

problems reported in this study is similar to that of children undergoing heart transplants, and that it seems to be the diagnosis alone, rather than the severity or treatment, that is responsible. Regarding the methodology, the study uses a small sample, which has implications for interpretation, and it does not compare the outcomes with a control group. However, it does make for interesting reading, and certainly suggests a way that we might improve our care for these lifelong patients.

Are repeated injections worthwhile?

■ Papers reported in this issue of 360 have outlined how to pick winners for nerve root injections. Although the vast majority of these injections are successful, there are a proportion that will not be. In the lumbar spine, many will move directly on to decompression following one or two injections; however, things are not as simple in the cervical spine, where at cord level there is a higher risk of more significant complications.

This paper from **Zürich (Switzerland)** asks the question, if a single epidural steroid injection has been only partly effective or if patients have recurrent radicular pain, would a second injection help? This series attempts to answer that question by prospectively following 102 patients after an epidural injection (in 57 patients for lumbar symptoms and in 45 patients for cervical symptoms). Those patients who required a second injection were then prospectively followed for a year to establish what the outcomes were. Outcomes were assessed with the usual battery of patient-reported outcome measures; in this case, pain was scored using a visual analogue scale (VAS), functional outcomes were scored with a spinal score (Oswestry Disability Index or the Neck Pain and Disability Index), and health-related quality of life was scored using the 12-Item Short-Form Health Survey (SF-12). Despite the reasonable numbers in the initial series, this paper is actually based on the results of the 17 patients who required a second lumbar epidural

and seven patients who required a second injection for cervical spine symptoms. The outcomes were satisfactory in all but one patient, who underwent a subsequent microdiscectomy, with an average VAS score for leg pain of 8.8 mm and for arm pain of 6.3 mm one year after the second injection. This paper adds some information in the poorly explored area of second epidural injections for intractable arm and leg pain. It suggests that it is not an unreasonable course of action to offer patients a second injection, and that those patients can reasonably be expected to do well a year following this injection most of the time. The problem here, of course, is the small numbers. Where the paper headlines with 102 patients, the repeat epidural group for cervical symptoms is just seven patients, and drawing any firm conclusions from such a small subgroup would be cavalier at best.

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Trauma

X-ref For other Roundups in this issue that cross-reference with Trauma see: *Foot & Ankle Roundup 6; Wrist & Hand Roundups 1 & 3; Shoulder & Elbow Roundups 1 & 5; Research Roundup 1.*

Assessment instability after isolated SER fractures X-ref

■ These authors from **Seoul (South Korea)** have stuck their proverbial oar in with the ongoing debate surrounding assessment of stability in ankle fractures.¹ There has been much written, debated, and argued about in regard to the supination-external rotation (SER) injury, and specifically which ones are unstable. Some units advocate weight-bearing films, some promote

gravity stress views, and the majority probably assess the medial side for pain and signs of deltoid ligament injury. The focus of this study was on the diagnosis of radiological instability. Taking the external rotation stress test as the 'gold standard' for diagnosing ankle instability, the authors enrolled 37 patients in their study and set about examining the diagnostic value (sensitivity, specificity, likelihood ratio, and post-test probability of instability) against the external rotation stress test. The candidate tests were clinical findings (medial tenderness, swelling, and ecchymosis), the gravity stress test, and MRI; these were all tested against the external rotation stress view. The findings are interesting. Overall the

gravity stress view appeared most accurate, with a positive likelihood ratio (LR) of 5.71 and a negative ratio of 0.33. This alone was not enough to shift the pre-test probability of instability in their study, and the authors suggested a combination of either clinical findings (1.45 to 2.54 positive LR; 0.25 to 0.70 negative LR) or MRI scanning (3.05 positive LR; 0.53 negative LR). In short, this study finds that a combination of any two of the tests are required to reach the diagnostic accuracy of the external rotation stress test. There is, of course, much debate on whether the external rotation stress test is really the gold standard in the first place. If you believe in it for diagnosis of ankle instability, then you can replace it

with a gravity stress test and clinical findings – if you don't then you are no further forwards.

ORIF versus ORIF and subtalar arthrodesis in calcaneal fractures

■ The calcaneal fracture continues to elude researchers with no clear single answer. The recent UK-Heal fracture trial tells us that open reduction and external fixation (ORIF) does not prevent subtalar arthrosis – but we kind of knew that already. The volume of work from Rick Buckley in Calgary tells us that some patients may benefit from fixation, but you have to pick your winners. Aside from these two large trials, there is a plethora of smaller studies looking

