

ROUNDUP³⁶⁰

Spine

x-ref For other roundups in this issue that cross-reference with *Spine* see: [Oncology roundup 4](#).

rhBMP complicates cervical spine surgery

■ The use of rhBMP to aid fusion in the spine and elsewhere has gained some traction in recent years and despite the increased costs and many questions surrounding the health economics of its use, rhBMP has found a home in spinal fusion and nonunion surgery (particularly of the tibia). As its use has become more widespread, so have concerns over potential complications. In 2008 the U.S. Food and Drug Administration issued a notification regarding its adverse effects when used in cervical spine surgery. Researchers in **Baltimore (USA)** have aimed to take a fresh snapshot of the use of BMP, particularly in cervical spinal fusion surgery and its potential associations with increased complications.¹ The authors designed a nationwide study based on the US Nationwide Inpatient Sample. They used this dataset to analyse use, changing patterns of administration and complications associated with rhBMP use. The researchers used a seven year sample of 1,064,372 patients who had undergone cervical spinal fusion and noted a nearly 8% rhBMP usage rate (n = 84,726). They undertook a multivariate logistic regression analysis to establish what the predictors were for the use of rhBMP and the relationship with complications. As would be expected, the

predictors of rhBMP use included patient age and sex, insurance type, surgical approach, use of autograft bone, and hospital teaching status, size, and region in which the hospital was located, reflecting local policy and regional variations. A relatively comprehensive analysis for predicting complications (including adjustment for all predictors of use and comorbidity scores) identified use of rhBMP as an independent predictor of complication incidence. The odds ratios for observed complications were dysphagia 1.53, dysphonia 1.48, haematoma 1.24 and neurological complications 2.0. All of these complications were most commonly seen with anterior approaches to cervical spine fusion. This paper is another nail in the coffin for the use of rhBMP surrounding the spine and neurological elements. We would certainly advise use with caution.

Posterior longitudinal ligament revisited

■ Ossification of the posterior longitudinal ligament is a commonly seen phenomenon in the cervical spine and although there is much debate about the clinical significance of such lesions, they are associated with age related degenerative change and accurate classification can be helpful to accurately describe the site, size and location of such lesions. Accurate classification is essential in determining the clinical significance of lesions such as these. Although well recognised, it is slightly curious that there is

no agreed CT based classification for these lesions. Authors from **Toyama (Japan)** have proposed a new CT based classification based on review of the plain films and CT scans of 144 patients.² The authors propose a classification system based on lesion type (bridging or non-bridging), lesion location (all vertebral and intervertebral levels affected) and the axial location. They undertook a validation exercise, with seven different observers to establish the intra- and inter-rater reliability. The results are, to us here at 360, slightly confusing. The conclusion of the Investigation Committee on the Ossification of the Spinal Ligaments of the Japanese Ministry of Public Health and Welfare is that based on these results their proposed classification system should be adopted. However, the authors only achieved a 0.43 inter-rater reliability, rising to 0.72 for the existence of ossification of the posterior longitudinal ligament. Whilst potentially descriptive, classifications that do not have high inter-rater reliabilities are of relatively poor clinical utility.

Thoracolumbar posterior instrumentation without fusion in burst fractures x-ref

■ The treatment of unstable thoracolumbar burst fractures is usually considered relatively straightforward, the difficulty often lies in determining stability. There are a number of surgical tactics, with some discussion surrounding the need to decompress the spinal canal

and whether fusion is required. Taking a less is more approach, surgeons from **Daegu (South Korea)** report on a series of 60 patients, all of whom underwent posterior instrumentation without any augmentation for their unstable thoracolumbar burst fractures.³ The surgeons treated 60 patients over a six year period and report on their results with a minimum of 12 months follow-up. Outcomes were assessed using a combination of the Oswestry Disability Index (ODI), Visual Analogue pain Scale (VAS), and the Smiley-Webster Scale (SWS). Unusually for a series like this the surgeons performed elective implant removal, and the effect of this on kyphosis correction was also established with serial radiographs up to a year after removal. The surgical team achieved an acceptable reduction with increase in the kyphotic angle and anterior vertebral height. These increases were maintained after implant removal. Clinical outcome scores suggested the majority of patients achieved pain free (VAS mean 1.77) and good functional (ODI 0.78) results following their lumbar burst fracture. The authors of this interesting series suggest that the maintenance of lumbar spine motion with their approach justifies the exposure to a second operation and the inherent risks associated with that. They have certainly demonstrated this is an acceptable strategy and that late complications are not associated with metalwork removal.

Risk modelling for VTE events in spinal surgery

■ The incidence of post-operative VTE events including pulmonary embolism is not insignificant in spinal surgery, although prophylaxis is often contraindicated due to the risks of spinal haematoma. Researchers in **Dallas (USA)** set out to establish which patient and procedure related profiles are associated with preventable causes of death.⁴ The authors utilised the familiar and well-trodden path of the US National Inpatient Sample (NIS) to investigate the epidemiology of venous thromboembolism in patients undergoing spinal fusion procedures. Like many of these studies involving the NIS, a very large sample of 710,154 patients were identified over a nine year time period. Of these, 0.50% (n = 3525) resulted in 3777 thromboembolic events including 2038 DVTs and 1739 pulmonary emboli. Patients suffering from a thromboembolic event were in general older (57.6 vs 52.8 years), likely to be male and black (0.78% incidence vs 0.47% for white). From a health economic point of view, the development of a VTE was associated with longer hospital stay (14 additional days) and an additional \$140 000 in total health care expenses. The authors constructed a comprehensive 'risk index' based on demographic and procedural factors that can be used in conjunction with national guidelines to tailor thromboembolism prophylaxis based on an individual risk profile. There is a clear benefit to patients and clinicians alike to reduce risk in selected individuals, although the overall event rate itself is still very low, targeted thromboprophylaxis is likely to reduce risks even further.

