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Spine

Should we operate after we inject steroids?

■ Spinal surgeons everywhere consider using steroid injections for patients presenting with degenerative lumbar spine disease. They are almost the bread and butter of spinal treatment and diagnosis. When used in hips or knees before arthroplasty there is some evidence suggesting a positive association between steroid injections and post-operative infection. However, the arthroplasty surgeons have established that the time interval is crucial; as one might expect, a longer interval between injection and arthroplasty makes the whole process somewhat safer. What we don't know is whether there is a similar association between epidural steroid injection (ESI) and surgical site infection after surgery for lumbar degenerative spine disease. Given the relatively low event rate for infection, a large study would be required to state definitively one way or the other. A group in **Boston, Massachusetts (USA)** have sought to resolve this question by carrying out a multivariate logistic regression of 5311 adult patients who have undergone surgery and either have or have not subsequently developed surgical site infections.¹ The results show that 18% of patients had an ESI in the 90 days prior to surgery. Overall, 134 (2.5%) patients had a post-operative surgical site infection. Accounting for a range of confounders through multivariate regression including the Charlson comorbidity index, tobacco use, obesity and age, no association between ESI and surgical

site infection was found within 90 days or 30 days, and what's more, no dose—response relationship was found. What the study team did, however, establish was that length of stay, a posterior approach, increased intra-operative blood loss and using a drain all increased the risk of infection, so perhaps future research should be targeted at modifying these. The study notes that patients may well have received treatment elsewhere, and that imputation is used for missing data. It seems that this work is good evidence that the appropriate use of ESI probably doesn't have the same effect as steroids do for our lower limb arthroplasty colleagues, even when used in the immediate pre-operative period.

Levels in spinal surgery

■ We regularly tell our trainees that the three most common errors in spinal surgery are 'level, level and level'. Gone are the days when clinical diagnosis was used to identify spinal pathology and it was acceptable to have a peep at the level above and below if there didn't appear to be much pathology at the intended level. MRI scanning has revolutionised localisation of pathology in spinal surgery. We were told this too as trainees, and clearly it is appropriate for spinal surgeons to be wary about levels in spinal surgery. Surgery at the wrong level is as big a mistake as operating on the wrong side, but much easier a mistake to make. Salvation may come from a team in **Baltimore, Maryland (USA)** who have investigated the practical use of

the LevelCheck software algorithm (Jeffrey H. Siewerdsen, I-STAR Lab, Johns Hopkins University, Baltimore, Maryland; Siemens Healthcare, Malvern, Pennsylvania), comparing pre-operative CT scans with intra-operative radiographs and X-rays to ensure that the correct level is targeted during surgery.² The software algorithm cleverly interprets intra-operative fluoroscopy using pre-operative imaging to intra-operatively establish the level of interest. The reported study used 398 intra-operative radiographs and 178 pre-operative CTs of the cervical, thoracic and lumbar spine inserted into the LevelCheck software, and asked three spinal surgeons about its performance, utility and suitability for use in real clinical settings. They found that the surgeons thought it helpful in 42% of cases and confidence-improving in 31%, and that there did not appear to be any negative effect on the flow of an operation. It was found by surgeons to be particularly useful in the more challenging situations — difficult anatomy, poor intra-operative radiology and anatomical variations — although no clinical outcomes are reported. Clearly, the orthopaedic spinal community has found this to be a useful tool when dealing with the age-old 'where am I?' problem. The authors are able to report 100% accuracy of the algorithm by the authors, although here at 360 we suspect that the fear of wrong level surgery will not be so easily assuaged. The use of surgical technology is always difficult to begin

with, and has a learning curve during which there can be no substitute for the experienced eye.

Interpreting MRIs

■ With back pain being endemic in modern society, more and more primary care and allied health professionals are requesting and interpreting — or attempting to interpret — MRI scans, and in some cases patients are reaching surgery based on these findings. Sadly, there is no current evidence to say one way or the other if this is a sensible approach. Usually, given the high false-positive rate in MRI scanning, accurate interpretation requires an experienced clinician. In **Amsterdam (The Netherlands)** this has become widespread enough to warrant its own study. The research team set out to examine the concordance between the MRI interpretation of chiropractors, chiropractic radiologists and medical radiologists with an expert panel to see how accurate their interpretations are.³ The study team selected 300 scans and each person was asked to review 100 in one sitting, followed by 50 scans from the same selection at a later date. Scans were divided into 'specific finding' or 'no specific findings', depending on the interpretation from an expert panel. Chiropractors showed a specificity of 0.77 for severe spinal disease but a sensitivity of just 0.70 in their analyses. This fell to 0.61 with minor pathology, suggesting that they are increasingly inaccurate with milder pathologies. Medical radiologists showed the

highest specificities across the board, whereas chiropractic radiologists showed superior sensitivity but lower specificity in every case. Although these differences did not reach significance, they suggest a certain level of 'overcalling' of pathology. What does this mean for clinical practice? MRI outside the expert setting apparently leads to overdiagnosis, and subsequently pressure on the already stretched systems. Balancing this with the practical considerations of referring every suspicious back pain to specialist care is a tricky act, and perhaps alternative strategies in MRI interpretation are needed in systems where chiropractic medicine plays a role in primary care.

