

X-ref For other Roundups in this issue that cross-reference with Spine see: Sports Roundup 2; Children's orthopaedics Roundup 4; Research Roundup 5.

Symptom duration and outcomes after fusion for degenerative spondylolisthesis

■ On average, surgical decompression and fusion have been shown to improve the health status of selected patients with degenerative lumbar disease. This is particularly true in patients who undergo arthrodesis for degenerative spondylolisthesis. In patients who experience decompression for disc herniation or stenosis, the literature suggests that the duration of preoperative leg pain impacts upon surgical outcomes. Overall, a longer duration of symptoms correlates with a blunted improvement in postoperative symptoms. The aim of this study carried out in **Louisville, Kentucky (USA)** was to determine whether the duration of presurgery symptoms affects the postoperative outcomes in patients presenting with level one or two degenerative spondylolisthesis and stenosis.¹ This longitudinal cohort consisted of 123 patients, and the authors report on their demographics, comorbidities, pain, and functional status. The sample was stratified into three groups based on the duration of preoperative symptoms: less than one year, between one to two years, or greater than two years. Single-level posterior decompression and fusion was performed in 68% of cases, and 41% of patients underwent interbody fusion. Analysis revealed that patient characteristics and preoperative symptoms were similar across the three cohorts. Further, at 12 months postoperatively, all groups demonstrated a significant improvement in back pain, leg pain, and Oswestry Disability Index. However, despite an adequately powered study, the only trend observed was in the shorter duration of symptoms (less than a year) resulting in better improvements in postoperative leg pain. There was no significant difference in back pain or disability between the cohorts, unlike that found for patients with disc herniation or stenosis. This study suggests that, contrary to cases of disc herniation or stenosis, symptom duration of two years or less may not be a useful predictor of postoperative improvement in patients with spondylolisthesis requiring decompression and fusion.

Timing in decompression for traumatic cervical spinal cord injury

■ In the treatment of acute cervical spinal cord injury (CSCI), the timing of surgical decompression

is still controversial. At present, most experts support the idea that early decompression leads to a better neurological recovery; however, the evidence has some sizeable gaps. In particular, it is unclear whether all patients, regardless of injury severity, require early decompression, and this forms the focus of the present study. A group from **Xi'an (China)** explore the timing of surgical decompression for patients suffering from a cervical spinal injury at the C3-C7 level with a subaxial injury classification score of > 4.² Patients underwent either early (< 72 hours after injury) or late (> 72 hours after injury) decompressive surgery of the cervical spinal cord. All subjects in the study underwent internal fixation and fusion at the same time as their surgical decompression. They were grouped using the AO Spine subaxial cervical spinal cord injury classification system (SCSICS) on presentation, and were assessed with the American Spinal Injury Association (ASIA) impairment scale and spinal cord independence measure at 12 months' follow-up. There was a total of 402 patients, of whom 187 were classified as having undergone early decompression and 215 were classified as having undergone late decompression. The study reports that patients with cervical fractures causing compression of the vertebra with an intact tension band, or fractures of the facet joint that are not subluxed or dislocated, did not require early decompressive surgery. In contrast, the authors present an analysis that supports early surgical treatment for patients with more significant injuries in order to achieve better clinical outcomes. This is because it is argued that these injuries may lead to displacement of the vertebra, such as a general failure of anterior and/or posterior elements, or subluxed/dislocated facet joints.

Curve correction or 'top level' in adolescent idiopathic scoliosis X-ref

■ Shoulder height imbalance is a recognized complication following surgical correction of Lenke type one and two adolescent idiopathic scoliosis (AIS). As a result, surgeons encounter patients with poor cosmetic results, dissatisfaction, and, in some cases, a need for revision surgery. Several techniques, including selection of the Upper Instrumented Vertebra (UIV), have been identified as key elements in the prevention of this unfortunate complication. In this study carried out in **New York, New York (USA)**, the authors explore the impact of correction on the main thoracic curve

