

# ROUNDUP<sup>360</sup>

## Hip & Pelvis

**X-ref** For other Roundups in this issue that cross-reference with Hip & Pelvis see: *Knee Roundup 8; Research Roundups 1 & 4*

### Acute kidney injury after total hip arthroplasty X-ref

Increasingly, we are performing total hip arthroplasties (THAs) in patients with significant comorbidities, and there is good evidence that these patients are at greater risk of an acute kidney injury (AKI) perioperatively. Even mild, transient acute kidney injuries can increase the risk of future chronic kidney disease. In the perioperative period, AKI has been associated with increased length of stay and complications including temporary renal dialysis and mortality. This excellent paper from **Rochester, Minnesota (USA)** highlights not only the problem but also ways of identifying those patients that are particularly at risk.<sup>1</sup> The rate of AKI has often been underreported due to the lack of agreement on how to diagnose it. With the adoption of the Kidney Disease Improving Global Outcomes (KDIGO) definition of AKI, rates have been reported from 6% to 25% in gastrointestinal and vascular surgery. Nonetheless, the data following orthopaedic surgery are somewhat lacking. The authors of this large retrospective cohort study proposed that, if risk factors for AKI could be identified preoperatively, early intervention and optimization could lead to better outcomes, as well as reducing costs and patient length of stay in hospital. From a total of 10 323 THAs in 8949 patients, there were 114 cases

(1.1%) of postoperative AKI. Patients with AKI were older, more often male, had a history of heart failure, diabetes, hypertension, and chronic kidney disease, and had a high body mass index (BMI). The odds ratio of developing AKI was 1.4 per decade of age, 1.78 in male patients, 4.6 in those with chronic kidney disease, and 4.5 in those with heart failure. A total of 25% of those who developed AKI had received a combination of nonsteroidal anti-inflammatories (NSAIDs), angiotensin-converting enzyme (ACE) inhibitors, and angiotensin receptor blockers (ARBs) and diuretics at the same time. However, NSAIDs used in patients without comorbidities was not associated with an increased risk of AKI, suggesting that their use in the perioperative period for multimodal pain relief is safe and appropriate. The most common cause of an AKI was pre-renal with hypotension followed by acute tubular necrosis (ATN). This would explain the higher percentage of patients requiring transfusion being found in those who developed AKI (53.5%) compared with those who did not (19.7%). The authors had enough data here to construct a risk model convincingly. While the incidence of AKI following arthroplasty is an uncommon event, with increasing life expectancy and the accompanying rise in chronic disease and the growth in demand for joint arthroplasty, one can expect that AKI will become more common. As orthopaedic surgeons, we need to look out for those patients at risk, but this study also emphasizes the important role of a robust

pre-assessment service to aid in prevention.

### Recovery after total hip arthroplasty using a direct anterior or posterolateral approach: a randomized controlled trial

There is considerable discussion among orthopaedic surgeons with a specialist interest in the hip as to whether the direct anterior approach (DAA) conveys a sufficient advantage to patients undergoing a total hip arthroplasty (THA) to justify changing their surgical approach. The learning curve associated with the DAA has been well documented, and when the outcomes following THA using the posterior or anterolateral approach produce consistently good results, it is understandable that a significant number of surgeons are reluctant to change to the DAA. The proponents of the DAA argue that it is a minimally invasive, muscle-sparing, internervous approach, resulting in better functional recovery and a higher quality of life. However, other studies have also suggested that there are higher rates of complications such as wound problems, intra-operative femoral fractures, femoral perforations, neurological injury, and component malposition, particularly for surgeons who have recently adopted the technique. The authors from **Chengdu (China)** proposed that this randomized controlled trial would mitigate the different confounding factors associated with a direct comparison between the posterior and direct anterior approach.<sup>2</sup> The authors hypothesized that the

