Roundup360

Hip & Pelvis

X-ref ***For other Roundups in this issue that cross-reference with Hip & Pelvis see: Knee Roundup 4; Spine Roundup 6.***

Prosthetic joint infection – the longer-term view

Prosthetic joint infection (PJI) after total hip arthroplasty (THA) is one of the important postoperative complications and is devastating to patients. Many measures have been reported for prevention. Research and development has focused on everything from skin preparation to theatre ventilation, implant coatings, and antibiotic regimes. However, despite all of this expenditure of effort, money, and brain power there has been no difference in reported PJI incidence for 15 years. This important paper from **Hamilton (Ontario, Canada)** is a population-based cohort study.[1] The authors utilized the well-respected healthcare datasets from Ontario, which are linked healthcare provider datasets. They were able to include all primary THAs and then undertook proportional hazards modelling to estimate the hazards ratios for surgical and patient factors on the risk of developing PJI. This paper draws on a large dataset of 100,674 patients all aged over 55 years who underwent primary THA for osteoarthritis during the study period. In terms of risk factors, the authors established that on a background of overall risk for infection of 1.44% by 15 years of follow-up, the important covariates that were associated with the development of PJI during the 15 years were male sex (hazard ratio (HR) 1.43), diabetes mellitus (HR 1.51) discharged to convalescent care (HR 1.36). There were two significant insights given in this paper that are not necessarily new observations but have not been directly reported previously. The first is the distribution of infected cases. The majority (62%) occurred within the first 24 months following implantation and just 2% occurred after ten years. The second is that the rates of infection have not changed in the 15-year study period leaving incidence rates essentially flat for a decade and a half. This paper informs joint surgeons that it is important to note that there is no breakthrough PJI preventive measure other than the conventional basic measures reported several decades ago.

Surgical approach and major surgical complications

The most controversial topics in total hip arthroplasty (THA) are probably whether there is a role for computer navigation in aiding better implant placement and what surgical approach to use. Implant design has changed little in the last ten to 20 years. Of the two topics, surgical approach is probably the most controversial being the subject of many a debate at various meetings around the world, and one that seems not to want to go away as new approaches and refinements of older approaches come and go. The lateral and posterior approaches are the most popular, allowing for excellent visualization of the acetabulum and femur and the added advantage that both approaches are extensile. However, they also have well documented potential disadvantages (either perceived or actual), which include a Trendelenburg gate due to a superior gluteal nerve palsy following the lateral approach and a higher dislocation rate following the posterior approach certainly historically. The anterior approach has seen a resurgence in popularity, and has the advantage of exploiting a natural pane between muscles, lending it a theoretical advantage of less pain and a quicker recovery. On the other hand, some reports in the literature have suggested higher complication rates such as nerve injuries, undersizing of the femoral stem and femoral fractures, and most recognize there is a significant learning curve.

To date, a lot of the evidence in the literature has been centred on 'expert' opinions, case series, small trials, and systematic reviews of limited literature. Despite this, there has been considerable publicity about the potential benefits of the direct anterior approach and its widespread adoption, especially in the USA having increased from 12% in 2009 to 40% in 2018. The authors of this study report on one of the largest retrospective cohort studies to date of consecutive patients who had undergone THA in **Toronto (Ontario, Canada)**, where the approach had been recorded as well as their outcomes.[2] Of the 30,098 patients with a mean age of 67 years, 2,995 (10%) underwent an anterior approach, 21,248 (70%) the lateral approach, and 5,855 (20%) the posterior approach by one of 298 surgeons in one of 73 hospitals. Those undergoing the anterior approach were younger (mean age 65 years compared to 67 years), had a lower body mass index, fewer were diabetic and hypertensive, and had their surgery performed by higher volume surgeons. Before matching, patients who had their THA via an anterior approach had a significantly higher risk of a major surgical complication within one year compared to the other two approaches. After matching, patients who underwent an anterior approach were twice as likely to have a major surgical complication. Those who had an anterior approach were more at risk of deep infection that required surgery, dislocation requiring a closed or open complication, and revision arthroplasty. In addition,

