
Percutaneous Cementoplasty for the Pelvis in Bone Metastasis: 12-Year Experience

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Abstract

Introduction: In advanced cancer patients, pelvic bone metastasis often causes pain and gait disturbance. The use of percutaneous bone cement [polymethylmethacrylate (PMMA)] injection for pain management and strengthening in pelvic bone metastasis has rarely been reported. To evaluate this method, we aimed to determine surgical outcomes and complications over a long-term follow-up period using a large patient group.

Method: We retrospectively collected data from 178 patients who underwent percutaneous cementoplasty for pelvic metastatic lesions, 201 in total. Surgical outcomes evaluated included pain reduction and improvement of ambulation. Mortality within 1 month after procedure and pulmonary embolism caused by thrombus, fat, tumor emboli, or bone cement were investigated as surgical complications. For long-term survivors, pain relapse and mechanical failure were analyzed. The mean follow-up period was 12.6 months, and there were 159 fatalities at last follow-up.

Results: The mean regional pain numerical rating scale scores decreased from 6.1 preoperatively to 2.4 1 month after procedure (p < 0.01). Gait function was maintained, worsened, and uncheckable in 68%, 24%, and 8% of patients, respectively, 1 month after procedure. Of long-term survivors followed up for > 12 months (n = 53), there were no significant changes in serial plain radiographs, and regional pain aggravation was observed in 9%. Pulmonary cement embolism and bone cement implantation syndrome was observed in 11% and 10%, respectively. However, all patients with these complications were asymptomatic.

Conclusions: Percutaneous cement injection into the pelvis is a feasible and safe palliative surgical option for patients with advanced malignancy in terms of pain reduction and maintenance of ambulatory function under regional anesthesia.
Knee joint sparing surgery for primary bone sarcoma resections with the use of 3D printed patient-specific instruments

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Abstract

Introduction: To date, the gold standard of care for osteosarcoma and Ewing's sarcoma is limb salvage surgical resection. In cases where the tumor arises in the distal femur or the proximal tibia in proximity to the joint line, knee-sacrificing surgery is mostly performed, followed by reconstruction with a total knee arthroplasty involving metallic modular endoprostheses with tibial and femoral stems. Here we present an accurate 3D approach for knee sparing surgeries in such cases, thus preserving the native knee joint.

Methods: A single-center retrospective study (N=13, average age 17.2±7.7 years, 8 males) that presents surgical, functional, and oncological outcomes. All patients were followed-up for at least 12 months post-operatively (33.85±9.90).

Results: All patients demonstrated negative surgical margins. The average estimated blood loss was 542.31±453.13 cc and the average surgery time was 6:06±3:03 hours. Two patients suffered from mild short-term complications (superficial wound infection and transient vascular occlusion). Three patients experienced long-term complications; two underwent revision surgery due to graft non-union while the other patient underwent above-knee amputation due to local recurrence. Overall, 12/13 patients (92.3%) retained a native knee. The average Musculoskeletal Tumor Society (MSTS) score at 12 months was 27.0±2.83.

Conclusion: We believe that the 3D approach will become increasingly popular in the future as a widely applicable, highly accurate, cost-effective tool that has the potential to ease prognosis and improve the quality of life for patients with primary bone sarcomas.
A comparison of oncological, surgical, and functional outcomes in endoprosthetic reconstruction versus rotationplasty for paediatric lower extremity bone sarcoma.

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Abstract

Introduction:
Paediatric bone sarcomas around the knee are amenable to either endoprosthetic reconstruction or rotationplasty, we compare these groups in this study.

Methods:
We reviewed all wide resections for bone sarcoma of the distal femur or proximal tibia between January 2004 and December 2017 with a minimum 2-year follow-up. Musculoskeletal Tumor Society score, Toronto Extremity Salvage Score, and PROMIS Adult Global Health measures were administered to assess the functional outcome.

Results:
Fifty patients underwent wide resection with endoprosthetic reconstruction (n=26) or rotationplasty (n=24). Groups had comparable demographic parameters and systemic tumour burden at presentation. Selection of endoprosthetic reconstruction versus rotationplasty did not impact the five-year overall survival amongst patients who presented without metastasis (51.4 vs 67.9%, p=0.864).

However, when only patients without metastasis with greater than 90% chemotherapy-induced necrosis were considered, overall survival was significantly better in the rotationplasty versus endoprosthesis group (100% vs. 37.5% at five years, p=0.03).

There was also a trend towards greater local recurrence rate in endoprosthesis group 11.5% vs. 0%, p=0.09, as well as further surgery mainly due to wound complications 42.3% vs 29.2%, p=0.33.

There were no statistically significant differences in the functional outcome measures between the endoprosthesis group (n=9) and the rotationplasty group (n=8). Mean average follow up was 103.6 months in endoprosthesis group and 129.9 months in rotationplasty group.

Conclusion:
While an endoprostheses may offer a superior cosmetic result, it is associated with a higher complication rate and may affect local recurrence. There are no long-term functional outcome differences between these groups.
Intermuscular extremity myxoid liposarcoma can be managed by marginal resection following neoadjuvant radiotherapy

Mr Jonathan Perera1, Dr Meshal AlFaraidy2, Dr Izuchukwu Ibe3, Dr Ahmed Aoude4, Mr Ibtissam Acem5, Prof Michiel van de Sande5, Ms Mireille Dessureault4, Prof Robert Turcotte4, Dr Sophie Mottard6, Dr Georges Basile6, Dr Marc Isler6, Mr Hugo Saint-Yves6, Mr Nick Eastley7, Mr Jonathan Stevenson7, Dr Matthew Houdek8, Dr Peter Chung9, Mr Anthony Griffin2, Prof Peter Ferguson2, Prof Jay Wunder2, Dr Kim Tsoi2

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Abstract

Introduction:

Following pre-operative radiotherapy, extremity intermuscular myxoid liposarcoma can be marginally resected without compromising local recurrence-free, metastasis-free or overall survival.

Background:

Compared with other soft tissue sarcomas, myxoid liposarcoma (MLS) occurs in younger patients, has a propensity for intermuscular locations and is highly radiosensitive. With pre-operative radiotherapy, intermuscular MLS demonstrates substantial volume reduction and can be easily separated from surrounding tissues during resection. However, it is unclear whether marginal excision of MLS is oncologically safe. This study aimed to assess the association between margins and survival in irradiated, intermuscular MLS.

Methods:

The study identified 198 patients from seven sarcoma centres with a first presentation of localized, extremity, intermuscular MLS that received pre-operative radiotherapy and was diagnosed between 1990 and 2017. Patient and treatment characteristics, radiological and histological responses to neoadjuvant treatment and clinical surveillance were recorded.

Results:

Margins were microscopically positive in 11% (n=22), <1.0mm in 15% (n=29) and ≥1.0mm in 72% (n=143). There was no association between margin status and local recurrence-free, metastasis-free or overall survival. This finding held true even in patients at higher risk of worse overall survival based on multivariable analysis (% round cell35%, percentage ellipsoid tumour volume change £-60.1%).

Conclusion:

Irradiated, extremity, intermuscular myxoid liposarcoma can safely undergo marginal resection without compromising oncologic control.
Planning and executing surgery using 3D printing technology - with 3D designing, modeling and rapid prototyping; end-to-end tips from an Engineer's perspective in an orthopedic oncology team.

Mr Kumar Sukrit¹, Dr Pramod Chinder¹,², Dr Suraj Hindiskere¹,², Dr Amar Kamat¹,², Dr Anto Gopurathingal¹,²
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Abstract

Introduction: Orthopedic oncology cases involving hip joints and pelvic region are complicated ones. 3D printing is emerging as a boon for limb salvage opportunities in such cases. This study stresses on the importance and benefits of 3D printing technology assisted surgeries, and their impact on the patients' treatment.

Method: 3D models of the tumor and associated bone were extracted by reconstructing the ROI using patient's CT and MRI scans. Surgery planning was done by analyzing the extracted 3D models into CAD software. Based on the plan layout, implant, bone-cutting guides, and implant placement guides were designed and developed using the same CAD software. Jigs and guide were manufactured using in-house 3D printing facility of The Yellow Ribbon (Manfrini & PHO Institute of sarcoma research, India).

Results: 3D printed anatomic models helped the surgeons in tactile assessment of the ROI intra-operatively. Bone-cutting guides proved essential in precise and safe resection of the infected bone and the tumor, with adequate margins. Implant placement guides aided the surgeons in precise fitment of the implant, while ensuring good mobility of the limb. Few observations were noted during design phase and intra-op, to serve as tips for future cases. The cost of in-house developed implant and guides/jigs were significantly lower than the standard options, available in the market.

Conclusions: This study serves as a "Proof of Concept" case, which focuses on better outcomes of incorporating 3D Printing technology in orthopedic oncology cases, in terms of eliminating disease from the body, limb salvage, retaining limb function, and minimizing the overall cost of treatment for the patient, without compromising the quality of treatment.
Three-dimensional (3D) printed guides for malignant bone tumours: Institutional experience of 127 cases and work-flow to design ideal guides for complex resections of pelvis and sacrum

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Abstract

Introduction: In anatomically challenging locations like the pelvis, periarticular region and paediatric resections, personalized 3D-printed cutting guides have helped to perform complex resections and precise reconstructions. We report our experience with the use of 3D-printed guides in resecting malignant bone tumours and the workflow involved in designing the guides, to prevent errors and achieve safe surgical margins.

Methods: We retrospectively reviewed 127 cases in whom 3D-printing technology was used to aid bone and soft tissue tumour surgeries between June 2015 to April 2022. Characteristics of 86 patients in whom cutting guide was used were considered for the study. The mean age of the study population was 38 (±12.5) years. Pelvis (including sacrum) was the most common location (n=68, 79%) and osteosarcoma was the most common diagnosis (n=28, 33%). Operated patients were followed up for a mean duration of 33 (±16.7) months.

Results: The mean maximum axial tumour area was 14cm² (±8.6). The mean operative time was 5.1 (±2.6) hours, the mean intraoperative blood loss was 1400 (±980) ml. There were no intraoperative complications attributable to the use of guides. Histological margins were free of tumour in all resected specimens. The mean MSTS score at final follow-up was 24 (±2.8). Local recurrence-free survival and overall survival at five years were 93% (95% CI: 89-97) and 84% (95% CI: 78-90) respectively.

Conclusion: The use of personalized 3D printed guides for resection of bone tumours helps in performing osteotomy in anatomically challenging locations like the pelvis. With accumulated experience designing guides over the past years, in the recent past advanced guides like: floating guides, multiplanar detachable guides, limited contact sacral guides, etc. are routinely used.
Outcomes of anterior minimally invasive (robotic & laproscopic) dissection of malignant bone tumours of the pelvis and sacrum: A multidisciplinary surgical approach

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Abstract

Introduction: Robotic anterior dissection helps in releasing the bowel, genitourinary structures and vessels from the pelvic surface of sacral and pelvic tumours and makes subsequent sacrectomy less morbid. We report our experience with a staged technique of robotic surgery assisted anterior adhesiolysis coupled with posterior En-bloc resection, for primary bone tumours of the sacrum.

Methods: 13 patients with primary tumours of the sacrum underwent robotic anterior dissection, of which 11 patients with follow-up of at least 1 year were considered for the study. Sacral chordoma was the most common diagnosis (64%, n=7). The median age of the study population was 39 years (range: 17-56). S1-S2 resection was performed in seven patients, S2-S3 resection was performed in three patients and one patient underwent a left hemisacrectomy. The median duration of follow-up was 49 months (range: 14-87).

Results: The mean duration of robotic surgery was 195±130 minutes. The mean blood loss during posterior En-bloc sacrectomy was 810±240 ml, which was significantly less when compared to a historic institutional cohort of patients operated without robot (mean blood loss of 1400±650 ml in 9 patients, p=0.012). The mean duration of En-bloc sacrectomy was also lesser with the use of a robot (245±130 minutes vs. 360±140 minutes, p=0.003). Local recurrence-free survival at 5 years was 93% (95% CI: 89-97). The mean MSTS score at the final follow-up was 25±3.5.

Conclusion: Anterior preparatory robotic surgery assisting posterior staged sacrectomy is a relatively new technique. It allows effective and safe anterior dissection and mobilization of vital pelvic structures and helps in achieving faster and less morbid En-bloc sacrectomy, resulting in good oncological and functional outcomes.
Prostho-prosthetic composite Limb salvage for massive Chondrosarcoma of the proximal humerus- maiden use of 3D printing to reconstruct multiple bones around the shoulder: a video demonstration

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Abstract

Introduction: A 29-year-old software engineer presented with a chondrosarcoma of the left proximal humerus measuring 35cms in its longest diameter, extending from the base of the neck till the mid-arm, with gross destruction of the upper half of the humerus, medial clavicle and the proximal scapula; the axillary neurovascular structures were displaced with no signs of infiltration.

Methods: The massive skeletal defect after wide excision of the tumour was planned to be reconstructed by 3D printed titanium implant. A monoblock unit was used to print the scapula, acromion, glenoid and clavicle, and a hollow titanium shell was printed for the humerus, which could be anchored to the retained lower humerus with an extracortical plate. Through the hollow shell, a commercially available reverse shoulder humerus stem was cemented and connected to the native humerus using interlocking bolts.

Results: The surgery was performed over two days: the tumour resection was performed on the first day with the procedures lasting for 8 hours. The patient remained intubated in the intensive care unit overnight and the second day involved prosthetic skeletal reconstruction of the shoulder. Following implantation, the shoulder joint and surrounding soft tissue reconstruction were performed by prolene-meshplasty. 18 months following surgery, there is no evidence of local or distant disease. The patient is back to independent work with a functional range of movements of the left upper limb.

Conclusions: With adequate planning and 3D printing technology, skeletal reconstructions can be performed to yield good functional outcomes, even when limb salvage appears to seem impossible.
Quality improvement project: Occupational Therapy [OT] led pre-assessment in the adult orthopaedic oncology team at Royal National Orthopaedic Hospital [RNOH]

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Abstract

Introduction

- A patient survey by Sarcoma UK found that 45% of patients felt they did not receive enough information at time of diagnosis (Sarcoma UK 2020).
- Ortho-oncology therapy pre-assessments are not routinely offered at Royal National Orthopaedic Hospital [RNOH].

Method

- Between November 2020 – March 2021 patients undergoing large endoprosthetic replacements participated in a telephone call with an Occupational Therapist (OT) discussing social history, post-operative restrictions and discharge planning.
- Quality improvement methodology was used following ‘Plan-Do-Study-Act’ cycle. Functional data/LOS from pre-assessment cohort was compared to cohorts who were not pre-assessed.
- Feedback was gained from patient/staff

Results

- 10 patients (7 sarcoma, 3 metastatic bone cancer) with average age 48 years undergoing a proximal femoral replacement or proximal humeral replacement were pre-assessed.
- OT led pre-assessment was positively received by the wider team/patients, as well as assisting with early discharge planning/patient expectations.
- LOS was reduced by 2 days, however difficult to accurately compare to previous cohorts due to confounding factors.
- Functional levels on discharge discussed with patient from pre-assessment were often accurate or patient progressed to a high level of function better than anticipate.

Conclusion

OT led pre-assessment helps prepare patients for surgery from a social and functional perspective. Self-management strategies developed using this approach can support improvements in patient care throughout the ortho-oncology surgical pathway at RNOH. OT pre-assessment is now embedded within the pathway.

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Use of regional anesthesia to reduce blood loss in isolated limb perfusion (ILP) - a pilot study

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Abstract

Introduction

ILP for sarcomas is usually performed with TNF-α and melphalan. The procedure yields in a regular blood loss of 1.5-2 l/patient. With >200 ILPs in the last 15 years we observed a constant low-threshold systemic blood loss (BL) from the central blood circulation to the limb circulation with start of the ILP which can be explained by instable pressure gradients on both sides of the tourniquet and an unavoidable inflow via the bone. Bolus administration of melphalan regularly resulted in an instability of the pressure gradient and an increase in BL. The question is whether the use of perioperative regional anesthesia (RA) reduces BL and can stabilize pressure gradients.

Method

After establishment of limb circulation and leakage exclusion with Indium and technetium labeled erythrocytes ILP starts with the bolus administration of TNF-α. Half the dose of melphalan is given as a bolus after 30 min. and the remaining dose continuously over 30 min. The extremity is washed out until no more radioactivity is detectable after 90 min. total perfusion time. From november 2019 ILP with perioperative RA was performed in 17 patients. BL was documented after melphalan bolus administration (BLm) and as total BL after completion of ILP (BLt). BLt consists of: Initial filling volume of the extracorporeal system (~450 ml), blood volume of the limb and blood volume leaving central blood circulation into the limb circulation during ILP. For RA a supraclavicular plexus block (15-25 ml prilocaine 1%) was used on the arm, and a peridural catheter (15-25 ml prilocaine 2%) on the leg with maximum loading 30 min before melphalan bolus.

Results

In the control group without RA (n=14) there was a median total blood loss (BLt) of 1500 ml whereas the group with RA (n=12) had a median BLt of 900 ml. With a difference of 600 ml statistical evaluation was not significant (Mann-Whitney test; p = 0.0862).The mean blood loss after melphalan bolus (BLm) of >500ml observed without RA was only 116ml [0-800ml] with RA. The outlier with 800 ml showed a dislocation of the PDK.

Conclusions

As a pilot study, the study has limitations due to the small case numbers. But with the use of RA the BL can reproducibly be reduced in ILP. This can result in a reduced need for postoperative blood transfusion, an improved general condition of the patients and a shorter length of stay. More evidence supporting the observations of this pilot study is desirable in a prospective control study with a larger number of cases.
Joint-retaining resections for pediatric lower limb sarcomas with intercalary allograft\&vascularised fibula reconstructions.

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Abstract

Introduction

Limb-saving resections are the preferred surgical option in orthopedic oncology management. In selected cases it is also possible to retain the natural neighbouring joints

Methods

This is a retrospective review of 10 children (7 boys, 3 girls) aged 12.3 y on average (range: 7-16 y) at the time of surgery treated for osteosarcoma (6) Ewing sarcoma (3), fibrosarcoma (1). The site distribution included the tibia (5; shaft 1, distal 3, proximal 1) and femur (5; shaft 2, distal 3). All patients had local tumor resection with transmetaphyseal (3) or transepiphyseal (7) osteotomies, followed by reconstruction using allograft/VFG combinations with bridging plate fixation. The average follow-up period was 58 months.

We assessed the oncological results, function, timing of bony fusion, MSTS score, complications.

Results

All patients are alive able to walk full weight bearing with satisfactory range of motion in the joints neighbouring the tumor. There were no local recurrences or infections or graft removals. The graft-host junctions fused after 11 and 12 months on av., at diaphysis and meta/epiphysis, respectively. Mean MSTS score was 24,2 on av. The most frequent complications were fractures (10 fractures in 6 patients), followed by prolonged reconstruction/host fusion in 2 patients.

Conclusions

Our cohort is small but based on a uniform pediatric population and surgical solution. Limb salvage surgery with joint preserving resections followed by allograft/VFG reconstructions remain reliable option for selected primary bone sarcomas in children.
Feasibility of novel in-situ local tumor ablation and recycling machine using radiofrequency dielectric heating

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Abstract

Introduction

The standard surgical procedure for malignant musculoskeletal tumors, limb salvage surgery, involves wide resection and reconstruction of tissue defects. It can vary depending on the reconstruction method, each of which has different disadvantages. We devised a novel concept, in-situ local tumor ablation and recycling machine using radiofrequency (RF) dielectric heating, and intended experimental research to demonstrate its feasibility.

Methods

Fresh femurs of pigs were used. Its distal part was contained in the heating device using an RF generator. Fiber-optic sensors were inserted in the metaphysis, meta-diaphysis, and diaphysis, then, each temperature was measured during heating.

In a biomechanical study, rigidities were measured for the RF-treated bones, pasteurized ones, and untreated ones.

In a modeling analysis, subjects were simulated to be heated by the same electrode as the current device, and by using another narrow bottom electrode.

Results

Under 300 W, the highest temperature and the time for the temperature to reach 70°C were 129.8°C and 14 minutes in all regions.

RF-heated bones showed no significant difference in compressive rigidity compared to untreated bone (p=0.485). The median compressive and bending rigidities were higher in RF-treated bone than in pasteurized one.

In the simulation study, the temperature rise was regionally inconsistent under the same condition as the experimental device. However, such discrepancy was alleviated using a narrow bottom electrode.

Conclusions

It might be feasible to maintain the temperature at which tumor ablation is expected and the favorable bone rigidity by in-situ local tumor ablation and recycling machine using RF dielectric heating.
Providing insight in a patients' physical functioning in musculoskeletal oncology.

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Abstract

Introduction

Patients dealing with musculoskeletal oncologic disorders often receive invasive treatment. Depending on the type of tumor, patients can undergo chemotherapy, radiotherapy and / or an orthopedic oncologic surgery. After intervention, patients often deal with challenges regarding physical functioning. Adequate rehabilitation to optimize activities of daily living and participation is therefore important. A physiotherapist working in a center of expertise for bone tumors can provide guidance in rehabilitation. Insight into the course of physical functioning after intervention is important to provide patient specific interventions and adequately inform patients.

Methods

A new care path involving pre- and post-intervention physical therapy consultations was introduced. The new care pathway includes pre-intervention instruction by a physiotherapist, improved information transfer to the physiotherapist at home and physiotherapeutic follow-up. During in-hospital stay the patients receive standard physiotherapy care.

Results

Patients undergoing extensive surgery are followed in physical functioning by physical testing. The physical testing is performed preoperatively and during standard control visits with the orthopedic oncologic surgeon. Measurements on physical functioning consist of handgrip strength, active range of motion measurements of knee and ankle, circumference measurements of upper and lower leg, and upper leg strength. Physical activity is measured by the self-reported mean amount of steps in the last week as provided by smartphone or smartwatch and the self-reported maximal walking distance. The first patients seem to be satisfied with the addition of physiotherapy in the whole trajectory.

Conclusions

Physical testing will provide valuable information regarding physical functioning of patients with musculoskeletal oncologic disorders.
Novel Patient-Specific Additive-Manufactured Lattice Titanium Implants for Critical-Sized Bone Reconstruction

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Abstract

Introduction- Advancements in surgical methods, augmented by adjuvant therapies and radiographic techniques have enabled surgeons to achieve clear margins in primary bone sarcoma resections. Despite this progress, the critical-sized segmental bone loss remains a major challenge for reconstruction. In this study, we propose a novel reconstruction approach based on AM-Ti64 patient-specific implants (PSIs).

Methods- Herein, we present our approach applied on five patients with primary bone sarcoma. The approach includes (1) data acquisition (CT, MRI), (2) image segmentation and fusion; (3) 3D-digital surgical planning, (4) 3D-printing of anatomical models and surgical jigs, (5) AM-Ti64 implant design (including Finite Element Analysis), (6) AM-Ti64 implant fabrication, (7) tumor resection, (8) reconstruction with an AM-Ti64 implant, and (9) routine follow-up.

Results- All patients had negative margins consistent with preoperatively multi-planar planned distances. At the time of surgery, AM-Ti64 implants fit perfectly into the bone defects. Postoperative follow-up was 12-34 months. No short-term complications were seen. All patients were able to ambulate at 6-weeks follow-up. Long-term complications were seen in two patients, one underwent a below-the-knee amputation two-years after the initial surgery due to local recurrence, and one underwent revision surgery due to a fracture at the proximal side plate hole one-year after surgery.

Conclusion- We demonstrate a proof of concept of novel AM-Ti64 PSIs made of a lattice body that promotes osteointegration combined with orthopedic instruments that supply mechanical support for the reconstruction of critical-sized bone defects. These innovative implants open a new era in reconstruction possibilities following primary bone sarcoma resections.
Abstract

Introduction: Extraskeletal Ewing sarcoma (EES), is a rare soft tissue sarcoma. Treatment for EES typically involves chemotherapy and surgical resection, with or without radiotherapy. Combined surgery and radiotherapy are the preferred treatment for most soft-tissue sarcomas, and there is debate on if addition of radiotherapy (ST+RT) to our standard treatment of chemotherapy and surgery (ST) improves outcome for patients with EES.

Methods: We reviewed 36 (18 males:18 females) patients (mean age 30 years) with a non-retroperitoneal/visceral EES treated with either ST (n=24, 67%) or ST+RT (n=12, 33%). All patients were treated with chemotherapy, most commonly VDC/IE (n=23, 66%) Radiotherapy was mostly delivered preoperatively (n=9). The mean follow-up was 8 years.

Results: The 10-year disease specific survival for patients was 78%, with no difference in the survival between patients in the ST versus the ST+RT groups (83% vs. 71%, p=0.86). There was no difference in the 10-year local recurrence (91% vs. 100%, p=0.29) or metastatic free survival (87% vs 75%, p=0.45) between the ST and ST+RT groups.

Conclusion: The results of the current study highlight the ability to achieve excellent local control with chemotherapy and surgery for EES. We recommend for multidisciplinary management of patients with EES, including chemotherapy and surgery, with use of radiotherapy if there is concern for a potentially close margin of resection.
Serum Metal Ion Concentrations in the Setting of an Oncologic Endoprosthesis: Is There Cause for Concern?

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Abstract

Background: The use of an endoprosthesis has become the primary means for reconstruction following oncologic resection. Endoprosthesis are commonly made of cobalt-chromium (CoCr) alloy which can undergo wear and corrosion, releasing Co and Cr ions, which are associated with cardiac and renal toxicity. The purpose of the current series was to evaluate the serum concentration of Co and Cr ions in patients with endoprosthesis.

Methods: Serum Co and Cr samples were obtained from 24 (12 male:12 female) patients with a history of an oncologic endoprosthetic reconstruction. The mean age at surgery was 45±20 years and the mean time from surgery to the serum collection was 12±10 years. Implants were most commonly distal femoral replacements (n=15, 63%).

Risk stratification was based on the current AAHKS/AAOS recommendations for low (<3 ppb), moderate (3-10 ppb) and high (>10 ppb) risk patients.

Results: Co levels were elevated in 15 (63%) patients and Cr levels were elevated in 7 (35%). The mean Co and Cr levels were 9.6 (range 1.1-35) ppb and 5.9 (range 1.6-21.7) ppb. Six patients (25%) would be “low risk”, 4 (17%) would be “moderate risk” and 6 (25%) would be considered “high risk”.

Conclusion: The results of the current study indicate that Co levels were elevated in many of these patients, with over 40% of patients being at least “moderate risk” for complications. Further studies are needed to determine if these ion levels change over time and if these serum ion levels lead to cardiac and renal complications.
Vascularised fibula physis transfer for upper limb paediatric sarcoma defects

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Abstract

Introduction:
Free vascularised fibula transfer for reconstruction of physeal and epiphyseal defects in the skeletally immature patient can confer restoration of longitudinal growth and provide an articular surface. Various pedicle designs are employed in harvesting the fibula physis and there is no consensus on the optimal method.

Methods:
We present the evolution of our technique in harvesting the fibula physis, describing bipedicled raise with peroneal vessels and a specific nutrient vessel. A retrospective chart review is performed for patients undergoing autologous vascularised fibular epiphyseal transfer between June 2020 and April 2021. Data collected include: age, tumour location, histological subtype, defect size, adverse events and longitudinal growth

Results:
4 patients, 3 male and 1 female with a mean age of 10 years at the time of surgery underwent reconstruction using epiphyseal fibula. 3 patients underwent proximal humeral reconstruction and 1 distal radius. Mean tumour size was 11.3cm (range 7.5-14.5) with a mean vascularised fibula length of 17.7cm. Longitudinal growth is demonstrated in all patients. 2 patients undergoing harvest on anterior tibial vessels experienced foot drop, in 1 case permanent and requiring tendon transfer. This was not observed in 2 cases where a bipedicled harvest is employed.

Conclusions:
These data corroborate the reported high donor site morbidity caused by fibula physeal harvest on the anterior tibial vessel. Our bipedicled solution can reduce this and aid rehabilitation. Future comparative study is warranted and further anatomical study to characterise the nutrient vessel to the physis in children.
Pedicled ipsilateral Fibula with Allograft for reconstruction of Paediatric Tibial Defects

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Abstract

Introduction:

Combined cadaveric allograft combined with free vascularised fibula has been successfully employed in reconstruction for long tibial defects after sarcoma resection in children. Pedicled ipsilateral fibula can be employed as an alternative. We present here our technique and outcomes data.

Methods:

Retrospective case series review of the use of a vascularised pedicled fibula autograft with tibial allograft in patients who underwent tibial resection for lower limb sarcoma between August 2019 and August 2021. Data collected include: age, histological diagnosis, defect size, soft tissue reconstruction, adjuvant therapy, radiological union and early adverse events.

Results:

6 patients underwent reconstruction within the study period: 4 male and 2 female. Mean age was 14 years. 3 reconstructions were two-staged, utilising cement spacer temporisation, 1 case required a gastrocnemius flap and split thickness skin graft at the time of primary surgery. 66% of patients underwent neoadjuvant chemotherapy. Mean tibial defect size was 12.2cm (range 7 -22.4cm). 5 tumours were diaphyseal and 1 distal tibial tumour was resected, necessitating tibiotalar fusion. Excellent radiological union was evident in all cases with a mean follow-up period of 16 months. No instances of deep infection or reconstructive failure were observed.

Conclusions:

Reconstructive success with pedicled ipsilateral fibula with allograft is equivalent compared with free contralateral fibula. Reduced donor site morbidity, avoidance of microvascular assembly and reduced operating time may support this as the preferred method.
Complications of surgical management of bony tumors of the obturator framework. (Enneking Zone 3)

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Abstract

Introduction:

Bone tumors of the pelvis are rare diseases. Surgical management is one of the therapeutic options. These are long and difficult surgeries; associated with a much higher rate of complications and revision than conventional orthopedic surgery. Surgery of the obturator framework has specificities due to its proximity to the perineum and the potential consequences on the abdominal wall.

Our objective is to evaluate the complication rate, infection and surgical revision, of resections and curettages of bone tumors of the obturator frame (zone 3).

Materials and Methods:

We collected data from 47 patients in a retrospective, monocentric fashion. Two subgroups were compared: 24 malignant tumors whose management was exclusively resection (100%) and 23 benign tumors of which only 5 (22%) were resected.

The primary endpoint was analyzed according to Kaplan-Meier.

Results:

The most frequent histology was chondrosarcoma (38%). The median size of the tumors is 6 cm [4; 9].

The rate of surgical site infection (SSI) was 31% at one year (95% CI: 18 - 45) and 38% at 5 years (95% CI: 23 - 54). The rate of revision, whatever the cause, was 28% (95% CI: 15 - 42) and 33% (95% CI: 17 - 50) at 1 and 5 years respectively. Infection and surgical revision rates were higher in the malignancy group.

Conclusion:

The revision rate in resection or curettage surgeries of bony tumors of the pelvis involving the obturator framework (zone 3 of Enneking's classification) was 33% at 5 years. Infection was the most frequent complication.
Review of 21 patients with low-grade chondrosarcoma who underwent surgical treatment, is intra-lesional curettage enough?

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Abstract

INTRODUCTION

Low-grade chondrosarcomas are locally aggressive lesions. The focus of discussion seats on the differential diagnosis between benign lesions or aggressive cartilaginous tumors, and on their treatment: intrallesional curettage or en bloc excision. This study presents the results obtained in the surgical treatment of 21 cases of low-grade chondrosarcomas.

METHOD

Retrospective study including 21 patients with low-grade chondrosarcomas who underwent surgery from 2013 to 2021. Fourteen of them were located in the appendicular skeleton and seven in the axial (shoulder blade, spine or pelvis). Fourteen patients underwent intrallesional curettage (11 peripheral and 3 axial lesions) and seven patients underwent en bloc excision (3 peripheral and 4 axial).

RESULTS

There were six recurrences during the follow-up, 42.9% of the axial lesions recurred, rising to 66.7% in curetted ones. Peripheral chondrosarcomas recurred in 25% of cases, only 18.2% of curetted peripheral lesions were not eradicated. The 5-year survival rate is 90% (10 patients have adequate follow-up). In 9% of cases the preoperative biopsy was inconsistent with the pathology of the surgical specimen.

CONCLUSIONS

Intra-lesional curettage is advocated as a less mutilating technique for the eradication of low-grade chondrossarcomas; however, the preoperative histological and imaging studies are difficult to interpret and misgrading is frequent. The presented cases, despite their small sample, highlight three important data: high overall survival, high rate of recurrence with intra-lesional treatment of axial chondrosarcomas and a significant divergence in pre- and post-operative grading. It is the authors' opinion that more studies should be carried out, with larger samples to obtain statistically robust results.
Distal femur prosthetic resurfacing in avascular necrosis of the knee: report on 4 knees

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Abstract

Introduction
Symptomatic avascular necrosis of the knees in young patients represents a therapeutic challenge; prosthetic total knee replacement remains the standard surgical treatment after unsuccessful conservative therapy. We reported the results of a novel surgical indication aimed at preserving tibial bone stock, menisci and cruciate ligaments while resurfacing the distal femur.

Methods
With a mean follow-up of 9 years, 5 distal femur endoprosthesis were reviewed. Extension of ON, condition of soft tissues and degenerative changes in the proximal tibia has been assessed through x-rays, MRI and CT-scan evaluation. An anterior knee approach was performed, and a femoral component of an unconstrained cruciate-retaining knee prosthesis was cemented. The clinical data, complications and clinical outcomes, were recorded and analyzed.

Result
The average KSS increased from 52 pre-operative to 95 post-operative. All cases had by-condylar involvement with multiple foci, two presented Ficat stage 3 and the remaining had Ficat stage 4. Osteophytic lipping were present in 2 cases. At a mean follow-up of 9 years progressive degenerative changes were observed in all patients but no implant revision was necessary. One patient underwent arthroscopic selective meniscectomy due to meniscus injury occurred after 60 months. All patients walked without support or limitation with an active range of motion > 90° and complete active extension of the knee.

Conclusion
Prosthetic resurfacing of distal femur in symptomatic ON may represent a bone-sparing technique in young patients specifically targeted at the pathologic compartments, resulting in a rapid return to normal activity, decreasing pain and delaying total knee replacement.
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Does chemotherapy treatment affect families/work/school and social relations for patients with bone tumours? An observational study.

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Abstract

INTRODUCTION: The chemotherapy treatment affects the health conditions of patients with bone tumours. Several side effects are described. For patients with bone tumour, these aspects are further amplified by the motor deficit that resection and reconstruction surgeries cause. There is a lack of data about the family and social aspects. The aim of this work is to describe families/work/school and social relations for patients with bone tumours during the chemotherapy treatment.

METHODS: The items investigated family support, social, work or school relationships, the need for psychological support from professionals and the changes in daily life. The items were evaluated by the Likert scale, with a score ranging from 1 (critical issue) to 7 (absence of problems).

RESULTS: 42 patients were enrolled. The average score on the scale reported from 0 to 100 is equal to 62.8 with DS 27.4. Questions related to the need for psychological support and impact on daily life were the most critical aspects with an average score of 2.9 (± 1.8)

CONCLUSION: In bone cancer patients, daily life is significantly compromised during chemotherapy treatment and there is an important request for psychological support. The family environment and the social relationships are strong points for the patient.
SPINAL CORD COMPRESSION SYNDROME AS A WAY OF PRESENTATION OF A VERTEBRAL HEMANGIOMA.

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Abstract

INTRODUCTION: Hemangiomas are benign vascular malformations with a good prognosis, but sometimes they could have an aggressive and tumor-like behavior. Usually, the way of appearance is in 50 years-women, clinically self-limited and located in the dorsal vertebral level.

METHODS: A 52-year-old woman was referred to the emergency room for presenting an hypoaesthesia 25 days ago and progressive weakness of both lower limbs (LL). She presented preserved strength and sensitivity in both upper limbs (2/2); infraumbilical, perianal and bilateral lower limb tenderness (1/2). The strength in LL was: hip extension 4/5 right and 5/5 left; hip, knee and ankle flexion 4/5 bilateral and 1st finger flexion 5/5; with exalted patellar reflexes and doubtful bulbocavernosus reflex. She presented a crush-fracture with mottled pattern image on D9. The CT and MRI showed a tumor-like lesion compatible with a large hemangioma in body, pedicles and posterior elements of D9 that invades the canal with signs of underlying myelopathy.

RESULTS: Due to the established motor deficit, urgent surgical intervention was performed. A central posterior approach was performed, with posterior decompression and fixation 2 levels above and below with pedicle screws and rods. The patient presents clinical improvement from the first postoperative day. In the following days, she recovered her strength and sensitivity in its entirety, beginning to walk during her hospital stay.

CONCLUSIONS: Vertebral hemangiomas are usually limited to the vertebral body and asymptomatic, requiring only observation. They must be intervened in case of compression symptoms or if they show signs of aggressiveness with risk of progression.

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Using QR codes to improve access to patient information and reduce printing costs - a Quality Improvement project

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Royal National Orthopaedic Hospital, Stanmore, United Kingdom

Abstract

Introduction: Following ortho-oncology surgery at Royal National Orthopaedic Hospital, patients were provided with a therapy booklet containing exercises and advice. These booklets are often requiring replacements leading to further paper waster and printing cost. Quick response (QR) codes provide the same information on a smart device. Aim is to determine if the use of QR codes can improve access to information and are a viable option to decrease wastage.

Method: Patients are selected post op to be allocated a booklet or QR leaflet. QR instructions are demonstrated to patient and reverted to booklet if they cannot access. Qualitative feedback via a survey is completed at one month post discharge. Feedback questions focus on ability to access information, preference of resources and recommendations for improvements.

Results: 20 participants received information via a QR leaflet and 15 participants via standard booklet. Majority of patients found QR code information acceptable and easy to access. Variations found with participants who find technology challenging or lost leaflet.

Conclusions: This project has highlighted the need for a hybrid approach to information and advice provided to patient’s post-surgery. It needs to reflect a patient’s age, language and reading skills and technology abilities. Has demonstrated that QR codes are a viable method and patients willingly engaged with virtual information and found easy to use. A further project needs to be undertaken to expand this information into other languages. Financial and environmental benefits of QR codes could save £1000 and over 2000 sheets of paper per financial year.

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Embedding Advanced Care Practitioners (ACP’s) in sarcoma follow up

Mrs Abigail McCarthy, Mrs Suzy Hudson, Mrs Julie Woodford
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Abstract

Introduction:
ACP’s can transform pathways of care, enabling the safe and effective sharing of skills across traditional professional boundaries. The role is shaped by the organisation within which it is supported. The Sarcoma Service at Royal National Orthopaedic Hospital Stanmore wanted to embed a stratified model of follow up utilising nursing and physiotherapy to ensure optimal post surgical follow up while embedding holistic needs assessment, end of treatment summary and health and wellbeing support.

Methods:
2 years of Macmillan funding secured to enable a Physiotherapist to work alongside established Nurse Consultant. New pathway required patients to be seen by a consultant at 6 weeks post op and Physiotherapist at three months for Electronic Holistic Needs Assessment (eHNA), End of Treatment (EOT) summary and routine surveillance. Follow up shared by Nurse and Physiotherapist with patient seeing a consultant for their 1 year review.

To measure the effectiveness of the new roles patient feedback and service measures were used.

Results:
• 40 patients reviewed in quarter 1
• 100% offered an eHNA and EOT appointment
• 95% completed an EOT appointment - 1 DNA, 1 UTA (hospitalised due to chemotherapy therefore rebooked after Q1)
• 50% completed eHNA prior to appointment, 37.5% during and 12.5% reported no concerns
• 84% patients stratified to Nurse/AHP follow up
• 50% consultations F2F, 34% video, 15% telephone
• Friends and Family 100% very good
• 1 joint EOT clinic for those who have had radiotherapy and surgery

Conclusions:
The roles are beneficial in improving quality of care and also enabling release of consultant time.
Concerns Raised During Holistic Needs Assessment by Patients Following Sarcoma Diagnosis and Treatment.

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Abstract

Introduction:

Personalised Cancer Care (PCC) was a joint enterprise between Macmillan Cancer Support and National Cancer Survivorship Initiative. The NHS Long Term Plan for Cancer states “by 2021, where appropriate, every person diagnosed with cancer will have access to PCC, including holistic needs assessment (HNA), care plan....”

It is now practice to offer patients at Royal National Orthopaedic Hospital (RNOH) HNA at 2 pathway points – initial diagnosis and end of treatment (EoT). Recruitment of Highly Specialist Physiotherapist within the follow-up team, working alongside Nurse Consultant, has allowed EoT HNA/Care Planning and provision of treatment summary to become embedded within service.

Method:

All patients with definitive sarcoma diagnosis offered HNA at diagnosis. Patients under 2 consultants offered further HNA at EoT. After completing HNA, a care plan is created jointly between patient and clinician, addressing concerns raised.

Data collected included: concern type, gender, diagnosis, age

Results:

8 out of 10 top concerns are consistent year on year indicating a true reflection of concerns experienced by RNOH sarcoma patients. Top 3 concerns: Worry/Fear/Anxiety, Thinking about Future, Moving Around. 3860 concerns raised (272pts)

- Female v Male - 49.2% v 50.8%
- ST v Bone - 58.1% v 41.9%
- Average Concerns Initial v EoT - 15.9 v 12.4

Conclusion:

HNA is a comprehensive forum for patients to raise concerns at different pathway points ensuring concerns are addressed and supported. Demonstrates concerns raised by sarcoma patients are consistent and adequate provision for support in these areas needs to be addressed, whether internal or externally through 3rd party provision.
SURGICAL WOUND INFECTIONS IN A CONSECUTIVE SERIES OF 107 SARCOMAS. STUDY OF RISK FACTORS ASSOCIATED WITH THE INFECTION.

Abstract

INTRODUCTION: The objective is to analyze infections in bone and soft tissue sarcoma surgery in our center to identify risk and protective factors that explain how to reduce their incidence.

METHODS: Retrospective study between 2017-2020. Twenty-one of 107 sarcomas had postoperative infections. About 100 variables were analyzed to determine significantly factors associated with infection using a logistic regression model.

RESULTS: The infection rate was 19.6%: 5 cases were superficial infections (4.6%) that only required local debridement and antibiotics; the other 16 cases (15%) were deep infections. According to the location of the surgical approach, infection was more frequent in axillary and inguinal fold surgeries (44.4% of axillary and inguinal sarcomas became infected), followed by pelvic sarcomas (33.3%).

Sixty% were acute infections in the first month, being E. Faecium and Fecalis and S. Epidermidis the most frequent microorganisms, 69% oxacillin resistant and 23% multi-resistant. Forty% were chronic infections mainly by S. Aureus and Enterococcus, 30% multi-resistant. The surgical plan involved: 77% needed surgery approach, 41% was treated with VAC and 55% covered by plastic surgery.

The factors significantly associated with infection (p<0.05) were: preoperative albumin, Charlson index, post-resection coverage by plastic surgery, number of drainages and their duration. The prolonged regression model shows that preoperative albumin >3.5g/dl and neoadjuvant radiotherapy are protective factors against infection.

CONCLUSIONS: The study of infections and their management in sarcoma surgery is almost unknown in literature. Following the results of our study, there are risk and protective factors associated with infection that could encourage a change in perioperative management of these tumors.
PERSISTENT METATARSALGIA WITH NON-MECHANICAL ORIGIN. A REPORT OF TWO CASES.

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Abstract

INTRODUCTION: Metatarsalgia is a recurrent reason of orthopedic consultation. Cases that do not respond to well-oriented diagnostic and therapeutic approaches should suggest other less common causes. Two patients with atypical metatarsalgia, after a year of medical consultations, were diagnosed with synovial sarcomas (SS) of the foot.

METHODS:

1. A 52-year-old male with metatarsalgia under the first radius of one year's evolution. The first sign of suspicion was a millimetric image of calcification proximal to the medial sesamoid. On MRI, nonspecific nodular lesion (10x12x10mm) adjacent to the distal diaphyseal-metaphyseal 1st metatarsal. Excisional biopsy: grade 2 spindle-cell SS.

2. 58-year-old male farmer with metatarsalgia of the 4-5th without improvement with insoles. The x-rays showed an increase in soft tissues at the plantar level of 4-5th metatarsals. In MRI, solid plantar mass lesion (50x40x48mm). Open biopsy: SS grade 2.

RESULTS:

The body CT scan in patient 1 did not showed metastatic disease so he underwent an immediate revision surgery: wide en bloc resection including almost the entire 1st metatarsal. Coverage of the defect with plantar skin of the hallux was performed by plastic surgeons. Twelve weeks after wound healing, adjuvant radiotherapy was performed.

Patient 2 body-CT revealed lung metastasis, neoadjuvant chemotherapy treatment was started. After 5 months, he underwent a Pirogoff amputation. Both patients presented good functional evolution and prosthetic adaptability, without requiring complementary oncological treatments, and are currently free of disease.

CONCLUSIONS:

Synovial sarcomas are rare and even more in foot, where they can be confused with other inflammatory processes. Early diagnosis and radical treatment are essential (40% metastasize, 50% local recurrence).

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Is bone marrow aspiration and biopsy necessary in the initial staging of extraskeletal Ewing sarcoma

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Abstract

Background: Extraskeletal Ewing sarcoma (EES) are rare forms of soft-tissue sarcoma. Initial staging studies for EES include imaging and bone marrow aspiration and biopsy (BMAB), based on staging for osseous Ewing sarcoma. Recent studies on osseous-based ES have questioned the utility of BMAB compared to modern imaging in detecting metastatic disease. However, no such investigation has investigated the utility of BMAB in EES.

Methods: We reviewed patients at our center with an ESS from 1994 – 2021. Initial diagnostic and staging information including the use of PET scan, bone scan, and BMAB was collected. Metastatic disease at the time of presentation was noted. Patients were excluded if adequate records of their initial diagnosis and staging were not available or if the diagnosis of Ewing sarcoma was not definitive.

Results: Of 109 patients, 91 patients met criteria for inclusion. Fifty-four patients (59%) underwent BMAB in addition to PET and/or bone scan during their initial workup. Ten (19%) of these patients were found to have metastatic disease at the time of presentation. Sites of metastasis included lung (n=5), bone (n=4), liver (n=1), bowel (n=1), and distant lymph nodes (n=1). These were detected on PET scan in 5 patients, bone scan in 4 patients, and CT Chest in 2 patients. BMAB was negative for marrow involvement in all 54 patients at presentation including those with metastatic disease. Of the 37 patients with no BMAB during their initial workup, 7 (19%) presented with metastatic disease and an additional 12 (32%) later developed metastatic disease. Two of these patients had a negative BMAB after metastatic disease was detected.

Conclusions: The standard utilization of BMAB in the staging process of EES is of low diagnostic yield. BMAB is unlikely to diagnose metastatic involvement even in patients with known metastases to bone.
Functional outcomes in patients undergoing resection and reconstruction surgery of proximal femur or pelvis bones after malignant bone tumor. A case series.

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Abstract

Introduction

Several reconstruction techniques can be used after hip resection, involving the bone, the muscle-tendon unit or both, with several impacts on function (instability, pain and altered walking ability). The aim of this study is to describe the functional results achieved in patients undergoing hip resection and reconstruction after bone tumor.

Methods

From April 2019 to June 2022, all patients who accessed to Chemotherapy Unit of Rizzoli Orthopedic Institute after hip reconstruction surgery for bone cancer, were treated according to rehabilitation protocols drawn up by a healthcare team of experts. Patients were evaluated at 3 and 6 months from surgery measuring hip range of motion (ROM), hip flexors strength, motor skills (TUG), walking endurance (6mWT) and level of autonomy (TESS).

Results

In total 16 patients were evaluated: 10 treated with prosthetic replacement and 5 underwent pelvis resection surgery. At 3rd and 6th month, 15 and 8 patients were evaluated respectively. An improvement of mean values measurements was recorded between the two follow-up assessments: hip flexion changed from 92 to 109 degrees, hip flexors strength from 2,1 to 2,6 (MRC), TUG from 13,7 to 12,8 sec, 6Mwt from 192,4 to 342,5 mt and TESS score from 55,4 to 63,34 %.

Conclusions

Rehabilitation protocols implemented facilitate the functional recovery of patients undergoing hip reconstruction after bone tumors, allowing to achieve good functional outcomes already in the first post-operative months.
Patient experience connected to mobility, physical function and rehabilitation following lower limb salvage surgery for sarcoma

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Abstract

Introduction: Limb salvage surgery for sarcoma can involve sacrifice of muscle and/or bone leading to variable functional impairment. Little is known of the lived experience following surgery. This study aimed to explore the experience with movement, function and engagement in rehabilitation for people following lower limb salvage surgery for sarcoma. Secondary aims included exploring clinician experience with function and rehabilitation.

Methods: A qualitative exploratory design was used. Patients undergoing limb salvage surgery and treating clinicians were recruited from an Australian sarcoma service. An interview guide was developed using existing literature and clinical knowledge. Deductive and inductive coding techniques were used to identify emerging themes.

Results: Semi-structured interviews were conducted with 16 patients and 11 clinicians. Patient themes included a focus on key physical challenges, milestones related to walking and return to work and that physical recovery can be slow and frustrating but ultimately leads to an acceptable functional level. Themes from clinicians included oncological treatment is priority and significantly influences function; individual’s characteristics will influence their functional goals; and supporting the individual may be fragmented due the specialised nature of services and expertise. Both groups highlighted communication as critical to support functional outcomes and mental health.

