open reduction should not worry unduly that they are compromising the long-term outcomes of their patients.

Combined pelvic and femoral osteotomies in Perthes' disease

Patients with Legg-Calve-Perthes' (LCP) disease are usually treated conservatively. Although a range of operative options are described, given the natural history of the majority of patients is one of complete resolution with expectant management, patients end up with a period of supervised neglect. That said, of course there are severely affected patients or those with progressive potentially destructive changes in the femoral head. For these patients there are a range of interventional operative options, but most involve rather significant surgery with a not insignificant risk profile. This study from **Hamburg (Germany)** investigated the outcomes of patients treated with combined pelvic and femoral osteotomies with the aim of containment of the hip.[8] The authors report the outcomes of 69 patients with LCP who underwent the described combined pelvic and femoral osteotomies. The mean age at index surgery was just shy of eight years, with follow-up to around ten years. Outcomes were assessed using the Harris Hip Score, Stulberg classification and the sphericity deviation score. The mean Harris hip score at the time of follow-up was 90, and just short of 40% of patients achieved a Stulberg class I hip at final follow-up. The authors conclude that more invasive procedures did not give much benefit to patients with LCP when compared with the historic series of either upper femoral osteotomy alone or pelvic osteotomy alone. In those cases not amenable to conservative management, it would seem that the best course of action at the moment is to choose technically simple and less invasive procedures for treatment of LCP.

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Research

X-ref ***For other Roundups in this issue that cross-reference with Research see: Foot & Ankle Roundup 7; Wrist & Hand Roundup 3; Trauma Roundup 8.***

Vitamin D levels and revision arthroplasty X-ref

It never ceases to amaze us here at *360* how orthopaedics, and orthopaedic research in particular, run in trends and fashions. Just at this point in time, vitamin D is very much in vogue for the retrospective registrar paper. Although not all of this research is valuable, and there is a danger of poor study design and a 'me too' attitude, there is certainly some worth in these investigations as vitamin D deficiency is easily correctable medically. This retrospective review from **Charleston, South Carolina (USA)** of 126 patients undergoing revision joint replacement surgery sets out to compare a number of different outcome measures between patients with normal pre-operative vitamin D levels and patients with low vitamin D levels.[1] Although there was not a huge number of patients here, the authors' first finding was that patients whose levels were low were at statistically increased risk of periprosthetic joint infection (PJI). As such, the authors undertook a regression analysis; this therefore allowed them to control for PJI itself, following which they still discovered an increased risk of all complications at 90 days, and a higher all-cause 90-day re-operation rate. The take home message from this straightforward paper is that vitamin D deficiency should be considered a pre-operative modifiable risk factor in this patient cohort. Although the authors did not demonstrate a non-causal relationship, and a number of other variables might also warrant further consideration, this is a simple test for a simple problem that may potentially reduce morbidity and cost following revision surgery, and, as such, it merits closer scrutiny.

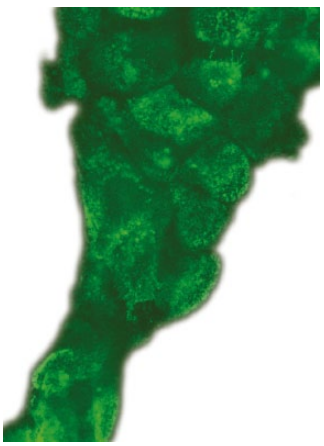
What is the effect of age on risk of revision?