the surgery took longer but they did have a significantly shorter length of stay. There was no difference in terms of unplanned presentation to the emergency department or readmission to hospital. The authors postulated some suggestions for the increase in deep infection following the anterior approach, including location of the incision, use of fluoroscopy intraoperatively, and longer duration of surgery. The higher dislocation rate following the anterior approach identified in this study could be due to the significant capsular releases needed to deliver the opening of the femoral canal into the wound so that it can be accessed for canal preparation and stem insertion. Alternatively, the hips could dislocate as patients are advised postoperatively that they do not need to adhere to any hip precautions. With the anterior approach, difficulties encountered in exposing the femur may lead to femoral component malposition and undersizing, as well as femoral fracture. However, the proponents of the anterior approach have suggested that these difficulties can be overcome once the surgeon has passed through the learning curve. To date, a significant number of studies reviewing the anterior approach have been published from specialized centres, with experienced surgeons performing the surgery with favourable outcomes. However, the authors point out that in this study the surgeons who elected to perform the anterior approach were high-volume surgeons. Therefore, such an argument could not be levied at their data that the anterior approach technique was being performed by inexperienced low-volume surgeons. This contemporary study is particularly notable because of the large number of patients involved utilizing current surgical techniques. Thankfully, the risk of a major surgical complication using any one of the surgical techniques was small. The authors argued that previous studies were unable to detect any significant differences in complications between the techniques as they were not adequately powered because of their small numbers. Previous studies have shown that patients who undergo the anterior approach have a shorter length of stay, which was also demonstrated in this study. However, the patients who underwent the anterior approach in this study were younger, healthier undoubtedly more physically active prior to their surgery and possibly more motivated to go home earlier. One notable omission in this study was no record of the incidence of meralgia paraesthetica and periprosthetic fracture, which have both been shown to be higher with the anterior approach. What is becoming clear, not from just the present study but the dizzying array of other studies on the topic, is that it is not an easy technique to master and is associated with higher complication rates. There may be short-term advantages with the technique, but there are a number of confounding factors, such as patients' young age and possibly that patients who have undergone an anterior approach are more motivated, having been told that it is muscle sparing and that they do not need to adhere to any hip precautions. Should posterior or lateral approach surgeons be tempted to adopt the anterior approach, a formal period of training with a recognized expert is strongly encouraged. Otherwise, it will be the patients who will ultimately suffer should and if complications occur.

Patients with modular-neck total hip arthroplasty: a brief five-year follow-up study

