

X-ref For other Roundups in this issue that cross-reference with *Trauma* see: *Foot & Ankle Roundups 3, 4, and 7; Shoulder & Elbow Roundups 1, 3 and 4; Oncology Roundup 6; Children's orthopaedics Roundups 2, 5 and 7; Research Roundup 4*

The economics of proximal femoral fractures x-ref

■ The choice of management method of displaced hip fractures in under 65-year-olds can be a difficult decision to make. Where does the surgeon best bet? With a primary ORIF or arthroplasty? One increasingly popular method for helping with decision making is the use of economic decision models. These work by taking previously published data to establish costs and success rates of different treatments and then using a simulation model to establish what is the best treatment option from a cost-effectiveness perspective. However, most surgeons already have age bands in mind when deciding on the treatment of these fractures. At one end of the spectrum, treatment options are relatively solved at the extremes of age, with few arguing that the widely accepted algorithms for fixation and arthroplasty (which were tested in a series of Scandinavian RCTs a few years ago) are anything but entirely appropriate. Although the evidence is not as robust as a well performed RCT or meta-analysis, the use of a Markov decision analytic model allows simulation of economic outcomes for fixation, hemiarthroplasty and THR based on outcome variables determined from previously published high-level evidence. In this paper from **Charlotte, North Carolina (USA)**, the authors looked at ORIF or arthroplasty in patients younger than 65 years old.¹ The average clinical outcome scores were similar for fixation and total hip arthroplasty (THA) for patients in an age range of 40 to 65 years old, but

fixation was found to have a wider variability of outcomes depending on the success or failure of the initial fixation. Hemiarthroplasty was worse for all ages. The outcomes of this paper were that essentially the most cost-effective option was a THA for those healthy patients over 54 years in age, and for those with mild comorbidities over 47 years of age, and multiple comorbidities over 44 years old.

Healing bisphosphonate fractures x-ref

■ The incidence of bisphosphonate-associated fractures isn't quite as high as many feared when the phenomenon was first identified a few years ago. However, given the millions worldwide that take these medications there is still a not insignificant burden of pathology presenting to trauma centres and district hospitals the world over. While the anxiety of a global 'epidemic' of atypical fractures has subsided somewhat, there is still some rightful concern among surgeons. There are some potentially very difficult to treat fractures presenting with high complication rates in a steady trickle which will likely turn to a stream as the population ages. The combination of the bisphosphonates acting directly on the osteoclast and the dynamics of the typically tension-sided subtrochanteric fracture can create headaches for surgeons trying to understand how best to treat this awkward fracture presentation. Among the many unknowns are the determinants of healing in this fracture group. An enlightening study from **Changwon (South Korea)** reports the outcomes of 109 consecutive atypical fractures, all in patients with a documented history of bisphosphonate use.² Logistic regression analysis was used to assess factors associated with healing or nonunion. This is an interesting topic with no clear answer. Some

advocate excision of the diseased segment, whereas others recognise the importance of secondary bone healing in the process of fracture union following these injuries. The study cohort had been on bisphosphonates for around 7.5 years on average, and at least three years at the time of their fracture. The authors collated a range of patient demographic, fracture and surgical details, including the femoral neck-shaft angle, coronal and sagittal femoral bow, and cortical thickness. The authors report healing rates of 70% within six months of presentation, with the remaining 30% going on to either delayed union or nonunion. This dichotomy formed the basis for the multivariate analysis. A number of factors beyond surgical control such as BMI, bisphosphonate therapy usage, increased femoral bow ($\geq 10^\circ$), proximal fractures and thicker lateral cortices (index > 1.4) were identified as being factors associated with nonunion. Increased anterior and lateral fracture gaps are key factors that can be controlled and clearly represent the common problem of flexion and varus in the proximal fragment due to poor surgical technique. What this paper does serve to highlight is the importance of entry point when nailing these tricky fractures.

Are we fixing too many clavicles? x-ref

■ This registry study from **Tampere (Finland)** is a bit of a reality check with regard to clavicle fractures.³ The authors undertook a population study with the intention of identifying both the incidence of clavicle fractures over a decade, and secondarily the fixation rates between 2001 and 2012. The authors use a fairly simple methodology and use national registry data to identify the causes for the observed increase in surgical fixation. Are clavicle fractures simply becoming more common

or are we simply fixing a higher proportion of them in light of recent randomised controlled trials? These authors identified a total of 44 609 fractures occurring during the study period, and there was an appreciable increase in the overall incidence of fractures from 35.6 per 100 000 person years in 2001 to 59.3 per 100 000 in 2012. Interestingly, the highest increased incidence was found in the older age groups. Although on the face of it this might explain the observed increase in fixation rates, this only represented a 67% increase in fracture incidence but was seen in parallel with a 705% increase in fixation rates. We have observed a similar pattern in the UK in response to the COTS trial. The situation is similar to that of the distal radius in which fixation has exploded in the face of a lack of evidence to support long-term benefit. The findings of this study reflect those of the DRAFFT investigators, where the use of plate fixation in the UK was seen to fall both during and after the study in light of the findings. There is a bit of a double-edged sword here, however. Clearly surgeons are willing to change practice and it is not at all unreasonable to attribute the increase in fixation to this study. Nevertheless, there have been two equally well performed trials since the COTS study suggesting that non-operative management may well be the best option – and no 'dip' has been seen in surgical intervention rates.

