

**X-ref** For other Roundups in this issue that cross-reference with *Trauma* see: **Foot & Ankle Roundup 4**; **Paeds Roundup 4, 5**; **Research Roundups 3, 4**.

## The ultimate antibiotic prophylaxis? X-ref

■ There is plenty of evidence that the key determinant of outcome following an open fracture is the speedy administration of appropriate antibiotic prophylaxis. Traditional focus on the time to stabilisation and debridement has been superseded by focusing on the 'time to antibiotics'. Traditional administration of systemic antibiotics, however, has been called into question in a number of areas including osteomyelitis and arthroplasty, where local elution has proven to be more efficacious. Researchers in **Chapel Hill (USA)** have taken what could be considered to be the next logical step and have evaluated the benefit (or otherwise) of local injection of antibiotics into the immediate vicinity of the open fracture.<sup>1</sup> Aqueous aminoglycosides (gentamicin and tobramycin) were added directly into the cavity in addition to the administration of systemic antibiotics. While the study is reported using terminology common with randomised and case comparison series, it is in fact a mixed bag and an unselected case series. Patients were treated with either systemic (183 fractures) or systemic and local antibiotics (168 fractures). The locally administered antibiotic group were also heterogeneous, with 34 patients receiving additional local post-operative irrigations of aminoglycosides. While the authors report a significantly lower infection rate in the intervention group (6% vs 14.2%), there are a large number of confounders. Multivariate adjustment for potential confounders gave an odds ratio of 3.0 (95% CI 1.1-8.5). The authors go on to perform an additional *post-hoc* power calculation and boldly state that local

antibiotic administration has no effect on union rate. This study is interesting but we would caution readers regarding it as anything more than hypothesis generating. Studies of this nature are prone to selection, reporting and treatment biases among others. Perhaps a small pilot RCT is called for here.

## Low FLOW just as good in open fractures X-ref

■ Initial debridement and lavage of open wounds has become less of a priority as the evidence has accumulated that, other than in contaminated wounds, antibiotic therapy is more important than lavage. That said, careful debridement and lavage has a central role to play in preventing long-term deep infection and optimising outcomes in all open fractures. There are, however, two schools of thought on the lavage. The age-old mantra of 'the solution to pollution is dilution' may well hold true, but high-pressure lavage has the advantage of thoroughly cleaning and debriding tissue (*à la* VersajET (Smith & Nephew)). However, this technique may also injure tissues and resist their ability to fight infection. So there is real equipoise surrounding the question: should we use low pressure or high pressure irrigation? Is a soap solution or saline most effective? The **COTS Group (Canada)** have reported their FLOW study,<sup>2</sup> a large multicentre pragmatic study reporting the results of 2551 patients treated at 41 institutions, all with open fractures. Their study randomised patients between both irrigation type (soap vs saline) and high, low and very low pressure irrigation, answering both questions by using a 2 x 3 factorial study design. Their primary end point was re-operation within a year (reasoning that both infection and nonunion would be included in this). The study team report that re-operation occurred in 13% of high pressure (n = 109 / 826), 12.7% low

pressure (103 / 809) and 12.7% (103 / 809) in the very-low-pressure group, meaning there were no substantial or meaningful differences between the lavage type. However, there was a small but significant difference between the soap *versus* saline group (14.8% vs 11.6%) in favour of lavage with saline. Given the added costs of high-pressure lavage, the authors conclude (not unreasonably) that properly performed lavage and debridement can be safely and most cheaply performed with low or very low pressure saline.

## EXACTly how to manage ankle fractures X-ref

■ Ankle fractures do not carry with them a universally good outcome. Even those stable fractures not requiring surgery can have a poorer outcome than might be expected, with patients suffering from pain and stiffness for months, and sometimes permanently, following a relatively innocuous fracture. To minimise this disability and help with general rehabilitation needs, many centres routinely offer physiotherapy advice, while some do not. Investigators in **Sydney (Australia)** have reported an effectiveness study for ankle fracture rehabilitation.<sup>3</sup> Their prospective randomised controlled trial reports the outcomes of 214 patients randomised to either advice or a supervised exercise programme. Outcomes were assessed in this case with the Lower Extremity Functional Scale and quality of life scores. The participants all completed the study, although enrolment was below the planned 342 at 214 patients due to funding restrictions. Outcomes following three months of rehabilitation were almost identical, with no statistically significant differences between the two groups at any of the time points in terms of activity limitation.

