ROUNDUP360

Hip & Pelvis

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

Body mass index and mortality after total hip and knee arthroplasty X-ref

There continues to be much discussion around the implications of body mass index (BMI), regarding decision-making about joint arthroplasty surgery. It has been well documented that obese patients, and morbidly obese patients in particular, have an increased risk of both infective and thromboembolic complications. Increasingly, however, focus is also being brought to bear on mortality rates following different types of elective orthopaedic intervention. Given the overall low incidence of death following even the most major of orthopaedic interventions, this necessitates population level research. This paper from **Melbourne (Australia)** and **San Diego, California (USA)** throws up some interesting findings of relevance.[1] The paper adopts a retrospective methodology to capture mortality data following a total of 59 999 total hips and 112 786 total knees, using data from two different arthroplasty registers. A detailed statistical analysis was undertaken to calculate hazard ratios, 95% confidence intervals, and p-values with respect to potential association between BMI and postoperative mortality rate after hip and knee arthroplasty. Interestingly, a statistically higher mortality rate was identified in underweight patients following both total hip and total knee arthroplasty surgery, whereas there was no increase in risk of mortality in the high BMI groups. Even when these were subdivided into different levels of obesity, the most obese patient group (BMI $>$ 40 kg/m^2) showed no increase in mortality risk; indeed, some of the high BMI subgroups showed a reduced risk of mortality. The authors acknowledged the limitations of their study – in particular, the fact that the BMI measurement constitutes a 'snapshot' at a single point in time of the patients' weight, the retrospective nature of the study design, and the limitations inherent in any registry-based study. Nevertheless, notwithstanding the fact that other groups have previously published in this area, both the patient numbers and duration of follow-up in this study are substantially higher than those reported by other authors. The conclusions of this paper are certainly worthy of note. First, whilst these findings do not detract from the importance of counselling patients appropriately regarding the risk of complications if joint arthroplasty is undertaken when BMI is elevated, they do suggest that there is no increase in mortality risk as compared with a normal BMI cohort. Second, caution should be exercised when undertaking such surgery in underweight patients.

Ceramic-on-ceramic or ceramic-on-polyethylene: 15-year follow-up

At present, it remains unclear whether younger patients are better off with a ceramic-on-polyethylene (CoP) or ceramic-on-ceramic (CoC) bearing hip arthroplasty. This Canadian randomized trial from **Toronto (Canada)** has previously been published up to ten-year follow-up, with their previous report showing no difference in either revision rates or symptomatic/functional outcomes. The same group now publish their minimum 15-year results.[2] The authors undertook recruitment to this randomized trial between October 1997 and 1999, where 58 primary hip arthroplasties were undertaken for osteoarthritis in 57 active patients aged under 60 years. All patients were randomized to receiving either CoC or CoP (29 *vs* 28 patients; one had bilateral surgery). This series reports on the longer-term follow-up for this group of young and active patients. The overall 15-year revision rate of 16% is higher than might be expected in more recent series, but the authors make a point that both polyethylene and ceramic manufacture have evolved since this particular series was undertaken (higher cross-linkage and delta ceramic, respectively). Allowing for the three patient deaths (5%) and seven patients (12%) who were lost to follow-up, of the remaining cohort, there was no statistical difference between revision rates with CoC *versus* CoP (four and five, respectively). Harris Hip Score and St Michael's Hip Score were comparable between the two bearing surface groups. The numbers are small in this study. However, this does represent one of the few randomized trials undertaken with differing bearing surfaces. On the basis of these data, at a minimum 15-year follow-up, there appears to be no significant clinical difference between the two bearing services. The authors did find, however, that differences were demonstrated in observed wear rates between the two bearing surfaces. All patients in the CoP cohort had a degree of detectable wear, compared with just 12 of those with CoC. Not unreasonably, the authors observe that this may be a portent of potentially higher failure rates at a longer follow-up with hard-on-soft *versus* hard-on-hard bearings, although they also postulate in their discussion that this might, to an extent, be reduced with the advent delta ceramic heads and ultra-highly cross-linked polyethylene in the longer term. The main value of the present study, however, is that, even whilst allowing this degree of license for more recent changes in both the polyethylene and ceramic components, these data suggest that both bearing couplings can justifiably be used in younger, more active patients, with the expectation of equivalent survivorship between the two cohorts, at least up to 15 years.