Conclusions: Lower limb salvage surgery offers challenges for an individual’s physical functioning but acknowledgement of psychological factors is crucial. Important milestones include walking and return to work. Communication is key for optimal recovery and rehabilitation. The study identified important themes that sarcoma centres can integrate to improve patient experience and enhance care.
Cryoablation of sacral Giant Cell Tumor using 3D printing: a case report

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Abstract

Giant Cell Tumors (GCTs) of the sacrum require a modified approach from the more common GCTs of the long bones. In this region, existing treatments are even more controversial due to the complex anatomy of the sacrum. Currently, for these tumors there is therefore no accepted standard therapy. 3D planning of image guided cryoablation is a novel approach to sacral GCTs that offers a minimal invasive alternative. This technique accommodates to the intricacies of sacral GCTs providing a safer, more efficacious treatment method. / 23-year-old female. Presented to Tel Aviv Sourasky Medical Center with ongoing lower back and pelvic pain as well as right drop foot and left leg weakness. For six years, the patient was in and out of the hospital for Denozumab treatment every 2-3 months as in addition to treatment for recurring infections throughout the disease course. Six years later, when the tumor progressed, it was decided that further treatment was necessary. / CT scan of the pelvis was imported into an image-processing software. The images were merged and segmented to produce a 3D digital model that contained the precise bone anatomy and tumor borders. A Patient Specific Instrument (PSI) was designed based upon the segmentation results and the desired cryoablation needles. Finally, the PSI was washed, double-packed, and underwent a standard autoclave sterilization process. / By six months follow-up the, the patient was mobile and pain-free. With the help of 3D planning, image guided cryoablation is an effective treatment method for sacral GCTs.
**Trabecular metal collars in Endoprosthetic Replacements: do they osteointegrate?**

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**Abstract**

**Introduction**

Limb salvage surgery (LSS) is the primary treatment option for primary bone malignancy. Endoprosthetic replacements (EPRs) are used for LSS, and Trabecular Metal (TM) collars have been developed to encourage osteointegration into EPRs. Several studies have looked at different collar materials in EPRs for bone tumour, however, no studies were found that looked solely at TM. The primary aim of this study was to assess whether osteointegration occurs when TM collars are used in EPRs for tumour.

**Methods**

All patients (n=124) from 2010-2021 who underwent an EPR for tumour under the West of Scotland orthopaedic oncology team were identified. 65% (n=81) of patients met the inclusion criteria and two consultants independently analysed radiographs at 3 months, 12 months, and last x-ray using the Stanford Radiographic Assessment System.

**Results**

Osteointegration of the TM collar was found to have occurred in approximately 65% of patients at last x-ray. The percentage of patients with osteointegration at 3 months (65.4%) reflected 12 months (65%) and last x-ray (64.4%). Radiolucency at the bone:collar junction was present in 28.4% (n=23) of cases at 3 months but only 6.7% (n=4) showed progression of this at 12 months.

**Conclusion**

Osteointegration occurs in TM collars but at rates lower than that of Hydroxyapatite for the same purpose. Osteointegration will occur by 3 months and will reflect osteointegration at 12 months and last x-ray. Furthermore, radiolucency at the bone:collar impact junction does occur in some patients but only a low number will show radiolucency progression at longer term follow-up.
Bone Sarcoma (Ewings)

TWO RARE SIDES OF ONE RARE DISEASE: EWING SARCOMA WITH AND AS SECONDARY MALIGNANCIES - EPIDEMIOLOGICAL AND CLINICAL ANALYSIS OF AN INTERNATIONAL TRIAL REGISTRY

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Abstract

Introduction: Intensive, multimodality treatment of Ewing sarcoma (EwS) improves survival at the expense of late effects such as secondary malignant neoplasms (SMN). Patients with secondary EwS are excluded from risk stratification in several studies and therefore do not benefit from new therapies. More knowledge about EwS patients with SMN or as SMN is needed to identify at-risk patients and adapt follow-up strategies.

Methods: Epidemiology and clinical characteristics of EwS patients with SMN or as SMN were analyzed in 4518 and 3874 patients treated in the last five and three consecutive international EwS trials, CESS81, CESS86, EICESS92, Euro-E.W.I.N.G.99, and EWING2008, respectively.

Results: Ninety-six patients developed SMN after primary EwS, with solid tumors detected more frequently than hematologic neoplasms (55.2% and 44.8%, respectively). The median latency between EwS and first SMN was 4.9 years (range, 0.1-28.1), with a significant difference of 6.1 years between earlier development of hematologic malignancies compared with solid tumors (P<.001). The clinical characteristics of the primary EwS did not differ between patients with and without SMN. All patients received multichemotherapy, with 80.2% receiving adjuvant radiotherapy.

Forty-four cases of secondary EwS were reported, preceded by a heterogeneous group of malignancies, mainly acute lymphoblastic leukemias (n=7) and lymphomas (n=7). Two cases (7.6%) occurred in the radiation field of the primary tumor. The median age at diagnosis of secondary EwS was 21.4 years (range, 5.9-72) compared with 10.9 years (range, 0.9-53.5) for primary EwS. The 3-year OS/EFS was 0.70 (SE=.09)/0.55 (SE=.10) for localized patients and 0.33 (SE=.12)/0.27 (SE =.11) for metastatic patients (OS: P=.01). Survival in secondary EwS did not differ between hematologic or solid primary malignancies.

Conclusions: SMN after EwS remains a rare but severe event and requires a structured follow-up system. EwS as SMN accounts for approximately 1% of all reported EwS, and its risk-adjusted treatment should be curative, especially in localized patients.
Follow-up after curative surgical treatment of soft-tissue sarcomas: patients receiving more or less visits than protocol and association with recurrence

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Abstract

Introduction: Follow-up (FU) in soft tissue sarcomas (STS) patients is recommended to allow detection of recurrence at an early stage. European FU guidelines are not altered to patient or tumor characteristics, and therefore remains controversial, particularly given concerns about cost, radiation frequency and over-testing. This study assessed the extent to which STS patients after curative surgical treatment received FU visits according to protocol in relation to recurrence.

Methods: All patients with a malignant STS treated surgically at the Leiden University Medical Center between 2000-2020 were included. For each patient, all radiological examinations from date of surgery up to five years were included and compared to protocol, which required patients to receive three annual visits in the first three years and two annual visits in subsequent years. Recurrence was defined as local recurrence or metastasis.

Results: 396 patients were included of which 252 had a high-grade tumor (63.6%). In the first year, only 89 (22%) received the required three FU visits, with 187 (47%) having fewer visits particularly among patients with a low grade tumor (75%). Among 60 patients with a recurrence in the first year, 31 (52%) received more whereas 6 (10%) had fewer FU visits than protocol. In contrast, 91 (29%) patients without a recurrence received more than protocol which may suggest over-testing.

Conclusion: FU patterns of STS patients after curative surgery vary widely. Future research is needed to investigate whether and for which patients it is safe to have a less frequent FU pattern.
Reduction of blood loss by tranexamic acid in cases of lower extremity tumor resection and modular tumor endoprosthesis

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Abstract

Introduction:
Tranexamic acid (TXS) is known in primary and revision arthroplasty to reduce blood loss. There are no data about the effect in orthopedic oncology patients undergoing tumor resection of bone tumors.

Methods: 253 patients with reconstruction of a bone defect with a modular tumor endoprosthesis (Mutars system by Implantcast) following resection of a bone tumor of the lower extremities were examined in a retrospective study. The TXS group contained 134 patients, the control group with the same procedures but without TXS 119 patients. TXS patients received 1g TXS at time of incision in a single dose. Data were analyzed for blood loss, complication rate, transfusion rate and hemoglobin levels.

Results: There was no significant difference between the 2 groups according to operation time, preoperative HB values and operation technique. Significant differences could be seen in estimated median blood loss with 3661 ml as compared to 2914 ml in the TXS group. Also the number of blood transfusions differed significantly. No difference in thromboembolic complications could be seen.

Conclusion: TXS reduces blood loss and number of blood transfusions significantly in the group of patients with bone tumor resection and reconstruction with a modular tumor endoprosthesis. TXS should therefore be a standard treatment in these cases.
Do cemented standard-length femoral stems have enough longevity for the pathological fractures of the femoral neck with metastatic lesions? A retrospective study

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Abstract

Introduction: Cemented long-stem hip arthroplasty is a treatment of choice for the pathological fractures of the femoral neck with metastatic lesions and the prevention of further fracture caused by metastasis progression. Recently, this concept has been challenged by studies that have shown a low incidence of new lesions after cemented arthroplasty with standard-length stems. The present study was an evaluation of the outcome after treatment of metastatic femoral neck fractures with cemented standard-length hemiarthroplasty.

Methods: We retrospectively studied 23 patients in whom the pathological fractures of the femoral neck with metastatic lesions were diagnosed. All patients underwent cemented standard-length hemiarthroplasty. Metastasis progression-free survival time was analyzed via the Kaplan–Meier curve.

Results: The mean age of the patients was 51.5±11.7 years. The median duration of follow-up was 6.8 months (interquartile range, 5–22.6 months). Four patients exhibited tumor progression according to radiographic evaluation, but no patients had new fractures in the same bone or needed reoperation. The Kaplan–Meier curve revealed that 88.2%(74.2,100) and 73.5%(49.4,100) of femurs demonstrated 1 year and 2 year radiographic progression-free survival respectively.

Conclusions: Our study demonstrated that the use of cemented standard-length stems in hemiarthroplasty for pathological fractures of the femoral neck with metastatic lesions is safe, and the rate of reoperation was low. We believe that this prosthesis is optimum for treatment in this group of patients because the length of survival in patients is expected to be short and the rate of metastasis progression in the same bone is low.
Evaluation of the effect of neoadjuvant chemotherapy on the resecability of extremity soft-tissue sarcoma

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Abstract

Introduction
Preoperative chemotherapy may be used in the treatment of locally advanced soft-tissue sarcoma. During preoperative chemotherapy the tumor may shrink and facilitate surgical treatment or grow and complicate surgery.

Method
The pre- and post-chemotherapy images of 12 thigh sarcomas were evaluated by 12 surgeons. Each rated the imaging of 3 tumors, without knowing which images were conducted pre or post-chemotherapy. The main anatomical structures studied were the femoral artery, the femur, and the sciatic nerve. The surgical technique employed was ordered in 3 classes, with 2 subclasses each: dissection with extra- (EF) and subfascial (SF) dissection, resection with partial (PR) and complete resection (CR) and transfemoral amputation (TA) or hip disarticulation (HD). Minor changes were those between subclasses and major changes those between classes.

Results
There was no change in the planned femur resection between pre and post-chemotherapy for 21 cases (58%); the technique was upgraded in 5 cases and downgraded in 8. Major changes occurred in only 6 cases. For the sciatic nerve there was no change in 30 cases (83%), with an upgrade in 4 and a downgrade in 2 cases, mostly through major changes (5 cases). For the femoral artery there was no change in 13 cases (36%); the technique was upgraded in 17 cases (47%) and downgraded in 6. Major changes occurred in 9 cases. There were significant differences in the ratings among surgeons (P<0.05).

Conclusion
We advise close imaging monitoring for patients undergoing preoperative chemotherapy so as to not miss the opportunity to perform a limb salvage surgery.
Giant cell tumor of bone is an intermediate, locally aggressive and rarely metastasizing, primary bone neoplasia. In recent years denosumab emerged as a treatment alternative for this pathology. The objective of this work was to analyze its indications as well as the clinical outcomes, side effects and local recurrence rates in patients diagnosed with giant cell tumor of bone, who received denosumab as neoadjuvant treatment. Between 2010 and 2018, 80 patients with giant cell tumor were analyzed, of whom 14 received denosumab as a neoadjuvant treatment. The minimum follow-up was 12 months. In 8 patients it was a primary tumor, while 6 showed tumor recurrence. In all cases, clinical improvement was evident. Thirteen patients presented radiographic changes, and 11 showed complete histological response. A local recurrence was evidenced in 6 of 14 patients, and at least one adverse effect related to denosumab (including tumor malignancy) was identified in 7. Despite being a useful tool for treating giant cell tumor, the use of denosumab is associated with a higher rate of local recurrences and is not free of adverse effects.
Chondrosarcomas of the pelvis: about 106 operated cases

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Abstract

Introduction: Chondrosarcomas (CS) are malignant mesenchymal tumors whose curative treatment relies almost exclusively on surgery. The lack of effective adjuvant treatments makes them difficult to treat tumors, especially for those that affect the bones of the pelvis.

Method: We conducted a single-center retrospective study in 106 patients who underwent oncological excision surgery of CS in the pelvis from February 1996 to March 2021. Among these cases, 24 had low-grade CS (23%), 54 had CS grade 2 (52%) and 26 had CS grade 3 or higher (dedifferentiated CS) (25%). It was central CS for 86 cases (81%) and peripheral CS for 20 cases (19%). Two cases (2%) had metastases at the time of diagnosis. We used the Enneking’s classification to locate the tumors by classifying them according to four distinct zones which could be associated with each other or not (1: iliac crest, 2: peri-acetabular zone, 3: peri-ischiatic zone, 4: peri-sacral). Intra-articular invasion was present in 34 cases regardless of the area of tumor invasion. The median for tumor size was 8 cm (5-11).

Results: The use of several combined approaches was useful in 42 patients (40%) regardless of tumor grade. An interruption of the continuity of the pelvic ring occurred in 68 cases (64%). Reconstruction after excision was performed in 50 cases (47%). Among them, 41 cases had a prosthesis in the pelvis (39%), 50 cases had a prosthesis in the femur (47%) and 38 cases had osteosynthesis in the pelvis (36%). Non-conservation of the limb was necessary in 4 cases. Eighty-five patients were still alive at the time of the study. Among them, 22 had had a metastatic evolution (21%). The resection was R0 for 77 cases, R1 for 15 cases and R2 for 9 cases (not applicable for 5 cases). The cumulative incidence of survival was 79% at 5 years (95% CI 70-89) and 75% at 10 years (95% CI 63-88) all grades combined. The cumulative incidence of local recurrence was 19% at 10 years (95% CI 11%-28%) for all grades, ranging from 8% for grades 1 to 36% for grades 3.

Conclusion: Recurrence-free survival after excision of chondrosarcoma of the pelvis is correlated not only with histological grade but also with resection margins. Complications leading to a new intervention after excision surgery in the pelvis occur in almost half of the cases. Excision and reconstruction after resection of a CS of the pelvis must therefore be particularly cautious in order to improve survival without recurrence.
Excision of 87 primary malignant bone tumors of the pelvis

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Abstract

Introduction: Primary malignant bone tumors (PMBT) of the pelvis are particularly difficult lesions to resect for the orthopedic surgeon. The difficulty lies in the surgical technique of excision and reconstruction as well as in the management of complications. Our objective was to study the most frequent PMBT in the pelvis and to analyze survival after surgery and postoperative complications.

Materials and method: Our study was retrospective, monocentric and related to 26 cases (30%) of high grade chondrosarcoma at least grade 3 and more (CS), 31 cases (36%) of Ewing's sarcoma (ES), and 30 cases (34%) high-grade osteosarcoma (OS). We classified the tumors by histology but also by anatomical location in the pelvis using the Enneking classification. The median tumor size was 9cm.

Results: Resection was R0 for 19 patients operated on CS (73%), 16 patients operated on ES (52%) and 23 patients operated on OS (77%). The cumulative incidence of revision surgery at 10 years was 46% (95% CI 26-64) for CS, 40% (95% CI 22-58) for ES and 67% (95% CI 42-83) for OS. The cumulative incidence of local recurrence at 10 years was 36% (95% CI 15% – 57%) for CS, 8% for ES (95% CI 1-24) and 44% (95% CI 20-66) for OS. The 10-year survival was 45% (95% CI 28-75) for ES and 17% (95% CI 3-90) for OS; no chondrosarcoma had survived more than 5 years.

Conclusion: PMBT excision surgery remains associated with lower survival rates and a high complication rate. Comparatively, OS and CS had lower survival than SE. At 5 years, at least one complication has occurred (revision...
Establishing a sarcoma reference score for EQ-5D

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¹University Hospital Zurich, Zurich, Switzerland. ²University of Zurich, Zurich, Switzerland. ³Luzerner Kantonsspital, Luzern, Switzerland

Abstract

Introduction: In April 2021, Switzerland introduced a law on quality and economics in the treatment of patients. In this context, patient-reported outcome measures are increasingly accepted and required to determine the quality of treatment of patients. There are many validated questionnaires covering a wide variety of aspects of life that are directly reported by the patients and independently of the clinical metrics as assessed by the physicians.

Method: According to the EQ-5D, we requested a consecutive cohort of patients who were being treated for sarcoma or for suspected sarcoma, to judge their level of walking, self-sufficiency, usual daily activities, pain, and fear level. The patients were asked during a regular outpatient visit which was conducted either at a first-time presentation or follow-up visit. Overall, 634 consecutive patients were included in this analysis.

Results: The overall satisfaction level was 76.6% (range, 0 to 100%), with a median of 80%, and Q1/Q3 with 70%/90%. Summarizing all the scores of the five parameters, we found a mean score of 87% (range, 30 to 100), with a median of 90% and Q1/Q3 of 80%/100%.

Conclusions: A health-related quality assessment of daily living in a consecutive series of sarcoma patients in an outpatient setting is possible. The level of satisfaction of this cohort of sarcoma patients is satisfactory overall. We will now further detail the analysis focusing on the patient parameters, tumor parameters, and treatment parameters.

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“CUSTOM-MADE” TUMOR PROSTHESIS IN A PATIENT WITH PELVIS CHONDROSARCOMA.

Dr Juan Luis Cebrián Parra, Dr Patricia Rodríguez-Zamorano, Dr Elena Manrique Gamo, Dr Roberto García Maroto
Hospital Clínico San Carlos, Madrid, Spain

Abstract

INTRODUCTION: Restoration ad integrum in sarcomas is an objective that is getting closer to becoming a reality with the arrival of customizable prostheses, returning the patients their lost anatomy and recover its functionality.

METHODS: A 36-year-old woman was diagnosed with high-grade pelvic chondrosarcoma that occupied the right hemipelvis without distant disease. The multidisciplinary committee decided its extensive exeresis. On the preoperative CT, the margins of the resection were planned to make an anatomical Custom Link© tumor megaprosthesi in Germany, obtained by 3D printing.

RESULTS: Under general anesthesia and prone-lateral decubitus, a direct lateral hip approach was performed. Cutting guides, proximal and distal, printed in 3D for the wide resection with safety margins were placed in the precise place previously planned with preoperative CT. After resection, the tumor prosthesis was implanted following an instruction map with the order and numbering of each screw, which were measured preoperatively for sequenced placement. A double-mobility cemented cup oriented intraoperatively by its surgeons and the femoral stem were implanted according to the usual technique. Closure is performed by plastic surgery, reinforcing the inguinal wall with a mesh and muscular coverage by means of a rectus abdominis myocutaneous flap. The surgical margins were free.

The patient begins walking on admission with an articulated hip orthosis locked at 15º of abduction. Two years later, she is still disease-free and walks medium distances unaided.

CONCLUSIONS: The use of customizable mega-prostheses represents a great advance in orthopedic reconstructive surgery. Proper patient selection, interprofessional cooperation and communication between the orthopedic surgeon and the implant designer are paramount.
ATYPICAL VARIANT OF RARE ROSAI-DORFMAN DISEASE.

Dr Juan Luis Cebrián Parra, Dr Patricia Rodríguez- Zamorano, Dr Elena Manrique Gamo, Dr Roberto García Maroto
Hospital Clínico San Carlos, Madrid, Spain

Abstract

INTRODUCTION: Rosai-Dorfman is a rare benign disease of lymphomatous lineage with unknown etiology. There is a typical systemic variant, usually in male children and teenagers with a self-limited systemic symptom (fever, lymphadenopathy...) and extranodal manifestations in different organs. But it can also be as an atypical extranodal variant in 3% of cases, typical of middle-aged women, affecting skin and soft tissues as the target organ without the systemic manifestations.

METHODS: A 46-year-old woman who consulted for a one-year-old tumor on her thigh, with no other history. She presents a hard and mobile tumor of 3x4cm in the proximal and medial third of the thigh. In MRI a soft tissue tumor of glandular-fibrous or muscular origin was observed, with undetermined potential for malignancy. The ultrasound-guided biopsy revealed inflammatory fibrous tissue with abundant plasma cells. Surgical intervention was decided for complete the anatomopathological study.

RESULTS: A longitudinal medial approach and a marginal resection was performed, including the adjacent adductor fascia but preserving the muscle compartments with direct closure and no postoperative complications.

Pathology shows large histiocytes with a polymorphic infiltrate of lymphocytes and plasma cells. These histopathological images are typical of Rosai-Dorfman disease and are known as emperipolesis (lymphocytophagocytosis). The final diagnosis is made through histology and immunohistochemical markers, with CD68 and protein-S100 being positive, as in the case of this patient.

CONCLUSIONS: Rosai-Dorfman disease is a rare, normally self-limited entity that in some cases, due to its location, is managed with corticosteroids or surgery and even radiotherapy and chemotherapy in refractory cases.

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#JOGLE - A service evaluation. Does a group exercise challenge increase physical activity levels in teenagers and young adults?

Rebecca Pickford  
Royal National Orthopaedic Hospital, London, United Kingdom

Abstract

Introduction

20% of teenagers and young adults (TYA) meet the recommended exercise guidelines. At UCLH we initiated #JOGLE – collectively cycling the 874 miles from John O’Groats to Lands’ End. This service evaluation looks at the impact of #JOGLE on physical activity levels and patient engagement in TYA with a diagnosis of cancer.

Methods

#JOGLE was advertised throughout the TYA unit, allowing TYA to self-refer to physiotherapy. Any gym equipment could be used whilst supervised by a physiotherapist to contribute to #JOGLE, whilst an interactive map was updated weekly to show the distance completed. TYA were excluded if they were medically unstable. Data was collected on patient demographics, diagnosis and cycling distance alongside questionnaires and 1:1 conversations.

Results

The distance was completed over 242 sessions in 8 months, during which patient engagement increased by 240%, with 34 patients engaging in gym sessions. The average number of physiotherapy sessions increased by 50%. The average distance travelled was 5.8km per session, with the static bike used in 93% of sessions. Feedback from the patients showed increased confidence to engage in physical activity and the interactive element led to increased motivation for physiotherapy. TYAs reported that they enjoyed the competition with other patients which provided further motivation and improved mental well-being.

Conclusions

This has shown that a group challenge increased physical activity levels and well-being in TYA patients undergoing cancer treatment and increased engagement with physiotherapy. This principle could be applied to other patient populations and include the use of step counters where equipment isn’t available.
Identifying barriers in the Paediatric Bone Sarcoma Rehabilitation pathway in South East England

Rebecca Pickford
Royal National Orthopaedic Hospital, London, United Kingdom

Abstract

Introduction

Sarcoma patients undergo complex treatment regimens including chemotherapy, radiotherapy and surgery. Sarcoma surgery is complex with a prolonged rehabilitation period, which can be further complicated by medical treatment and side effects.

Paediatric therapists at the Royal National Orthopaedic Hospital (RNOH) identified an increasing number of patients coming into surgical follow up clinics requiring an inpatient rehabilitation admission. The aim of this evaluation was to identify current barriers in the paediatric rehabilitation pathway in South East England.

Methods

Physiotherapists at RNOH worked with the Quality Improvement team and contacted the Physiotherapists (PT) and Occupational Therapists (OT) at the Primary Treatment Centres (PTC) and local hospitals. A virtual meeting was arranged to discuss the strengths, weaknesses, opportunities and threats in the current rehabilitation pathway.

Results

Ten therapists including PT, OT and therapy assistants, from five centres attended the meeting. It was identified that there was good communication between the surgical centre and one PTC however this was not maintained across all PTCs. Barriers identified within the pathway originated from the following themes; communication, lack of resources and experience and delayed appointments.

Therapists set the standard of discharge summaries being sent within 24 hours of discharge, and introduced a clinical reasoning meeting quarterly via teams to support local services. Early evidence has shown no further rehabilitation admissions from clinic appointments.

Conclusion

There are currently multiple barriers across the sarcoma pathway. Ongoing work is required to improve communication across the sarcoma MDT and between hospitals, as well as to improve staffing, training resources and support to PTCs.

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Download file
Assessing the impact of a physiotherapy follow-up clinic in paediatric sarcoma rehabilitation

Rebecca Pickford
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Abstract

Introduction

An increase in the number of paediatric inpatient rehabilitation admissions was seen due to lack of joint range on completion of treatment. Furthermore improvements seen on admission were not maintained on discharge and families did not like returning to hospital on completion of treatment. The aim of this project was to identify how to reduce inpatient rehabilitation admissions and improve functional outcomes for paediatric sarcoma patients.

Methods

Stakeholder meetings showed that on completion of treatment patients were often not linked in to local therapy services despite poor physical function due to rehabilitation difficulties while undergoing treatment. A physiotherapy follow-up clinic was set up at RNOH to review paediatric sarcoma patients at 6 months post-operatively. A summary report was then sent to the Surgeon, Oncologist, GP, patient and to any new services that were required.

Results

There has been 100% uptake in the follow-up clinic. 72% of patients were not linked to local services. Of these, 50% opted to continue their ongoing physiotherapy at RNOH over local services due to previous poor experiences. All patients and their families found the follow up clinic valuable and felt it an important liaison to guide ongoing rehabilitation.

There have been no further rehabilitation admissions since the initiation of the follow up clinic.

Conclusions

Communication is vital to improving patient outcomes in highly specialist clinical areas. The physiotherapy follow-up clinic has ensured that all paediatric patients have access to ongoing rehabilitation on completion of their cancer treatment and avoid the need for further hospital admissions.
What is the burden of long-term physical limitations after surgery for extremity sarcoma?

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Abstract

Introduction: Patients treated for extremity sarcomas present in clinics with long-term (≥5 years) physical limitations which can vary by treatment. We aimed (1) to investigate long-term activity limitations, and (2) to determine factors affecting such outcomes after surgery for extremity sarcoma.

Methods: Phase 1-Systematic review of studies before April 2021. Phase 2-Retrospective analysis of Toronto Extremity Salvage Score (TESS) datasets of 38 patients attending the long-term follow-up clinic after extremity sarcoma surgery at RNOH.

Results: This project confirmed wide-ranging long-term physical limitations after extremity sarcoma surgery. 18 papers in the review demonstrated that suprafascial sarcoma, sarcomas below the knee and limb salvage surgeries that preserve important muscles and nerves tend to have better physical function. Our patient data showed that the non-chemosensitive group had higher median TESS scores (93.93) than the chemo-sensitive group (85.68) (p>0.05). TESS scores of “distal femoral+knee” sarcomas (85.00) and “tibial” sarcomas (84.88) were lower than “pelvic+proximal femoral” sarcomas (87.62) (p>0.05). The contradiction between two stages requires multicentre study to prove. Kneeling was found to be the most affected activity after distal femoral replacements and proximal tibial replacements, 37% and 83%, respectively. After proximal femoral replacements and humeral replacements, gardening and yard work (20%) were the most affected.

Conclusion: Patients treated surgically for extremity sarcomas have long-term reduction in functional outcomes. Factors associated with poor functions were found to be sarcomas involving resection of important muscles and surgical methods, such as amputation. Better understanding of physical functioning may help target interventions aimed at supporting long-term sarcoma survivors.

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SILENT OSTEOSARCOMA AND ITS RECONSTRUCTION THROUGH HEMI-CAPANNA TECHNIQUE.

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Abstract

INTRODUCTION: Surface osteosarcoma is an intermediate grade and 80% is located around the knee. A case and its reconstructive surgery are described.

METHOD: A 46-year-old male who consulted for a soft tissue tumor painless, 10x15 cm and attached to deep planes that appeared in the knee 2-3 months ago without previous history. The MRI shows a soft-tissue mass adherent to the anterior tibial surface, consistent with stress fracture callus; performing an open biopsy that confirm diagnosis. During close follow-up by his orthopedic surgeon, significant growth was observed with thickening of the cortical bones of the proximal tibia on the X-ray. Given the clinical suspicion of osteosarcoma, surgical treatment was decided.

RESULTS: Wide excision of the lesion (skin, soft tissue mass and 13 cm proximal tibia) was performed; being able to preserve the tibial metaphysis, TTA and the articular surface. A vascularized fibula flap was tunneled and inserted in a 11 cm femur allograft sarcophagus using the Hemi-Capanna technique. The ends of the fibula protruding from the allograft were inserted into the patient's tibial preforming boxes and the final assembly was performed with a medial large fragments plate. Soft tissues were covered with a medial gastrocnemius flap and skin autograft. The histology diagnoses an intermediate-high grade surface osteosarcoma with free margins and adjuvant chemotherapy was performed. The patient is currently free of disease, technical-aids free and preserved knee and ankle joint balance.

CONCLUSIONS: Local recurrence is the most important prognostic factor for surface osteosarcoma. It is important to perform a wide resection, trying to preserve the functionality.
Delay in diagnosis and treatment of primary bone neoplasms

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Abstract

Introduction Delay in diagnosis is common for patients with primary bone neoplasms, however prolonged diagnosis can decrease the chance of therapeutic success. Therefore, this study aims to assess the delay in diagnosing primary bone neoplasms, explore the most frequently occurring symptoms, and analyze the course of the diagnostic and therapeutic path.

Method The 32 (F=18; M=14) patients with primary bone neoplasms were included in the retrospective study. An analysis of patients medical history was performed. Delay in diagnosis was defined as the time between the first onset of symptoms and referring the patient to an orthopaedic oncology center.

Results The delay in diagnosis was, on average 13,2 (range, 1-60) months. After the first report to the physician, an X-ray was administered in 19 cases (59,38%) and 9 of those patients (47,37%) were referred further to an orthopaedic oncology center. The most frequent symptoms were - pain of the affected area (90,63%), restriction of movement (28,13%), pathological fracture (25%). After the admission to department, the biopsy was conducted after 8,5 (±10,38) days. The histopathological results were ready after next 13,3 (±5,82) days, and the surgical treatment was implemented after next 3,1 (±1,2) months.

Conclusion Although patients present typical symptoms of bone tumors, only a small proportion of them are referred straight to the oncology center. After raising suspicion of a primary bone neoplasm, the further diagnostic and therapeutic path goes efficiently, following the current guidelines.

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Phototherapy in the Treatment of Malignant Bone Tumors

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Abstract

Local control of primary malignant bone sarcomas, as well as metastatic bone disease, remains a challenging problem in orthopedic oncology.

Photodynamic therapy (PDT) is a clinically approved, minimally invasive, and highly selective treatment, and has been widely reported for cancer therapy. Under the irradiation of light of a specific wavelength, the photosensitizer (PS) causes the increase of intracellular ROS, leading to tumoricidal effects, and can thus result in improved local control.

Method: In this study, the effect of PDT with two different PS, chlorin e6 and 5-aminolevulinic acid, on various primary bone tumours cell lines (Ewing's sarcoma, and giant cell tumour of bone) and different human bone metastatic cancer cell lines (including breast, renal and lung carcinoma).

Results: The effects on cell migration, viability, apoptosis and senescence were examined in all cell lines 24 hours after PDT treatment. Breast cancer cell cultures responded with inhibition of cell migration and decreased viability as well as signs of apoptosis (nuclear fragmentation). A weaker effect was observed in giant cell tumors of bone and Ewing's sarcoma cells in terms of inhibition of cellular viability. In contrast, cell cultures from renal carcinomas showed a different behavior - the cells exhibited senescent features with no significant effects on cell migration or viability.

In conclusion, we could demonstrate that PDT might be a successful therapeutic concept for local tumor control in some entities of malignant bone tumors.
Phototherapy in the Treatment of tenosynovial giant cell tumor

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Abstract

Surgery remains the most common treatment for tenosynovial giant cell tumor (TGCT), however, adjuvant therapies will become increasingly important.

Photodynamic therapy (PDT) is a clinically approved, minimally invasive, and highly selective treatment, and has been widely reported for cancer therapy. Under the irradiation of light of a specific wavelength, the photosensitizers (PS) are activated and oxidize nearby biological macromolecules in the tumor cells, leading to cytotoxicity and cell death, and can thus improve local control.

Method: The effect of PDT was evaluated using patient-derived TGCT cell lines as well as cartilage tissue blocks. Two different photosensitizers, chlorin e6, and 5-aminolevulinic acid were used.

Cell cultures were co-incubated with PS for 1h and then irradiated for up to 2000 sec. Subsequently, the PS was washed out. The effect on cellular migration, viability, apoptosis, and senescence were assessed in all cells and tissue blocks 24h after PDT treatment.

Results: There was a different response to PDT in the different tumor cultures. However, the results were consistent for the all same tumor samples. Some TGCT cell cultures responded with an inhibition of cell migration coupled with reduced viability and signs of apoptosis. Other tumor cells showed a significantly lower response, characterized by senescent features, without a notable effect on cell migration or viability.

No decrease in vitality was observed in the different cartilage blocks.

In conclusion, we were able to show that PDT could act as a successful adjuvant therapy concept for local control of TGCT.
Wound complications in soft tissue sarcoma treated with Preoperative Radiotherapy

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Abstract

Introduction
The study aim was to analyze the wound complication (WC) rate and determine the risk factors for WC in patients with soft tissue sarcoma (STS) treated with preoperative radiotherapy and surgical resection.

Methods
Using the OUH Sarcoma database 126 cases of STS treated with preoperative radiotherapy and surgery between 2007 and 2021. Wound complications were defined as minor wound complication (MiWC) without surgical intervention or major wound complication (MaWC) if they received secondary surgical intervention. Univariate and multivariate regression analyses on gender, age, BMI, diabetes, anxiety or depression, smoking, alcohol, pre-radiotherapy SUVmax of PETCT, tumour site, size, volume, depth, type of surgery, margin, histology subtype and time interval between surgery and wound complication were performed using frequency of WC and MaWC as a dependent variable. A nomogram was formulated and the areas under the receiver operating characteristic curves (AUCs) were adopted to measure the predictive value of major wound complication.

Results
The incidence of WC and MaWC in the whole study group was 43% (55/126) and 18.8% (24/126). Age (OR:1.03, 95%CI: 1.00-1.06, p=0.016), tumour size (OR:1.11, 95%CI:1.01-1.21, p=0.027) and tumour site namely proximal lower limb vs upper limb OR:10.87, 95%CI 1.15-103.03, p=0.038) were risk factors for WC on multivariate analysis. Age (OR:1.08, 95%CI:1.03-1.14, p=0.004), metastasis at presenting (OR:8.27,95%CI:1.31-52.35, p=0.025), and tumour size (OR:1.12, 95%CI:1.01-1.24, p=0.032) were risk factors for MaWC. In nested case control analysis, the incidence of MaWC was 43.6% (24/55). Smoking increases the risk for MaWC (OR:8.32, 95%CI:1.36-49.99, p=0.022). Moreover, the time interval between surgery and wound complication reduces the risk for MaWC (OR:0.91, 95%CI:0.84-0.99, p=0.028) in multivariate analysis. The sensitivity and specificity of the MaWC predictive nomogram is 0.90 and 0.76, respectively. The area under ROC curve value for the nomogram was 0.86 (95%, 0.78-0.92).

Conclusions
Tumor size and site are risk factors for WC with preoperative radiotherapy. Age, metastasis at presenting and tumour size are risk factors for MaWC. Smoking and the time interval between surgery and complication are risk factors for MaWC as compared with MiWC. The nomogram constructed in the study effectively predicts and quantifies the risk of MaWC after preoperative radiotherapy and surgery for STS patients.
Is Reconstruction Necessary Following Iliosacral Resection? A Comparison of Outcomes from Two Tertiary Sarcoma Centers

Dr Matthew Houdek1, Dr Kim Tsoi2, Mr Anthony Griffin2, Dr Peter Rose1, Dr Peter Ferguson2, Dr Jay Wunder2

1Mayo Clinic, Rochester, MN, USA. 2Division of Orthopaedic Surgery, Department of Surgery, University of Toronto Musculoskeletal Oncology Unit, Sinai Health System, Toronto, Canada

Abstract

Introduction: The sacroiliac (SI) joint is the only mechanical connection between the spine and lower extremities. Following iliosacral resection, there is debate on whether reconstruction of the joint is necessary. There is currently a paucity of data comparing patients undergoing reconstruction and those who are not reconstructed.

Methods: 60 (25 females, 35 males; mean age 39±18 years) patients undergoing en-bloc iliosacral resection were reviewed. The mean follow-up for surviving patients was 9 years.

Results: Twenty-seven (45%) patients underwent sacropelvic reconstruction, while 33 (55%) patients had no formal reconstruction. Patients with NO reconstruction had a larger tumors (11 vs. 8 cm, p<0.01), shorter surgical times (663 vs. 1,323 minutes, p<0.01), and required less blood units (8 vs. 14 units, p<0.01). The 5-year disease specific survival was 74%. Patients with NO reconstruction had improved 5-year survival (85% vs. 58%, p=0.01). Disease recurrence occurred in 17 (28%). Patients who were reconstructed were more likely to develop metastatic disease (HR 3.93, p=0.02).

Complications occurred in 47 (78%) patients, most commonly a wound complication (n=31, 52%), with no difference in the incidence of complications between groups (p=0.11). Patients undergoing a reconstruction were more likely to have a deep infection (HR 4.71, p<0.01). There was no difference in the proportion of ambulatory patients (89% vs. 94%; p=0.64) or mean MSTS93 score between patients who did or did not have a reconstruction (59 vs. 68, p=0.16).

Conclusion: Reconstruction of the SI joint following iliosacral resection is a demanding procedure. Reconstruction is associated with longer operative times, blood transfusion and a higher risk of postoperative infection, but without improvements in functional outcome.
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**Trends in surgical treatment of long bones diaphysis metastases among orthopedic surgeons**

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**Abstract**

**Introduction:** Proper diagnosis and treatment of bone metastases is essential for patients' length and quality of life. Several strategies for the surgical treatment and lack of clear guidelines make treating those patients difficult. Therefore, the aim of the study was to analyze what factors influence the choice of a treatment method.

**Methods:** An online survey was conducted within the Polish Society of Orthopedics and Traumatology. It consisted of 45 questions and was divided into 4 main parts: Participant Characteristics; Diagnosis and Qualification; Treatment; Clinical Cases - metastases to the long bones diaphysis are given as examples.

**Results:** A total number of 104 responses were collected. Surgeons are more likely to choose radical treatment in patients with a life expectancy of >12 months (29.3% vs. 5.4%, p=0.0009), and in patients with metastatic renal cancer than breast cancer (20.8% vs 13.9%, p=0.03). The less experienced group of orthopedic surgeons more often (47.5% vs. 39.5%) decided to use intramedullary devices without tumor resection than the more experienced group (p=0.046). Surgeons from district hospitals less frequently (13.7% vs. 23.1%) would decide to use megaprotheses than surgeons from university hospitals (p=0.000076). Orthopedists who performed ≥ 11 bone metastases surgeries per year would more often use megaprotheses (34.8% vs. 13.2%) than those who performed ≤ 10 operations per year (p=0.000114).

**Conclusion:** Experience, place of work, and the number of metastasis surgeries performed during a year may influence the choice of treatment method in patients with bone metastases

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Comparative Survival Times for Patients Following Endoprosthetic Reconstruction After Primary and Metastatic Bone Tumour Resection Based on Disease Spread: A Retrospective Tertiary Centre Study

Ms Jessica Harewood, Mr Kenneth Rankin
Newcastle University, Faculty of Medical Sciences, Newcastle, United Kingdom

Abstract

Introduction

Endoprosthetic reconstruction (EPR) is a treatment option for malignant tumours, either as a curative approach or to regain functionality in palliative scenarios. Studies have demonstrated increased survival times (ST) for primary bone tumours (PMT) compared to Metastatic bone tumours (MBT) surgeries, but few have compared the ST based on disease spread at the time of surgery.

Method

Patients who underwent EPR for malignant tumours were identified via the hospital database. Procedures between 2014-2021 were selected allowing a minimum 12-month follow-up. Kaplan-Meier survival analysis was performed, and log-rank analysis was used to highlight statistical differences between patients with solitary bone lesions (SBL), multiple bone lesions (MBL) and multiple organ metastasis (MOM).

Results

The study included 80 patients with PBT (n=29) and MBT (n=51) with a mean follow-up time of 25 months (PBT-33, MBT-20.6). Statistical analysis showed PBT had higher ST than MBT overall (p=0.04). However, SBM-MBT patients had ST that were not statistically different from the PBT group (p=0.93), and better ST than metastatic PBT patients (p=0.003). SBM-MBT had better ST than MBL-MBT (p=0.01) and MOM-MBT (p=0.007). However, there was no significant difference in ST between MBL-MBT and MOM-MBT (p=0.90).

Conclusion

Patients following MBT resection have worse ST than those following PBT resection overall. Subsets of MBT patients have similar ST to PBT patients, potentially due to treatment progressions in MBT. In suitable patients, EPR serves as a beneficial treatment for MBT considering the improvement in quality of life and significant ST from surgery even with palliative or unknown intent.

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Abstract

Introduction

Soft tissue metastasis of carcinoma is very rare. This study aimed to investigate the clinical features in patients with soft tissue metastasis of carcinoma.

Methods

Patients who were referred to our department and diagnosed as soft tissue metastasis of carcinoma from January 2007 to December 2019 were identified. Twenty-one patients met our criteria. Variables were investigated as the clinical features.

Results

Eighteen patients were men and three were women. Mean patient age was 68.2 years (47–93 years). Three tumors were located in the upper extremities, seven in the lower extremities, and 11 in the trunk. Mean tumor size was 5.4 cm (2.1-13.9 cm). Nineteen tumors (90.5%) were located under the muscular fascia. Primary origin of the cancer was lung in eight, kidney in six, esophagus in two, liver in one, ureter in one, anus in one, and unknown in two. Mean CRP level was 2.7 (0.1-13.6). Sixteen tumors (76.2%) were suspected as a soft tissue sarcoma or an inflammatory lesion by the previous doctor. Mean time to diagnosis was 2.3 months (1-20 months). Carcinoma marker was positive in 10 and negative in six. Twelve patients (57.1%) had history of carcinoma. Sixteen patients (76.2%) had other metastases. Eight patients (38.1%) had a surgery for soft tissue metastasis.

Conclusions

The prognosis of patients with soft tissue metastasis of cancer is poor. After the soft tissue metastasis of carcinoma is diagnosed, it is necessary to promptly decide the treatment plan in cooperation with the department in charge of the primary organ.

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Neoadjuvant denosumab in GCT: long term injection can decrease the risk of local recurrence.

Anastasia Tararykova¹, Prof Alexander Fedenko², Prof Elmar Musaev³, Aslan Valiev¹, Eugene Sushentsov¹, Kirill Borzov¹, Anatolii Sokolovskii¹, Denis Sofronov¹, Ruslan Kabardaev¹

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Abstract

Introduction. In a case than initial surgery of giant cell tumor of bone (GCT) could lead to worse functional results and/or complications, most centers prefer neoadjuvant denosumab. The aim of this study is to analyze the efficiency of long term neoadjuvant denosumab for GCT.

Method. We observed 65 GCT cases from 2016 till 2020. Options for surgical treatment include intralesional curettage or marginal excision (A group), and a wide excision or en bloc resection (B group). In all cases treatment continued until confirming stabilization disease (SD) (clinically and radiologically). With anatomically complex GCT, patient was administered at least 15 injections. Binary logistic regression model (BLRM) calculated the total number of denosumab injections to exclude disease recurrence, based on SD and additional injection (AI).

Results. The average follow-up period was 23.5±18.3 months (from 2 to 86 months). The average denosumab injections was 14.7 ± 7.8 (from 6 to 50 injections). SD according to radiological and clinical data occurred on average at 10.7 ± 5.3 injections (from 6 to 39 injections). Local recurrence (LR) rate for B group was 0% (p < 0,05) and 57,6% for A group (p > 0,05). Median time to LR was 12 months (95% CI: 7.5-16.5). According to BLRM for anatomically complex GCT minimum neoadjuvant denosumab injections for decrease risk of LR is 18 (overall prediction accuracy 82,14%), considering the SD and AI.

Conclusion. In this study we represented the minimum neoadjuvant denosumab injections, which reduces the risk of LR in a case of attenuated surgery.
Reconstructions surgery with custom-made 3D-printed pelvic prosthesis due to malignancy or benign bone tumors involving the acetabulum. - Single-center retrospective cohort study with clinical follow-up including patients from 2014 to 2020

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Abstract

Introduction:
Limb-salvage surgery is the preferred surgical treatment for patients with malignant bone tumors, metastasis, or benign tumors resulting in major bone loss. This study assesses surgical and functional results following pelvic reconstruction with a custom-made 3D-printed pelvic prosthesis.

Methods:
Retrospective single-center cohort study including 12 patients (M/F=8/4, mean age 51, range: 15-76 years) reconstructed with custom-made 3D-printed pelvic prosthesis due to malignancy or benign tumors. Pathology; Chondrosarcoma(n=4), Ewing sarcoma(n=1), Giant cell tumor(n=1), B-cell lymphoma(n=1), Renal cell carcinoma(n=2), Ductal carcinoma(n=1), Planocellular carcinoma(n=1) and Aneurismal bone cyst(n=1).

Eligible patients (n=12, not alive=1, infection=1, sick=1, leaving n=9 for follow-up) were assessed for follow-up with active/passive ROM, isometric muscle strength, MSTS, TESS, EQ-5D-5L, EORTC QLQ-C30, 6-minute walk test, and 30-second chair-stand test on average 4 years postoperatively.

Results:
Significant difference in active-ROM for the surgical limb compared healthy contralateral site in hip abduction(p=0.007), adduction(p=0.007), internal rotation(p=0.007) and external rotation(p=0.007), in passive ROM a significant difference was found in flexion(p=0.007) and internal rotation(p=0.05)
Significant difference in isometric muscle strength in hip flexion(p=0.008), abduction(p=0.008), and knee extension (p=0.008) and flexion (p=0.008) were found.
EQ-5D-5L (preoperative: 0.9, range: 0.87-0.97, and 0.9, range: 0.84-0.92 postoperatively),TESS (mean: 68.3, range: 55-90), MSTS (mean: 66.1, range: 55-85) and EORTC QLQ-C30 (mean: 63.3, range: 55-80) 6-minute walk test (mean: 413.6, range: 320-501.5) and 30-second chair-stand test (mean: 11.2, range: 7-18) was assessed at follow-up.

Conclusion:
Reconstruction with custom-made 3D-printed pelvic prosthesis has overall lower isometric muscle strength and ROM compared with the healthy site, functional outcome is as expected affected.
Abstract

Introduction: The scapula is a common site for primary bone tumors; however large series examining the outcome of scapular resections are limited. The purpose of the current study was to analyze a series of patients undergoing scapular resections to determine patient and oncologic outcome.

Methods: One-hundred ten (44 females, 66 males; mean age 42±20 years) patients undergoing a scapular resection for a malignant bone tumor were reviewed. The mean tumor size was 8±4 cm. Based on the Tikhoff-Linberg classification the most common resection was Type 2 (n=35, 32%) and based on the Enneking Classification Type 1 (n=32, 29%). In patients who had a resection of the humerus (n=52, 47%) the mean length of resection was 12±5 cm.

Results: The 20-year disease specific survival was 60%. Factors associated with worse survival include high tumor grade (HR 4.02, p<0.01), pathologic fracture (HR 3.6, p<0.01) and local recurrence (HR 3.11, p=0.01).

Thirty patients developed disease recurrence including metastatic disease (n=19), local recurrence (n=6) and combined metastatic disease and local recurrence (n=6). Factors associated with metastatic disease included high tumor grade (HR 3.17, p<0.01) and the need for a total scapular resection (HR 2.35, p=0.03). A positive margin was associated with local recurrence (HR 10.01, p<0.01).

At final the mean MSTS93 (72±17%) and ASES (71±16%). The mean shoulder forward elevation was 61±60° and external rotation was 20±22°. Partial scapular resections and those who did not have a humeral resection had improved function (p<0.05).

Conclusion: Scapular resections are large undertakings with oncologic outcome tied to tumor grade; with functional outcomes associated with the size of resection. We advocate for a negative margin excision in all patients as positive margins were associated with local recurrence; and local recurrence was associated with death due to disease.
Durability of Intercalary Endoprosthesis for Humeral Reconstruction

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Abstract

Introduction: The humerus is a common site of long bone metastases and primary bone tumors, and the treatment for these lesions are pain relief and immediate and unrestricted functional restoration. In cases of a segmental defect and/or diaphyseal cortical destruction a cemented intercalary device may provide a more reliable construct, however data on their use is limited.

Methods: We reviewed 41 (26 male, 15 female) patients with an intercalary humeral spacer. Lesions were secondary to metastatic disease (n=25), hematologic malignancy (n=12) and sarcoma (n=4). First generation taper joint device were used in 21 patients and second-generation lap device in 20 patients. Mean follow-up for surviving patients was 5 years.

Results: 39 patients ultimately died of disease progression at a mean of 2-years. Nineteen (46%) deaths occurred within the first year, with a median survival of 10-months for metastatic disease, 17-months for hematologic malignancy, and 3-years for primary sarcoma (p=0.51). Five patients (12%) underwent reoperation, including forequarter amputation for disease recurrence (n=2), revision due to distal segment failure (n=2), and open reduction internal fixation due to periprosthetic fracture (n=1).

