

ROUNDUP³⁶⁰

Spine

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SPECT CT and facet joints

■ With a high prevalence of both asymptomatic arthrosis and idiopathic back pain, the diagnosis of facet joint arthrosis can be tricky. The development of SPECT/CT offers the attractive combination of three dimensional and functional imaging, which may be very useful in distinguishing idiopathic facet disease from that which is causing genuine symptoms. Researchers in **London (UK)** set out to establish if indeed there is any benefit in the use of SPECT/CT in distinguishing patients with genuine facet joint pain. The investigators designed a retrospective study, using a cohort of 72 patients all with chronic back pain who had undergone SPECT/CT imaging of their spines, and in whom a history suggestive of facet joint pain was given. The cohort consisted of 72 patients (37 females, 35 males) with an average age of 54 years. Just over a third of the patients underwent cervical scanning, with the remainder undergoing lumbar spine scans. The SPECT/CT scanning was most sensitive in the cervical spine, where over 50% of patients had identifiably abnormal facet joints on CT and other pathology was identified in a further third. In the lumbar spine group nearly two thirds were diagnosed with active facet joint pathology and just over 15% other pathology.¹ We were certainly impressed with the potential for this

relatively new imaging technology. The combination of both CT and SPECT scanning allows for a 3D scan with an indication of biological activity and hence symptomatology. A more thorough evaluation is required before we can jump to any significant conclusions but this is certainly early evidence that SPECT may be of use in this diagnostic group.

A difficult conversation: scoliosis and complications

■ Scoliosis surgery is almost unique in orthopaedics in that it carries high risks and is undertaken for a range of both serious pathology and cosmetic deformity. Great strides have been made with the use of spinal cord monitoring, CT and MRI planning and image-guided instrumentation. Surgeons in **Aarhus (Denmark)** have tackled the thorny topic of complication rates in scoliosis surgery in the first of a pair of articles dealing with complications in this edition of 360. Seeking to establish what complication rates are with current surgical practices, they performed a thorough meta-analysis and data trawl to drag up the most current research from all corners of the globe. The researchers limited their search to articles concerning complication data for neuromuscular scoliosis correction published within the last 15 years. The researchers set out to calculate a pooled estimate of complication rates (PR) using a random effects model. The study team were able to report on the results of 15 218 scoliosis surgeries reported in 68 cohort and case controlled studies. The

complication rates were quite simply astounding. Nearly a quarter of patients suffered a pulmonary complication (PR = 22.7%) and over one in ten suffered an implant-related complication (PR = 12.5%) and infection (PR = 10.9%). Neurological complications and pseudarthrosis were much less common (PR = 3.0% and PR = 1.9%). Rates of revision were estimated at 7.8% and misplacement of pedicle screws was seen in about 4.8%. The study team noted that there were high levels of study variability and heterogeneous methodology and outcome reporting.² While this variation in study design could explain some of the observed variability, we have to wonder if there is a large level of underlying variation. Some of this will undoubtedly be due to variation in surgical technique and implant type. This meta-analysis would be a good platform for a large multicentre outcome study to establish other causes of variability in outcomes, including patient-, intervention- and surgeon-related factors. Given the level of currently reported complications, patients and their carers should be counselled with this in mind.

Time for a paradigm shift? Complications under the microscope

■ Hot on the heels of a slightly worrying article describing complications in neuromuscular scoliosis surgery, the spinal centre in **Zurich (Switzerland)** argue that in the current health economic climate, too much emphasis has been placed on

surgical outcomes, particularly with regards to patient reported outcome scores. Patient reported scores tend to emphasise different aspects of outcomes, often ones which are more important to patients. While now commonly used in functional scores, more traditional reporting methods tend to be used with regards to complications. With this in mind the research team set out to establish the different effects that complications have on surgeon reported and patient reporting levels. They used a prospective cohort of patients at a single institution undergoing lumbar spine surgery. They recruited 2303 patients (mean age 62) with a roughly 1:1 male to female ratio. Each patient completed a core outcomes measure index, self-reporting of complications (including a bothersome index) and global treatment outcomes and satisfaction questionnaires. The surgeons also reported the outcomes using the Spine TANGO system and surgeon-related follow-up data, and complications were recorded. Outcomes were recorded at six weeks and three months following surgery. Baseline questionnaires were also completed. With regards to the patient reported outcomes, around a quarter of patients recorded complications of some form (n = 615/2303). The majority of complications (as would be expected) scored on the bothersome index, with patients declaring them slightly- (22%), moderately- (26%) and very- (34%) bothersome. Of all the complications recorded,

