the adult literature, let alone in the paediatric and adolescent literature. Given the usually higher tolerances in terms of union rates and the capacity for remodelling, paediatric orthopaedic surgeons have traditionally been much more cautious in their approach with fractures – and the clavicle is no exception to this. This retrospective small-sample comparative study from **Rochester, Minnesota (USA)** investigated functional outcomes in patients aged between ten and 16 years with mid-shaft clavicle fractures and ⩾ 15 mm shortening. The authors were able to achieve a minimum of nine months of follow-up.[7] Of 41 fractures, 20 met the inclusion criteria and were treated operatively with plate fixation. A total of 16 patients, equally divided between operative and non-operative plate fixation, were included in the eventual study and completed a Quick Disabilities of the Arm, Shoulder and Hand Score (QuickDASH) and Constant Shoulder Score, in addition to questions about satisfaction with treatment. Quantitative isometric strength, range of movement and abduction fatigue testing were performed on the involved and uninvolved arm. There was no difference in demographics, and QuickDASH and Constant Shoulder Scores were perfect in all but one patient in the operative group. This was due to persistent symptomatic metalware and required removal. In total, one quarter of patients required the removal of metalware. There was, however, no difference in range of movement, isometric strength or abduction fatigue between groups. Although the study has many weaknesses, it demonstrates that shortened mid-shaft clavicle fractures in adolescent patients have excellent outcomes after non-operative treatment. There does not appear to be any functional advantage associated with surgical stabilisation, and plate removal was necessary in 25%. It appears that, for the time being, the cautious approach adopted by the majority of paediatric orthopaedic surgeons is appropriate.

The eight-plate: generally successful

■ This interesting paper looks at the effectiveness of deformity correction using guided growth with eight-plates. These tension band constructs place a screw above and below the epiphysis and are able to address angular deformities specifically as the remainder of the epiphysis continues to grow. The real advantage of the eight-plate is in the relatively minor nature of the surgical intervention. The authors of this multinational multicentre study co-ordinated by the **AO Foundation in Davos (Switzerland)** set out to establish what the results of eight-plate surgery could be expected to be using a cohort of 126 patients. This large case series demonstrates the eight-plate to be a safe technique which can correct deformity effectively in 66% of patients and leg length difference in 59% (although previous studies have shown that drill or percutaneous epiphysiodesis is more reliable in the correction of leg length inequality). Maintenance of correction in the longer term is high at 85%, and of the adverse events, which are relatively common (occurring in 18% of patients), the majority were minor screw issues. This series confirms the eight-plate as an effective and, most importantly, safe technique that we should continue to use.

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Research

X-ref ***For other Roundups in this issue that cross-reference with Research see: Hip Roundup 8; Knee Roundups 8 & 9; Trauma Roundups 3 & 4.***

Bone-preserving stem designs

X-ref

■ In the modern age of total hip arthroplasty (THA), there has been considerable interest in developing an implant that is bone-preserving, and is associated with small resections and physiological loading to maintain bone stock. Hip resurfacing is one such implant with mixed results, and is not without controversy, particularly with the recent Medicines and Healthcare products Regulatory Agency (MHRA) guidelines in mind. Another development is that of the short femoral stem. In this design, load transfer is more physiological compared with more traditionally designed stems, potentially reducing stress shielding around the proximal part of the stem. The authors of this paper from **Seoul (South Korea)** highlight the problems of assessing short femoral stems as their size and shape is so variable, making direct comparisons very difficult.[1] However, they wished to highlight a feature they had identified in a femoral stem which they had been using that was a shortened tapered version of a conventional stem, the TRI-LOCK (Depuy International Ltd, Leeds, UK). This study came about as the authors had noticed lateral cortical atrophy in Gruen zone I and blunting of the cut surface in zone VII. This was a retrospective study of 72 consecutive patients with a mean age of 48.2 years who underwent 80 THAs. Follow-up was 37.3 months with a detailed radiological analysis. The authors demonstrated that a total of 61 cases (76.3%) had either an intra-cortical osteolytic lesion (IOL) or thinning of the lateral cortex of greater than 10%. In 37 cases (46.3%), the lateral cortical thickness was less than 20%. With univariate analysis, the authors identified that cortical thickness appeared to correlate with a low body mass index (BMI). With a cortical thinning of more than 20%, there appeared to be a correlation with low BMI, gender and operation time. While the clinical significance of this is perhaps uncertain, there was one case of a periprosthetic fracture in a patient with lateral cortical reduction of 33.2%. This study will be of interest to hip surgeons as there has been increasing popularity in these