Modular neck femoral stems have previously been popular offering a number of options in terms of offset, leg length, and anteversion. However, this design has run into its own problems, including fracture, metal corrosion related to the interface between the titanium stem, and cobalt-chromium neck. The general view within the community is that the addition of a second taper junction has been a retrograde step. The adverse local tissue reaction (ALTR) to the metal debris has been widely documented in the medical literature. This has led to a number of modular neck-stems being voluntarily recalled. The authors of this study have previously published their two-year follow-up; in this paper they publish their results at a mean of five-year follow-up. A total of 215 hips in 202 patients who had a total hip arthroplasty (THA) with the ABG II Modular stem (Stryker, Kalamazoo, Michigan, USA) in **Philadelphia (Pennsylvania, USA)** were included in the study.[3] The ABG II proximally-coated, uncemented titanium stem with a cobalt-chromium modular neck were reviewed. However, this stem has subsequently been recalled. The majority of patients had the direct anterior approach with the remaining having the direct lateral approach. Patients were divided into three groups according to their symptoms: typical symptoms from ALTR (groin pain ± local swelling), atypical pain (buttock, trochanteric and lateral thigh pain), and asymptomatic. The mean follow-up was 60.1 months. Following some justifiable exclusions, a total of 186 hips in 175 patients were reviewed in this study. Of these, 103 hips were asymptomatic (55.4%), 42 hips (22.6%) had atypical pain possibly related to issues other than the hip, and 41 patients (22%) had symptoms typical of an ALTR. All patients in the typical pain group were revised and there was evidence of corrosion at the neck-stem interface in all cases. In those where serum cobalt and chromium ion levels had been taken, the levels were significantly higher on average comparing the revision group to the other two groups. The cobalt ion levels appeared to increase with time following the index operation, and the increase in cobalt ion levels was largest in those patients that had revision surgery. MRI findings suggested that the presence of a fluid collection and mass-like lesion were potentially a warning sign that may indicate the likely development of symptoms in patients who were asymptomatic or had atypical symptoms not attributed to the hip at the time of the scan. The results also suggested that increased offset may lead to a higher chance of revision surgery. The survival rate using the Kaplan-Meier method was 87% at three years, and 72% seven years postoperatively using revision THA for neck stem corrosion as the endpoint. This stem design has long since fallen out of favour, but a significant number were implanted and there are a number of patients who require careful follow-up to ensure that they are appropriately managed. The findings of this study help inform how such patients should be followed up. The revision rate appears to increase with time, cobalt levels appear to increase, and imaging results demonstrated an increase in abnormalities in patients with typical symptoms of ALTR. The majority of patients (56%) had revision surgery due to neck stem corrosion within the first three years, but a significant number required revision after four years, necessitating careful long-term follow-up. The authors could not identify a cut off for serum cobalt ion or chromium ion levels that would lead to revision surgery. Therefore, similar to previous studies serum cobalt and chromium ions cannot be relied upon as the only indicator to determine whether to revise a hip in femoral stems with modular necks. In addition, the authors recommended that based on their findings and those of others, that a normal MRI or ultrasound should not preclude revision surgery in the presence of typical symptoms of corrosion. For this reason, advanced imaging such as MRI or ultrasound is not a useful screening tool. However, a careful clinical history is a much

better tool for determining whether stem-neck corrosion is likely. From this very helpful study, it is clear that patients' clinical symptoms are the most important feature in deciding whether to revise a femoral stem with a modular neck. The new onset of anterior groin pain in a previously asymptomatic and happy patient should be treated with significant suspicion. Careful clinical follow-up is essential in this patient group.

Time to block: early regional anaesthesia improves pain control in geriatric hip fractures X-ref