and proximal thoracic curves.³ The relationship between curves was analyzed with the purpose of describing a simple strategy for decreasing the risk of shoulder height imbalance in AIS patients. For this investigation, 13 independent spine surgeons assessed the shoulder height of 145 patients using preoperative and five-year postoperative clinical photographs and posteroanterior full-length standing spine radiographs. The authors aimed to identify potential predictors of postoperative imbalance, and then test them using univariate and multivariate analysis. In this series, the reported UIV lay between T3 and T5 in 87% of patients, with 8.9% instrumented up to T1 or T2 and 3.4% to T6 or T7. The interobserver reliability of each method for assessing shoulder balance showed fair agreement across all 13 reviewing surgeons. At five years, 36% of patients were reported to have a shoulder imbalance. When the proximal thoracic Cobb angle was corrected by more than 52%, 80% of patients had balanced shoulders. In contrast, when the proximal curve Cobb angle was corrected to less than 53% and the main thoracic curve was corrected to less than 54%, 87% of patients had balanced shoulders. When the proximal thoracic curve was corrected to less than 52% and the main thoracic curve was corrected to more than 54%, only 41% of patients had balanced shoulders. This study shows that considerable correction of the main thoracic curve with simultaneous under-correction of the upper thoracic curve results in shoulder height imbalance, regardless of the upper instrumented level. It further emphasizes the need to carefully plan for controlling the proximal thoracic curve, especially when larger corrections of the main thoracic curve are being performed.

Bladder scans and post-void residual volume measurement improve diagnostic accuracy of cauda equina syndrome X-ref

■ Cauda equina syndrome (CES) is one of a few orthopaedic emergencies; however, despite the importance of timely diagnosis and treatment, there are few clear diagnostic tests. Often, the diagnosis is left to junior surgeons and must be done clinically. Diagnosing CES is challenging, not helped by its poor definition and the myriad of presentation symptoms. 'Red flag' clinical features raise suspicions, but no combination of these features reliably predicts true cauda equina compression, as visible on an MRI scan. The serious

ramifications of a missed CES make sensitivity and negative predictive values the most valuable of diagnostic options. Loss of executive control of the bladder, which results in urinary retention or overflow incontinence, is a demonstrable endpoint of CES. However, delaying treatment until the point where incontinence is reached is likely to have downsides in terms of adverse outcomes for the patient. A group from **Nottingham (UK)** have instead assessed whether pre- and post-void residual bladder volume is affected earlier in the course of CES, and therefore may be used to predict the presence of surgically amenable disease.⁴ The authors commenced a prospective study to confirm post-void residual volume as a useful diagnostic measure. Over the six-month study period, patients without CES (negative MRI scans) had mean pre- and post-void bladder volumes of 423 ml and 199 ml, respectively. Patients with CES (positive MRI scans) had mean pre- and post-void bladder volumes of 627 ml and 466 ml. Receiver operating curves identified that the optimal bladder volume cut-offs for predicting CES equalled > 400 ml for pre-void volume and > 200 ml for post-void volume (sensitivity of 94%, specificity of 72%, and negative predictive value of 98%). This results in the probability of CES when having a bladder volume of < 400 ml (pre-void) and < 200 ml (post-void) being 4.5% and 3.6%, respectively. Further logistic regression analysis on this cohort revealed that the odds of having CES is 20.7 times higher given a post-void bladder volume > 200 ml and, thus, post-void bladder volume is a useful adjunct in CES diagnosis, with a better negative predictive value than physical examination. Because of the valuable nature of a very high (98%) negative predictive value, this simple and useful study should be factored into clinical algorithms. In this day and age of networked care and unavailability of out-of-house MRI scanning, patients with a high likelihood of CES should probably be transferred to a centre where scans are available.