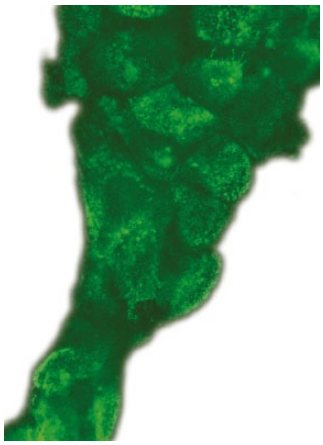
'bone-conserving' femoral stems. As with hip resurfacing implants, not all short femoral stems are the same, and the type of cortical thinning identified with this study may not be seen with all short femoral stems. Following the results of this study, the authors' institution no longer uses shortened tapered femoral stems in patients with a BMI lower than 23.3 kg/m² or in younger patients, as it seems unwise to expose them to unnecessary risks. The clear message from this study is that not all short femoral stems are the same. As with the different types of hip resurfacings, there may be some significant losers with some short femoral stem designs.

Arthroscopic competence in surgical training X-ref

■ Arthroscopic surgery has its own peculiar skill set that isn't really reliant on transferable skills from open surgery. It also has a clear and well defined learning curve, requiring a reasonable number of cases to achieve competence. Arthroscopic skills are also an orthopaedic 'bread and butter' operation group and competency is expected in every training programme. Hypothesising that orthopaedic programmes throughout the UK may be struggling to achieve the required competency at the end of training, in light of the European Working Time Directive, investigators from this **Oxford (UK)** designed cross-sectional study attempted to establish whether arthroscopic skills were complete at the time of finishing training.[2] The study revolved around 45 participants, all of whom were attempting to perform a simple diagnostic task and the more complex Bankart repair of the shoulder, using an arthroscopic simulator. The investigators also collated local information on performance itself using the Global Rating Scale and motion analysis. They then undertook receiver-operating characteristic (ROC) analysis to establish task proficiency. Perhaps not surprisingly, increased surgical experience yielded better performance in the Global Rating Scale and motion analysis. The sensitivity and specificity analysis from the ROC curve established that 52 previous arthroscopies were required to achieve competence with the diagnosis, and a whopping 248 to achieve competence at the complex task. In order to perform at the expert level in both basic and complex tasks, 290 and 476 arthroscopies, respectively, were required. This is an important article regarding the attainment of arthroscopic competence during a training programme. A simulated shoulder arthroscopic performance was used, encompassing a basic diagnostic scope and a more complex task of a Bankart labral repair. As expected, increasing surgical experience results in improved performance. Analysis suggested an estimated number of arthroscopies to attain competency in basic tasks and complex tasks. These estimates may exceed what many training programmes are able to provide.