A UK FASHIoN? Hip arthroscopy in a randomized controlled trial

This is a well-designed, high-impact, assessor-blinded study originating in **Coventry (UK)** comparing the 12-month results of personalized physiotherapy *versus* hip arthroscopy for femoroacetabular impingement (FAI).[3] Following an initial identification of patients thought potentially to be likely to

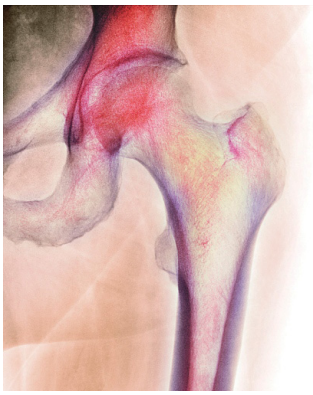
benefit from hip arthroscopy for FAI (either cam or pincer), those with established OA Tönnis (Grade I or above) were excluded, as were those with previous hip pathology (e.g. Perthes' disease, slipped upper femoral epiphysis, avascular necrosis, trauma, or previous surgery). The authors were able to recruit 348 patients from across the 23 participating hospitals, and randomized them to receive either arthroscopy (n=171) or physiotherapy (n=178). The 12-month follow-up rate was 92%. The primary outcome measure was hip-related quality of life, quantified with the international Hip Outcome Tool (iHOT-33). Both physiotherapy and arthroscopy groups showed improvements 12 months after randomization. A number of different sub-analyses were undertaken; in all of these (most notably the intention-to-treat analysis), hip arthroscopy showed statistically significantly greater improvements in iHOT-33 than physiotherapy, even when allowing for the fact that 73% of the hip arthroscopy patients reported some form of adverse event. These adverse events were most commonly muscle soreness, but also various post-operative complications, including infection, scrotal haematoma, and so on. It is an important detail that the mean difference in iHOT-33 scores was interpreted adjusted for impingement type, sex, baseline iHOT-33 score, and centre, which is slightly unusual, as, due to their randomized nature, trials such as this do not usually need an adjusted analysis. The research group conclude that offering hip arthroscopy patients with femoroacetabular impingement syndrome leads to superior patient-assessed function 12 months following randomization, compared with the (perceived) best nonoperative treatment. They acknowledge, however, that this does not equate to better cost-effectiveness of hip arthroscopy over care within the first 12 months. This an important addition to the ever-expanding literature on this topic, and represents significant support for the use of arthroscopy in the treatment of this patient cohort.