Four patients (10%) had aseptic loosening of the cement mantle, however only 1 patient underwent revision. The areas of cement loosening included the distal segment (n=3) and proximal segment (n=1).

Following the procedure, mean American Shoulder and Elbow Surgeons score and Musculoskeletal Tumor Society scores were 78% and 80%.

Conclusion: Reconstruction of the humeral diaphysis with an intercalary endoprosthesis provides a durable means of reconstruction and restoration of function, with a low rate of reoperation due to hardware failure.
Does Patient Specific Instrumentation (PSI) improve local control when operating pelvic bone tumors: a controlled multicenter trial.

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Abstract

Introduction

To address the ability for PSI to better achieve clear margins and local control after resection of primary tumor of pelvis and sacrum than free-hand bone section (NCT02544711).

Methods

Prospective multicenter, controlled non randomized study. Patients with a primary bone tumor that required a monobloc resection, located at pelvic location were included between 2016-2018 and operated with a PSI. PSI group patients were compared to patients matched for – Enneking zone resection – histological type - size -- chemo responds and operated between 2010 and 2016 (Hand-free Group, HFS). Finally, 44 patients were included in PSI group and 44 in HFS. There were no differences in term of diagnosis, sexe ratio, age, size, between groups. All patients were followed-up 3 years.

Results

Subjective appreciation of PSI by the surgeon was excellent, very good and good in 43 of 44 procedures (1 failure of adequate placement).

R0 margins were obtained for 35 pts (81.4%) in PSI group and 34 pts (77.3%) in HFS group. R1 bone margins were reported in 3 PSI patients (6.9%) compared to 7 HFS patients (15.9%) (not significant).

Eight local recurrences occurred in each group (3 y. follow-up). PSI was not associated with a better local control (OR=0.94 [0.35-2.48], survival competitive risk method).

Similar rate of adverse effects in both groups.

Conclusion

Despite a low rate of positive bone margins, PSI doesn’t offers significant better local control. This can be due to soft tissue local recurrence and/or surgeon confidence in PSI that pushed to reduce margins.
Study of the spatial heterogeneity of the microenvironment of osteosarcoma by innovative histopathological and mechano-biological approaches: role in resistance to treatment

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Abstract

Better understanding the spatio-temporal heterogeneity of osteosarcomas, to better understand the mechanisms of resistance to treatment, is the challenge of the next years. The OST is subjected to extrinsic/intrinsic mechanical stresses. Our hypothesis is that mechanical effects contribute to spatio-temporal modifications of the anarchic production of tumor osteoid, of the immune microenvironment, and modify the response to treatments.

Material and methods. By multiplex immunohistochemistry, we studied immune microenvironment cells spatial distribution in good response and poor response territories of 14 bone surgical specimens obtained after chemotherapy, 2) by using segmentation, mathematical algorithms, and scaling methods, we modeled the osteosarcoma at the tissue scale from digitized histological images, to establish geometric correlation (bone extracellular matrix/immune cell density) and mechanical correlations (permeability/tumor cell density).

Objective: to integrate the role of mechanical effects in the osteosarcoma response to treatments and in the spatial distribution of the immune microenvironment.

Results: Osteoclasts were mostly numerous in poor response territories. We found a negative correlation between the bone extracellular matrix and the density of CD163 macrophages cells. We also found a positive or negative correlation between permeability, the extracellular matrix and the response to treatment depending on the microarchitecture of the bone extracellular matrix.

Conclusion: We show for the first time that the microarchitecture of the tumoral bone modifies both the response to the treatments and the spatial distribution of the microenvironment tumor immune system. The study of mechano-biomarkers offers new innovative approaches to better understand the biology of tumors and resistance to treatments.
Abstract

Introduction: Post-traumatic total talar loss is a rare and challenging clinical problem. A case report of ankle motion-preserving surgery using a modular custom-made 3D printed talar prosthesis used to treat one such patient is presented with the functional outcome at two years follow up.

Methods: Staged reconstruction with a custom-made 3D printed modular talar prosthesis was done in a 27-year-old chemical engineer with right-sided post-traumatic total talus. 3D CT of the opposite ankle was mirrored to ascertain the exact size. DICOM files were retrieved and converted into 3D models using Slicer 3D software which were further refined using Autodesk Meshmixer and the final design was made using Autodesk Fusion 360. It was designed in two interlocking components with the distal part made up of titanium and the proximal part of Ultra-high molecular weight polyethylene. Provisions for screw fixation of the subtalar joint and ligament augment attachments were made for ankle stability. A universal approach to the ankle and medial malleolar osteotomy was used for approach. The patient was started on non-weight-bearing ambulation with gentle ankle movement post-op. Full weight-bearing was delayed for 3 months with the use of an ankle binder during ambulation.

Results: He developed an early post-op wound infection requiring debridement retention of the prosthesis and long-term broad-spectrum antibiotics suppression following which he had an uneventful recovery. VAS pain score at final follow-up was 3 and FAOS score of 70. The patient was ambulant unaided and had 50 degrees of plantar flexion and 15 degrees of dorsiflexion.

Conclusion: Ankle preserving surgeries can be considered for total talus loss following trauma using a 3D printed prosthesis with acceptable early functional results however, long term results are yet to be seen.
Oncology - other

Safety and efficacy of vimseltinib in tenosynovial giant cell tumour (TGCT): Long-term phase 1 update

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Abstract

Introduction: TGCT is a rare, locally aggressive neoplasm caused by upregulation of colony-stimulating factor 1 (CSF1) gene. Vimseltinib is an oral switch-control tyrosine kinase inhibitor specifically designed to selectively and potently inhibit CSF1 receptor. We report long-term safety and efficacy for patients with TGCT from the phase 1 arm (dose escalation) of the phase 1/2 study (NCT03069469).

Methods: Patients with TGCT not amenable to surgery were treated with vimseltinib in 3 cohorts: 30 mg twice weekly with a 30-mg once-daily (QD) loading dose for 5 days, 10 mg QD with a 30-mg QD loading dose for 3 days, and 6 mg QD with a 20-mg QD loading dose for 3 days. Primary objectives were to determine safety, tolerability, and recommended phase 2 dose (RP2D).

Results: As of February 18, 2022, 32 patients were enrolled; 20 patients remained on study. Median treatment duration was 16.4 months. Grade 3/4 treatment-emergent adverse events in >5% of patients included increases in creatine phosphokinase, aspartate aminotransferase, lipase, and amylase, along with hypertension. Combined objective response rate (ORR) was 69%; most responses were achieved ≤6 months after initiation of treatment. RP2D is 30 mg twice weekly (no loading dose).

Conclusions: Vimseltinib demonstrated long-term tolerability in patients with TGCT not amenable to surgery. ORR continues to improve; sustained responses were observed across all cohorts both within and after 6 months, demonstrating prolonged benefit.

Oncology - other

Efficacy and safety of vimseltinib in tenosynovial giant cell tumour (TGCT): Phase 2 expansion

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Abstract

Introduction: TGCT is a rare, locally aggressive neoplasm caused by upregulation of colony-stimulating factor 1 (CSF1) gene. Vimseltinib is an oral switch-control tyrosine kinase inhibitor specifically designed to selectively and potently inhibit CSF1 receptor (CSF1R). We report safety, efficacy, and preliminary patient-reported outcome data for patients with TGCT treated with the recommended phase 2 dose (RP2D; 30 mg twice weekly; NCT03069469).

Methods: Patients with TGCT not amenable to surgery were treated in 2 cohorts: A (no prior anti-CSF1/CSF1R therapy except imatinib and/or nilotinib) and B (prior anti-CSF1/CSF1R therapy). Objectives were efficacy and safety of RP2D. Pain was evaluated using brief pain inventory (BPI) worst and average numeric rating scale scores.

Results: As of February 18, 2022, 57 patients were enrolled: 46 in A (enrollment complete) and 11 in B (enrollment ongoing). Objective response rates were 49% and 44% in Cohorts A and B, respectively. Clinical benefit (partial response + stable disease) was observed in 100% of patients. Most non-laboratory treatment-emergent adverse events (TEAEs) were Grade 1/2; the only Grade 3/4 TEAE observed in >5% of patients was elevated creatine phosphokinase. Overall, BPI score improvement was observed in >50% of patients at Week 25.

Conclusions: At RP2D, vimseltinib demonstrated encouraging antitumour activity. AEs were manageable and patients reported symptomatic benefit (improved BPI scores). Results support continued evaluation of vimseltinib in the ongoing phase 3 MOTION trial (NCT05059262).

Surgical outcomes in patients operated for symptomatic metastatic spinal cord compression: A single institutional analysis to determine the change in quality of life and prognostic indicators for surgery

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Abstract

Introduction: Surgical decompression is warranted in patients with metastatic symptomatic cord compression (MSCC) to improve and/or prevent further deterioration of neurological outcomes. This single institutional study aimed to report the outcome in patients undergoing surgical decompression for MSCC and to determine the factors associated with poor outcomes among the operated patients.

Methods: 174 patients surgically treated for extradural MSCC between November 2012 to April 2022 were considered and 152 were included in the analysis. The mean age of the study population was 55±8.3 years, 83 (55%) were male. Myeloma was the most common primary tumour (18%, 28/152) and lung cancer was the most common solid organ primary tumour (17%, 26/152). The thoracic vertebra was most involved (58%, 88/152). 22% (33/152) of the patients were non-ambulant (Frankel grade A, B or C) on presentation. Posterior decompression and spinal stabilization was performed in 88% (133/152).

Results: Postoperative systemic complications were seen in 7% (11/152) and three patients (2%) died due to causes attributable to surgery. The mean survival of the study population following surgery was 16 (±8.3) months. The overall survival was 62% (95% CI: 56-68) and 39% (95% CI: 31-46) one and two years after surgery. The variables for poor outcome were: non-hematogenous malignancy (p=0.002), non-ambulatory status (p=0.004), Karnofsky score < 50 (p=0.013), time duration between onset of neurological symptoms and surgery > 3 months (p=0.012), post-operative chemotherapy (p=0.010) and metastasis to other bones (p=0.04).

Conclusion: Though surgical procedures for MSCC do not add to the survival benefit in patients with cancer, they can significantly improve the quality of life. Early surgical intervention before gross neurologic and systemic progression of the MSCC improves the outcome of the procedure.
The role of post-operative radiotherapy in osteosarcoma: a retrospective analysis from the London Sarcoma Service (LSS)

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Abstract

Introduction
Standard-of-care management for osteosarcoma remains peri-operative chemotherapy and surgical resection. The role of post-operative radiotherapy (PORT) is unclear, but may be considered in high risk cases including positive surgical margins, displaced pathological fracture or chemotherapy-induced necrosis <90%. No trials have evaluated PORT for osteosarcoma, and observational studies have been confounded by imbalanced prognostic factors.

Methods
We retrospectively analysed the prognostic factors and outcomes (overall survival, OS; and local progression free survival, L-PFS) of patients with osteosarcoma treated with PORT in the LSS compared with matched controls from 2006-2019. Propensity score matching (PSM) was used to balance prognostic factors between treated and control groups to determine the treatment effect of PORT.

Results
Pre-matching gender, tumour size, histological sub-type, extra-osseous extension and metastases at diagnosis were balanced between treated (PORT) (n=32) and control groups (no PORT) (n=91). However, treated patients were older, had more non-limb tumours and positive surgical margins. Increasing age, metastases at diagnosis, necrosis <90% and positive margin were associated with poorer OS and L-PFS (P <0.10); additionally, non-limb site was associated with poorer L-PFS (P <0.10). PSM matched 32 treated to 32 control patients and balanced all prognostic factors (P >0.05). Post-matching OS and L-PFS did not differ between matched treated and control groups (P =0.4; P =0.87).

Conclusion
In this cohort, PORT did not improve OS or L-PFS in resected osteosarcoma when prognostic factors were balanced using PSM. These results do not support the routine use of PORT, and its role in this setting remains unclear.
Megaprostheses for Metastatic Bone Disease- A Comparative Analysis

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Abstract

Introduction: Megaprosthetic reconstruction can be indicated in advanced extremity metastatic bone disease (MBD) for oncological resection or when associated with large degrees of bone loss [1, 2]. For bone sarcoma indication this is associated with published risk of revision of 25-40% at 5 years [3, 4], but it is not known if this applies to MBD [5].

Method: We performed a comparative analysis of complications and revision surgery after megaprosthetic reconstruction for MBD (n=78) and bone sarcoma (n=133) surgery in a retrospective quality controlled institutional cohort from 2005-2019 with 2 years minimum clinical follow-up. We present the cohort by descriptive data with Kaplan-Meier (K-M) rates of revision at 1, 2 and 5 years as well as a competing risk assessment by indication type.

Results: The MBD cohort is older and has more often had radiotherapy and chemotherapy. K-M rates of revision are significantly lower for MBD (8% at 1 year, 12% at 2 years) compared to that for sarcoma (18% at 1 year, 24% at 2 years) in the intermediate term. There is no significant difference at 5 years of follow up by K-M analysis (25% for MBD and 33% for sarcoma), but remains significant in a competing risk analysis, accounting for death as a competing event (8% for MBD and 20% for sarcoma. Neither age, smoking status, radiotherapy, chemotherapy, fixation technique or earlier surgery appeared to influence the risk of revision.

Conclusion: Rates of revision after megaprosthetic reconstruction for MBD are significantly lower than for that of primary bone sarcoma.

Ewimgs Sarcoma

A propensity-score weighted analysis of local treatment modalities for Ewing Sarcoma - Report from the Ewing 2008 trial

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Abstract

Introduction

Local therapy is an important element in the treatment of Ewing sarcoma (EWS). The optimal choice of local therapy for EWS is still not fully clear. Aim of our study was to analyze the association between the different local treatment modalities and event-free survival (EFS) in patients treated according to the Ewing 2008 protocol.

Method

The prospectively collected data of 833 patients with localized EWS treated in the Ewing 2008 trial between 2009 and 2018 were analyzed. All patients received induction chemotherapy. Propensity scores were calculated using tumor site, tumor volume, sex and age of the patient as independent variables. Survival probabilities as well as Cox regressions were weighted using the propensity score. Results are presented with 95% Confidence Intervals.

Results

The 5-year EFS probabilities were 0.74 (0.67, 0.82) for surgery, 0.59 (0.48, 0.72) for radiotherapy and 0.74 (0.69, 0.79) for surgery & radiotherapy, p=0.006.

Adjusting for prognostic factors (age, sex, tumor volume & tumor site), we found that patients were at increased risk of any event after definitive radiotherapy compared to surgery only, HR 1.78 (1.04, 3.07), p=0.04. Patients did not benefit from additional radiotherapy when compared to surgery only, HR 1.04 (0.70, 1.55), p=0.85. However, patients that had high tumor volume and poor histological response to chemotherapy might benefit from additional radiotherapy, HR 0.50 (0.18, 1.34), p=0.17.

Conclusions
While in all patients treated with combination therapy, the hazards of any event were not decreased compared to surgery, patients with poor prognostic factor might benefit from combination therapy.
Treatment of Giant Cell Tumor of Bone in the Distal Radius and Ulna

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Abstract

Introduction: The preferred treatment of giant cell tumor of bone is curettage with the use of local adjuvant. If the tumor spreads beyond the bone into soft tissues, en bloc excision should be performed. The purpose of the study was to identify the risk factors for local recurrence and to compare the functional outcomes after both types of surgical procedures.

Method: The group included 16 patients with giant cell tumor of bone in distal forearm treated in 2005-2019. The mean age of patients was 38 years (22–53). The follow-up period was 6.75 years (2–15) on average. Based on the obtained data, we compared the effects of gender, Campanacci grade, type of surgery and administration of denosumab on the risk of local recurrence. The functional outcomes were evaluated retrospectively based on the MSTS scoring system.

Results: Resection and reconstruction using an allograft was performed in 9 patients. Seven patients were treated with tumor curettage and cementoplasty. The group of patients who underwent curettage showed a significantly higher mean MSTS score 89% compared to the group of patients with resection with the mean MSTS score 66% (P < 0.05). Local tumor recurrence was reported in 3 patients (18.75%).

Conclusions: Tumor curettage using local adjuvant is preferred in a well-circumscribed tumor and offers an excellent functional outcome. En bloc tumor resection after preoperative treatment with denosumab and reconstruction using an osteocartilaginous allograft is a suitable treatment option for a locally advanced tumor with a low risk of local recurrence.

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Pelvic ring reconstruction with the non vascularized fibular free graft following internal hemipelvectomy

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Abstract

Introduction: Currently, internal hemipelvectomy is one of the standard treatments for malignant pelvic tumors. In this case pelvic ring reconstruction with either a fixation device or bone graft is required for weight bearing and ambulation with the preserved leg. In our department, non-vascularized, fibular grafts (NVFG) are utilized for reliable pelvic ring reconstruction of our modified Enneking’s types I and I/IV resection. We evaluated the result of this procedure.

Methods: From 1996 to 2021, 12 pelvic ring reconstructions with NVFG were performed after internal hemipelvectomy. A key indication for internal hemipelvectomy in pelvic tumours is sciatic notch preservation confirmed by preoperative MRI.

Results: The NVFG united successfully in all patients. The mean operation time was 5 hrs 17 mins. The mean union time was 6.1 months. Post-operative deep infection did not occur in any case. Nine patients were eventually able to ambulate without a cane. Neither grafted bone fracture nor dislocation did not occur in any case. Recurrent tumour occurred in two of twelve cases. Death from tumour-related disease occurred in one of ten cases.

Conclusions: Our results demonstrated the importance of the non-vascularized fibula graft as a stable and reliable pelvic reconstruction procedure. Moreover, the reliability of our procedure may be linked to careful patient selection, limited to those with an intact sciatic notch and preserved gluteal vascular supply. Therefore, we can conclude that NVFG is a successful method of pelvic ring reconstruction for internal hemipelvectomy.


**Abstract**

Introduction: Ewing Sarcoma (EWS) is a rare and highly malignant bone tumor representing the second most common bone tumor in children and adolescents following osteosarcoma. The sacrum as primary is very rare and studies focusing on this location are scarcely available. Even though systemic treatment modalities have made huge improvements over the last decades, the anatomical location of sacral EWS poses a challenge for local treatment, especially regarding surgery.

Method: We retrospectively analyzed databases of EURO-E.W.I.N.G. 99 and EWING 2008. Both clinical trials included 124 patients (pts) with localized (n=70) or metastasized (n=53) sacral EWS. All pts received systemic treatment according to the protocols. For local control 64.3% received definitive radiotherapy (followed by combined modality treatment (25.2%) and surgery alone (4.3%). Some pts had no local treatment (6.1%) mainly due to early relapse. The study endpoint was event free survival (EFS). Factors probably associated with survival e.g., age, sex, tumor volume, local treatment modality and applied study protocol were included in the univariate and multivariable analyses.

Results: Age under 18 years was associated with better outcome (3y-EFS: .45 vs .12; P=.03) in patients with metastases at diagnosis. Interaction was seen in patients with definitive radiotherapy compared to other patients by higher EFS in localized disease in contrast to lower EFS in metastatic patients (P<.001).

Conclusion: Young age is associated with better outcome and interaction was observed between definitive radiotherapy and metastases at diagnosis. Regarding local therapy modality, the anatomical location is decisive and the majority of pts received definitive radiotherapy.
The impact of increasing the use of virtual consultations on Physiotherapy contacts in the East Midlands Sarcoma Service.

Jo Bacon, Lynsey Green, Ms Kathryn Steele
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Abstract

Introduction. Enforced changes to working practices as a result of the SARS Covid19 pandemic have challenged the historic tendency for physiotherapy consultations to be face-to-face. We aim to explore the impact of the introduction of virtual consultations on our physiotherapy service.

Method Data has been collected for all patients under the sarcoma physiotherapy service remit at Nottingham University Hospitals, which also includes benign soft tissue tumours. Physiotherapy contacts have been recorded using the electronic system Clinical Manager and categorised as face-to-face, telephone and video calls. The period 2018-2021 has been analysed.

Results Total face-to-face contacts in 2020 (n=718) decreased from 2019 (n=773) by 7.1%, with April containing the least contacts (n=16), returning to pre-pandemic levels by August 2020. Virtual contacts increased from 20 and 16 in 2018 and 2019 respectively by >1000% in 2020 (n=222) and a further 81% in 2021 (n=402).

Conclusion Following initial implementation of virtual appointments due to SARS-Covid19 restrictions, potential was identified to increase contact capacity of the physiotherapy service. 96% of 2021’s virtual contacts are via telephone, offering significant time reductions per contact (versus face-to-face). This additional capacity has allowed us to provide a telephone triage service for post-operative benign patients and provide earlier interventions for this patient group. Virtual consultations also allow for increased review and progression of exercise programmes whilst reducing hospital footfall, although regular face-to-face contacts are required to maintain quality interventions. Further research is indicated to explore the quality of virtual contacts, and the satisfaction of patients when comparing virtual to face-to-face contacts.
Oncology - Other

Improving survival of children with osteosarcoma: an international cooperation approach

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Abstract

Introduction

The highest percentage of pediatric cancers is found in low/middle-income countries (LMIC) with significant differences in survival compared to high-income countries (HIC). This study presents a successful therapeutic strategy developed for Osteosarcoma (Os) patients between Italian team and Kyrgyz team.

Method

This observational retrospective study enrolled Os patients, initially treated with chemotherapy in Kyrgyzstan followed by surgery and adjuvant chemotherapy in Italy between 2010 and 2021 (based on ISG/OS Oss protocol, poor-responders arm (Ferrari S, et al, Tumori. 2014;100(6):612-9)). Treatment, outcome and prognostic factors were examined.

Results

Thirty-four patients were enrolled. Median age at diagnosis was 12.3 years. All patients presented with extremity Os and 23 (67.6%) had localized Os. A median of 2 cycles of doxorubicin-cisplatin were administered in Kyrgyzistan (due to the impossibility of doing methotrexate (M) in the country). 18 patients (53.0%) underwent limb salvage, 15 patients (44.1%) were amputated for high percentage of locally advanced Os, surgery was not feasible in 1 patient (2.9%). Median tumor necrosis was 58.6% (range 20-98), with 5 patients achieving good histological response (> 90%). The adjuvant chemotherapy was MAP-Ifoasamide regimen. Nineteen patients (56%) developed M-related hepatotoxicity > grade 3 (CTCAE criteria v5.0). Fifteen patients (44.1%) relapsed during treatment. The 3-year survival estimate is 60% (95% CI: 45-80%) with a median follow-up 3 years (range 0.6-10,8 years).

Conclusions

The survival of the children with Os in LMIC have been raised up to the same level of the HIC through the international collaboration between a volunteer organization and a medical oncology-orthopedic team.
Autobiologic reconstruction of the hip with dual vascularized fibula grafts in the immature skeleton. A 20-year follow-up with functional evaluation.

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Abstract

Introduction
Limbsparing tumor surgery with preserved joint-function in children can be performed using vascularized fibula grafts (VFGs). An autobiological reconstruction is defined as exclusively using the patient’s own skeleton and soft tissues when performing the reconstruction.

Method
A nine-year-old girl with a IIB Ewing-sarcoma of the proximal femur had chemotherapy (High-dose Bu-Mel, Euro-Ewing 99). In July 1999, 18 cm of her proximal femur was resected. Dual VFGs were used as a reconstruction. The fibula head was inserted in the acetabulum, and the remaining hip joint-capsule was sutured like a pouch around the fibula head. Restriction of motion was maintained for 18 months postoperatively.

Results
Functional Score (FS-AMSTS) 4-years-postop was 23/30. 10-years-postop the LLD (leg-length discrepancy) was 60 mm. Callus distraction was performed 2011-09 with a Taylor Spatial Frame (TSF) and the TSF was extracted 2012-10. 2012-10 she also had an open knee release and an achilles tendon lengthening. FS was 26/30 after leg-lengthening. At follow-up 20-years-postop the fibula head has remodeled into a femoral head. Her walking capacity is restricted (maximum 1 – 2 km) due to limitation of hip range motion (0 - 70 degrees), The FS has declined to 16/30, 53% (TESS 103/140, 74%, ADL 4/5, Handicap 3/5). She works as a gemologist, mostly sedentary work.

Conclusion
This autobiologic reconstruction shows a good potential to remain a functional permanent reconstruction. The patient has limited pain due to denervation, but restricted range of motion. LLD and achilles tendon shortening need to be corrected. Her FS remains at a reasonable 16/30.
Autobiologic reconstruction of the knee with dual vascularized fibula grafts in the immature skeleton. A 20-year follow-up with functional evaluation

Prof Örjan Berlin¹, Prof Peter Bergh¹, Dr Christina Berger¹, Prof Hans Mark², Prof Jonas Lundberg²
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Abstract

Introduction
Limb-sparing tumor surgery with preserved joint-function in children can be performed using vascularized fibula grafts (VFGs). An autobiological reconstruction is defined as exclusively using the patient’s own skeleton and soft tissues when performing the reconstruction.

Method
A nine-year-old girl with a IIA-osteosarcoma of the distal femur had chemotherapy (ISG-SSG I). In 2000-09 the tumor was resected and reconstructed with dual VFGs. The cruciate ligaments (ACL/PCL) were reconstructed using the Lateral-Collateral-Ligament and Biceps-Femoris-Tendon.

Results
Functional Score (FS-AMSTS) 3-years-postoperatively was 20/30. Epiphysiodesis was performed when leg-length-discrepancy (LLD) was 4.5 cm. Anterior dislocation of the VFGs necessitated resection of the distal femur reconstruction 7-years-postoperatively. A Mutars prosthesis (TKP) replaced it (2007-09). FS with the original reconstruction remained at 20/30, but improved (26/30) after the TKP. LLD (65 mm) necessitated callus distraction with a Taylor Spatial Frame ending up with a tibial valgus deformity.

Her MSTS score 20-years-postoperatively with the Mutars TKP is 27/30 (TESS 146/150; 97%. ADL 5/5, Handicap 4/5). She has a family with 2 children, and works full-time with a clerical job. The TKP has been revised twice due to wear of components, without further complications.

Conclusion
This autobiologic reconstruction functioned as a temporary reconstruction for 7 years. Her unstable knee necessitated an orthosis, but she had no pain – an acceptable but not good function. TKP at skeletal maturity improved her FS, but tibial valgus deformity after a LLD operation remains an issue. So, at best this can be regarded as a multiple-year temporary solution until skeletal maturity.
Autobiologic reconstruction of the shoulder with a single vascularized fibula graft in the immature skeleton. A 20-year follow-up with functional evaluation

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Abstract

Introduction
Limb-sparing tumor surgery with preserved joint-function in children can be performed using vascularized fibula grafts (VFGs). An autobiological reconstruction is defined as exclusively using the patient’s own skeleton and soft tissues when performing the reconstruction.

Method
A six-year-old girl with a IIB telangiectatic osteosarcoma of the proximal humerus had chemotherapy (ISG-SSG I) in 1999-11. 10 cm of her proximal humerus was resected and a single VGF was used as reconstruction. The long biceps brachi tendon was sutured to the LCL (lateral collateral ligament) and the distal end of the BF (biceps femoris) tendon of the fibula graft. The remaining rotator cuff was sutured like a pouch around the fibula head.

Results
Score (FS-AMSTS) 2-years-postop was 26/30 (28/30 at 5 years). 6-years-postop she had a soft-tissue recurrence in the triceps brachi muscle. After pre-operative chemotherapy a local wide excision was performed (2006-05). At Follow-up 20-years-postop there are no signs of local or distant recurrence. Her HLD (Humeral Length Discrepancy) is 93 mm. Lengthening is deemed too risky due to the narrow diameter of the remaining humerus. The fibula head partly transforms into a new humeral head. The patient experiences no pain due to denervation, despite subluxation of the new “humeral” head. Her FS is 25/30 (TESS 143/145, 99%. ADL 5/5, Handicap 4/5). She has a fairly strenuous industrial job, and a family with a 2-year-old daughter.

Conclusion
Autobiologic reconstruction of the shoulder remains a functional permanent reconstruction 20 years postoperatively. Her FS remains at a satisfactory 25/30.
Using augmented reality for intraoperative guidance during needles placement for cryoablation of Desmoid tumors

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Abstract

Traditional treatments of Desmoid tumors, are associated with frequent local recurrence and complications. Percutaneous cryosurgery (CRA), has been proven to be effective in reducing tumor burden and improving symptoms while maintaining a low incidence of morbidity. This study is examining the feasibility and accuracy of CRA needles insertion guided by Augmented Reality (AR) to treat Desmoid tumors. Five patients with Desmoid tumors eligible for CRA were included. Segmentation of the tumor and surrounding tissues derived from an MRI scan done adjacent to the procedure with fiducial markers. Virtual surgical planning (VSA) i.e. CRA ice balls positioning for homogenous freezing process assisted the surgeon during the procedure in understanding the tumor location and needle trajectory insertion. The surgeon used the Microsoft HoloLens headset to guide the CRA needles according to the VSA. Validation of needles positions was done via Medtronic navigation system. Intraoperative CT scan was acquired following needles insertion. Post-op segmentation and parametric comparison of needles position was done. Radial error and angle of error were determined using vector coordinates. Summary statistics were calculated individually and collectively. The combined angle of error of was 2.8° ± 1.7°. The mean radial error for users was 3.7 ± 1.2 mm. The mean target depth was 85.41 mm. Results showing promising and safe procedure. Surgeons’ feedback regarding user experience were satisfying. Those results should assessed clinically in future follow-up for the CRA efficacy (tumor recurrence).
Application of carbon plates in bone defects after resection of soft tissue tumors sarcomas

Ms Laura Castillo Ruiperez, Mr Victor Manuel Zarzuela Sanchez, Mr Jose Diranzo Garcia, Mr Lorenzo Hernández Ferrando
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Abstract

Introduction

Carbon-fibre-reinforced polyetheretherketone plates have recently been introduced in orthopaedics. Compared with metal plates, they have several beneficial features as the elastic modulus closer to cortical bone, increased flexibility, high load carrying capacity and radiolucency, allowing improved assessment of fracture healing. In addition there is a marked reduction in artifact with CT and RMN, useful in oncology.

Method

We present 3 patients affected by high-grade pleomorphic sarcoma, treated by extended oncological surgery, partial bone resection and placement of a carbon plate as support, associated with a dorsal flap. We analyze the oncological control (local recurrence by MRI, development of metastases, survival), postoperative complications (infection, suture dehiscence) and complications derived from the use of this type of implant (material failure).

Results

The mean follow-up time was 28 months (12-48). Concomitant neoadjuvant chemotherapy and radiotherapy were applied in two cases, and only radiotherapy in the other one.

During follow-up, one patient suffered a local recurrence and progression of the disease and died, the rest are free of disease.

Bone consolidation was seen in 2 of them. No material failure was noted. One patient suffered seroma. There were no suture dehiscences or infections.

Conclusions

Due to carbon plates low artifact in RMN, they allow local control of soft tissue sarcomas. Moreover, they provide good biomecanical support to the bone, so we think they are a good option in sarcomas that are in relation with bone.

Poster upload

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USE OF THE COMPRESS® SYSTEM IN MEGAPROSTHESIS. OUR EXPERIENCE.

Mr Victor Manuel Zarzuela Sanchez, Ms Laura Castillo Ruipérez, Mr Jose Diranzo García, Mr Lorenzo Hernandez Ferrando
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Abstract

Objectives

To assess the survival of the implant and the medium-term results in use of the Compress® system as a method of fixation in tumor prostheses after oncological surgery.

Material and methods

We have carried out a retrospective study with 14 patients surgically treated in our musculoskeletal tumor unit between 2013 and 2021, with an initial diagnosis of primary tumors or patients with oligometastasis with involvement of the lower extremity in whom the Compress® system was used as fixation method in OSS megaprostheses. Evaluation of surgical complications (early and late), integration of the implant as well as functional and oncological results is performed.

Results

The mean age of our series was 42 years with a mean follow-up of 4 years. We had 3 cases of Henderson classification type 1A, 3A and 4A implant complications with an overall survival of 78%. The mean score achieved on MSTS scale was 21 (70.4%). The most frequent complication was postoperative anemia (30.3%).

Conclusions

The use of Compress® system after oncological surgery allows a good fixation of the implant with similar results to the traditional stem system in megaprostheses, with low failure implant rate due to loosening and good functional results.

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Does the histological presence of a nidus correlate with improved outcomes in osteoid osteoma treated with percutaneous radiofrequency ablation (RFA)?

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Abstract

Introduction

We aim to compare the clinical outcomes of osteoid osteoma (OO) between the group of patients with the presence of nidus on biopsy samples from radiofrequency ablation (RFA) with those without nidus. Secondly, we intend to assess other factors that may affect the outcomes of OO treated with RFA.

Methods

88 consecutive patients diagnosed with OO treated with RFA between November 2005 and March 2015 were reviewed. Sixty-six patients (75%) had nidus present in their biopsy samples. Lesions were in the appendicular skeleton in seventy-nine patients (90%) while nine patients (10%) had an OO in the axial skeleton. Outcomes assessed were based on patients’ pain alleviation (complete, partial or no pain improvement) and the need for further interventions. Median duration of follow-up was 12.5 months (6-20.8).

Results

Pain improvement in the patient group with nidus was significantly better than the group without nidus (OR 7.4, CI 1.35-41.4, p=0.021). The patient group with nidus on biopsy demonstrated less likelihood of having a repeat procedure compared to the group without nidus (OR 0.092, CI 0.016-0.542, p=0.008). Our study showed significantly better outcomes in pain improvement in appendicular lesions compared to the axially located lesions (p = 0.005). Patients with spinal lesions tend to have relatively poor pain relief than those with appendicular or pelvic lesions (p=0.007).

Conclusion

Patients with nidus on histology had better pain alleviation compared to patients without nidus, with less likelihood of having repeat interventions. Patients with appendicular lesions demonstrated better outcomes than spinal or axially located lesions.
Oncology - Other

Living with sarcoma in childhood: An in-depth qualitative analysis of psychosocial factors

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Abstract

Introduction

Bone and soft tissue sarcomas account for approximately 10-15% of all cancer cases in children aged ≤16. Poorer quality of life (QoL) is recorded in comparison to other cancers; however, these studies are limited to generic cancer QoL measures. This qualitative study explored the psychosocial impact on children of a sarcoma diagnosis.

Method

Nine patients diagnosed with soft tissue and bone sarcoma (7 female, aged 8-16 years) and 11 carers from three UK Principal Treatment Centres participated in semi-structured interviews. These were recorded, transcribed verbatim and analysed using Framework Analysis.

Results

Six themes were identified: Diagnostic experience; Impact of treatment; Emotional wellbeing; Long-term effects; Family; and Education. Children shared worries about treatment side effects, including hair loss and mucositis, and frustrations around sarcoma preventing them from engaging with hobbies. Parents expressed fear of relapse. Concerns related to their children’s ability to adapt to living with a disability, and the impact of sarcoma on education and fertility.

Conclusions

The experiences shared by children and carers demonstrated a marked impact of sarcoma on QoL. Important study findings demonstrate issues affecting children that are insufficiently covered by existing, generic QoL measures. Specifically, emphasis was placed on disability and inclusivity. A better understanding of adaptation factors could therefore improve patient outcomes. The themes generated from the analysis are informing the content of a paediatric sarcoma-specific measure of QoL (SAM-Paeds). This will be used to improve the sensitivity of QoL assessment within clinical trials, and to identify children who benefit from supportive services.
HIP Reconstruction for Proximal Femur Sarcomas in the first decade of life

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Abstract

Introduction: Infantile proximal femur(PF) reconstructions are rare and few literature available. We started 1996 functional hip reconstructions in PF sarcomas below age 10. Our strategy utilized allograft-prosthetic-composites(APC), small stems cemented in fresh-frozen massive bone allograft (MBA), fixed to residual femur with plate, bipolar cups in native acetabulum. However smallest available cup was 36mm, not usable in smaller acetabula.

So, starting in 1997 we used an original reconstruction in kiddies: ipsilateral growing fibula autotransplant (GFA) with fibular head inside acetabulum and diaphysis inserted inside a MBA, fixed to femur by plate. Technique was abandoned in 2006 starting using fixed heads in APC.

Methods: We collected 34 PF reconstructions in children below age 10 performed from 1996 to 2020 (6 OGS, 28 EFT), in 5 Italian (31) and in one Indian (4) Institution by:

-GFA in 6 small children (<5 y/o)

-APC in 27 children: 14 bipolar cups (36-40mm) and 13 fixed heads (22-40mm)

-non-invasive growing-prosthesis(fixed head 28mm) in one case

Results: At F-UP 78 months (24-263) 22 patients alive (65%).

4 GFA patients had mechanical (3) or septic failure (1). After several surgeries, 3 cases had THA.

In APC bipolar cups, 2 patients (20%) had mechanical complications and 1 was revised with THA.

In APC fixed heads 6 patients (60%) had mechanical complications but all maintained original implant and nobody had THA.

Conclusions: In young children, APC with small prosthetic stem cemented into MBA reconstruct the bone stock, allow early rehabilitation and durability. Bipolar cups represent an effective method preserving acetabulum during growth but also fixed prosthetic heads are effective in smallest patients.
Upper limb reconstruction with tumor prosthesis: our experience

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Abstract

Introduction

Tumor involvement of the upper limb has an approximate incidence of 32% of all bone tumors. Its anatomical characteristics and incapacity after oncological surgery represent a surgical challenge. This, added to advances in the medical treatment of systemic disease and increased survival, has led to an increment in the use of tumor prosthesis to the detriment of treatments such as intramedullary nails.

Method

A retrospective study is presented with 28 patients treated with upper limb tumor prosthesis between 2009 and 2021, with a minimum follow-up of 6 months. 18 patients were men and 10 women; with an average of 56.81 years. 20 patients were diagnosed with bone metastases, three with chondrosarcoma, two with multiple myeloma, one with osteosarcoma and one with Ewing's sarcoma. Based on their anatomical location, 23 patients were treated with a tumoral shoulder prosthesis, four with an elbow prosthesis, and one with a scapula and proximal humerus prosthesis.

Results

70% of the interventions presented free resection margins (R0). A mean active mobility of 50° abduction and 45° antepulsion was obtained. Three episodes of aseptic loosening and one of prosthetic dislocation were described, requiring revision of the prosthetic components in two cases. Surgical wound dehiscence added one case that required Friedrich-type debridement.

Conclusions

Reconstruction of oncological lesions of the upper limb with tumor prosthesis is, based on our experience, an optimal technique in the treatment of primary tumors and oligometastases, as it leads to a notable improvement in pain and preserves acceptable limb function.
Local treatment of cervical cancer metastases to spine

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Abstract

Introduction. The relevance of treatment in patients with spine metastases increased simultaneously with increasing in number of these patients in clinical practice. The choice of treatment are based on patients survival rate (SR), functional status (FS) and quality of life (QoL).

Methods. The data of 54 patients with cervical cancer metastases to spine underwent LT were analyzed. Post-treated and distant functional and oncological results of LT were studied, QoL before and after treatment were revealed, as well prognosis factors were analyzed and ranked to justify choice of the optimal LT.

Results. One-year SR after LT of patients were 64.0%. The multivariate regression analysis showed the most significant prognosis factors in patients with cervical cancer metastases to spine were histological type of tumor, molecular and genetic characteristics of tumor, number of affected areas, solitary or multiple metastases, visceral metastases, FS and quantity of chemotherapeutic lines. These factors correlate with patients SR and consequently are significant for choosing the optimal treatment. More than that, in our study, we identified a group of patients with high overall survival rates. These are patients who have had a solitary spine metastasis of squamous cervical cancer, which has undergone radical surgical treatment (wide En-block resections).

Conclusion. Due to sufficient SR in patients with cervical cancer metastases to spine these patients may undergo surgical treatment in order to support functional results and improve QoL. Choice of LT type should be determined using neurological, orthopedic state, general health status and SR of patients.
**Dual time point [18F]FDG PET/CT can differentiate benign from malignant musculoskeletal tumors**

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**Abstract**

**Introduction**

FDG-PET/CT is increasingly used for the work-up of musculoskeletal tumors (MST). But differentiating malignant from benign tumors and grading malignant MST remains controversial. The aim of this study is to determine whether dual time point PET/CT imaging could improve the diagnostic accuracy and grading of MST.

**Material and methods**

Prospective single center trial. Patients with undetermined MST underwent PET/CT imaging at 1h (t1) and 3h (t2) post [18F]FDG injection. Semi-quantitative analyses were performed using SUVmax (t1) and delta SUV max (t2-t1)/t1 x 100. SUV max and delta SUV max were compared between benign and malignant lesions and the diagnostic performance was measured with area under ROC curve (AUC).

**Results**

As of June 2022, 24 benign and 38 malignant tumors (88 % sarcomas) were included. Significantly higher mean SUVmax and mean delta SUV max were found in malignant vs benign MST (10.3 +/- 9.0 vs 4.4 +/- 3.7, p < 0.001 and (+21.8 +/- 21.4 vs -0.9 +/- 19.5, p <0.001) respectively). Using SUV max, the AUC was 0.73 and a cut-off value > 4.5 resulted in a sensitivity (Se) of 68% and a specificity (Sp) of 71%. Using delta SUVmax, AUC was 0.82 and a cut-off value > +16.2% was more accurate (Se: 82%, Sp: 83%). Regarding soft tissue tumors (n=38), delta SUV max > +14% predicted highly malignity (AUC: 0.85, Se: 77%, Sp: 100%).

**Conclusion**

Our intermediate results demonstrate that dual time point [18F]FDG PET/CT identifies malignant tumors with high accuracy.
Custom 3D implants for glenoïd tumor reconstruction should be designed as reverse total shoulder arthroplasty

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Abstract

Introduction

Bone tumors involving the glena are rare occurrences. In some cases, it is possible to avoid a total scapulectomy. Previously, massive bone allografts were used with poor results both in terms of reconstruction quality and shoulder function.

3D printed patient specific cutting guides and implants may be a solution to improve shoulder function after glenoid reconstruction. We hereby present a short series (n=4) of patients with custom anatomical hemi arthroplasties (HA, n=2) vs custom reverse total shoulder designs (RTS, n=2).

M&M

Two patients (low grade chondrosarcoma and chondroblastoma) received a custom glenoid HA with a design based on the contralateral glena. Two patients (solitary metastasis and chondrosarcoma) received a RST arthroplasty with a custom glenoid implant.

Results

HA resulted in a poor function, painful shoulder and subsequent revision to a total anatomical arthroplasty with a proximal humerus resurfacing that improved pain but not function.

RST design resulted in a better function, less pain and one revision (intraprothetic dislocation of the proximal humerus component).

This design is better in several ways:

- The resection often encompasses the superior glenoid notch resulting in the damage of the suprascapular neurovascular pedicle. The supra-/infra-spinatus function is therefore lost.
- In HA, the glenoid design was copied from the bony aspects and not the soft tissue surface of the contralateral side resulting in higher center constrains on the proximal humerus and thus rapid degradation of the articular surface.

Conclusion

Custom glenoid replacement is possible and should be considered directly as a reverse total shoulder arthroplasty.
Clinical case: multi-organ en-bloc resection of the solitary metastasis of cervical cancer to the spine.

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Moscow Oncology Hospital 62, Moscow, Russian Federation

Abstract

Introduction. Metastases of squamous cell cervical cancer to the spine are an actual issue. This category of patients is characterized by the young age and the frequent solitary metastasis to spine. The feasibility of enlarged En-bloc resections in solitary spine metastases of cervical cancer is questionably, therefore it requires additional research.


Results. The postoperative period proceeded without complications. The patient was activated on the 5th day, discharged from the hospital on the 14th day. To date, the patient is under the dynamic supervision without progression. As a result of the treatment the patient has achieved full control over the disease and monitoring is ongoing. Overall survival is 46 months. Survival from local treatment is 17 months. Remote functional results are good enough. PS ECOG 2. The patient moves independently with a cane support. According to QLQ, SF36, SOSGOQ the patient's quality of life considers as good.

Conclusion. According to our observations and latest data available, patients with solitary spine metastasis of cervical cancer indicated for an En-bloc resection including multi-organ resection which significantly increases survival, while maintaining a high QLQ and performance status.
Assessment of physical activity in children and adolescents after malignant bone tumour surgery.

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Abstract

Introduction

Childhood cancer survivors suffer from cancer- or treatment-related late effects. Decline in physical fitness, decreased functional capacity, decreased activity level and cancer-related fatigue are common tangible late effects¹. Adolescents who underwent surgery experience relatively more limitations in daily functioning, ambulation and the level of physical activities². Besides consequences of the chemotherapeutic treatment of childhood cancer, this may also be due to; postoperative limitations imposed by the surgery, residual pain, muscle weakness / control, loss of mobility and emotional problems³.

Methods

Aim of this study is therefore; to evaluate the physical activity level of survivors after malignant bone tumour surgery; to identify hindering and facilitating factors; and finally to explore the relationship between activity level / physical activity and factors of disease and treatment.

Results

Physical activity will be assessed in a cross-sectional national cohort study. The Actigraph activity monitor⁴ (an objective activity measure), will be provided to patients following a visit at the multidisciplinary follow-up outpatient clinic for late effects.

The cohort to be evaluated are patients, aged 8-25 years, at least 2 years since a local treatment due to a malignant bone tumour in the upper-, lower extremity or pelvic region.

Conclusions

This study will provide important information on the level of physical activity in bone cancer survivors and the need to improve physical activity care in this patient group.

Reference(s)

Use of Patient Specific Instrumentation (PSI) in pelvic tumors resection: cost-effectiveness analysis based on a French multicenter clinical trial

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Abstract

Introduction:
To evaluate the efficiency of PSI in the resection of a primary pelvis/sacrum tumor as an alternative to hand-free bone section (HFS).

Methods:
Cost-effectiveness analysis based on a multicenter clinical trial in which 43 patients operated on with PSI (2016-18) were matched to 43 patients operated on with HFS (2010-16) (NCT02544711). ICER relates the difference in total cost per group to the difference in the number of local recurrences over a 3-year period. Costs of hospitalization, rehabilitation (national database), and the cost of PSI (€3,600) were valued from the French health system perspective. Costs and recurrences were discounted at a rate of 2.5% per year starting in year 2.

Results:
Cost per patient in the PSI and HFS groups were €58,835 and €42,847 (p=0.07). Cost differential is mainly due to rehabilitation costs. No statistically significant difference was observed in the number of discounted recurrences between the groups (p=0.91). The ICER was €-9,472,346, with PSI strategy strictly dominated (higher cost without higher effectiveness). The willingness to pay to avoid a recurrence must be €1,500,000 to achieve a 46.3% probability that the PSI strategy is efficient. Additional analyses conducted in terms of cost/life year gained confirm these results.

Conclusions:
Resection of a primary pelvic tumor with PSI is not efficient enough. Limitations are potential differences in management between both groups not accounted for in the patient matching (rehabilitation, closer resections with PSI, surgical confidence in PSI...).
The development of a National Sarcoma Educational Programme

Ms Joanne Coleman
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Abstract

In May 2022 a National Educational Programme for Sarcoma was piloted by the London Sarcoma Service, in collaboration with Sarcoma UK. This was in response to recognition of a growing need for sarcoma education and training to be more widely available for existing sarcoma specialists and to support those new to the speciality. An annual programme has been devised. It is delivered monthly via a one hour virtual MS Teams session, held over a Wednesday lunchtime. Invited speakers from the specialist Sarcoma MDT and Allied Health Professionals provide a presentation followed by an open Q & A session.

Topics relating to bone and soft tissue sarcoma diagnoses, surgical and medical treatments and rehabilitation have taken place. The education programme is oriented towards nurses, allied health professionals, and those working with sarcoma patients. Invitations are sent by email, containing a link to the sessions. The education sessions are recorded and subsequently made available for people to watch again at a later date.

The sessions have been well attended (on average 43 participants) with representation from all over the UK. There has also been a request for specialists to join from New Zealand! Feedback received through a completed evaluation form has been positive. Additional unexpected positive outcomes have included improved professional networking and communication between specialist centres.

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Value of Radiotherapy Dose on the Outcome in Non-Metastatic Ewing Sarcoma


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Abstract

Introduction Radiotherapy (RT) is a fundamental part of Ewing Sarcoma (EWS) therapy. The Ewing-2008 protocol recommended radiotherapy doses from 45 to 54Gy. However some patients (pts) received other RT-doses. We analyzed the value of different RT-doses on event-free survival (EFS) in EWS patients.

Methods The Ewing 2008 database included 534 radiotherapy-admitted pts with non-metastatic EWS. Recommended treatment consisted of multimodal chemotherapy and local treatment consisting of surgery and (S&R group)/or radiotherapy (RT group). EFS was analyzed with univariable and multivariable Cox regression models including known prognostic factors age, sex, tumor volume, surgical margins and histological response.

