included the results of 24 patients, all with a massive rotator cuff tear, who were treated with an ADM to establish a bridging repair. As far as the rabbit experiments went, the normal rotator cuff (287 N) and ADM with stem cells (217 N) showed similar loads to failure, while the ADM on its own achieved a tensile strength of just 170 N. Histologically, there were signs of normal cuff tendon forming in both the ADM group and ADM plus stem cell group. As for the clinical study, there were statistically significant improvements in the American Shoulder and Elbow Surgeons (ASES) scores (50 pre-operative *vs* 83 post-operative), which were matched by similar improvements in the University of California Los Angeles (UCLA) shoulder rating scale (17 to 30) and the Simple Shoulder Test (4 to 8). Although the clinical group clearly did not undergo any further surgery, routine follow-up included post-operative MRI scanning. There were no progressions apparent in fatty degeneration or muscle atrophy on the post-operative scans. However, there was a significant re-tear rate (similar to primary cuff repair) on MRI imaging of 21% (n = 5/24). It is heartening to see some high-quality basic science work being undertaken prior to human implantation studies in a rigorous and scientifically valid way. There does look to be some scope for the ADM either with or without stem cell augmentation. We look forward to further development and reports of the technique.

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Spine

X-ref *For other Roundups in this issue that cross-reference with Spine see: Oncology Roundup 5; Research Roundup 4.*

Is surgery needed in lumbar degenerative kyphosis?

Lumbar degenerative kyphosis (LDK) is affecting older adults with increasing frequency. Although it has always been a diagnosis that we've encountered in clinical practice, as the activities and expectations of older adults have risen exponentially over the past two decades we are now at a stage where treatment for symptomatic sagittal imbalance is increasingly sought. As with all spinal surgery, the key is establishing when to take the decision to operate. The evidence for surgical correction of LDK is poor, and so it is currently unknown whether surgery offers a better outcome than conservative management. Surgery generally requires a corrective osteotomy and, in some cases, still results in persisting symptoms. The decision to proceed to operation for these patients is difficult at the best of times. However, Goh et al,[1] who have conducted a cohort study of over 100 patients, have been able to show the relative successes of these two treatments. The authors from **South Korea** report a two-year prospective

cohort study between January 2008 and December 2012, with 97 patients presenting to a unit in Busan, South Korea. Patients were allocated to either surgical or non-surgical treatment based on patient preference, after having both treatments impartially and objectively explained to them. Patients were excluded from the study if they showed compression fracture, tumour, hip pathology, spondylolisthesis or spondylosis, abnormal muscle activity, or ambulation. Patients were also discounted from the reporting and analysis if they had less than two years of follow-up. Patients were treated either with physiotherapy and analgesia, or with a posterior subtraction osteotomy (PSO) with or without a posterolateral fusion if spinal stenosis was present, using pedicle screw fixation and subsequent thoracolumbar spinal orthosis for three months. Outcomes were assessed with a Visual Analogue Scale (VAS) score for pain, the Oswestry Disability Index (ODI) score, a SF-36 score, and radiological measurement of sagittal balance. A total of 47 patients were treated with surgery, while 50 were conservatively managed. At 12 and 24 months, those who underwent surgery showed a lower ODI score and significantly less back pain. After six months, surgical patients also showed an improved SF-36 score. Similarly, the C7-sagittal vertical axis was improved when compared with conservatively treated patients after six months. There were 15 complications in surgical patients, and six in conservatively managed patients. Both treatments improved symptoms throughout the follow-up of the study; however, this improvement was found to be significantly greater in those surgically treated. Only surgery improved sagittal balance. These results should be tempered with the evident weaknesses of this study. Patient allocation leaves a fair amount to be desired, as a well-established principle shows that patients undergoing surgery are more likely to be well and active. Similarly, different pathologies that give rise to longstanding post-treatment back pain, which can cloud results, are not considered. The age-old argument of too few patients being included in the study rears its head and the role of population characteristics limits its generalisability. This is, in short, a useful study that starts to steer treatment of LDK towards surgery, but the question remains unanswered. I think more work is needed here.