only 17% were reported as being extremely bothersome. Patients were most likely to report sensory changes (around a third of complications) or pain (27%). The least commonly reported complications were wound related (11%) and motor disturbance (8%). The surgeons reported complications in a lower number of patients, around one in five, but worryingly there was minimal overlap between those patients who felt they had suffered complications and those in whom the surgeons felt complications had occurred.³ In these days of medico-legal minefields, the reporting of complications is extremely difficult. Surgeons tend to underestimate complication rates and when independent observers assess patients, higher rates are nearly always recorded. However, we are yet to be convinced that patient reported complications are necessarily the way forward. Patients regard a complication for the most part as something happening that they had not expected. Asking patients to report their own complications is just as subjective and probably more related to the pre-operative information given than the actual occurrence of a genuine 'operative complication'.

Minor trauma and cervical injury: a predictable phenomenon?

■ In the world of spinal injuries, sadly even minor injuries can result in the full gamut of complications including paralysis, and predicting which patients are likely to have suffered a significant injury can be difficult. Classically, this low-energy type injury is thought to be associated with more elderly patients and spinal stenosis. Researchers from across **Switzerland** and **Australia** joined forces in an attempt to shed some light on this difficult to predict phenomenon. Reasoning that the incidence of neurological injury associated with minimal trauma is historically thought to be associated with pre-existing canal stenosis, the research team concluded that

this may be an explanation for the discrepancy between the severity of the neurological injury and trauma. The established historical measure of 'canal: vertebral body' does not evaluate soft-tissue stenosis (i.e. ligamentum hypertrophy, disc prolapse, etc.) so the researchers utilised MRI in a series of patients suffering from spinal cord injury after minor trauma in a prognostic study. They designed a retrospective radiologically-based study of 183 serial patients undergoing MRI of the cervical spine following minor trauma. Spinal cord injury was suffered in 52 of these and the investigators measured a range of sagittal MRI parameters (vertebral body diameter, mid-vertebral canal diameter, disc-level canal diameter, and spinal cord diameter) and conventional radiological measures (vertebral body diameter and mid-vertebral canal diameter). Using the measured parameters the predictive value of canal: vertebral body, the space available for the cord and the 'canal: cord' were calculated from the MRIs. Using the conventional radiographs canal: vertebral body was determined. These ratios were evaluated using ROC analysis to evaluate the predictive classification accuracy of these parameters for risk, severity, and course, of spinal cord injury. The research team in this study noted that all of the MRI parameters were significantly narrower than their uninjured controls, but there were no differences in any measured ratio between different grades of impairment. The ROC analysis demonstrated that the most accurate predictive value and likelihood ratio for predicting spinal cord injury was a canal diameter of ≤ 8 mm at disc level. In a very similar study⁴ with



almost identical methodology (and in all likelihood featuring a number of the same patients) the use of the Torg-Pavlov ratio was evaluated by the same group of researchers using 45 patients with acute cervical spine injury and 68 patients without. The group again used a similar statistical method to demonstrate that the Torg-Pavlov ratio of 0.7 is the best predictor of cervical spine injury following low-energy trauma.⁵ These

two studies taken together (the cynical amongst us might consider them a single study) demonstrate that there is benefit in measuring the canal diameter either as a ratio or absolute value. Both these

measures have a relatively positive predictive value and should be considered when patients present with signs of cervical stenosis but no acute injury. Patients with canals narrower than 8 mm on MRI or a Torg-Pavlov ratio of < 0.7 are at high risk of cervical spine injury even with minor trauma.

More costly all round: incentivising more complex operations?

