

facing this dilemma. This group from **New York, New York (USA)** sought to answer the question with a retrospective case-control analysis of data from their database.<sup>8</sup> Patients with a history of rotator cuff repair undergoing reverse total shoulder arthroplasty between 2000 and 2015 and who had a minimum of two years' follow-up were eligible for inclusion in this study. These patients were matched with a control group matched by age and sex, all of whom had undergone reverse arthroplasty over the same period with no previous rotator cuff repair. The study group therefore consisted of 45 patients and the control group 135 on a 1:3 basis. Only primary reverse arthroplasties were included and all surgeries were performed by one of six surgeons at a single institute. The mean age was 69 years and 60% of patients were female. The mean American Shoulder and Elbow Surgeons (ASES) score improved from 43 to 76 at two years postoperatively and to 67 at five years. There was

a statistically significant difference between the groups in terms of the outcomes at two years, but there was significantly greater improvement in the control group with a higher baseline. When the baseline ASES scores were matched, there was no difference in score improvement. Therefore, the authors conclude that previous cuff repair does not appear to adversely affect the early outcomes of reverse shoulder arthroplasty.

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## Spine

**X-ref** For other Roundups in this issue that cross-reference with Spine see: *Children's orthopaedics Roundups 3 & 4.*

### Aortic position and curve severity in scoliosis

■ At the forefront of every spinal surgeon's mind is the potential for significant complications. As all will be aware, the range of complications includes not just the usual surgical complications but also significant spinal injury, blindness, and aortic injury. With instrumentation of adolescent idiopathic scoliosis, pedicle screw insertion at the apex of a thoracic curve is, perhaps, the most technically challenging due to vertebral rotation and smaller pedicle size. This difficulty in position is likely to increase the risks of pedicle breach with the screws. In the event of a left-sided lateral breach, the aorta is at risk with the potential for fatal haemorrhage, pseudoaneurysm formation, aortic dissection, or infection. The authors of this study from **Kuala Lumpur (Malaysia)** investigated the relationship between curve magnitude in Lenke 1 and 2 adolescent idiopathic scoliosis and the distance and position of the aorta from the vertebra.<sup>1</sup> The study focuses on the anatomy of 39 patients who had undergone preoperative CT scans, with various radiological parameters being measured to analyze the relationship between the spine (in particular the apex vertebrae) and the aorta. The

key findings were a moderate to strong positive correlation between the observed aortic-vertebral distance and the Cobb angle from the T8 to T12 vertebrae, as well as for the apical vertebra. Moreover, the distance between the pedicle entry point to the wall of the aorta was particularly small in the thoracic region, with a mean observed value of less than 30 mm. These results show that the larger the spinal curvature, the greater the distance from the aorta to the apical vertebral wall, which may be of some reassurance to the surgeon when attempting insertion of a difficult apical screw on the concavity of the curve. This is a valuable, albeit somewhat counterintuitive, observation. One should always take the utmost care in placement of pedicle screws, but it is somewhat surprising that the risk of aortic injury is actually highest in those patients with smaller deformities.

### Urinary N-telopeptide and pseudarthrosis X-ref

■ Reportedly, up to 30% of patients go on to develop a persistent nonunion following anterior cervical discectomy and fusion (ACDF). The authors of this study from **New York, New York (USA)** investigated whether markers of bone turnover can predict which patients will go on to develop a nonunion.<sup>2</sup> The team selected urinary N-telopeptide (uNTX), as their marker, which is a fragment of type 1 collagen, is produced by osteoclastic

bone resorption, and is renally cleared. This was a diagnostic cohort study where the authors aimed to establish the diagnostic accuracy of uNTX for predicting successful fusion in patients undergoing ACDF. The authors of this study report the outcomes of 69 patients, all of whom underwent 1 to 4 level ACDF surgery. Fusion was assessed by dynamic radiographs and a nonunion was defined for the purposes of the study as > 1 mm movement between flexion/extension radiographs. As would be expected, fusion rates increased with time post-surgery: 37.3%, 70.9%, and 95.3% at six months, one year, and two years, respectively. Preoperative uNTX was greater in the fusion group compared with the nonunion group at six months and one year, but there were no apparent differences in the two groups at two years. There were no differences between fusion and nonfusion groups in terms of proportions of smokers, immunomodulatory agents, corpectomies, or fusion levels. Multivariate regression analysis demonstrated uNTX to be an independent predictor of fusion. The authors conclude that preoperative uNTX was greater in patients with successful ACDF compared with patients without a fusion at six months and one year. This raises the possibility of whether pharmacological agents, such as parathyroid hormone, can be used to optimize fusion in patients predicted to have a low fusion potential immediately postoperatively.