Results S&RT was performed in 336 patients (70.4%), and 145 patients (29.6%) received definite RT. In the S&RT group radiotherapy-dose was (a) <=53Gy in 193(57.4%), (b) 54-58Gy in 118 (35.1%) and (c)
>= 59Gy in 25 (7.4%) pts. In the RT group radiotherapy-dose was (a) in 17 (11.7%), (b) in 64 (44.1%) and (c) in 64 (44.1%) pts. 3y-EFS in the S&RT group was .76 (SE=.03) for (a), .76 (SE=.04) for (b), and .69 (SE=.10) for (c) (P=.57), and in the RT group .58 (SE=.13), .69 (SE=.06), and .73 (SE=.06) (P=.63), respectively. Multivariable Cox regression revealed age >=15years (HR=2.3 95%CI 1.2-4.4), non-radical margins (HR=2.6 95%CI 1.4-5.0) for the S&RT group (Sex P=.81, Histological response P=.20, Tumor volume P=.13, Dose P=.35), and large tumor volume (HR 2.2 95%CI 1.2-4.0) for the RT group as independent factors (Dose P=.15, Age P=.08, Sex P=.40).

**Conclusions** No impact of RT-dose on survival outcomes in our cohort was found, whether patients were treated with surgery and radiotherapy or definitive radiotherapy. To control for potential selection bias, the upcoming iEuroEwing trial will assess the value of different radiotherapy dose in a randomized manner.

**Poster upload**

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Treatment of periprosthetic infection in children and adolescents with malignant bone tumors

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Abstract

Introduction. Infection of megaprostheses according to the literature ranges from 3.5 to 19.5%. Treatment includes long-term antibiotic therapy, removal of the endoprosthesis and installation of a spacer, re-implantation of the endoprosthesis. In some cases, it can lead to limb amputation (up to 20% of cases), sometimes fatal. In children who need an endoprosthesis extension, each procedure increases the risk of infection by 5%.

The purpose of our study: to evaluate the effectiveness of treatment of infection of elongated endoprostheses depending on the time of primary endoprosthesis.

Materials and methods. Cases of endorothesis infection in 64 patients with malignant bone tumors aged 7 to 50 years with a follow-up period of 15 years were analyzed. There were 42 patients with local osteosarcoma, 13 patients with stage 4 osteosarcoma, 5 patients with local Ewing sarcoma, 3 patients with Ewing sarcoma stage 4, 1 patient with malignant giant cell tumor. Endoprostheses in 16 patients were manufactured by "Link", the rest by "Inmed" (Ukraine). There were 9 cases of endoprosthesis infection (14%): 1 acute infection (up to 4 weeks after endoprosthesis), 2 early infections (4 weeks to 2 years) and 6 late endoprosthesis infections (more than 2 years after endoprosthesis). All patients received long-term antibiotic therapy for 6-8 weeks. The cause of acute infection of the endoprosthesis was a soft tissue defect over the endoprosthesis. This required covering the defect with a displaced skin-subcutaneous-muscular flap with removal of the endoprosthesis and re-implantation. 2 early infections required removal of the endoprosthesis, fixation of fragments by the device of external fessation, re-implantation. 3 late infections were treated with removal of the endoprosthesis and installation of an external fixation device, re-implantation. 3 late infections of the endoprosthesis, which arose acutely after elongation, were successfully treated conservatively with the introduction of intra-articular antibiotics, corticosteroids.

Results. In all cases, treatment of megaendoprosthesis infection was successfully performed, only 1 patient had to undergo limb amputation due to the small number of soft tissues to cover the endoprosthesis. Acute infections of the endoprosthesis after prolongation can be treated conservatively.
Is there a difference in outcomes between limb salvage and amputation in the treatment of lower extremity sarcomas?

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Abstract

Introduction
Sarcomas are tumours originating in bone or soft tissues, commonly in the extremities. Treatment of choice has been amputation but advancements in limb salvage surgery (LSS) and neoadjuvant treatments mean LSS is now the primary treatment option. Controversy exists about whether amputation or LSS achieves better outcomes. Clinical and oncological outcomes are measured using patient data, whilst functional outcomes are measured using tools such as the MSTS. This paper evaluates whether there is a difference in clinical, oncological, or functional outcomes between treatment types for lower extremity sarcomas.

Method
A literature search of Medline, Embase, and Web of Science identified eligible papers which were assessed for quality and bias, and outcome data was extracted. Outcomes for treatment below knee level were looked at.

Results
LSS has longer 5-year survival, less metastasis and better MSTS scores compared to amputation. Amputation has lower local recurrence rates and complications. Whilst some results reached statistical significance, others found similar results with no significant difference between treatments.

Conclusions
LSS and amputation generally provide similar outcomes, except for several domains such as survival, metastasis, complications, or local recurrence, in which one exceeds the other. These results may play a role in determining what treatment option is best for the patient depending on what outcomes are most important to them, therefore providing patient-centred care. This highlights the importance of a multidisciplinary approach on a case-by-case basis to determine which treatment option to proceed with, regardless of indications leaning towards one treatment and instead focusing on outcomes.

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Is it safe to send patients with tumor endoprosthesis to MRI? Heating and displacement force testing of tumor endoprosthesis within the MR field

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Abstract

Introduction. Bone and soft tissue malignancy could be treated with resection and endoprosthetic reconstruction, and magnetic resonance imaging (MRI) is commonly used in the postoperative surveillance. To our knowledge, no testing of the interface between tumor endoprostheses (TmEp) and MRI has been published.

Methods. We performed testing of three commonly used TmEp systems (Stryker GMRS, DePuy LPS and Implantcast MUTARS) matching 10cm of distal femur resection, in a 3T MRI environment. All tests were performed following the ASTM protocols. Radiofrequency induced heating was assessed using fiber-optic temperature probes, with a “worst-case” scenario with maximum specific absorption rate MRI protocol. The displacement force was measured using a goniometer attached to a custom-made fixture positioned in the center of the bore of the MRI apparatus.

Results. For radiofrequency induced heating, no probe showed isolated increases in temperature greater than the reference. The overall rise in temperature was less than 0.5°C during the test period at any measurement point. The displacement force observed on TmEp showed displacement angles of under 6°. The highest calculated displacement force was 1,12N (0,12kg) with a TmEp weight of 1,3kg.

Conclusions. Our results suggest that the tested TmEp are safe for the MRI environment. The radiofrequency induced heating of the TmEp is similar to daily variations of the normal body temperature of a healthy person. The displacement force put on the endoprostheses during MRI is considered to be neglectable as the resulting force is less than 10% of the force exerted by the earth’s gravitational field.
Predicting proximal femoral pathologic fractures from digitally reconstructed radiographs using deep learning in advanced cancer patients

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Abstract

Introduction

In advanced cancer patients, pathologic fractures are common and have a serious effect on walking ability and quality of life. Therefore, preemptive treatment for impending fractures is essential. Nevertheless, results from existing prediction systems were not successful. Thus, we tried to find a novel deep learning approach for predicting proximal femoral pathologic fractures from digitally reconstructed radiographs (DRRs).

Methods

We have collected the opportunistic abdomen CT scan images of 388 advanced cancer patients with proximal femoral bone metastasis who were treated at our institution. The dataset was randomly split into training (316 patients, 81.4%) and test (72 patients, 18.6%) sets. The intensity of input voxels was clipped to the bone window (level=500, width=2000) to emphasize bones, and DRRs were produced. A positive label indicates a case where a fracture developed within 3 months after a CT scan. The size of DRR images in the training and test set is modified into 224 × 224 pixels. We used DenseNet-121 convolutional neural network (CNN) model with Adam optimizer and the batch size was set to 32. Given the class imbalance between positive and negative labels, weight loss of 1e-10 is utilized.

Results

The area under the receiver-operating characteristic curve for prediction performance was 0.83 and the accuracy was 0.78. When CNN set the decision boundary for determining positive and negative labels at 0.5, sensitivity and specificity were 0.67 and 0.80, respectively.

Conclusions

Our deep learning model showed a favorable prediction performance for predicting proximal femoral pathologic fractures compared with pre-existing methods.
Secondary malignancy in giant cell tumor in the extremity: a single-center experience

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Abstract

Introduction

Giant cell tumor of bone (GCTB) may rarely undergo sarcomatous transformation. Secondary malignancy in giant cell tumor (MGCT) is known to be associated with radiotherapy and has a dismal prognosis. We investigated the clinicopathological characteristics and prognostic factors of patients with secondary MGCT based on the recent diagnostic criteria.

Methods

This study was a retrospective medical record review of patients with histologically confirmed secondary MGCT. The enrollment criterion was high-grade spindle cell sarcoma which developed at the site of prior GCTB treatment.

Results

A total of 12 patients were analyzed. The median age was 42.5 years. Benign recurrence occurred in five GCTB patients not treated with radiotherapy. No pulmonary implants were observed. The median latency to the malignant transformation was 63 months. Nine patients were AJCC stage IIB and three were stage IVA. The median follow-up period after malignant transformation was 62.5 months. Five patients developed local recurrence and six had distant metastasis. Five-year overall, recurrence and metastasis-free survivals were 61.9%, 66.7% and 58.3%. Initial metastasis was a predictive factor for overall survival. Benign local recurrence of GCTB was also a negative factor for metastasis-free survival of MGCT patients. Differences in overall survival according to benign recurrence also showed a tendency towards significance.

Conclusions

In our series, the occurrence of secondary MGCT did not follow radiotherapy, contrary to reports in Western literature. The prognosis was better when compared with findings reported in previous studies. Local recurrence of benign GCTB before malignant transformation could reflect the prognosis of MGCT.
Giant cell tumor of bone and pregnancy: preliminary report by the Eastern Asian Musculoskeletal Oncology Group

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Abstract

Introduction

A few articles reported that giant cell tumor of bone (GCTB) clinically showed dramatic changes such as rapid aggravation and growth of unrecognized recurrences during pregnancy. Some researchers suggested a hormonal influence. Others focused on an immunologic change during pregnancy. It was recently proposed that pregnancy causes epigenetic changes. However, the phenomena might still be coincidental in pregnant women as affected patients are often of childbearing age when the tumors show a high incidence in the general population. We tried to investigate the clinical characteristics of GCTB at pregnancy.

Methods

We retrospectively review the medical records of patients who were diagnosed as occurrence or recurrence of GCTB during pregnancy and peripartum period in collaboration with Eastern Asian Musculoskeletal Oncology Group.

Results

A total of eight cases were analyzed, with a median age of 27 years; three had recurrent lesions. Prognosis of pregnancy was preterm birth and artificial abortion in one case each, and full-term birth in six cases. Although the first symptom related to GCTB occurred at the median six months of gestational age, radiologic evaluations were always delayed. All lesions showed Campanacci grade 3. No initial pulmonary implants were observed. For immediate treatment, two patients had a caesarean section and one artificial abortion. No local recurrences were observed in all the cases without gross remnant lesions. All patients survived to the last follow-up of the median four years.

Conclusions

All lesions showed an aggressive feature. Experimental studies related to hormonal, immunologic, and epigenetic impact should be additionally performed.
Sarcomas in teachers using 3D printers

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Abstract

Introduction

While low-cost, small-scale, desktop 3-dimensional (3D) printers have seen growing popularity in education sector, some studies have reported harmful emissions of particles and volatile organic compounds during the fused deposition modeling (FDM) process, therefore posing a potential health risk. Sarcomas are rare tumors, constituting a group of diverse rare malignant tumors. While some genetic and environmental factors contribute to the development of sarcoma, most cases are idiopathic and sporadic. In this study, we shared our unusual experience of sarcomas that occurred in high-school teachers who frequently used 3D printers.

Methods

We secured the medical records and statements about work environment from teachers diagnosed with sarcoma after frequent use of 3D printers in high school, reviewed the cases, and described them in a narrative. Furthermore, popularization of FDM 3D printer, worrisome emissions released during the printing process, and related precautions and countermeasures were discussed

Results

Exceptionally, the cases of sarcomas, such as Ewing’s sarcoma, malignant peripheral nerve sheath tumor and well-differentiated liposarcoma, arose in a common specific condition. All the teachers regularly operated 3D printers in poorly ventilated spaces for at least two years. They had no past or family history of relevant diseases.

Conclusions

We first report three cases of sarcoma in teachers who used 3D printers in poorly ventilated conditions. Although a relationship between the use of 3D printers and the development of sarcoma has not been determined yet, it is important to come up with measures to protect teachers and students using 3D printers from the potential hazard.

Poster upload

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Development of a patient-reported outcome measure specific to sarcoma: the Sarcoma Assessment Measure (SAM)

Prof Nick Hubert-Williams\textsuperscript{1}, Dr Lee Hubert-Williams\textsuperscript{2}, Ms Lindsey Bennister\textsuperscript{3}, Dr Lorna Fern\textsuperscript{4}, Mr Craig Gerrand\textsuperscript{5}, Mrs Maria Lawai\textsuperscript{3}, Dr Rachael Windsor\textsuperscript{4}, Mrs Julie Woodford\textsuperscript{5}, Prof Mary Wells\textsuperscript{6}, Dr Rachel Taylor\textsuperscript{4}

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Abstract

Introduction: The Sarcoma Assessment Measure (SAM) was developed as a sarcoma-specific patient-reported outcome measure (PROM) to be used in clinical practice. We have reported in detail how the SAM has been developed in collaboration with patients and healthcare professionals (https://doi.org/10.1007/s11136-020-02481-x). This paper will report the preliminary validation of SAM.

Methods: The 22-item SAM was administered alongside the EORTC-QLQ-C30 quality of life questionnaire and Toronto Extremity Salvage Score (TESS) as part of an online, self-report questionnaire. As the SAM was intended primarily for use as a clinical checklist individual items may be independent and so traditional factor analysis was not applicable. Instead, multivariate linear modelling was used to build a measure which had predictive validity with respect to the more established PROMs.

Results: Total of 762 patients responded (54% female, aged 13-82 years). Clinically, participants presented with a range of STS (72%), bone sarcoma (21.8%) and GIST (10.2%). Three items had a predicted value $<2\%$ so they were removed. Our preliminary analysis indicated that the 19-item version of SAM predicted 61\% of global quality of life and 45\% of functional outcome.

Conclusion: We have established the preliminary validity of SAM and believe this has utility as both a patient-reported research tool and a clinical checklist for assessing the impact of symptoms and dysfunction related to sarcoma as part of clinical care. Further validation using a larger and more clinically diverse sample is now needed.
Outcome of surgical treatment of chondrosarcoma of the extremities and impact of surgical revision

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Abstract

Introduction
Chondrosarcoma is the second most common primary malignant bone tumor. With a prevalence of 1:100,000 and most cases happening in the pelvis and the spine, tumors in the extremities and ribs are rare. In the latter therapy mainly consists in wide resection for high grade tumors and frequently intentional intra-lesional treatment for low grade tumors, while the significance of adequate treatment options remains doubtful.

Method
In a single-centre study, 114 chondrosarcomas of the extremities were reviewed, including 66 males (58%) and 48 females (42%) who had a mean age of 50 years at the time of diagnosis. The mean follow-up time was 15 years (1 to 45 years). A total of 56 (49%) patients had their tumor in the proximal humerus or femur. 31 (27%) patients had a lesion in the distal femur or humerus. 27 (24%) had their tumor localized in the tibia, fibula, radius or ulna. Additionally, the impact of surgical revision on survival was statistically evaluated.

Results
A total of 75 patients (65%) were alive and 40 patients (35%) had died at the endpoint of the study. Hence, overall survival was 94%, 89% and 82% at one, five and ten years post-operatively, respectively. In total, 33% had a grade I lesion, while 38% had a grade II lesion, 17% a grade III lesion and 10% a dedifferentiated type of tumor. There was no significant difference in the chi-square test by comparing the localization. Altogether, 56 (49%) patients were initially treated with a primary endoprosthesis. 32 (28%) patients had an augmentation after resection, 19 (17%) only got a resection, 6 (5%) patients were treated with a primary amputation and one (1%) was treated with a rotationplasty. In the end, 15 local recurrences (13% of the patients) were detected during the follow-up period. 12 patients developed metastases during the follow-up period. The impact of surgical revision throughout follow-up revealed a significant worse survival for patients undergoing revision surgery.

Conclusions
The primary treatment for chondrosarcoma is the surgical resection of the lesion, with the attempt to achieve the best functional result for the patient. An aggressive surgical resection with the aim to achieve wide margins whenever possible remains the main goal of treatment for high grade tumors, but may be inflicted with the risk for surgical revision which can have a negative impact on survival.
Interstitial brachytherapy for organ and function preservation in soft tissue sarcomas: Long term outcomes

Prof Siddhartha Laskar, Dr Nehal Khanna, Dr Jifmi Jose Manjali, Prof Ajay Puri, Dr Ashish Gulia, Dr Prakash Nayak, Dr Manish Pruthi, Dr Shashikant Juvekar, Prof Nirmala Jambhekar, Dr Bharat Rekhi, Dr Mukta Ramadwar, Dr Jyoti Bajpai, Dr Manish Agarwal, Prof Subhash Desai
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Abstract

Aims: To report the long-term outcomes with a combination of organ conserving surgery and perioperative interstitial brachytherapy (BT) for adults with soft tissue sarcomas treated at a tertiary cancer centre.

Methods: Between December 1986 and December 2016, 353 patients with non-metastatic soft tissue sarcomas were treated with combined modality approach at our institute. The median age of the patients was 44 years (Range: 18-88years) and the majority (64%) were males. Sixty-nine percent had primary lesions and lesions involving the extremities. Spindle cell sarcoma was the most common histology (22%) followed by pleomorphic sarcoma (16%) and synovial sarcoma (14%). The majority (69%) had grade III lesions. Treatment included wide local excision of the primary tumor followed by BT alone in 65% and a combination of BT with external beam radiotherapy (EBRT) in 35% of the patients. The majority (88%) underwent primary closure, while 12% required flaps. Close or positive margins were seen in 17%.

Results: After a median follow-up of 50 months (range: 2-187months), the 10-year local control (LC), disease-free survival (DFS), and overall survival (OS) for the entire cohort was 82%, 64%, and 81%, respectively. On multivariate analysis, deep tumors and a positive margin significantly predicted for a worse LC. Deep tumours, positive margin, Tumor size >5cm and high grade predicted a worse DFS.

Deep tumors and tumor size >5cm predicted a worse OS. Acute wound complications were seen in 40 (11%) patients and were not higher in patients with flap (p=0.48) or patients receiving EBRT (p=0.32). Subcutaneous fibrosis (24%, n=84) was the most common late complication and strongly correlated with additional EBRT (p=0.001).

Conclusions: Interstitial BT with or without EBRT, as a part of function-preserving protocol results in excellent local control in patients with STS. BT alone results in fewer complications compared with the combination of BT and EBRT.
Oncology - other

Drug combination screening as a translational approach toward an improved drug therapy for chordoma

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Abstract

Background

Drug-screening programmes have revealed epidermal growth factor receptor inhibitors (EGFRis) as promising therapeutics for chordoma, an orphan malignant bone tumour, in the absence of a known genetic driver. Concurrently, the irreversible EGFRi afatinib (Giotrif®) is being evaluated in a multicentric Phase II trial. As tyrosine kinase inhibitor (TKI) monotherapies are invariably followed by resistance, we aimed to evaluate potential therapeutic combinations with EGFRis.

Methods

We screened 133 clinically approved anticancer drugs as single agents and in combination with two EGFRis (afatinib and erlotinib) in the clival chordoma cell line UM-Chor1. Synergistic combinations were analysed in a 7 x 7 matrix format. The most promising combination was further explored in clival (UM-Chor1, MUG-CC1) and sacral (MUG-Chor1, U-CH1) chordoma cell lines. Secretomes were analysed for receptor tyrosine kinase ligands (EGF, TGF-α, FGF-2 and VEGF-A) upon drug treatment.

Results

Drugs that were active as single agents (n = 45) included TKIs, HDAC and proteasome inhibitors, and cytostatic drugs. Six combinations were analysed in a matrix format: n = 4 resulted in a significantly increased cell killing (crizotinib, dabrafenib, panobinostat and doxorubicin), and n = 2 exhibited no or negligible effects (regorafenib, venetoclax). Clival chordoma cell lines were more responsive to combined EGFR-MET inhibition. EGFR-MET cross-talks (e.g., via TGF-α secretion) likely account for the synergistic effects of EGFR-MET inhibition.

Conclusion

Our screen revealed promising combinations with EGFRis, such as the ALK/MET-inhibitor crizotinib, the HDAC-inhibitor panobinostat or the topoisomerase-II-inhibitor doxorubicin, which are part of standard chemotherapy regimens for various bone and soft-tissue sarcomas.

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Dr Fabio Luca Giardina, Dr Tommaso Frisoni, Dr Lorenzo Andreani, Dr Barbara Rossi, Dr Elisa Pala, Dr Pietro Pellegrino, Dr Sabrina Varì, Prof Davide Maria Donati, Prof Rodolfo Capanna, Prof Pietro Ruggieri, Dr Raimondo Piana, Prof Domenico Andrea Campanacci, Dr Flavio Fazioli, Dr Primo Andrea Daolio

Abstract

Introduction: Surveillance is crucial in musculoskeletal pathology and the lack of evidence-based guidelines contributes to non-uniform follow-up protocols. This work aims to investigate the surveillance strategies of the main Italian reference centers.

Method: Digital surveillance evaluation questionnaires regarding the main pathologies of interest were submitted to the centers of the Italian Club of Oncology of the Musculoskeletal System “M. Campanacci” (CIOSM). Parameters such as modalities and timing of follow-up and overall duration of surveillance were investigated.

Results: Representatives of 8 centers (72.7%) complete the schedules. High grade bone sarcomas surveillance protocols show variation during the course of follow-up. According to national and international guidelines, is accepted a follow-up interval of 3-4 months for the first 3 years post-treatment, every 6 months for year 4 and 5 and annually thereafter. 10 years is widely defined as final follow-up timing. X-ray in local monitoring of tumor site is the first choice for most of the centers. There is no agreement on chest monitoring methods and CT is the modality most used for the first 5 years post-treatment. Disagreement on low grade sarcomas, benign and locally aggressive tumors among centers was observed for both local and systemic surveillance practices. For low grade bone sarcomas, the frequency of follow-up is usually reduced to 4-6 monthly for 3 years and then 6-12 until the end of surveillance. Clinical examination is considered mandatory at every visit.

Conclusions: This work identified similarities and differences in surveillance protocols between reference centers in Italy. Further studies are needed to standardize these strategies.
Elbow synovial sarcoma - biopsy and imaging challenges in recurrent disease - case presentation

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Abstract

INTRODUCTION

Less than one third of soft tissue sarcomas affect the upper limb, with less than 1\% of tumors found in the elbow area, where synovial sarcoma is the expected type. Standard treatment includes complete resection combined with chemotherapy or radiation therapy.

METHODS

We present the case of a 29-year-old-woman with an anterior elbow soft tissue mass, causing a mild decrease in ROM. MRI scans showed a well delimited soft tissue mass, heterogenous with “triple sign”, without calcifications or bone invasion. CT scans were clean for metastases and open biopsy diagnosed a biphasic, G1 synovial sarcoma. Resection was performed with confirmation of a B1 stage tumor followed by radiation therapy. After 21 months, follow-up MRI scans reveal a recurring mass, verified by a PET-CT scan. Two biopsies were performed to diagnose the recurrence and guide the treatment strategy.

RESULTS

Pathology reports after both biopsies showed no proof of malignancy recurrence, with descriptions of only fibrous scar tissue. The patient is currently under a strict follow-up imaging protocol. Albeit locally disease free the functional impairment caused by the diagnostic and therapeutic procedures is debilitating, with significant ROM impairment, pain, and median nerve symptoms.

CONCLUSIONS

Local recurrence and metastasis rates of synovial sarcoma are high which makes repeated imaging and accurate biopsies critical and particularly challenging. Furthermore, numerous surgical procedures and radiation therapy have devastating effects, especially in stiffness prone areas like the elbow. A fine balance between preservation of soft tissue and good oncologic results needs to be pursued.
High accuracy of positioning custom 3-dimensional printed pelvic implants in tumour and total hip revision surgery: a multicentre cohort study of 35 patients

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Abstract

Introduction

In recent years, there has been an increasing usage of custom 3-dimensional printed pelvic implants (3DPPI) for revision total hip arthroplasty (THA) and oncological surgery involving the acetabulum. These custom implants are designed to precisely fit the patient’s pelvic defect and (in)accuracy of implant positioning could affect pelvic/hip function and implant fixation. The aim of this study was to evaluate the accuracy of positioning 3DPPI’s in patients undergoing either THA revision or tumor resection surgery including the acetabulum, using a novel 3D analyzing technique.

Method

This retrospective cohort study included 35 patients and hips (27 tumor and 8 THA revision cases), that received a 3DPPI between February 2017 and March 2021. Individual planned and achieved implant position was assessed by means of a semi-automatic three dimensional pre- and post-operative computer tomography (CT) based method. Primary outcomes were position deviations between the pre-operative digital plan and achieved position. Acetabular cup angles described as inclination, anteversion and rotation were assessed, together with the translation in three planes of cup center of rotation (COR) and the implant pubic, ischial and ilium flange in millimeters. Secondary outcomes were assessment of intra-operative navigation, implant dimensions and surgical indication on implant position accuracy.

Results

The mean absolute deviation between the pre-operative plan and the achieved position in inclination was 2.7° (SD: 3.9°), in anteversion 3.6° (SD: 6.1°) and in cup rotation 2.1° (SD: 3.2°). The mean absolute deviation in COR in the medial-lateral direction was 2.4mm (SD: 3.2), in antero-posterior direction 3.8mm (SD: 6.3) and in inferior-superior direction 2.8mm (SD: 6.1). The COR showed a median absolute translation vector of 5.9mm (SD: 7.2). Translation of the ischial flange showed the largest aberration (median absolute translation vector in the three planes of 7.0 mm, SD: 8.7), followed by the pubic flange (6.4 mm, SD: 8.4) and the ilium flange (5.3 mm, SD: 3.0). Image 1 shows the mean translation vectors of all assessed points. There was a statistically significant more accurate positioning of tumour implants (inclination and rotation) compared to revision THA implants; 1.5° vs 3.4° for inclination (P=0.02), 1.3° vs 2.4° for implant rotation (P=0.02). Although not statistically significant, results also showed that navigated and larger implants showed a higher positioning accuracy as compared to non-navigated and smaller implants.

Conclusions
Results show an overall good agreement between the planned and achieved 3DPPI implant position in THA revision or tumor resection cases. Also, there seems to be a more accurate positioning for tumour indications, intra-operatively navigated and larger 3DPPI’s. Although results are promising, the clinical relevance of positioning accuracy has yet to be determined.
Spindle cell sarcoma of the calcaneus: resection and reconstruction with a 3D printed custom made implant

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Abstract

INTRODUCTION: The malignant bone tumors of the foot are extremely rare, with a world incidence of 4/10,000/year. Due to their rarity, aggressiveness and non-specific clinical presentation, these tumors often have a late diagnosis and require amputation. However, in case of early diagnosis and localized lesion, limb-sparing surgery can be performed. In those cases a resection with wide margins should be followed by a prosthetic or biological reconstruction.

METHOD: We report the case of a 43 years old female who complained of pain in her hindfoot, associated with significant functional limitations (MSTS 18/30). Imagining evidences of an osteolytic lesion in the anterior calcaneus justified a TC guided biopsy that revealed the presence of a spine cell sarcoma.
In the operative theater, the patient underwent a resection of her anterior calcaneus (performed with wide margins), leaving intact the posterior calcaneus and the insertion of the achilles tendon. The bone gap was then filled with a 3D printed custom made implant, which was stabilized with what remained of the patient's hindfoot.

RESULTS:
After 16 months of FU, our patient did not develop complications or local recurrences. She walks autonomously and shows good functional outcomes (MSTS 30/30).

CONCLUSIONS:
The implant of 3D printed custom made implants may represent a reliable reconstructive option after calcaneal resection.

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A preliminary Comparison of CT-guided Navigation-assisted Surgery versus conventional surgical Treatment of Osteoid Osteoma in the Spine

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Abstract

Introduction

Osteoid osteoma is a benign and painful bone tumor, which can be treated by radio frequency ablation (RFA) or surgical excision. While RFA might be a good solution in the treatment of certain peripheral lesions it might not be first choice in spinal lesions due to vulnerability of central neural structures. Due to difficulties to identify the nidus of an Osteoid osteoma during surgery, CT-guided navigation-assisted surgery (CTNAS) may provide additional surgical accuracy in the treatment.

Methods

We conducted a retrospective comparative study including patients from the in-house musculoskeletal oncology database who underwent surgery at the department for orthopedics and trauma surgery at the Vienna General hospital between 1988 and 2021. Inclusion criteria were histologically verified osteoid osteoma localized in the spine (from C1 to L5) and surgical removal. A total of 16 patients with osteoid osteoma of the spine were retrospectively reviewed. In 3 (18%) patients CTNAS was used to localize the lesion and to curettage, two in the cervical spine and one in the lumbar spine. In 13 patients conventional radiologic localization by x-ray was used to assist excisions in the cervical (4/31%), thoracic (2/15%) and lumbar (7/54%) spine. The mean age was 26.3 ± 4.2 for the CT and 24.2 ± 11.7 years for patients operated conventionally assisted, there were 3 female and 13 male patients. Postoperative pain was ordinarily measured on a scale of 1-4, consisting of 1 (none), 2 (mild), 3 (intermediate) and 4 (severe). Type of intervention was defined as either curettage, resection, laminectomy or osteosynthesis.

Results

All patients in the CTNAS group received curettage, whereas in the conventional group 7 ppts received curettages (54%), 2 pts resections (15%), 3 pts laminectomies (23%) and 1 pt osteosynthesis 1 (8%). Mean duration of CTNAS was 99.3 ± 6 minutes vs. 118 ± 58 minutes in conventionally assisted patients. 2 CTNAS patients (66%) experienced no pain versus 6 (46%) after conventional assistance. One patient (33%) after CTNAS experienced mild pain versus 4 (31%) after conventional assistance. Three (23%) patients experienced intermediate pain after conventional assistance.

Conclusion
CT-guided navigation-assisted surgery (CTNAS) may provide additional surgical accuracy leading to improved pain reduction while reducing time of surgery in the therapy of benign skeletal lesions of the spine.
Sports, physical activity, and cancer survivorship in survivors of lower limb bone sarcoma, a qualitative interview-based study.

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Abstract

Introduction

Surgery to treat bone sarcoma of the lower limb can cause a significant impact on survivors’ quality of life. Previous research has found that the social and psychological domains of survivorship are poorly understood, and the relationship between survivorship and physical activity (PA) needs to be explored, with the view to possibly incorporate PA into treatment plans and what potential barriers there could be to this.

Methodology

5 lower limb sarcoma survivors (mean age 54.8 +/- 14.8 years) were interviewed using semi-structured interviews informed by a previous systematic review. The data generated was analysed thematically and Consolidated criteria for reporting qualitative research (COREQ) reporting guidelines were followed, these help certify reporting transparency.

Results

Population demographics are shown in table 1. Four core themes emerged: (1) Sports and exercise; (2) Physical survivorship; (3) Psychological survivorship; and (4) Social survivorship. Participants felt that sports and PA had an overall positive affect on their quality of life, it helped improve their social lives and mental health. Several barriers to PA were identified in the data including lack of knowledge from clinicians, stigma, and physical barriers.

Conclusion

Sports and PA is not only good to improve physical fitness but also to target the social and psychological aspects of survivorship. Despite this, education on sports and PA is lacking leaving survivors to explore this by themselves resulting in difficulties that reduce adherence to exercise. Re-designing the clinical pathway following surgery and providing personalised support through all phases of rehabilitation is important to combat these issues.

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What are the survivorship issues that occur following proximal femoral replacement surgery for musculoskeletal cancer? A Systematic Review

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Abstract

Introduction:

Proximal femoral replacement (PFR) surgery for a musculoskeletal cancer is extensive and can lead to varied physical limitations. Yet little is known about people’s lived experiences after such surgeries.

The main aims of this study were to review the literature to: (a) describe survivorship following PFR surgery (2) identify how survivors differ from comparative groups in terms of functional outcomes, social outcomes, long-term effects and overall quality of life following PFR.

Methods:

A systematic literature search, covering the years 2000-2021 was performed using the PubMed, Medline, and Web of Science databases. Studies were included if the population of sarcoma survivors had PFR and the study recorded survivorship outcomes or long-term functional and psychosocial deficits following surgery. The methodological quality of the selected studies were evaluated by using a 16-point scale, evaluating aspects such as study design, participant demographics, and use of appropriate analysis techniques.

Results:

The search strategy resulted in 684 studies. 17 studies evaluating survivorship outcomes in PFR sarcoma patients were identified, with an overall medium methodological quality. Predominately physical outcomes were recorded in the studies, a low number of studies assessing social or psychological outcomes were found. Functional outcomes were the best understood and reviewed throughout the studies, with obvious differences found between PFR survivors and normal comparative groups.

Conclusions:

There is a difference in sarcoma PFR survivorship, physical function is the best described, and psychological and social domains are less documented. There is a need for studies exploring these domains further.
Non-invasive detection of soft tissue sarcoma using volatile organic compounds in exhaled breath: a pilot study

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Abstract

Introduction

Volatile Organic Compounds (VOC) are widely investigated as a new diagnostic biomarker in medicine. The aim of this pilot study is to assess whether an electronic nose can discriminate between patients with and without soft tissue sarcoma (STS) based on VOC profiles in exhaled breath.

Methods

In this cross-sectional pilot study, patients with primary histologically proven STS were included for breath analysis. Healthy persons matched on sex and age and patients with rejected STS were included for the control group. Machine-learning techniques were used to develop the best fitting model. Ten-fold cross-validation was used for internal validation.

Results

Fifty-eight breath samples were collected (29 STS and 30 controls) from March 2018 until March 2022. The final model yields an area under the curve of 0.85 with a sensitivity and specificity of 83% (95% CI 64-93) and 60% (95% CI 41-66), respectively.

Discussion

This study suggests that exhaled VOC analysis could serve as a non-invasive diagnostic biomarker to achieve a higher pre-test probability for STS with a good overall performance. Future studies are needed to validate these promising preliminary findings before VOC analyses could be incorporated in clinical practice.
What is the experience of those with cancer-related reduced quality of life and associated physical disabilities after upper limb sarcoma treatment in England? - A national study of outcomes

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Abstract

Introduction

Significant functional disability and reduced Quality of Life (QoL) are common following treatment for upper limb sarcoma. This study aimed to explore the current extent of physical function and QoL for upper extremity sarcoma patients in England to enhance rehabilitation strategies.

Methods

A retrospective analysis of the upper extremity datasets from the Sarcoma Assessment Measure (SAM) study was conducted. SAM is a national study led by University College London Hospital (UCLH) aiming at developing a sarcoma-specific outcome measure.

Results

Of 74 patients identified with mean age=62.34, female/male=40/34, 63 were diagnosed with chondrosarcoma and 16 with osteosarcoma. 93% underwent surgery, of which 9% had an amputation. Datasets showed that participants reported high medians of Toronto Extremity Salvage Score (TESS) and European Organisation for Research and Treatment of Cancer (EORTC) QoL Questionnaire (QLQ-C30) (TESS=91.95, EORTC Physical=86.67, Role/Emotional/Cognitive=83.33, Social=100), indicating good overall function and QoL. However, sub-analysis revealed that activities of daily living (ADLs) were majorly restricted including: heavy household chores, overhead lifting of boxes, participating in usual sporting activities, and strenuous activities. While there were no significant differences between treatment methods, amputation led to reduced functional outcomes and QoL (p=0.002*/0.012*) compared to other surgeries. Gender, sarcoma type, combined site tumour, marital status, and ethnicity (p<0.05*) showed relevance, and functional outcomes were also found to have a strong correlation with QoL (p<0.001*).

Conclusions

While people treated for upper extremity sarcoma in England show high levels of physical function and QoL experience, it remains important to recognise patients’ needs and provide holistic post-treatment support. Patient, tumour, and treatment-related factors all warrant focused attention.

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Download file
Malignancy of osteosarcoma cells is based on methionine addiction via modulation of the epithelial-mesenchymal phenotype and histone-H3 lysine-methylation status.

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Abstract

Introduction: Sarcoma is a recalcitrant and poorly understood heterogeneous group of cancers. Methionine addiction is a fundamental and general hallmark of cancer and is due to excess use of methionine for aberrant transmethylation reactions. The present study investigates methionine addiction and the mechanism of its link to the malignancy of osteosarcoma.

Methods: Methionine-independent revertant 143B osteosarcoma cells were selected from parental methionine-addicted cells by low methionine culture medium, using recombinant methioninase (rMETase). The degree of malignancy of the cells was compared by testing cell invasion and migration capability and by tumor growth after orthotopic cell-injection into the tibia bone of nude mice. Epithelial-mesenchymal phenotypic expression and the status of H3 lysine-methylation were determined by immunoblotting.

Results: Parental cells had an IC50 of 0.20 U/ml and revertant cells had an IC50 of 0.68 U/ml for rMETase, demonstrating that the revertant cells became independent to methionine, similar to normal cells. The revertant cells had reduced cell invasion and migration capability. The revertant cells formed much smaller tumors than the parent cells. The revertant cells showed loss of mesenchymal markers vimentin, Snail, and Slug and gain of the epithelial marker, zo-1, and an increase of histone H3K9me3 and H3K27me3 methylation and a decrease of H3K4me3, H3K36me3, and H3K79me3 methylation.

Conclusion: The present study show that the malignancy of osteosarcoma cells is based on methionine addiction via changes in the epithelial/mesenchymal phenotype and modulation of histone H3-lysine methylation status. The present results demonstrate the rationale to target methionine addiction for improved sarcoma therapy.
A Deep Learning Model for Classification of Chondroid Tumors on CT-Images.

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Abstract

Purpose

Differentiation between enchondromas, atypical cartilaginous tumors (ACT) and high-grade chondrosarcomas is crucial for adequate patient management. The goal of this study was to develop a deep learning model (DLM) for the classification of chondroid tumors based on CT images.

Material and Methods

Patients from two independent cohorts (n=344) who were diagnosed with either an enchondroma (n=124), an ACT (n=92) or a high-grade chondrosarcoma (n=128). The final diagnosis was based on the consensus of an interdisciplinary tumor board. The tumors were segmented on the CT images. The major cohort was split into training and validation sets (n=168/76), and the smaller cohort was used for external testing (n=100). A 2D convolutional neural network (CNN) was trained for classification, consisting of 3 convolutional layers ending in a fully connected layer followed by one output neuron.

Results

The DL model achieved an area under the curve (AUC) of 0.87 for the differentiation between benign, intermediate and malignant cartilaginous tumors on CT images. The AUC of the readers was at 0.77/0.81/0.83. For the differentiation between enchondromas and ACTs performed by the DLM, the AUC was at 0.80. The ROC of the DLM was significantly better than the ROC of resident 1 for the differentiation between benign and malignant lesions (p=0.012). Sensitivity, specificity and accuracy are displayed in the figure.

Conclusion

Compared to readings of the resident radiologists, the DLM showed better results for the differentiation of benign, intermediate and malignant chondroid bone tumors.
Distal fémur osteosarcoma: A limb preservation surgery

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Abstract

Introduction: Osteosarcoma appears as a primary aggressive and malignant tumor in 85% of the cases. Commonly occurs during the second decade of life, involving the metaphyseal aspect of long bones.

Methods: A 12-year-old female with right knee pain with one month of ongoing associated with claudication and night awakening. She had a swelling in the distal medial right tight. The X-ray showed a periosteal reaction in the distal fémur. The CT scan revealed an interruption of the cortical bone, coexisting small lytic lesions associated with certain sclerosis of the endosteal bone, and badly defined limits compatible with infiltrative type. Then a CT scan-guided biopsy was made, which diagnosed a chondroblastic osteosarcoma of the distal femur. She did MRI to better define the lesion and completed the study for staging. No metastasis were found. She underwent neoadjuvant chemotherapy with good tumor response and was proposed for surgery. Wide resection (8.5 centimeters of the distal femur) and reconstruction with the ipsilateral vascularized fibula, distal femur allograft and distal femur plate.

Results: The histology was confirmatory of free margins resection. One month after surgery, she walks with crutches with controlled pain, MSTS score of 25/30.

Conclusions: The wide bone resection associated with chemotherapy before and after surgery is the gold standard treatment. When there is no neurovascular commitment and a resectable lesion with free margins, limb-sparing is the choice. Vascularized fibular graft has a very high bone union rate and can improve local circulation, particularly in cases in which tissues were damaged by radiation and chemotherapy. We pretend to describe a surgical option of limb preservation in distal femur osteosarcoma.

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Diagnostic and therapeutic considerations in the rare case of a hemosiderotic fibrolipomatous tumor of the foot-case report

Dr Sergiu Andrei Iordache¹,², Dr Adrian Cursaru¹,², Dr Bogdan Stefan Cretu¹,², Dr Bogdan Serban¹,², Dr Mihnea Ioan Popa¹,², Prof Catalin Florin Cirstoiu¹,²
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Abstract

Introduction
Hemosiderotic fibrolipomatous tumor is a rare soft tissue tumor that mainly affects the subcutaneous tissue of the limb extremities, especially the ankle, foot and hand. [1]

Although it belongs to the category of benign tumors, this tumor has an increased risk of local recurrence after excision (30% -50%), but mortality is associated only with malignant transformation and the presence of metastases. [2]

Methods
We present the case of a 61-year-old patient with a personal history of treated malignant melanoma who presents with pain and increased volume of the dorsal part of the left foot. The patient is admitted in the orthopedics and traumatology clinic of the Bucharest University Emergency Hospital and undergoes an MRI examination of the foot, abdominal thoracic and pelvis CT scan and three-phase whole body scan scintigraphy. During hospitalization, incisional biopsy is performed with histopathological examination, following which the diagnosis of hemosiderotic fibrolipomatous tumor is established. Differential diagnosis with pleomorphic hyalinizing angiectatic tumor and myxoinflammatory fibroblastic sarcoma is required, which is why immunohistochemistry tests are performed, which establish the final diagnosis of hemosiderotic fibrolipomatous tumor.

Results
Given the benign but invasive and diffuse nature of the tumor, excision of the tumor cannot be performed and a watchful waiting attitude is chosen also with pain management, following which the patient repeats the MRI examination of the foot at 3 months, 6 months and 1 year after the biopsy.

Conclusion
Considering the personal history of the malignant tumor and the risk of malignant transformation of this histopathological tumor type, should we adopt a more aggressive attitude of treatment?

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Surgical management options for long-bone metastasis

Dr Bogdan Stefan Cretu1,2, Dr Sergiu Andrei Iordache1,2, Dr Bogdan Serban1,2, Dr Mihai Aurel Costache2, Dr Adrian Cursaru1,2, Prof Catalin Florin Cirstoiu1,2
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Abstract

Introduction

The most common malignant bone tumors are bone metastases, which are caused by visceral tumors and primary hematopoietic neoformations.

Bone metastases are difficult to treat surgically, necessitating a multidisciplinary approach that must be applied to each patient depending on the specifics of their case.

Methods

Following a multidisciplinary preoperative evaluation, candidates for surgical treatment can be identified and optimal approaches established.

Depending on primary cancer and its characteristics, the number of metastases present and their anatomical location, life expectancy, patient expectations, and activity level, the surgeon will be able to choose the optimal treatment method. (Table 1 and Table 2)

Single bone metastases in the pre-fracture stage, or even with an associated fracture, should be treated with extensive resections and reconstructions to considerably improve long-term life expectancy. Regarding multiple metastatic disease in which a bone metastasis is in the pre-fracture stage, prophylactic fixation has proven to be not just cost-effective but with the optimal restoration of functionality compared to the treatment of a fracture. In areas where bone destruction is important, increasing osteosynthesis resistance with acrylic cement may be a solution.

In the case of a bone metastasis associated with a pathological bone fracture, osteosynthesis or reconstruction should be considered. For patients with a high level of activity, a definitive treatment, such as segmental resection or arthroplasty, should be chosen.

Results

Each neoplasm has its own characteristics in terms of life expectancy, the healing potential of a fracture, local and systemic progression, and sensitivity to various treatments.[1] Following the appreciation of these characteristics within the multidisciplinary team, valid decisions can be made regarding potential treatments. To choose a treatment, we need to know the average life expectancy for each neoplasm with bone metastases: 48 months for thyroid neoplasm, 40 months for prostate, 24 months for breast, 6 months to 4–5 years for renal neoplasm depending on the type, and 6–7 months for lung cancer.[2]

Conclusion

Bone metastasis management is a difficult task that necessitates the use of a multidisciplinary approach. Palletia is frequently the only option for patients who have been carefully monitored and diagnosed early. The best treatment option for a patient with metastatic bone disease will be determined only after a thorough preoperative evaluation has been completed and the exact origin of the neoplasm has been determined.
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Therapeutic considerations for the treatment of long-bone metastasis

Dr Bogdan Stefan Cretu¹,², Dr Sergiu Andrei Iordache¹,², Dr Bogdan Serban⁵,², Dr Mihai Aurel Costache², Dr Adrian Cursaru¹,², Prof Catalin Florin Cirstoiu¹,²
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Abstract

Introduction

The main indications for surgical treatment are a lack of response to chemotherapy, radiation therapy, hormone therapy, immunotherapy, and bisphosphonates which is defined by persistent pain or tumor progression, the risk of imminent pathological bone fracture and surgical treatment for single bone metastases.

Methods

Patients with tumor bone lesions are divided into two categories: patients with a previously diagnosed tumor and patients with no known history of neoplasms who are on the first presentation. In the face of a suspicious bone lesion, a primary tumor should always be excluded, especially in the case of a patient without neoplastic history. The next step in the diagnosis and treatment process is staging, localization of the primary lesion, and general investigations. All decisions regarding staging and diagnosis should be discussed in a multidisciplinary team before any treatment is applied.

Results

The surgeon should select the best surgical strategy based on the primary tumor and its characteristics, the presence of single or multiple metastases, age, anatomical location, and the functional resources of the patient.

Preventive osteosynthesis, osteosynthesis to stabilize a fracture, resections, and reconstructions are the main surgical options for bone metastases.

Resection and reconstruction with a modular prosthesis remain the generally approved surgical option to restore functionality, increase the quality of life, and increase life expectancy.

Preoperative embolization is necessary, especially in the case of metastases of renal or thyroid origin. This procedure is extremely important to avoid complications, with a major impact on survival rates.

Conclusion

Bone metastasis management is a difficult task that necessitates the use of a multidisciplinary approach. An important aspect of choosing the right treatment for these patients is accurately estimating life expectancy. Improved chemotherapy, postoperative radiation therapy, and sustainable reconstructive modalities will increase the patient’s life expectancy.

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Abstract

Introduction: In localized Ewing-sarcoma, histologic response to neoadjuvant chemotherapy was used for risk-stratification in clinical trials. Patients with poor response receive Busulfan-Melphalan (BuMel) high-dose chemotherapy (HDCT) in the Euro-E.W.I.N.G.99 GPOH (EE99-GPOH) and the Italian ISG/SSGIII clinical trials. Histological response after 6 courses VIDE induction-chemotherapy in EE99-GPOH was compared to 4 courses of VAC, VDI, EI in ISG/SSGIII concerning event free (EFS), overall survival (OS), and toxicity.

Methods: Outcome of 1048 patients (EE99-GPOH: 806; 76.9%; ISG/SSGIII: 242; 23.1%) with localized Ewing-sarcoma < 40 years was analyzed, using Fisher’s exact test, Kaplan-Meier, log-rank-test, and Cox-regression. Sex, age, tumor site/volume, local therapy, and HDCT were considered as covariates.

Results: Good histological response (<10% vital tumor cells) was seen in 75.3% EE99-GPOH patients vs 43.8% ISG/SSGIII (P<.001). Stratification to HDCT was more frequent ISG/SSGIII (40.2% vs 8.3%; P<.001). Surgery (S) alone was more frequent in ISG/SSGIII (61.1% vs 46.8%; P<.001). EE99-GPOH patients received more combined local treatment of S and radiotherapy (43.5% vs 21%; P<.001). R0 S was reported more often in ISG/SSGIII (88% vs 73.8%; P<.001). EFS and OS were similar between EE99-GPOH and ISG/SSGIII, respectively: 3y-EFS (OS) 0.70 (0.81) vs 0.67 (0.78), SE<.03 (P>.48). Multivariable
Cox regression revealed large tumor volume (HR=1.60; 95%CI 1.28-2.00), higher age (HR=1.57; 95%CI 1.26-1.96), and histological response in patients with surgery (HR=2.03; 95%CI 1.54-2.67) as independent prognostic factors.

**Conclusions:** Intense induction chemotherapy leads to better histological response and prevents from HDTC and respective long-term sequelae. A more standardized local treatment approach should be discussed.
Development of a Targeted Dual-Modality Radioimmunoconjugate for Image Guided Sarcoma Surgery

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Abstract

Introduction:
Fluorescence guided surgery (FGS) for bone and soft tissue sarcoma resection is an evolving field, with the aim of reducing the positive margin rate and improving oncological outcomes for patients. Although FGS has shown promise, currently only non-targeted agents such as indocyanine green (ICG) have been adopted with known limitations, and therefore the need for a targeted agent is an important next step. Membrane type-1 matrix metalloproteinase (MT1-MMP) is a cell surface proteinase overexpressed in sarcoma tissue, representing a suitable molecular target.