Pain control in patients who have sustained a hip fracture is an important consideration. Inadequate pain control leads to worse outcomes with increased rates of delirium and a longer length of stay. Opioids are often the default analgesia in this patient group, but are not without their complications; specifically there is a high rate of postoperative delirium. Hence opioid alternatives are important to consider. Fascia iliaca peripheral nerve blocks (FIBs) are gaining in popularity as they provide an anaesthetizing effect over the proximal thigh, reducing preoperative and postoperative pain and opioid use. While there is already evidence to support FIBs in patients who have sustained a hip fracture, this is the first study to review the timing of the FIB, the effect on opioid use, and pain control. For the purposes of this study, the time to block (TTB) is the time between arrival at the emergency department and siting of the block. This study from **Los Angeles (California, USA)** aimed to establish if TTB has an effect on the efficacy of the analgesia.[4] There were a number of important exclusion criteria which included delirium, multiple fractures, an atypical or pathological fracture, and a history of chronic opioid use, but patients with dementia were included. FIBs were performed by experienced anaesthetists using US guidance. Successful placement was confirmed using an alcohol cold-sensation test. Blocks were either a single shot or a continuous infusion via a nerve catheter which was then left in place. Bupivacaine was used in all cases and in combination with adrenaline for the single-shot block. Of the 136 patients who received a block, 107 were eligible for inclusion in the study with a mean age of 83.3 years. Unsurprisingly, those patients who had a longer TTB required a larger amount opioids preoperatively. There was also a correlation between longer TTB and higher opioid requirement on postoperative days one and two. Most opioids were consumed pre-operatively and pre-block. Longer time to surgery correlated with a higher opioid use post-block, between block placement, and the surgical procedure. For the purposes of this study, patients were divided into two groups based on the median TTB. In all, 53 patients (49.5%) received the block within 8.5 hours (faster group). Patients in the faster group had a 63.7% decrease in the median pre-operative opioid consumption. Alternatively, for each one-hour increase in TTB, the authors estimated that patients would require 2.9% more in morphine milligram equivalents (MME). In addition, the longer time to surgery was also independently associated with a higher pre-operative MME, with a 0.9% increase in preoperative MME/additional hour to surgery. Postoperatively, the faster TTB group had a significantly lower mean pain score on day one but not on day two. They also had a significantly reduced median length of stay of four days compared with 5.5 days for the patients with a prolonged TTB. For each additional hour to block, the authors saw a 1.01% increase in length of stay and for each additional hour to the surgical procedure, and saw a 0.7% increase in the length of stay. This important prospective study highlights the value of providing adequate and timely analgesia to patients who have sustained a hip fracture. A fascia-iliaca block, if correctly placed, can significantly reduce the opioid requirement in these patients who are particularly susceptible to their side-effects. In addition, it can reduce the patients' pain postoperatively and can also have a positive impact on their length of stay, interestingly even more so than the delay to surgery. Time to block is an important parameter in managing patients who have sustained a hip fracture and should be placed by a suitably trained practitioner as soon as a hip fracture is confirmed. Not only is this kind to the patient, but can have significant and ongoing implications for the hip fracture pathway.

Nutritional optimization in large joint replacement X-ref

Over the past few years, we have started to understand malnourishment, malnutrition, metabolic syndromes, and body composition in a much more sensitive way than just body mass index. The link between nutritional status and outcomes following surgery of all varieties has also become well recognized. While much focus is on obesity in orthopaedic surgery, we were delighted to see this paper, the winner of the Chitranjan S. Ranawat Award from **Bridgeton (Missouri, USA)**, which examines nutritional status and outcomes.[5] The authors focus on those with low albumin, outcomes, and the potential to intervene with a nutritional intervention, focusing on the effects that their intervention may have on hospital length of stay, rates of readmission, and the total cost to the patients of an elective large joint replacement in patients with an established malnourished status. This is a data-driven, rather than intervention-driven, study and the authors utilized an extract of 4,733 patients, all of whom underwent large joint arthroplasty and had a pre-operative albumin measurement. Overall, 543 patients (11.5%) were malnourished (defined as an albumin < 3.4 g/l). In a single of the five study centres, a nutritional intervention programme, which consisted of a high protein, anti-inflammatory diet, was instituted for all patients undergoing elective hip and knee arthroplasties. In terms of the outcomes of interest, the study team established that malnourished patients receiving the nutritional intervention had shorter length of stay, lower hospitalization spell charges, and lower super spell charges. The authors also undertook a confounder analysis, although it was somewhat limited with adjustment for age, anaemia, diabetes, and obesity.

Infection in the direct anterior approach

Complementing the previous study from Canada evaluating the outcomes of the direct anterior approach in a large healthcare provider dataset, this study from **New York (New York, USA)** takes a direct look at outcomes from the direct anterior approach in terms of infection rates.[6] The authors used an impressive single institution series of 6,086 patients undertaken over a three-year period, which provides greater precision but less generalizability than the Canadian paper. Retrospective data was collected pertaining to age, sex, body mass index (BMI), medical comorbidities, surgical approach, and outcomes in terms of deep periprosthetic infection. The cohort was representative with a male:female ratio of 50:50, a mean age of 63 years, and a mean BMI of 28.8 kg/m^2. Overall, 1,985 patients had a direct anterior approach