Fixed spinopelvic alignment and hip dislocation

The cause of hip instability following total hip arthroplasty (THA) is often multifactorial, being associated with surgical factors such as operative approach, choice of implant, implant positioning, and soft-tissue repair. Of these factors, it is often the implant positioning that surgeons spend considerable time and effort trying to get right. Previous literature has referred to the 'safe zone' of acetabular placement. However, siting the acetabular component in the 'safe zone' does not guarantee stability. The reason for this is that the orientation of the acetabular component is not static and changes according to the position of the pelvis. Pelvic orientation changes according to whether the patient is standing, sitting, or lying flat during the gait cycle. This becomes more complicated when the patient has had previous spinal surgery, such as a lumbar fusion, or suffers from a degenerate lumbar spine with little movement. Patients with stiff lumbar spines have little ability to change their pelvic tilt from standing to the sitting position. To be able to sit, patients must deep flex their hips and, in patients who have had a THA, this could result in rim impingement and a posterior dislocation. At the recent American Academy of Orthopaedic Surgeons meeting, and also at recent national meetings in the United Kingdom, there has been considerable discussion on how best to manage these patients and where to place the acetabular component. This study published from the Hospital for Specialist Surgery in **New York, New York (USA)** attempted to compare patients who have undergone a THA and have dislocated with those who have not, in terms of the lumbar-pelvic-femoral alignment in the sitting position in both groups.[4] A total of 1000 patients with a mean age of 61 years were included in this study, who underwent a THA using 28 mm, 32 mm, or 36 mm femoral heads for osteoarthritis, all undertaken via the posterior approach. Importantly, the surgeons either used an imageless optical navigation system (AchieveCAS; Smith & Nephew, Memphis, Tennessee) or CT-based navigation (Mako Surgical, Tampa, Florida) to aid the implant positioning. The acetabular component was placed in 40° inclination and 20° anteversion. Patients were followed up for a minimum of one year. An imaging system was used so that patients could undergo standing and sitting radiographs from the thoracolumbar junction to the ankles using a low-dose radiation imaging system. This enabled the authors to visualize the entire lumbar-pelvic-femoral complex of patients in sitting and standing positions. From the reported series, a total of 12 patients (1%) experienced a posterior hip dislocation in the first year after THA. Of these 12 patients, 11 had multilevel lumbar degenerative disc disease, with four of these patients having undergone a surgical spine fusion prior to THA. Only one of the patients who dislocated had a 'normal' spine, although the authors demonstrated that this patient had more spine flexion and change in pelvic tilt than the other patients who had dislocated. As would be expected, the dislocating patients had significantly less spinal flexion, lower pelvic tilt, and more hip flexion from standing to sitting positions compared with the patients with normal spines. These patients had a lower sitting acetabular functional inclination angle and a lower sitting acetabular functional anteversion angle compared with the non-dislocators. The authors did not consider the femoral version, which has also been shown to influence hip stability post-THA. The problem of a relatively fixed spinopelvic alignment has gained considerable exposure in the more recent orthopaedic literature. This condition can be secondary not only to spinal fusion, but also to lumbar multilevel degenerative disc disease. This study demonstrated that patients with a fixed spinopelvic alignment from standing to sitting are more at risk of THA dislocation. It is important for hip surgeons to fully appreciate that conventional acetabular orientation does not then necessarily exclude the risk of dislocation. This paper is the first to formally describe this relationship between reduced spine flexion and increased hip flexion, and therefore higher risk of dislocation, post-THA. Rather than aiming for a conventional acetabular alignment of 40° inclination and 20° anteversion, there is a sound argument based on this paper that surgeons should opt for a functional acetabular orientation that will be different for different patients depending on the mobility of their lower spine. In those patients who are considered at risk, preoperative x-rays, including sitting and standing views, could therefore become the norm to fully understand what happens when patients stand and sit. Increasing the anteversion in patients with relatively stiff lumbar spines would require additional cup anteversion to reduce the risk of dislocation. However, the authors were unable to recommend an alternative 'safe zone' in patients with stiff lumbar spines, as each patient's 'stiffness' was different to another patient.

Outcomes after metal-on-metal hip revision surgery

Metal-on-metal hip arthroplasties (MoMHRs), including stemmed hip arthroplasties and hip resurfacings, have in some instances experienced high rates of unexpected short-term complications requiring revision surgery. The reasons for revisions include dislocation, loosening, infection, fracture, and complications in relation to adverse reactions to metal debris (ARMD). In the case of ARMD, the complication rate of revision



surgery has been reported as high (50%), likely due to the destructive nature of the lesions. This led to surgeons lowering their thresholds for revision surgery for this indication, with the aim of revision prior to too much soft-tissue damage. Revision surgery is a significant undertaking for both the patient and the surgeon, and robust data to support decision-making can be very helpful. The authors of this study reviewed a large cohort of patients obtained from the National Joint Registry (NJR) by researchers in **Oxford (UK)** who had undergone MoMHRs to compare the risk of complications and reoperation after revision surgery for ARMD and non-ARMD revisions.[5] A total of 4908 patients underwent a primary MoMHR – 2913 MoM total hip arthoplasties (THAs) and 1995 hip resurfacings (HR) – and subsequently required revision surgery for any indication. To reduce the risk of bias, revision procedures were matched for multiple potential confounding factors using propensity scoring methods. The final matched cohort included 2576 MoMHR revision procedures, with 1288 in the ARMD group and 1288 in the non-ARMD group. The mean follow-up in both groups was three years. In terms of intraoperative complication at the time of revision, there was no difference between ARMD (2.4%) and non-ARMD (2.5%) revisions. The most common complication in both groups was calcar and greater trochanteric fractures. Excluding infection, there was no difference in mortality rates at five years between the two groups. All-cause re-revision rates were lower in the ARMD group (94.3% five-year survival rate) compared with the non-ARMD group (90.5% five-year survival rate). Re-revision indications included dislocation/subluxation, ARMD, infection, loosening with or without lysis, unexplained pain, and fracture. Revisions performed for infection and dislocation/subluxation had the lowest five-year implant survival rates compared with the ARMD group. This study suggests that those patients undergoing revision for ARMD had approximately half the risk of further revision and death compared with matched patients undergoing revision for other reasons. Importantly, they identified that infected cases were responsible for the higher mortality risk and infection, and dislocation/subluxation was responsible for the higher re-revision risk. This is not what previous studies have suggested, as revision for ARMD was thought to have a much higher risk of complications and further revision surgery. This study gives some encouragement to both patients and surgeons alike that revision surgery in the presence of ARMD is perhaps not quite as bad as was first thought. Clearly, careful planning is needed before any surgery, and the information from this study can help inform the discussion between surgeon and patient when considering revision surgery for MoMHR. Previously, surgeons have been encouraged to perform revision surgery at an early stage following the development of ARMD complicating MoMHR. This study would suggest that the threshold for revision should not be lowered any further, as there could be a risk of performing revision surgery too early, with the potential for the surgical risk outweighing the benefits. What is concerning is the high risk associated with revisions for infection and subluxation/dislocation, and further research is needed not only into the treatment of this condition but also, more importantly, into its prevention.