■ With broadly similar indications, but little consensus between professionals and within equivalent results in the scientific literature, it is difficult to choose between transforaminal lumbar interbody fusion (TLIF) and anterior-posterior fusion (AP). Researchers in **New York (USA)** set out to see if there may be a financial benefit to either procedure. They conducted a comprehensive health economic analysis encompassing hospital costs, charges and payments received for single-level spinal fusion undertaken at a single institution through either the TLIF or AP approach. Using the usual retrospective approach of notes review

and financial treatment records, the study team were able to include 169 patients treated over a two-year period, 79 with AP fusion and 90 with TLIF. The authors established that the resource and financial costs associated with AP fusion were significantly higher with a longer operative time (246 *versus* 202 minutes) and the cost per case was also higher at \$25 164 for AP fusion and \$23 290 for TLIF. This increased cost was, however, more than offset with significantly higher invoiced charges (1.07) and payments received (1.35-fold) in favour of AP fusion.⁶ While we would agree with the authors of the study that the clinical decision making should always rest with the clinician, one has to ask questions as to how a more costly operation with equivocal outcomes could result in a higher profit margin for the hospital. This sort of economic analysis is most welcome here at 360 in these times of economic hardship. Incentivising more expensive treatments is an unaffordable option in the longer term.

Minimally invasive surgery = minimal scarring

■ Just as clothing fashions are cyclical, so are fashions in surgery. Having been haute couture in the hip surgery world a few years ago, 'minimally invasive surgery' (MIS) is now unpopular with arthroplasty surgeons due to excess complications and few benefits found on a number of randomised controlled trials. Never wanting to be left out, spinal surgeons have jumped on the MIS bandwagon. Surgeons in **Philadelphia (USA)** have set out to evaluate the use of MIS techniques in spinal fusion. The authors noted that although MIS techniques have been well-evaluated in lumbar body fusion, they have never been evaluated in anteroposterior lumbar body fusion which has the advantages of being able to evaluate the effects of an MIS approach on pedicle screw fixation without the confounder of simultaneous cage placement. The research team set out to establish the advantages (or otherwise) of MIS in a

case controlled series using AP fusion as a model. Using a retrospective case controlled study design, a number of outcome measures (operative factors (blood loss, surgical time, fluoroscopy time), length of stay and complications) were reported in a cohort of 162 patients. The authors used case matched comparisons and matched patients by number of operated levels. Data were collated via chart review, and statistical analysis undertaken to establish the significance level of any observed differences. In addition, a secondary analysis was undertaken to determine any effect of concomitant posterior decompression. The groups appeared to be relatively well matched with no significant differences in baseline characteristics. While there appeared to be a higher transfusion rate and blood loss in the open group, with further subgroup analysis this appeared to be due to a selection bias in favour of open surgery for patients requiring synchronous decompression and fusion. The investigators were unable to find any significant differences in length of stay between

groups. Although fluoroscopy time was longer in the MIS group, there were no demonstrable differences in complication rates or infection rates between the two cohorts.⁷ Although the authors were able to discern some significant differences in transfusion requirements, this was only evident on a subgroup analysis and we do wonder if this was due to a significant selection bias with combined fusion and decompression. It seems that given the remarkably similar outcomes the truth of MIS surgery is that the only difference is the size of the incision.

Symptomatic lumbar spine stenosis

■ Spine surgeons are blighted by high levels of asymptomatic pathology and the possibility therefore of false positives with any spinal investigation. Researchers in **Wakayama (Japan)** sought to establish the prevalence of lumbar spinal stenosis (LSS) in the asymptomatic 'background' population. They designed a cross sectional study of 938 patients who underwent MRI scanning of their lumbar spine.

Following an MRI scan, signs of central stenosis, lateral stenosis and foraminal stenosis were established by independent radiologist reports, while the presence and severity of spinal symptoms were reported using the American Spine Society system. High rates of radiological moderate central stenosis were found, with over three quarters of patients exhibiting moderate central stenosis and a third severe stenosis. Central stenosis was the only variety to relate to clinical symptoms in this study, however, there was a high rate of false positives with only 17.5% of patients with severe stenosis reporting clinical symptoms.⁸ This well-reasoned study yet again highlights the difficulties facing the spinal surgeon. With such a low true positive level, even the most sophisticated diagnostic tools cannot be relied upon in isolation to make clinical diagnoses.

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