## Conservative clavicles: simple usually better

■ The humble clavicle fracture is the focus of this randomised controlled

trial from **Istanbul (Turkey)**.<sup>4</sup> The research team have turned their attention to a comparison of the simple broad arm sling and figure-of-eight bandaging as a treatment for clavicular fractures. On the one hand those patients managed in a sling have the advantage of ease of application, while the figure-of-eight bandages and various modifications thereof have the distinct advantage that they aim to restore the position of the clavicle and reduce potential deformity. In a small study of 60 patients, the study team randomised patients to either a figure-of-eight bandage or a broad arm sling and assessed outcomes with pain, functional and radiographic measures. In the early post-fracture phase the figure-of-eight bandage caused more pain, and surprisingly also resulted in more shortening of the clavicle on final radiographic outcomes. It seems that given poorer pain and radiographic scores, and few perceived advantages, we would tend to agree, here at 360, with the research team that there does not seem to be much to recommend the figure-of-eight bandage here.

## Shortening in femoral neck fractures X-ref

■ One of the predictors of outcome in total hip arthroplasty is abductor function. Universally recognised as important, hip replacement surgeons strive to restore the femoral neck offset in an attempt to maximise function. To this end, arthroplasty designs have evolved to match proximal femoral geometry as accurately as possible. It is curious then that fixation strategies in proximal femoral fractures rely on controlled collapse and compression to achieve acceptable union rates. In the older patient population the associated shortening and abductor dysfunction may go unnoticed, but what about the younger patients? A study team from **Vancouver (Canada)** have set out to establish in a retrospective study

what the incidence and magnitude of femoral neck shortening is in younger patients with femoral neck fractures.<sup>5</sup> The study team were able to include 65 patients aged around 51, all treated with either cannulated screws or a sliding hip screw and derotation screw. Outcomes were assessed radiographically at just six weeks following surgery. The rates of shortening were huge, with over half of patients suffering more than 5 mm of shortening, and in 32% of cases shortening was by more than 10 mm. As perhaps would be expected, displaced fractures shortened more than undisplaced fractures, and those treated with a dynamic hip screw suffered 2.2 mm more shortening than those with cannulated screws. Sadly, the authors did not collect any functional data, and while these findings highlight the need for further research to determine the impact of severe shortening on functional outcome and quantify the incidence of shortening, it is not clear what an acceptable threshold for shortening is.

### Biomechanics of patellar fracture fixation

■ Perhaps there is nothing quite so dangerous as an orthopaedic surgeon with a good idea, a new implant and a biomechanics lab. It's not that here at 360 we don't enjoy fundamental research; it is essential to establish the underlying principles for treatment strategies. Sometimes, however, we feel investigators miss a step and try to infer clinical conclusions from controlled experiments. This biomechanical study from investigators in **Muranau (Germany)** concerns the potential application for locking plates in patellar fractures.<sup>6</sup> They utilised foam models to compare the stability of unicortical lock plate fixation with tension band wiring. The models were subjected to combined tension and bending and the failure loads of each construct tested. The tension band wiring failed at 66% of the locking plate and with five

times the fracture gap. While the authors conclude that 'based on the biomechanical advantages, locked plating of the patella may constitute a reasonable alternative to tension band wiring', we are concerned that all this test has shown is the relative strength of each construct underload. There is a fundamental difference in the way fractures heal when subjected to locked plating or tension band wiring, and this is where research should focus, not on the strains to failure. The more rigid angular stable construct provided by the locking plate may not allow for enough micromotion to promote healing, and given that early metalwork failure is rarely a problem in tension band techniques, we are somewhat sceptical to say the least.

### Frailty and cognitive function as predictors of outcome

■ We were delighted when this paper from **Nashville (USA)** crossed the editorial desks here at 360 HQ.<sup>7</sup> The authors report on 188 elderly patients, all of whom were admitted to their institution with a geriatric trauma diagnosis. Structured interviews were conducted to establish pre-injury cognitive and physical impairments within 48 hours of admission for all 188 patients, with 176 being available for follow-up at one year following injury. The study team aimed to establish the influence on outcomes that cognitive and physical impairment posed to this frail elderly group. The predictors of mortality outcome in this group included age, physical frailty and the severity of injury. The authors were also able to establish that frailty at one year is dependent on cognitive impairment and pre-injury frailty. While this may seem obvious to many who treat these patients regularly, there is precious little research surrounding comorbidity, physical and cognitive impairment and its effects on outcomes in the elderly. We congratulate the study team on their well-conducted research.