at subtalar arthrodesis, minimally invasive approaches, and even some work on arthroscopic assisted surgery. Although not a definitive piece of work, we were interested in this decision analysis, which utilized expected value decision analysis as a method for establishing (based on expected outcomes) if patients would be better with ORIF alone or ORIF plus subtalar arthrodesis (PTSA) at the time of injury. The investigators from **El Paso, Texas (USA)** used 100 randomly selected volunteers with a hypothetical clinical scenario of ORIF *versus* ORIF with primary subtalar arthrodesis.² The authors used the product of the average outcome probabilities established by previously published studies, and the average ascribed patient utility values for each outcome probability, to run their analysis. The authors used expected values for ORIF and ORIF with PSTA based on the literature and patient group of 8.96 and 18.06, respectively. This clearly favours ORIF with PSTA. The authors then went on to vary the outcomes of the model and established that the rate of secondary subtalar arthrodesis, following ORIF alone, drives the more favourable decision analysis for ORIF with PTSA. Somewhat confusingly to the casual reader, the authors also state that when moderate complications of subtalar arthrodesis are adjusted to 100%, then the ORIF with PTSA is still the favoured option. This, of course, is due to the relatively low weightings the participants have placed on complications following subtalar arthrodesis. This paper makes for interesting and thought-provoking reading, but doesn't really offer any more than that.

Parallel or not – ORIF of the femoral neck X-ref

■ The traditional AO foundation teaching that all registrars and residents (practically worldwide) receive around fixation of the femoral neck suggests that parallel implants are one of the keys to success.

Providing a parallel set of implants will, it is argued, allow the fixation to collapse into a stable position without cut-out of the implants through the osteopenic femoral head. Conversely, it is argued that the position of non-parallel implants may make no difference, given the 'empty ice cream cone' make-up of the femoral neck and divergent position of the implants, and could maximize hold without compromising the ability to stably collapse. There are, as with many of these theoretical arguments, many biomechanical and cadaveric studies to support each point of view, yet no large-scale clinical studies to settle the argument one way or the other. This large registry-based study from **Denmark**, however, may well do just that.³ The authors set out to estimate the risk of reoperation for patients with femoral neck fractures based on the 'parallel' nature or otherwise of their implants. They utilized 1206 consecutive patients who underwent fixation with the aim of achieving parallel implants. Other data collected included a complete set of demographic data and fracture configurations. The authors also collected a significant volume of data surrounding the reduction and the fracture including fracture displacement, posterior tilt, the number of implants, posterior distance, calcar distance, tip-cartilage distance, and angulation of implants on both pre-operative and postoperative films. The authors establish the effects of the implant angle and used a Cox regression analysis. Overwhelmingly, the Danish surgeons preferred two implants (997 vs 209 preferring three). Overall, there were 157 revisions, which were far more common in those under 70 (18%) than those over (9.8%), although this is likely accounts for the excess death rates in those over 70. In terms of identifiable risk factors for revision, the authors established that female gender, higher ASA score, and displaced fractures all independent risk factors. Surprisingly, time to surgery was



associated with increased risk of reoperation in displaced fractures only. As far as surgical quality markers go, the authors were only able to establish the benefits of fracture reduction, a shaft implant angle of $>125^\circ$, and avoiding femoral head perforation. No other factors including 'tip-apex' or parallel screws had an effect on the survival of the osteosynthesis. There is plenty of food for thought here with large numbers to back up the authors assertions. Perhaps we should be paying more attention to getting these patients to theatre in an appropriately rapid manner and ensuring they have a top-quality reduction.

Lawn mowers and children's injuries X-ref

■ It is a sad fact that in 2018 unintentional injuries are the leading cause of morbidity and mortality among children in the United States. By definition, all of these are avoidable. Worryingly, among these there are up to an estimated 17 000 paediatric lawn-mower injuries a year. A research team in **Kansas City, Missouri (USA)** set out to establish what the epidemiology of these injuries is, and to establish the predictors of significant injury.⁴ They undertook a 20-year retrospective review of patients presenting to their unit including the outcome of injury and surgery. At a single centre, there were 157 patients with these injuries and the age distribution showed peaks at four and 15 years of age. Overall these patients underwent an average of three operations, and

over 80% of them involved the lower limb with 40% resulting in traumatic amputation at the time of injury. The investigators established that there were several predictors of a more significant injury including patients under nine, those riding a lawn mower, those with a grandparent operator, and those injured in a rural setting. Clearly, there is a lot to learn here and the authors conclusions quite rightly focus around education. The fact that 13% of these injured children ended up with the requirement for a prosthesis, and that all of these injuries are avoidable, is enough to support the authors' main conclusions that education is of paramount importance.