Another clavicle RCT

■ One of the conclusions of the Finnish study above was the potential need for further clavicle randomised controlled trials (RCTs) – we would hold, here at 360, that more is always better, but with three high-quality RCTs on the topic there is probably already enough data out there on which to make a reasonable decision. It is therefore timely that authors from **Leiden (The**



Netherlands report their own randomised controlled trial on the topic.⁴ In this study, the investigators performed and report a multi-centre, prospective, randomised controlled trial comparing operative and non-operative clavicle fracture management. The study included patients between 18 and 60 years of age, presenting with a displaced mid-shaft clavicular fracture. In all, the investigators recruited 160 patients who were randomised to either non-operative treatment or open reduction with internal plate fixation. Outcomes were assessed not with functional scores as in previous studies, but with the primary outcome measure of evidence of nonunion at one year. Secondary outcome measures included further surgery, functional measures (Constant shoulder score, DASH score, pain score), cosmetic results, and general health status. Outcomes were recorded at six weeks, three months, and one year following injury. As would be expected, the rate of nonunion was significantly higher in the non-operatively treated group than in the operatively treated group (23.1% vs 2.4%). This was also reflected in an increased rate of secondary plate fixation (12.9% vs 1.2%). The overall rate of secondary operations was reported at 27.4% in the operatively treated group (16.7% for elective plate removal) and 17.1% in the non-operatively treated group. However, there were no differences seen between the groups in the functional outcome measures (Constant and DASH scores) at all

time points. This is in contrast to the 2007 Canadian Orthopaedic Trauma Association study⁵ which reported that Constant and DASH scores were significantly improved in the operative fixation group at all time points. The investigators concluded that for patients with a displaced diaphyseal clavicle fracture, plate fixation improves the chances that the bone will heal. However, this is at the cost of a very high rate of re-operation. Plate fixation primarily did not improve shoulder function or general symptoms, and it seems that the data here would support a non-operative initial management strategy with a move to operative intervention should it be required.

MRI for hip fracture diagnoses? x-ref

■ The occult hip fracture is a diagnosis not to be missed. The insertion of some percutaneous screws or simply protected weight-bearing can save displacement of the fracture and the complications of hip fracture surgery which, as we are all aware, are not insignificant. In recent years, the use of MRI scanning has become more prevalent for the identification of potentially fractured hips without the radiation associated with CT scanning and with increased sensitivity in addition to the benefits of picking up other diagnoses. Despite the widespread adoption, the use of MRI scanning hasn't quite hit the mainstream in terms of agreed indications between surgeons and units as to when, why and how it is indicated. A study team from **Malmö (Sweden)** have shared their experience of 616 patients at a university hospital, all of whom had an MRI scan of the hip following trauma.⁶ The study period was around ten years, so in their centre just over one patient a week was receiving an MRI scan. However, the incidence was seen to be increasing over the course of the study period, possibly reflecting both increased availability of MRI scanning and the medicolegal aspects of reaching a definitive diagnosis. Just over a third

(37%) of scans revealed an occult hip fracture, the majority of which were pertrochanteric fractures. Other diagnoses seen included pelvic fractures (30%) and negative scans (29%). Despite promising much in the title, the paper did not leave us with a clear idea as to when the authors were advocating the use of scanning, other than to say that in a patient with a suspected hip fracture and pain, a scan is indicated. What is reassuring is the finding that there was no excess of complications in patients who underwent an MRI scan to reach their diagnosis (and had therefore had to wait to have their scan).

The InterTAN better for active hip fracture patients x-ref

■ There has always been some debate surrounding pertrochanteric fractures. Patients present with potentially lengthy unstable fractures and are treated in most institutions with sliding devices, either an intramedullary nail or plate and screw construct. This improves healing rates as the 'controlled collapse' ensures continued fracture apposition and allows the patient to mobilise effectively while the hip is healing. However, there is little in the way of treatment options available for the subsequent abductor shortening that patients suffer. There are several devices that potentially address this issue by providing fixed compression. The proximal femoral locking plate and its cousins have fallen out of favour due to high complication rates, however, the InterTAN device offers a similar fixed compression but via an intramedullary nail option. We were delighted to see a prospective, randomised, multicentre clinical trial from centres across **Canada** in an attempt to establish if this fixed compression had much to offer over the venerable dynamic hip screw.⁷ The authors managed to recruit 249 patients from five centres across Canada. The patients were all 55 years of age or older and were randomised to either a sliding hip screw or InterTAN construct. The study

reports the outcomes of 123 InterTAN patients compared with 126 sliding hip screw patients, at a final outcome of 12 months using the Functional Independence Measure (FIM) and the Timed Up and Go test (TUG). The authors reported significant differences in femoral shortening, with patients in the sliding hip screw group suffering 2 cm of excess shortening over the other group. With regard to the functional outcomes, the majority of patients did not have any differences. However, when those patients with high levels of function (defined here as being able to walk more than 150 m prior to injury) were considered, there were some differences with the InterTAN group outperforming those with a sliding hip screw. In this subgroup of 70 patients, there was greater shortening and poorer FIM and TUG scores in patients with a sliding hip screw than in those treated with an InterTAN device. We were delighted to see this paper which highlights the potential to improve functional outcomes in patients requiring fixation of an intracapsular neck of femur fracture which is applicable to those with moderate pre-operative function – let's face it, 150 m isn't exactly high performance.

Revised classification of tibial fractures x-ref

■ There has been a sea change in the management of tibial plateau fractures. With the recognition of the posterior shear type fracture patterns, fixation of the posterior plateau elements with shear fractures has become commonplace. The results of large series, particularly from China, would suggest that this leads to an excellent result in the majority of patients. This change has resulted in much discussion about the relative indications for fixation with the previous classifications not really being able to address this change in decision making. These authors from **Louvain (Belgium)** have set out to develop a new classification system based on the now improved understanding of

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.