

ROUNDUP³⁶⁰

Trauma

Ankle fractures: risky wounds?

■ Ankle fractures are common, and present with a bimodal distribution: high energy fractures in the young, often resulting from sports and motor vehicle accidents, and fragility fractures typically in the elderly patient population. In both subgroups there is a significant incidence of infection following osteosynthesis. The subcutaneous nature of the fibula, combined with poor perfusion to the peripheries, results in reported complication rates of between 5% and 40%. The majority of these complications are wound related with up to 19% of patients in some studies suffering wound complications. Researchers in **Philadelphia (USA)** noted that the majority of the current body of evidence is based upon hospital billing codes, not directly on patient records. Many superficial wound infections are managed in the outpatient setting, and data surrounding this group of patients is likely to be inaccurate. The research team performed a review of the notes and patient records of 478 patients treated with ankle fracture fixation over a seven-year period. They investigated the potential effect that patient demographics, surgical timing, comorbidity status and post-operative care had on the endpoint of wound complication. The authors of this study identified wound complications as those wounds requiring dressing changes and oral antibiotics, or further surgical inter-

vention. The researchers identified six patients (1.25%) who required further surgery, and 14 (3%) who required antibiotics and dressing changes. A number of risk factors were explored and those found to have a significant association with wound complications were diabetes, non-compliance and older age. There was no association with surgical timing and an increased number of complications.¹ While we were delighted to see a large study of this nature giving up-to-date and accurate complication rates, by the nature of the study design we really were not able to agree with the authors' conclusions regarding the timing of surgery. The authors suggest that 'with careful pre-operative monitoring of swelling, time to surgery does not affect wound outcome'. Given that there is no comparison group and that all surgery was undertaken based on a clinical decision when the swelling reduced, the study really does not tell us anything about time to surgery.

Absorbable implants result in slower healing

■ Osteosynthesis has been performed with metal implants since the earliest days of trauma surgery. Offering reliable fixation and known biomechanical properties, they remain the choice of the majority of orthopaedic trauma surgeons throughout the world. However, the stress modulus does differ dramatically from bone, and given time, many implants need to be removed. Researchers in **Gangwon-do**

(South Korea) designed a randomised controlled trial (Level I evidence) to evaluate the potential benefits of novel absorbable implants. The researchers enrolled 109 patients, all presenting with ankle fractures who were randomised to either traditional or biodegradable fixation. Outcomes were assessed as time to union, and clinical outcomes (American Orthopaedic Foot & Ankle Society (AOFAS) score and short musculoskeletal function assessment (SMFA)) at regular intervals to a final follow-up of one year. The researchers lost five patients at a mean of 19.7 months' follow-up. They found no significant differences in reduction quality. However, the resorbable fixation took significantly longer to apply (56.4 *versus* 30.2 minutes), outcome scores were significantly poorer (84.3 *versus* 87.5) and healing was significantly slower (17.6 *versus* 15.8 months). However, there were no differences in outcome in isolated fibular fractures.² Although the authors conclude that there is little currently to recommend bio-absorbable fixation it seems to us here at 360 that the potential attractions of this form of fixation are many. Nevertheless, the key to fracture fixation and successful outcomes is achievement and maintenance of anatomical reduction. We as surgeons are thoroughly familiar with how best to do this with traditional implants, but the longer union times and slightly poorer outcomes make us wonder if perhaps optimal stability hasn't

quite yet been achieved with the much more flexible biodegradable fixation.

Minimally invasive heel fracture fixation

■ Calcaneal fractures are some of the most difficult fractures to manage, and often occur in the trickiest of patients. While the results of conservative management are often poor, the rare but significant complications associated with fixation make treatment decisions difficult. Tricky patients, tricky fractures and tricky decisions. A surgical team in **Liestal (Switzerland)** reasoned that, if they could develop a new surgical approach giving appropriate access and reducing the wound complication rates, the balance would tip in favour of fixation for many fractures. The research team describe the use of a novel minimally invasive subtalar approach for the fixation of displaced posterior facet fractures. Their new approach is designed to allow access to the posterior facet to effect reduction and fixation without raising a large flap. They report the use of this new approach in 21 patients who all underwent a sinus tarsi exposure, plate and screw fixation. Patients were Sanders grade II (nine patients) and III (13 patients). A total of 16 had involvement of the calcaneo-cuboid joint. Follow-up was to a little over 2.5 years, and outcomes were assessed with CT scans (post-operatively and at one year) with a minimum follow-up of one year. The surgical team were

able to achieve reduction within 5° and 1 mm of anatomically normal in 14 patients (64%). The research team were not able to identify any loss of reduction in the posterior facet or calcaneo-cuboid joint on follow-up CT scan. However, in three patients, Bohler's angle had decreased by > 5°.³ The results of this paper are extremely encouraging. Although the authors do not present any clinical outcomes, the radiological results presented here are similar to those for more traditional forms of open reduction and internal fixation. If the clinical results were found to be similar the subtalar approach presented here would certainly find favour, and not only at 360. Maybe this is the missing piece in the ongoing puzzle that is calcaneal fractures.