Biochemical tests for infection?

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■ In our practice here at 360 we would regard clinical examination as the most sensitive test for early superficial post-operative infection. However, we do recognise that deeper infection may be more challenging to diagnose. Traditionally, inflammatory markers have been felt to be unreliable as post-operative markers of infection, and in many centres inflammatory markers such as C-reactive protein (CRP) and white blood cell count are not even measured post-operatively due to the acceptance that they will be raised following surgery. The authors of this study from **Nara (Japan)** set out to determine if and when inflammatory markers become useful diagnostic aids following instrumented spine fusion, and the diagnostic threshold values.⁴ In a slightly opportunistic study, the authors appear to have commented on just their standard clinical practice. Inflammatory markers were measured in patients who underwent instrumented lumbar fusion at various non-standard time points before and after surgery. Comparison was made between those that developed a surgical infection (11 patients) and those that did not (130 patients). The

non-surgical site infection group was used to assess the effect of surgery, and in particular three factors: operating time, blood loss and the number of fusion segments on the post-operative inflammatory markers at various time points. Diagnostic cut-offs were calculated from receiver-operating characteristic (ROC) curves to maximise the sensitivity and specificity of each test. For the clinician, key features to note are a lymphocyte count at day four (<1180/ μ L) that was highly sensitive, and a CRP at day seven (>4.4 mg/dl) which was highly sensitive, and specific for a post-operative infection. These results should be taken with a slight pinch of salt – only 11 events occurred, and to comment meaningfully on the diagnostic value of the test is far from proven. However, the sensible take home message is perhaps that in patients with a high clinical index of suspicion, inflammatory markers may be taken as a diagnostic augmentation.

To drain or not to drain?

■ To drain or not to drain is a question as old as surgical practice itself, and one commonly asked after decompressive spinal surgery. The purported advantages of drainage include the prevention of an epidural haematoma and thus reduction in the risk of secondary neurological compromise or post-operative wound infections. The counterpoint, however, is that the presence of a drain may itself act as a source of infection, increase hospital length of stay or increase the need for transfusions. There are many papers on this topic, but little in the way of consensus as to which position in the argument is the winning side. This timely systematic study, again from **Amsterdam (The Netherlands)**, involved a review of all the literature reporting the outcomes of non-complex spine surgery (discectomies and laminectomies).⁵ Despite their extensive search strategies, the authors only identified eight suitable studies: three randomised controlled



trials, three retrospective and three prospective cohort studies between them, reporting the outcomes of 1333 patients. Overall, a low incidence of post-operative epidural haematoma (0.15%) and wound infection (0.75%) was noted, and drainage or lack of drainage did not seem to have any influence on the clinical outcomes in what is a large series of patients. However, the authors comment that their report is severely limited by the included high level of bias, particularly as blinding was not possible, and by variations in surgical practice such as the type of drainage (suction vs free), criteria for drain removal, and techniques for haemostasis and closure, as well as the definition of a haematoma (neurological compromise vs no compromise). So it would seem from this study that the use of a drain did not prevent post-operative haematomas and the absence of a drain had no effect on wound infections. The debate goes on.

Topical vancomycin under the spotlight

■ In what has become a hotly-debated topic, two further studies have been published, both supporting the growing trend among spinal surgeons to add vancomycin to surgical wounds to prevent surgical site infections. The first study involved deep placement of vancomycin directly onto the metalwork and bone, whereas the other reports the outcomes of superficial placement

above the fascial layer. The incidence of surgical site infection was lower in the vancomycin-receiving treatment groups for both studies, compared with the control groups who received just the standard post-operative IV antibiotics. The first study from **Nashville, Tennessee (USA)** investigating deep vancomycin placement reports the outcomes of 2056 patients, of whom 966 were treated with vancomycin.⁶ There was a marked increase in wound infection rates in those without vancomycin (5.1% vs 2.2%). Other perhaps unsurprising risk factors identified were increased vertebral levels, surgical blood loss, longer operative time and admission to intensive care. The second, smaller study from **Singapore (Singapore)** investigates the use of superficial topical antibiotics.⁷ The authors report the outcomes of nearly 400 patients who received the same standard operative and post-operative care, of whom 117 had vancomycin, and 272 in the comparison cohort did not. The authors again report a significant decrease in wound infection rate (6.3% vs 0.8%). These authors identified a slightly different group of contributing factors with smoking, diagnosis, intra-operative blood loss and surgical approach all contributing to the post-operative risk of infection. The advantages are clear, and both studies illustrate these well. Intravenous vancomycin can cause systemic complications (renal toxicity, hypotension) and spinal penetration may be poor, whereas local use enables high levels in the surgical site with fewer systemic complications. The unanswered issues though include the effect on fusion rates and in particular cytotoxic effects on osteoblasts, which has been shown *in vitro* and in animal studies, although not in clinical studies. In addition, antibiotic-resistant or gram-negative organisms may be selected, and indeed *pseudomonas aeruginosa* was the most common organism in one treatment group.

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

X-ref

■ 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?

X-ref

■ 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,