has significant drawbacks. A non-invasive continuous monitoring test would be a very welcome addition to the diagnostic armoury.

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Oncology

Margin classification and risk of local recurrence

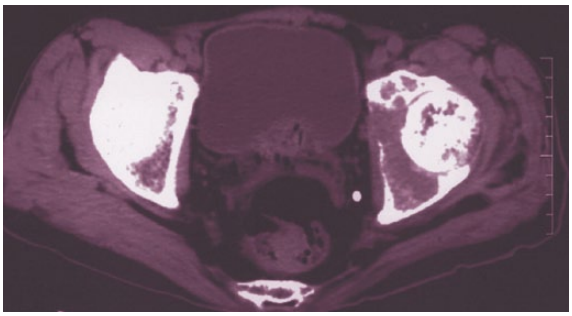
There are a range of different systems for use in classifying the success or otherwise of soft-tissue sarcoma (STS) excision at the surgical margin. Whilst it is universally agreed that the presence of clear margins is an important factor in prognostication in patients with a STS, what isn't agreed is which of the many classification systems is the best to use. In what has obviously been a mammoth task, investigators in **Toronto (Canada)** have done a good job of shedding light on this question.[1] Their paper revolves around the applications of residual tumour (R) classification, the R + 1 mm classification, and the Toronto Margin Context Classification (TMCC) to a case series of 2217 patients. All patients presented with non-metastatic limb and truncal STS treated with surgical resection and multidisciplinary consideration of perioperative radiotherapy. The authors retrospectively reviewed their excision margins and classified with all three systems. Although the systems share similarities, there are some subtle but important differences. The original residual tumour classification uses microscopic tumour at inked margins, defined as R1. The R + 1 mm classification is similar; however, here, microscopic tumour within 1 mm of ink is defined as R1. For the Toronto Margin Context Classification, positive margins are separated into planned close but positive at critical structures, positive after whoops re-excision, and inadvertent positive margins. The authors then went on to look at survival analysis using competing risks models to establish if there were any differences between the three classification approaches. The authors' results suggest that the original R0, R1, R2 classification is probably the best discriminator where the R + 1 mm (what many would consider an Enneking 'marginal' resection) is in between R0 and R1 risk of LR. There were some additional benefits to the TMCC, which the authors concluded does provide some additional stratification of positive margins at the time of surgery, and may therefore aid in surgical planning and prognostication in these subgroups of patients.

Grade, local recurrence, and survival in chondrosarcomas

Chondrosarcoma is a difficult condition in which to prognosticate. There have been a number of recent cases suggesting that biopsy results may be a rather poor indication of disease-specific survival. This paper from **Birmingham (UK)** sets out to examine the potential value of histological grade and disease-specific survival.[2] The authors were able to include the results of 343 chondrosarcomas, an impressive number, treated at their unit. The patients all had a histological grading performed both at the initial diagnostic biopsy and subsequently at definitive surgery from the resection specimen. The authors treated patients with mixed grade, which is not uncommon in chondrosarcoma; the highest identified grade was used for the purposes of the study. One of the more interesting findings of the study is that only around 40% of patients kept their initial grade determined at biopsy following formal histological examination of the resection specimen. This factor has clearly had a role to play in the difficulty of interpreting the results of previous papers and clinically. In around a third of patients, a small number of cells or focal areas of a higher grade were also seen, which again makes diagnosis tricky. What the authors did establish, however, was that not only is biopsy unreliable in predicting eventual grade of a chondrosarcoma, but that prognosis related to the final highest grade identified in the tumour, and that the highest grade of tumour seen should be that used for prognosis.

Local treatment of Ewing's sarcoma within a randomized controlled trial

One of the better recent randomized controlled trials looking at outcomes in musculoskeletal tumour was the European Intergroup Cooperative Ewing's Sarcoma Study (EICESS)-92. The trial randomized patients to different chemotherapy options in Ewing's sarcoma and was undertaken by two national clinical trial groups: one in the United Kingdom (Children's Cancer and Leukaemia Group (CCLG)) and one in Germany (German Paediatric Oncology and Haematology Group (GPOH)). An unexpected outcome of the trial was the observation that the survivals were different between the patients in the different trial networks. This rather overdue paper from multiple centres in the **United Kingdom** and **Germany** analyzes why there was an unexpected difference in survival between the two countries.[3] In the initial study, a total of 647 patients were randomized to one treatment or another. Cox regression analyses were used to compare event-free survival (EFS) and overall survival (OS) between the two study groups. The five-year EFS rates were 43% and 57% in the CCLG and GPOH study networks, respectively, giving OS rates of 52% and 66%. The authors went on to explore differences in the treatment regimes that may have accounted for the marked differences in survivals. The clearest differences were in the chances of the English cohort having both surgery and radiotherapy (18% *vs* 59%); there were also higher rates of preoperative radiotherapy in the German cohort (45% *vs* 3%). The most striking finding of this study is that after adjusting for age, metastases, primary site, histology, and local treatment modality, the risk of an EFS event was 44% greater in the



English cohort and the risk of death was 30% higher. The differences here turned out to be due to less intensive treatment for the local disease in the United Kingdom, with most patients having either radiotherapy or surgery, whilst in Germany most had double therapy (radiotherapy and surgery). The findings of this differential survival have resulted in a complete change in management of Ewing's sarcoma patients in the United Kingdom, as well as the formation of an innovative web-based national multidisciplinary team to get consensus on treatment.