and 4,101 other approaches. The authors split the analysis into two time periods due to changes in the infection prevention protocols and, as such, analyzed 2013/14 and 2015/16 separately. The overall rate of infection was low, with 0.82% of patients (50/6,086) suffering deep infection during the study period. However, similarly to the Canadian paper, there was a difference in infection rate which favoured other approaches. The deep infection rate was 1.22% in the anterior approach group, significantly higher than the other approaches (0.63%). Once confounders had been taken into account, the odds ratio for the anterior approach was 2.2 over the study period. With two different methodologies in well-conducted studies coming to broadly similar results, it is hard to ignore this finding that the anterior approach appears to be associated with a roughly double risk of periprosthetic infection than other approaches. It is not clear if this is due to technical difficulties, the location of the incision or the longer operative time. However, at the very least patients should be counselled that by going for the anterior approach they will be exposing themselves to a higher rate of infection than other approaches likely offer.

Periprosthetic fracture in femoral neck fixation

All surgeons will recall being taught how best to position screws in order to achieve optimal fixation, while still managing to avoid complications. It has also been taught to generations of surgeons that position of the inferior screw below the level of the lesser trochanter on the lateral cortex results in stress concentration within the femur can result in periprosthetic fracture. This team from **San Diego (California, USA)** noted that despite the case reports and orthopaedic tradition suggesting this is a problem, there is no supportive biomechanical data.[7] The authors decided to fill this evidence gap with a saw bones based study.Their study set out to answer the question, "Is there an increased risk of subtrochanteric femur when the distal-most screw is started distal to the lesser trochanter?" And secondly, "Does the screw starting point position affect load to failure?" The model the team designed used osteoporotic sawbones femora with a varied inferior screw entry point to be either proximal to, at, or distal to the level of the lesser trochanter. The constructs were then loaded to failure and results compared. The investigators established that a screw start point distal to the lesser trochanter risked both periprosthetic fracture and reduced load to failure (normal density subset 13,502 ± 1,980 N vs 14,675 ± 1,528 N; osteoporotic subset 8,946 ± 1,509 N vs 10,026 ± 1,256 N). This paper is not exactly revolutionary, and some would say not necessarily even evolutionary. However, here at *360* we think it does add a certain level of understanding as to the implications of a poor screw position both in terms of reducing load to failure of the whole screw construct, and risking periprosthetic fracture in osteoporotic bone.

Lipped polyethylene liners – good, bad, or ugly?

Lipped polyethylene liners have become commonplace in both cemented and uncemented acetabular components. By increasing coverage, the idea is that the increased lip coverage is positioned to cover the least stable position. Whilst there is widespread use of lipped liners—particularly in uncemented settings—the practice is without doubt controversial. The authors of this paper from **Palmerston North (New Zealand)** utilized the New Zealand Joint Registry (NZJR) in an attempt to answer the question, "Does the potential for increased stability offset the risks of revision secondary to impingement and associated wear?"[8] In what is a fairly straightforward registry study, the authors established Kaplan-Meier survival rates, the rates of revisions for dislocation between neutral and lipped PE liners, and the revision rates for aseptic loosening for the four most commonly used modular uncemented cups. Overall, the results are based on just over 31,000 total hip arthroplasties available on the NZJR who had implantation of the four most commonly uncemented acetabular components. Of the results, 20,240 patients received a lipped liner and 11,007 received a standard acetabular liner. While the authors report some minor differences in indications and sex, these were essentially clinically irrelevant differences but statistically significant due to the large group sizes. In terms of revision-free survival, the authors report the lipped liners as being superiors with a hazard ratio of 1.17 after controlling for age, sex, approach, and head size. The authors have comprehensively demonstrated that the use of a lipped liner does not result in a higher rate due to the occurrence of aseptic loosening in patients who undergo primary total hip arthroplasty. They have also confirmed the previous observations that report lipped polyethylene liners to be associated with lower rates of dislocation and lower all-cause revision.

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