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## Spine

### Do you need to send that text?

■ Smartphones are a necessary accoutrement to modern life. Walk down a typical street or stand waiting for a bus and you are more likely to see people texting, status updating or swiping left and right than chatting or even looking where they are going! The consequences of the typical posture assumed by the smartphone user may be more significant than one might think. A group from **Los Angeles, California (USA)** have investigated the potential deleterious effects and consequently achieved the surgical dream by naming a condition: Text Neck.<sup>1</sup> An increase in the number of young patients presenting with cervical pathology, including disc herniation and painful kyphosis prompted the investigation. They describe heavy smartphone usage associated with a typically flexed posture when sending text messages, and the more that patients flexed, the more symptoms they apparently show. Those assuming a neutral cervical position had minimal symptoms, whereas symptomatic patients typically flexed greater than 45°, where the weight of the head is increased by a factor of up to six. This is supported by other work quoted by the authors, which shows that persistent texting is associated with increasing neck, back and shoulder

pain and a higher incidence of numbness and tingling in the hands. What isn't known is how these symptoms translate into clinically relevant and treatable disc pathology, though studies in the kyphosed lumbar spine would suggest that increased anterior loading of the discs increases the chance of disc pathology. This is of particular concern in the developing spine, especially as smartphone use starts at an early age. How should we overcome this impending avalanche of spinal pain-related status updates? The authors suggest ergonomic solutions, using phones at eye level with two hands, adjusting a work environment to elevate the tablet, performing stretches of anterior cervical tissue and strengthening upper thoracic muscles. Just need the right celeb to pop this advice on their wall.

### Was Waddell a winner?

■ Waddell's signs (WS) are well established in the assessment of spinal pain, and are used by even the most inexperienced as evidence of inorganic back pain. In spinal clinics, the WS are often used to decide whether a patient's symptoms require investigation. However, we don't actually know how these signs correlate to surgically amenable pathology on MRI scanning. In an attempt to rectify this, a group from **Portland, Oregon (USA)** have correlated WS with MRI findings in a cohort of 30 patients with an

Oswestry Disability Index (ODI) score greater than 50 using a retrospective cohort methodology.<sup>2</sup> Each patient was assessed for the presence of WS at their clinical visit. This was followed by a spine MRI to evaluate for surgically treatable pathology. These scans were then reviewed by three spinal surgeons, each blinded to the symptoms, clinical findings and WS of the patient. Each surgeon classified the MRI by the presence, type and severity of pathology. The authors found that every patient without any WS showed at least one pathological lesion within the spine, whereas only 70% of those with at least one WS had identifiable pathology ( $p = 0.02$ ). There was no difference in the severity of pathology between the two groups and, similarly, disc herniations, stenosis and spondylolisthesis were equally severe between the groups. More than one WS does not increase the likelihood of more pathology, however, there is statistical relevance when comparing the presence of one WS with none. The authors admit, however, that there are some significant limitations to the study. The retrospective nature and the request for the MRI scan in the first instance suggests that the treating teams felt the patients were likely to have surgically amenable pathology. Traumatic, oncological and infectious spinal pathologies were specifically excluded and the

dynamic nature of some pathology is not visible using MRI, which could influence the findings of the blinded assessors. Also, the young age group investigated (35 to 55 years) limits the external validity. We all use WS to help filter through the huge numbers of patients presenting to spine services. However, this evidence suggests that they may not be as powerful a discriminator as we were led to believe at medical school, and they should be interpreted with caution. The psychosocial element of back pain is well described and this work lends some evidence to their role in spinal pain. What is needed now is a clinical study, showing whether those with WS show a better or worse recovery than those without, and a better understanding of the psychological management of pain would be a positive step in dealing with these difficult symptoms.

### Dural tears: a sticky situation

■ Inadvertent intra-operative dural tear is usually associated with a sinking feeling on behalf of the surgical team and is a potentially devastating complication. At the very least, it's likely to lead to a re-evaluation of surgical tactic and, at worst, the patient could suffer catastrophic infection, neurological injury or haemorrhage. Identifying the dural tear and performing its subsequent repair is critical to prevent these problems. Traditionally, the dura was