DAA would be associated with less pain, better functional recovery, and a shorter hospital stay during the early postoperative period. There were, nonetheless, some notable exclusion criteria, which included patients with a body mass index (BMI) of  $\geq 30$ , and the first 100 patients who had a THA performed with a DAA. The patients and the research fellows were blinded to the approach protocol. A total of 64 patients were randomized into each group. According to the markers used for muscle damage, the DAA was associated with lower levels compared with the posterior approach. In addition, the DAA was associated with a shorter incision and shorter hospitalization, as well as lower self-reported pain on all three postoperative days. At three months, the DAA was associated with a significantly higher Harris Hip Score (HHS) and University of California, Los Angeles (UCLA) Activity Score. However, as suggested by previous studies, these differences were no longer apparent by six months after surgery. Similarly, there were significantly better gait parameters in the DAA group at three months but these differences also disappeared by six months. Despite all surgeons being experienced, having previously carried out over 100 procedures using the anterior approach, the DAA group had longer operating times and greater blood loss. Somewhat frustratingly, the authors put considerable emphasis on the smaller variance in acetabular component orientation in the DAA cohort in their discussion, which is hardly surprising when all patients who had the DAA had intraoperative fluoroscopic



guidance, unlike those patients who had the posterior approach. Concerns have been raised about the DAA and the risk of component malposition, and this study does not provide any reassurance on that count, unless fluoroscopy is used intraoperatively. Nevertheless, studies like these are important in informing patients and surgeons alike about the role of the DAA. While there are attractions to the DAA in terms of reduced muscle damage and a quicker postoperative recovery, the outcomes at six months appear to be the same as for the posterior approach. However, the DAA is associated with a longer operating time and requires additional resources in terms of a table attachment, in some cases, and access to fluoroscopy.

### Massive endoprostheses and periprosthetic joint infections of the hip and knee X-ref

■ Surgery is a crucial component to the successful management of infected joint arthroplasties. Options include the recently popularized debridement, antibiotics and implant retention (DAIR), implant revision (either single or two-stage), arthrodesis, excision arthroplasty, or amputation. The best outcomes are known to be obtained in dedicated units with a multidisciplinary approach. However, there is a subset of ‘heart sink’ patients who have multiply revised total hip arthroplasties (THAs), as well as infection, which poses a challenge for the surgeon. These patients present challenges including bone loss, poor quality of the soft tissues,

and biofilm formation, as well as a failed implant. It is not uncommon to find that, following debridement and removal of dead bone, standard revision implants are not sufficient to replace the lost bone. In this scenario, endoprosthetic replacement (EPR) or megaprosthesis may be the only option. Most surgeons would balk at putting such implants into a previously infected joint; however, the authors of this study report the mid-term clinical outcomes of EPRs in the treatment of periprosthetic joint infection (PJI) and infected osteosynthesis around the hip and knee joint. A total of 69 EPRs were retrospectively reviewed by surgeons in **Oxford (UK)** for the treatment of PJI (40 hips and 29 knees) with a mean follow-up of 3.8 years (2 to 10).<sup>3</sup> The mean number of previous surgeries was 3.1 (1 to 10). The type of organism did not appear to affect the successful eradication of the PJI; most of the infections were polymicrobial. A total of 12 cases (17%) required additional input from the plastic surgeons to perform flap coverage, and the majority (70%) of cases had a two-stage revision. The authors could demonstrate successful eradication of the PJI in 50 patients (72%), which was not prejudiced by a single-stage procedure. Subgroup analysis appeared to demonstrate that PJI eradication was more successful in the hip cohort, and silver-coating the implants did not appear to affect the outcome in terms of PJI eradication. Of the 19 patients (28%) who had PJI recurrence, eight were treated with long-term antibiotic suppression and 11 patients had a revision of the EPR, DAIR or an above-knee amputation. The five-year implant survival was 81%. This is the largest series, to date, reporting the management of PJI in the presence of significant bone loss with massive endoprostheses. It provides reassuring evidence that there are reconstructive options available to those patients who have infected joints with significant bone loss. Previously, patients may have been managed with an excision arthroplasty or amputation, but

only one patient in this series went on to have an amputation. While patients with infected arthroplasties may previously have been managed at their local hospital, however, the best outcomes are clearly achieved in specialist centres. Such complex reconstructive challenges in the presence of infection are likely to become more common as the population ages and the number of patients with arthroplasties increases, and the establishment of regional arthroplasty infection centres is clearly becoming an urgent requirement.