Providence night-time bracing effective in curves larger than 35° X-ref

■ Well-documented in the literature, brace treatment for adolescent idiopathic scoliosis (AIS) is effective at decreasing progression of curve magnitude and reducing the need for surgical intervention. However, braces are unloved, to say the least, and patient compliance is often poor. A glimpse of hope comes in the form of a study by authors from **Mid-delfart (Denmark)**, in which night-time bracing using the Providence brace is compared to full-time use of the Boston brace.⁵ The authors report a series of 124 patients presenting with AIS and a Cobb

angle of > 20°. All patients had remaining growth potential and were treatment-naïve. Providence night-time treatment, eight hours nightly, was initiated. Treatment was continued until two years post-menarchal for females and until six-month growth arrest for males. Patients were evaluated using standing radiographs during treatment and six and 12 months after termination of bracing. The authors report a minimum in-brace curve correction of 60% and a mean in-brace correction of 83%. During a mean 18 months of treatment, 71/80 patients had their curve progression halted. This study describes the premise of night-time bracing as applying corrective forces on the spine during sleep, when there is no loading of the spine and vertebral growth is at its peak. It is concluded that night-time bracing is as effective as full-time bracing, and that one should aim for a 70% initial in-brace correction and eight hours of use per day.



Anterior release and contemporary adolescent idiopathic scoliosis surgery X-ref

■ With the advent of pedicle screw instrumentation, anterior release (AR) surgery, which involves resecting the intervertebral disc and anterior longitudinal ligament, is less commonly performed than it once was. Although posterior instrumentation and correction is a powerful technique biomechanically, pedicle screw instrumentation is not always as effective as we might hope. This study led from **New York, New York (USA)** looks at whether there remains a role for anterior release, and whether it offers better 3D correction than pedicle screw instrumentation alone.⁶ Five surgeons performed a retrospective review of their thoracic adolescent idiopathic scoliosis (AIS) cases between 2003 and 2010. Patients were

assigned to one of two groups: thoracoscopic anterior release and posterior fusion, or posterior fusion only with pedicle-screw-based instrumentation. The two cohorts were matched according to curve magnitude, T5-T12 kyphosis, and angle of trunk rotation. Radiological and clinical parameters were compared between the two groups. There were 47 cases in the anterior release and posterior fusion group that were matched with 47 cases in the posterior fusion group. The study found that, postoperatively, cases involving anterior releases had a smaller major curve (20° vs 25°, $p = 0.034$; 72% vs 66% correction, $p = 0.037$) and greater thoracic kyphosis (26° vs 20°, $p = 0.005$), but a similar angle of trunk rotation. Reported implant density was also lower (1.6 vs 1.9, $p < 0.0001$) in the AR group. There were three complications associated with anterior surgery: one pneumothorax and two conversions to minithoracotomies, none of which resulted in long-term clinical problems. In this series, scoliosis correction by anterior release resulted in better coronal and sagittal correction than posterior-only surgery. The question remains as to whether this improvement yields better clinical outcomes to compensate for the greater morbidity of a double approach, particularly for moderately sized curves. Here at 360, we would say that, at the least, this series warrants revisiting the need for anterior approaches. Concern remains in the scoliosis fraternity over less-than-perfect corrections and loss of balance in AIS surgery.

Degenerative disc disease: what is in a name?

■ Degenerative disc disease (DDD) is a common term that is used in both radiological reports and research studies. It can be given as a diagnosis, which in turn can have clinical implications, but is it actually a disease? In an effort to clarify the situation, this study from **London (Canada)** has usefully scrutinized the term's use and meaning in the scientific literature.⁷ The study team interrogated several medical databases (Ovid MEDLINE, Embase, CINAHL, and Scopus), which were systematically reviewed from 2007 through to 2017 for the term 'degenerative disc disease'. Publications that used the term were identified and analyzed, categorizing the definition for DDD used in each manuscript. DDD was used in the title of 402 publications, with increasing frequency over time. In the majority of publications, there was no single definition used, and most commonly the term was used without definition (30.1%). In other cases, the term DDD included radiculopathy or myelopathy (14.4%) and back or neck pain (5.5%), and was equated with disc degeneration (15.4%), regardless

of the presence of symptoms, or with discogenic pain (12.7%). The definitions varied between surgeons and other healthcare professionals, as did whether they were applied to the lumbar or cervical regions. The authors highlight the variable usage and definition of DDD, and state that this could hinder accurate communication and could “create confusion and misconceptions among clinicians, patients and others”. In this very simple paper, a very important observation is made. If commonly used terms are not standardized, there are issues with interpretation of the literature, systemic reviews, and evidence synthesis. Perhaps, therefore, a standard definition of DDD is required?

