ROUNDUP360

Spine

Feel the burn – neural tissue and polymerising bone cement

Fractures of vertebral bodies, for a variety of reasons, are extremely common, whether they are caused by osteoporosis or metastases. One way of treating them is with cement vertebroplasty. This procedure has always frightened *360*, polymerising bone cement being immediately beside the spinal cord, so a paper from **Munich (Germany)** on the heat distribution of the polymerisation temperature of bone cement on the spinal canal during vertebroplasty grabbed our attention. The authors recognise that cases of neurological impairment have been reported in the scientific literature, so they analysed whether potentially harmful heat is radiated and/or conducted to the spinal canal per-operatively during the polymerisation of polymethylmethacrylate bone cement. They performed vertebroplasty on 25 vertebral bodies and measured the temperature distribution during polymerisation of the bone cement within the spinal canal using heat probes placed in the respective areas. The vertebral bodies were located in a circulating water bath at 37°C. During polymerisation of the bone cement, a temperature rise was measured, the peak temperature being reached after a few minutes. However, temperature curves differed; a maximum temperature of up to 43.16°C was detected for a few seconds only. The authors' conclusion is that when vertebroplasty is performed correctly, there is no temperature development that could eventually damage the spinal cord or spinal nerves.[1] We hope they are right, we think at *360*. A temperature rise to 43.16°C seems a lot to us even if it is for only a few seconds. How long does it actually take to destroy neural tissue?

A new prognostic score for spinal metastases from prostatic tumours

Should prostatic cancer metastasise to the spine, this generally means bad news. Yet how bad is it? Researchers from **Umeå (Sweden)** have investigated this by retrospectively analysing prognostic factors for survival in patients with prostate cancer who had undergone surgery for metastatic spinal cord compression. The authors' aim was to obtain a clinical score for prediction of survival after surgery. A proper prognosis is clearly important when deciding about treatment of patients with metastatic spinal cord compression. The criteria for identifying prostate cancer patients who may benefit from surgical treatment are unclear. This study comprised 68 consecutive patients with prostate cancer who had undergone surgery for metastatic spinal cord compression. The indication for surgery was neurological deficit; 53 patients had hormone-refractory prostate cancer, and 15 had previously untreated, hormone-naïve prostate cancer. In 42 patients posterior decompression was performed and 26 patients were operated on using posterior decompression and stabilisation. Using these data, the authors fashioned a new score for the prediction of survival. Their score included: 1) hormone status of prostate cancer; 2) Karnofsky performance status; 3) evidence of visceral metastasis; and 4) pre-operative serum PSA. The total scores ranged from 0 to 6. The authors formulated three prognostic groups: group A (n = 32) with scores 0 to 1; group B (n = 23) with scores 2 to 4, and group C (n = 12) with scores 5 to 6. The median overall survival was three months in group A, 16 months in group B, and in group C more than half (7 of 12) of the patients were still alive at the time of the study.[2] At *360* we liked this system. The authors' score is easy to apply in clinical practice and may be used as additional support when making decisions about treatment.

Recovery after spinal decompression for trauma

After a traumatic spinal cord injury it is sometimes necessary to undertake an urgent surgical decompression. Yet not all patients respond adequately to this and some do not respond at all. So why might this be? Certainly, after decompression, relief of bony impingement on the thecal sac and spinal cord can be confirmed intra-operatively. However, post-operative imaging often reveals that the cord has swollen to fill the subarachnoid space. Little is known about the extent and timing of this morphological response. Researchers from **Vancouver (Canada)** have investigated this using a pig model. They performed quantitative *in vivo* ultrasound imaging of the spinal cord and dural morphology after an acute, experimental spinal cord injury and decompression in a pig. Their aim was to study the morphological changes that might occur in the spinal cord and dura immediately after surgical decompression for acute spinal cord injury. To do this, the authors used Yucatan miniature pigs. The animals received sham surgery (n = 1), or a moderate (n = 6) or high (n = 6) severity weight-drop spinal cord injury followed by eight hours of sustained compression and six hours of post-decompression monitoring. Sagittal-plane ultrasound images were used to quantify the dimensions of the spinal cord, dural and subarachnoid spaces pre-injury, and every hour after decompression. The results were convincing in *360*'s view. Animals with a moderate spinal cord injury exhibited a residual cord deformation of up to 0.64 mm within ten minutes of decompression. This tended to resolve over six hours as a result of tissue relaxation and swelling. For animals with high severity spinal cord injuries, cord swelling was immediate and resulted in occlusion of the subarachnoid space within ten minutes to five hours; this affected only half of the moderate injury group. So it appears that decompression of an acute spinal cord injury may result in residual