### Myocardial cobalt levels are elevated in the setting of total hip arthroplasty X-ref

■ We often state that a total hip arthroplasty (THA) is one of the safest procedures that a patient can undergo, with a well-characterized side-effect profile and evidence of low perioperative morbidity and mortality. The longevity of traditional hip arthroplasties is also well known, with both large long-term follow-up series and large cohorts of registry patients supporting excellent longevity with traditional metal-on-polyethylene (MoP) bearing surfaces. Although as a community we clearly understand the long-term effects of polyethylene wear, we are only starting to learn about the long-term effects that metal debris from both metal-on-metal (MoM) implants and more traditional MoP articulations may have on the human body. This study from **Rochester, Minnesota (USA)** aims to investigate the effect of cobalt chromium (CoCr) on myocardial tissue after long-term THA implantation.<sup>4</sup> This innovative study is based around post-mortem examination. The authors identified individuals over a 23-year period who had undergone post-mortem examination and had a hip arthroplasty *in situ*. The authors were able to access archived myocardial tissue for 75 patients, all of whom had a MoP hip arthroplasty. There were also 73 non-arthroplasty controls included for completeness. The study team established significantly

higher myocardial concentrations of cobalt in the patients with a THA compared with controls (0.12 µg/g versus 0.06 µg/g). In those who had undergone a revision THA, the median cobalt concentration was 69% higher than in the primary THA group. Cardiomegaly, interstitial fibrosis, and a decreased ejection fraction were observed more frequently in the post-mortem samples of patients with implants than in those of controls. The future significance of these findings is not exactly clear. Although the authors did attempt to age- and gender-match the patients, there is also clearly a potentially large selection bias here, in that patients undergoing primary joint arthroplasty are, on average, more comorbid than those who are not. However, there is definitely some food for thought. If cobalt is associated with cardiac comorbidity – and indeed there is a causation here, not just an association – it could have significant ramifications for the future of joint arthroplasty.

### Preoperative anaemia

■ Much has been written recently on perioperative transfusion surrounding large joint arthroplasty and, in particular, total hip arthroplasty (THA). The use of permissive transfusion protocols is now commonplace; the reduced viscosity associated with a lower haematocrit is also associated with an improved oxygen delivery. While there are large numbers of publications about perioperative haemoglobin (Hb) that address the association with increasing complications and postoperative anaemia, and propose strategies to reduce the need for transfusion, there is, perhaps surprisingly, still no clear threshold for predicting the need for postoperative transfusion. Researchers in **Durham, North Carolina (USA)** have set about tackling this simple but important problem.<sup>5</sup> Pointing out that the strongest predictor of postoperative transfusion requirement is preoperative anaemia, they then go on to identify the ideal preoperative haemoglobin threshold. Their study

was a simple retrospective cohort study of 558 patients undergoing primary THA. The authors used the receiver operating characteristic (ROC) curve to establish the optimal threshold for predicting postoperative transfusion, and adjusted for gender and use of tranexamic acid (TXA). In the series as a whole, there was an 11% incidence of blood transfusion and confounders, including the American Society of Anesthesiologists (ASA) score, intravenous TXA (IV TXA) use, and preoperative Hb. The investigators established that Hb was one of the most important determinants of postoperative transfusion requirement (odds ratio (OR) 2.6), with female gender (OR 4.2) and TXA use (OR 13.5) also significantly associated with transfusion requirement. The authors go on to suggest that a preoperative Hb of 12.6 g/dL or lower is the most sensitive threshold value for predicting postoperative transfusion. Although this is indeed what the data describe, we can't help injecting a bit of cynicism here at 360. When using the ROC method, the predictor and outcome variables should be independent; however, here they are not. The unit policy of postoperative transfusion will dictate the threshold for transfusion, and this in itself is related to the preoperative Hb. The most interesting finding in this study is that of the vastly reduced odds of transfusion with TXA use.