### Own the bone: osteoporosis therapy after fracture surgery X-ref

■ The ongoing burden of fragility fractures is likely to be the challenge of this generation of orthopaedic surgeons. With increasing fracture complexity, frequency and patient comorbidity, perhaps more than ever before the age-old adage of 'prevention is better than cure' is appropriate. A paired article and associated editorial from **Chicago (USA)** highlight again both the need for secondary fracture prevention in those suffering osteoporotic fractures, and the lack of progress being made towards delivering

secondary prevention despite prolonged campaigns to encourage it.<sup>8</sup> This large data study concerned patients suffering proximal humeral, wrist, hip or vertebral fractures. The investigation reported the outcomes of 31 069 patients over a three-year period. This observational cohort study reported an incidence of secondary prevention of around 10% of those who received anti-osteoporotic therapy following their initial fracture. Outcomes were reported as secondary fractures requiring treatment. Judicious use of secondary prevention measures in this population saw a 40% reduction in risk of subsequent fracture maintained over a three-year follow-up period in those patients over the age of 50. The data presented are US-based, and the greater organisation and joined-up care provided by nationalised systems, such as the NHS, deliver higher intervention rates, but it is clear given the significance in reducing refracture rates that more can always be done to reduce the unnecessary burden of disease.



### Surgery for geriatric ankle fractures? X-ref

■ At a confusing time when Tim White and researchers in Edinburgh (UK) are identifying good results from the fibular nail in the older but not the younger patient, Keith Willett and colleagues in Oxford (UK) are promoting close contact casting following the reporting of the AIM study as being as good as traditional surgery. Throwing yet more fuel on the fire, researchers in **Providence (USA)** took a fresh look at outcomes in geriatric ankle fractures.<sup>9</sup> Utilising the comprehensive Medicare database reporting the results of over five million patients, researchers set out

to establish what the prognosis is for patients with different fragility fractures. The report concerns the outcomes of 19 648 patients with ankle fractures and 193 980 patients with hip fractures. The groups were not matched, with the ankle fractures being younger, and less comorbid than their hip fracture counterparts. With regard to one-year mortality, the hip fractures fared worst (28.2%), while the ankle fractures fared best (11.9%), set against an average mortality of 21.5% for the remainder of the population. Given that the authors find that mortality among ankle fracture patients is significantly better than among either patients with hip fractures or patients with any other condition in the geriatric population, even after accounting for age and comorbidities, it is not unreasonable to interpret this as showing that ankle fracture patients are healthier and more active. The jury is definitely still out on the best treatment for the geriatric population with ankle fractures but this paper eloquently and convincingly makes the point that an ankle fracture is not a hip fracture, and that ankle fracture

patients are healthier than their geriatric population contemporaries.

### Preparing for the worst?

■ On April 15 2013, at 2:49pm, two bombs were detonated 12 seconds and 150 m apart near the crowded finish line of the Boston Marathon, the oldest marathon in the world. On November 13 2015 at 9:30pm, explosions occurred at the Stade de France, Paris. Within 20 minutes, there are four separate shootings and three explosions. At 9:40pm, a massacre takes place in the Bataclan concert hall. These two contemporary papers describe the responses mounted by the emergency services in the face of multiple major casualties in an urban area. With wartime signature injuries, how well would your unit and trauma network cope? We would thoroughly recommend to all readers of 360 to read the original articles of these two papers<sup>10,11</sup> which describe the lessons (good and bad) from the responses to these two terrorist acts. Sadly, lessons are available for us all to learn from the experiences of others, and those described here include more robust communication infrastructure and the reinforcement of the value of preparatory drills, more robust organisational hierarchy

for mass casualty events and the implementation of a multi-trauma follow-up clinic. Paris (France) has a crisis unit and in this situation was able to co-ordinate 40 hospitals, with a total of 100 000 healthcare professionals, up to 22 000 beds, and 200 operating theatres. Few developed cities have such resources, and indeed neither London during the 7/7 London bombing, New York on 9/11 nor Boston had the benefit of such a well co-ordinated response although all emergency services coped incredibly well in the face of such a human tragedy. We ask the question here at 360: are we as well prepared? Are you as well prepared? Yes and no. Here in the UK we do not have the same crisis unit, so triage may not be as good as in Paris, and in the light of summated learning from Boston (Massachusetts), it is likely that major incident plans need some revision and adjustment. France has a network system for Paris but nowhere else in the country, so the UK is likely better prepared on a national scale than the French were. In our own units, could we produce a similar number of beds rapidly? In similar circumstances, probably. Are we geared up to switch to hypotensive resuscitation

for shooting victims? Permissive hypotension is now standard in the pre-hospital setting for all the Major Trauma Centres in the UK and is being practised. Blood and blood products may be a genuine problem, particularly if the scale of the incident is not recognised early. The first few patients through the door (often not the worst injuries) could use up stocks and rationing which would be needed until the transfusion service was able to set up an emergency donor centre. Hopefully we will never need to know, however, we would commend you wherever you are to think again about your own unit and network's action plans.