Reaction time and brake pedal depression following arthroscopic hip surgery: a prospective case-control study

■ "When am I safe to drive, doctor?" is a tricky question to answer. With little in the way of agreed national guidance from regulators, healthcare providers, or motor insurers, it is often left to the best guess of the clinician. Although there is a plethora of work now surrounding driving in plasters and following total joint arthroplasty, there is little that is known about many other relatively common procedures. A research team in **Bethesda, Maryland (USA)** used the now-familiar approach of a car simulator and measured braking response time following hip arthroscopy in an attempt to establish when exactly patients are safe to drive.[6] The authors undertook a prospective cohort study of 59 patients undergoing arthroscopic hip surgery for femoroacetabular impingement (FAI) and compared these with 59 age- and gender-matched controls without FAI syndrome. Total brake reaction time (BRT) and brake pedal depression were measured preoperatively, and at two, four, and six weeks postoperatively. The group of patients with FAI had significantly prolonged BRT prior to surgery. In patients undergoing left hip surgery, there was no difference in any measures, whilst patients undergoing right hip surgery had significantly prolonged BRT at two weeks compared with preoperative baseline (688 *vs* 573 milliseconds). This paper, in spite of its limitations, provides information about brake reaction time prior to and following hip arthroscopy. The testing was done on a simulator and revealed a prolonged brake reaction time in patients undergoing arthroscopic surgery of the right hip until four weeks postoperatively. In general, it would therefore seem sensible to advise patients to avoid driving for a month postoperatively.

15-year prospective UEFA Elite Club Injury Study X-ref

■ Hip and groin injuries are surprisingly common in football. As a result, there are plenty of Saturday soldiers who sustain injuries and present to either the specialist sports clinic or, more frequently, to the hip clinic with their various ailments. This paper from **Linköping (Sweden)** looks at the elite end of the sporting spectrum, with the authors presenting 15 years of experience from hip and groin pain in professional UEFA football clubs.[7] The cohort consisted of the players in 47 European teams over a 15-year period. The cohort was prospective; however, there were differences in the number of seasons that were followed per club. In total, 268 team seasons are presented over the 15-year period of the study. The individual player exposure and time loss to injuries was calculated, with the injury rate defined as injuries/1000 hours and injury burden as lay-off days/1000 hours. The authors used Poisson regression to examine time trends and a negative binomial regression model for injury burden. Hip and groin injuries were responsible for 14% of injuries (n = 1812/12 736). The commonest hip injury was adductor-related injuries (n = 1139, 63%). The rates of injury were 1.0/1000 hours, decreasing year on year on average by 2% per season. The seasonal trend of hip and groin injury burden did not improve. Despite the significant proportion of football-related injuries accounted for by hip injury, there has clearly not been any successful effort to address these injuries, as, despite the decrease of rate of injury, there has been no improvement in disease burden over 15 years for the injury burden to improve.