Aspirin continuation in spinal surgery: a systematic review and meta-analysis X-ref

The topic of continuation of antiplatelet agents and thromboprophylaxis remains an important subject, and is particularly acute in spinal surgery, where spinal canal bleeding and haematoma can have catastrophic consequences. This has turned into an ongoing battle against the use of anticoagulants on the wards, in the clinics, and in the pre-operative assessments. In many units, there is a blanket policy prohibiting the use of anticoagulants because of the risks associated with bleeding in spinal surgery. However, as with anticoagulation across orthopaedic surgery, the evidence of stopping or continuing oral anticoagulation remains inconclusive. The latest episode in this saga comes from **The Hague (The Netherlands)**, where Goes et al[2] have conducted a systematic review looking at blood loss, complications, and cardiovascular events in spinal surgery when aspirin is either continued or stopped prior to spinal surgery. The results may surprise some readers. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, the authors undertook a comprehensive literature search, looking for studies that explore the effect of low-dose aspirin in spinal surgery. After exhaustive searching and screening, they found three case series and no randomised controlled trials. The studies uncovered contained between 102 and 200 cases, aspirin doses of between 81 mg and 325 mg, and only 27 cases of cervical spine surgery. One study restricted recruitment to patients who had undergone cardiac stenting. Overall, only one study showed significantly increased blood loss in patients who remained on aspirin (553 mls *vs* 538 mls). Similarly, operative time, post-operative transfusion, and post-operative complications were not significantly different, whether aspirin was continued in the peri-operative period or not. The study explains that, regardless of these findings, the trend is that aspirin is an unnecessary risk for post-operative bleeding. In a survey performed in The Netherlands, 50% of surgeons felt that they had encountered a complication due to its continued use. Nonetheless, this position is not yet supported by the evidence. In the end, the authors unsurprisingly suggest that their decision to operate with aspirin on board lies with the operating surgeon and that (in the time-honoured tradition) more evidence is needed.

The efficacy of local autologous bone dust: a systematic review

A second tempting systematic review crossing the editorial desks at *360* this month comes from **Auckland (New Zealand)**, where the authors have been exploring the use of bone dust taken from high-speed burrs as a source of viable bone grafting in spinal fusion.[3] Bone grafting has a long-established role in spinal surgery when trying to achieve solid fusion, but its harvesting is fraught with painful, prolonged surgery and increased peri-operative bleeding. Despite a range of biologics (such as bone morphogenetic protein) and local bone graft being used, nonunion in cervical and lumbar spine fusions can reach 50%. Again, using a strategy compatible with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), and assessing the evidence using the Oxford Centre for Evidence-Based Medicine (CEBM) levels of evidence criteria, the authors conducted a systematic review. They searched for any preclinical and clinical studies that provide evidence of bone dust, collected during high-speed burring of the spine, being used as bone graft to stimulate fusion. A total of 14 studies were identified for inclusion in this review. Preclinical *in vitro* studies showed that burr 'swarf' is composed of 65% bone (the remainder being blood and fibrous tissue), which also contains osteoblasts that are able to proliferate when placed in an osteoconductive environment. These cells were, however, slower to grow and less likely to be successfully cultured than those found in bone chips. Interestingly, the authors note that these differences in proliferation seemed to be due to the nature of the tissue harvested, rather than due to the mechanical effects of the burr. Preclinical *in vivo* studies show that bone dust can form organised bone, but it forms incomplete bony structures when applied to defects in animal models. Three clinical studies were found in the search, two of which showed that bone dust led to ossification when applied to a surgical bed, and one of which showed a complete absence of osteogenic activity. Only one of these studies controlled for thermal injury using hand tools, which the authors suggest may be a sensible precaution in harvesting graft. Similarly, the paucity of relevant studies means that it is impossible to predict the impact of bone dust in the clinical setting. The conclusion of the review explains that the weight of evidence suggests that bone dust will most likely find its niche as a component of a graft strategy, rather than superseding traditional graft chips.

Late bedtime video games are bad for your back X-ref

'Early to bed, early to rise', as the proverb goes, highlights the impact of lifestyle on health. This study from **Sendai (Japan)** has investigated

the incidence of lower back pain and its association with lifestyle factors in school-aged athletes.[4] The authors undertook a cross-sectional study in 6441 school-aged athletes (aged six to 15). Using a self-reported questionnaire, they collated various lifestyle factors, such as wake-up time, bedtime, and time asleep, as well as time spent watching television or playing video games. Once the risk factors and outcome (of self-reported back pain) were known, multivariate logistic regression models were used for analyses. The variables considered in the models were gender, age, body mass index, the level of the athlete's sporting team, number of days in practice per week, number of hours in practice per day, and lifestyle choices. The first interesting observation is that the point prevalence of low back pain was higher than one may expect, at 5% at the time of the survey (n = 320). The authors established that there was an association between late bedtime, short sleeping time, and long video-game playing, while wake-up time or television viewing had no association with reported back pain. As with all of these studies, all that has been shown is association, not causation. However, in this instance, this is interesting in itself. There is a link between unhealthy lifestyle choices and back pain, but, given the population of young athletes, it seems less likely that this is to do with a sedentary population. Late bedtime (after 10.30pm), short sleeping time, and video game playing were significantly associated with low back pain, suggesting that there is some truth to the adage of being 'healthy, wealthy, and wise'.