Methods:
Development and evaluation of a dual-labelled radioimmunoconjugate ([⁸⁹Zr]Zr-DFO-anti-MT1-MMP-IRDye800CW) and a non-specific IgG control were synthesised through a chemoenzymatic site-selective conjugation method. The probe underwent characterisation, stability testing, saturation binding and immunoreactivity assessment. A novel dedifferentiated chondrosarcoma mouse model was used to evaluate in vivo target binding and biodistribution of our radioimmunoconjugate, following orthotopic intra-femoral injection of HT1080-WT (MT1-MMP positive) or HT1080-KO (MT1-MMP negative) cell lines in NSG mice.

Results:
Fluorescence and Cerenkov radiation images acquired 24, 48, and 72 hours post injection of [⁸⁹Zr]Zr-DFO-anti-MT1-MMP-IRDye800CW indicated preferential tumour uptake in the WT mice compared to KO mice. Ex vivo gamma counting of the inoculated femur showed significantly higher uptake in the targeted group (17.64 ± 3.84 %ID/g) compared to controls (p=0.0006), with a significantly higher tumour-to-blood ratio. Analysis of invaded muscle tissue sections showed higher fluorescence and autoradiography signal in the targeted group compared to controls.

Conclusion:
[⁸⁹Zr]Zr-DFO-anti-MT1-MMP-IRDye800CW shows promise for potential use in fluorescence guided
sarcoma surgery and pre-operative imaging to help guide sarcoma resection, and warrants further development.
Silver coated tumour prostheses in oncologic indications: about 56 cases with 53 months follow up.

Abstract

Introduction: The rate of infection of non silver coated megaendoprostheses varies from 3% to 30%. Treatment is complex, sometimes leading to amputation or disarticulation. The use of a silver coated tumour prosthesis can decrease the risk of infection. The aim of this study is to evaluate the rate of postoperative infection as well as the results of treatment in a series of bone tumour patients operated with a silver coated tumour prostheses.

Methods: This is a single-center retrospective study including 55 patients (56 prosthesis) (31 men and 24 women) operated with a silver coated tumour endoprosthesis between 2005 and 2019 in our institution. We analyzed the incidence of periprosthetic infections of 56 prostheses, used in oncological indications (N=56, 32 primary bone tumors, 24 metastases), The average age was 55 years (12-84). The mean total follow-up was 53 months (6-156).

Results: 6 prostheses presented an infection (10%). There was no infection in the metastatic indications.

Surgical treatments of the infection were:
- 3 successful DAIR,
- 1 successful 1 one stage revision after a failed DAIR
- 1 patient with suppressive antibiotics after a failed DAIR,
- 1 long term spacer after a failed DAIR.

The mean MSTS score was 24 (14-30).

There was no amputation in this series.

Conclusion: In our experience, the use of silver coated implants in patients undergoing resection of a bone tumour was associated with a low rate of periprosthetic infection (10% at 53 months FU) in comparison with literature results. At final follow-up, all patients were free of infection except 1 patient with suppressive antibiotics 54/55 (98%).

The authors recommend the use of silver coated tumour implants in bone tumour surgery.
The challenge chondrosarcoma of fibular head: En-bloc wide resection and knee stabilization

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Abstract

Introduction: Chondrosarcoma is the second most frequent primary malignant bone tumor. Atypical cartilaginous tumor is an intermediate tumor with aggressive local behavior. Is the most challenging because of its difficult diagnosis towards enchondroma and appropriate treatment. Even low-grade chondrosarcoma has a risk of metastasis of 6%.

Methods: We report a case of a 68-year-old female patient presenting a constant left knee pain, sometimes irradiating through the leg. The X-ray revealed a lytic lesion in the fibular head. CT scan and MRI confirmed the lytic nature of the large lesion with partial interruption of the anteromedial cortical of the fibular head. CT scan-guided tru-cut biopsy suggested a chondrosarcoma grade I. The patient had no metastasis. En-bloc wide resection of the proximal fibula was performed, requiring dissection of the common peroneal nerve and its superficial and deep divisions and the femoral biceps tendon and lateral collateral ligament were fixed to the lateral tibial metaphysis with 2 PEEK anchors. The knee was then immobilized in 20° flection with an orthosis.

Results: The histology confirmed free margins. The patient is painless, without peroneal nerve palsy. After rehabilitation, she presents 0-120° ROM without knee instability, and recovered to normal walking.

Conclusions: In this case, a locally aggressive tumor behavior was found on imaging and therefore it was decided to perform a wide resection simultaneously allowing to maintain joint stability and integrity, and reducing the risk of local recurrence. Despite the risks of resection of the proximal fibula, good functional results can be obtained with this reconstruction technique.
Sequency-directed therapy in sarcomas - a case report

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Abstract

Introduction: Sarcomas are rare mesenchymal neoplasms with biological and genomic heterogeneity. Next-generation sequencing (NGS) can show actionable genomic alterations, opening new therapeutic options.

Methods: Retrospective analysis of the cases of sarcomas treated with sequency-directed therapies, in our centre, between Jan/2020-Jun/2021.

Results: Two patients were identified. A 62-year-old female presented with a left hypochondrium growing mass. CT showed a bulky lesion compressing stomach, suggestive of GIST. Atypical gastrectomy was performed. Histology showed a heterogeneous tumor in the serosa, adipose tissue infiltrated neoplasm of fusiform/round cells in a myxoid stroma. Immunohistochemistry was negative for AE1/AE3, SMA, desmin, pS100, CD117, DOG-1, CD31, CD34 and podoplanin. FISH was negative for DDIT3/FUS gene rearrangements. Anatomopathological diagnosis was high grade myxoid/round cell liposarcoma. After nine months, CT showed local relapse and doxorubicin was administered for three cycles, until tumor progression. NGS revealed a PDGFRA R841_D842del, and after discussion in Molecular Tumor Board (MTB), imatinib was started. After 1 cycle, she was admitted with SARS-CoV-2 infection and CT showed partial response.

A 28-year-old female was diagnosed with localized high-grade embryonal rhabdomyosarcoma. Surgery was performed and she underwent adjuvant chemotherapy and radiotherapy. Six months later, she presented distant relapse and was treated with chemotherapy for 4 cycles, until progression. NGS revealed a PIK3CA mutation and everolimus was started after discussion in MTB. She showed partial response but had progressing disease after 5 months.

Conclusions: These cases show the importance of NGS in sarcomas as a possible game-changer in the treatment approach, with the use of sequency-directed therapies.

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Prosthetic reconstruction of the shoulder after resection of proximal humerus bone tumors

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Abstract

Introduction

Prosthetic reconstruction following wide intraarticular resection of tumors of the proximal humerus presents a unique challenge. Two reconstructional methods are used: either proximal humerus endoprosthesis or reverse shoulder proximal humerus arthroplasty. The purpose of this study is to compare the functional outcomes, oncological outcomes, and complication rates for these two reconstruction methods.

Patients and Methods

Forty patients with proximal humeral tumors were retrospectively reviewed. Proximal humerus endoprosthesis (PHE) was used in 21 patients and a reverse shoulder -proximal humerus arthroplasty (RSA) in 19 patients. The clinical results, oncological outcomes and complication rates were assessed. The functional outcomes of the patients were assessed using the Musculoskeletal Tumor Society scoring system (MSTS), the QuickDASH score, and the shoulder range of motion. The mean follow-up was 62±15 months.

Results

At the latest follow up, the mean MSTS score was 68±10.3 for those with PHE, and 76±7.7 for the patients with RSA (p=0.72). However, the QuickDASH score was significantly better (p=0.031) for those with RSA (mean 19±6.3), compared to the patients with PHE (mean 30±4.8). Additionally, shoulder active abduction and forward flexion range were significantly higher for RSA (p=0.04 and p=0.03 respectively). Shoulder dislocations occurred in 8 patients with PHE, and in 1 patient with RSA (p=0.021). The other complication rates were similar for the 2 groups (p<0.05). Local recurrence occurred in 5 patients. There were reoperations for infection (1 patient) for aseptic loosening (2 patients) and for dislocation (5 patients).

Conclusion

Prosthetic reconstruction after oncologic resection of the proximal humerus is associated with satisfactory clinical results but with high reoperation and complication rates. RSA has better functional outcomes and lower complication rate compared to PHE after intraarticular resection of proximal humerus tumors.


Outcome after intralesional curettage of highly-differentiated chondrosarcomas/atypical cartilaginous tumors (ACTs) of the extremities

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Abstract

Introduction: Highly malignant chondrogenic tumors require extralesional resection. Due to locally aggressive growth but usually no metastases, highly-differentiated chondrosarcomas/ACTs of the extremities may be treated by aggressive intralesional curettage together with adjuvants (PMMA-bone-cement; hydrogen peroxide). In this study, we aimed to assess recurrence rates, complications, patient satisfaction and functional outcome after such intralesional strategy.

Methods: 45 prospectively enrolled consecutive patients (27 women, 18 men) had intralesional curettage at our over regional sarcoma center with the histological diagnosis of highly differentiated chondrosarcoma G1/ACT at the extremities. Mean follow-up was 57 months. Patients were followed-up regarding age, sex, location of the tumor, clinical symptoms, fractures, detailed surgical methods, complications, recurrences, and metastases. Functional outcome was assessed with the Musculoskeletal Tumor Society (MSTS) score.

Results: Mean patient age was 55. Leading localizations were the distal femur (14) and the proximal humerus (19). Most patients were symptomatic with local specific pain at the time of diagnosis. Aggressive intralesional curettage included filling with PMMA-bone-cement (n=42) or pelvic spongiosa (n=3) and additive osteosynthesis was rarely needed (n=14). The adjuvant hydrogen peroxide was regularly used after curettage (n=37). Postoperative results showed very good functional outcome (MSTS 95.3%). Despite strict follow-up including ongoing pulmonary screening, no distant metastases were found and local recurrence rate was very low (4%, n=2).

Conclusion: Intralesional therapy with aggressive curettage and application of adjuvants for highly differentiated chondrosarcomas/ACTs of the extremities showed very good functional results with a very high level of safety without evidence of metastases and very low local recurrence rates.
Genomic profiling of sarcomas – a retrospective study at a Portuguese reference centre

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Abstract

Introduction: Sarcomas are rare malignant mesenchymal neoplasms and knowledge about tumour biology is scarce. In advanced disease, standard chemotherapy yields poor results. Identifying actionable genomic alterations could open effective therapeutic options as a last resort in a therapeutic desert scenario.

Methods: Retrospective study of all sarcoma patients observed in a reference centre, submitted to comprehensive genomic profiling (CGP) between Jan/2020 and Jun/2021.

Results: Thirty patients were included (26.7% were male). Median age was 55 years (17-79). Histology included osteosarcoma (1), chondrosarcoma (1), Ewing sarcoma (3), liposarcoma (7), DFSP (1), IMFT (1), angiosarcoma (1), rhabdomyosarcoma (2), leiomyosarcoma (5), GIST (1), neurofibroma (1), MPNST (1), synovial sarcoma (1), STS, NOS (3) and FDCS (1). Most patients (96.7%) had reportable genomic alterations, microsatellite stability and low tumour mutational burden (≤10 Muts/Mb). The most common alterations were linked to cell cycle regulation (TP53, CDKN2A/B and RB1 deletions and CDK4, MDM2 and MYC amplifications). Two thirds had direct actionable mutations for a targeted treatment, including five cases with clinical benefit within tumour type, 10 in other tumour types and five in a clinical trial setting.

Conclusions: Sarcomas have limited available evidence regarding therapeutic approaches. In our study, a significant percentage of cases had actionable alterations with available targeted drugs. The use of NGS could be a feasible option to improve our knowledge about sarcoma biology and identify possible therapeutic options for individual patients. Molecular Tumour Boards should be implemented to discuss genomic findings and follow the growing application of CGP in clinical practice.

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Tenosynovial Giant Cell Tumour of the hip: Therapy, Results.

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Abstract

Introduction: Pigmented villonodular synovitis (PVS; giant cell tumor of tendon sheath) is a benign, aggressive synovial proliferation. The knee is the most common location. The hip is rarely affected. The aim of this study was to evaluate treatment and prognosis in a monocentric, retrospective series of patients.

Material and Methods

Between 2006 and 2020, 23 patients with TGCT of the hip were surgically treated in our centre. The mean age of the patients was 34.1 years (range 14 to 68 years). Standard therapy was open resection (synovectomy). The patients were followed with MRI of the affected region for 5 years after surgery.

Results

4 of the 23 lesion were localized in the bursa (3 x ileopectineal and 1 x trochanteric) and 19 intraarticular. 7 (30.4%) of 23 lesion showed a diffuse form. In 21 cases a synovectomy was performed (in 2 cases combined with surgical dislocation of the hip), in 2 cases (8.7%) the implantation of an endoprosthesis was in addition necessary.

The median follow-up was 19.4 months (range 3 to 188 months). Local recurrence of the disease was seen in 3 cases (13%) after a median time of 40.5 months, all had a diffuse form (p=0.02). After second resection, one patient had a further recurrence, however it was observed due to the small size and remained stable. Thus, 22 patients (95.7%) were free of recurrence in follow-up. In addition to 2 patients with endoprostheses at the time of synovectomy, 3 further patients (total 21.7%) required secondarily joint replacement due to arthritic changes.

Conclusion

The TGCT at the hip is a very rare location and may affect the periarticular bursae. Most of the cases showed localized nodular disease. The diffuse form has a significantly poor prognosis in respect to recurrence-free survival. The anatomy of a "narrow" joint makes the hip particularly susceptible to early bone erosion and hence to the need for endoprosthetic replacement.
The infected megaprosthesis: treatment strategies, results.

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Abstract

Introduction:

While standardized treatment techniques are established in prosthetics for degenerative joint diseases, no standardized approach is possible for prosthesis infections after resection of musculoskeletal tumors. The aim of this work is to compare the effectiveness of the measures mentioned with regard to infection control and limb preservation.

Patients and methods:

241 patients treated in our clinic between 2003-2019 were retrospectively evaluated. Only patients with endoprosthetic reconstruction due to an oncological disease were included.

Results:

The mean follow-up time was 48.5 months. During the follow-up period, 60 of 241 patients (24.9%) died in almost all cases due the oncological disease. A surgical revision due to the prosthesis infection was necessary in 42 cases (17.4%). Depending on the individual case, a complete prosthesis explantation (2-stage-surgery) was performed in 19 cases (26.8 of all revisions), in 15 (21.1%) cases the explantation of the mobile prosthesis parts while leaving the anchor shafts (2-stage-surgery), in 14 (19.7%) cases a 1-stage-revision with change of the mobile prosthesis parts and in 10 cases (14.1) only the lavage of the prosthesis and the joint. In 5 cases (7%) it was necessary to change the spacer. An amputation due to the uncontrollable infection was performed in 8 cases (81% limb salvage). The comparison of treatment effectiveness showed significant differences (p=0.022). While a further revision was necessary after an amputation (1 of 8 cases) in 12.5% of cases and after the complete explantation of the prosthesis (3/19) in 15.8% of the cases, the rate of revisions after the partial removal of the prosthesis (2-stage-surgery) was significantly higher (5 /15 cases; 33.3%), comparable with a 1-stage-surgery (5/14; 35.7%) and with lavage only (7/10; 70%).

Discussion:

This work is one of the few that deals with the problem of treating infections in megaprostheses. Our results show a significant advantage for an extended approach to surgical revision (2-stage-revision with complete removal and replacement of the prosthesis).
Mid to long-term clinical results of the LUMiC® prosthesis for reconstruction after periacetabular tumor resection

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Abstract

Introduction
The LUMiC prosthesis was designed for reconstruction of periacetabular tumor defects. We previously reported promising early results for this implant. In this study, we aimed to evaluate the mid- to long-term outcomes.

Methods
We retrospectively reviewed 40 patients after type 2 or 2/3 internal hemipelvectomcy and reconstruction with the LUMiC in our institution. Median age was 63 years (19-81). Median follow-up was 6.1 years (95%CI 4.2-8). Thirty-one patients (78%) were treated for a primary bone tumor, nine (23%) had osseous metastasis. Thirty-three (83%) implants were uncemented and 28 (70%) had a dual mobility cup.

Results
Nineteen patients (48%) required one or more reoperation(s), with 41/55 (75%) of reoperations taking place in the first six months. Mechanical complications included five patients (13%) who had open reduction for dislocation and one with an intra-operative peri-prosthetic fracture. Aseptic loosening was not observed. Reoperations for non-mechanical complications included 12 patients (30%) with a deep infection. Four reconstructions (10%) failed, three (8%) due to infection (at three, 13 and 64 months) and one (3%) due to locally recurrent disease (at 47 months).

Conclusion
The vast majority of complications after endoprosthetic reconstruction of periacetabular tumor defects occur in the first few months, suggesting that patients do relatively well once they have passed this critical period. Infection remains the major concern. Most infections were successfully eradicated however, and only 8% of the reconstructions failed as a result. No mechanical failures were observed, indicating that the LUMiC stem allows for durable fixation in the iliac wing.
Advantages of the Band 6 Sarcoma Clinical Nurse Specialist Development Role within the London Sarcoma Service

Mrs Lucy Bridgeman
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Abstract

Introduction : Advantages of the Band 6 Sarcoma Clinical Nurse Specialist Development Role within the London Sarcoma Service

Method/Results : In 2020, The Royal National Orthopaedic Hospital successfully obtained funding for two 18 month Sarcoma Clinical Nurse Specialist roles. The aim of this role was to allow the post holders to develop the skills and knowledge relating to investigations, treatment and follow up of sarcoma. They also worked closely with the Band 7 Clinical Nurse Specialists to support and provide information for patient’s with soft tissue sarcomas, bone sarcomas and patients with metastatic disease requiring orthopaedic intervention.

Conclusion: This presentation will discuss the role of the Band 6 Clinical Nurse Specialist within the wider Sarcoma MDT and also the personal experiences of Lucy Bridgeman who undertook this development post.
The past, present and future in treatment of Atypical Cartilaginous Tumours

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Abstract

Introduction: A decade has passed since the World Health Organization (WHO) changed the classification of chondrosarcoma grade 1 and renamed them Atypical Cartilaginous Tumours (ACT) when located in the long bones. At our institution ACT were treated with curettage and cryosurgery. Despite excellent oncological results, the negative side effects triggered us to implement active surveillance for ACT.

Methods: A digital decision aid was developed in order to support shared decision making, the answers of 84 patients were analysed. Currently at our institution, over 250 patients with enchondroma/ACT are under active surveillance. We examined the natural course of these tumours by investigating MRI characteristics with a minimal interval of 24 months between MRI’s.

Results: Only 5% of the patients preferred surgery to active surveillance. None of the patients who choose active surveillance revised their choice during follow-up. No tumour transformation has been observed in all patients under active surveillance, to date. MRI characteristics during follow-up (mean 50 months) of 128 cases were investigated. Only 13% showed some progression on MRI, tumour growth was minimal (median tumour growth 5mm). Interestingly 36% showed regression of the tumour, we provided additional evidence for fatty replacement of ACTs.

Conclusion: Active surveillance should be treatment of choice for asymptomatic ACT, irrespective of tumour size. MRI follow-up should be tailored according to biological behaviour as these tumours can either show progression, stability or regression. Fat entrapment seems a promising MRI characteristic to predict tumour regression, in the future watchful waiting might be sufficient for tumours with fat entrapment.
Natural History, Risk Factors and Surgical Outcomes of Coxa Vara Deformity in Fibrous Dysplasia/McCune-Albright Syndrome

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Abstract

Introduction: Fibrous dysplasia (FD) may cause coxa vara deformity, fractures, and disability. This study assessed risk factors and surgical outcomes of coxa vara deformity in patients with FD/McCune-Albright Syndrome (FD/MAS).

Methods: This study was conducted at the National Institutes of Health (NIH) and Leiden University Medical Center (LUMC). All patients with FD involving the proximal femur with ≥1 X-ray and age <30 years were included. X-rays were scored for the caput-collum-diaphyseal angle (CCDA). Varus deformity was defined as CCDA <110° or >10° below age-specific values. CCDA decrease over time was modelled by linear mixed model (LMM), evaluating potential risk factors for progressive deformity (growth hormone excess (GHE), hyperthyroidism, hypophosphatemia, >25% of the femur affected, calcar destruction, osteolysis, bilateral involvement). Revarisation and reoperations after correction osteotomy were evaluated.

Results: 180 patients were studied, 41% from LUMC, 59% from NIH, 57% female. Mean baseline age was 13.6 (±SD 7.5) year; median follow-up 5.4 (IQR 11.1) years. 63% of the patients were diagnosed with MAS. 94 patients were affected bilaterally; 274 FD-femurs were analyzed; 99 developed deformity (36%). The LMM included 114 femurs. Risk factors for deformity were GHE (β=7.2,p=0.013), hyperthyroidism (β=11.3,p<0.001), >25% of the femur affected (β=13.2,p=0.046), calcar destruction (β=8.3,p=0.004), osteolysis (β=3.9,p=0.009), bilaterality (β=9.8,p=0.010). Correction osteotomy was performed in 49/99 deformed femurs (50%), reoperation and re-osteotomy in 59% and 32%, respectively. Sufficient postoperative correction and adequate fixation appeared to prevent recurrence.

Conclusion: Mechanical and biochemical factors promote varus deformity in FD/MAS. Patients often need multiple surgeries. Adequate correction and fixation are crucial.
Sensitivity, specificity and predictive values of tru-cut biopsy in primary localized myxoid liposarcoma of the extremities

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Abstract

Introduction: Myxoid-liposarcoma (MLs) is the second most common subtype of liposarcoma¹. Histological grade is a prognostic factor and a strong determinant for appropriate treatment². Discordances in histological grade diagnosis between Tru-cut biopsy (TCB) and surgical specimens, could impact on patient’s outcome. This study aims to investigate the diagnostic accuracy of TCB and the potential impact on patient’s survival in case of misdiagnosis.

Methods: Patients with MLs undergoing TCB and a subsequent tumor resection were evaluated retrospectively. TCB results were compared with the final histopathological diagnosis on the resected tissue-specimens. MLs’ grade was defined on the amount of hypercellularity findings⁴. Histological grade concordance rate was calculated by Kappa coefficient. The probability of downgrading was calculated by a logistic-regression model. The sensitivity, specificity, and diagnostic accuracy were calculated.

Results: Of 144 biopsies, histological grade concordance-rate was 64%, Kappa 0,30. Twelve low grade cases at TCB (21%), upgraded in the resected tissue-specimens. Among high-grade MLs (87), neoadjuvant treatment (chemotherapy/radiotherapy), was associated with pathological downgrading. Patients treated only with neoadjuvant chemotherapy (OR 0,188; 95% CI 0,043-0,82 P<0,026), had a lower probability of downgrading compared to those treated with both regimens. There was no impact of misgrading on patients ‘survival (5-years OS-rate: 97% concordant vs 100% discordant). The sensitivity and specificity of TCB was 57% and 100% respectively, limited to patients untreated in neoadjuvant-setting.

Conclusions: In MLs, diagnosis with TCB might differ from that of surgical specimens. Neoadjuvant-chemotherapy alone has a lower probability of downgrading than neoadjuvant-combined treatments. OS is not impaired by misgrading.

NEW INCENTIVES AND PITFALLS IN PATIENT-SPECIFIC PELVIC IMPLANTS MADE BY ADDITIVE MANUFACTURING

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Abstract

BACKGROUND: With major advances in Additive Manufacturing (AM), with multi-disciplinary technology supporting Rapid Product Development (RPD) and Rapid Manufacturing (RM), AM is now used to improve design and reduce product development time in a relatively short time.

Custom implants can therefore be anatomically designed to assist in complex surgery of the bony pelvis in both orthopaedic oncology and orthopaedic reconstruction surgery.

METHODS: This series includes patients who had major pelvic bone loss after initially presenting with tumours, fractures or infection after previous total hip arthroplasty. The extent of the bone loss in the pelvis was severe and therefore impossible to be reconstructed by conventional ‘off-the-shelf’ implants.

The patients’ pelvis was scanned producing a 3D virtual model of the entire pelvic girdle. The resulting geometry was then converted into a stereolithography (STL) format by using Mimics TM (Materialise Interactive Medical Image Control System) and Magics RP software, in preparation for the manufacturing of a physical model of the pelvis, which would assist in the surgical planning. The STL was also imported into CAD through which the customised implant was designed. To ensure symmetry, the unaffected hemi-pelvis was mirrored (in CAD), and the level and size of the acetabulum was ascertained. The implant was designed considering the remaining bony structures of the contra-lateral hemi-pelvis, to provide an anatomical, secured support for the reconstructed hip joint. The latter was realised by strategically orientated screws and by porous structures (an integral part of the implant), which stimulates osseointegration.

A custom pelvic implant was designed, manufactured and 3D printed. Reconstruction of the pelvis was performed together with a cemented (bipolar bearing) acetabular cup. In some cases, a proximal femoral replacement was also necessary to compensate for bony defects.

RESULTS: All patients had sufficient range of motion (ROM) at the hip with post-operative stability. It has been verified, at six and twelve months postoperatively, that there is a strong hold of the implant due to osseointegration. Additionally, in patients whose posterior acetabular wall was missing, it was discovered that the implant assisted in bone formation and covered the entire posterior surface of the implant.

CONCLUSION: Custom implants offer reconstruction solutions to surgeons dealing with complex and challenging cases with massive and complex bone loss of the pelvis. This includes massive bony excisions to enable limb preservation surgery in tumour patients as well as reconstructive surgery, post failed or infected arthroplasty.

The modern technology combining MRI and CT imaging with Additive Manufacturing (AM), enables the rapid design and manufacturing of custom patient specific implants.

All patients in this study managed with this novel treatment option, proved to have a stable pelvic
reconstruction with restoration of leg lengths, improvement of strength and independent ambulation at short and medium term follow-up.
Is there any difference in mid to long term results of LCL reconstructions after proximal fibula resections?

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Abstract

Introduction: After resection of tumors in proximal fibula, remaining lateral collateral ligament (LCL) may require reconstruction to ensure the knee stability. Reattachment of LCL via bone anchor on the tibia is the most commonly used method. We sought to evaluate the mid to long term results of reattachment of LCL after proximal fibular resections and compare these results by means of applied method, tumor type and resection types.

Method: 33 patients with proximal fibular resection after benign or malignant tumors of proximal fibula between 2009-2020 were retrospectively reviewed. 2 patients with follow up less than 24 months were excluded. LCL continuity and anatomical changes were evaluated in post operative magnetic resonance images (MRI). LCL functions according to laxity in varus were noted. Musculoskeletal Tumor Society (MSTS) scores, knee stability and lateral site laxity at latest follow up were evaluated. Fibular nerve function and post-operative drop foot were also noted.

Results: Wide resections with muscular attachments were performed in 11 patients with malign tumor or metastasis, marginal resections were performed in 20 patients with benign tumors. No reconstruction method was applied in 19 patients while remaining LCL was reattached via bone anchor on the lateral surface of proximal tibia in 12 patients. Mean follow up time was 45 months. Mean MSTS score was 27.77. Fibular nerve was inevitably sacrificed in six patients. LCL function was significantly lower in patients who underwent marginal resection when compared to wide resection group (p=0.014). On MRI at 24th month follow up, the continuity of LCL was significantly higher in patients who applied bone anchor for the reconstruction compared to non-reconstruction group (p=0.008). Patients with reattachment via bone anchor had significantly less laxity during varus stress test compared to non-reconstructed patients group (p=0.009).

Conclusions: The reconstruction of LCL via bone anchor to proximal tibia is an effective method for knee joint stability with good functional outcomes after resection of proximal fibula in mid to long term. MSTS scores, knee stability and peroneal nerve functions were poor in wide resection group.
Failures and management experience in proximal femur tumor endoprostheses

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Abstract

Introduction: Wide resection and reconstruction with modular tumor endoprosthesis is the most common treatment method for primary malignant bone tumors and metastases of proximal femur. With increased survival of patients the complication of prostheses is encountered more frequently. We sought to evaluate the complication profiles of proximal femur modular tumor endoprostheses according to Henderson failure classifications.

Method: We retrospectively reviewed 49 patients, who operated for proximal femur malignancy and reconstructed with modular endoprosthesis between 2011-2021. We excluded 20 patients with less than six months follow-up. Apart from the demographic data, a total of 29 patients were evaluated regarding survival of prostheses, complication rates and profiles, revision rates, patient survival and functional scores.

Results: The mean age was 49.719.1 (17-82) and the median follow up was 41 months. Primary diagnoses were osteosarcoma and chondrosarcoma with eight patients in each group. According to Henderson's complications profile Type 1 failure (soft tissue failure) rate was 6.9%, Type 3 failure (structural failure) rate was 3.4%, Type 4a failure (early prosthetic infection) rate was 6.9%, tip 4b failure (late prosthetic infection) rate was %6.9, Type 5 failure (local tumor progression) rate was 13.8%. Most type 1 and 4a failures managed by debridement and vacuum assisted closure therapy. Hemipelvectomy was performed for salvage in two patients due to local tumor progression. Four prostheses were revised due to infection, local recurrence and structural failures which were managed by two stage revision procedure. Five years stem survival was 87.4% and implant survival was %80.7. Overall patient survival 63.8%. The mean MSTS was 21.7 (range 16-26).

Conclusion: Infections and local recurrences were the most common complication types encountered in our study which required revisions. Due to low survival of metastatic patients in proximal femur, it is difficult to detect, that survival rates of prostheses in these patients. Sparing stems in tumor endoprostheses revisions whenever possible have good functional results when compared to total revisions.
Survival and surgical outcomes in patients with tibial metastases: a dual-center study

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Abstract

Introduction

Tibial metastases (TM) are among the rarest secondary bone localizations but with a serious impact on patients' quality of life in terms of function and mobility.

The aim of the study was to retrospectively analyze the case histories of two European Musculoskeletal Oncology centers to identify demographic features, surgical management, and presence of any correlations between pre-operative clinical or laboratory parameters and survival.

Method

Through medical records and outpatient visits data on patient demographics, pre-operative laboratory parameters (C-reactive protein, alkaline phosphatase, fibrinogen, Hb, white blood cell and platelet counts), surgical treatment and complications, and survival were collected.

Results

A total of 91 patients (39 males, 52 females) with a mean age of 67 years were included in the study. No statistically significant differences were found in the 2 groups of patients at the admission; the most frequently involved tibial segment was the proximal and the most frequent primary tumor was clear cell renal cell carcinoma, followed by lung and breast (in females). The most used surgical treatment was curettage, bone filling with cement and internal fixation with plate and screws.

Median survival was 15 months with a correlation with age on admission, prognosis of the primary tumor and clinical presentation as a pathological fracture. No correlation was found with any laboratory parameter.

Conclusions

Due to the characteristics of patients, TM is difficult to treat and requires a multidisciplinary approach leading the surgical choice according to the characteristics of the primary tumor, age, anatomical location, and functional needs of the patient.
FOSTER (European Osteosarcoma Consortium) WP5 Survey – The current landscape of local osteosarcoma treatment in Europe

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Abstract

INTRODUCTION: FOSTER (Fight Osteosarcoma Through European Research) is the European Osteosarcoma Consortium. Its general objective is to improve outcome of patients with osteosarcoma (OS), in terms of duration and quality of life. Work Package 5 (WP5) of the consortium focuses on the local treatment for OS for both primary and metastatic tumor. The first objective of WP5 is to describe the current European landscape of local treatment.

METHOD: WP5 set up and sent out a survey to all FOSTER members, containing 54 questions on general aspects, preoperative work-up, surgery, radiotherapy (RT), and alternative local treatments.

RESULTS: A total of 73 surveys were returned. More than 80% reported multidisciplinary tumour board meetings at least once a week. An average of 12 surgical annual procedures for primary OS were reported by participants. Computer assistance, custom jigs and augmented reality were used in several centers to improve surgical margins. Different methods were used to evaluate margins. Radiosensitivity of OS was considered moderate according to 12%, low according to 54%, and very low according to 34% of participants. RT is used in most centers, with IMRT and conventional fractionation as most popular protocols. Surgery, stereotactic radiotherapy, radiofrequency ablation and cryotherapy were used for treatment of lung metastases. Most participants (70%) continue post-treatment follow-up of their OS patients for at least 10 years.

CONCLUSIONS: The WP5 survey describes the current landscape of local OS treatments in Europe. There are variations between different centers that should be taken into consideration when designing future international OS studies.

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Indications and clinical outcomes of oncological patients treated with carbon-fibre plates: an international multi-institutional study

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Abstract

Introduction: Carbon-fibre (CF) implants are a promising alternative to current implants due to their radiolucency which allows for precise radiation planning and facilitates visualization of local tumour recurrences. Additionally, their biomechanical properties should theoretically enhance bone healing and reduce complication risks. However, reported experience is limited. Therefore, this study aims to assess the indications and clinical outcomes of oncological patients treated with CF plates.

Methods: Between February 2015 and May 2021, 13 centres retrospectively registered all oncological patients that received a CF plate. Baseline characteristics, surgical variables and the cumulative incidence of complications, reoperations, and removal of the CF plate were analysed at 6-months, 1-year, and 2-years follow-up.

Results: 96 patients with a median age of 43 years (interquartile range [IQR]; 19-54) were included with a median follow-up of 23 months (IQR; 13-31). The three most common indications included chondrosarcomas or atypical cartilaginous tumours (34%), benign primary bone lesions (28%), and osteosarcomas (12%). In total, 29 (30%) patients had complications. Mechanical complications included: 5 (5%) soft tissue complications, 3 (3%) non-union, and 8 (8%) structural complications. Non-mechanical complications included 6 (6%) infections and 4 (4%) tumor progressions. Paediatric complications occurred in 3 (3%) patients. Twenty-two (23%) patients required reoperations and 15 (16%) CF plates were removed.

Conclusions: This study provides promising results in demanding reconstructions after bone tumour resections treated with innovative CF plates. Future comparative studies should assess the added clinical value of CF’s theoretical benefits compared with current metal plates.
Radiotherapy in Hip Heterotopic ossification: 3 cases reports

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Abstract

Introduction: Heterotopic ossification (HO) is defined as the formation of new bone in soft tissue outsider the skeletal system. Although non-steroidal anti-inflammatory drugs (NSAIDs) can be used as prophylactic agents against HO. Radiotherapy (RT) is an alternative treatment modality. However, evidence on prophylactic RT is sparse, and the dose and timing of the RT Schedule vary among different centres.

Methods: We report three patients with HO who underwent prophylactic RT in association with surgical resection.

Results:

Case 1: Male, 83 years old with HO and pain of the right leg after total hip arthroplasty. He underwent prophylactic RT (7,5Gy/1fr) 12 hours before excision of the HO. The leg pain improved without relapse after a follow up of 3 years.

Case 2: Male, 64 years old with HO and stiffness after left total hip arthroplasty. He underwent excision of the HO followed by indomethacin and RT (8Gy/1fr) because of the suboptimal surgical resection. 3 months later, the x-ray shows HO stability, and the stiffness has improved significantly.

Case 3: Male, 69 years old with HO after right total hip arthroplasty. The patient had right thigh pain and stiffness. He underwent excision of the HO followed by RT (8Gy/1fr) because prophylactic use of NSAIDs was contraindicated in this patient owing to his underlying medical conditions. 3 months later, the x-ray shows HO stability, the patient has no pain.

Conclusions: Single fraction of RT appears to be sufficient and safe to prevent HO.
Robot-assisted resection of Sacral Chordoma. A case series

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Abstract

INTRODUCTION
Sacral chordoma is a rare mesenchymal tumor that, however uncommon, represents the most frequent primary tumor of the sacrum¹,². This slowly growing neoplasm can reach notable dimensions, with late onset symptoms mainly due to compression (pain, constipation, sphincteric deficiency)³,⁴. Chordoma is chemo-resistant and has a poor sensitivity to radiotherapy, showing little to no remission⁵; thus sacral resection still represents the mainstay of treatment. This challenging procedure correlates with a high risk of complications and invalidating outcomes, due to impaired intestinal and urinary/sexual functions⁶. Robot-assisted Sacral resection can represent a valid surgical strategy in order to narrow the risk of intraoperative complications and improving the excision adequacy.

METHOD
4 patients (mean age 65.8yo) affected by sacral chordoma were treated consequently with Robot-assisted resection from May 2020 to March 2022. Mean follow-up was 11 months. A combined anterior-posterior approach was performed by the same multidisciplinary team in one-stage: anterior laparoscopic robot-assisted approach (Da Vinci Xi System) aiming to isolate and release the tumor mass from visceral adhesions, followed by posteriorly subtotal sacrectomy.

RESULTS
No major intraoperative complications occurred. In one case surgical margins came out as focally marginal; the same patient suffered from strain bladder. The remaining margins were assessed as wide. No local recurrence occurred.

CONCLUSION
Sacral resection is always a demanding procedure. Robot-assisted sacral resection is poorly described in literature and despite the still limited number of cases this combined procedure represents a promising treatment that could lead to good local control of the disease and functional outcomes.

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Free fillet flaps for reconstruction of massive oncologic resections

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Abstract

Introduction: Massive upper and lower extremity defects following tumor resections can be reconstructed using free or pedicled fillet flaps from discarded tissue to provide coverage. We present our experience with free fillet flaps to reconstruct massive oncological defects.

Methods: A retrospective chart review was conducted to include patients who underwent massive oncologic resection followed by reconstruction with a free fillet flap from July 2001 to March 2022.

Results: Fourteen patients were included. Mean age was 48.3 years old (21–67). Five patients had extended forequarter amputation and nine patients had external hemipelvectomy, all for oncologic indications. Five patients received neoadjuvant therapy (chemotherapy or radiotherapy). Thirteen patients underwent resection for curative intent. One patient underwent palliative external hemipelvectomy for life-threatening hemorrhage. Mean tumor size (longest axis) was 15.0 cm (3.5-24.5 cm). The mean flap size was 37 x 24 (ranging from 26 x 20 cm to 75 x 42 cm). There were 10 myocutaneous flaps, 3 fasciocutaneous flaps, and 1 osteomyocutaneous flap. Average hospital stay was 19.2 days and mean duration of follow up was 27.6 months. Two patients had a superficial wound dehiscence, but there were no flap losses. One patient required urgent re-exploration twice, with an eventual satisfactory outcome. At a 2-year follow-up period, 72% of patients were alive.

Conclusion: The free fillet flap is a safe technique that avoids donor site morbidity, with an acceptable complication rate providing a flap that can extend the limits of curative or palliative oncologic resection.
Evaluation of candidate biomarkers for fluorescence-guided surgery in myxofibrosarcoma: An immunohistochemical and in-vitro evaluation study

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Abstract

Introduction: Curative treatment for localized myxofibrosarcoma (MFS) highly depends on complete tumor resection, as positive margins are associated with local recurrence and survival. However, determining the tumor margin during surgery is challenging. Fluorescence-guided surgery (FGS) can facilitate complete resection by visualizing tumor tissue. This technique is based on fluorescent tracers binding to specific biomarkers on malignant cells. Unfortunately, MFS specific tracers are presently not clinically available. Therefore, the aim of this study was to evaluate candidate biomarkers applicable for the use of FGS in MFS.

Method: The following eight biomarkers, identified as promising for FGS in previous studies, were evaluated in parallel with immunohistochemistry on 17 MFS tissue samples; tumor endothelial marker-1 (TEM-1), vascular endothelial growth factor-1 (VEGF-1), vascular endothelial growth factor-2 (VEGF-2), vascular endothelial growth factor-A (VEGF-A), epidermal growth factor receptor (EGFR), insulin-like growth factor-1 receptor (IGF-1R), platelet derived growth factor receptor α (PDGFR-α), and cluster of differentiation 40 (CD40). A biomarker was considered promising when immunohistochemical evaluation demonstrated overexpression in tumor tissue, while being absent or low in adjacent healthy tissue.

Results: Immunohistochemical analysis identified TEM-1 as most promising biomarker for FGS in MFS. Strong TEM-1 expression was observed in MFS, while staining on their normal tissue counterparts was limited.

Conclusions: This study demonstrates the potential of TEM-1 as a target for FGS in MFS. Additional in-vitro experiments of a fluorescent tracer (1C1m-800CW) that binds to TEM-1 will be performed and presented during the conference.
Clinical and biomechanical considerations to develop a custom made 3D printed pelvic reconstruction - a collaborative work between surgeons and engineers.

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Abstract

Custom-made 3D-printed implants represent a promising reconstructive technique for complex oncological defects in the pelvis. Their design process require a close collaboration between surgeons and engineers. Therefore, it is important that surgeons become familiar with the development steps involved in the creation of a 3D printed implant.

The objective for this presentation is to describe how a 3D printed implant is created to accurately reconstruct a pelvic tumour. The whole process begins with the imaging data acquisition and continues with the creation of 3D virtual models of the patient’s anatomy. It follows with the virtual planning of the surgery. Clinical and mechanical considerations are taken into account such as: planning of the tumour margins; optimal bone selection for implant fixation; cortical and trabecular screw planning; analysis of the new centre of rotation, angles of inclination and anteversion; the shape of the implant to fulfil biomechanical requirements; lattice structures can be added to promote osseointegration as well as special design features for soft tissue reattachment. Once the design in complete, the implant, anatomical models and resection guides are produced by different 3D printing techniques such as powder bed fusion technology or selective laser sintering, for metal and plastic materials, respectively. After several postprocesses and sterilization techniques, the parts can be used safely in the operating room.

As 3D printed reconstructions will become increasingly accessible in the next decades, it is essential to promote a close collaboration between surgeons and engineers to produce safe, functional and cost effective custom devices.
Outcomes of Bone Sarcoma in the Over 90's

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Abstract

Aims: Although more common in children and young adults, approximately 11% of bone sarcomas are diagnosed in the over 75’s. The elderly are under-represented in medical research and as such little information available pertaining to local recurrence and survival rates. The functional impact of managing bone sarcoma is substantial and patient-centred, pragmatic decisions regarding the surgical management of these patients are necessary. We seek to quantify the local recurrence and survival outcomes in the over 90’s with a view to rationalising treatment and ongoing surveillance at our centre.

Patients and Methods: Retrospective access to our prospectively held oncology database yielded a list of 15 consecutive patients diagnosed with bone sarcoma of the axial and appendicular skeleton over 90. 60% were managed surgically – five had amputations and four with tumour excision. Two patients had positive margins.

Results: Median OS is limited to 6 months (range 0-24 months). Median LRFS time was 14 months (range 1-88 months) and LRFS was 86% at 5 years. Operative management was associated with longer survival times compared to non-operative management (17 months and 3 months respectively). Our data trended towards better survival times when patients were managed with an amputation compared to excision alone (17 months and 3 months respectively). When treated with excision, there was a modest survival advantage afforded by attaining clear margins (22 months vs. 4 months for R2 margins).

Conclusion: This study has highlighted the importance of patient-centred discussion pre-operatively and careful consideration of factors other than tumour histology, location and depth when determining the best management strategy. Rapid development of local recurrence and distant metastasis confirms the appropriateness of first follow-up but survival times suggest that follow-up need not be as prolonged or intensive as in younger cohorts. A pragmatic approach to follow-up involving GP/local oncology services may be advantageous.
TESS 2.0 - Adaptation of the German Version of the Toronto Extremity Salvage Score - Addition of an Item regarding the use of Touch-Screen and Keyboard in the Upper Extremity Questionnaire.

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Abstract

Introduction

The preferred treatment for malignant bone and soft tissue tumors is limb salvage surgery. The Toronto Extremity Salvage Score (TESS) has been cultural adapted and validated and has been published since March 2021. As further development, in collaboration with the original author, we decided to add a question in the upper extremity domain regarding the use of touchscreens or keyboards. In the literature with a youth sample size, many questionnaires were found to be outdated.

Methods

Two authors developed a German question on this topic based on the Italian version. This question is now in pretest, after that feedback interviews will be conducted in the outpatient clinic with the full version of the Disabilities of the Arm, Shoulder and Hand (DASH) and the TESS 2.0. After one week only the TESS 2.0 will be sent electronically.

Results

The statistically analysis is planned at the end of August. Validity will be measured by using the DASH questionnaire and the TESS Score, counted with the Spearman rank correlation (r). Reliability is calculated using Cronbach’s alpha (α). Furthermore, the Intraclass Correlation Coefficient (ICC) is used for re-test reliability.

Conclusion

It is expected to implement the TESS 2.0 instead of the TESS 1.0.
One- versus two-stage synovectomy of diffuse-type tenosynovial giant cell tumor (D-TGCT) of the knee: an international, retrospective, cohort study

Mr Geert Spierenburg1, Dr Floortje Verspoor2, Mr Anthony Griffin3, Prof Jay Wunder3, Dr Matthew Houdek4, Dr Richard Boyle5, Prof Robert Lor Randall6, Dr Steven Thorpe6, Dr Jacob Priester6, Dr Erik Geiger7, Dr Lizz van der Heijden1, Dr Nicholas Bernthal7, Prof Bart Schreuder8, Prof Hans Gelderblom1, Prof Michiel van de Sande1

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Abstract

Background

Diffuse-type TGCT’s (D-TGCT) intra-articular and common posterior extra-articular expansion about the knee often necessitates a surgical approach to the anterior and posterior sides of the knee to facilitate an extensive synovectomy. Consensus on whether a two-sided synovectomy should be performed in one or two stages is lacking. We compared short-term outcomes of one-stage (OSS) vs. two-stage synovectomies (TSS) of the anterior and posterior sides of D-TGCT of the knee.

Methods

This retrospective, multicenter study included patients in nine sarcoma centers worldwide. All patients underwent an OSS or TSS of the knee. TSS was defined as two separate surgeries on both sides but within six months, and data of both interventions were taken together.

Results

Between 2000-2020, 102 patients underwent OSS and 74 TSS. Baseline characteristics were comparable for both groups, except the centers’ preference for performing OSS or TSS differed (p<0.0001). The maximum range of motions achieved within the first year postoperatively (OSS flexion 123°/TSS flexion 120°; OSS/TSS extension 0°) and surgical duration (180 vs. 170 minutes, p=0.170) were comparable. Length of hospital stay for TSS was longer than OSS (6 vs. 4 days, p<0.0001). Also, complications occurred more often following TSS (38% vs. 26%, p=0.172). Furthermore, radiological progression and patients requiring a subsequent treatment were more common after TSS (53% vs. 37%, p=0.101)(54% vs. 34%, p=0.009).

Conclusion

Our study showed that OSS is not inferior to TSS regarding the range of motion achieved within the first year postoperatively. In addition, OSS resulted in shorter length of hospital stay.
Partnership working to deliver a guided physical activity programme to people who have undergone sarcoma surgery

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Abstract

Introduction

Research demonstrates there is strong evidence that being physically active reduces anxiety, improves depression, reduces fatigue, improves quality of life during and after cancer treatment.

People undergoing surgery for a diagnosis of sarcoma may face some form of long term disability making participation in physical activity more challenging. During the COVID pandemic the RNOH therapy team were approached by Move4You to support patients in returning to physical activity.

Method

Physiotherapists discussed the Move4you service with people who had sarcoma surgery and for whom increasing physical activity was a goal or felt beneficial in enabling them to return to function. Standard move4you referral completed and submitted. People were invited to attend a course of physical activity sessions delivered via zoom. Baseline markers were taken at the start and end of the series of sessions - Scottish Physical Activity Questionnaire, 30sec Sit to Stand Test Scores, EQ5D

Results

11 people with a diagnosis of sarcoma who underwent surgery at RNOH were referred and undertook the personalised programme.

Physical activity scores increased significantly (0.01) 180 to 270 minutes per week. The sit to stand scores demonstrated an improvement of 18% and quality of life scores increased by 19%. Qualitative feedback was positive.

Conclusion

As a national centre linking people who would benefit from physical activity to services can be challenging. With the use of virtual platforms and physical instructors who have heightened knowledge of oncology it has been possible to support this patient group and improve their physical function and confidence.

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Active surveillance of diffuse-type tenosynovial giant cell tumors: a retrospective, multicenter cohort study

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Abstract

Background
Diffuse-type tenosynovial giant cell tumor (D-TGCT) is a mono-articular, soft-tissue tumor. Although it can behave locally aggressively, D-TGCT is a non-malignant disease. This is the first study describing the natural course of D-TGCT in patients treated conservatively and evaluating active surveillance as possible treatment strategy.

Methods
This retrospective, multicenter study included therapy naïve patients with D-TGCT from eight sarcoma centers worldwide between 2000-2019. Patients initially managed by active surveillance following their first consultation were eligible. Data regarding the radiological and clinical course and subsequent treatments were collected.

Results
Sixty-one patients with primary D-TGCT were initially managed by active surveillance. Fifty-nine patients had an MRI performed around first consultation: D-TGCT was located intra-articular in most patients (n=56; 95%), and extra-articular in 14 cases (24%). At baseline, osteoarthritis was observed in 13 patients (22%) on MRI and the most reported symptoms were pain (n=43; 70%) and swelling (n=33; 54%). Eight patients (13%) were asymptomatic.

Follow-up data were available for 57 patients and the median follow-up was 29 months (range 3-259). Twenty patients (35%) had radiological progression after a median of 21 months. Eight of 44 patients (18%) without osteoarthritis at baseline, developed this during follow-up. Thirty-two patients (56%) did not clinically deteriorate during follow-up. Finally, thirteen patients (23%) required a subsequent treatment.