closed using sutures with a reinforcing tissue glue, however, modern techniques using bioabsorbable patches and fibrin glue may yield an easier, more robust and more reliable repair. A group from **Sapporo (Japan)** have looked at the most effective way of using fibrin glue with a polyglactin 910 sheet (PGS) to repair porcine dura.<sup>3</sup> Based on previous work, the authors explain that using these materials is likely to cause little biological reaction and, if used properly, should create a robust repair. Using fibrin glue alone as a control, the group used fibrinogen, thrombin and PGS in different combinations in order to find the most effective method of its application to resist the pressure of cerebral spinal fluid. The effectiveness of the porcine model dural repair was established using burst pressure measurements. A 5 mm dural hole was repaired in group 1 using fibrinogen followed by PGS and thrombin, and in group 2 using thrombin followed by PGS and fibrinogen. For group 3 fibrinogen was used, followed by PGS and fibrin spray, and the final group was repaired using thrombin followed by PGS and fibrin spray. The main result of this study was that the use of fibrinogen glue, followed by PGS, followed by fibrinogen/ thrombin solution yielded the most effective repair of a 5 mm defect, with it resisting  $147 \pm 65$  mmHg of pressure. If we are going to use these tissue glues and PGS to repair these potentially catastrophic complications, we should be using them in the most

effective manner. These authors demonstrate that method, and this can potentially open the door to rapid, effective dural repair.

#### **Pregabalin in sciatica?**

■ Management of acute neuropathic-type pain in the setting of sciatica can be troublesome, and the recent use of gabapentin and pregabalin offers the tantalising option of neuropathic pain control. The difficulty, of course, in this setting is that patients (and sometimes clinicians) will try anything and grasp at any straw. Clinical trialists from **Sydney (Australia)** and **Rotterdam (The Netherlands)** have just reported their randomised double-blinded placebo-controlled trial in the *New England Journal of Medicine*.<sup>4</sup> The trial tested pregabalin at a dose of 150 mg per day (adjusted to a maximum dose of 600 mg per day) or a placebo intervention. The outcomes were assessed as leg pain intensity (10-point VAS scale) at eight weeks. The study team were able to recruit and randomise 209 patients (101 to placebo and 108 to pregabalin). At eight-week follow-up, there was no statistically significant difference between the two groups, although the placebo group was favoured (3.1 *versus* 3.7). At final 52-week follow-up, there was again no difference between the two groups (3.4 pregabalin *versus* 3.0 placebo). Perhaps surprisingly, there were no differences between these two groups, with no advantage seen in the pregabalin group. Based on these results, there are clearly no real advantages to the use of pregabalin in this patient group.

#### **Endoscopic versus transforaminal discectomy**

■ Endoscopic discectomy under conscious sedation has many potential advantages: the patient is more likely to be discharged on the same day and the procedure should be less traumatic as there is less muscle stripping to access the disc. However, microdiscectomy under general anaesthetic (GA) is

already an effective “gold standard” procedure, with known success rates and long-term outcomes. Microdiscectomy can be performed through a small incision and as a day-case procedure. The authors of this long-awaited study in **Edinburgh (United Kingdom)** performed a randomised trial to determine superiority of one procedure over another.<sup>5</sup> Patients were randomised the week before surgery to either transforaminal endoscopic discectomy (TED) or microdiscectomy (Micro), with 70 patients in each group followed up for two years. All outcome measures (back and leg visual analog scale (VAS), Oswestry Disability Index (ODI) and SF-36) improved significantly in both groups following surgery. As expected, the TED group had a shorter hospital stay (0.7 vs 1.4) but, in addition, at two years the TED group had a lower post-operative VAS leg pain score compared with the Micro group (1.9 vs 3.5). There were, however, no significant differences in ODI, back pain or SF-36 between the two groups at final follow-up. In terms of revision surgery, there were five patients in the TED group compared with two in the Micro group, but this difference in itself was not significant. This study was non-blinded for both the surgeons and for the patients; with a different anaesthetic technique being undertaken between the two options, a blinded study is not possible. The authors themselves acknowledge an interest in endoscopic surgery, factors which may of course introduce treatment and reporting bias. There is clearly a learning curve here, and the five revisions were all within the first two-thirds of the study. For the practising spine surgeon, the question is whether the learning curve is worth the quicker patient recovery and greater improvement in sciatica.

