

Spinal cord injury without radiographic abnormality under the spotlight

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■ Spinal cord injury without radiographic abnormality (SCIWORA) is a rare and frightening condition which was described over three decades ago by Pang et al,⁸ prior to the advent of MRI scanning. In its truest sense, it refers only to normal radiographs although many patients are now routinely evaluated with MRI scanning and, as such, SCIWORA now often refers to patients with neurological spinal cord injury and no abnormality on MRI scanning. This epidemiological study reported by investigators from **Honolulu, Hawaii (USA)** investigated SCIWORA in 297 patients from a national paediatric database of admissions to characterise the epidemiology.⁹ The investigators divided patients into three age subcategories: group I: 0-3 years, group II: 4-10 years and group III: 11-17 years. Overall, the most common mechanism of injury was sports (41%), followed by motor vehicle accidents (26%) and falls (14%). The mechanism of injury did vary a little by age group; in group I, motor vehicle accidents accounted for 38%, falls 23% and assault (non-accidental trauma) 17%.

In group II, motor vehicle collisions were responsible for 40%, followed by sports injuries (21%) and falls (19%). In group III, 57% were caused by sports injuries, with motor vehicle collisions and falls accounting for the remainder. In terms of severity, the younger the patients were, the more likely they were to sustain complete and severe neurologic injuries. In this study, those patients included with SCIWORA were always associated with a high-energy injury, and as might be expected, concomitant injuries are common (group I: 89%, group II: 66%, group III: 41%). SCIWORA continues to be a problem in paediatric trauma cases. The take home message is that even in modern trauma systems there exists a not insignificant incidence of SCIWORA, and paediatric patients presenting with neurological symptoms following trauma must be treated with full spinal precautions even in the presence of normal radiology or MRI scanning.

Is surgery indicated in lumbar spinal stenosis?

■ Finally we would draw readers' attention to a well-written review from **Milan (Italy)**. The authors undertook the review with the aim of establishing whether conservative management or operative treatment was more effective

in the management of degenerative lumbar spinal stenosis.¹⁰ The review team identified five randomised controlled trials (RCTs) reporting the outcomes of 643 patients, all randomised to one treatment or the other. The review highlights the differences between conservative treatment options, but sadly, as the conservative interventions were relatively poorly described, it was difficult to undertake any form of meta-analysis with confidence. However, the review team was able to establish that universally operative management was very effective in all of the reported studies. Clearly, a consensus as to the best conservative treatment and then an appropriate large multicentre study is needed here to allow an effective comparison. For the moment at least, operative intervention looks not only the best bet, but, unusually, is the evidence-based treatment.

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Trauma

X-ref For other Roundups in this issue that cross-reference with **Trauma** see: **Foot & Ankle Roundups 4 & 6; Wrist & Hand Roundups 5; Shoulder & Elbow Roundups 2 & 4; Oncology Roundup 6; Children's orthopaedics Roundup 2.**

Treating the whole patient with a distal radial fracture

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■ We have become fairly advanced in our treatment of proximal femoral fractures, taking into consideration a number of issues beyond the fracture in order to treat more than just the whole bone. This paper from

St Louis, Missouri (USA) shines a light on similar issues in the distal radius population.¹ The authors focussed their study on postural stability in patients with and without previous distal radial fractures in a case-controlled evaluation. Their study reports the outcomes of 23 patients, all presenting with a low-energy distal radial fracture in the six to 24 month period prior to the study. These patients were compared with a control cohort matched for age and sex. The investigators undertook dynamic motion analysis in both cohorts to compare balance

and stability. In addition, secondary outcomes of the EuroQOL quality of life score were also reported and compared. As would be expected for a matched cohort, there were no differences in age, body mass index or baseline physical activity scores. There were also no differences in general health scores. However, the fracture cohort demonstrated significantly poorer balance and a higher incidence of dual-energy radiograph absorptiometry evaluation. This patient cohort may certainly benefit from interventions to improve postural stability.

Fixed angle devices for intracapsular fractures?

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■ Intracapsular fractures in young patients have traditionally been treated with screw fixation, although for unclear reasons. Though the screws offer superior torsional stability with multiple points of fixation, they do not resist shear particularly well and there are reports of subtrochanteric fractures. Our own experience here at 360 is that the use of fixed angle devices, which reduce the shearing failure frequently observed in intracapsular fractures,

is advantageous. This study from **Baltimore, Maryland (USA)** set out to compare multiple cancellous screws with a sliding hip screw (SHS) in adults with displaced intracapsular neck of femur fractures.² The authors retrospectively report their experience of both devices in a mixed cohort of 62 adults – 47 with the SHS and 15 with hip screws. All patients presented under the age of 60 with displaced intracapsular neck of femur fractures. The authors report avascular necrosis and nonunion as their primary outcome measures. Although this is a mixed, selected series with a relatively small number of patients in the young hip fracture group, it is also one of the few studies to report on young patients. In this series, the key determinants of outcome were accuracy of reduction and the use of a fixed angle device. The authors report that an accurate reduction with a fixed angle device gave an 85% success rate. Overall, there was a 21% failure rate in the SHS group compared with 60% in the multiple screws group, which may be explained by the observed differences in the avascular necrosis rate: 3% in the SHS group compared with 33% with screws.