Knee osteoarthritis: what cost? X-ref

■ The American Academy of Orthopaedic Surgeons (AAOS) Clinical Practice Guidelines for the treatment of knee osteoarthritis (OA) provide non-operative recommendations of physical therapy, non-steroidal anti-inflammatories (NSAIDs) and tramadol, as does the UK-centric NICE guidance. Despite clear guidance documents, non-recommended treatments for OA are in common usage, including hyaluronic acid (HA) injections, corticosteroid (CS) injections, knee braces, wedge insoles and opioids. Many of these options are expensive and may put the patient at increased risk of infection and/or additional complications following surgery. In the era of value-based medicine, we are encouraged to consider the ratio of benefit to cost when making clinical choices. Researchers from **Iowa City, Iowa (USA)** used the PearlDiver programme (Pearl Diver, Inc., Colorado Springs, Colorado) to interrogate billing data and establish the cost of non-operative knee OA treatments administered during the year prior to total knee arthroplasty (TKA).[3] Of 86 081 patients who underwent primary TKA in this analysis, only 56 690 (65.9%) received at least one of the treatments during the year prior to their TKA. Using the reimbursement fees paid by the insurance provider (both private and Medicaid/Medicare plans purchased through Humana, Inc. were included in the study), the aggregate costs of care per treatment type, per patient and per single episode were determined. Hyaluronic acid and CS injections made up more than 50% of all treatment costs, with HA injections accounting for nearly 30% of the total cost for all patients. The mean cost per patient over the course of the one-year period was highest for those treated with HA injections ($822), followed by physical therapy ($405) and knee bracing ($331). The mean cost for any single treatment episode was highest for knee bracing ($331), followed by HA injections ($294) and physical therapy ($84), NSAIDs and tramadol (the only AAOS recommended interventions) made up only 12.2% of the total cost for non-operative treatment of knee OA. The data to support HA and CS injections, knee braces, wedge insoles and opioids are mixed. In fact, recent evidence strongly suggests a higher risk of infection following HA injections, and limited pain relief and increased risk of complications following opioid administration. Knee OA is both a physically and financially demanding condition. The evidence here shows that costs related to non-inpatient, non-surgical procedures prior to TKA could be reduced by 45% if non-recommended interventions are avoided. This study raises a timely discussion on the balance between evidence and value-based medicine, particularly regarding cost reduction, in the year prior to TKA.



Vancomycin and ceftazidime in bone cement?

■ The two-stage exchange arthroplasty is considered the benchmark for the treatment of periprosthetic joint infection (PJI). As the World Health Organization (WHO) identifies antibiotic resistance as one of the major global health threats, interest is growing in methods of topical antibiotic delivery. In two-stage revision arthroplasty, an antibiotic-loaded bone cement spacer is implanted during the first stage of the procedure, delivering high-dose local antibiotics. If an organism has not been identified, either gram-positive or gram-negative organisms may be the culprit, and in some cases no organism is identified at all. To provide adequate antibiotic cover, broad-spectrum formulation or combination is often administered as a best guess. The research team from **Taoyuan (Taiwan)** designed their *in vitro* model to compare the efficacy of a variety of antibiotic combinations.[4] They tested the following combinations: vancomycin and ceftazidime; vancomycin and imipenem; vancomycin and aztreonam; teicoplanin and ceftazidime; teicoplanin; or teicoplanin (not available in North America) and aztreonam, against methicillin- and imipenem susceptible *Staph. aureus* (MSSA), methicillin-resistant *Staph. aureus* (MRSA), *Staph. epidermidis*, *P. aeruginosa*, and *E. coli*. The authors mixed simplex bone cement with various antibiotic mixtures (at a ratio

of 8 g antibiotic to 40 g cement) into cylindrical test specimens, and daily antibiotic release was calculated over the course of 60 days. Antibiotic activity was evaluated using a microtube dilution assay – bacterial growth associated with various concentrations of the antibiotics was compared visually and against a positive control. Elution testing showed that high doses of vancomycin and ceftazidime provided the best antibacterial activity against MSSA, MRSA, *Staph. epidermis*, *P. aeruginosa*, and *E. coli* for as long as, or longer than, all other combinations tested. Eight patients were diagnosed with a knee PJI and then enrolled in the *in vivo* portion of this study. All of the patients were treated with vancomycin- and ceftazidime-loaded cement spacers. The bioactivity of the joint fluid collected following implantation of the spacer (bacterial species identified were MSSA, MRSA, *Enterococcus faecalis* and *Serratia marcescens*) was evaluated for antibiotic concentration. Total antibiotic concentration reached over 500 µg/mL in some cases, without any toxic systemic effects. The results of this study suggest a possible alternative to the usual combination of vancomycin and an aminoglycoside (gentamicin or tobramycin) for antibiotic-loaded cement spacers. Longer follow-up is certainly required in an *in vivo* setting to determine the efficacy of the vancomycin/ceftazidime combination over time; however, the *in vitro* results look promising.