It is widely acknowledged that not only are primary joint replacement rates increasing in the general population, but there is a specific increase in the number of patients younger than 60 years who are undergoing these procedures. The authors of this study from **Oxford (United Kingdom)** highlight that this is a topic of concern as joint registries have shown that the ten-year revision rates in this group are much higher than for older patient groups.[2] The majority of surgeons quote the joint registry data for longevity because other studies with longer follow-up are usually less representative, being restricted to specific prostheses, small populations or single-surgeon series. There is a gap in knowledge about the true effect of age and its influence on joint replacement longevity. This novel study published in *The Lancet* aims to determine the lifetime risk of undergoing a revision procedure after primary total hip arthroplasty (THA) or total knee arthroplasty (TKA), with data obtained from the Clinical Practice Research Datalink (based on computerised primary care medical records of a patient population of 6.5 million from 433 contributing representative UK practices) and the Office for National Statistics. From the database, the authors identified 63 158 patients who underwent a THA, and 54 276 who underwent a TKA. A total of 15% of patients were aged between 50 and 60 years, and the estimated lifetime risk of revision increased with decreasing age at the time of primary operation. In patients of 70 years, the lifetime risk of revision was between 4.4% and 7.7%. In patients aged between 60 and 70 years at the time of their

original surgery, the lifetime risk of revision increased with decreasing age, reaching 15% for both TKA and THA at 60 years. The risk was higher in male patients. For women between 50 and 60 years, the lifetime risk of revision does not change much, but in men the lifetime risk is 29.6% for THA and 35% for TKA for the youngest patient group of 50 to 54 years. For those patients undergoing revision, this peaked within five years of the primary operation in all age ranges. The important message from this paper is that patients under 60 years of age stand a significant chance of revision of up to 35% should they undergo a primary THA or TKA, but not only that - the timing to revision in the majority of cases is under five years. This is of particular concern as patients of this age undergoing a revision tend to have poorer outcomes and are likely to spend most of their lives with a revision implant as opposed to their primary implant. While implant survival is just one indicator of success following a joint replacement, this paper carries an important message and the information it contains should be reflected on carefully by surgeons who perform joint replacements in patients under the age of 60 years.

Improving the accuracy of synovial fluid analysis with simple and inexpensive biomarkers

■ Point-of-care testing (POCT) and 'in theatre' biomarkers are all the rage at the moment, with a number of potential products promising to provide an instant answer at the time of revision arthroplasty to perhaps the most important question: 'is it infected?'. Heralded by promising looking literature, the first of the bedside commercial diagnostic tests is the 'SynovaSure' which has previously been shown to be reasonably accurate. However, a plethora of literature followed using the cheaply available leucocyte esterase test including comparative literature suggesting they may well be as accurate. Researchers in **Porto (Portugal)** have muddied the waters even more, with their own paper looking at improving the accuracy of synovial fluid analysis by utilising cheap and already available biomarker assays.[3] The paper concerns the diagnosis of infection in 55 patients (from a potential cohort of 143 revision arthroplasties) in whom sufficient synovial fluid was available to undertake additional assays for four well established biomarkers: C-reactive protein (CRP); adenosine deaminase (ADA); alpha-2-macroglobulin (α2M); and procalcitonin. Within the cohort, there were 23 patients with periprosthetic joint infection and 32 with aseptic loosening. The addition of several specific markers improved the accuracy of synovial diagnosis. Specifically, the use of total synovial fluid leucocyte count improved negative predictive value in the diagnosis of periprosthetic joint infection, while the addition of more specific markers (CRP and ADA) improved the positive predictive value markedly.While companies are trying to sell us expensive methods of identifying infection in arthroplasty, the question of refining and adding to the currently available laboratory panels to include cheap and widely available biomarkers for infection seems a reasonable one.