Further development of pre-operative planning

■ All good surgeons plan pre-operatively, albeit with varying degrees of formality. Planning is as essential in the unusual – such as complex pelvic and acetabular fractures – as it is in the routine, for example, hip arthroplasty. Planning in arthroplasty is a fairly straightforward affair from a software perspective, although how essential it is can be a little controversial; every surgeon would want a relatively current pre-operative radiograph at least, whereas some would require a CT scan and complex computer planning or custom jigs. Trauma has always been a little different, and with many ways to achieve even the simplest of fixations, planning at some level is a necessity. Nevertheless, the use

of planning software has not exactly taken off, partly due to issues with the lack of a suitable planning system. On a day-to-day basis in the operating room there are a range of different approaches, with some surgeons still tracing out the fracture and drawing over the planned fixation using tracing paper and templates, while others complete a similar exercise in their minds only. These authors from **Shanghai (China)** describe their use of a 3D planning technique to describe the fracture, manoeuvre the fracture fragments and plan the fixation and approach.³ The novelty of the approach is the ability of the software to perform automated segmentation, allowing potentially for a more efficient, computerised planning experience. The authors report the use of this software in six patients with acetabular fractures. The software allows for an automated 3D reduction and planning of virtual fixation. Although the planning exercise required nearly 40 minutes per patient, the authors apparently reported high levels of satisfaction. Clearly still an involved process, the use of auto-segmentation is a massive step forward for the computer planners among us. It may be that this technique will assist some surgeons, but for most of us here at 360 we would regard this as more of a training or interest tool than a useful clinical device in its current form.

Reverse arthroplasty for post-traumatic arthrosis of the humerus

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■ As the randomised controlled trials keep coming, deciding what to do with the humble proximal humeral fracture is becoming more and more challenging. While the jury is still out on which is best in the acute setting – fracture fixation, arthroplasty, reverse arthroplasty or simply a sling – surgical treatment of some variety is clearly indicated. Managing the case is more clear-cut in those patients who go on to develop post-traumatic arthroses of the shoulder. In those patients presenting with

arthroses and malunion of the proximal humerus following failed conservative management of displaced four-part humeral fractures, there are few who would argue that those patients do better with an arthroplasty of sorts. However, with an often compromised rotator cuff, they fare notoriously badly with traditional anatomic arthroplasties. A study team in **Heidelberg (Germany)** report their experiences with the reverse polarity arthroplasty.⁴ They report retrospective collated outcomes of 42 patients, all with a reverse polarity arthroplasty. Their outcomes were assessed using the Constant score at a mean of 3.5 years, and the patients represented the whole spectrum with an age range of 27 to 83 years. The results were fairly impressive, with the Constant score improving from an average of around 20 points pre-operatively to

around 55 points at final follow-up. As with all arthroplasty procedures there were a fair smattering of complications, with scapula notching seen in about half of the cases and four patients reporting complications. While clearly not a panacea, the reverse polarity arthroplasty comes into its own with these complicated patients where there is both malunion and exceedingly poor shoulder function and also an often irreparably damaged rotator cuff. We would agree with the authors that this is a viable treatment option for type 4 proximal humeral fracture sequelae that cannot otherwise be treated with anatomic shoulder arthroplasty.

Alendronate and atypical femoral fracture

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■ The benefits of bisphosphonate therapy at a population level for patients with a clear history of

insufficiency fracture or at high risk for osteoporosis are clear, and there is no doubt that bone protection makes health economic and quality of life sense. Across the entire variety of bone protective agents, the risk of side effects appears to be vastly outweighed by the overall reduction in fracture risk. However, the inhibition of bony remodeling appears to be associated with atypical femoral fractures, classically seen in the subtrochanteric and proximal diaphyseal area of the femur. As the incidence of atypical femoral fractures rose to prominence, there have been a number of publications on the matter but thus far this has been limited to case



series and smaller retrospective studies with little on which to establish the precise incidence and prevalence in a whole population. In the *BMJ* comes the publication of a nationwide prevalence study from **Odense (Denmark)**,

evaluating the incidence of atypical fractures across a 62 000-patient study of women aged 50 to 94 years.⁵ The study team reports the incidence of subtrochanteric femoral and femoral shaft fractures. The incidence was fairly low, with just 3.4 in 1000 patient years for both types of fractures. This risk benefit compares very favourably given the low incidence of hip fracture in this population of just 16.2 in 1000 patient years. The incidence of atypical fractures rose with longer term use, and this study supports the use of alendronate for extended periods of up to ten years given the findings of this study.