Brace treatment in adolescent idiopathic scoliosis: risk factors for failure

■ Following the 2013 publication of the Bracing in Adolescent Idiopathic Scoliosis Trial (BRAIST) study, bracing in adolescent idiopathic scoliosis (AIS) is enjoying a resurgence, and is now recognized as the most effective nonoperative treatment for AIS. The authors of this study lead from **Hali-fax (Canada)** have performed a literature review in order to determine what factors reduce the success of this treatment.⁸ Although the resurgence of interest has resulted in a plethora of publications, clinicians must start to establish which patients are

most suitable for surgery, and which for bracing. The authors undertook an extensive MEDLINE and Embase database search. They looked for studies that identified specific risk factors for curve progression under bracing, with the aim to establish the patient cohort that will do best with nonoperative management. Studies that involved night-time only bracing, comparisons between brace types, and the effect of physical therapy on brace performance were excluded from the analysis. As such, there was a relatively homogenous treatment intervention. Seven clear risk factors were identified: poor brace compliance (eight studies); lack of skeletal maturity (six studies); Cobb angle over a certain threshold (six studies); poor in-brace correction (three studies); vertebral rotation (four studies); osteopaenia (two studies); and thoracic curve type (two studies). Several studies also showed that there was a cumulative risk if multiple risk factors were present. This review is useful to guide surgeons in counselling patients appropriately; those at high risk of progression can be identified and warned that future surgery may be inevitable.

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Trauma

X-ref For other Roundups in this issue that cross-reference with Trauma see: *Hip & Pelvis Roundup 3; Wrist & Hand Roundups 1, 2 & 7; Shoulder & Elbow Roundups 6 & 7; Spine Roundup 4; Children's orthopaedics Roundups 2 and 7.*

A single screw: a screw too few in the medial malleolus? X-ref

■ Unstable ankle fractures are almost always treated with surgical fixation. When the medial malleolus (MM) is fractured, the traditional accepted treatment is to fix this fragment, usually with two parallel screws (though plate and tension band techniques are described). It is not uncommon to have a fractured fragment that is too small to accept two screws. Alternatives, such as tension band fixation and suture anchor fixation, have been proposed to afford adequate protection against rotational forces. These authors from **New York, New York (USA)** question whether such elaborate fixation methods are needed or whether, in fact, single-screw fixation is enough.¹ They conducted

a retrospective database-driven study and identified all patients that underwent surgical fixation of unstable ankle fracture between 2013 and 2017. Following exclusion of patients who were skeletally immature, did not have MM fixation, or had inadequate follow-up, 196 patients were identified. Of these, 47 underwent single-screw fixation; the remainder received dual-screw fixation. The authors utilized a 4 mm partially threaded cancellous screw for MM fixation. Postoperatively, after one to two weeks, the ankle was mobilized in a fracture brace, but all patients were kept non-weight-bearing for six weeks. Radiological and functional outcomes were assessed using the Maryland Foot Score (MFS). Patients had a minimum reported follow-up of one year. Demographics, including body mass index and smoking habits, were similar between the two groups. As expected, MM fragment size was significantly smaller in the single-screw fixation group. However, time to radiological union was 3.7 months (SD 3) for the single-screw group and 3.8 months (SD 2.5) for the dual-screw group.

Further, there was no difference with regard to MFS score, infection, revision, or metalwork removal. This research question is very relevant to everyday trauma, as well as foot and ankle practice. Unfortunately, the study methodology and reporting may not have been adequate enough to definitively answer this question. It is unclear whether the spectrum of injury was similar between the two groups, whether any patients had an isolated MM fracture, and whether the postoperative regime utilized was alike. Despite the limitations of this study, it is reassuring to note that the cohort of patients with single-screw fixation for fracture performed comparably to the dual-screw group. Certainly, there is enough here to call into question the use of elaborate fixation methods with a high complication rate.

Lifetime fatal carcinogenesis risk in the first year following polytrauma: a major trauma centre's experience over ten years

■ The advent of the ‘traumagram’ (a pan-CT scan taken at the time of resuscitation), combined