## Enhanced recovery after surgery and minimally invasive percutaneous plate osteosynthesis

■ Enhanced recovery after surgery (ERAS) protocols have gained real traction in many branches of surgery, and have been shown to improve patient outcomes and experience while reducing health-care costs and length of stay (LoS). They have been utilized in other surgical specialties including other orthopaedic subspecialties, such as arthroplasty and femoral neck fracture surgery. Most ERAS protocols involve a standard surgical and anaesthetic technique for a specific condition with the aim of reducing perioperative inflammation and reducing complications and LoS. Less invasive surgical approaches have a similar aim, with the idea that a reduced soft-tissue exposure and associated surgical injury will reduce the chances of complications and LoS. However, there has been no real uptake of ERAS protocols in spine surgery. This may be explained by the wide range of spinal conditions and surgical treatment options complicating the development of an ERAS pathway. A team from **New York, New York (USA)** has described their own initial experience in developing and introducing an ERAS protocol for patients undergoing minimally invasive lumbar surgery.<sup>3</sup> All patients in this series underwent either a surgical decompression or a discectomy in a single centre under the care of a single surgeon and single anaesthetist. The ERAS pathway was formulated following a literature review and applied to 61 consecutive patients, who all also underwent minimally invasive surgery. The key components to the pathway were: initial patient education and expectation setting; preoperative carbohydrate loading; preemptive analgesia; effective treatment of nausea and vomiting; a standard anaesthetic protocol involving total intravenous anaesthesia; and an agreed protocol for antimicrobial prophylaxis, analgesia, maintenance of normothermia and normovolemia, early mobilization, and nutrition. The primary outcome measure was LoS. Overall, there was an 85% reported pathway compliance in this series, with a median LoS of 279 minutes. There were four complications, each resulting in a prolonged LoS (more than 23 hours) with no readmissions within 90 days. There was no comparator group reported in this series, and the authors simply describe what can be expected with a similar pathway. However, the results themselves are rather good. This paper highlights benefits of an ERAS protocol in spine surgery. Although it involves small patient numbers and limited outcome measures, it describes the steps required to implement the treatment pathway.

Consistent teams are essential, especially in theatre, leading to greater pathway compliance. The pathway shows the benefits of using nonopioid multimodal analgesia, and that as treatment pathways become optimized, there is the potential for outcomes to be improved in all areas, not just LoS.



## Spinal manipulative therapy: friend or foe?

■ Low back pain is everywhere. Responsible for more sick days than nearly any other diagnosis, chronic back pain is a plague on modern society. The reasons for back pain have been thought to be due to the mechanical problems introduced by a bipedal gait or part of ageing. Many patients end up with difficult and intractable symptoms that are not suitable for surgery. There is a whole industry surrounding the variety of nonsurgical options available for these patients, which vary from manipulation through to physiotherapy and acupuncture. Any study that explores the vagaries of treatment options for these patients warrants examination, and one such study has been carried out by a group in **Amsterdam (The Netherlands)**.<sup>4</sup> The authors aimed to establish if there is an evidence base to support spinal manipulation as a beneficial treatment for low back pain. This enterprising group conducted a meta-analysis of 47 studies (reporting the outcomes of 9211 patients) to investigate if spinal manipulative therapy (SMT) has a role in managing adult chronic low back pain. The group found that SMT shows similar effects to other therapies, such as physiotherapy for short-term symptom relief, and an accompanying improvement in function. When compared with therapies not recommended, SMT results in small positive effects for short-term pain relief and functional improvement. Results were similar for

the intermediate and long-term outcomes. When compared with placebo therapy, the evidence for SMT was, however, inconclusive. Adverse events were recorded, but the reliability of their recording and their significance was unclear, with only sporadic records of significant adverse events being recorded. Overall, this well-conducted meta-analysis demonstrates that spinal manipulation has a role to play in the treatment of lower back pain, but the results are equivalent to other recommended therapies, such as physiotherapy. What is slightly more worrying is that there does not appear to be a benefit over placebo therapy. This makes us question if the positive results reported here actually mean anything, or if they simply represent the natural history of the disease or the placebo effect.

## Decompression versus fusion for grade 1 degenerative spondylolisthesis: a meta-analysis

■ Degenerative spondylolisthesis is a common condition afflicting the ageing spine. Characterized by the slip of one vertebra on another, it is usually clinically divided into five grades based on the anatomical relationship to the vertebrae below, with grade 1 being the most common. Various treatment options exist, from conservative through to surgical, with some of the biggest trials suggesting that surgical treatment yields improved pain and function in patients with symptoms. However, a team from **Baltimore, Maryland (USA)** have taken issue with this, pointing out that because all severities of spondylolisthesis have been lumped together, the conclusions of large studies are not applicable to grade 1 disease.<sup>5</sup> Based on this concern, the team went on to carry out a meta-analysis of 25 studies that evaluated the effect of decompression against decompression with fusion for grade 1 degenerative spondylolisthesis. Searching all the usual biomedical literature databases for relevant studies with at least one year's follow-up, the authors used a random-effects model to compare the outcomes of the two treatments in the literature. The outcomes here were assessed using the 36-Item Short-Form Health Survey (SF-36) patient reported outcome measure (the reported physical component). Overall, patients reported better clinical outcomes and there were some subtle differences between clinical groups. Complication rates were lowest in the decompression alone cohort (5.8%) compared with the decompression plus fusion cohort (8.3%). This was reversed when looking at the reoperation rate (8.5% vs 4.9%, respectively). Both strategies yielded similar improvements in back and leg pain, and likewise function improved by the same amount. Surgical

complications were more common when fusion was combined with decompression; however, repeated surgery was more common in patients undergoing decompression alone. This study shows that treatments are probably equally effective in managing this common condition. The authors note that fusion was more common in younger patients with more back-predominant pain, but at present it seems that both treatment options are fair game.