Conclusion
Active surveillance can be considered an acceptable approach for therapy naïve D-TGCT patients. Although follow-up data was limited, almost two-thirds of the patients remained progression-free, and most did not receive treatment.
Ewings Sarcoma

Proton Beam Therapy for Ewing sarcoma in Children and Young Adults: Clinical Results from the Prospective Registries KiProReg and ProReg

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Abstract

Introduction: Proton beam therapy (PBT) is a highly conformal modern type of radiotherapy increasingly used for sarcomas. The purpose of the study was to evaluate PBT for children and young adults with Ewing sarcomas (ES).

Methods: Patients with ES were enrolled to the prospective registries KiProReg (DRKS00005363) and ProReg (DRKS00004384) and were treated according to international protocols (EWING, HIT-MED, CWS). Treatment data and outcome were evaluated. Information on adverse events was classified according to CTCAEv4.0.

Results: Between May 2013 and May 2022, 161 patients (median age 14.3 years; range, 1.0‐54.2 years) were analyzed. Tumor sites were pelvis (n=68), spinal/paraspinal (n=36), head&neck (n=33) or thorax/abdomen (n=24), respectively. Gross total resection was achieved in 43 patients (26.7%). 32 patients (19.9%) had metastases. 98.8% and 71.2% had received chemotherapy before PBT and concomitant, respectively. The median total dose was 54.0 Gy (range, 3.6-59.4 Gy). During RT, ≥ grade 3 toxicities were documented mainly for bone marrow (n=90) and skin (n=14). Median follow up was 19.3 months (range, 2.0-146.8 months) upon first diagnosis. Progression occurred in 33 patients with either local (n=8), disseminated (n=23), and combined failure (n=2), respectively. New high grade (≥ grade 3) late toxicities were observed in organ classes like bone marrow (n=5), gastrointestinal (n=2), or general (n=3). 84.9% of the patients were still alive.

Conclusions: PBT was effective and feasible in a large mono-institutional cohort of ES when administering standard dose levels. Future studies will evaluate feasibility of PBT for dose escalation studies, i.e. within the future iEuroEwing trial.
What are the Experiences of Balance, Gait and Neuro-muscular Control Outcomes after Proximal Femoral Replacements for Musculoskeletal Tumours? A literature review and qualitative study

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Abstract

Introduction:

Osteosarcoma is a rare heterogeneous group of cancers, that commonly affects the lower limb. Patients with proximal femoral bone tumours frequently undergo proximal femoral replacement (PFR) surgery to remove the tumour. However, there is limited research on how PFR influences patients' gait, balance, and neuromuscular function post-operatively. This research includes a literature review and a qualitative study. The aim is to explore: 1. Facilitators and barriers to achieving a good outcome 2. How does the outcome in these three aspects affect patients’ life?

Methods:

This study is part of the STOMP study (REC ref: 21/WA/0027) in the RNOH London Sarcoma Service. A narrative literature review that identifies the current literature gap, helps to guide specific questions for the interview. The qualitative research, in the format of online interviews, will focus on the patients' experiences and the factors that affect them. Patients, that finished PFR 1-year and aged> 6, are identified from the database of RNOH with purpose sampling. The qualitative review adapted a Rapid Appraisal method, data analysed by a rapid appraisal sheet and the Framework method.

Early insight:

The current literature, across different ages and diagnoses, does not provide enough information to determine the impact of PFR on patients' daily lives. Most of the evidence suggested that patients’ social life and physical ability are heavily interrupted due to muscle weakness, fatigue, and stiffness. Our qualitative studies will provide a more in-depth understanding of factors that affect patient outcomes and what could be done to provide better care.

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Mid- to long-term clinical outcome of tumor-devitalized autografts in limb-sparing surgery for bone and soft tissue tumors - A nationwide multicenter study -

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Abstract

Introduction: This retrospective multicenter study aimed to determine the durability and the factors which affected the clinical outcome in three types of tumor-devitalized autograft (deep freezing, pasteurization, and irradiation).

Methods: The inclusion criteria were the patients treated by intercalary or composite tumor-devitalized autografts of long bone from 1993 to 2016 in 26 tertiary sarcoma centers, followed at least two years. Complications, event-free survival, graft survival, and functional outcome were investigated.

Results: Three hundred ten patients (162 male and 148 female) met the inclusion criteria with the mean age of 33.9 (ranged, 4 to 84) years. The mean follow-up period was 109 (ranged, 24 to 348) months. The types of devitalization were freezing in 147, pasteurization in 89, and irradiation in 74 patients. The types of graft were intercalary in 211, composite prosthetic in 83 patients, and hemicortical reconstruction in 16 patients. The cumulative incidence of the event was 42.7% in 5, 51.1% in 10, and 55.1% in 15-years. Long resection (>15cm) were significantly correlated with the incidence of an event by uni- (p=0.001) and multivariate analysis (p=0.001). Graft survival was 86.7% in 5, 80.8% in 10 and 79.6% in 15 years. Long resection (>15cm) was significantly correlated with grafted autograft failure by uni- (p=0.005) and multivariate analysis (p=0.002). There was no significantly difference in the incidence of the event and graft survival between the three types of devitalizing methods.

Conclusion: Although the incidence of complications was relatively high, tumor-devitalized autograft provided a long-lasting survival.
Life quality and functionality after internal hemipelvectomy

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Abstract

Introduction:
Internal hemipelvectomies are complex surgical procedures performed mainly in malignant bone tumors. Functional restrictions have a high impact on life quality (LQ). Data however are rare. Aim of the study was therefore to evaluate functionality and LQ in these patients.

Method:
In a single center retrospective cohort study 93 patients were treated with internal hemipelvectomy. Most of them died in the meantime, so 35 patients could be evaluated. Mean follow up was 11.8 years. Functional outcome was measured with Musculoskeletal Tumor Society-Score (MSTS), Toronto Extremity Salvage Score (TESS) and Oxford Hip Score (OHS). Functional (VR-12-PCS) and mental (VR-12-MCS) LQ were evaluated and compared using spearman correlation. Grading, R-status, adjuvant therapy and complication rates also were evaluated and influence on functionality and LQ examined using Mann-Whitney-U-Test.

Results:
Mean MSTS-Score was 16,8 (56,0%) (1-30, ± 6,9), mean TESS 79,1% (30-100%, ±18,3%) and mean OHS 33,7 (70,3%) (11-48, ± 10,4). Functional, as well as mental LQ (mean VR-12-PCS: 38,8, Range 18,4-59,8; mean VR-12-MCS: 50,4, Range 20,8-69,3) showed a strong correlation to functionality (PCS vs. MSTS r=0,777, p<0,001; PCS vs. TESS r=0,790, p<0,001; PCS vs. OHS r=0,796, p<0,001; MCS vs. MSTS r=0,337, p=0,051; MCS vs. TESS r=0,464, p=0,006; MCS vs. OHS r=0,518, p=0,002). Patients without postoperative complications showed a significant higher functional LQ (41,6 vs. 32,8, p=0,026) and higher functionality-scores (MSTS 18,2 vs. 13,7, p=0,100; TESS 82,0% vs.72,7%, p=0,126; OHS 35,4 vs. 30,2, p=0,241). In mental LQ there were no differences (49,8vs. 51,7, p=0,508). Tumor grading (G2 oder G3: 24/30), R-Status (R0: 24/35), chemotherapy- (14/35), radiotherapy- (13/35) and rate of used implants (15/35) had no significant influence on functionality or LQ.

Conclusion:
The better the postoperative functionality in long term survivors after internal hemipelvectomy, the better is the physical and mental life quality of the patients. Postoperative complications decrease functionality and LQ. There were no other factors influencing this outcome.
Biological reconstruction with distraction osteogenesis following resection of bone sarcomas: A prospective study

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Abstract

Introduction

Biological reconstruction with bone transport is an effective reconstructive method following bony resection for malignancy. Our objective is to determine when to expect cortex formation, full bone healing, full weight bearing, and the influence of chemotherapy on the bony regeneration process.

Methods

 Prospectively collected data and xrays from 30 patients who underwent bone transport reconstruction following tumor resection from 2018-2021 were analyzed.

Results

17 males and 13 females were included. Median age was 14. Tumor subtypes included osteosarcoma (16), Ewings (6), UPS of bone (3), Adamantinoma (2), other (3). The average resection length was 13.6cm (4-22). Resections were from 16 femurs, 11 tibias, 2 humeri and 1 radius. Patients underwent an average of 6.1 procedures (1-14). Half (50%) of all procedures were planned repeat lengthening procedures while half were unplanned (20% infection, 16% non-union or mal-union, 7% fracture, 9% other). The first lengthened segment, often concurrent with chemotherapy, required 10.7 months (+-6.6) for first cortex formation and 17 months (+-7.0) for full remodeling. Subsequently lengthened segments, occurring after systemic therapy, required 8.6 months (+-3.4) for full remodeling and 4.6 months (+-2.8) for formation of the first cortex (p=.0002). Average time to full weight bearing was 13.4 months (+-8.2).

Conclusion

In this largest reported series of bone transport reconstruction, we demonstrate a high rate of unplanned returns to the operating room. Surgeons and patients can expect the time for full remodeling and cortex formation to be twice as fast for lengthened segments occurring after completion of systemic chemotherapy.
Reliability of composite xeno-hybrid bone grafts in pediatric orthopaedic oncology

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Abstract

Introduction: Bio-hybrid grafts are commonly used in orthopaedic oncology practice with good results in integration and mechanical terms. In pediatric growing patients indications and results are still debated. The aim of this study is to evaluate the use of a xeno-hybrid graft in pediatric patients with an open growth-plate.

Methods: In the period 2017-2020 19 pediatric patients (age range 9-17) were prospectively enrolled. Diagnosis, involved bone, graft type, radiologic integration, complications were evaluated. Common factor and inclusion criteria was the presence of at least one open growth plate close to the surgical site

Results: Unicameral and aneurismal bone cysts were the commonest diagnosis. The involved bone was tibia (6), femur (5), humerus (4), calcaneus (2), fibula (1), pelvis (1). 13 graft blocks, 4 granules packs, 1 combination of granules and block, and 1 custom made graft were used. The integration of the graft was complete in 16 patients, partial in 3 patients. Surgical reintervention occurred 8 times for local recurrence (5) and partial integration/lack of fusion at the host bone-graft interface (3). No infection and no fractures of the graft occurred.

Conclusions: No systematic studies have been conducted yet on biohybrid bone grafts in growing patients. Composite xeno-hybrid bovine based grafts are safe and reliable from a biological and mechanical point of view also in pediatric patients.
Wound healing complication after excision of soft tissue sarcomas: does it delay radiologic follow up and increase local recurrence rate?

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Abstract

Introduction: Wound healing complications are common in soft tissue sarcoma surgery. Radiotherapy and extensive skin involvement are the most frequent causes. The aim of the study is to evaluate if and how wound dehiscence could affect the follow up and local recurrence rate.

Methods: We included 25 patients surgically treated for high grade soft tissue sarcomas with wound healing complications requiring further surgery or medications for at least 2 months till wound healing. Oncologic resection margins were wide (19) or marginal (6). We evaluated wound healing time, first radiologic local evaluation, and local recurrence rate.

Results: Wound healing was achieved at a mean time of 9 months (range 2-38), first radiologic study was performed at a mean time of 6 months (range 2-14). Only 4 local recurrences occurred (follow up range 6-38 months), 1 identified at the first Imaging study, 3 later on during follow up, none clinically. In 2 patients postoperative chemotherapy and radiotherapy were delayed by wound complications. Five patients died of disease and 2 for other unrelated diseases during follow up.

Conclusion: Even if some follow up protocols consider only clinical evaluation in our center we usually perform US or MRI 4 months after surgery. Probably the frequent clinical examinations during every medication could safely delay or replace local radiologic studies. Multicentric studies with a larger number of patients could affirm which is the best radiologic follow up with an open wound and if clinical examination itself is reliable in term of early identification of local recurrences.
Soft tissue sarcomas in elderly patients: do we have to operate always?

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Abstract

Introduction: People are getting older and survive from and live with several diseases. Soft tissue sarcomas (STSs) frequency is increasing with the age. The aim of the study is to evaluate survival and complication rate and whether we should change the clinical and surgical approach in patients over 75 years old with STSs.

Methods: In the period 2013-2021 we treated in an orthopedic oncology reference centre 220 patients over 75 years with STSs. We evaluated diagnosis, survival, hospital stay length, complication rate, retrospective identification of frail conditions.

Results: Patients were divided in 2 groups: STSs receiving surgery (165 patients, age range 75-97, mean 80.4) and STSs refusing surgery or sent to palliative cares (55 patients, age range 75-95, mean 83.6). Mortality was lower in the surgical group 41.8% (vs 80%) with a mean survival of 34.4 months (vs 19.8). Average hospital stay after surgery was 12 days. Most frequent complications after surgery were wound dehiscence or infection (21) and DVT (4). Major or fatal complications occurred 3 times. 83 patients were retrospectively evaluated as frail.

Conclusions: Surgery is probably the only chance to cure sarcomas in this age range but it could be fatal or worsen general conditions and both the patient and the family should be adequately informed. Sometimes patients refused amputation or families protect them from surgery. Age does not represent an absolute contraindication for surgical or oncologic treatments but frailty condition should be identified before. Family/caregivers network, cognitive evaluation, quality of life are fundamental to decide the best approach.
Wound complications in Operations of the Thigh & Pelvis: Outcomes from the London Sarcoma Service’s Bone and Soft tissue Sarcoma Team

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Abstract

Introduction
Risk factors for surgical wound dehiscence (SWD) are frequently recognised in patients treated by sarcoma services. Specifically, resections of the lower extremity are associated with higher rates of wound complications. This study aims to highlight factors increasing the likelihood of wound complications in operations of the thigh and pelvis, to identify future cases at risk and intervene pre-operatively.

Methods
A retrospective review was conducted of cases performed by the London Sarcoma Service’s Bone and Soft Tissue sarcoma team from October 2020 to March 2021. Of a total 727 cases, 220 patients undergoing operations of the thigh and pelvis were analyzed.

Results
Wound complications were documented in 33 patients (15%), with evidence of SWD in 18 patients (8.2%), wound infection in a further 11 (5%) patients and seroma in 4 (1.8%). Of the SWD sample, the most prevalent diagnosis was chondrosarcoma (5/18) and the most common incision site was the groin (40% of available documentation). 83% of these patients received neoadjuvant or adjuvant therapy. 14 patients with SWD required return to theatre (77%). The plastic surgery team were involved 7 of these cases; these 7 patients had on average a shorter length of stay (29.71 days ± 28.03) compared to those with no plastic surgery input (35.5 days ± 33.85), though this difference was not statistically significant.

Conclusions
Rates of wound complications were low in this cohort, compared to previous studies. Identifying patients pre-operatively who have received neoadjuvant treatment or where the anticipated incision site is the groin may allow earlier intervention from the plastic surgery team.
Understanding the experiences of patients returning to activities of daily living and exercise following limb sparing surgery for bone or soft tissue sarcoma around the knee

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Abstract

Introduction:
A large proportion of sarcomas occur in the extremities, particularly around the knee joint, presenting numerous physical limitations. There is limited qualitative literature providing insight into patients’ lives. This sub-study is part of a larger study, the Stanmore Tumour Outcomes Project, measuring survivorship and rehabilitation outcomes in The London Sarcoma Service.

Objective:
The objective of this study is to understand the experiences and potential barriers of returning to daily activities and exercise following treatment for knee sarcoma, to pre-operatively guide patient expectations and support rehabilitation.

Methods:
In phase one, a narrative literature review was undertaken on sarcoma survivors, with a focus on knee tumours. This informed phase two, a qualitative study of eight patients at least one-year post limb salvage surgery of the knee. Ethical approval was granted from a National Ethics Committee in the UK (reference 21/WA/0027).

Results:
Eight patients with around knee sarcoma were included in the study. Patients received either a distal femoral replacement, proximal tibial replacement or a tibia resection with fibula allograft. Four themes emerged, Navigating activities of daily living, Barriers to exercise, The need for mental health support and Lack of local knowledge. Patients demonstrated resilience returning to life after treatment and expressed both positive and negative aspects of recovery.

Conclusion:
Most patients following limb sparing surgery continue to experience not only physical limitations but also long-term effects on mental health. Improved individualised rehabilitation and comprehensive follow up perhaps based on biopsychosocial models, may help to mitigate some of the difficulties faced.

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Myxoid liposarcoma 10-year surveillance programme

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Abstract

Myxoid liposarcoma, the most prevalent subtype of liposarcoma in our cohort, has a good prognosis but unlike other soft tissue sarcomas, it has a tendency of extra-pulmonary metastasis. This leads to significant variation in surveillance methods for these patients throughout the continent. The purpose of this study was to observe the treatment and surveillance pathways for patients with myxoid liposarcoma in the North West region of England and to identify the patients with recurrence or metastasis after initial treatment and assess their metastatic patterns and detection methods.

From 2011 to 2021, 40 patients with myxoid liposarcoma were diagnosed, treated and followed up for 10 years within the Manchester Sarcoma service. Data was collected retrospectively to identify histology, recurrence rates, detection methods and metastatic patterns.

The mean age was 45 years. Eight patients developed metastasis, with average presentation at 41 months post-operatively (range between 6 and 104 months). One patient had local recurrence. The most common sites for metastasis were the pelvis (7), spine (6) and chest (5). Most patients received pre-op radiotherapy. Our data show that marginal excision (<1mm) following pre-operative radiotherapy does not increase the risk for local recurrence nor for metastatic disease. 76% of tumours responded well to radiotherapy.

As myxoid liposarcoma exhibits an unusual extra-pulmonary metastatic pattern, our experience demonstrates that clinical examination and yearly whole-body MRI can facilitate detection of metastatic disease. In our cohort, marginal excision following pre-operative radiotherapy did not appear to be associated with higher rates of local recurrence or metastatic disease.
Balance and Gait Outcomes after 1-year post-operative Hemipelvectomy Surgery?

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Abstract

Introduction: The ability to walk after surgery can be compromised in patients with osteosarcoma, so the assessment of post-operative physical function has an important impact on treating patients. No studies have measured the dynamic balance of pelvic sarcoma patients after surgery. It has been shown that the center of mass (COM) and the center of pressure (COP) can be a valid inference of stability in subjects. This article will therefore focus on calculating postoperative COM and COP in pelvic sarcoma patients to infer whether the patient can maintain stability.

Methods: The project will be conducted as part of the Stanmore Tumour Outcomes Project (STOMP) running at the London Sarcoma Service (Approval reference _21/WA/0027_) has been obtained. I will conduct a narrative literature review and retrospective data analysis of gait lab datasets, which are Gait Real-time Analysis Interactive Laboratory (GRAIL) assessments undertaken in the Moto lab of Royal National Orthopaedic Hospital (RNOH). The review on functional assessments for pelvic sarcomas post-operatively will provide the theoretical basis for the subsequent data analysis part.

Results: Based on the literature review, the focus has been on specific age groups like adolescents with pelvic sarcoma and discrepancy present between outcomes obtained from objective assessment and Musculoskeletal Tumor Society (MSTS) and the Toronto Extremity Salvage Score (TESS). The data analysis will focus on filling this research gap and exploring gait and balance in this group of patients post-operatively.

Conclusion: This study is still in development and the data analysis part will be finished before the conference.
Long term follow up in a High-Grade Sarcoma of the arm encasing the Radial Nerve treated by ISP technique

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Abstract

INTRODUCTION: A combined technique of In-situ preparation and Adjuvant radiotherapy in a case of Undifferentiated Pleomorphic Sarcoma encasing the radial nerve was attempted successfully, which can be considered for the preservation of neurovascular structure close to soft tissue sarcomas for a good functional and oncological outcome.

METHODS: A 41 year old female diagnosed with Undifferentiated Pleomorphic Sarcoma of left arm underwent, Enbloc excision of the lesion along with preservation of encased Radial Nerve using In situ Preparation followed by Adjuvant Radiotherapy. Patient has good functional outcome and a local recurrence free and overall survival of 5 years.

RESULTS: Patient was followed up every 3 months for 1st year followed by every 6 months then after. MRI and PET CT were repeated at yearly interval ever since. At the end of five years, patient is disease free and has full range of motion at elbow, wrist and fingers. Her postoperative function at five years according to the Musculoskeletal Tumor Society was 27.

CONCLUSION: We reported a case of Undifferentiated Pleomorphic Sarcoma encasing the left Radial Nerve, an ISP technique and adjuvant Radiotherapy were successfully attempted for attaining a good functional and oncological outcome.

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Abstract

Introduction: Low-grade myofibroblastic sarcoma (LGMS) is a rare type of malignant lesion composed of myofibroblasts. It is an uncommon tumour of unknown etiology that mainly develops in the bone or soft tissue. We are reporting one such case which was presented to us following open biopsy and curettage from elsewhere.

Method: A 41 year old male patient presented with mildly expansile lesion of left shaft of femur with mild endosteal scalloping, underwent open biopsy, curettage and bone grafting from elsewhere. Post op HPE was s/o low grade myofibroblastic sarcoma, slides were review and the disease was confirmed, a PET CT was done to rule distant metastasis. Following which the patient underwent en bloc excision + ECRT autograft + plating.

Results: Patient was mobilised early and there was no post-operative complications. Toe touch weight bearing was started by 6 weeks and was gradually increased as he tolerated. Patient is being followed up every 3 months, clinically and radiologically. He is having satisfactory functional outcome based on MSTS score till the last follow up with a score of 23.

Conclusion: Low-grade myofibroblastic sarcoma (LGMS) is a rare type of tumour which more often than not, may be missed. Hence, any atypical lesion should be subjected to biopsy and a confirmatory result before initiating any treatment.

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Early outcomes of Allograft/Autograft prosthesis composite for reconstruction in lower limb tumors. A single institution study.

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Abstract

Introduction- Reconstruction after long tumor resection are challenging due to limited options available. Augmenting residual bone length with either allograft or autograft to enhance prosthesis fixation after long segment resection, provides a good option for avoiding a total bone replacement.

Methods- In order to analyse the short-term outcomes with a view to judge the efficacy of this technique, we retrospectively analyzed 20 patients operated between 2005- June 2021 at out institution for graft union, time to weight bearing and associated complications.

Patients in whom patient’s own bone was used as size matched autograft after sterilization (Extracorporeal radiotherapy/Cryotherapy), were also included in the study. Mean follow up duration was 28 months (range 1-69 months). In 13 out of 20 patients, more than 50\% of stem was in the augmented bone. Fixation with plate was done in 10 out of them to improve the stability. In remaining 3, allograft was telescoped with the host bone to improve stability.

Results- At a mean duration on 12 months, 11 graft united with host bone. Full weight bearing was started after a mean duration of 4.5 months (range 0-20 months). Five nonunion were noted. Seven patients died of disease and 3 were lost to follow up. We observed only 2 plate walkouts as complications related with this technique. Two patients under went revision to megaprosthesis and 1 ended up in amputation due to infection.

Conclusion- Allograft/Autograft prosthesis construct is therefore an acceptable option for reconstruction after long segment resection in lower limb.
Oncologic and functional outcomes after excision of proximal femur primary bone tumours and hemiarthroplasty.

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Abstract

Introduction: Proximal femur endoprosthetic replacement (PFER) has become a primary treatment option for proximal femur tumors allowing early weight bearing with improved functional status and implant survival. We present our experience in these cases with respect to oncological outcomes, functional outcomes and implant survival.

Methods: 137 patients (97 males, 40 females) with a mean age of 29 years (5–69) were operated between January 2006 and December 2018. Median follow up was 88 months (1-167). Osteosarcoma (29), Ewing's (50), chondrosarcoma (44), Synovial sarcoma (1) and GCT (13). Musculoskeletal Tumor Society score (MSTS), recurrence free survival, overall survival, and implant survival were evaluated.

Results: 17 patients underwent revision surgery, 13 for mechanical - stem loosening (3), dislocations (6) and implant failures (4), infection (4) and 2 patients underwent amputation for local recurrence. At median follow-up of 88 months 10 lost to follow up. 44 patients had died (39 due to disease and 5 due to other causes) and 83 are alive. There were 5 local recurrences, 31 distant recurrences, 11 had both. The 5 year OS, LRFS, DRFS were 70.2, 85.8, 63.8% respectively. The mean MSTS was 26.4 (22 – 28). Overall implant survival was 89% at 5 years. 5-year survival of indigenous RESTOR prosthesis is 88% and imported prostheses were 91%.

Conclusions: PFER is a durable procedure, oncologically safe and provides adequate functional recovery, with minimal complication rate and acceptable implant survival. This series is one of the largest across the globe, largest in the country, proved that the indigenous implant with an affordable price performs equally better with imported implants in proximal femur reconstructions, an advantage which can be utilized by developing nations across the world.
Proximal femur replacement after excision of primary bone tumors in children - Do they behave different compared to adults?

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Abstract

Introduction: Endoprosthetic replacement for proximal femur tumors is well established in adults, but its efficacy in pediatric age group is uncertain. Use of smaller implants, lack of adequate soft tissue, subsequent acetabular hypoplasia, may lead to high rate of revision surgeries. We present our experience in these cases (<18yrs) with respect to oncological outcomes, functional outcomes and implant survival.

Materials and Methods: Cases were retrieved from our prospectively maintained surgical database. 46 patients (27 males and 19 females) with a mean age of 14 years (range 5 – 18 years) were operated between January 2006 and December 2018. The diagnosis included osteosarcoma (13), Ewing’s sarcoma (33). 8 patients had complications. Recurrence free survival, overall survival, implant survival, MSTS were evaluated.

Results: Mean resection length is 17cm (12 – 25cm). 6 patients underwent revision surgery, 4 for dislocations, 2 for infection. 2 had persistent instability. At mean follow-up of 50 months (Range, 4-167 months) 20 patients had died due to disease and 25 are alive. There was one local recurrences, 16 distant recurrences 6 had both. The 5year OS, DRFS, LRFS were 57.1%, 53.5%, 77.2% respectively. The mean MSTS score was 26 (22 – 28). The implant survival was 74.8% at 5 years. On radiological assessment the mean lateral translation is 6% and superior translation is 5.75mm. The mean increase in medial joint space was 1.2mm, with no much observable change in superior joint space.

Conclusions: Proximal femur prosthetic replacement in children is a good option for limb salvage especially in elder children above 11 years with acceptable implant survival and complication rates.
SARCOSIGHT: A Randomised-Control Trial of Fluorescence Guided Sarcoma Surgery Versus the Standard of Care

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Abstract

Introduction:

Sarcomas are rare, aggressive cancers which can occur in any region of the body. Surgery is usually the cornerstone of curative treatment, with unexpected positive margins associated with increased local recurrence and decreased overall survival. Indocyanine green (ICG) is a fluorescent dye which following intravenous administration accumulates in sarcoma tissue and can be imaged intraoperatively using handheld near-infrared cameras, theoretically helping guide the surgeon’s resection margins. We have secured a £1.45 million grant to run a randomised-controlled trial of fluorescence guided surgery (FGS) versus standard resection for sarcoma.

Methods:

We will conduct a prospective, 2 arm, randomised, open label, multi-centre trial. Patients with intermediate/high grade bone or soft tissue sarcomas at 19 centres across the United Kingdom, excluding visceral, intra-cranial or retro-peritoneal sarcomas, will be eligible for the trial. Over a 30-month period, 500 patients will be randomised at a ratio of 1:1 to either conventional surgery or FGS. Sub-studies will be conducted to evaluate the role of ICG in histopathological assessment of sarcoma samples, as well as the use of artificial intelligence to improve the application of FGS.

Results:

We will compare the unexpected positive margin rates between the 2 groups as our primary outcome. As secondary outcomes, we will report complication rates, local recurrence and overall survival, as well as patient reported outcome measures and functional scores.

Conclusions:

We hope to demonstrate a reduction in the unexpected positive margin rate with the use FGS for the resection of intermediate/high grade sarcomas, thus changing practice in sarcoma management.
Gait kinematics of sarcoma patients at 1-year post-operative internal hemipelvectomy surgery: A retrospective study

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Abstract

Introduction:
Gait deviations are common in sarcoma patients who undergo internal hemipelvectomy (IH) surgeries. To assess the effectiveness of the surgery and rehabilitation, the examination of gait deviations in these individuals is crucial. Gait analysis helps in detecting these deviations but, produces a significant volume of graphs that requires intricate interpretation. The Gait Profile Score (GPS) and the Gait Variable Score (GVS) were developed in order to summarize the kinematic gait data and simplify the understanding of these results. The main purpose of this study was to quantify gait deviations in IH patients using novel measures.

Methods:
This was a retrospective cross-sectional pilot study of 10 patients who had an IH surgery between 2018 to 2021. All the patients had undergone gait analysis at the gait lab, a year after their surgery. Their kinematic gait data was used to calculate the GPS and GVS values. A reference GPS value was calculated from the database using the kinematic data of healthy individuals. These scores were then compared using the Mann-Whitney U test. The GPS and gait speed of the patients were correlated using Spearman’s rank correlation coefficient. 7 of the 10 patients also filled out the TESS questionnaire. Spearman’s correlation was used to investigate the correlation between the GPS and TESS scores.

Results:
The results of this study suggested that there was a statistically significant difference in the GPS values of the IH patients and the healthy individuals (p<0.01). The GVS values for all parameters were deviated from the reference ranges when compared with the GVSs of healthy individuals. The correlations between the GPS and gait speed showed an insignificant negative correlation (r= -0.465, p= 0.176). An insignificant negative correlation (r= -0.679, p= 0.09) was found between the GPS and TESS scores.

Conclusion:
It was found that the GPS in the patients who underwent IH was higher than the healthy individuals, suggesting gait abnormalities in the patient group. The GVS further helped this understanding by emphasizing that the hip, pelvis, knee, and ankle were all compensating for the gait deviations. The gait speed of the IH patients was slower compared to healthy individuals. The GPS and the TESS scores when used in combination may provide clinicians with the objective as well as the subjective functional outcomes of a patient. However, studies with a larger sample size are needed to confirm our findings and develop these novel outcome assessments further to apply to clinical practice.

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The role of surgery and the impact of Renal Cell Carcinomas bone metastasis in patients with risk of severe skeletal-related events.

Dr Mihnea Ioan Gabriel Popa1,2, Dr Adrian Cursaru2,1, Dr Sergiu Iordache1,2, Dr Bogdan Cretu1,2, Dr Bogdan Serban1,2, Prof Catalin Florin Cirstoiu1,2

1 UMF Carol Davila, Bucharest, Romania. 2 University Emergency Hospital, Bucharest, Romania

Abstract

Introduction:
Renal cell carcinomas (RCC) are cancers of the renal tubule epithelium. One in three instances of kidney cancer in adults is due to this form of malignancy. In the course of RCC, bone metastasis is a frequent and deadly complication. The osteolytic nature leads to pathological fractures and, as a result, high morbidity and death in patients.

Methods:
The clinical and medical records of RCC patients with sBMs were collected. The gender, age, time of BM, the extent of BM, the number of BMs, the presence or absence of visceral metastasis, and the pathological type of BM were investigated. Overall survival (OS) was calculated from the date of BMs diagnosis to death or last follow-up using Kaplan-Meier method and modelled with Cox regression analysis.

Results:
A total of 49 RCC-BM patients were enrolled with the gender ratio (male:female) of 3:1, mean age of 65.32 years, and all present of osteolysis bone lesions 39.7% of them had synchronous bone metastasis and 23.5% had multi-organ metastasis. The common sites of bone metastasis were vertebra (39.5%), pelvis (31.2%) and long bones (22.3%). Incidence of severe skeletal-related events was 47.1%. The median overall survival time was 51 months for all and 34 months for those in unfavorable risk stratification.

Conclusion:
Even when systemic chemotherapy is helpful for metastases in other organs, bone metastasis is a poor prognostic indicator for metastatic RCC. It can increase despite the administration of systemic chemotherapy. Larger bone lesions produce SRE and have a bad prognosis.

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Primary aneurysmal bone cyst and its recent treatment options: a comparative review of 74 cases

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Abstract

(1) INTRODUCTION: Aneurysmal bone cyst (ABC) is a benign, locally aggressive tumor. Different treatment modalities are described in the literature i.e. en bloc resection, intralesional curettage or percutaneous sclerotherapy. (2) METHODS: This single-center study is a review of 74 patients with primary ABC who underwent a surgical treatment or polidocanol instillation. Cyst volume measurement on MRI and conventional radiographs is compared. (3) RESULTS: The mean pre-interventional MRI-based cyst volume was 44.07cm³, the mean radiographic volume was 27.27cm³. The recurrence rate after intralesional curettage with need of further treatment was 38.2% (13/34). The instillation of polidocanol showed a significant reduction of the initial cyst volume (p<0.001) but a persistent disease occurred in 29/32 cases (90.6%). In 10 of these 29 cases (34.5%) further treatment was necessary. After en bloc resection (eight cases) a local recurrence occurred in two cases (25%), in one case with need of further treatment. (4) CONCLUSIONS: MRI scans are superior to biplanar radiographs in the examination of ABCs. Sequential percutaneous instillations of polidocanol are equally effective in the therapy of primary ABCs compared to intralesional curettage. However, several instillations have to be expected. In a considerable number of cases a conversion to intralesional curettage or en bloc resection can be necessary.

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Abstract

Introduction: to present statistics and results of osteosarcoma patients treatment in Ukraine, to show the possibilities of combined limb salvage treatment in accordance with modern protocols.

Methods: according to the Ukrainian National Cancer Registry, 389 new confirmed cases of all primary malignant bone tumors were registered in 2020. 329 in adults and 60 in children. The incidence rate of osteosarcoma was 0.9 cases per 100 thousand population, including 1.1% per 100 thousand male, 0.7% per 100 thousand female. Mortality rate counted 0.5% per 100 thousand. The diagnosis of osteosarcoma was established in 195 patients (50.1%). 64.1% of primary cases underwent special treatment only.

Results: The American Joint Committe on Cancer Staging System for primary malignant tumors of Bone diagnoses, 6th edition, 2002 was used. The main treatment protocol is the Scandinavian Sarcoma Group SSG XIV, 2001. For local control in the specialized centers of Ukraine, limb salvage surgical techniques were used in 90.4% of the cases. The most common surgery was modular arthroplasty (in adults - 94.7% of all reconstructions, in children - up to 75.0%). Modular and individual endoprosthetic systems were used.

Conclusions: 5-year event-free survival rate was 56.6% for the non-metastatic osteosarcoma and 23.6% for the metastatic disease. Overall 5-year survival rate after detection of lung metastases and metastasectomy + 2nd line chemotherapy was 35.6%.
Outcomes of tenosynovial giant cell tumour of the foot and ankle

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Abstract

Introduction

Tenosynovial giant cell tumour (TGCT) is a benign proliferative disease affecting synovial membranes. There are two forms, localised and diffuse, which although histologically similar are managed differently. It is locally invasive and is treated in most cases by operative excision. The aim of this study was to assess outcomes and present a management algorithm from the largest single-centre experience to date.

Method

A retrospective analysis of 123 cases was performed in patients treated between 2003 and 2019 with TGCT of the foot and/or ankle. Data was collected on age at presentation, treatment provided and recurrence rates. The minimum follow-up was 2 years with a mean of 7.7 years.

Results

85 (69.1%) cases were categorised as localised and 38 (30.9%) were diffuse. Half of the cases presented in the ankle (62/123, 50.4%). 89% (110) of patients underwent open operative excision of the lesion. Radiotherapy was used in 2 cases for recurrent disease. Pain was the most common postoperative symptom which developed in 20% (22/110) of cases). 13 cases were managed nonoperatively where symptoms were minimal, with one case requiring surgery at a later date. Disease recurrence was 3.5% (3/85) in localised disease and 36.8% (14/38) in diffuse disease giving an overall recurrence rate of 13.8% (17/123).

Conclusions

The outcomes of TGCT management are dependent on the type of disease, the extent of preoperative erosive changes and the presence of pre-operative pain. We present a summary of recommended management based on the experience from this single tertiary centre
New technique of allograft acetabulum reconstruction due to malignant bone tumours

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Abstract

Introduction: reconstruction of pelvic after malignant tumour resection remains a major challenge in orthopaedic oncology surgery. The objective of this study was to evaluate the clinical and functional outcome after limb salvage surgery and new technique of allograft reconstruction following the pelvic type II and type I + II resection.

Methods: The files of 12 patients with malignant pelvic bone tumours, who underwent surgical resection at Sytenko Institute between 2016 and 2021, were retrospectively analyzed (9 chondrosarcoma, 2 osteosarcoma, 1 Ewing's sarcoma). All patients underwent pelvic tumour resection and allograft + attachment “Trevira” tube reconstruction. The mean age was 38 years (range, 10–56). We elaborated techniques, functional outcome and complications following the new procedure in 1 to 5 years follow up.

Results: All 12 patients received a non-structural allograft bone reconstruction. Deep infection was successfully treated by wound revision and debridement. X-rays images show good periacetabulum bone formation from 12 to 60 month after surgery. The average MSTS functional score was 68 % (range, 54–96 %). All patients walked with or without any assistive device.

Conclusions: On the basis of the clinical and functional outcome, our “chips” allograft reconstruction technique seems to be a reliable for treating patients with malignant periacetabulum bone tumours. Early promising results were reported in our 12-cases series. We recommend the use of new method of pelvic acetabulum allograft that can restore the anatomy and provide good functional results. However, longer period of follow up and larger number of cases treated are needed.
Bioactive ceramics in the treatment of benign bone tumours and tumour-like lesions

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Abstract

Introduction: benign bone tumors and tumor-like lesions are the very common pathology, which in most cases affects young patients. According to pathomorphological classification, there are bone, cartilage, fibrous and cystic neoplasms. To address the issue of treatment tactics, the main aspects are the surgical gradation of these tumours (Grade 1, 2, 3) and tumour activity according to Enneking (latent, active or aggressive). In any case, the bone defect replacement should always allow the fastest restoration of the limb and joint function, and biological reconstruction with the structure restoration.

Methods: we have provided an analysis of the treatment results 34 patients with benign tumours and tumour-like lesions, aged 6 to 44 years, for the period 2017-2021. Nosological distribution of pathology was: aneurysmal bone cyst, fibrous dysplasia, benign giant cell tumour, chondroblastoma. The follow-up is from 6 months to 5 years after surgery.

Results: using bioactive ceramics based on bone cement "CalCemex" 100% positive clinical results were obtained with full preservation of limb and joint function, early full weight bearing, complete biological and anatomical reconstruction of the bone defect area.

Conclusions: bioactive ceramic "CalCemex" combines osteoconductive properties due to β-tricalcium phosphate and mechanical properties of PMMA-bone cement. This unique combination of micro-macro-porosity of the reconstructive material allows to obtain in the process of restructuring the complete replacement and restoration of bone tissue. The main aspect of the use of "CalCemex" is a verified diagnosis, unconditional surgical technical performance of the surgery and the choice of indications for this surgical procedure.
Aneurysmal bone cysts: a UK-wide tumour centre experience

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Abstract

Introduction

Aneurysmal bone cysts (ABCs) are benign, locally aggressive lesions. There is uncertainty around the optimal management strategy for preventing recurrence and minimising complications. This retrospective multi-centre series reports on the presentation, treatment and outcomes of patients presenting with extra-spinal ABCs and aims to identify risk factors for treatment failure.

Methods

Cases of extra-spinal ABCs treated within seven collaborating tumour centres from January 2015, with over 12-months follow-up were included. Study data was collected from clinical records and relevant imaging. Risk factors for treatment failure were studied using a logistic regression model for multivariate analysis.

Results

132 patients were suitable for inclusion. Median age at presentation was 13 years and median follow-up was 27 months. 86 patients underwent surgical curettage, of which 28 (33%) required further procedures for recurrence/persistence. Curopsy (biopsy with limited percutaneous curettage) was performed on 31 patients from a single centre, of which 16 (52%) required further procedures for recurrence/persistence. Nine underwent injection therapy, one underwent surgical resection, one received Denosumab therapy and four did not receive any formal treatment. Patients under 10 years of age (OR 3.5, p = 0.011) and those with secondary ABCs (OR 6.1, p = 0.046) were found to be at a higher risk for recurrence/persistence.

Conclusions

Recurrence or persistence of ABCs following any form of treatment is high. Surgical curettage appears to offer the best success rates following a single intervention. There are advantages to less invasive approaches, but further prospective research is required to understand if their benefits offset the requirement for multiple treatments.
Local treatment of Ewing sarcoma; no benefit of adjuvant radiotherapy for tumors resected with a wide surgical margin

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Abstract

Background: Most studies have shown that surgery is the preferred local treatment for Ewing sarcoma (ES) due to improved local control compared with radiotherapy (RT) or only systemic therapy. Nonetheless, radiotherapy has a pivotal role in local treatment of ES, either as an adjuvant, or definitive treatment. However, it is not known how RT reduces local failure with regards to surgical margin. It is also debatable how well local control can be achieved with definitive RT.

The aim of this study was (1) to investigate the role of RT in reducing local failure among surgically treated patients: (2) to investigate the risk for local failure in patients treated with definitive RT.

Methods: This was a nationwide population-based retrospective register study. The cohort consisted of all patients with a tumor classified as a member of the Ewing family of tumors registered in the Swedish Childhood Cancer Registry during the period January 1st, 1982-June 1st, 2017. Individual charts were assessed if there were any uncertainties regarding exposure or outcome.

Results: Only 18/205 (17%) patients were treated locally with radiotherapy alone. Ninety-seven (47%) patients were treated exclusively with surgery. Patients treated with surgery alone had less often metastasis at diagnosis (10%) compared to patients treated with RT alone (32%) or surgery with RT (31%). Local failures were observed in 37 (16%) of the patients. The failure rate at 5 years was 28% for patients treated with definitive RT and 11% for patients treated with surgery alone (P<0.05). The local recurrence-free survival rate was only 47% at 20 years for patients treated with RT alone.

5-year local recurrence-free survival rates were 91% and 69% for patients with wide and marginal margins respectively (p<0.05). Nevertheless, there was no difference in local recurrence-free survival rate among patients who had a wide margin and patients with a marginal margin who also received RT (p=0.27).

Adding RT to patients with a wide surgical margin did not improve the local control rate (p=0.33). Moreover, there was no difference in local control rate for patients with intralresional margins with or without RT.

The 10-year overall survival rate for patient was 23% and 66% for patients with and without a local relapse respectively (p<0.05).

Conclusion: This study supports aggressive local treatment with surgery striving for wide margins to achieve local control, which again is essential for improved survival. If only marginal margin is obtained, adjuvant RT should be given. This study could not prove any benefit of adding RT for patients with a wide or intralresional margin.
Fourty-year experience with primary bone sarcoma local control surgery: A retrospective review of limb salvage, rotationplasty and amputation outcomes

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Abstract

Introduction

Surgical resection is critical in the local control of primary bone sarcomas. Many patients are candidates for limb salvage reconstruction whereas amputation was the only option in the past. Our aim is to provide comparative outcomes data for complications, infection and recurrence following limb salvage, rotationplasty or amputation.

Methods

A retrospective review was performed of patients with primary bone malignancies of the lower extremity who underwent surgery between 1980 and 2019, with minimum of two years of follow-up. Cohort classifications were limb salvage, rotationplasty or amputation. Characteristics were compared across treatment groups using analysis of variance, Kruskal-Wallis tests, or chi-squared tests, as appropriate. Recurrence and complication rates were estimated using 95% confidence intervals and compared across groups using chi-squared tests.

Results

Of 177 patients in this study, 143 (81%) underwent limb salvage surgery, 18 (10%) rotationplasty and 16 (9%) amputation. Complications were experienced in 10.1%. All occurred in the limb salvage group. The infection rate was 33.6%. There were more infections in the limb salvage cohort. 78% of the limb salvage patients required surgery for infection, whereas 75% of rotationplasty patients required antibiotics only. The local recurrence rate was 21.8%. No difference was detected across primary treatment groups.

Conclusion

Despite limitations of the study, having data for forty years of consecutive patients provides some of the longest follow-up outcome data in the literature. The results support the use of rotationplasty and amputation as local control approaches with similar local recurrence and fewer complication and infection rates than limb salvage.
3D-printing and computer navigation in preoperative planning and surgical management of soft tissue sarcoma.

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Abstract

Introduction: The long-term outcomes of soft tissue sarcoma have improved in the past decades. Nevertheless, patients with metastases and recurrence still have poor prognosis. Computer navigation surgery and 3D printing have become more usable for the benefits they bring in the preoperative planning and the precision they offer during surgery. Surgeons typically rely on their training, experiences and visual aids from medical imaging for surgery planning. Often, due to the anatomical complexity of soft tissue sarcomas, two dimensional and virtual images are not sufficient to convey the structural details. For such scenarios, a 3D printed model of the tumor and the surrounding anatomical structures enables a more accurate preoperative planning. Also, due to the challenges of the surrounding anatomy of soft tissue sarcomas, it has been reported that the probability of achieving a 1 cm surgical margin in all three planes of the tumor is only 50%, leaving a sequela of inadequate resection, important local recurrence rates and diminished overall survival. In response to these factors and in the attempt to minimise the incidence of inadequate resection margins in soft tissue sarcomas, the use of computer navigation in the surgical management is an important tool. Method: This single-center retrospective review included 12 patients who underwent soft tissue sarcoma tumor surgery using 3D-printed models of the tumor and the anatomical surrounding structures for preoperative planning and computer navigation for the surgical resection. Clinical information was collected regarding patient demographics, tumor characteristics, pathologic diagnosis, surgery details, and functional recovery. Results: Wide resection surgery was performed in every patient. Using 3D-printed real scale models of the tumor and the surrounding anatomical structures for the 12 patients, preoperative planning was developed. All the bone, vascular, neurological and muscular structures around the tumor were carefully studied. The 12 patients underwent 3D-printing-assisted surgery planning followed by computer navigation surgery. No technical problems were reported. All margins were defined negative. Infection was the most prevalent complication (2/12). No local recurrence was reported at 12 and 18 month follow up. Conclusion: The innovative technology not only assists the medical staff but is also beneficial for the patients because the medical problems, which were not curable in the past, are now possible with modern technology. The use of 3D printing and computer navigation for the planning and resection of soft tissue sarcoma allows accurate identification of the local anatomy and can define the extent of the tumour and proposed resection margins.
Characteristics and therapy of CIC-sarcoma - a comparison to classical Ewing sarcoma

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Abstract

Introduction

Undifferentiated round cell sarcomas involving the CIC gene-locus are rare entities and no optimal treatment strategy is defined.

Methods

The EWING-2008 study (EudraCT 2008-003658-13), the iEuroEWING registry (DRKS 00023469) and the tumor-registry of the West German Cancer Centre Essen have reported 26 cases of CIC-translocated tumors since 2010. In our retrospective study, characteristics and treatments were analyzed in comparison with classical Ewing sarcomas using data from the EURO-E.W.I.N.G. 99 and EWING-2008 studies (n=1625).

Results

In CIC-sarcoma diagnosis was made predominantly (61.5%) by CIC-FISH. Advanced analyses obtained CIC-DUX4 (n=11) and CIC-FOXO4 (n=1). Metastases at diagnosis were reported in 12/26 (46.2%) CIC-sarcoma vs. 489/1625 (30.1%) in classical Ewing-sarcoma (p=.082). All patients received chemotherapy, 88.5% analogous to EWING-2008. In 10/26 (38.5%) cases progression during first-line treatment was reported, of them 9 had metastatic disease at diagnosis. Early relapse was diagnosed in 6/26 (23.1%) patients (4/6 localized and 2/6 metastatic). Metastatic CIC-sarcoma showed inferior 3-years-OAS (0.22 vs. 0.50, p<.0001) and 3-years-EFS (0.17 vs. 0.34, p<.0001) compared to metastatic classical Ewing-sarcoma. In comparison, 3-years-OAS was 0.69 vs. 0.85 (p<.0001) and 3-years-EFS was 0.59 vs. 0.74 (p<.0001) for localized patients. In multivariable survival analysis, patients with CIC-sarcoma had a Hazard-Ratio of 2.11 (1.17-3.81, p<.050) after adjustment for age and initial tumor spread compared to Ewing-sarcoma.