Platelet-rich plasma enhances bone union in posterolateral lumbar fusion

Achieving a solid fusion depends on many factors, including surgical technique and choice of bone graft. In addition, biological agents with osteoinductive properties have the potential to stimulate and boost bone formation. Platelet-rich plasma (PRP) contains several osteoinductive growth factors, such as platelet-derived growth factor and transforming growth factor beta, and has been shown to promote bone formation in animal models. A group from **Chiba (Japan)** has now performed a prospective randomised controlled clinical trial comparing posterolateral fusion with local bone autograft, with and without PRP.[5] Patients enrolled in the study were randomised to either simple fusion alone or fusion with PRP. The plasma was prepared by drawing 400 ml of blood from the patient immediately before surgery and this solution underwent several stages of centrifugation to prepare the PRP, which was applied as a gel and added to the autogenous local bone graft while the red blood cells were returned to the patients during surgery. Bone union was assessed by a benchmark final CT and regular radiographs, which were interpreted by three surgeons blinded to the treatments. The authors were able to successfully recruit 62 patients (31 in each arm) into the study, and outcome assessment, including bone fusion rate, the area of bone fusion mass, the duration of bone fusion, and the clinical score using the Visual Analogue Scale (VAS), were reported as the endpoints of this study. The findings suggested enhanced bone fusion with PRP. The bone union rate (defined as the presence of bone bridging the adjacent transverse processes) was significantly greater in the PRP group (94%) than in the control group (74%), as was the fusion mass area (572 mm^2 *vs* 367 mm^2), and the time required for union was shorter (7.8 months *vs* 9.8 months). In terms of clinical outcomes, there was no significant difference in lower back pain, leg pain, or numbness in either group at any timepoint. The mean growth factor concentrations were 50 times greater than those measured in the blood. For the spine surgeon looking to improve fusion rates, this technique represents a lower-cost alternative to directly applying growth factors or bone morphogenetic proteins. Further studies are required to determine its safety (is heterotopic bone formation induced?), but this study does suggest that PRP is a useful adjunct to stimulate bone fusion.

Twenty years of scoliosis surgery: are things improving?

Surgery for adolescent idiopathic scoliosis (AIS) has changed significantly as instrumentation, intra-operative care, classification, indications for surgery, and the understanding of deformity have evolved over the past decades. The authors of this study from **New York, New York (USA)** have analysed their multicentre AIS registry database, which was established in 1995, to assess the changes that have occurred in aetiology over the more than 20 years of this study, and specifically to see whether there is a corresponding improvement in patient outcomes.[6] The authors assessed a range of parameters, which included pre-operative sagittal and coronal radiological parameters, surgical approach, operative time, need for thoracoplasty, estimated blood loss, levels fused, anchor type, lowest instrumented vertebra (LIV), and length of stay. They also reported the Scoliosis Research Society-22r (SRS-22r) questionnaire as a quality-of-life measure. The study essentially describes a change such that patients are currently presenting with greater pre-operative Cobb angles, but, overall, a better correction was achieved. There have also been a number of changes in 'surgical pattern', with an increased number of levels fused, and the LIV became more distal in certain curve types (Lenke 1 and 2) over time. From a technical perspective, things have become markedly better over the past 20 years; operative times have fallen, there has been a decrease in blood loss, and, overall, post-operative days in hospital have also reduced. In terms of approaches, anterior spinal fusion (ASF) rates for Lenke 1 (main thoracic) curves in this series have fallen from 81% to 0%, whereas posterior spinal fusion (PSF) has increased consistently over the years with improvements in surgery and instrumentation to 99.6% for this curve type, essentially reflecting the increased power and effectiveness of posterior instrumentation for effecting and maintaining a curve. The incidence of thoracoplasty has fallen from 76% to 20.3%, as pedicle screw constructs now allow better vertebral body derotation that decreases the size of the rib hump. While other orthopaedic interventions, such as joint replacement surgery, have remained relatively unchanged for the past 30 years, spinal deformity surgery has rapidly evolved. This study provides a useful insight into this evolution, particularly for the more junior surgeon. The question is whether this pace of improvement can be maintained and whether current 'novel' innovations such as growing rods and tethering will stand the test of time.