Smoking and sarcoma patients

The evidence against smoking continues to mount in orthopaedic surgery, with a range of complications and poor outcomes now having been shown, all but definitively, to be due to smoking. The negative effects of smoking are only too well known to oncologists; however, more and more data continues to emerge about the outcomes of smoking and surgical treatment, arguing that the outcomes following treatment of soft-tissue sarcomas (STS) are an interplay between treatment and patient characteristics. Treatment usually consists of preoperative radiotherapy, with or without chemotherapy, and then a planned wide local excision. It has already been established that tumour size, grade, response to therapy, and certain patient characteristics such as age do have an effect on survival. Smoking, however, has yet to be found to be relevant one way or the other. These authors from **Milwaukee, Wisconsin (USA)** report their investigation, which aimed to establish if smoking impacts overall survival (OS), distant metastasis-free survival (DMFS), and progression-free survival (PFS).[4] This cohort-based paper reports patients over a 15-year period from a single centre, yielding a cohort of 166 patients. The patient variables were retrospectively reviewed and smoking was defined as a ⩾10 pack-per-year history. In the initial cohort, around a third (n=57 34%) of patients had smoking histories ⩾10 packs per year. Screening for potential associations using a simple univariate analysis suggested that smoking was associated with decreased DMFS and PFS but not OS. These somewhat unexpected results echo what has been found in other areas of musculoskeletal oncology, and show how smoking may decrease survival even in patients with STS and preoperative radiotherapy.

Limb-sparing resection for pelvic sarcoma

The pelvic sarcoma is perhaps the most difficult of them all in terms of providing a functional reconstruction. A range of options have been described in the past, ranging from hemipelvectomy to hind quarter. However, very little is known about the potential for limb salvage in these patients. The authors note that in previous research, which for the most part has consisted of little more than small series or case reports, the common theme is one of very poor eventual functional outcomes. A review team from **Nashville, Tennessee (USA)** has set out to draw all of these disparate case series together and undertaken a thorough systematic review in an attempt to establish what the results likely are.[5] The review team undertook their review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and undertook a thorough search using PubMed and Cochrane databases. Studies were included if they reported more than ten patients, reported more than 12 months of follow-up, and reported functional outcomes. Due to the broad nature of the search strategy, over 2300 studies were identified, of which 22, all level IV evidence, fulfilled the inclusion criteria for the systematic review. The studies in total reported the outcomes of 801 patients, enough to get a good estimate of complications and outcomes. The described surgical techniques varied widely and included allografts, allograft-prosthesis composites, saddle prostheses, custom endoprostheses, and irradiated autografts. The pooled mean estimates showed a five-year patient survival of 55 and an overall non-oncological complication rate of around 50%, with a 37% reoperation rate. Functionally, however, things were not too bad, with a mean Musculoskeletal Tumor Society score of 65%. This is the only pooled outcomes study we are aware of here at *360*, and it illustrates the high complication rates and low survival in patients presenting with pelvic sarcomas. However, taken as a whole, the literature suggests that in some situations the function result expected following reconstruction may be no better than a simple excision. Clearly, there is a lot of work needed on this diagnosis to establish the optimal option (if any) for reconstruction.

Complications of allograft reconstructions in young children

There are no clear answers in terms of how to treat children presenting with malignant bone tumours who are skeletally immature. Clearly, the aim is to maintain and maximize postoperative function, whilst allowing for growth to minimize deformity and disability. One widely accepted option, particularly in the younger patient (under ten years old), is the resection of bone sarcomas and reconstruction with an allograft; however, there are few long-term follow-up series. The later follow-up of this series from **Buenos Aires (Argentina)** is therefore welcome, with patients followed up to a minimum of ten years after reconstruction.[6] The authors presented a clinical and radiographic follow-up of a total of 22 patients who were treated in this way. None of the children were lost to follow-up, and the authors aimed to quantify the resulting limb-length discrepancy, risk of amputation, revision surgery, and complication rates. By the ten-year follow-up interval, six of the initial cohort had died of their disease and, as such, this report is based on the outcomes of 16 patients who had reached a mean age of 20 years. Those patients (n=3) who did not have growth place involvement in the initial presentation did not experience any growth disturbance by final follow-up. The authors reported, however, that in the remaining 13 patients, there was shortening of less than 3 cm in seven, and of greater than 3 cm in six. The risk of amputation was negligible, with a single patient undergoing amputation. Whilst limb-length discrepancies and procedures to correct them were common in this series, the authors have adequately shown in a reasonable number of patients that bone allograft is an alternative and does reasonably well compared with published series on other options such endoprosthesis and rotationplasty.