### Magnetic resonance spectroscopy and disc pain

■ The painful disc is a large problem for the spinal community. There are no agreed diagnostic tests and, although many surgeons and patients have had much success with a range of treatments, there remains much controversy over the best treatments, the benefit of these treatments, and who is best placed to diagnose the problem in the first place. Magnetic resonance spectroscopy (MRS) is a modification of MRI that allows the radiologist to see the metabolic activity of neural and other tissue. This is gaining some traction as a potentially interesting modality for diagnosing the painful disc. In this study from **Chesterfield, Missouri (USA)**, a group of investigators has sought to assess the utility of this technique in identifying painful discs, in an attempt to predict potential surgical outcomes.<sup>6</sup> In what is actually a fairly large study, given that each disc level was assessed, the authors sought to establish which levels were painful. Using an MRS protocol to define specific structural and biochemical features, 623 discs in 139 patients were scanned. Following this, 75 patients then went on to have surgical treatment for their perceived discogenic back pain, the outcomes of which were clinically assessed based on the results

of the MRS investigation. When compared with provocative discography as the benchmark, MRS showed a total accuracy of up to 93%. When discs that showed a high signal on MRS were surgically treated, surgical success was thought, subjectively, to have been achieved in 97% of cases, compared with 57% in those with a negative MRS scan. In this series, MRS seems to be a very useful tool in the diagnosis of low back pain, and an adjunct to the counselling of patients preoperatively. Its introduction might be hampered by technological considerations, but perhaps this is a discussion to be had with our radiological colleagues.

### Pathological compression fracture and vertebroplasty/kyphoplasty X-ref

■ Malignancy of the spine can manifest itself in many different forms. One of the more common forms is the pathological fracture, which is prone to nonunion, instability, and progression, and which needs stabilization to facilitate either analgesia or subsequent oncological therapy. An option open to the spinal surgeon is either vertebroplasty or kyphoplasty that avoids the insertion of metalwork in the presence of diseased bone, often in systemically unwell patients. However, the relative effectiveness and safety of these options is not clear, despite multiple studies in the literature. Fortunately, a group from **Middelfart (Denmark)** have taken it upon themselves to conduct a systematic review looking at these factors and the impact of these treatments when used to manage malignant pathological vertebral fractures, using the visual analogue score for pain, Oswestry disability index (ODI), and Karnofsky Performance Score.<sup>7</sup> The review found that there were similar improvements in pain with both kyphoplasty and vertebroplasty. ODI improved by a greater amount with

vertebroplasty over kyphoplasty; however, cement leakage was more common in vertebroplasty. The authors note that within the 3426 patients included in the study, systemic complications occurred in only 43. Overall, both treatments seem to be safe and effective for these specific injuries. With the safety profile being good, it is a treatment that we can consider offering our patients as part of their wider multidisciplinary care.

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## Trauma

**X-ref** For other Roundups in this issue that cross-reference with Trauma see: **Foot & Ankle Roundups 2 & 3; Wrist & Hand Roundups 1, 2 & 5; Children's orthopaedics Roundups 4, 5 & 7; Research Roundup 3.**

### Medial plate in high shear femoral neck fracture

■ It is no secret that the fracture (Pauwels) angle in a pertrochanteric and femoral neck fracture significantly affects the biomechanical environment of the fracture. When loaded, high Pauwels

angle fractures suffer from significant shear forces that must be resisted by any implants inserted, usually in a very mechanically unfavourable way. This accounts for the poor outcomes when fixing these fractures. Despite many attempts to improve things, there has been little progress for the past 50 years and these fractures still suffer from high failure rates. More recently, there has been a small but consistent argument that placement of a medial plate would allow for neutralization of the shear forces and, consequently, sounder fixation. Despite this slight shift in practice in some centres, there is

very little published evidence. A group of authors from **Rio de Janeiro (Brazil)** have set the ball in play by reporting this biomechanical study, which sought to establish the mechanical role of a medial buttress plate for Pauwels type III femoral neck fractures.<sup>1</sup> The investigators simulated Pauwels fractures in the femoral neck in synthetic bone, fixed with either two parallel cannulated screws or with a transverse neck screw. The comparison fixation was as before, but with the addition of the medial calcar plate. The testing model was of cyclical axial loading to failure. This study shows that