Delayed dural leak following posterior spinal fusion for idiopathic scoliosis using all posterior pedicle screw technique

To further the knowledge on pedicle screw malposition and its consequences, this group of authors from **Turku (Finland)** provide some much-needed insight into delayed dural leak after posterior spinal fusion.[7] The literature suggests that about 16% of pedicle screws are malpositioned, and, among these, those screws breaking the medial pedicle wall can produce a leak of cerebrospinal fluid through a tear in the dural sac. This is not always noted

at operation, and hence a delayed dural leak can be seen. In this study of 322 patients, the authors identified just three in whom a delayed dural leak had developed (a rate of 0.9%), and the diagnosis was reached a mean five months after the initial surgery. The typical symptom of this condition is delayed positional headaches in patients who underwent posterior spinal fusion. If the headaches persist, this should prompt a diagnostic workup consisting of a CT myelogram that can show the leak very precisely, along with a brain/cervical spine MRI that can show a Chiari I malformation. It seems likely to us here at *360* that, given the imprecise nature of the presenting symptoms, many of these complications probably go unrecognised. The authors agree that treatment consists, for the most part, of simply removing the malpositioned screw and closing the dural defect, usually providing full resolution of symptoms.

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Trauma

X-ref ***For other Roundups in this issue that cross-reference with Trauma see: Hip Roundup 2; Shoulder & Elbow Roundups 1, 2, 4, 5, 6 & 7; Research Roundup 3.***

Early outcomes of paediatric elbow dislocation: risk factors associated with morbidity

X-ref

■ Elbow dislocation is a rare and sometimes devastating injury in children. However, little is known about the risk factors for poor outcomes. These authors from **Boston, Massachusetts (USA)** describe their experience of the largest cohort we are aware of here at *360*, and report their review of 145 paediatric patients, all presenting with ulnohumeral elbow dislocations.[1] As with all large series of unusual and rare conditions, this is a retrospective series that is somewhat limited by the information contained in the medical notes, operative records, and imaging taken at the time. The mean age of the cohort was 11 and ranged from five years to 18 years. As perhaps would be expected, there was a high incidence of associated elbow fracture (at 80%), the most common of which was of the medial epicondyle (n = 60%). Around 60% of patients were treated operatively. Outcomes, as is almost ubiquitous in the paediatric population, were generally excellent, with a mean range of movement of -5° to > 126° at 14 weeks' follow-up. There were some children who lost terminal extension in this series and this was associated with multiple fractures, immobilisation and operative intervention. There was a generally moderate rate of complications, with 16% of patients requiring intervention for a complication, and this was associated with a poorer functional outcome. Although most patients suffering an elbow dislocation appear to have an acceptable result, this paper underlines the fact that it is a far from benign injury. Patients in whom complications are suffered, or those with multiple fractures or prolonged immobilisation, appear to have markedly compromised outcomes here.

InFix: what rod-to-bone distance is anatomically optimal?

■ These authors studied the now-fashionable InFix (Zimmer Biomet, Warsaw, Indiana) construct for pelvic stabilisation. Initially constructed from spinal pedicle screws and a contoured rod, the InFix has become a standard technique in treating patients with lateral compression fractures. The construct relies on two screws running across the pelvis from the anterior inferior iliac spine, secured with a long spinal rod to the other side. The construct is biomechanically disadvantaged by the lever arm of the pelvis, which is acting some distance from the rod and polyaxial screw head. This paper from **Zürich (Switzerland)** and **Graz (Austria)** sets out to identify the biomechanical ramifications of the rod-to-bone distance, and to determine whether there are any considerations for the vascular or neurological structures for any given position.[2] The study was a fairly simple one, in that the surgical team utilised ten soft-fixed cadavers and undertook InFix positioning using the standardised approach and equipment available in most Level 1 trauma centres. The authors constructed their InFix with three different rod:bone distances in order to establish what, if any, were the anatomical considerations of InFix positioning. The positioning of the InFix 1 cm from the bone resulted in widespread compression of anatomical structures within the groin, with the exception of the neurovascular bundle. Increasing the rod:bone distance to 2 cm had the desired effect of relieving the pressure on underlying anatomic structures. However, increasing the distance further to 3 cm had some undesirable effects. With a 3 cm rod:bone distance, deep hip flexion then introduces compression into a number of structures including the lateral femoral cutaneous nerve to the thigh. The more superficial the rod, the more likely the damage to the superficial nerves. At 3 cm rod:bone distance, the lateral femoral cutaneous nerve was injured 80% of the time and the anterior cutaneous branches of the femoral nerve was injured 35% of the time, both suddenly becoming structures at risk.

Hip fracture surgery within 24 hours reduces complications

X-ref

■ Despite our greatest efforts to prove that hip fractures do better with early surgery (and on the face of it this seems self-evident), the evidence doesn't support the most ardent of many trauma surgeons' beliefs. A number of registry and cohort studies have attempted to demonstrate that earlier surgery leads to lower death rates; nevertheless, in all major studies so far this has not been demonstrated to be the case. The most likely explanation for this is the confounder of delaying sicker patients for anaesthetic optimisation. The HipAttack study is still recruiting and will tell us one way or another what the benefits are of