Aspirin or rivaroxaban for venous thromboembolism prophylaxis after hip or knee arthroplasty X-ref

■ Against the backdrop of the ongoing debate regarding the best form of chemical

thromboprophylaxis following lower-limb arthroplasty, this multicentre randomized controlled trial from **Canada** makes a useful contribution to the existing evidence base.[8] Across 15 centres, 3427 patients undergoing joint arthroplasty surgery (1804 hips, 1620 knees) were randomized to receiving a total of 35 days of postoperative rivaroxaban *versus* five days of rivaroxaban followed by 30 days of aspirin. Patients and assessors were blinded to which patients received which regimen. The study was a superiority design and the primary effectiveness outcome was assessed as the presence of symptomatic deep vein thrombosis or pulmonary embolism within 90 days (asymptomatic patients did not undergo radiological evaluation). The study also reported safety outcomes in terms of major bleeding complications and clinically relevant non-major bleeding. Specifically, pre-specified secondary outcome measures were death, myocardial infarction, cerebrovascular accident, and wound infection. Symptomatic venous thromboembolism rates for the aspirin and rivaroxaban groups were, respectively, 11 of 1707 patients (0.64%) and 12 of 1717 patients (0.70%). For bleeding complications, the observed rates were 0.47% (n=8) and 0.29% (n=5). No differences were statistically significant in superiority analysis, and an additional noninferiority analysis suggested no differences between the aspirin and extended rivaroxaban groups. These findings certainly align well with other recently published work in supporting aspirin as a cheap, clinically non-inferior alternative to post-discharge thromboprophylaxis following joint arthroplasty surgery.

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Knee

X-ref ***For other Roundups in this issue that cross-reference with Knee see: Hip & Pelvis Roundups 1 & 8; Children's orthopaedics Roundup 1; Research Roundups 1, 2, 5 & 7.***

Intra-articular injection of microsphere triamcinolone acetonide on knee osteoarthritis pain

■ Pain secondary to osteoarthritis is on the increase in an ageing population who are keen to remain active as they get older. Injecting joints with hydrocortisone is nothing new, and a number of studies have documented its therapeutic benefit. However, the effects tend to be short-lived. In the light of any viable alternative, the use of intra-articular corticosteroid is relatively common in primary care, as well as in orthopaedic and rheumatology clinics, and is again on the ascendency, as, although beneficial in some studies, SynVisc never quite lived up to expectations. The authors of this study headed by a team in **Leeds (UK)** reviewed the therapeutic benefit of injecting 'FX006', a microsphere-based, extended release formulation of triamcinolone acetonide (TA).[1] Previous studies have suggested that measurable concentrations of TA can be demonstrated in the joint for up to 12 weeks. They performed a multinational (41 sites), randomized controlled trial comparing FX006 with a saline solution placebo, as well as the standard 40 mg TA crystalline suspension (TAcs) in patients with knee osteoarthritis. Importantly, painkillers were withheld except paracetamol. Patients were reviewed on a regular basis. A total of 486 patients were enrolled, with 161 patients in the FX006 group, 163 patients in the saline/placebo group, and 162 patients in the TAcs group. A total of 443 patients completed the study. The mean age of the patients was 62 years; the majority of patients were female (61.2%) and 50% were obese (BMI $\geqslant$ 30 kg/m^2). Pain was significantly improved in those patients treated with FX006 compared with those treated with a placebo. In addition, patients treated with FX006 demonstrated better Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC scores) and Knee Injury and Osteoarthritis Outcome Scores (KOOS) compared with patients treated with a placebo. FX006 also performed better than TAcs in terms of WOMAC subscale scores for pain, stiffness, and physical function, and had a similar onset of action to TAcs. The analgesic effects of FX006 was shown to last beyond 12 weeks and there were no incidences of joint infections, although other side effects were noted, which were not especially significant. Further work is needed into the cost-effectiveness of this treatment compared with other treatment modalities. More research is certainly needed into the non-arthroplasty management of osteoarthritis. The nonoperative management of osteoarthritis is a huge industry but with very little high-quality evidence to support individual treatments. This multicentre, multinational randomized controlled trial is a significant step in the right direction when comparing relatively new treatment modalities with current established techniques. Studies of this type should be used to provide treatment algorithms to health practitioners with an interest in managing osteoarthritis, so that best practice is observed and health resources are not wasted on techniques with little merit.

Mechanical axis, survival, and functional outcomes of modern total knee arthroplasties

■ Recent literature has suggested that restoring the mechanical axis in total knee arthroplasty (TKA) is not quite the nirvana that it was previously thought. Increasingly, there has been more of a focus on