### REFERENCES

1. Lawing CR, Lin FC, Dahners LE. Local injection of aminoglycosides for prophylaxis against infection in open fractures. *J Bone Joint Surg [Am]* 2015;97-A:1844-1851.
2. FLOW Investigators. A trial of wound irrigation in the initial management of open fracture wounds. *N Engl J Med* 2015. (Epub ahead of print).
3. Moseley AM, Beckenkamp PR, Haas M, Herbert RD, Lin CW, EXACT Team. Rehabilitation after immobilization for ankle fracture: the exact randomized clinical trial. *JAMA*. 2015;314:1376-85.
4. Ersen A, Atalar AC, Birisik F, Saglam Y, Demirhan M. Comparison of simple arm sling

- and figure of eight clavicular bandage for midshaft clavicular fractures: a randomised controlled study. *Bone Joint J* 2015;97-B:1562-1565.
5. Stockton DJ, Lefavre KA, Deakin DE, et al. Incidence, magnitude, and predictors of shortening in young femoral neck fractures. *J Orthop Trauma* 2015;29:e293-298.
  6. Wurm S, Augat P, Bühren V. Biomechanical assessment of locked plating for the fixation of patella fractures. *J Orthop Trauma* 2015;29:e305-308.
  7. Maxwell CA, Mion LC, Mukherjee K, et al. Pre-injury physical frailty and cognitive impairment among geriatric trauma patients determines post-injury functional recovery and survival. *J Trauma Acute Care Surg* 2015. (Epub ahead of print).
  8. Bawa HS, Weick J, Dirschl DR. Anti-osteoporotic therapy after fragility fracture lowers rate of subsequent fracture: analysis of a large population sample. *J Bone Joint Surg [Am]* 2015;97-A:1555-1562.
  9. Hsu RY, Lee Y, Hayda R, et al. Morbidity and mortality associated with geriatric ankle fractures: a Medicare part A claims database analysis. *J Bone Joint Surg [Am]* 2015;97-A:1748-1755.
  10. Tobert D, von Keudell A, Rodriguez EK. Lessons from the Boston marathon bombing: an orthopaedic perspective on preparing for high-volume trauma in an urban academic center. *J Orthop Trauma* 2015;29(Suppl 10):S7-10.
  11. Hirsch M, Carli P, Nizard R, et al. The medical response to multisite terrorist attacks in Paris. *Lancet* 2015. (Epub ahead of print).

## Oncology

### Salvage of the pathological proximal femur X-ref

■ There is a misconception among surgeons that pathological fractures of the proximal femur through a benign lesion necessitate replacement. Surgeons from Caracas (Venezuela) set out to dispel this myth with their own comparative series of patients treated for both proximal femoral fracture, and without a fracture through benign bone tumours.<sup>1</sup> The authors report the outcomes of 97 patients treated overwhelmingly with fixation (86.2% for pathological fractures and 98.5% for those

without fracture). Local recurrence risk was similar for patients in the pathological fracture (10.3%) and non-fractured groups (8.8%) with excellent functional outcome scores in both groups and not statistically significantly different. The authors concluded that the majority of pathologic fractures through a benign bone tumour of the proximal femur can be successfully treated with curettage, burring, bone grafting and internal fixation without increasing the risk of local recurrence or negatively impacting functional outcome when compared to those without a fracture.

### Fractures in giant cell tumour of bone

■ There is 'common sense' presumption that pathological fracture can lead to localised spread, seeding and recurrence of benign tumours, and as such patients presenting with pathological fractures should perhaps be treated with a more aggressive approach than those with lesions that are not fractured. Researchers in Singapore (Singapore) have undertaken a meta-analysis to establish if this approach is evidence-based, using the giant cell tumour.<sup>2</sup> Their literature review and meta-analysis

included the results of 19 papers reporting the outcomes of 3215 patients, all of whom had undergone treatment for giant cell tumour (GCT). The cohort included 580 patients who underwent treatment for fracture. There was no difference in local recurrence rates between patients who have a GCT of bone with and without a pathological fracture at the time of presentation, and neither was there a difference in outcomes between those patients undergoing curettage with and without a fracture. The resounding message from this paper is that based on the