cord deformation followed by gradual swelling, or immediate swelling leading to subarachnoid occlusion. The response clearly depends on the severity of the initial injury.[3] All is now clear, we think at *360*. These observations appear to explain the poor response to decompression in some patients and suggest a need to reduce cord swelling in order to achieve the very best outcome after what can be a catastrophic injury.

Spinal tuberculosis – a description of 284 patients

■ Spinal tuberculosis (TB) may be almost unheard of in some parts of the world but for many of our colleagues it is almost a way of life. An interesting paper has appeared from **Chongqing (China)** that has used a retrospective chart review to investigate the characteristics of patients managed for spinal tuberculosis. The annual incidence of spinal tuberculosis was stable throughout the study period, which ran from 2004 to 2010. There were 284 patients, 147 women and 137 men, with a mean age of 38.2 years. The majority of the lesions involved the thoracic spine (45.3%), followed by the lumbar spine (45.0%). Multiple level skip lesions were seen in 5.6% of cases. The ESR was normal in 26.8% of patients and the CRP was normal in 30.2% of patients. Type A and type O were the most common blood types. Neurological involvement was seen in 21.8% of patients. Concomitant tuberculosis of the lung was seen in 73 (25.7%). The patients with middle school education and above accounted for 60.4% (102/169) in rural patients and 68.7% (79/115) in urban patients. Somewhat worrying, in *360*'s view, was that the mean time from symptom onset to diagnosis was 18 months. In one case diagnosis took 30 years. There was a significant difference between rural (23 months) and urban patients (10.7 months). Surgical treatment was performed in 233 patients (82.0%). The preferred surgical procedure was radical anterior debridement, bone grafting and internal fixation (132 patients, 46.5%).[4] Happily, there were no deaths related to spinal TB in this investigation. We felt this was an excellent paper at *360*. It gives valuable data from an experienced unit and of a large number of patients. Well worth a read.

Unintended durotomy at spinal surgery

■ How steady are our hands during spinal surgery? Unintended durotomy is certainly a common occurrence, with a reported incidence ranging between 3% and 16%. So write authors from **Seattle (USA)**. Risk factors identified in earlier studies include age, type of procedure, revision surgery, ossification of the posterior longitudinal ligament, gender, osteoporosis, and arthritis. However, these studies were largely univariate analyses using retrospectively recorded data. The authors thus undertook a multivariate analysis of prospectively collected registry data focusing on 1745 patients who underwent spinal surgery over a two-year period. Using these data, univariate and multivariate statistical analyses were performed to identify and quantify risk factors for unintended durotomy during spinal surgery. The analysis demonstrated that age, lumbar surgery, revision surgery, and the magnitude of surgery were significant risk factors for an unintended durotomy. Of these, revision surgery was the strongest risk factor for a dural tear. Meanwhile, diabetes was a significant risk factor in the univariate analysis but not in the multivariate analysis.[5] This is helpful information for both surgeons and patients when considering surgical treatment. An unintended durotomy is not sought but cannot always be avoided and it is good to know the odds before you start.