#### **Pedicle screw fixation under the spotlight**

■ Two complementary papers caught our eye, here at 360, dealing

with the tricky topic of pedicle screw fixation; the first, evaluating the safety of positioning with CT scanning and the second, asking whether post-operative radiographs offer any diagnostic reliability in assessing pedicle screw fixation. Inserting a pedicle screw into a dysplastic pedicle on the concave side of a scoliotic curve can be an anxious moment for the spine surgeon. Vascular, neurological and pulmonary injuries have all been recorded, and patients should be made aware of this risk. The authors of this study from **Kuala Lumpur (Malaysia)**<sup>6</sup> have set out to establish what the incidence of screw perforation is in scoliosis, be it anterior, medial or lateral, so that patients can be accurately counselled. This study reports the outcomes of 2020 pedicle screws inserted into 140 patients, with outcomes analysed by CT. Lateral perforations in the thoracic spine (suggesting an in-out-in technique) were excluded, giving an overall perforation rate of 8.6% and a “critical” perforation rate (defined as  $> 2$  mm medially or  $> 4$  mm anteriorly) of 2.2%. These figures will give patients and clinicians an idea of the risk of screw misplacement. The reported range from other studies is comparable, with studies based on radiographs underreporting perforation rates and CT-based studies being more sensitive (ranging in the reported literature from 3.7% to 65%). Clinicians may then wonder how useful routine post-operative radiographs are in detecting misplaced screws. A study from **New York, New York (USA)** has set out to establish just this.<sup>7</sup> The study team have investigated the utility of six blinded observers assessing radiographs following posterior instrumented deformity surgery and recording how many misplaced screws could be detected when compared with the gold standard, CT evaluation. This study is based around the post-operative radiographs of 104 patients with 2034 pedicle screws

inserted. The CT scans revealed 1772 of these to have been placed acceptably and the remainder to have perforated one cortex of the pedicle. The radiographs were reported by blinded observers and there was a 52% rate of correctly detecting unacceptable screws (sensitivity) and a 70% rate of correctly identifying acceptable screws (specificity), which suggests poor and moderate diagnostic values, respectively. The authors conclude that the best time to detect misplacement is intra-operatively and with fluoroscopy; the C-arm position can be manipulated to give the best radiographic view. Post-operative films may be limited by the rods obscuring the pedicles, but any change in the screw-vertebra relationship due to screw pullout can be detected. Using a 2D image to assess a complex 3D structure may not yield a high sensitivity, but the simple radiograph serves as a useful baseline with which subsequent follow-up radiographs can be compared. Although the authors establish that the use of plain film radiographs is not terribly helpful in identification of misplaced pedicle screws, there are other reasons to obtain plain films such as metalwork failure.

#### Adult spinal deformity surgery and its impact on health-related quality of life

■ There have been real advances made in recent years in what is known about spinal treatments, based on the large multicentre research collaboratives that have started to report on all aspects of spinal outcomes. The European Spine Study Group have reported their own multicentre study led by

**Barcelona (Spain)** with the aim of establishing whether adult spinal deformity surgery has an impact on health-related quality of life.<sup>8</sup> The study group have produced a prospective multicentre study reporting the changes in health-related quality of life (HRQOL) domains by adult spinal deformity (ASD) surgery. Three self-assessment HRQOL measures, SF-36, Oswestry Disability Index (ODI) and the Scoliosis Research Society outcomes questionnaire (SRS-22), were used in assessing 170 eligible patients pre-operatively, and at one and two years post-operatively. This study reiterates the fact that surgical treatment offers better overall HRQOL outcomes compared with non-operative care of ASD. However, it is not all good news, with two disadvantages in the domains of personal care and lifting on the ODI. As perhaps would be self-evident, a difference was noted in function between patients where the lowest instrumented vertebra was above L5 and those between S1 and the ilium. Patients with the lowest instrumented vertebra above L5 exhibited less restriction in the functional components of the scores than those with the lowest instrumented vertebra from S1 to the ilium, and maintained their improvement. Daily activities were limited, personal care and lifting included, for at least a year after surgery, but this disadvantage diminished after another year of follow-up. Although surgical management of ASD offers better overall quality-of-life scores than conservative treatment, it is important to note that the associated stiffness does have an impact, particularly on

certain aspects of self-care.

#### Neurological complications following adult spinal deformity surgery

■ In this study, a team of surgeons from the International Spine Study Group in **New York, New York (USA)** set out to identify another piece in the puzzle evaluating the evidence for or against adult spinal deformity surgery.<sup>9</sup> The authors sought to quantify the incidence of, risk factors for, and outcomes of, patients who sustain neurological complications after adult spinal deformity (ASD) surgery. The incidence of neurological deficits reported in the literature ranges between 1% and 18%, however, there are no large series on which to make an accurate estimate and identify potential risk factors. The authors of this study report on the post-operative outcomes of 564 patients eligible for the study, of which 99 patients (17.6%) suffered 116 complications. The incidence of surgical neurological complications in this series was 13.7%, and patients with a prior history of spinal surgery were found to be at a higher risk of neurological complications. There were no significant increased risks of neurological complications found to be associated with the curve magnitude or SRS-Schwab type of spinal deformity. The team attempted to identify potential surgical risk factors, and only interbody fusion procedures were found to increase the likelihood of neurological complications. Interestingly, in one of the only series large enough to evaluate the risks of osteotomies, they were found (regardless of type) not to be related

to a higher risk of complications. Radiculopathy was most the most common post-operative issue, with a lower incidence of motor deficits, mental status changes and sensory deficits.

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