Elderly patients, advanced soft-tissue sarcoma, and chemotherapy

This pooled analysis of the previously reported European Organization for Research and Treatment of

Cancer (EORTC) Soft Tissue and Bone Sarcoma Group trials is important, in that it looks at the outcomes of primary treatment with chemotherapy across a range of trials with the focus on the elderly patients.[7] The authors argue, reasonably, that this is of interest as there are few reports of outcomes of metastatic soft-tissue sarcoma (STS) in the elderly, despite half of the patients presenting STS with metastasis being over 65 years old. The authors use a composite of 12 EORTC clinical trials to establish the outcomes of STS in the elderly in terms of overall survival (OS), progression-free survival (PFS), and response rate (RR). Of the 2810 participants in EORTC trials, there were 348 elderly patients, representing 12.4% of the potential study population. The performance status of the patients was usually 0 (n=134; 39%) or 1 (n=177; 51%), and the most common diagnoses was leiomyosarcoma (n=130; 37%). Just over half of the patients presented with lung metastases (52%), and liver metastases were present in 63 patients (18%). The participants received a range of different chemotherapy regimens, which were determined by the primary tumour and the trial they were involved in. The overall RR was low at 14.9%, median PFS was 3.5 months, and median OS was only 10.8 months, all slightly worse than in patients under the age of 65. The authors concluded that this is an under-represented cohort in the ETORC trials, and that the overall survivals, progression-free survival, and response rate were worse, albeit only marginally worse, than those of younger patients.

Can the epiphysis be transferred in primary sarcoma of bone?

■ As outlined in the previous paper on children's sarcoma, there are problems associated with treatment of primary sarcoma. The major potential complication and limitation to eventual function is the lack of an epiphysis and the sometimes dramatic limb-length discrepancy seen. A very attractive option for these patients is reported by surgeons in **Birmingham (UK)**, who described an approach to potentially preserve the growth in the limb.[8] These ingenious surgeons have been using a vascularized fibula autograft, which provides both the potential for bone growth and the rapid incorporation and longevity of the reconstruction at the cost of technically challenging surgery. This present study focused on the potential for maintaining limb length with such a procedure. It describes the graft hypertrophy and annual growth to establish if, when used in the proximal humerus, the vascularized fibular graft allows for retention of any normal growth and development. As perhaps would be expected in such a specialist surgical procedure undertaken in a rare diagnosis, the series presented here contains just 11 patients, all of them with a primary bone tumour of the proximal humerus, presenting over a period of 11 years. Outcomes were assessed annually and follow-up was to an average of five years. The overall survival was 91%; a single patient died of local recurrence a year following the index procedure. The authors of this report found complications occurring in the majority of cases, with seven fractures, four transient nerve palsies, and two cases of avascular necrosis of the graft. There was evidence of growth of the graft in terms of hypertrophy and axial growth in nine of the 11 patients; a single patient suffered a slip of the fibular epiphysis. The rate of growth was not insignificant, with a mean hypertrophy index of 65% and mean axial growth of 4.6 mm per annum. In terms of functional results, at a mean of five years following surgery, the average modified functional Musculoskeletal Tumor Society score was 77% and the authors reported an average Toronto Extremity Salvage Score of 84%. This paper certainly underlines the facility of a free vascularized fibular graft to grow. With an average of 5 mm per annum on average, the arms of these children grew 2.5 cm in the course of the study follow-up, which is certainly not insubstantial. The free vascularized fibular might just be the option that surgeons are looking for. If the complexities of the surgery can be provided, and if patient and surgeon are prepared to cope with the almost certain rate of complications, the eventual functional outcomes are relatively good.

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Children's orthopaedics

Rectus femoris in stiff knee gait: transfer or lengthen? X-ref

■ Stiff knee gait is common in spastic diplegic cerebral palsy, resulting in a compressed total knee motion arc throughout the stance and swing phases of the entire gait cycle. Abnormal firing of rectus femoris through this period has been implicated as a contributing factor and, in recent years, the distal rectus transfer has been the accepted surgical intervention of choice. Theoretically, transferring rectus femoris to hamstrings offered the advantage of converting a knee extensor into a flexor, although debate has been ongoing about whether it is actually clinically effective in producing a flexion moment. The release of the extensor may therefore be the therapeutic component of this procedure, and this group from **Houston, Texas (USA)** hypothesized that rectus femoris intramuscular lengthening and rectus femoris transfer would have equivalent clinical outcome.[1] Their technique involved a mid-substance resection of the rectus aponeurosis, leaving the surrounding muscle intact, and