Conclusion
Metastases at diagnosis is a main prognostic factor in CIC-sarcoma. Survival was inferior when compared to classical Ewing-sarcoma after adjusting for risk factors. Structured registration in clinical trials or registries and international collaboration are recommended to improve the outcome.
The use of three-dimensional (3D) imaging allows for virtual reality workspace generation. The most investigated fields have been neurosurgery and laparoscopy. However, fewer applications have been reported for orthopedic surgery. Even fewer applications have been reported for orthopedic oncology. Here, we investigated and developed musculoskeletal tumor surgery planning and anatomical characteristics using virtual reality. Also, we performed 3D virtual surgery in the enrolled patients. Patients undergoing surgery for musculoskeletal tumors (n=15) between August 2019 and February 2022 were enrolled and presurgically subjected to computed tomography (CT) and magnetic resonance imaging (MRI). Imaging data were transferred, integrated, and segmented using 3D Slicer software to produce patient-specific virtual anatomical 3D models. These models were imported into Blender software for further processing. The final processed 3D models were exported to Oculus Quest 2 hardware device for performing virtual surgery (simulation and visualization of musculoskeletal tumors and its anatomical surroundings). The presurgical 3D anatomical reconstructions and intraoperative anatomical characteristics (virtual versus actual data) and surgical approach (virtual versus actual situation) measurement and subjective appearance were compared. Results: Anatomical characteristics in the surroundings of the tumor and tumor diameters in all 3 planes (superior-inferior, medial-lateral, and anteroposterior) were consistent between virtual and real data (3.61 ± 1.03, 1.54 ± 0.93, and 1.93 ± 0.73 vs. 3.62 ± 1.13, 1.51 ± 0.84, and 1.89 ± 0.71; respectively). Nevertheless, some virtual surgical situations were inconsistent with real intraoperative situations, leading to minor complications. Resolutions of the original imaging (CT and MRI), directly correlated with 3D simulation quality, with soft tissues most poorly represented when compared with bone. Soft tissue tumor imaging quality in 3D varied extensively by tumor type while bone tumor regularly maintains good quality. Conclusions: Musculoskeletal tumors and the anatomical surrounding structures can be reconstructed using the described system (or any virtual reality system) with good accuracy in the case of simple fenestration, increasing treatment individualization, surgical competence level, and potentially reducing intraoperative complications. However, further development of virtual reality tools for the use in orthopedic oncology applications that involve specialized tools and procedures, such as wide margin resection of soft tissue malignant tumors, are needed.
Proximal fibula resection for tumors - case series and technical note

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Abstract

Introduction
The resection of aggressive or malignant tumors of the proximal fibula includes removal of the lateral collateral ligament (LCL) and biceps femoris muscle (BFM) attachment. There is no standard technique on how to reconstruct the posterolateral knee stability. This study’s aim is to evaluate the surgical reconstruction technique in terms of objective and subjective functional outcome.

Methods
A series of 7 patients received a proximal fibula resection and reconstruction using suture anchors reattaching the LCL and BFM to the lateral tibia between 2019 and 2022 at our department. Five female and two male (range 22-59 years at index operation) were followed up to a minimum of 4 months (range 4-29). The postoperative knee flexion strength and lateral joint stability were objectively measured and compared with the contralateral knee (X-ray stress tests, flexion power). Subjective outcome (MSTS-Score) and postoperative complications were assessed.

Results
The subjective outcome was very good (MSTS-Score 26.6/30). No lateral instability could be observed in the stress tests. The knee flexion strength was 19.2% less than the contralateral side. Two patients reported postoperative peroneus paresis; one of them fully recovered after 16 months, the other still had the intermediate need for a support. No other postoperative complications were detected.

Conclusions
The described surgical technique seems to provide very good functional outcome. Our results show that the LCL and BFM reattachment through suture anchors could allow lateral joint stability and adequate knee flexion strength. Anatomical challenges und possible postoperative complications must always be considered.
Mid-term results of modular noninvasive expandable endoprosthesis after bone tumor resection in skeletal immature patients.

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Abstract

Introduction: Mechanical expandable prosthesis offered a very reliable solution for leg length discrepancy after tumor resection in children and adolescents. However, they are associated with high rate of periprosthetic joint infection. New generation, non-invasive modular endoprosthesis are currently used. The purpose of this study is to assess the clinical, oncological, and functional outcome after musculoskeletal tumor resection and reconstruction using non-invasive expandable endoprosthesis, in pediatric patients.

Materials and Methods: Between 2005 and 2020, 20 pediatric patients with bone sarcoma of the lower extremities, were treated using noninvasive expandable prosthesis (Stanmore in 11 patients and MUTARS in 9 patients). Fourteen (70%) male and 6 female patients, with 2-year minimum follow-up were retrospectively reviewed. The mean age was 11.6 years, at the time of the surgery. Nine patients (45%) were diagnosed with osteosarcoma and 11 with Ewing sarcoma.

Results: In twelve patients (60%), the tumor was located in distal femur, in 7 patients (35%) in proximal tibia and in one patient (5%) the tumor was located in proximal femur. Post-operative complications included: knee stiffness in 5 patients, periprosthetic joint infection in 3 patients, mechanical failure of the expand mechanism in 2 patients, and periprosthetic fracture after fall in 1 patient. Six patients required reoperation (above knee amputation was required in two patients with periprosthetic joint infection). The overall mean gaining leg length after the finish of the lengthening process was 12 cm.

Conclusion: Noninvasive expandable prosthesis consists an effective reconstructive option after bone tumor resection in skeletal immature patients, offering very satisfactory clinical outcomes and restoration of leg length. Periprosthetic infection and knee stiffness are the main complications.
What is the complication rate in total femur replacement? Case series

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Abstract

Introduction

Total femur replacements (TFR) are very rare. This complex surgery includes not only replacement of the whole bone, but also reconstruction of the hip and knee joints, as well as soft tissue reconstruction for function and joint stability. Aim of this single center retrospective analysis is to report the surgical and oncological outcome as well as postoperative complication rate after TFR.

Methods

Twenty patients received a TFR due to oncological or non-oncological indications at our department between 1990 and 2022. Eleven female and nine male, aged between 4 and 78 at index operation, were included.

Results

Fifteen cases had an oncological indication: Ewing-Sarcoma (n=7), Osteosarcoma (n=4), Thyroid-Carcinoma Metastases (n=1), Pleomorphic-Sarcoma (n=1), Myxofibrosarcoma (n=1), Liposarcoma (n=1); eleven of this cohort were primary implanted TFRs. Seven were expandable-TFRs in skeletally immature patients. In total 14/20 patients developed complications requiring revision-surgery; hip-enucleation was performed in 5/20 cases. Complications included infection (11/20, 55%), aseptic loosening, knee contracture, luxation, argyrosis. Overall survival 16/20 patients (two patients DOD 2 years after TFR-surgery, and two died of other causes); survival with limb 12/20.

Conclusions

The morbidity, mortality and outcomes after TFR in our collective are comparable to those reported in prior literature, showing high complication and revision rates. To our knowledge, there is no literature regarding further specific functional analysis including gait analysis. A multicentric study analyzing larger cohort, with clinical, oncological, surgical und functional outcomes including gait analysis is planed, which will provide further insight about performance of TFR.
Custom cutting jigs in internal hemipelvectomy: safe and cost effective

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Abstract

Introduction:

Custom cutting jigs and 3D models are designed to facilitate more effective pre-operative surgical planning and achieve a more predictable bone margin in complex pelvic sarcoma surgery. This study aims to assess whether they are safe and cost effective.

Methods:

All internal hemipelvectomies between 2017 and 2022 were identified via a histology database (total 54). Nineteen ‘jig’ patients were identified, 13 met the inclusion criteria. These were compared to 13 ‘non-jig’ patients.

Data was collected on patient demographics, diagnosis, operative metrics, length of stay and complications.

Results:

The non-jig to jig male:female ratio (1:0.4 vs 1:0.6) and mean age (41.6(11-73) vs 40.6(7-66) years) were similar. Operative time (372 (140-477) vs 335 (180-630) mins), mean blood loss (2927 (200-8000) vs 3377 (2200-6500) ml), transfusion requirements (5.1 (1-10) vs 6.5 (4-12) units), postoperative ICU stay (1.6 (1-5) vs 3.1 (1-11) nights), overall stay (38.1 (5-134) vs 41.3 (10-87) nights), major complications (9 vs 11) and positive margins (0 vs 3) were lower in the jig group.

Cost analysis was conducted using average NHS costs. 3D model and jig manufacture costs approximately £2500 per patient. The cost saving (blood product requirements and admission costs) per patient is £3140.

Conclusion:
The results demonstrate that the use of the 3D-printed model and cutting jig is safe, with no positive margins and an improvement in all measured domains. They are also shown to be cost-effective with a small cost saving of £640 per patient.
Unplanned excision of soft tissue sarcomas of the hand and the wrist

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Abstract

Excisional biopsy for soft tissue sarcomas (STS) is a common treatment strategy for many patients with masses of the hand and the wrist. The inappropriate preoperative evaluation and staging frequently leads to excisions with contaminated margins. Most of these patients are undergoing a supplementary surgical excision using complex reconstruction methods. The purpose of this study is to assess the clinical, oncological and functional outcome of these patients after definite surgical treatment.

Material: Between 2014 and 2020, 24 patients (14 male and 10 female), mean age 52 ± 12 years, were referred to our department, after unplanned excision of a STS of the hand and wrist. All patients had at least positive microscopic tumor margins after the initial surgical procedure. The minimum follow-up period was 24 months.

Results: Epithelioid sarcoma was the most common diagnosis, after the final biopsy, followed by fibrosarcoma and synovial sarcoma. 30% of the patients underwent tumor resection without pre-op imaging and in 50%, the surgery was performed under local anesthesia. 20 patients (83%) underwent limb salvage surgery with tumor bed re-excision, while amputation was performed to 4 patients. Negative resection margins were achieved in 23 out of the 24 patients. Microsurgical techniques for wound reconstruction were used for soft and bone tissue defects in 12 patients (70%). Wound healing complications developed in 2 patients, successfully treated. Regional node or lung metastatic disease developed in 4 patients (16.5%). The mean DASH score, was 24.2 points (range 9.2-79.2).

Conclusion: Unplanned excisions of the hand and wrist STS results in a relative high amputation rate. Tumor bed re-excision, can offer satisfying oncological, clinical and functional outcome. Microsurgical techniques are frequently needed for reconstruction of tissue and functional defects with a low complication rate.
Surgical Treatment of Sacral Chordomas. A Retrospective Study of 26 cases

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Abstract

Introduction:

Surgical treatment of sacral chordomas remains challenging and is associated with increased rates of local recurrence and complications. The objective of this study is to determine the overall survival, local recurrence, complications in patients undergoing en bloc resection of primary or recurrent sacral chordoma.

Methods:

The authors retrospectively reviewed all patients who underwent en bloc resection of sacral chordoma at one institution and by the same surgical team. From 2005-2021, there were 26 patients: 15 male and 11 female. Twenty-three patients (Group A) had a primary chordoma and 3 patients (Group B) had a recurrent chordoma initially treated elsewhere. Overall, 22 patients had partial sacrectomy and 4 total sacrectomy and spinopelvic fixation. A combined anterior and posterior approach was used in 11 patients and a posterior alone approach in 15. Colostomy was done in 8 patients. Negative margin resection was done in 19 patients, marginal contaminated in 4 and intralesional in 3. Soft tissue reconstruction was necessary in 8 patients. Demographic, perioperative, and complication data were collected. Outcomes included: overall survival, local recurrence, and complications.

Results:

The median follow-up was 6 years (12 months-15 years). At the latest follow up, 4 patients were dead (15%): 3 died from complications related to the disease, and one from unrelated reasons. Local recurrence occurred in 6 patients at a mean time of 3 years. All these 6 patients had chordomas above S2 with significant intrapelvic and soft tissue extension; 3 patients had one or more reoperation and all 6 had radiation therapy. Three (3) alive patients had distant metastases (osseous in 1, soft tissues 1, lung 1 patient). Of the 22 alive patients, 19 were able to ambulate without any support, 2 used a cane and one wheelchair. Major complications in 10 patients (38%) included wound related problems in 7 patients, deep infection in 1, flap necrosis in 1, hardware failure in 1 patient, and late bowel rupture and fistula in 1 patient. A negative margin resection was associated with a significant decreased risk of local recurrence. The mean survival was 82 months (9 – 180 months).

Conclusions:

Most sacral chordomas below S2 are feasible to complete resection with low recurrence rate. Negative margin resection is associated with decreased local recurrence. Perioperative complication rate is high. Despite the perioperative morbidity, most patients have a favorable the long-term clinical outcome after surgical resection of sacral chordomas.
The Safety and Efficacy of Tranexamic Acid in Oncology Patients Undergoing Endoprosthetic Reconstruction and a ROTEM-Based Evaluation of Their Hemostatic Profile: A Pilot Study

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Abstract

Introduction: An endoprosthetic reconstruction in musculoskeletal oncology patients is associated with significant blood loss. The purpose of this study is to evaluate the safety and efficacy of tranexamic acid (TXA) for these patients and to assess any changes in their hemostatic profile using rotational thromboelastometry (ROTEM).

Methods: A retrospective observational study was performed including 61 patients with primary or metastatic bone tumors who underwent surgery. Group A (n = 30) received both intravenous and local TXA whereas Group B (n = 31) was the control group. The primary outcomes were perioperative blood loss and blood unit transfusions and the secondary outcomes included the incidence of thromboembolic complications and a change in blood coagulability as reflected by ROTEM parameters.

Results: The median difference in blood loss between the two groups was 548.5 mL, indicating a 29.2% reduction in the 72 h blood loss following TXA administration (p < 0.001). TXA also led to a reduced transfusion of 1 red blood cell (RBC) unit per patient (p < 0.001). The two groups had similar rates of thromboembolic complications (p = 0.99). The antifibrinolytic properties of TXA were confirmed by the significantly higher INTEM, FIBTEM and EXTEM LI60 (p < 0.001, p = 0.005 and p < 0.001, respectively) values in the TXA group.

Conclusion: Tranexamic acid was associated with a significant reduction in perioperative blood loss and transfusion requirements without a complete shutdown of the fibrinolysis. Larger studies are warranted to assess the frequency of these outcomes in musculoskeletal oncology patients.
Automated 3D reconstruction and biomechanical adjustment on virtual 3D models for complex hip joint reconstruction pre-surgery planning

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Abstract

Introduction. Biomechanical assessment in complex hip affections is challenging. The development of 3D-virtual tools now allows to accurately visualize the morphology of the patient and define the reconstruction steps with predictable outcome. Identifying the biomechanical axis, the loads as well as the orientation of the artificial acetabula is essential in hip reconstruction planning. However, the 3D reconstruction (3DR) and anthropometric landmarking are fastidious and time-consuming, although evolving toward automation. We present a new, free, web-access approach of pre-surgical planning using data engineering and machine-learning for virtual pre-surgical planning.

Method. Based on 1500 CT-scans, including L5, hip and knee and following a specific acquisition protocol, semi-automated 3DR is performed. Reference points are marked by a biomedical engineer and validated by an orthopedic surgeon. Convolutional Neural Networks (CNNs) are developed and trained using structured and validated 3D-data to achieve full automation of 3DR and anthropometric landmarking. To optimize the data allocated for CNNs training, 3D-models are pre-segmented into pathology-affected and pathology-free segments. Marked 3D-models are then uploaded into the virtual environment of the pre-surgical planning platform for further evaluation and corrections.

Results and Conclusions. 3DR and anthropometric landmarking could be automated using CNN, ensuring the continuity of 3D pre-surgical planning process. Additionally, the surgeon can adjust the anthropometric landmarks, providing validation of generated 3D data, which is then used to iteratively train CNNs for improvement of their performance. However, this type of automated analysis remains challenging due to large anatomical deviations in severe pathologies. Larger amount of data is needed to increase the efficacy of the algorithms.
Expectations of mobility following lower limb massive endo-prosthetic replacement (EPR) for primary bone sarcoma in children

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Abstract

Introduction: The majority of children with bone sarcoma will have surgical and/or oncological management. Massive endo-prosthetic replacements (EPR) are the most common form of surgical reconstruction, yet there is limited evidence of the adverse effects of EPR on children’s physical activity, social functioning and quality of life. The aim of this presentation is to explore the expectations and mobility experiences of child sarcoma patients who have undergone EPR from the point of view of healthcare professionals, parents and the children themselves.

Methods: The study was designed as a qualitative study based on 19 interviews with patients, parents/carers, healthcare professionals and prosthesis manufacturers. The interviews were audio recorded and transcribed. The data were analysed using framework analysis.

Results: Healthcare professionals expressed a desire for children to be able to return to a normal life post EPR, but we found variation in their perceptions of the physical activities children could/could not do. Healthcare professionals also mentioned that they had to prepare and advise both children and their parents, and this often involved different processes and levels of information. Children highlighted concerns about being able to engage in the same types of activities as before the surgery and mentioned feeling pain post-surgery.

Conclusions: Most participants agreed that children’s capacity for physical activity post EPR needed to be considered as an individualised process (shaped by children’s interests, physical characteristics, and the features of the prosthetic device), but they also highlighted the need to develop standardised and evidence-based guidelines to advise children and their parents.
What are the barriers to mental health care for patients with sarcoma?

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Abstract

Introduction: Symptoms of anxiety and depression exist at a higher prevalence for patients with sarcoma than the general population and lead to increased morbidity and mortality, as well as increased health care costs. Therefore, identifying and treating these patients is an important part of their total care. However, many barriers exist to accessing mental health care. The purpose of this study was to evaluate barriers to care for patients who were provided with referrals to mental health care providers.

Methods: Patients with sarcoma were assessed using the General Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) questionnaires in the outpatient clinic. Those with scores corresponding to moderate or worse anxiety and/or depression were contacted and offered referrals for mental health care. One year later, patients were contacted to inquire about results and utility of those referrals. Thematic analysis was performed to assess those discussions.

Results: Forty patients met criteria for referral. Of these, 3 were deceased and 16 were unable to be reached, leaving 21 who participated in discussion. Several themes were identified as barriers to care, including challenges in establishing care, provider availability, and changes in care preference. For patients who did connect to providers, most did find their care to be beneficial.

Conclusions: Multiple barriers exist to accessing mental health care for patients with sarcoma. The most common theme identified was challenges in establishing care. Leaving messages was not successful when compared to direct conversations. We recommend closed-loop communication with patients to help improve access to mental health care.
Mixoinflammatory fibroblastic sarcoma: a case series from two sarcoma centre

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Abstract

Introduction

Myxoinflammatory fibroblastic sarcoma (MIFS) is rare, occurring mainly in subcutaneous tissues and distal extremities. The slow-growing infiltrative pattern often leads to misdiagnosis, under-treatment, and local recurrences (LR).

Method

This retrospective study investigated the oncologic outcomes of MIFS patients treated in two high-volume sarcoma centres. Patients > 18 years were identified from prospective databases. Patient, tumor and treatment characteristics and oncologic outcomes were evaluated. Median follow-up was 50 months (range 6-97 months).

Results

There were 23 MIFS patients with median age 53 years (range 20-80 years). Six (26%) patients were referred with local recurrences (LR), 5 (22%) following incomplete excisions, 12 (52%) with intact tumors. Mean tumor size was 4.5cm (range 0.8-8cm). Six tumors were deep and 17 superficial. Thirteen (57%) tumors occurred in the hands/wrist or foot/ankle. Following resection 4 (17%) patients developed LR: 1/10 after negative margins, 1/9 after microscopically positive and 2/4 after intralesional margins. Of nine patients treated with preoperative radiation and resection there were no LR. Two patients developed lymphadenopathy, and 2 metastases.

Conclusions

MIFS commonly present as slow growing, superficial masses mimicking benign disease. Almost 50% patients were referred following inadequate surgery or with LR. 17% patients developed LR following treatment at a sarcoma center, but none following combined treatment with preoperative radiation and resection. When wide margin resection is not possible, radiotherapy may minimize LR risk. Two LR occurred very late at 8 and 10 years, consistent with the slow growth generally associated with this tumor. Metastases were uncommon (9%) consistent with low histologic grade.
The significance of neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio in appendicular conventional osteosarcomas in a neoadjuvant setting

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Abstract

Introduction

Convencional osteosarcomas are usually treated with neoadjuvant chemotherapy followed by surgery. Some studies have established cut-off values for neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) that serv as prognostic markers in this subset of sarcomas.

Method

We assessed 7 consecutive appendicular conventional osteosarcomas who underwent at least one cycle of neoadjuvant chemotherapy and performed a survival analysis using the aforementioned cut-off values for NLR and PLR to assess their impact regarding local relapse-free survival, metastasis-free survival, overall progression-free survival and overall survival in these patients.

Results

4 patients had metastatic progression and 1 of these also had local relapse and died during the follow-up period. Patients with high NLR or PLR had worse outcomes, though not statistically significant (p>.05).

Conclusions

This study shows that higher NLR or PLR are associated with worse prognosis, though not statistically significant. The reduced number of patients in this sample negatively influenced conclusions, but this study did not prove high NLR ou PLR as prognostic markers in conventional osteosarcomas undergoing neoadjuvant chemotherapy.

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Download file
Meaningful interpretation of Toronto Extremity Salvage Score in people with soft-tissue sarcoma using Rasch analysis

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Abstract

Introduction: The purpose of this study is to estimate the extent to which items of the TESS fit a unidimensional linear construct, the Rasch model.

Methods: Rasch analysis was used on the data arising from the lower extremity TESS items completed by 162 people with STS prior to surgery. All analyses were done using RUMM 2030 software. Of the 30 lower extremity items, 18 related to activity limitations and 12 related to how these limitations affected participation in usual roles demonstrating multidimensionality and construct dependency. Rasch analysis proceeded through the usual steps needed to demonstrate threshold order, fit to the Rasch model, unidimensionality, lack of item response dependency, lack of differential item functioning (DIF), targeting, and discrimination (Person Separation Index). Rasch analysis coverts ordinal responses to an interval-like scale through a logit transformation. A range of -4 to +4 logits is optimal to reflect the range of the underlying construct and is equivalent to ±4 standard deviations on a standard normal distribution.

Results: 7 of 18 activity items had to be rescored as the categories for ‘not at all’, ‘a little bit’, and ‘moderately difficult’ were used inconsistently by the participants to reflect greater difficulty (disordered thresholds). One item did not fit the Rasch model (kneeling is) and was eliminated. Six items showed dependency: putting on shoes and socks, going up and downstairs, and walking in and outdoors. We chose to include the more challenging item from each of these pairs (shoes, upstairs, outdoors). No items showed DIF by age or sex. The final model included 14 items with a range on the logit scale of -9 to +4. All items fit the model (Chi-square: 34.2; df=28; p=0.19). The PSI was 0.89 indicating excellent suitability for individual discrimination. Approximately 25% of participants achieved the highest score pre-surgery (ceiling effect) and no one achieved the lowest score (floor effect).

Conclusion: The major change to the original lower extremity TESS was to separate activities and participation constructs because participation is at least somewhat dependent on activities. The R-LE-Activity-TESS achieved the same degree of precision with fewer items. The demonstration that the items fit a linear hierarchy can be used to estimate change over time accurately. For clinical use only those items around the current ability level need to be queried to identify change. For research purposes, the Rasch-based total score can be used mathematically to estimate change. There were many more item-thresholds at the low end of the ability hierarchy indicating that in order to comprehensively evaluate disability items of greater difficulty need to be included (e.g., running, jumping, cycling). Additional analyses are underway to evaluate the performance of the R-TESS post-surgery.
Options and Challenges when treating Bone Metastatic Renal Cell Carcinoma

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Abstract

Introduction:
Renal cell carcinoma (RCC) affects more than 250,000 people globally each year, and the illness claims the lives of 116,000 people. RRC bone metastases are mostly osteolytic in nature, reducing bone integrity, causing bone pain and causing severe morbidity for patients owing to skeletal-related events.

Methods:
This study included patients with Renal cell carcinoma who had metastatic bone lesions and were treated on the Orthopedic ward of the University Emergency Hospital, Bucharest between January 1, 2002 and June 15, 2022. Clinical and medical records were reviewed there. Patients with solitary renal cell carcinoma metastases underwent curative surgery, while patients with severe comorbidities and numerous metastases underwent palliative surgery.

Results:
In deciding whether to operate on someone with a short life expectancy or a threatening medical condition, the benefits of surgery must be weighed against the risks. A total of 24 RCC-BM patients were enrolled with the gender ratio (male:female) of 3:1, mean age of 62.32 years. All patients had osteolysis bone lesions, 36 % of them had synchronous bone metastasis and 31% had multi-organ metastasis. The common sites of bone metastasis were vertebra (37.5%), pelvis (29.2%) and long bones (26.3%).

Conclusion:
Unfortunately, survival is low when BMs are present, and only palliative treatment can be provided in most instances. According to the International Metastatic Renal Cell Carcinoma Database Consortium, BMs are an independent prognostic variable that predicts poor overall survival (OS) regardless of prognostic factors (time from diagnosis to systemic therapy, Karnofsky Performance Status, hemoglobin, corrected calcium, neutrophils, and platelets levels)

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Centre the Persona: The Re-development of the Sarcoma UK Website to Better Serve Individual Needs

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Abstract

Introduction

The aim was to create a simpler, more efficient Sarcoma UK website that enabled individuals to access information more suited to their individual needs at the different stages of their sarcoma journey.

Method

The changes were made based on evidence from site analytics; consultation with stakeholders; and advice from analysts and developers.

A development and content plan was agreed and this included identifying various user personas. To ensure users were presented with relevant information at an appropriate time, six major user personas, representing 95% of visitors, were developed spanning pre-diagnosis, newly diagnosed, in treatment, living with and beyond, palliative care and those looking for ways to support the charity.

The development process involved creating, testing, adjusting and re-testing content before the April 2022 launch.

Results

After Q1, we have seen a 71% increase in visitors compared to the same period in 2021. Notably, a dramatic 70% decrease in the average amount of time spent on page, suggesting that users are both getting to where they need to be and finding the information they need more quickly.

Conclusion

The site appears to be both reaching more users and serving them appropriate content. We continue to monitor this data and we intend to follow up through panels, online polling and other data points to verify the initial findings.

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Impact of DNA-damage repair dysregulation on chemotherapy response in novel soft tissue sarcoma models

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Abstract

Introduction
Chemotherapy remains the most important systemic treatment in patients with sarcomas. No biomarkers have yet been identified to predict response. Recent studies have provided strong evidence for DNA damage repair (DDR) dysregulation in various sarcoma subtypes. We studied the impact of mismatch repair deficiency (dMMR) and MGMT-inactivation, on chemotherapy response in preclinical sarcoma models.

Methods
We generated isogenic sarcoma cell line models deficient and proficient of MSH2 and or MGMT via CRISPR/Cas9 mediated knockout (KO) and lentiviral overexpression. Several sarcoma cell lines were continuously treated with increasing doses of chemotherapy to establish chemo-resistant, isogenic sublines. Cell lines were then characterized for sensitivity to various chemotherapeutic drugs using cell viability assays.

Results
MSH2 knockout caused mismatch repair deficiency in our models, as measured by Western Blot, IHC and microsatellite instability. Cell viability assays revealed resistance to nucleoside-analogues (Gemcitabine, Cytarabine, 5-FU). Notably, no shift in sensitivity was observed for other drug classes (e.g., Doxorubicin, Cisplatin). MGMT overexpression in a previously MGMT-negative LMS cell line led to increased temozolomide (TMZ) resistance (IC50: 100µM vs 500µM). Surprisingly, TMZ resistance developed by continuous treatment with TMZ that induced strong induction of MGMT as measured by Western Blot. In contrast, MGMT KO in a myxofibrosarcoma cell line did not impact TMZ sensitivity.

Conclusion
The sarcoma cell lines reported herein represent novel in vitro models to study DNA damage repair alterations (MMR and MGMT-status) in the context of chemotherapy. Our data suggests a predictive value for some chemotherapeutic drugs which warrants clinical validation.
Is there a role for adjuvant chemotherapy for patients with primary, high-grade, non-metastatic myxofibrosarcoma?

Dr Emanuela Palmerini, Dr Federico Ostetto, Dr Elisa Carretta, Prof Davide Donati, Dr Toni Ibrahim, Dr Giuseppe Bianchi
IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Abstract

Introduction: Optimal treatment for myxofibrosarcoma is controversial. The present study examines the role of adjuvant chemotherapy in a retrospective series of patients with primary non-metastatic, high-grade, deep-seated location and >5 cm myxofibrosarcoma.

Method: Primary endpoint was event-free survival (EFS) by treatment group: chemotherapy (CT)-YES, CT-NO; secondary endpoint was overall survival (OS). The 5-year predicted OS (pr-OS) was estimated with the Sarculator and patients were stratified into higher (5-year pr-OS < 60%) and lower risk subgroups (5-year pr-OS ≥ 60%).

Results: The study included 98 patients (44% female and 56% male); median age was 70 (14-92), size >10 in 64%. All patients underwent surgery. Adequate surgical margins: 60 (61%) patients. Ifosfamide/doxorubicin-based chemotherapy was administered to 25 (26%) patients. Size, grade and Sarculator higher risk distribution presented no major differences in the CT-NO and CT-YES, while median age was significantly higher in the CT-NO group.

With a median follow-up of 80.7 months (IQR:39-130), the 5-year EFS was 47.5% (CI% 35.9-58.3): CT-NO 53.5% (CI% 40.0-65.2), CT-YES 28.0% (CI%9.0-51.0), 0.1485.

5-year OS was 63.3% (CI% 51.7-72.8): CT-NO 64.9% (CI% 51.6-75.4), CT-YES 57.9% (CI% 32.6-76.7); p=0.1253. No differences in survival according to use of adjuvant chemotherapy was shown both for higher risk (5-year OS CT-NO 56.3% (CI% 35.4-72.8), CT-YES 60.6% (CI% 25.1-83.4), p=0.8575), and lower risk (5-year OS CT-NO 73.1% (CI% 54.5-85.0), CT-YES 51.9% (CI% 16.4-78.8), p=0.3586) groups by Sarculator.

Conclusions: With the limitation of the retrospective design this series confirms that patients with high-grade myxofibrosarcoma often present with large tumors, have an high rate of relapse, and do not benefit from adjuvant use of chemotherapy.
The Sarcoma UK Induction Package

Mrs Helen Stradling, Mrs Sam Hackett, Mrs Carly McDonald
Sarcoma UK, London, United Kingdom

Abstract

Title: The Sarcoma UK Induction Package

Introduction:

In 2020 the Sarcoma UK Support Line Team realised that it was difficult for new health care professionals working in sarcoma to access, in one place, relevant and useful education materials to help them learn more about sarcoma. The team sought to rectify this and in Aug 2021 the new Sarcoma UK Induction Package was launched.

Method:

The induction package includes treatment guidelines, educational videos, links to sarcoma UK webinars, contact details for the specialist centres, educational modules and PowerPoint presentations. At first it was a very basic SharePoint folder with a list of subfolders containing the information, which despite including all the information, was not very engaging.

Changed format:

In June 2022, the team were introduced to the Padlet software, through which the induction package was transformed. It is much easier to see what is included from the first page of the Padlet, the education sessions and webinars can be played in just one click and it is inviting to readers in comparison to the previous format

Results:

The updated version of the induction package has been well received by health care professionals. The support line team encourage feedback and ideas for additional material to include

Conclusion:

Formal evaluation of the Sarcoma UK Induction package will be undertaken in Autumn 2022. The package will be updated regularly and content added as appropriate.

Poster upload

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The Sarcoma UK Support Line

Mrs Helen Stradling, Mrs Sam Hackett, Mrs Carly McDonald
Sarcoma UK, London, United Kingdom

Abstract

Title: The Sarcoma UK Support Line

Introduction:

In February 2016, Sarcoma UK opened its support line, providing expert support and information via telephone and email, to anybody affected by sarcoma. The team speak to individuals affected directly, their family and friends, the general public and health care professionals.

Data:

In the first year the team had 972 telephone and email contacts. To date there have been over 14,600 contacts with the team from 3480 individuals.

The team are here to listen and have time to spend answering any questions that come into them. The team do not provide second opinions or make suggestions relating to people’s clinical care. However, they can discuss options and give people the tools to advocate for themselves in order to know they are accessing the best clinical care. Over the past 6 years, the team have guided 132 individuals into a sarcoma specialist centre from a non-specialist centre.

The team speak to people about all areas of the pathway, from pre-diagnosis all the way through to bereaved callers and believe that no question is a silly question. In November 2019 a text service was introduced.

Conclusion:

The Sarcoma UK support line has successfully supported those affected by sarcoma and the team have plans to further expand the service.
SURFACE OSTEOSARCOMAS. A RECLASSIFICATION OF THE LESIONS

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Abstract

introduction: Surface osteosarcomas (SO) are rare subtypes of osteosarcoma. According to WHO 2020 classification, they include three entities: parosteal osteosarcoma (POS), periosteal osteosarcoma (PerOS) and high grade surface osteosarcoma (HGS0).

Method: we reviewed retrospectively 30 cases of surface OS treated between 2006 and 2020. clinical, radiological and pathological features were available for all cases.

Results: Eighteen cases were POS, among 10 were dedifferentiated. Five cases were PerOS and 7 cases were HGS0. POS and PerOS had specific radiological appearance and were able to be identified from plan X-rays. they were characterized respectively by a melon shape opacified lesion pasted on the surface of the bone for the POS and a saucer shape lesion for PerOS. however, HGS0 hadn't specific appearance and they shared features of the other lesions. the diagnosis of HGS0 was based on histology.

Conclusion: we think that SO are devided into two entities based on their origin that determines their radiological appearance. Each entity is devided into 2 subtypes according to their grade of malignancy. thus, the new classification is:

- POS: originating from outer layer of periosteum
  . Classic POS with fibrous low grade of malignancy
  . Dedifferentiated POS with high grade of malignancy
- PerOS: originating from the inner layer of periosteum
  . Classic PerOS with chondroblastic intermediate grade
  . Dedifferentiated PerOS with chondroblastic high grade
Evaluation of the effect of photodynamic therapy on CAM-grown sarcomas

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\(^3\)Division of Translational Pathology, Gerhard-Domagk-Institute of Pathology, University Hospital Muenster, Muenster, Germany

Abstract

Local relapse has a negative impact on survival in sarcoma patients. While resections aim to include a safety margin, the extent of tumor surrounding tissue varies depending on proximity to neurovascular bundles and prior treatments. Photodynamic diagnostics and therapy (PDD/PDT) have been used to improve resection margins in other specialties. Therefore, it is the purpose of this study to evaluate the effect of PDT on CAM-grown sarcomas.

Short-term cell cultures (n=6) were generated from 6 sarcoma patients (subtypes n=5). From these, 3-dimensional tumors were derived on the CAM. On day 7 after inoculation, tumors were treated with 200µl 5-ALA. After 4h of incubation, protoporphyrin IX (PPIX) excitation (420 + 10nm) was documented. A subset of tumors was exposed to different intensities of red light (635nm, 10 J/cm\(^2\)). After photodocumentation, tumors were processed for histopathological analysis.

Different macroscopic morphologies and tendencies to hemorrhage were observed between tumor entities. PPIX fluorescence was observed for all entities, despite varying intensities within the same tumor group. Blood vessels within and surrounding the tumors on the CAM showed increasing rates of fragmentation after increasing intensities of red light exposure.

Red light exposure of PPIX leads to production of reactive oxygen species (ROS). The rapid fragmentation of blood vessels observed in this study indicates a strong production of ROS and subsequent cell death. Therefore, 5-ALA mediated PDD and PDT seem to be a promising tool in defining tumor margins during resection (PDD) and adjuvant treatment of the tumor bed (PDT) after the resection is complete.
Is there an association between preoperative serum albumin levels and intervention-requiring seroma formation after limb-salvage treatment for lower extremity soft tissue sarcoma?

Dr Christoph Hofer, Mr Paul Igor Apelt, Dr Carmen Trost, Dr Kevin Döring, Prof Philipp Theodor Funovics, Prof Ioannis Panotopoulos, Prof Reinhard Windhager, Dr Gerhard Martin Hobusch
Medical University of Vienna, Vienna, Austria

Abstract

Introduction

Seroma formation is a common early wound complication after treatment for soft tissue sarcoma. After total hip replacement and incisional hernia repair, low preoperative serum albumin levels were related to higher risk for seroma formation. Following mastectomy or thyroidectomy, no such association could be shown. To our knowledge, no data are available regarding surgical treatment of soft tissue sarcoma.

Methods

The preoperative serum albumin levels of 166 patients (84 females, 82 males) treated with limb-salvage surgery for lower extremity soft tissue sarcoma between 2008 and 2018 were reviewed. It was examined whether there is an association with the formation of seroma requiring interventions such as aspiration or revision surgery.

Results

Thirty-seven (22.29%) patients (16 females, 21 males; p=0.31) developed postoperative seroma leading to at least one intervention.

Preoperative serum albumin levels were available in 134 patients (100 without seroma, 34 with seroma). Patients without postoperative seroma showed a mean preoperative serum albumin level of 41.54g/l (SD 5.46), patients with postoperative seroma a mean of 41.99g/l (SD 4.80). No significant difference was found in this regard [p=0.667, 95% CI (-2.53557, 1.62722)].

Additionally, postoperative serum albumin levels were available in 120 patients (89 without seroma, 31 with seroma) and showed a mean postoperative decrease of 7.70g/l (SD 4.44) and 7.83g/l (SD 4.70), respectively [p = 0.889, 95% CI (-1.99354, 1.73098)].

Conclusions

No association between preoperative serum albumin levels and the development of intervention-requiring postoperative seroma was found after limb-salvage treatment for lower extremity soft tissue sarcomas. Further laboratory parameters should be explored in the future.

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Complications of Liquid Nitrogen Recycled Bones: The dark side of the moon!

Dr Osman Emre Aycan, Dr Muhammed Coşkun Arslan, Dr Muhammed Alptekin Kocaoglu, Dr Berksu Polat Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey

Abstract

Introduction: The reconstruction of bone defects after resection of malignant bone tumors with liquid nitrogen recycling method is a good alternative to bone allografts and endoprostheses. Most studies report favorable outcomes however the longer the follow up the more the complications are encountered. We sought to evaluate the causes and solutions to overcome the complications related with liquid nitrogen freezing method.

Methods: The clinical and radiological data of 42 patients, who underwent tumor resection and reconstruction with liquid nitrogen recycled bone in our institution between December 2015 and March 2019, were retrospectively reviewed. 23 complication free patients and 6 patients with less than 24 months follow up were excluded. A total of 13 patients (9M/4F) were evaluated for study. Apart from the demographical data the patients were evaluated regarding Enneking stage, pre-chemotherapy tumor volume, liquid nitrogen recycling type, operation time, intraoperative blood loss, bone union, complication profiles for biological reconstruction regarding Henderson et al. and management for complications. The MSTS scores at last follow up were noted.

Results: Most common diagnosis was osteosarcoma with 11 patients. The mean age was 21.4 and the mean follow up was 35.7 months (24-45). Mean operation time was 235.4 minutes and mean blood loss was 646.2 cc. A total of 32 complications were encountered. Most common complications were soft tissue coverage defects, recycled bone fractures and early infections which encountered in 5 patients each. Vacuum assisted closure (VAC) method was helpful in soft tissue failures and infections. Late infections were encountered in 4 patients. Complete bone union was achieved in 6 patients with mean 31.8 months. There were no recurrences. Two patients were lost due to systemic disease. Mean MSTS score was 17.8 (6-26).

Conclusion: VAC is “game changer” in soft tissue failures and infections which was helpful in closing the defects with flaps. Augmentation of liquid nitrogen recycled bone segment with a vascularized bone or insertion of a vascular supply is essential in long term duration of the recycled reconstruction. In pediatric patients growth arrests and dysplastic joint requires meticulous evaluation.
Enchondroma and atypical cartilaginous tumor: To operate or not to operate...

Dr Berkay Doğan, Dr Osman Emre Aycan, Dr Muhammet Coşkun Arslan
Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey

Abstract

INTRODUCTION

Enchondroma (E) and atypical cartilaginous tumor (ACT) may lead to misdiagnoses with similar radiological findings and clinical presentation. Radiological findings including endosteal scalloping, lesion’s longitudinal length in coronal plane, localization may be helpful tools in differential diagnosis. The purpose of our study was to compare the results of E and ACT patients with biopsy proven followed up group and surgically treated group.

METHODS

We retrospectively reviewed the single center outpatient clinic records of surgically treated patients and biopsy patients of E and ACT between January 2010 – January 2020. The data of 687 patients with diagnosis of E and chondrosarcoma were evaluated. The patients with diagnosis of chondrosarcoma or enchondromatosis, insufficient follow-up, bone tumors other than long bones excluded. A total of 114 (35 male, 79 female) patients with minimum follow-up period 24 months were selected. 51 patients were in operated group, 63 patients were in observed group. Follow-up period, biopsy diagnosis, curettage diagnosis, lesion localization, lesion’s longitudinal MRI length in coronal plane, endosteal scalloping number, pathological fracture, preoperative pain complaints, residual lesion, recurrence, postoperative infection rates and functional outcomes were evaluated.

RESULTS

We reviewed the records of biopsy results of 55 patients diagnosed with E, 8 with ATC and curettage results of 32 patients diagnosed with E, 19 patients with ACT. The mean age was 43.7 for operated group and 45.1 for observed group. Median follow-up period was 43.5 months for operated group and 36 months for observed group. Localization of the lesions were metaphysis in 32 patients, diaphysis in 31 patients for the observed group and metaphysis in 32 patients, diaphysis in 19 patients for the operated group. Pain was the leading symptom in 59 patients in observed group and 49 patients in operated group. 3 patients (%3.9) had pathologic fracture in operated group. Lesion’s longitudinal MRI length in coronal plane was not related with tumor type. Endosteal scalloping number was the main decision-maker factor for operation in our study group (p=0.047). We tend to operate when the endosteal scalloping number was greater than five (p=0.007). Patients with endosteal scalloping number greater than five were all in operated group. Proximal humerus lesions and proximal femoral lesions operated more often (p=0.002). 2 patients (%3.9) had infection, 2 patients (%3.9) had postoperative fracture, 4 patients (%7.8) had residual lesion postoperatively. Complication rates and infection rates were higher in operated group as expected. No recurrence was seen. Operated group had mean 26.5 points and biopsy group had mean 29.1 points of MSTS score.

CONCLUSION

Lesions longitudinal length, age, preoperative pain were not major factors for decision of the operation. Most of the proximal humerus lesions were operated and most of the distal femoral lesions observed after biopsy. Biopsy, observation method in E and ACT are cost effective method as we take into consideration of complications in operated group. We recommend observation in E and ACT without progression or suspected findings on the radiological images and clinical presentation.
The operative results of enchondroma, atypical chondroid tumor and low grade chondrosarcoma: Does it make any difference?

Dr Berkay Doğan, Dr Muhammet Coşkun Arslan, Dr Osman Emre Aycan
Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey

Abstract

INTRODUCTION

The differential diagnosis of enchondroma (E), atypical cartilaginous tumor (ACT) and grade 1 chondrosarcoma (G1CS) remains controversial. Although the clinical presentation and radiological findings may be helpful in preoperative evaluation, the biopsy or final histopathology may differ. We sought to evaluate radiological and clinical findings of operated E, ACT and G1CS of the long bones in our series with comparative outcomes.

METHODS

We retrospectively reviewed the data of surgically treated patients between January 2010 – January 2019. Out of the data of 687 patients with the diagnosis of enchondroma and chondrosarcoma, the patients with insufficient data and follow up and low grade chondroid tumors other than long bones, were excluded. We have included 56 patients (39F/17M) with a minimum follow up of 24 months. The patients were evaluated regarding biopsy diagnosis, resection histopathology, location, lesion’s longitudinal MRI length in coronal plane, endosteal scalloping number, pathological fracture, preoperative pain, residual lesion, recurrence, postoperative infection and MSTS at final follow up.

RESULTS

The mean age was 47 and the median follow up was 43.5 months (24-145). The biopsy results demonstrated 41 patients diagnosed with E, 13 with ATC and 2 with G1CS. The resection histopathology revealed that 32 patients diagnosed with E, 19 patients diagnosed with ACT and 5 patients diagnosed with G1CS. The biopsy results of 20 patients were changed in resection histopathology. The location of the lesions was diaphyseal in 21, metaphyseal in 35 patients. Lesion’s longitudinal MRI length in coronal plane was found higher in diaphyseal lesions. (p=0.041) Six patients had secondary chondroid tumor lesion over a preexisting chondroid lesion. %96.9 of E patients, %94.7 of ACT patients and all of G1CS patients had preoperative pain complaint. Only three patients presented with pathologic fracture. Lesion’s longitudinal MRI length in coronal plane was not related with tumor type. (p=0.171) Although not statistically significant, the number of endosteal scalloping was found to be increased in G1CS compared to E and ACT. (p=0.065) Two patients had infection, two had postoperative fracture, four had residual lesion and a patient (%1.8) had pseudoarthrosis postoperatively. No recurrence was seen. The MSTS were significantly higher with age below 50. (p=0.040) Both E and ACT groups had mean MSTS of 26.4 and G1CS patients had 27.6.

CONCLUSION

Pain was the presenting complaint in vast majority of the operated patients. Biopsy remained controversial in differential diagnosis of E, ACT and G1CS in our series. There was no clinical significance between tumor type and endosteal scalloping, pathological fracture, infection and other type of complications. Lower MSTS scores should be expected in this specific patient group above 50 years.
Unicameral bone cysts at lesser trochanter level: A warning for pathological fractures

Dr Osman Emre Aycan, Dr Ozan Kaya, Dr Muhammet Coşkun Aslan
Baltalimani Bone Diseases Training and Research Hospital, Istanbul, Turkey

Abstract

Introduction:

Unicameral bone cysts (UBC) are reported to be the underlying lesion in 40% of pathological femoral neck fractures in skeletally immature patients. They are typically asymptomatic however may present with pathologic fracture which causes pain, swelling or deformity. We sought to evaluate risk factors for pathological fracture and recurrence in pediatric proximal femoral unicameral bone cyst,

Methods:

Medical records were retrospectively reviewed of patients with pediatric proximal femoral UBC’s who underwent surgery between 2004 and 2018. We included 51 consecutive patients with pediatric proximal femoral UBC (36 impending fracture/15 pathological fracture). The patients were evaluated regarding localization of the UBC and the activity of the cyst. The cyst parameters were measured and the patients were further assessed regarding the presence of pathological fracture and applied treatment. Pathological fracture group were compared to impending fracture group by means of radiological cyst parameters, management options, healing, recurrences and other related complications.

Results:

The most commonly affected localizations were combined involvement of femoral neck and intertrochanteric (n=21) The number of latent lesions were 27 and active lesions were 24. The mean cyst index in our series was 3.8±1.2 (1.2-7.2). The cyst index in our series was correlated with pathological fractures. (p=0.048) There was significantly higher cyst index values in recurrent cases. (p=0.016) The cyst extension below lesser trochanter level was found as a risk factor for pathological fractures. (p=0.021) The most common treatment in our series was curettage, graft packing and plate fixation with 27 patients. The treatment method showed no correlation with consolidation or recurrence rate. According to the healing criteria for UBC’s at final follow-up, 36 cysts were completely consolidated, 13 were evaluated as incomplete healing and two were persistent. Recurrence rate was significantly high in UBC’s who were operated at <10 years of age. (p=0.006) Accordingly the active lesions were also significantly related with earlier recurrence. (p=0.03)

Conclusion:

Although younger age, active cysts and higher cyst index are shown as risk factors for recurrence, but not for fracture in proximal femoral UBC’s. However, with age, the cyst relatively migrates to the weight bearing lesser trochanteric area, which may inevitably impose a major risk for pathological fractures. Ensuring stability with a plate even in impending fractures of proximal femur may aid early mobilization and faster recovery.
Optimizing follow-up care for survivors of pediatric bone sarcoma of the extremity: a multidisciplinary and standardized approach.

Ms Leonie Tigelaar¹, Dr Lianne Haveman¹, Dr Peter Bekkering¹, Ms Irene Oude Lansink², Dr Laura Beek¹, Prof Martha Grootenhuis¹, Ms Marloes van Gorp¹, Ms Hinke van der Hoek¹, Ms Annemarie Peek¹, Mr Stijn Westerbos¹, Dr Jos Bramer¹, Prof Michiel van de Sande¹, Prof Bart Schreuder¹, Dr Hans Merks¹

¹Princess Máxima Center for Pediatric Oncology, Utrecht, Netherlands. ²University Medical Center Utrecht, Utrecht, Netherlands

Abstract

Introduction: For pediatric bone sarcoma patients, surgery with or without radiotherapy is the cornerstone of treatment. However, proper guidelines for follow-up care after these often life changing interventions are missing because of insufficient follow-up data. Therefore we set out to develop a well-structured, multidisciplinary follow-up clinic to be able to systematically evaluate the domains affected by local therapy, improve care, and create a basis for bone sarcoma specific guidelines.

Methods: For evaluation of functioning after local therapy for a bone sarcoma, the following domains were thought to be essential to cover: occurrence of adverse events, functional outcome, psychosocial outcome, and quality of life. Literature was assessed for measurements covering these domains. Instruments were carefully weighted by a national team of pediatric bone sarcoma experts considering content, feasibility, and measurement properties.

Results: At the new multidisciplinary follow-up clinic bone sarcomas, survivors are successively seen by a (pediatric) oncologist, orthopaedic surgeon, physical therapist, rehabilitation specialist, and psychologist. The core set includes: the Henderson classification and a selection of Common Terminology Criteria of Adverse Events for registration of adverse events; questionnaires, physical examination and function tests for evaluation of functional outcome; and questionnaires and a semi-structured interview for evaluation of psychosocial outcome and quality of life.

Conclusion: We set up a multidisciplinary follow-up clinic for survivors of pediatric bone sarcoma to optimize follow-up care after life changing local therapy at the Princess Máxima Center in the Netherlands. Care will continuously be evaluated in order to refine the clinic where required. Initial results will be presented.

Poster upload

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Identification of miRNAs as potential biomarkers for relapse in soft tissue sarcoma

Dr Federico Scolari1, Dr Guido Scoccianti1, Dr Anna Boddi1, Dr Elisabetta Gambale2, Prof Ilaria Palchetti3, Dr Francesco Muratori1, Dr Roberto Scanferla1, Dr Adriano Pasqui2, Prof Domenico Campanacci1, Prof Lorenzo Antonuzzo2,4, Dr Serena Pillozzi4

1Orthopaedic Oncology Unit, Careggi University Hospital, Florence, Italy. 2Medical Oncology Unit, Careggi University Hospital, Florence, Italy. 3Department of Chemistry Ugo Schiff, Universitiy of Florence, Sesto Fiorentino, Italy. 4Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy

Abstract

Introduction: Soft tissue sarcomas (STS) are a heterogeneous and complex group of tumors. MicroRNAs (miRNAs) are considered optimal candidates in predicting the outcome in particular circulating miRNAs, which require less invasive testing procedures.