What about the children?

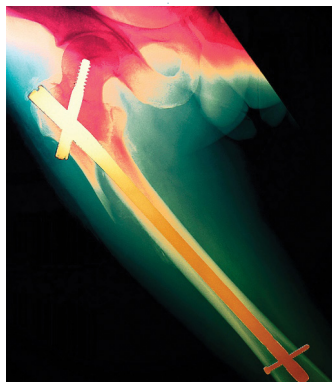
■ Modern trauma systems are continually evolving with many developed nations adopting a variation of the integrated trauma care system. Systems differ throughout the developed world with Australia and the UK adopting an integrated system where a major trauma centre (MTC) sits at the centre of a hub-and-spoke network with smaller centres on the periphery. This differs from the North American system which often has one multilevel centre in each city. While both systems recognise certain centres as accepting children, due to the very low incidence of major injury in this patient subgroup, there is, however, little known about how trauma networks may impact on their survival. Investigators from **Melbourne (Australia)** designed a retrospective study (Level IV evidence) using their trauma registry to establish what information they could glean from eight years of data. The study population included 1634 patients under the age of 18, managed within their trauma network during the period of time they were interested in. The median ISS was 18 and 1361 patients were treated at a major trauma centre with

69% (943) of those being treated at a designated paediatric major trauma centre. Over half of the patients had a moderate head injury and only 40% required any form of surgical intervention. The researchers noted that there have been year-on-year improvements in mortality (OR 0.87), and that being treated in a level 1 centre significantly reduces mortality (OR 0.27).⁴ It is heartening to see that the restriction and regionalisation of trauma services has as profound an effect on improving mortality in paediatric trauma as it does in adult trauma. The low volume of injuries, and the even lower volume requiring surgery suggests to us here at 360 that perhaps trauma networks are even more important in paediatrics. We were surprised to see that paediatric patients were as effectively managed at a 'normal' level 1 centre, and outcomes were not improved through being treated at a paediatric major trauma centre.

Nail or plate? Ptertrochanteric fractures revisited

■ Despite a plethora of high-quality randomised controlled trials demonstrating no discernible difference in outcomes between the dynamic hip screw (DHS) and intramedullary hip screw (IMHS) devices, there has been a steady decline in the use of the DHS over the past five years. The venerable DHS has been tried and tested since the 1970s, and researchers in **Kuopio (Finland)** decided to establish the respective success or otherwise of the IMHS and DHS. The research team used the Finnish Healthcare Register to study the outcomes of nearly 15 000 patients treated for a ptertrochanteric fracture with either a DHS or IMHS over a ten-year period. They collated

comorbidities, residential status and date of death through linkage with other databases. During the period of the study, usage of intramedullary implants increased dramatically. Researchers identified significantly higher rates of mortality (26.6% versus 24.9%) and re-operation (11.1% versus 8.9%) in patients treated with an IMHS-type device. To make matters even worse for the nailers in the orthopaedic fraternity there was



a significantly higher rate of periprosthetic fracture (3.2% versus 1.05%) associated with the IMHS.⁵ The authors concluded that the higher cost of intramedullary implants was not supported by superior outcomes, and

certainly their data would suggest this might well be the case. But how can this be? We asked at 360, how, when many randomised controlled trials have shown parity between the implants, could this particular study show something completely different? The answer is in the statistical power and follow-up. With the outcomes of failure, mortality and re-intervention, the event rate increases as time passes, thus increasing the effect size. It seems highly likely to us that a larger RCT with longer follow-up would have the same outcome.