### Conversion to total hip arthroplasty after hip arthroscopy

■ Despite the increasing popularity of hip arthroscopy in contemporary orthopaedic practice, there is little known about the predictors of success or failure (let alone any robust efficacy studies). The authors of this interesting study from **Westmont, Illinois (USA)** set out to establish the risk of conversion to total hip arthroplasty (THA) following hip arthroscopy.<sup>6</sup> They sought to determine if there were any preoperative or intraoperative variables that were associated with failure, and then use these

variables to establish a predictive tool to predict failure. These investigators have managed to assemble an impressive series of 792 patients (from an initial cohort of 893) who were available for follow-up at a minimum of two years following hip arthroscopy. The authors collected 41 variables and then undertook a multivariate analysis to establish which of this plethora of factors were associated with poor outcome, i.e. the requirement for conversion to a THA within the short two-year follow-up of the study. Those covariates that went on to be included in the risk model (and, as such, were associated with a higher risk of conversion to THA) were older age (risk ratio (RR) 1.06), poorer Harris Hip Score (RR 0.98), and lower femoral anteversion (RR 0.97). There were a number of other factors such as revision surgery (RR 2.4) and higher Outerbridge classifications (RR 2.23 to 2.93). Using these covariates, the authors of this paper present a simple calculator that will allow surgeons and patients to establish whether patients planning to undergo surgery for labral pathology are likely or unlikely to be met with a successful conclusion.

### And the complications of the procedure itself

■ To complete the picture of predicting short-term failure of hip preservation surgery, we were delighted here at 360 to come across this paper from **Cambridge (UK)**, which sets out to quantify the actual complication rates and risks of the procedure itself.<sup>7</sup> The authors have undertaken a comprehensive systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) system. In what must have been a mammoth task, the authors identified 276 relevant studies; their paper is based on the reported outcomes of 36 761 patients, all of whom underwent arthroscopy of the hip. In the cohort as a whole, there was a not inconsiderable 3.3% complication rate (1222 patients). Of these, the commonest complications were nerve injury (0.9%), and

iatrogenic chondral and labral injury (0.7%). The rate of major complications was low, with just 58 (0.2%), the most common of which was intra-abdominal extravasation of fluid. This paper serves to illustrate the relatively high rate of minor complications following these procedures, which presumably is amenable to the learning curve. The major complication rate is low; however, some complications, including violation of the abdominal cavity and death – although rare – warrant serious attention.

### Alternative bearing surfaces used in total hip arthroplasty in young patients

■ The holy grail of hip arthroplasty and the development of orthopaedic implants is the everlasting bearing surface. Although this is irrelevant for the majority of patients (well into their eighth decade by the time they get their arthroplasty), for a proportion of young, high-demand patients, the bearing surface couple is extremely important. The health-economic, societal, and personal costs of avoiding one or more subsequent revision operations in patients who are in their 50s when they have their primary joint are clear. Although the joint registries are able to tell us the outcomes of our decisions, they cannot really tell us what decisions to make, as by their very nature they are full of selection biases. As such, there is still very much a place for randomized trials in arthroplasty such as this one from **Toronto (Canada)**.<sup>8</sup> The authors present an impressive ten-year follow-up of patients aged 18 to 65 years old who underwent total hip arthroplasty (THA) and were randomized to one of three bearing couples: cobalt-chromium (CoCr) femoral head with an ultra-high-molecular-weight polyethylene (UHMWPE), highly cross-linked polyethylene (XLPE), or ceramic-on-ceramic (CoC) bearing. There were 102 hips in 91 patients enrolled in the study and, impressively, there were results available at ten years for 97 of them. There were two revisions and

three patients were lost to follow-up. Outcomes were assessed using a validated radiological method for assessing wear within the prosthesis. Essentially, the XLPE and CoC groups demonstrated similar outcomes with linear wear of just 0.07 mm/year in the XLPE group. The UHMWPE group had relatively high wear rates and six patients with osteolysis visible at final follow-up. This article does highlight how successful the new generations of XLPE are with an equivalent performance to CoC at ten years. Although there are different side-effect profiles with each bearing surface, here at 360 we agree with the authors of this article that the evidence presented really does support the use of either CoC or XLPE in the young patient's hip.

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