Methods: We performed a miRNA profiling analysis with nanoString nCounter platform on 24 tissue and plasma samples obtained from patients enrolled at the Careggi University Hospital, Florence (RESEARCH study). Differentially expressed miRNAs were selected with a reduced model likelihood test and further tested to evaluate their prognostic value via ROC analysis. Furthermore, experimentally-validated target genes of such miRNAs were identified from online databases and tested for enriched KEGG modules.

Results: Clustering analysis revealed that a panel of 25 miRNAs was upregulated in relapsing patients both in tissue and plasma samples (adjusted p-value <0.05, Fold Change >1). KEGG module enrichment analysis on selected miRNAs target genes showed 11 significant pathways mainly involved in cell metabolic processes, including an enrichment of glucuronate pathway involved in tumor metastasis. In addition ROC analysis revealed that hsa-miR-382-5p and has-miR-132-3p displayed good predictors of relapse (AU-ROC = 0.7667) in both tissue and plasma biopsies.

Conclusions: Our data indicate that a panel of miRNAs is differentially expressed in patients who will experience relapse vs not relapsing patients. The combination of miR-382-5p and miR-132-3p could potentially serve as biomarker for predicting tumor relapse of STS patients.

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Bone tumour (OS)

FOSTER (Fight Osteosarcoma Through European Research): an European Osteosarcoma Consortium for research and cure for osteosarcoma patients

Dr Emanuela Palmerini1, Dr Akmal Safwat2, Dr Anna Raciboska3, Dr Claudia Valverde4, Dr Cristina Mendes5, Dr Daniel Baumhoer6, Dr Edita Kabickov7, Dr Eugenia Papakonstantinou8, Dr Fredrik Baecklund9, Dr Gwen Sys10, Prof Hans Gelderblom11, Dr Jukka Kanerva12, Dr Kjetil Boye13, Dr Leo Kager14, Dr Marieke Kuijjer15, Dr Monika Csóka16, Dr Michael Capra17, Dr Stefan Bielack18, Dr Thomas Kuhne19, Dr Natalia Fernandez20, Dr Pan Pantziarka21, Dr Sandra Strauss22, Dr Natalie Gaspar23

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Abstract

INTRODUCTION: Osteosarcoma is the most common bone cancer in adolescents and young adults. Its genomic and epigenetic complexity and heterogeneity with poor understanding of tumour biology has hampered progress with little improvement in outcome in recent decades. No European first line trial has been launched in over 15 years, and only a few at national level. The majority of European patients are not being offered access to new drugs or treatment strategies, despite an estimated number of new cases of 1135 in the EU per year and a third experiencing relapse.

METHOD: The FOSTER consortium (Fight Osteosarcoma Through European Research) proposes to connect multidisciplinary and patient/parent advocate expertise, at a Pan-European level to improve biological, translational and clinical research on osteosarcoma, to ultimately improve survival.

RESULTS: With 265 members from across 19 countries, and 8 work packages from biology to late-effects, FOSTER consortium work is overseen by an Executive Committee, with the help of a project manager, to implement a strategic research plan agenda with regular meetings where knowledge sharing can be freely developed; to pursue the aim of gaining a comprehensive overview of current osteosarcoma clinical and biological knowledge and trial status, and thus tackle the current gaps and ongoing challenges in osteosarcoma.

CONCLUSIONS: The Consortium will be responsible for the development and maintenance of a strategy to strengthen, harmonize and optimize collaborative efforts by a network of clinicians, researchers, patient and parent advocates working at the European level to achieve overarching and specific objectives defined by workpackages, reduce inequalities and improve survival for patients with osteosarcoma across Europe.
Improving Physiotherapy Services for Sarcoma Patients Across the East of England Cancer Alliance: Creation of the ‘STAR Class’ - Sarcoma Telehealth Activity & Rehabilitation Education Class

Mrs Nicola Day, Ms Navya Shastri
Cambridge University Hospitals NHS Trust, Cambridge, United Kingdom

Abstract

Introduction

Sarcoma patients across the East of England have been inconsistently referred to both physiotherapy at Cambridge University Hospitals Trust (CUH) and other regional musculoskeletal (MSK) hubs despite having complex rehabilitation needs. Innovation funding was awarded for a 1-year pilot project to develop a Sarcoma Rehabilitation Pathway between CUH, the Specialist Surgical Centres and other Trusts across the region providing adjuvant treatment to this patient cohort.

Methods

A secondment post for an MSK physiotherapist to join the existing CUH Cancer rehab service was created and a number of key tasks were undertaken including:

- Access to MDT outcomes to allow early identification of the patients likely to require physiotherapy input.
- Inclusion of relevant Patient and Public Involvement (PPI) to ensure that new services and developments were patient-centred.
- Development of sustainable communication and rehabilitation pathways between CUH, the Specialist Surgical Centres and other Trusts across the region.
- Creation of a patient-facing online education classes for Sarcoma patients: ‘STAR Class’ - Sarcoma Telehealth Activity & Rehabilitation Education Class

Results

A Divisional business case was successful in securing long-term funding for this post and the ‘STAR’ class has now been integrated into the existing Rehabilitation & Exercise during Addenbrooke’s Cancer Treatment (REACT) programme; a Physiotherapist-led initiative providing rehabilitation and exercise opportunities for those undergoing Cancer treatment in Cambridge.

Conclusion

This new role and pathway development has been well received by both clinicians and patients; enabling us to facilitate consistent rehabilitation/exercise advice across the cohort and begin to address gaps in therapy across the region.
Application of 3D printing in Guided Pelvic Resections: Experience from 2 Tertiary Referral Centers in the UK

Mr M A Siddiqi, Ms H A Branford White, Dr S McMahon, Prof T D A Cosker, Mr D J Whitwell, Mr J R Perera, Mr R C Pollock

1 Nuffield Orthopaedic Center, Oxford, United Kingdom. 2 Royal National Orthopaedic Hospital, London, United Kingdom

Abstract

Introduction

Guided osteotomies in a 3-dimension pelvis represents a fundamental technique in attaining safe closer margins. Classical osteotomies are becoming obsolete with use of CAS and 3D image rendering. We present the UK experience of using 3D printed models and jigs for pelvic resections in 35 cases at 2 referral centers.

Methods

CT and MRI images were collated using Simpleware IP to create a plan. Custom 3D printing using a Connex3 object 260 3D printer was done for all models and jigs. Precision cutting guides were generated using anatomical reference points. Data was collected from notes review.

Results

35 cases were included including 14 chondrosarcomas, 6 Ewing Sarcomas, 4 osteosarcomas, 1 MPNST, 1 UPS, 1 radiation induced spindle cell tumour, 1 epitheloid haemangioendothelioma and 7 metastatic tumours. Mean age was 47 (Range 7-70). There were 13 females and 22 males. All cases had 3D printed models. 30 jigs were constructed. Adequate bone margins (>5mm) were obtained in all cases. One close soft tissue margin was reexcised in a leiomyosarcoma. Complications were vascular injury in three patients, visceral injury in 2 patients, one nerve root damage and one tumour leak. One model was discarded due to manufacturing defect and two jigs could not be used due to soft tissue interposition. Key structures saved were viscera, SI joints and periacetabular bone enabling easier reconstructions.

Conclusions

3D printing provides patient specific tools and is time saving, its main advantage over CAS. In our experience, comparable safe bone margins were obtained using this technique.
Early Radiological Outcomes of a Fully Porous Bridging Collar in Lower Limb Endoprosthetic Reconstructions: A Case Matched Study

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Abstract

Introduction

Endoprosthetic reconstructions (EPR) use is increasing and so are revisions for failures. Aseptic loosening accounts for 25% of these. Osseointegration enhancing collars have been developed that promote extra-cortical bone bridging (ECBB) to counter this. We investigated the use of a new fully 3D printed titanium porous collar at two tertiary centers in the UK.

Materials and methods

This is a retrospective case matched review of lower limb EPRs using the porous collar versus a cohort using a non porous collar. Radiographs at six, twelve- and 24-months were assessed independently. Radiographic on-growth score for EPRs (ROSE) was used to measure ECBB on a scale of -4 to +4. Mean scores were compared using the Chi-squared test. Implant survival was estimated using the Kaplan-Meir method.

Results

After exclusions 39 patients were in each group. Indications for surgery were PJIs (n=28), primary tumours (n=16), metastatic tumours (n=15), aseptic loosening (n=11) and failed trauma (n=9). Mean age was 63.5 years (range 16 to 91 years) with 36 males and 43 females.

At six months the mean number of cortices with radiographic ongrowth for the porous collar vs non-porous group was 1.9 and 1.8 respectively. At 12 months it was 2.1 and 0.5 and at 24 months 3.2 and -0.2 respectively. Implant survival showed no difference (p=0.35, chi-squared).

Conclusion

Fully porous collars demonstrate better on-growth at 6-24 months as compared to non-porous collars. This may translate into a reduced incidence of aseptic loosening with a fully porous bridging collar in the medium-term.
Stanmore Tumour Outcomes Project (STOMP): What is the patients’ survivorship experience after extremity sarcomas? - A presentation of preliminary findings

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Abstract

Background:

The last five decades have seen significant improvement in the survival of patients with sarcoma leading to increase in the importance of improving survivorship. The impact of orthopaedic surgeries can be extensive and long lasting. The STOMP aims to investigate functional outcomes and quality of life (QoL) in sarcoma survivors using personalised and holistic approaches, to build evidence-based rehabilitation strategies.

Methods:

This cross-sectional study rolls out the International Classification of Function and Disability (ICF) framework, a World Health Organisation (WHO) recommended bio-psycho-social model to collect outcomes for 100 patients. ICF brings together questionnaires, individualised examination and novel technologies such as qualitative interviews, activity monitoring and 3D gait-analysis to present an all-inclusive picture of the patients’ life.

Early Results:

23 patients have been recruited into the study, 15 adults and 8 children. Preliminary results were presented for adult patients who underwent limb salvage surgery in the lower limb, more than 1 year ago. 8 adults had average Toronto Extremity Salvage Score (TESS), EuroQol 5 dimension VAS (EQ5D), Quality of Life Scale for Cancer Survivors (QoL-CS) and modified Re-integration to Normal Living (mRNL) scores of 73.6±1.7, 61.5±21.5, 5.3±1.84 and 70%±17.25 respectively highlighting moderate degree of physical limitations and deterioration of QoL. Similarly 4 children and young adults had Bone Tumour version of DUX questionnaire (BT-DUX) scores of 3.25±0.95 describing moderate degree of school and recreational participation concerns.

Conclusion:

Early findings confirm wide-ranging functional and QoL issues in sarcoma survivors. Personalised, comprehensive and evidence-based rehabilitation strategies are
Curopsy and Steroid Injection is Reliable in Proximal Humerus UBC’s

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Abstract

Curopsy and Steroid Injection is Reliable in Proximal Humerus UBC’s

Introduction: Unicameral bone cysts (UBC) often constitute 3% of primary bone lesions, and are the most common cause of pathological fractures in pediatric age group. Parameters involving the distance between the epiphyseal cyst, the cyst index, and the ratio of the transverse length of the cyst to the bone diameter predict the risk of fracture in patients with UBC’s located in the proximal humerus. Our aim is to reveal the radiological parameters that predict the risk of UBC related proximal humeral fractures in pediatric patients, to evaluate the effect of fractures on cyst regression, and the effect of steroid injection on cyst regression, recurrence and refracture rates.

Methods: 128 patients aged 5-15 years who were treated with the diagnosis of proximal humeral BCC in our clinic between July 2012 and September 2021 were evaluated retrospectively. 16 patients with insufficient radiological data, 23 patients with a follow-up of less than 1 year, and 18 patients who were treated with methods other than the combination of curopsy + steroid were excluded. A total of 71 patients (55M/16F) were included in our study. The mean age was 10.2 (5-15). Apart from the epidemiological data, the first complaint on admission, cyst volume, biopsy method, first curopsy, recurrent curopsies and the amount of steroid used were evaluated. The radiological evaluation of the lesion according to the Neer classification after the first curopsy, the radiological changes after repeated curopsies, the total number of curopsies, the mean follow-up time, and the radiological evaluation at the last follow-up according to the Neer classification were determined.

Results: The mean follow-up period in our study was 42.5 months (12-99). Pathological fracture was found to be the first reason on admission in 81% of the patients. A biopsy was performed right after the conservative follow-up in all patients with pathological fractures. The mean cyst volume was determined as 26,433 mm3, core biopsy method was applied in all patients. After histopathological evaluation, curopsy + steroid injection was performed in histopathologically revealed UBC patients. Repeated curopsies were performed with an average of every 3 months. The lesions were evaluated with radiographies and MRI before and after repeated interventions. After a mean 1.9 (1-4) curopsy + steroid injections, 94.4% of the lesions which preoperatively evaluated as B/C according to the Neer classification were evaluated as A at the last follow-up. Deformity was observed in 3 patients and pathological fracture was observed in 1 patient after the first procedure.

Conclusion: Consolidation can be achieved in a safe and minimally invasive way with curopsy + steroid injection in proximal humeral UBC’s patients in the pediatric age group. Although the number of patients presenting with pathological fractures is high, curopsy + steroid injection treatment provides an effective, inexpensive and reliable treatment for consolidation, supported by repeated procedures when necessary.
Uncommon location for solitary osteochondromas: Scapula, ischium and ribs.

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Abstract

Introduction: Osteochondroma is considered the most common benign bone tumor of the axial skeleton (8-15% of all primary bone tumors and 35-50% of all benign bone tumors). Usually affects children and young adults. It is typically located in the metaphysis of long bones, although it could also affect flat bones like scapula, ischium and ribs. Involvement of the flat bones occurs in 10% of cases, pelvis in 5%, scapulae in 4%, and ribs in 2%. Symptoms are not very specific. The present study describes atypical cases of osteochondromas in atypical locations: scapula, ischium and ribs. Method: We present 3 patients (2 women, 1 men) with uncommon location of solitary osteochondromas (scapula, ischium and ribs) who underwent tumor resection. The mean follow-up period for each case was 14 months. For each case, functional outcomes, oncological outcome and complications were evaluated by Toronto Extremity Salvage score, clinical examination and radiological follow-up. The three patients had 3D printed real size scale models for preoperative planning and computer navigation guided surgery. Results: A 14-year-old girl presented limited amplitude of movement of the upper extremity. Radiography of the scapula revealed a mushroom-shaped outgrowth from the scapular body. The patient was treated with partial scapulectomy. Histopathological examination revealed features suggestive of osteochondroma. A 54-year-old woman with abdominal pain and constipation. An abdominal computed tomography revealed a huge osteochondroma like mass growing from the right ischium. Intra-abdominal excision was performed. Histopathological studies reported pelvic osteochondroma. A 9-year-old boy with one year of evolution painful tumor at the left anterior part of the thorax, with evident deformation. He was diagnosed with osteochondroma of the 7th, 8th and 9th ribs. Due to the persistence of the symptomatology surgical excision was performed. Conclusions: Osteochondromas of uncommon location presenting as symptomatic masses are a rarity. They can cause multiple clinical manifestations including limitation and pain. Different locations of solitary osteochondromas can influence both patients' symptoms and clinical examination findings. Improved understanding of the clinical spectrum of this entity is essential. 3D printed models for preoperative planning plays a crucial role in the correct execution of the surgical treatment. Surgical excision is the best line of treatment and is also important to prevent possible complications of malignant transformation.
Distal femur pedicle frozen autograft reconstruction for malignant bone tumors.

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Abstract

Introduction: Limb salvage surgery is becoming increasingly popular after tumor resection in the lower extremity. Biological reconstructions and the use of megaprosthesis are the gold standard methods for malignant bone tumors of the distal femur. These methods remain controversial due to short- and long-term complication in the knee. Tumor bearing bone treated by liquid nitrogen also known as “frozen allograft” is one of the biological reconstruction described techniques. This study aimed to evaluate the mid- and long-term functional outcomes and complications in patients treated with pedicle frozen autograft reconstruction in the distal femur. Method: This retrospective study included 11 patients (7 women, 4 men) with malignant tumors of the distal femur who underwent tumor-wide resection and pedicle frozen autograft reconstruction of the distal femur (mean age, 16 years; range, 9-23 years). The mean follow-up period was 20 months (range, 9-31 months). Functional outcomes, oncological outcome and complications were evaluated by Musculoskeletal Tumor Society score, Toronto Extremity Salvage score, clinical and radiological examinations. Results: The overall survival rate was 72.33%, and the mean Musculoskeletal Tumor Society functional score was 26.4 points (88%). Pedicle frozen autograft survival rates were 80% at 2-year follow-up. Three of the 11 patients (27%) had complications: 2 required prosthesis reconstruction due to fracture and 1 developed a deep infection around the knee. Wear of the knee articulation occurred in 1 case, while disease recurrence was reported in 1 case. There were no cases of tibial fracture, absorption around the frozen bone, plate or screws loosening or leg length discrepancy. Conclusions: Distal femur pedicle frozen autograft (frozen autograft without femoral osteotomy) technique presents a satisfactory functional outcome of the knee articulation and provides biomechanical stability that is comparable to the other biological reconstruction methods or megaprosthesis.
The Sarcoma-Specific Quality of Life Study (SARC-QoL): identifying key domains of health-related quality of life in adult patients with extremity soft tissue sarcoma

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Abstract

Introduction:

The study objectives were to explore the domains of HRQoL and functioning in adult patients diagnosed with extremity STS from the patient’s perspective from active care through survivorship through qualitative inquiry, so as to form the basis for the development of a patient-derived, sarcoma-specific, preference based HRQoL tool.

Methods:

Study design is a sequential exploratory mixed methods study of patient experience in localized or metastatic adult extremity STS (2007 and 2017). The study was conducted at a high-volume sarcoma centre. Qualitative descriptive design was grounded in an integrated knowledge translation approach and aimed at identifying HRQoL domains through in-person and electronic focus groups, and individual semi-structured interviews in both English and French (N=28). The interview guide topics were selected based on existing knowledge about PROs and HRQoL life [24], including (a) impact of diagnosis on employment or acquisition of academic/vocational skills; (b) physical and psychological functioning; (c) symptom burden; (d) treatment preferences; (e) knowledge of and use of existing resources; (f) impact on family time and resources; and (g) overall experience. Data was analyzed using inductive thematic networks approach using the qualitative software N-Vivo 12. Codes were generated by 2 independent qualitative experts capturing key concepts of HRQoL that is impacted by STS. Basic themes were clustered into organizing themes, and merged into global domains. Attention was paid to deviant cases and within-group dynamics during focus group discussion analysis. Discrepancies or inconsistencies in coding were resolved in consensus meetings. Final sample size was determined when data saturation was reached and no new themes emerged. Qualitative reduction of identified items to reach a consensus framework was facilitated by a moderator during multi-disciplinary panel meetings comprised of sarcoma experts, patient partners, allied health staff and other stakeholders.

Results:

Twenty-nine patients with biopsy-proven localized or metastatic STS of the extremity participated (69% lower extremity STS; mean age 56 years, 25% with local recurrence, 21% metastatic, 18% amputation). Inductive thematic network analysis revealed five domains and subdomains of HRQoL for patients with STS: 1) physical domain (subdomain: physical symptoms, treatment complications), 2) psychological domain (anxiety, distress, mood, body image and identity), 3) medical support (emotional support, practical support, confidence in positive outcome and reluctance to medical personnel), 4) social life (family and social support), and 5) daily living (disruption of routine and finances).
Conclusion:

Patient-centered research is crucial to understanding the impact of surgery, adjuvant therapy and the associated complications for patients with extremity STS, and thereby improving the quality of care provision. This study offers a unique perspective on what domains and sub domains are most impactful on HRQoL and provides the basis for our on-going development of a disease-specific, preference-based HRQoL measure.
Patient-reported outcome measures to measure health-related quality of life in people with soft-tissue sarcoma: a systematic review of measurement properties of patient-reported outcomes

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Abstract

Introduction: Patient-reported outcomes measures (PROMs) provide valuable information and are increasingly used in clinical care and measure what matters to the patient population. Various generic and disease specific PROMs are developed for cancer. This has resulted in rapid update on PROMs in clinical care for soft-tissue sarcoma (STS) with limited information on their psychometric properties. COncensus-based Standards for the selection of health Measurement INstruments (COSMIN) steering committee developed a checklist to evaluate psychometric properties of PROMs. The purpose of this study is to systematically review study quality that have reported psychometric properties of PROMs used in STS using COSMIN criteria and provide evidence as to whether studies adhere to standardized reporting guidelines. The results of this study will be useful in selecting the optimal PROM for STS.

Method: A systematic search was conducted in PubMed, Ovid Medline, CINAHL, EMBASE and the Cochrane Library between 2000 and 2018. The studies that assess the quality of PROMs in STS and published in English language were identified. Two reviewers will independently read the abstract and identified relevant full-text articles. The quality of the PROMs questionnaires will be evaluated using COSMIN checklist by the same two reviewers independently and any conflicts between them will be resolved in consultation with the third reviewer. Relevant data will be extracted from the studies related to constructs measures, content of the PROM, number of items or domains, psychometric information and other characteristics of the study as relates to patient demographics. The methodological quality of each study will be evaluated for risk of bias on 4-point ordinal scale (excellent, good, fair, or poor) and also on COSMIN checklist for each of 9 measurement properties.

Results: We have completed the systematic search and in process of extracting relevant information from each included studies. This project is on-going and findings will be presented at the conference.

Conclusions: Studies that report psychometric properties of PROMs are recommended to use COSMIN checklist so as to make sure that important information related to the measure is made available to the reader. This project will highlight any gaps related to reporting of PROMs in STS and provide information on which PROMs should be used for trials.
A systematic review of patient-reported outcomes used to measure health-related quality of life in soft-tissue sarcoma

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Abstract

Introduction: FDA defines Patient-reported Outcomes (PRO) as measurement that are based on a report that comes directly from the patient (i.e., study subject) about the status of a patient’s health condition without amendment or interpretation of the patient’s response by a clinician or anyone else. Health-related quality of life (HRQOL) is defined an individual’s perception of the effects of illness or treatment on various aspects of his life. HRQOL is a multi-dimensional construct and quantified using PROs. PROs provide direct information as it relates to the patient’s perspective of their health. Soft-tissue sarcomas (STS) are heterogenous group that arise from connective tissues such as muscle and fat. STS are rare cancers and typically affects young population in the productive years of their life.

There is limited information related to what PROs are used to measure HRQOL in people with STS. The purpose of this study is to systematically review recent literature on PROs used STS from active care through survivorship.

Methods: We have systematically reviewed the literature between 2015 and 2018 and included all articles that were published in English-language where any PROs were reported in studies with STS.

Results: An integrated research methodology was be used to summarize the PROs used STS. A total of seven studies: two cross-sectional surveys, one systematic review, one expert review, one cohort study and two qualitative studies were obtained were included in this review. Beside functional restoration, there were three areas of importance to extremity STS patients: symptom management, the experienced distress under the course of diagnosis and treatment and emotional restoration. Fourteen PRO measures were used across the included studies, although none of them was specified to Extremity STS patients.

Conclusion: There is a compelling need to further QOL-related research, specifically in patients with extremity soft-tissue sarcoma, Using existing PROs and patient’s areas of importance to develop STS-specific QOL measure.
Integration of Transcriptome and Metabolome to identify novel biomarkers for soft tissue sarcoma

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Abstract

Introduction: Soft tissue sarcomas (STS) are a heterogeneous and complex group of tumors with significant metastatic potential. Hence, to track down potential biomarkers and therapeutic targets for these malignancies is extremely relevant. Studies combining state-of-the-art transcriptomic and metabolomics approaches could help identify such biomarkers and targets in a field where knowledge is still relatively sparse.

Methods: We performed a miRNA profiling analysis with nanoString nCounter platform on 24 tissue and plasma samples obtained from patients enrolled at the Careggi University Hospital, Florence (RESEARCH study). Differentially expressed miRNAs were selected with a reduced model likelihood test. Experimentally-validated target genes of such miRNAs were identified from online databases and tested for enriched KEGG modules. Serum samples had metabolomic assessment by nuclear magnetic resonance (NMR).

Results: Differential expression analysis revealed that 70 miRNA showed differences in expression in relapsing patients both in tissue and plasma samples (adjusted p-value < 0.05, Fold Change > 1). The following clustering analysis showed that a panel of 25 miRNAs was upregulated in relapsing patients regardless of the sample source. Validated target genes identification showed 789 genes regulated by this miRNA panel. KEGG module enrichment analysis on target genes revealed 11 significant enriched pathways (adjusted p-value < 0.01), including “Methionine degradation”. An alteration of Methionine metabolism was confirmed by NMR analysis.

Conclusions: Our data indicate that a panel of miRNAs linked to methionine metabolism is more expressed in patients who will experience relapse vs not relapsing patients evidencing that sarcoma metabolic landscape may pave the way for new therapeutic target identification.
**Do blood parameters effect the survival in paediatric Ewing sarcoma patients? The results from a single centre.**

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**Abstract**

**Introduction:**
Ewing sarcoma is still a problematic oncological disease for paediatric population. Although Ewing sarcoma is rare, but it is one of the primary bone cancers among the kids. Although there are parameters such as the volume of the tumour, having lung metastases, stage of the disease affects the survival but there are limited studies about the blood parameters. In this study the aim was to examine which blood parameters affect the survival of the Ewing sarcoma patients using the database of a single centre.

**Material and Method:**
The files of 50 patients who were diagnosed and followed up with Ewing sarcoma between 2009 and 2021 in the Department of Pediatric Haematology and Oncology, Selcuk University, were evaluated retrospectively. Demographic characteristics, clinical characteristics, treatment approaches, follow-ups, and the relationship between prognostic factors and survival were examined. Haemoglobin, lymphocyte, neutrophil, platelet levels and platelet lymphocyte ratio, neutrophil lymphocyte ratio were studied using blood tests. Statistically, \( p < 0.05 \) was considered significant.

**Results:**
The age of the patients ranged from 9.6 months to 17.5 years (median: 10.1 years). The duration of complaints before admission to the clinic was between 3 days and 365 days (median, 60 days) and the most common complaint was pain \( (n = 43, 86\%) \). There were 38 patients \( (74\%) \) without distant metastases, 6 patients \( (12\%) \) with lung metastases, and 6 patients \( (12\%) \) with distant metastases. A follow-up period of the patients ranged from 0.2 years to 15.7 years (median 3 years). When survival analyses were evaluated, overall and event-free survival rates were 60.1±8.9\% and 52.5±8.2\%, respectively.

Although female gender, advanced disease, high LDH value, tumor volume > 10 cm3, age ≥ 12, presence of anemia, and neutrophil-lymphocyte ratio had negative effects on survival, these parameters were not statistically significant. “Platelet lymphocyte ratio > 150” parameter had negative effect on event free survival \( (p=0.012) \).

**Conclusion:**
This study is about determining the survival using the clinical and hematologic parameters at the time of admission. Blood parameters at the time of admission especially platelet lymphocyte ratio can be
important for commenting on survival of Ewing sarcoma patients. Further randomized, controlled prospective studies are needed for supporting this situation.

Poster upload

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**Modified surgical technique of sacrectomy in treatment of bone sarcoma and its impact on function and overall survival**

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**Abstract**

**Objective**

Large defects caused by tumor resections around sacrum and posterior pelvic column require sophisticated reconstructive solutions such as dedicated customized implants manufactured with 3D technology. The aim of the study is to present the innovative approach to reconstructions in sarcoma patients in whom the sacral and pelvic resections were performed at the same surgical procedure.

**Study Design and Methods**

Material was composed of 20 selected patients hospitalised at The Department of Orthopaedic Oncology of Pomeranian Medical University of Szczecin, Poland between 2013 and January 2022 due to advanced forms of primary bone tumors. All patients were treated with a modified posterior approach and reconstructed with 3 D custom made implants of the same origin. The surgical procedure in all cases was a combined partial or total sacrectomy with the resection of posterior pelvic column. The reconstruction of the defect was performed by 3D custom made implants covered with deep EPORE® surface (Implantcast gmbh). We used gammakamera SPECT/CT GE Hawkeye 4 bone scintigraphy with TcPPm MDP dynamic, planar and tomographic aquisities to precisely visualise the bone ingrowth into the surface of the implant. The test and clinical evaluation were performed at 12 month after surgery in all patients.

**Results**

We showed promising short term results regarding both oncological aspects and reconstruction options in patients treated with wide sarco-pelvic resections. Good functional results were achieved as the presented surgical techniques and firm primary stability of the new concepts of implants enabled better healing and osseointegration.

**Conclusions**

The presented methods show the possibilities of oncologically clear wide sacro-pelvic tumor resections, surgical technique of nerve roots release have a great impact on functional results. Innovative implants designs can help stimulate osteoblasts migration form the adherent bony area.
How does bone strength change after radiation therapy for metastatic disease, can we avert pathologic fractures. CT base biomechanical finite element analysis of patients with bone metastases to the femur.

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Abstract

Introduction-

Metastatic bone disease (MBD) to the femur is a significant cause of morbidity in cancer patients. Metastases cause tumor related pain and mechanical pain leading to pathologic fractures. Impending pathologic fractures present with increasing weight bearing pain and limping, they are treated with prophylactic surgical fixation to avoid fracture risk.

Metastases which do not yet pose fracture risk are treated with radiation to alleviate tumor pain and to avoid local disease progression. The biomechanical effect of radiation for MBD has not been studied.

CT based biomechanical finite element analysis (CTFEA) of the femur is a validated method for assessing bone strength with high accuracy in cancer patients. Comparing sequential CT scans can reveal changes in biomechanical strength.

Methods-

This prospective clinical study enlisted cancer patients referred for radiation because of femur metastases. CT based biomechanical analysis was acquired before radiation and 3, 6 and 9 months thereafter. We measured patient reported pain and function and compared these to CTFEA results and clinical outcomes.

Results-

Nine patients have currently been enlisted for this study. CTFEA analysis showed low fracture risk at presentation. Currently, none of these patients have fractured and none have shown local progression after radiation. One patient went on to have surgery because of increasing pain and PET-CT showing viable tumor. CTFEA did not show any change for better or worse in following scans in all patients, as of yet.

Conclusions-

This is the first clinical study looking at biomechanical changes in cancer patients with MBD after
radiation. Initial results look promising, none of the patients have disease progression and mechanical weakening. Sequential CTFEA accurately assesses mechanical bone strength in this group of patients.
The orthoplastic approach in soft tissue tumors of the foot

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Abstract

Introduction: Soft tissue foot tumors are relatively common entities, easily overlooked after misdiagnosis and inadequate treatments. Prognosis of sarcomas is poor. Our aim was to evaluate the efficacy of orthoplastic approach analyzing 1) indications and type of soft tissue reconstructions; 2) complications rate and (3) oncologic and functional outcomes.

Methods: In over 1170 patients with foot tumors, we analyzed 26 patients (14 females), mean age 56 years), with sarcomas of the foot treated at our hospital with plastic surgeons. Orthoplasty has been considered for free flaps (18), chimeric flaps (2), pedunculated flaps (3), propeller flaps (3). Perioperative morbidity, mortality and flap loss were studied. Functional outcome was assessed using the Toronto Extremity Salvage Score (TESS), and the Musculoskeletal Tumour Society Rating Scale (MSTS).

Results: At a mean follow-up of 5.3 years (range 2-8), patients continuously showed no evidence of disease in 80.7%, were alive with disease in 6.2% and were dead with disease in 13.0%. Overall, 38.5% developed a complication (mainly minor: 90%). Mean MSTS and TESS was 74.8 ± 14 and 79.1 ± 13, respectively, with no significant differences (p<0.05). A significant pre- to post-operative difference was identified for patients in both the pedicled (p < 0.02) and free flap groups (p < 0.04).

Conclusions: Orthoplasty is a combined approach effective for sarcoma patients, even in foot surgery. Functional results should be better than a below-knee amputation. The effect of radiation therapy should be considered. One-stage reconstructions are technically feasible and are not associated with increased risk of complications.
The use of navigation vs custom-made saw jigs in computer assisted pelvic resection and reconstruction. What is better?

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Abstract

Introduction: Computer-aided surgery is a novel concept. Computer navigation facilitates surgical resection, as well as osteotomies made with custom surgical jigs. Our aim was to evaluate the efficacy of navigation-assisted surgery for pelvic resection analyzing 1) indications and designs of bone reconstructions related to surgical accuracy; 2) complications rate considering site (3) oncologic and functional outcomes at mid-term follow-up

Methods: A total of 25 patients (13 females) with pelvic tumors or challenging revision surgery surgically treated at our hospital (2016-2021) were selected. Eleven were non-oncologic patients, whereas in the remaining cases chondrosarcoma was the predominant diagnosis (n=5 [20%]). Reconstruction included custom-made 3D printed prostheses (21-five with spinopelvic implant), massive allografts (2) and hip coartation (2). Navigation surgery has been used in 12 patients, custom jigs in 18 (both in 5 patients).

Results: The mean follow-up was 24 months. Margins were wide in all cases. Overall survival was 89% at 5 years follow-up. In the oncologic group, 10 patients (71%) were disease-free (4 after treatment of relapse), one was alive with disease (7%) and three died with disease (21%). No significant difference was found in margins’ evaluation between navigation and jigs groups (p<0.05). Overall complication rate was 32%. Mean MSTS score was 73% (range, 23%-100%).

Conclusions: Navigation-assisted surgery has increased safety for patients and allows for a better oncological outcome. We found no significant differences between the two approaches for resection, and we strongly suggest a combined use of navigation and jigs. Custom-made 3D printed prostheses represent a good reconstructive technique.
Limb lengthening for deformities in Ollier’s disease: a systematic review in 121 patients (272 bone segments)

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Abstract

Introduction. Management of limb deformity, shortening, and bone defects in Ollier’s disease is a major challenge. This study aims to summarize and compare the different surgical treatments, and to evaluate the outcome and possible prognostic factors of leg lengthening in these patients.

Methods. A systematic review of the literature from 1993 to 2017 was performed. Nineteen articles were found including a total of 121 patients with limb deformities because of Ollier’s disease. Mean patients’ age at time of first surgery was 12 years. A total of 272 segments were surgically treated (14 segments in the upper limbs) with variable techniques including osteotomies and external fixation, intramedullary nails, epiphysiodesis and lengthening over nail. We studied bone healing index (BHI), distraction index (DI), distraction time, gained length, total treatment time, and complications.

Results. Available implants and techniques allowed correction of patients’ deformities (lengthening and correction of angular defects) in most cases. External fixators were the most commonly used technique. The Ilizarov external fixator was the most commonly used frame (196 segments). The BHI was significantly better when the external fixation was combined with intramedullary nails (p<0.05). Joint stiffness, infection, early consolidation, pathological fracture, deformity recurrence, delayed union, non-union, neurapraxia, and overlengthening were the reported complications with an overall rate of 27.9%.

Conclusions. There is no consensus for the optimal surgical technique and implants for correction of limbs deformities in patients with Ollier’s disease. Circular external fixators are the most commonly used implants; however, complications do occur.

Keywords: Ollier’s disease · Limb length discrepancy · Deformities · External fixator
Decompressive surgery for spine metastases: analysis of 49 patients from a single Institute

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Abstract

Introduction. Metastatic spinal cord compression (MSCC) can occur in advanced stages of carcinomas, with serious impact on quality of life. Standard treatment consists of corticosteroids and radiotherapy, while the role of surgery is not clear. Aim of the study was to evaluate the effectiveness of surgery in MSCC.

Methods. We analyzed 49 patients (29 males) with a mean age of 64 years, surgically treated (2014-2021). Forty patients were treated with vertebral stabilization and decompression (8 with partial debulking) whereas 9 decompressed without stabilization. A kyphoplasty was performed in 7 cases, vertebroplasty in 1 and one patient was treated with anterior somatectomy after posterior stabilization. Frankel grade, pain, onset of complications and survival were analyzed.

Results. Lesions were located at the thoracic level (59%) and lumbar level (39%). Multiple myeloma was the most frequent histotype (11), followed by lung (9) and breast cancer (8). 89% of patients had further metastases at the time of MSCC. In 37 cases (75%) an improvement in Frankel Grade and pain was noted (p <0.05); 63% regained the ability to walk after surgery. Complication rate was low (9%). At a mean follow-up of 19 months, survival was 77%. Five patients developed postoperative complications (with the need for reoperation or exitus).

Conclusions: Surgical decompression associated with radiotherapy appears to be superior to radiotherapy alone for patients with MSCC. Timely appropriate surgical treatment can significantly decrease the patient's neurological and pain symptoms. Perioperative mortality and complication rate are not sufficient to justify a conservative treatment in these patients.
Joint sparing endoprostheses of the long bones in the treatment of musculoskeletal tumours

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Abstract

Aim
To review joint sparing endoprostheses (JSE) of the humerus, femur and tibia, specifically mechanical (Henderson 2 and 3) failures.

Patients and methods
Retrospective study of clinical records of patients between 2000 to 2018. 154 patients were identified: 38 had insufficient data, 21 humeral, 52 femoral and 43 tibial replacements. Junctions were classified as joint sparing or diaphyseal. Survival analysis examined time to failure of the bone-implant junctions and the whole implant. Patients were censored at last follow up or non-mechanical failure.

Results
Humerus. 55% (95% CI: 28% to 86%) had mechanical failures at 9 years. Every 10-year age increase was associated with 25% reduction in mechanical failure rate (P= 0.04). No significant association with sex, implant type or design. In the distal humerus, diaphyseal outperformed joint sparing designs (P= 0.03).

Femur. 40% (95% CI: 23% to 63%) had mechanical failures at 18 years. Every 10-year increase in age was associated with a 44% increase mechanical failure rate (P=0.04). No significant association with sex or implant design.

Tibia. 31% (95% CI: 18% to 51%) had mechanical failures at 15 years. No significant association with age, sex or implant design.

Conclusion
Joint sparing and short stem implants can work well. Failure rates were higher in the humerus. In the distal humerus, extracortical plates outperformed short intramedullary stems. In the femur failure rates were higher with joint sparing implants with short intramedullary stems. In the tibia, no difference between joint sparing and diaphyseal designs but those with extramedullary plates only performed well.
The Role of the Specialist Sarcoma Radiographer

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Abstract

Since June 2019, the Radiotherapy Department at University College Hospital has had a Macmillan Sarcoma Specialist Radiographer in post. Over the last 3 years, this new and unusual role has developed to include a variety of different clinical, technical and research aspects. The role has resulted in improved sarcoma awareness amongst junior radiographers and radiotherapy students, superior treatment setup troubleshooting and enhanced communication throughout the treatment pathway as evidenced by staff feedback. Importantly, this role has also provided a new keyworker support system for 450 sarcoma patients undergoing radiotherapy as part of their radical treatment pathway.
Management and surveillance of metastatic giant cell tumour of bone

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Abstract

Introduction

Giant cell tumour of bone (GCTB) is a benign condition with metastatic potential. The treatment is surgical and/or chemotherapy (denosumab).

Staging is undertaken before surgery as GCTB may present with distant disease. The common site is the chest (≤5%) and is monitored following treatment. What is uncertain is the behaviour of distant disease. The purpose of this review was to assess the incidence and surveillance of chest disease.

Methods

A retrospective audit of Oxford bone tumour registry. The inclusion criteria is patients with diagnosis of GCTB confirmed histologically. Exclusion criteria is medical records and full imaging were not available/incomplete, or referred for secondary MDT opinion. A total of 75 patients (from 122 histopathology records) were identified.

Results

Pulmonary metastasis was identified in 9 patients, 1 at presentation and 8 (89%) at follow-up between 2 – 42 month period. 3 of these were histologically confirmed.

5 (56%) of patients with chest disease have died (between 1 and 22 months after confirmed chest disease), 4 alive with stable disease.

6 (67%) with chest disease had recurrence of local disease requiring further limb/axial surgery.

35 (47%) had denosumab (MDT recommendation). 8 patients (89%) with chest disease were treated with denosumab/chemotherapy (6 before, 2 after chest diagnosis).

Overall local recurrence occurred in 19 patients (25%). 15 (79%) with local/extremity recurrence were treated with denosumab (9 before, 6 after recurrence diagnosis).

Conclusions

GCTB is unpredictable and has metastatic potential both at presentation and follow-up. Chest disease on surveillance may not be stable and progress and requires careful monitoring with PET scan and CT.

Histological review of biopsy, surgical specimen and chest metastasis may indicate metastatic potential and requires formal MDT review.

This requires a multi-centre/BOOS audit of GCTB outcome and chest surveillance.
**Circulating tumour cells during surgery for chondral tumours**

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**Abstract**

Chondral tumours express a unique DNA mutation (IDH 1/2) which can be measured in blood. Being able to measure this may allow evaluation the immunomodulatory effects of surgical or anaesthetic interventions or may indicate those at higher risk of recurrence.

The aim of this study was a proof of concept that this unique mutation can be measured from a blood sample at the time of surgery and to see if the amount of circulating tumour DNA (ctDNA) was increased immediately following surgical treatment in chondral tumours.

Consent was obtained and samples were taken immediately after anaesthesia, after surgical resection and on recovery. 51 patients were recruited with 35 having a full data set available for analysis. 69% of patients had the mutation which meant ctDNA levels could be measured. 12 tumours were well differentiated, 7 were grade 2 chondrosarcoma and 5 were de-differentiated. All low grade chondral tumours had a curettage, higher grades all had en bloc resection.

In well differentiated tumours, no ctDNA was detected pre-operatively, 5/12 had ctDNA detected immediately post surgery, no ctDNA was detected on follow up samples. In grade 2 chondrosarcomas, 4/7 lesions had pre-operative ctDNA but none was seen post-operatively. In the de-differentiated group, all had pre and post resection ctDNA, but the levels did not increase following surgery.

It is possible to measure ctDNA from blood samples in chondral tumours. Curettage appears to increase the level of ctDNA, whereas resection does not. The significance of this is unclear and perhaps warrants further investigation.
Intraoperative TEG data to customise VTE risk and individualise care for sarcoma patients

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Abstract

Sarcoma patients have a conflicting coagulation profile with both pro and anticoagulant factors playing a role. On presentation for surgery, it is important to understand these competing risks and provide a strategy which prevents VTE formation, but also minimises bleeding risk. The hypothesis of this study is that the use of point of care thrombelastography can help individualise care for sarcoma patients and minimise risks.

Local institutional approval was obtained and a blood sample for point of care TEG measurement was taken immediately after anaesthesia to examine the baseline coagulation profile.

Results were obtained in 53 primary sarcoma patients, 26 of these had received chemotherapy. 8 patients had metastatic bone disease.

In the primary sarcoma group, average R time and MA were within normal range indicating adequate coagulation factors and platelet function. There was no difference between the group who received chemotherapy and those who didn’t. Between 25% and 35% of patients have a shorter than normal R time, indicating pro-coagulant tendencies.

In a small cohort of primary sarcoma patients, chemotherapy does not appear to have long lasting effects on platelet function showing that platelets regenerate quickly and effectively following chemotherapy. Between 25 and 35% of patients may be prothrombotic and this should be borne in mind when managing these patients for surgery. Thromboelastography is a useful tool to help guide management in this group of patients.
Minimally Invasive Fixation of Pelvic Metastases by CT-Assisted Surgical Navigation Improves Pain and Maintains Function at One Year

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Abstract

INTRODUCTION: Metastatic disease of the pelvis is common and frequently associated with disabling pain. Radiotherapy remains invaluable but response and palliation may be incomplete. While total hip replacement has been shown to effectively address periacetabular cancer, the role of surgery is not well established for management of cancer outside or beyond the periacetabular region and refractory to radiation. Minimally invasive percutaneous fixation is an attractive treatment option, due to limited risk of perioperative complications and faster recovery than open surgery. We explored this technique to address mechanical pain and impaired function in a cohort of patients with limited residual bone stock and lack of dependable treatment options. Effectiveness of CT-navigated percutaneous fixation was prospectively assessed via metrics of pain palliation, functional capacity, and quality of life.

METHODS: This was a retrospective review of prospectively collected data on 14 patients treated from 2017 to 2021 for locally advanced pelvic metastatic cancer. All patients presented with incapacitating functional pain requiring high-dose narcotics, very limited or absent ambulatory capacity, and evidence of pathologic fracture through a lytic lesion in 10/14 patients (70%). The goal of surgery in all patients was to improve pelvic stability by internal fixation through remaining osseous stock. Outcome measurements for pain were the Visual Analog Scale (VAS) score and analgesic requirements according to the New York Department of Health and Mental Hygiene Morphine Milligram Equivalent (NYDHMME). Function and quality of life were assessed by Eastern Cooperative Oncology Group (ECOG) Performance Status and self-reported ambulatory capacity. Outcome measurements were prospectively recorded at preoperative baseline, one month, and every three months afterwards. Differences between pre-operative, one month post-operative, and 12 month post-operative data were assessed with ANOVA and Chi-squared analyses.

RESULTS: There were no cases of hardware misplacement and there were no intra/perioperative complications. All 15 at 3 months and 9 patients were alive at 12 months follow-up. Reduction and stable fixation were maintained in all patients. The mean preoperative VAS score and MME were significantly improved at one month post-operatively (p=0.001 and p=0.04, respectively). 3-months mean VAS score remained significantly improved while mean MME was still improved but not significantly so (p= 0.006 and p=0.4). One-month ECOG improved at least 1 point-scale in all patients and further improved of at least 2 in 9 patients at 3 months. At 12-month follow-up, the 9 patients alive maintained stable fixation and unchanged pain measurements, analgesic requirements and performance score/ambulatory capacity compared to 3-month follow-up.

CONCLUSIONS: CT-guided percutaneous fixation was clinically successful for pain relief, narcotic reduction and functional restoration in patients with disabling metastatic cancer of the pelvis. Clinical benefit was durable and persisted in all living patients at 12 months from surgery. Future studies are needed to refine indication technique and provide longer follow-up.
Hybrid Reconstruction with Modular Cemented Intercalary Prosthesis and Plating for Metastatic Disease of the Humerus Provides Durable Fixation and Excellent Functional Outcome

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Abstract

INTRODUCTION: Humeral metastatic disease is common; treatment goals are pain relief and function/quality of life restoration. Internal fixation, nail or plate, is usually recommended when bone stock is sufficient, often supplemented by cement augmentation. However, internal fixation may be insufficient for extensive segmental bone destruction. Successful use of cemented intercalary prostheses has been described in this setting. Nevertheless, implant failure has been reported up to 30% due to mechanical complications and loosening. Limited proximal/distal bone stock may also prevent intercalary fixation and require joint replacement. To address these limitations, we developed a hybrid reconstructive concept based on combined use of cemented intercalary prosthesis and plate fixation. In this study, we describe this novel technique for reconstruction of large segmental humeral defects and assess implant durability, effectiveness of this reconstructive method in preservation of surrounding articular surfaces with limited available osseous stock, and incidence and severity of complications.

METHODS: From 2017 to 2021, 13 patients with humeral metastatic disease and extensive segmental bone destruction underwent reconstruction using this technique. Etiology: renal cell cancer 4, breast cancer 3, lung cancer, colorectal cancer, prostate cancer, pancreatic cancer, multifocal hemangioendothelioma and soft-tissue undifferentiated pleomorphic sarcoma 1. Surgery was primary reconstruction in 11 cases and revision of failed fixation in 2. Five of the nine primary cases and both revision cases presented with pathologic fracture; all patients underwent preoperative/postoperative radiation. Surgery consisted of segmental resection of cancer and suboptimal bone in all cases, followed by cemented intercalary prosthesis and supplemental large/small fragment plate spanning the prosthetic body proximally and distally. Stem was shortened with a metal cutting tool to allow preservation of the nearby joint in 8 cases (shoulder 6 cases, elbow 2). (Figure 1). Postoperatively, patients were allowed immediate full weight-bearing and ROM as tolerated. Preoperative and final MSTS Upper Extremity scores were reported. Results were reported using descriptive statistics, and statistical significance was set to p< 0.05.

RESULTS: 4 of 13 patients were alive at index follow-up. Average follow-up 2 years. One case required additional surgery for new metastasis of the elbow. There was no evidence of clinical/radiographic loosening/mechanical failure. There were no complications except from 1 incomplete radial nerve palsy in a revision case, completely recovered 8 weeks. All patients had complete or nearly complete resolution of pain. MSTS Upper Extremity scores improved from 16.5 to 26.3 (p < .001).

CONCLUSIONS: At short-term follow-up, this technique for reconstruction of large, segmental defects of the humerus demonstrated no reoperations for mechanical complications, no incidence of infection and low complication rate overall, allowing for immediate weight bearing and unrestricted activity of the upper extremity with overall excellent function. This technique is a valuable option for more durable fixation of intercalary humeral reconstruction compared to previously reported results. In our opinion, preservation of an intact rotator cuff is an important consideration for early recovery and improved function when compared to standard intramedullary fixation. Longer follow-up is needed to confirm early results.