The consequences of dural tears in microdiscectomy

■ Dural tear and the occasional associated neurological compromise is one of the most concerning complications of spinal surgery. Despite the general recognition of the complication, there is surprisingly little information on the longer

term consequences of dural tears during routine microdiscectomy and lumbar spinal decompression. As with many complications, it is relatively poorly studied and the longer term outcomes are somewhat opaque. Researchers in **Nagano (Japan)** set out establishing the natural history and incidence of incidental dural tears during lumbar decompression.⁵ They established a cohort follow-up study of 555 serial patients, all of whom underwent lumbar decompression with microscope assistance. In their series, dural tears were sustained in almost exactly 5% of patients, with risk factors including age and attempting a bilateral decompression through a unilateral approach. With regards to clinical outcomes, a dural tear slowed post-operative recovery (as measured by the Japanese Orthopaedic Association score) although at final follow-up there was no difference in Oswestry Disability Index between those who had and had not sustained a tear. Management for those patients who did sustain a tear was symptom management and the surgical teams did not perform direct dural repair. Follow-up included routine MRI scanning at six months, which showed a slightly higher rate of recurrence than would be expected and the authors hypothesise this was due to the dural tear preventing adequate subsequent decompression.

Trends in revision spinal surgery

■ It seems to us here at 360 that there is almost nothing researchers feel that they cannot find out using the United States Nationwide Inpatient Sample dataset. We would add a note of caution to these papers (many of which we

have summarised elsewhere in this edition) as they are not registries (which have their own inherent issues), these forms of studies just say what was done, not what happens in the longer term. However, these types of studies do have their place and some strong advantages due to sheer weight of numbers. These researchers from **Los Angeles (USA)** utilised the dataset to identify trends in revision spinal fusion and attempted to compare comorbidities, complications and surgical factors to a comparative cohort of primary spinal fusion patients.⁶ This impressive number crunching exercise compares 410 158 primary patients to



22 128 patients undergoing revision spinal fusion during 2009 along with a comparison across the seven years of the study to determine trends since 2007. Between 2002 and 2009, the increase in incidence of primary fusion outstripped that of revision surgery and as would be expected revision patients stayed in hospital longer (4.2 days vs 3.8 days) and cost more (\$91 909 vs \$87 161), with higher rates of rhBMP use (39.6% vs 27.6%). Patients themselves were more likely to suffer from depression or psychiatric disorders than their primary fusion counterparts. Like many other forms of revision surgery, the complication rate was higher in lumbar spine revision fusion. The authors found higher rates of dural tears (OR 1.41) and surgical site infections (OR 3.40). Whilst the limitations of this study must be taken into consideration with regards to its cross sectional rather than longitudinal nature, there is a lot of useful information here which could not be gleaned using any other study methodology.

Radiofrequency denervation likely effective in facet joint pain

■ Facet joint pain is one of the most tightly fought battles in spinal surgery, with views at polar opposites, even within the profession as to whether facet joint symptoms even exist, never mind how best to treat those symptoms should they in fact originate from an organic pathology at the facet joint. Researchers from **Sao Paulo (Brazil)** did not shy from the controversy and set out to establish with a systematic review what data is out there, and what the current standards of care based on high quality evidence are, particularly with relation to radiofrequency ablation.⁷ The review team identified a reasonable number of trials dealing with the problem, with 15 studies fulfilling the screening criteria and nine providing sufficient detail to be eligible for the study. The research team identified severe problems with the quality of the available evidence, despite the number of published trials. They noted that there was insufficient evidence to perform cost effectiveness or complications analysis, although some poor to moderate quality data supports the use of radiofrequency denervation in these cases. Like so many studies, the authors feel more high quality randomised controlled trials are urgently needed in this area.

Hooks optimally biomechanically transition posterior instrumentation x-ref

■ There is interest in most areas of orthopaedic surgery relying on metal implants in offloading stress in a more gradual manner. The stress risers at the tips of trauma implants and stemmed knee and hip replacements have all been closely linked to peri-prosthetic fractures. The situation in the spine is somewhat different, with periprosthetic fracture almost unheard of, however overly stiff constructs do result in similar problems with offloading onto the motion segments resulting in

adjacent segment disease, particularly in long instrumented segments in the mobile lumbar spine. A biomechanics team in **Cincinnati (USA)** designed an experimental model to test the theory that the use of transverse process hooks at the proximal end of posterior instrumentation would act to provide a gradual transition to the adjacent motion segment when compared with an all pedicle screw construct.⁸ The researchers utilised a porcine spine model which underwent biomechanical testing prior to instrumentation with one of two strategies. In seven cases, superior TP hooks were used and in six an all pedicle screw construct was used. The biomechanical testing set up allowed for testing

of both flexion/extension and lateral bending. A combination of vertebral displacements, range of movement and stiffness at each segment were determined. There was a significant difference in proximal segment control between the two instrumentation strategies, with pedicle hooks allowing 21% of the control movement at the proximal segment where pedicle screws allowed just 9%. The biomechanical properties of the two instrumentation strategies varied markedly with a more gradual transition to normal movement in the pedicle hook constructs compared with the all pedicle screw constructs. Whilst there is obviously no clinical data yet to support this interesting biomechanical observation, we

reckon here at 360 that this would certainly be worth a clinical study.

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