

fracture patterns that has developed over recent years.⁸ They developed a revised ‘three-column’ approach to tibial plateau fractures and to do so reviewed the CT images of 36 patients. The authors revised the three-column approach such that the posterior border of the lateral column lies posterior instead of anterior of the fibula. Extended lateral column fractures therefore were defined as a single fracture extending posteriorly into the posterolateral corner. CT images of 36 patients were reviewed and classified twice online according to the Schatzker and revised three-column classification approach by five observers. The authors argue that their ‘revised’ three-column approach is suitable to classify injuries with the newer variable angle locking plates. We have to confess, although they have undoubtedly updated the original Schatzker classification, we were rather disappointed here at 360 that their new classification doesn’t place any emphasis on those fractures that are now widely accepted as requiring posterior approaches and fixation, and no emphasis is placed on the tibial tuberosity which is clearly

an important problem and remains unaccounted for.

Markers of resuscitation and metabolic injury X-ref

■ The group in **Cleveland, Ohio (USA)** is continuing its push to understand the physiological response to trauma.⁹ Their most recent contribution is the development of the ‘early appropriate care’ approach, providing a genuine balance between the contrasting philosophies of damage-control orthopaedics and early total care. Continuing this approach, the authors report on a cohort of 335 patients with severe orthopaedic injuries (fractures of the pelvis, acetabulum, femur or spine), along with the outcomes of their resuscitation protocol. Patients underwent early total care if they had one of the following parameters: lactate < 4.0 mmol/L; pH ≥ 7.25; or base excess (BE) ≥ -5.5 mmol/L. Resuscitation success was judged by achieving these metabolic parameters. The authors report that the success of resuscitation did have a bearing on outcomes. In their series, 19.7% of patients developed complications (which was lower than

a historic series) and the complication rate was dependent on the number of resuscitation parameters which were achieved. Patients achieving just one parameter had a 34% chance of complications. In addition to the success of resuscitation, the gender and injury severity were clearly markers of resuscitation. It is reassuring to see a study reporting improvement in outcomes with a modern protocol compared with a historic series, and also highlighting the importance of achieving adequate resuscitation with a patient’s chances of developing a complication intimately linked to the adequacy of their resuscitation.

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Oncology

X-ref For other Roundups in this issue that cross-reference with *Oncology* see: **Research Roundup 1**.

Survival in metastatic spinal disease X-ref s

■ Metastatic spinal disease is one of the most common presentations of metastatic bone disease. Associated with carcinomas, adenomas and myelomas, this is a common site for metastatic spread. The typical patient presents to oncological and spinal services rather than to surgical oncologists, and there is a definite debate about who should undergo which intervention. One of the key pieces in the complicated jigsaw

of decision making is estimation of survival. If a patient isn’t going to live too long then a kyphoplasty, radiotherapy or a watch-and-wait protocol might be appropriate. On the other hand, if the prognosis is many years the same tumour may be treated with decompression and multilevel instrumentation. There has been significant difficulty with survival estimation, and in the last edition of 360 we reported on the development of the Boston prognostic score which is designed to estimate the survival of patients presenting with metastatic spinal disease. A research team in **Akita (Japan)** have reported a small series of 31 patients, all with

vertebral metastasis, which perhaps provides food for thought.¹ These authors report on patients with lung cancer and have compared their post-operative prognosis with those with other primary diagnoses following surgical treatment. As perhaps might be expected with a series like this, at the 16-month average follow-up point only 22% of patients were alive. However, the lung cancer metastatic group appeared to derive the same post-operative benefit as those being operated upon for other primary diagnoses. The authors utilised the revised Tokuhashi score and report that this prognostic tool may well underestimate the survival of

lung cancer patients and that, in this series at least, these patients derived the same benefit from surgical intervention as those with vertebral metastasis from other cancer types.

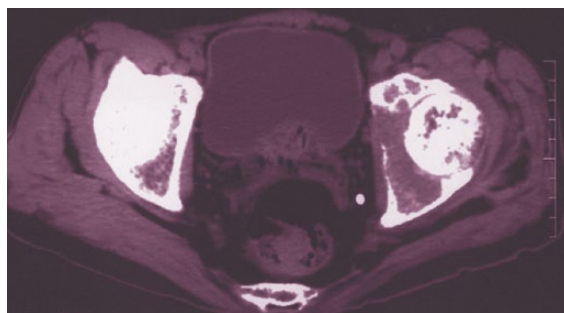
Biopsy tracts: a site for local recurrence in sarcomas?

■ One of the central tenets of orthopaedic oncology practice for many years has been that the biopsy should be done by the eventual treating surgeon in order to allow for excision of the tract at the time of definitive surgery. On the face of it this seems sensible, however, there is little evidence to establish what the frequency of biopsy tract contamination is.