Arthroplasty rules the roost in intracapsular hip fractures

■ Despite being the most commonly presented fracture at trauma conferences the world over, the displaced intracapsular hip fracture is still able to provoke a spirited debate. Garden claimed in 1961 to have solved the 'unsolved fracture' but, over 50 years on, the debate over how best to treat patients with Garden grade III and IV injuries

continues unabated. Recent studies have tended to favour total hip replacement (THR) for patients with displaced fractures, although their follow-up periods are short. Researchers from **Stockholm (Sweden)** add perhaps one of the final pieces to this puzzle with their report of long-term follow-up over 17 years of a previous randomised controlled trial (Level I evidence). The researchers enrolled 100 patients and randomised them to internal fixation (57) or THR (43) for displaced intracapsular fractures. Patients had a mean age of 78 with regular follow-up over a 17-year period. The primary outcome measure was function (measured with the Harris hip score), with secondary outcomes of mortality, re-intervention, gait speed and ability to perform activities of daily living. The headline result from this study (like many similar studies) was the significantly better Harris hip scores which had a mean improvement of 14.7 points in patients undergoing THR. This was a consistent finding at every time point and in addition there was a significantly higher re-operation rate in fixation patients (9% versus 39%). Interestingly, however, the fixation group had poorer gait speed and performance of activities of daily living during the first year, although this evened out after one year.⁶ The researchers have demonstrated that THR is a reliable and functional option for patients with displaced fractures of the femoral neck. The results are consistently good over time, and there was no excess mortality in their study. We would add a slight note of caution in interpreting these results: the randomisation was not equal, indicating a failure of randomisation, and due to the small study numbers it is unlikely that excess mortality would be seen in either group. There are other larger studies suggesting a higher mortality associated with THR and, as such, perhaps in the fragile elderly patient, fixation would seem a sensible option.

How best to wash?

■ In treatment of contaminated open wounds, be they fractures, blast wounds or simple soft-tissue injury, the two most important factors in management are the timing of antibiotic therapy and the performing of effective wash out and debridement. There are two dichotomous schools of thought regarding lavage. Some argue that aggressive lavage (either high pressure or antimicrobial) more effectively clears bacterial load and reduces the risk of infection. The counter argument is that the resulting damage or soft-tissue compromise reduces the effectiveness of the patient's own tissue to combat infection. Researchers from **San Antonio (USA)** set out to establish which point of view is correct. They selected a rat animal model to determine whether chlorhexidine gluconate (Savlon) was more or less effective at wound decontamination than saline alone. Using a segmental defect rat animal model (an extensively validated model) the researchers contaminated the fracture with *Staphylococcus aureus* and treated the wound six hours after injury with standardised debridement and irrigation with 60 mL of low-pressure irrigation. The study population consisted of ten animals divided into four treatment groups (saline, and 0.5%, 0.05% and 0.005% chlorhexidine

gluconate). The investigators performed a primary closure and the animals were sacrificed at 14 days for microbiological analysis. Disappointingly, the investigators were unable to find any differences between any of the groups in any outcome measure.⁷ It does appear to us at 360 that this study effectively defends the old adage 'The solution to pollution is dilution'. The problem with studies like this is it is impossible to know if the saline and Savlon were equally effective or if the model is simply not representative of the clinical scenario. We may have to wait until the FLOW study (currently recruiting patients, and run by the COTS team) reports to know how much dilution is the solution, and how best to apply it.

Extensor mechanism disruption

■ Traumatic disruption to the knee extensor mechanism, be it at the quadriceps, displaced patellar fracture, or patellar tendon, obligates surgical repair. We have never really been certain here at 360 what the long-term outcomes were of each of the three discrete injuries. We have always assumed that the fractures healed more quickly, but with the potential for long-term functional deficit (especially given how tricky they can be to reduce), there is little evidence to support our

assumptions. Researchers in **New York (USA)** have stepped into the knowledge gap with a retrospective case controlled series (Level III evidence) comparing outcomes between the three injuries. The researchers report on the outcomes of 99 patients; 50 with patellar fractures (PF), 36 with quadriceps ruptures (QR) and 13 with patellar tendon ruptures (PT). All patients were followed up at six-month and one year. Outcomes were assessed using a combination of objective measures (range of movement, quadriceps circumference and strength) and outcomes scores (SF36, Lysholm, Tegner activity levels), in addition to radiographs to assess bony healing and post-traumatic arthritic change. At a minimum of one-year follow-up the research team were able to report the outcomes of 77% of patients. From a demographic point of view PT occurred most commonly in younger males and PF in females. With regards to outcomes there were no differences between either group in range of movement, arthritis rates or scores. However, patients with PFs had lower thigh circumferences during the first year.⁸ Contrary to our assumption, it appears that whatever the injury, the outcomes are similar and that we can expect our patients to do well whatever the nature of their injuries.

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