Titanium-copper oxide coating in periprosthetic infection

■ One of the greatest challenges facing mankind, let alone health care, is the continuing development of antibiotic resistance in the community. With the potential for loss of efficacy of the major antibiotic groups over the next 20 years, with no signs of novel agents around the corner, we may be facing a situation where surgery with implants becomes as fraught with risk of significant infection as it was prior to the development of modern antibiotics.One potential route to deal with this problem is the use of either local surface technologies, novel coatings or high doses of locally eluted antibiotics, all of which offer the tantalising prospect of high efficacy without the risk of either inducing community resistance or becoming obsolete in a year or two. Copper titanates is one of the potential candidates for this – and there are technologies available to either surface-coat copper onto the titanium surface or have copper-eluting compounds. Both have their proponents and, to date, there has been little in the way of commercially available or commercial candidate technologies in the literature. We were delighted to see this paper originating from **Rochester, Minnesota (USA)** which tests the hypothesis that coating titanium with a film of copper titanate (TiCuO) would confer antimicrobial properties.[4] This is very early basic science research, and the research team tested 90 Ti6Al4V discs which were then coated with either titanium oxide or TiCuO using magnetron sputtering. These were then subjected to a *Staphylococcus epidermidis* challenge for 24 hours, with both the biofilms and planktonic bacteria retrieved via sonication at 24 hours to quantify any inhibitory effect of the copper. In addition, the potential toxicity to osteoblast cell line viability was calculated by measuring copper concentrations at days 1, 2, 3, 7, 14 and 28 using a coupled plasma mass spectrometer. The results overall were promising, with discs covered with 80% copper showing greater reduction in biofilm and planktonic bacteria than the other discs. Perhaps most reassuringly, there was no difference in copper concentrations with regard to the potential for copper toxicity.

Intravenous *versus* oral paracetamol in total joint arthroplasty X-ref

■ The use of intravenous (IV) paracetamol (acetaminophen) in recent years has spiralled. Initially developed to allow for paracetamol use intra-operatively and in patients who are 'nil by mouth', the use of the paracetamol drip has soared in recent years, with proponents arguing that the treatment appears to be as effective as morphine but does not have the associated side effects. Those involved in a clinical trial in **Columbus, Ohio (USA)** have set out to establish whether IV paracetamol really is all it's cracked up to be.[5] The literature that exists supports the use of paracetamol to reduce pain scores and opioid use but does not, however, support intravenous paracetamol over the oral form. This randomised controlled trial allocated 120 patients to either an oral or IV form of paracetamol. Although the dosing regime was the same, the mode of delivery was different. Each patient received 1 g of paracetamol pre-operatively and 1 g post-operatively, and again every six hours for the next 24 hours. This was in addition to a standardised multimodal pain pathway. Outcomes were assessed using total opioid consumption and VAS pain scales, with measures every four hours and follow-up to 24 hours post-operatively. There were no differences in any of the later outcomes in terms of either measure, however, the picture was somewhat different in the first four hours following surgery. At the early follow-up, the VAS scores were significantly better in the IV paracetamol group (3.00 *vs* 3.40). The authors conclude, not unreasonably, that while IV paracetamol appears to be a useful adjunct intra-operatively,

there is no real evidence that it offers any benefit in the more extended post-operative period.

Femoral version and tibial torsion and arthritis? X-ref

■ A much underused resource is the large osteological collections that exist worldwide. They represent a cross-section of 'normal'. Although CT scanning can give accurate and detailed 3D reconstructions in life, the older osteological collections have some specific advantages – usually representing patients with a known history, and often without joint disease. Worth a passing thought is this paper from **Cleveland, Ohio (USA)** which aims to establish whether there is any relationship between tibial torsion, femoral anteversion and knee arthritis.[6] The authors used a major osteological collection to measure tibial torsion and femoral anteversion in 1158 cadaveric tibias and femurs, respectively, and the relationship to degenerative joint disease of the hip and knee joints in these specimens was established. The authors report differences based on the sex and race of the specimen in regards to torsional measurements. However, using a multiple regression analysis, neither tibial torsion nor femoral anteversion was found to be an independent predictor of knee or hip arthritis. Rotational complaints are a common cause of paediatric orthopaedic referral, and there has been much interest in cohort series, particularly of hip patients recently, when geometry of the hip has been investigated as a possible cause of arthritis. Based on the results of this study, one should perhaps take a longer pause for thought, and treatment should be driven by symptomatology and functional issues. Asymptomatic children and their parents can be reassured that long-term consequences are unlikely.

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