Surgical oncologists from **Madrid (Spain)** have reported an excellent study that essentially confirms treatment biases from the past 30 or so years.² The authors ask how often biopsy tracts are contaminated with 'seeded' cells, and whether that contamination results in a higher risk of recurrence. The study is based on a retrospective analysis of an oncology register in the authors' institution. A total of 221 patients, all having undergone biopsy as part of their tumour work-up, have been included in the study. The authors reported the outcomes of 180 patients, 112 of whom had biopsies at the treating centre and 68 at outside institutions. Follow-up was reported to 3.5 years and the authors were able to report the outcomes in terms of tumour recurrence. All patients had pathological examination of the biopsy tract to determine whether or not the tract was contaminated with seeded tumour cells. The authors were able to identify biopsy tract contamination in 12% of the samples and these were overwhelmingly in the open biopsy samples. On average, patients with clear biopsy tracts survived disease-free for 97 months longer than those with contaminated biopsy tracts. This nicely executed paper confirms the teaching over the past 30 years – biopsy tracts can contain tumour and should always be excised. They also add weight to the principle that deferring biopsy of a suspected sarcoma to the centre that will be treating it is a good thing. In this series, the treating centre had lower contamination rates of their biopsy specimens, and contamination was clearly linked to poor survival.

The consequences of the 'whoops' procedure

■ Unplanned excisions, or partial excision, of a soft-tissue sarcoma can catch out the unwary surgeon and the consequences of the so-called 'whoops' procedure are the focus of a new study from surgeons



in **Graz (Austria)**.³ Reasoning that intralesional or incomplete initial resections may lead to poorer outcomes, but aware that there are some reports of better long-term disease-free survival following re-resection, the authors designed a multicentre study with the aim of establishing what the impact of unplanned excision was on the patients concerned. Their report is based on the outcomes of 728 patients presenting for definitive surgery at three tumour centres. The primary outcomes were estimated using a propensity score method to estimate the time-to-event analyses using an inverse probability-of-event weighting method. There was a surprisingly high rate of unplanned excision, with 38.6% of patients having undergone unplanned excision at presentation. Those with unplanned excision were more likely to be younger males with smaller, superficial tumours. During re-resection there was a greater chance of adjuvant radiotherapy and plastic reconstruction being required. While in primary analysis the re-resection group had improved event-free survival, the propensity weighting demonstrated that there were no differences in overall survival or incidence of distant metastasis. Another paper showing that patients who have a 'whoops' procedure – inadvertent or unplanned excision of a soft-tissue sarcoma, do not have a worse outcome but require further and more extensive surgery to achieve the same result. Although reassuring news for patients who have had an inappropriate excision, clearly the optimum treatment

remains early referral to a sarcoma centre if there is suspicion of a sarcoma.

Imaging prior to referral not appropriate in sarcoma

■ Taking a slightly different approach to evaluating the tumour network model, researchers in **Aarhus (Denmark)** reported the results of their investigation into imaging prior to, or at, referral.⁴ The rationale is that in many centres around the world there are now fast-track protocols in place where patients with suspected sarcomas are referred prior to obtaining an imaging diagnosis. These authors were able to report time to diagnosis as their outcome measure using 545 consecutive patients, all referred to their sarcoma centre. Using a combination of questionnaires and notes review, the authors established the time points for each patient pathway in order to determine the outcome of time to diagnosis. Patients who were referred from outside the referral network with initial MRI/CT or histology were then compared with those patients referred directly without primary investigation. The study established that the time from symptom to diagnosis was 166 days for outside referrals and just 91 days for patients referred as part of a local cancer network. When the research team performed a like-for-like comparison, an additional 41 days were taken for definitive diagnoses in patients from outside the network. Another paper which was along similar lines showed that investigations done outside a sarcoma centre are often delayed and

inappropriate. The message is the same: if suspicious – refer.

Allografts as cost effective as endoprosthesis? X-ref

■ It is a truism that cost-effectiveness analysis is here to stay. If we cannot prove that expensive treatments are worth doing, in terms of resulting in economic productivity or a reduction in long-term healthcare costs, then the widespread availability of more expensive treatment options will become a thing of the past. There is little known about the cost effectiveness of bone tumour surgery, with the three competing options being amputation, limb salvage with endoprosthesis, and limb salvage with bulk allograft. With each having an extensive impact on the complication rates and functional outcomes, it is a perfect comparison for the more complex cost-effectiveness analyses. A group in **Nashville, Tennessee (USA)** have used all of the available data to undertake a Markov cost-effectiveness model.⁵ They used the Medicare reimbursement rates and implant prices to calculate costs, and the Health Utilities Index 3 (HUI-3) survey to calculate health utility. The authors used the widely accepted method of incremental cost-effectiveness ratios (ICER), and less than \$100,000 per quality-adjusted life year was considered cost effective. The results here are actually fairly clear-cut. Osteoarticular allografts, and endoprostheses (but only with around 30% discount applied), were cost effective treatments, with ICERs of \$92.59 and \$6,114, respectively. In terms of break-even points, discounted endoprostheses were more cost effective than allografts costing over \$21 900, assuming the endoprostheses cost less than \$51 900. This interesting study shows the cost effectiveness of allografts *versus* endoprostheses for knee tumours but the implant companies are