The posterior malleolus in distal tibial spiral fractures X-ref

■ Distal tibial fractures are one of those junctional metaphyseal injuries where there are range of acceptable treatments, and surgeon preferences are often built around patient presentations, than a 'usual care' policy. The publication of the FixDT study from Matt Costa's group in **Oxford (UK)** has looked at those 'equipoise' injuries where either a nail or plate may be suitable. There are others still who would aim for a circular frame in these injuries (and indeed the question of plate *versus* frame is in the process of being developed by the ACTIVE trial). One of the fracture characteristics that would push the average orthopaedic surgeon towards a plate and against a nail or frame is the presence of a posterior malleolar fracture. Although these can be easily dealt with using a separate lag screw and then either a plate or nail, simplicity wins out for many surgeons, and spiral distal tibia fractures with a posterior malleolar component get a plating. The authors of this interesting case series from **Newark, New Jersey (USA)** set out to establish how often a concomitant posterior malleolar fracture is seen in distal tibial fractures.⁵ The series consists of 193 consecutive

adult patients treated in a single centre who had operatively treated tibial (not pilon) fractures and, as such, could be potentially treated with plates, nails, or frames. The authors did not just consider plain film radiology; all patients also underwent axial CT scanning. This was used to confirm or refute the presence of a posterior malleolar fracture. Of the original cohort, 26 had distal third spiral fractures, and ipsilateral posterior malleolar fractures were seen in 24 cases. In this series, the authors sensibly undertook supplemental fixation of the posterior malleolus to prevent unwanted secondary displacement. It would certainly seem, based on this series, that all spiral distal tibial fractures should be investigated with a CT scan to ensure that there is no posterior malleolar fracture (displaced or not) visible on the CT that cannot be easily visualized on the plain films, as this may change management.

How oblique can screws be in a locking plate?

■ As the osteoporotic population continues to age with their hip and knee joints *in situ*, there is a wave of periprosthetic fractures starting to emerge. In many patients these are treated by fixation, and, essentially by definition, the screws need to be oblique to the cortex due to the presence of the implant stem in the canal. There are a few studies looking at this, but usually with non-locking screws. There are some clear clinically relevant messages from this biomechanical study performed

in **Galveston, Texas (USA)** which sets out to establish what the impact of the type and orientation of peripheral screw placement has on locked plate constructs in a composite osteoporotic humeral model.⁶ The authors investigated the structural and mechanical properties of the construct in order to establish what the effects were, if any, when centrally or eccentrically placed locking and non-locking screws were placed in the most proximal hole. The constructs were tested in torsion to failure. The most stable constructs were the centrally placed plates with a non-locking screw in the most proximal hole. The non-centrally placed non-locking screw construct failed at a significantly lower peak torque (51 Nm vs 39 Nm). The locking eccentric screws and non-orthogonal eccentric standard screw groups exhibited the lowest peak torques to failure with little to choose between the two (35 Nm and 32 Nm). Total energy expended to cause a periprosthetic fracture reflected the peak torques to failure.

Does intertrochanteric collapse affect shortening? X-ref

■ It is accepted widely in hip surgery that the restoration of femoral offset is one of the keys to successful hip arthroplasty. This impacts both the tension of the abductors and their lever arm, and functions to add stability to the hip joint, to reduce the muscle work required to walk by optimizing the abductor mechanical advantage, and to have a positive

effect on hip stability. While this is not a surprise to any reader, there is a counterpoint in trauma surgery for intertrochanteric fractures. The controlled collapse is gospel, with fractures being encouraged to dynamize into a stable position with either a hip screw construct or a proximal femoral nail. These two aims are somewhat at odds in patient populations that are not that dissimilar, and there has been some contemporary thought that, while controlled collapse and compression improves healing rates, too much collapse may inhibit function. However, these authors from **New York, New York (USA)** set out to establish if there were any association between proximal femoral shortening and function in intertrochanteric hip fractures using the trochanteric fixation nail (TFN) and helical blade.⁷ This study is based around the outcomes of 72 serial patients with intertrochanteric hip fractures all treated with the TFN cephalomedullary nail. At follow-up the authors undertook a gait analysis and radiographs in combination with a range of patient-reported outcome measures (Harris Hip Score, visual analogue scale for pain, Short Form-36 Physical Component Score, and Short Form-36 Mental Component Score). The follow-up period was, on average, a little under nine months and the average patient shortened by 4.7 mm; with 15 patients more than 8 mm. From a functional perspective, the patients with excess shortening had a poorer gait, with

increased shortening resulting in decreased cadence, step length, and gait asymmetry. Despite these visible differences on gait analysis, none of the patient-reported outcome scores suggested a significant difference.

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Oncology

The significance of a 'close' margin in extremity sarcoma: a systematic review

■ Tumour surgery relies on accurate local staging to aid in the

diagnosis and assess the efficacy of treatment. A critical part of this equation is the surgical tumour margin. However, how tumour margins are defined and reported is

controversial. One group from **Iowa City, Iowa (USA)** has sought to use a comprehensive literature search and review to question if defining a margin as close, rather than

positive or negative, is sufficient for clinical use.¹ The authors searched published literature for reports of studies that reported the treatment of at least ten patients presenting