conclusive; the only difference between the groups was the surgical approach. Both showed significant improvements over baseline, and both had a similar outcome.

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Spine

***X-ref** For other Roundups in this issue that cross-reference with Spine see: Oncology Roundup 1; Children's orthopaedics 4*

Walk off your decompression

Decompression of lumbar stenosis is a common operation, one on which many training spinal surgeons will cut their teeth. The outcomes are rather tricky to assess, and a whole range of objective and subjective measures are in widespread use for clinical and research purposes. These outcome measures are often difficult to administer, somewhat lengthy and can be a significant time burden on patients and clinicians. Salvation may well have arrived in the form of a simple robust test to assess the effectiveness of lumbar decompression. Although several walking tests have previously been described in monitoring spinal stenosis, a group from **Oswestry (UK)** have used the maximum walking distance as a measure of spinal stenosis symptoms and attempted to utilise differences in the function of a patient before and after surgery as a measure of operative success.[1] This study reports the measure in a group of 76 patients, all presenting with an MRI-proven diagnosis of spinal stenosis, who were surgically treated. The study team assessed their maximum walking distance before surgery and again immediately, and at three months, post-operatively. Furthermore, the authors followed up their cohort for at least 6.3 years. The results showed that mean walking distance (which the authors termed 'self-paced walking test' (SPWT)) increased from 78 to 1285 metres, with two thirds of patients exceeding 2000 m following surgery. Over 95% of patients had a statistically significant increase in SPWT. In the longer term, 8% had undergone revision surgery by eight years and 35.5% reported some residual leg symptoms at the end of follow-up. The authors found that having a greater pre-operative intervertebral disc height and being male was associated with a greater increase in SPWT, and that, overall, surgery improves functional walking in the vast majority of patients. The series is probably reasonably generalisable, however, all of the operations were performed by a single surgeon and the authors admit to a high threshold for surgery in lumbar stenosis. The SPWT is perhaps a simple and useful way to assess the functional improvement following decompression. However, it would have been nice to have a more comprehensive statistical analysis and a formal validation of the tool. The SPWT is simple, reliable and hard to get wrong. It might well be useful in assessing the effectiveness of surgery, and we should probably make a point of asking walking distances when following up with patients. It would be nice to see a formal validation of this approach against some of the more traditional outcome measures.

Could denervation succeed where surgery has failed?

We've heard it said that 'every subspecialty has its back pain'. In spinal clinic, the back pain is the 'back pain'. It's no secret that back pain can be a challenge to treat and that patients can return many times before a solution is found, if ever. The combination of chronic pain, somatisation and functional overlay, along with a range of recognised organic pathologies, presents a challenging diagnostic and treatment test. A group in **Vienna (Austria)** may well have come up with a useful new precision approach to the treatment of back pain with the ablation of the basivertebral nerve at the level of the affected vertebra.[2] Although industry-sponsored, this study used radiofrequency ablation to target the basivertebral nerve which enters the vertebrae through the vascular channel on the posterior wall. This small cohort of 17 patients, each presenting with back pain present for more than six months and unresponsive to conservative measures, were identified as participants for the study. Each patient underwent discography and an MRI scan demonstrating Modic I or II changes at the affected level to confirm the source of the pain. Patients underwent ablation and were then reviewed at three, six and 12 months. The authors established that pain and disability levels were all improved by a clinically significant amount at every follow-up point after this procedure. This conclusion must be considered within the context of this being an industry-sponsored investigation with no control group and restrictive inclusion criteria. Taking a sensible approach, the generalisability of this work to everyday practice is limited, however, this is an interesting concept and we look forward to seeing further work in this area.

Straightening out pain following fusion for adolescent idiopathic scoliosis

Surgery for adolescent idiopathic scoliosis (AIS) is one of the more painful procedures that orthopaedic