going to have to work to ensure endoprostheses continue to be available at a discounted rate.

Sarcomatous metastasis and IM nailing? X-ref

■ Treatment of sarcomatous metastasis can be somewhat tricky. Usually widespread but occasionally solitary, the debate about excision or stabilisation is not quite as straightforward as in other tumours. The use of intramedullary stabilisation is extensive, but in some circumstances excision may be indicated. To a certain extent, the decision between simple stabilisation and excision and endoprosthesis reconstruction does rely on knowledge of the patient's longer-term prognosis – those patients with a poorer prognosis who can be treated with a smaller operation without compromise to their longevity clearly should be. The difficulty, particularly in sarcomatous metastasis, is knowing what the longevity actually is. This is where there is a large gap in the published literature; almost nothing is known about the longevity of patients with sarcomatous metastasis. The recent case series from **Nashville, Tennessee (USA)** crossed the editorial desks at 360 and is definitely worthy of a mention.⁶ The authors were able to report on the results of 98 sarcomatous metastases in 92 patients. Of these, 40 intramedullary stabilisations were performed in 34 patients and 58 underwent resection over an 18-year period. The selection criteria varied between patients, with the authors choosing intramedullary stabilisation in patients who were at risk of impending fracture from multifocal sarcomatous metastases, and excision for either metaphyseal

lesions or solitary metastasis. The authors were able to provide a mean follow-up of 13 months, and during that time there were no metalwork failures. As perhaps would be expected, there were some differences in peri-operative care, and adjuvant chemotherapy or radiotherapy was given as indicated. The majority (88%) of patients died under observation and surgery was definitive in 85% of patients treated with an intramedullary nail. The most common cause of revision was for local progression, with 12% (n = 4) of patients requiring revision surgery for local progression. Based on these results, it is clear that patients with widespread metastases from a sarcoma can be managed similarly to those with metastases from any other cancer, and it is fair to expect reasonable results from long bone stabilisation with an intramedullary nail. However, given the 12% revision rate for those where fixation is difficult to achieve or in those with a solitary sarcoma metastasis, this should be treated like a new primary with wide excision and reconstruction.

Osteosarcoma of the sacrum under the spotlight

■ Surgeons in **Beijing (China)** have shared their extensive experience of sacral osteosarcoma excision.⁷ The difficulty of achieving good functional results due to issues with soft-tissue reconstructions and complications of sacral nerve root involvement is well known, and we were interested to read this large series of 26 cases, all treated with surgical excision. The authors were able to report adequate excision in 62% of cases (n = 16/26), although

the rate of recurrence was high with 13 patients (50%) suffering distal metastasis, and local recurrence occurring in ten patients during the period of the study. While the short-term outcomes were not too bad with one-year survival of 92.3%, the five-year survival rates were truly dismal with just 38.7% surviving at five years. An interesting observational paper that confirms what was previously thought about the poor prognosis of sacral osteosarcomas.

Fertility in adolescent sarcoma survivors X-ref

■ Sarcoma are relatively common in childhood and adolescence, and as survivals are improving and children are becoming disease-free adults, the long-term sequelae of adolescent bone tumours are becoming more relevant. In one of the few studies evaluating the long-term effects on family life of childhood sarcoma, a collaborative from **Japan** report the reproductive and family consequences for survivors of high-grade sarcomas.⁸ The study reports on the outcomes in 38 survivors of childhood, adolescent and young adult high-grade sarcoma. The study team also took the opportunity to assess the long-term quality of life scores in these survivors. Initial diagnoses were of osteosarcoma (n = 28), Ewing's sarcoma (n = 4), synovial sarcoma (n = 4) and others (n = 2). The study population consisted of 18 males and 20 females and there was a marked difference in terms of marital status and children between males and females (44% vs 75%). Married survivors had better mental

health SF-36 scores (although this is reflective of the general population without sarcomas and so may not be a specific finding). There was also a specific finding with regard to ifosfamide which appeared to particularly impact on the likelihood of children in the male survivors.

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