Posterior cruciate ligament is a twisted and flat structure: new prospective on anatomical morphology

There are a large number of papers about the anatomy of the anterior cruciate ligament (ACL). However, there is little written on the bundle structure of the posterior cruciate ligament (PCL). If the surgical team is to effect an anatomical repair, understanding the anatomy, and not just in terms of the origins and insertions of the PCL, is essential. This anatomical study from **Hiroshima (Japan)** focuses on PCL morphology.[5] The authors undertook a cadaveric study of 17 cadaveric knees in order to characterise the structure of the PCL. The authors collated a range of information about the cadaveric ligaments. They examined the dimensions of the PCL and Humphreys and Wrisberg's ligaments. In this study, the ligament itself was located between 12 and four o'clock in the right knee, and between eight and 12 o'clock in the left knee. The PCL was between 11 mm and 13 mm wide at the mid-substance and around 5 mm thick. Perhaps the most interesting observation was that the ligament was made of multiple interconnected layers which were aligned from posterolateral to anteromedial coalescing to form a CD shape at the level of the medial meniscus. The authors conclude that, given the reproducibility of findings from knee to knee, the PCL is in fact a twisted flat structure. Surgical reconstruction, whether with hamstrings, direct repair, allograft, or artificial ligament, should take into account this type of structure in the same way as surgeons do with the ACL.

Degenerative rotator cuff-related disease on an upward spiral X-ref

There is no doubt that as the population ages, orthopaedic surgeons are facing an increasing burden of degenerative pathologies. This is combined with increasing morbidity, and obesity has resulted in an explosion in several pathologies. While there is much work in the scientific literature to quantify the future encumbrance of primary and revision joint arthroplasties, there is little clarity about the increasing requirement for treatment of other musculoskeletal conditions. We were delighted, here at *360*, to read this paper from **Hvidovre (Denmark)**, which aims, using the Danish National Patient Registry, to quantify the changes in presentation patterns of shoulder pathologies and, in particular, degenerative rotator cuff disease.[6] This study used The Danish National Patient Registry over a study period from 1996 to 2013. The authors combined this information with data of regional population incidence rates for degenerative rotator cuff disease, and for other shoulder pathologies that could then be calculated. The changes in incidence rates across the nearly 18-year observation period were reported as the main findings of the study. The study focuses on the presentations of nearly 250 000 patients, all presenting with degenerative shoulder conditions. The male-to-female ratio was roughly even, and the median age was 51. The most frequent diagnosis was degenerative rotator cuff disease, for which a mean incidence of 313 105 person-years at risk was calculated. This incidence rate increases significantly throughout the period of the study, from around 150 per 105 person-years to 700 per 105 person-years at the end of the study. There were no significant differences in incidence rates between the sexes. However, patients working in rural areas, and therefore presumably in farming and manual work, had a 1.4-fold higher annual incidence than those living in cities. The authors of this study chart a disturbing rise in the incidence of shoulder conditions that are, for the most part, explained by an increase among patients of working age. The authors comment that, given the huge socioeconomic burden and personal distress caused by shoulder lesions and, in particular, rotator cuff pathology, healthcare providers, funders and policymakers should be aware of the dramatic increase in the need for teaching in shoulder surgery.

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