The unintended durotomy – a Swedish view

■ Clearly an unintended durotomy is a global issue, as a group in **Lund (Sweden)** has also reported the problem. This time, however, they focused on dural lesions during decompression for lumbar stenosis. Decompression for lumbar spinal stenosis is one of the most frequent operations on the spine today and its most common complication seems to be a per-operative dural lesion, or so write the authors. There are few prospective studies on this complication regarding its incidence and effects on long-term outcome. This was the background for their study. The Swedish Spine Register (Swespine) documents the majority (> 80%) of lumbar spine operations in Sweden today. The register was used to identify 3699 operations for spinal stenosis over a five-year period specifically in respect of complications and the one-year post-operative outcome. The mean patient age was 66 years and 44% were males. Smokers formed 14% of the patient population and 19% had undergone previous lumbar spine surgery. The authors found an overall incidence of a per-operative dural lesion of 7.4%. More specifically, these lesions occurred in 8.5% of patients undergoing decompressive surgery in isolation and 5.5% of those undergoing decompressive surgery and fusion. A logistic regression analysis demonstrated that advanced age, previous surgery and smoking were significant predictive factors for dural lesions. An odds ratio estimate demonstrated an age-related risk increase of 2.7% per year. The risk also increased with the number of levels decompressed. However, and we were pleased to read this at *360*, the one-year outcome was identical in patients with and without a dural lesion.[6] This does not mean we should be more cavalier about surgery but it is good to know that these dural lesions have not resulted in any long-term harm.

Carry a load on your head? Watch that cervical spine if you do.

■ When *360* travels the world, particularly to developing countries, we so often see local people transporting loads on their heads. It looks so scenic, so photogenic, but according to research from **Dhaka (Bangladesh)** it can also be extremely dangerous. The authors undertook an observational study on 84 patients who had sustained a cervical spinal cord injury because of a fall while carrying a heavy load on their head. Relevant personal information, neurological status, the nature of any bony injury and radiological findings were noted on a questionnaire. In addition, each subject was interviewed to establish the cause of the accidental fall while carrying the load. The age range for the patients was between 10 and 50 years. All were male, of whom 79 (94%) were farmers and/or low-paid daily labourers. The majority were carrying a weight of between 60 kg and 80 kg on their head when the fall occurred. A total of 48 (57%) subjects had a complete neurological lesion, the most common vertebral levels being C5 and C6. The mechanism of injury was hyperflexion of the cervical spine in 61% and hyperextension in 36%.[7] At *360*, we will never look at a developing world rural scene in the same way again. And an 80 kg weight on your head? That is incredible.

Age changes you – and your lumbar spine

■ The ageing process does all manner of strange things. Life is, essentially, the management of decay. However, bony morphology can also change, a factor that is important to appreciate when looking at radiographs and scans. One area of change is in the morphology of the spinous

process, an event looked at in detail by authors from **Auckland (New Zealand)**. They undertook a blinded radiological analysis of the lumbar spinous processes on CT scans. This was to assess the effect of ageing on morphology and the influence of spinous process morphology on sagittal alignment of the lumbar spine. The authors noted that there is little in the literature to describe the influence of ageing on spinous process size. There are some papers describing the increase in size of other body parts with age, such as the femur, ears, vertebral body, and nose. Meanwhile several old cadaver and radiological studies have reported the formation of osseous spurs within the supraspinous and interspinous ligaments. The researchers thus examined 200 abdominal CT scans that had been taken for trauma and vascular investigation. The scans were reformatted to allow precise bony measurement of the lumbar spine. Two observers were blinded from the age and demographics of the patients. Sagittal and coronal plane projections were used to measure the height and width of the spinous processes (L1 to L5), respectively. The relationship between the size of the spinous process, age, and supine lordosis was also investigated. The authors found that the height of the lumbar spinous process increases by 0.03 mm/year to 0.07 mm/year and its width by 0.05 mm/year to 0.06 mm/year. Lumbar lordosis decreases as the height of the lumbar spinous process increases and is not related to increasing spinous process width. Meanwhile, the supine lordosis increases by 0.1°/year.[8] We liked this study at *360*. It clearly demonstrates that the dimensions of the lumbar spinous process change with age. Increases in height and even more impressive increases in width occur as the years pass. There is also an inverse relationship between lumbar lordosis and lumbar spinous process height. Do keep that in mind next time you are inspecting a lumbar spinal radiograph or scan.

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