surgeons undertake and can be difficult for our young patients to tolerate. The extent of the incision, stripping, instrumentation and graft harvesting all contribute to pain, which in turn needs pharmacological control, which of course has subsequent effects on time to rehabilitation and discharge home. The trajectory of the pain following this extensive surgery, despite its impact on the patients and the relatively common nature of scoliosis surgery, is not well described. A group from **Kuala Lumpur (Malaysia)** have sought to understand how the pain changes in the two weeks following surgery in order to better inform patients about their post-operative course, analgesic use and subsequent return home.[3] The authors based their report on the outcomes of 40 patients, all treated surgically for AIS. Patients were excluded from the study if they showed pathological anxiety, psychological illness, underlying metabolic bone disease or revision surgery, all of which would have an impact on reported pain scores. The corrective surgery undertaken of course included a variable amount of hardware implanted in a range of configurations, and also included bone grafting procedures. Drains were used and removed at 48 hours post surgery, and for post-operative control local anaesthesia was applied to the wound and patients all received opiate-based patient-controlled analgesia (PCA). The PCA was removed when morphine use fell to less than 5 mg in 24 hours. The study team established that pain reduced significantly by day four, such that the PCA could be discarded and free mobilisation was possible, and dropped further to negligible levels by day seven post-operatively. Around half of patients were pain free by day 11, and at two weeks this had increased to 63%. Mobilisation and sitting did not influence analgesic use at any stage, suggesting that early mobilisation should be encouraged across the board. Although all patients have pain and experience its effects differently, we can now, in the light of this study, reassure patients that the pain is generally short-lived, that mobilisation won't increase their average pain and that, by two weeks, two thirds of patients have no pain at all. How comforting these facts are to any one patient is hard to say, but patients usually manage better with clear expectation setting and, after all, this may help relieve the anxiety that is known to adversely affect pain perceptions.

Smartphone-based teleradiology in spinal fractures

Smartphones have transformed being on call for the modern clinician; allowing easy access to rapid information, they also offer the ability to rapidly share diagnostic information. Although many PACS systems have a smartphone facility, it is far more common for clinicians to use services such as iMessage and WhatsApp to send images. While accurately describing a fracture on a radiograph is a fundamental part of orthopaedic training, sending radiographs by photo-text messages has made life easier for the registrar and their on-call consultant colleagues. Data protection issues aside, it can be invaluable in rural areas or between hospital systems that do not have a formal IT link. Proper assessment of spinal pathology, however, often requires multi-slice imaging in both sagittal and axial planes in order to guide treatment, and as smartphone-based instant messaging applications enable convenient video messaging, so multi-slice sequences can be recorded and sent as a short clip. The authors of this study from **Haifa (Israel)** have set out to compare video clips of thoracolumbar fractures taken from a PACS-based CT and sent using WhatsApp with images viewed directly from a PACS system four weeks later.[4] The authors sent the WhatsApp images to five consultant spinal surgeons and asked them to diagnose the injury, classify and decide treatment in each case. There was substantial intra-observer agreement, with all the κ values at around 0.70 or better for diagnostic, classification and treatment decisions. This high intra-observer agreement for determining fracture level, AO classification, Denis classification, proposed treatment and neural canal penetration (κ = 0.94, 0.75, 0.69, 0.73 and 0.71, respectively) led these investigators to conclude that instant messaging applications are a "readily accessible, simple and inexpensive method" of transmitting images and can be reliably used between specialists. A picture is worth a thousand words and it would seem a video is worth more.

"Knee-up test" to detect motor deficits following spinal surgery

Early detection of altered neurology after a spine operation is of paramount importance; the window for removal of compromising metalwork, or relief of neurological symptoms caused by acute correction is a narrow one. However, the difficulty we all face is getting enough patient co-operation to establish the neurological picture in the immediate post-operative period as the anaesthetic agents wear off. The authors of this study, from **Fukuoka (Japan)**, describe their novel "Knee-up test" that can be performed after the patient is ready for extubation.[5] The test involves passively flexing the patient's knees into an upright position. If the patient can maintain this position the result is negative, whereas if one or both legs "flop over", i.e. the hip abducts or adducts, the test is positive. To test their hypothesis that this test may well predict inadvertent acute neurological injury, they undertook a prospective study on over 500 patients. All of the patients were undergoing spinal surgery at either cord and cauda levels. Seventeen patients had a positive result and 521 patients had a negative result. Sixteen of the 17 "positive" patients did indeed have a new-onset motor deficit. Of the 521 "negative" patients, two were subsequently found to have a new motor deficit. The sensitivity, specificity, and positive and negative predictive values were 88.9, 99.8, 94.1 and 99.6, respectively. The anatomic explanation is that hip flexors are supplied by L1-L4, hip adductors L2-L4 and the hip abductors by L4 – S2 nerve roots, and so upright knee flexion could be affected by dysfunction of any of the L1 – S2 nerve roots. There are limitations, however, and weakness in the muscles supplied by nerves unrelated to hip function may of course be undetected. The test is also not applicable in patients with severe joint osteoarthritis who are unable to maintain the knee position, or in patients with pre-existing paralysis. For any spinal surgeon that has spent time anxiously waiting for a patient to recover from a deep anaesthetic, this test will provide an accurate inkling of what is to come but will not replace the certainty of a definitive neurological examination. Given that it only takes a moment to perform, we cannot see why not to recommend it.