Tranexamic acid in extracapsular hip surgery

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■ Tranexamic acid is very much the drug of the moment, having excellent evidence for its use in

both major haemorrhage and joint arthroplasty. There is, however, little in the way of evidence for its use in hip fracture surgery, and specifically in extracapsular surgery. We were delighted to see reported this month a well-conducted randomised controlled trial from **Athens (Greece)**, evaluating the use of tranexamic acid.⁶ The authors designed and performed a randomised prospective study of 200 patients, all aged over 65 years and undergoing surgery for an intertrochanteric fracture treated by intramedullary nail. The participants were randomised to either subfascial administration of 3 g of tranexamic acid or to the control group without tranexamic acid. The primary outcome measure for this study was the requirement for peri-operative blood transfusion. The authors evaluated the blood transfusion rates as total units transfused to each group and reported a 43% reduction in transfusion requirements in the tranexamic acid group ($p < 0.01$). Packed red blood cells were transfused at 27 units, to 22 of 100 patients in the tranexamic acid group, whereas 48 units of packed red blood cells were transfused in 29 of 100 patients in the control group. Nonetheless, the authors reported no difference between the two groups in terms of late complications and overall mortality rates. In a basic cost analysis, the authors report a net saving of 7780 euros for the tranexamic acid group. The investigators conclude that the subfascial administration of tranexamic acid in their study was safe and cost effective, while significantly reducing the requirement for blood transfusion. Certainly something to consider trying in the management of hip fracture patients.

Fixing the back in APC ring injuries improves outcomes

■ The use of sacroiliac (SI) screws to improve stability in pelvic ring injuries has become almost routine in many centres, while in others — due to the risks of nerve root injury and the relative difficulty of the technique — they are considered an ‘optional

extra’ in the less severe injuries. These authors in **Nashville, Tennessee (USA)** evaluated the requirement for SI screws in moderate anteroposterior compression (APC) pelvic injuries.⁷ The investigators retrospectively report the outcomes of their series of 134 patients, all presenting with anteroposterior compression type-2 (APC-2) pelvic ring injuries. Individual patients were treated with either an anterior symphyseal plate or a symphyseal plate in combination with posterior stabilisation in the form of SI screws. Ninety-two patients (69%) underwent combined anterior and posterior fixation, and 42 patients (31%) were given anterior fixation alone. Anterior plate fixation failed in five patients (5%) in the combined fixation group and in 17 patients (40%) in the anterior-only group. Malunion was identified in one patient (1%) in the combined group and in 15 (36%) in the anterior-only cohort ($p < 0.0001$). As was perhaps already known in many centres, the authors concluded that supplemental posterior screw for fixation of APC-2 pelvic ring injuries is almost essential and significantly decreases the rate of anterior plate failure and malunion compared with the use of an anterior plate alone. However, the authors note that the potential for selection and detection bias introduced by their retrospective study design limited the strength of this conclusion. We would perhaps venture that it seems more likely the bias would be the other way around. In selected series, surgeons are more likely to provide supplementary fixation to those injuries they feel are more likely to be unstable, and, as such, this conclusion is potentially strengthened by the inherent biases in the study design.

Acetabular fractures

■ A pair of simple papers shed some light on two different and as yet unresolved aspects of acetabular surgery. The first concerns the outcomes of older patients undergoing open reductions. With widely

differing approaches to the older patient with an acetabular fracture, some centres advocate synchronous fixation and arthroplasty, others conservative management and arthroplasty, with the final approach of ‘fix first’ the focus of the current research study. The authors from **Cleveland, Ohio (USA)**⁸ retrospectively reviewed 193 patients over the age of 60, all of whom presented with acute acetabular fractures to a single centre and were managed with either acute open reduction or conservative management. Overall, 22% developed early complications, with a trend towards a higher rate in patients treated surgically (27% compared with 16%, $p = 0.057$). Following open reduction internal fixation (ORIF), post-traumatic arthrosis and conversion to total hip arthroplasty occurred in 18% and 14% respectively, compared with 3.8% of patients who had non-operative care. Clearly there are some significant selection biases here, however, it serves to underline the complication rates of conservative treatment of acetabular fractures in the elderly, which were higher than one might expect, and the not insignificant chances of subsequent conversion to a total hip arthroplasty. The second series from **Cincinnati, Ohio (USA)**⁹ addresses the question, what is the effect of delay on quality of surgery in acetabular fractures? The authors report 650 patients, all treated surgically and included in this retrospective series. The authors set out to correlate the quality of fracture reduction to time interval from injury to ORIF. In their series, 85% of patients were classified as achieving an anatomic reduction. In the 11% of cases in which imperfect or poor reductions were achieved, these patients waited longer for their surgery, with a median of 4.5 days compared with three days for the anatomic group. Earlier intervention improves the probability of achieving an anatomic reduction with an odds ratio of 0.12 per additional day waiting for surgery.

A unified theory of bone healing and nonunion

■ We would finally recommend to our readers a thought-provoking article from **Nottingham (UK)** which presents a unified clinical theory that links established facts about the physiology of bone and homeostasis¹⁰ with those involved in the healing of fractures and the development of nonunion.

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