Dynamic stabilisation the answer for adjacent segment disease?

Adjacent segment disease or degeneration (ASD) is a recognised complication of lumbar spinal fusion. The stiffening of a segment results in dynamic overload of the adjacent segment and more rapid degeneration. Several risk factors

have been identified, but few effective preventative measures proposed. In the current study from **Tokyo (Japan)**, the hypothesis is that the use of a semi-rigid (dynamic) instrumented segment at the superior end of the instrumented segment would reduce adjacent segment disease by reducing the stress concentration and distributing it across two levels.[6] The authors investigated the potential benefit of this approach by undertaking dynamic fixation at the adjacent cranial level during a lumbar fusion. The rationale is that this "soft" stabilisation reduces mechanical stress at the junction of a stiff segment of the spine. They performed a retrospective cohort analysis of 76 patients comparing those who had undergone an L4/5 posterior lumbar interbody fusion (PLIF) with a hybrid procedure consisting of an L4/5 PLIF (n = 23) and L3/4 dynamic stabilisation with sublaminar taping (n = 53) of the L3 vertebra. Adjacent segment degeneration was detected as facet joint degeneration visible on CT and disc degeneration on MRI at an adjacent segment. Various risk factors for ASD including facet tropism, and the pelvic incidence – lumbar lordosis mismatch were also measured to allow some account to be taken for confounders. Outcomes were assessed at a minimum two-year follow-up. Those undergoing the hybrid procedure had a significantly lower incidence of ASD (3.7% vs 30.4%). Interestingly, there were no differences between these groups at the L2/3 or L5/S1 levels, or for the other risk factors. While this is a small retrospective study, these promising results would definitely warrant a larger-scale investigation, perhaps also including interspinous devices that are commonly used adjacent to a fusion.

Steroids helpful in caudal epidurals

A mainstay of spinal treatments is injections, usually of local anaesthetic and steroids. Spinal surgeons will undertake injections for both treatment and diagnostic purposes, and will usually carry out nerve root blocks under image guidance. However, some spinal surgeons and many pain doctors will also undertake epidural injections, of either local anaesthetic or local anaesthetic and steroid. Often used in less specific spinal problems, they have a mixed reputation, and patient experience is definitely variable. In a straightforward randomised controlled trial, investigators in **Bursa (Turkey)** undertook an analysis of local anaesthetic alone *versus* local anaesthetic and steroid in patients with a diagnosis of multilevel lumbar disc pathology.[7] The investigators were able to enrol 98 patients into their study with fluoroscopy-guided injections, and outcomes were assessed using the visual analog scale (VAS) and Oswestry Disability Index (ODI). Outcomes were assessed at regular intervals until final follow-up at 12 months. In what is one of the more conclusive results in randomised intervention studies, the steroid group outperformed the local anaesthetic-alone group at every measurement point up to 12 months. There were no apparent predictors of a successful outcome on secondary analysis. There are some potential methodological flaws that could be said to invalidate this result, however, no trial is perfect and the results here are fairly clear. This trial does not support epidural management *per se*, but what it does do is quantify the effects of the steroid in epidurals, and it is certainly a significant effect in this study.

Surgeon compensation drives treatment decisions in spinal surgery

The delicate relationship between surgeon, patient and feepayer is crucial to the decision-making process, with the balance of power over treatments often differing in different healthcare systems. In those systems in which patients themselves pay, they will often have the final say, however, in insurance-based or national healthcare-based systems the relationship is sometimes more complex. Researchers in **Boston, Massachusetts (USA)** have looked at whether compensation drives treatment decisions in spinal surgery.[8] They reviewed the treatment of 28 344 patients, of whom 21 290 were treated in a fee-for-service system and 7054 were treated in Department of Defense hospitals. The results make startling reading. There were significant differences seen in rates of fusion, discectomy and decompressions between the two systems. The authors established that there were significantly higher odds ratios for receiving interbody fusions (OR = 1.25) in those patients treated in a fee-for-service setting. The preferential use of interbody fusion procedures does appear here to have been driven directly by the feepayer. While there is the possibility that this was diagnosis-related, subgroup analyses of disc prolapse and spinal stenosis found interbody fusion rates to be higher when there was financial gain for the surgeon, whereas in spondylolisthesis there were no differences between the cohorts. It does appear that in this case there are some significant differences in decision making that are influenced purely by surgeon-related financial compensation. We all probably suspected this, but the dramatic differences reported here are much more than we would have imagined.

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