

X-ref For other Roundups in this issue that cross-reference with Knee see: *Research Roundup 1*

Can the ACL really be primarily repaired?

■ Primary repair of ruptured anterior cruciate ligaments (ACL) is not new and has been around for over 100 years. ACL repair was the most common treatment for ACL injuries in the early 1990s, although it later fell out of favour because outcomes tended to deteriorate in the mid to long term. However, we are now seeing a resurgence in the interest in primary ACL repair. With the advent of, and enthusiasm for, arthroscopic ACL reconstruction in the mid to late 1990s, ACL repair was often forgotten. Yet there is a wealth of historic papers reporting their outcomes and highlighting the fact that patients with proximal tears and excellent quality of tissues may indeed do well. Better outcomes following repair are associated with proximal tears compared with patients with mid-substance tears, and more recent studies have elected to revisit whether tear location was important in the outcomes following ACL repair. The authors of this systematic review from **New York, (USA)** intended to collate all of the historical literature to see if there was sufficient support in repairing certain ACL ruptures.¹ The authors identified a total of 29 studies, which reported the outcomes of 1457 patients. In this cohort, 72% were proximal tears, 23% were mid-substance tears, and 5% were distal tears. The mean age of the patient was 30 years (11 to 72 years) and the mean follow-up was 3.6 years (0.5 to 13 years). Despite the limitations of this study, there are some useful observations and we applaud the authors. As ACL repair is starting to regain traction within the wider orthopaedic community, it is refreshing to be reminded of the

lessons of the past before we have to relearn them. Outcomes following proximal ACL repair were excellent at short- to mid-term follow-up. While there was a trend towards a better anterior drawer examination, reduced failure rate and better satisfaction rates in studies with proximal tears, this did not reach statistical significance. Interestingly, there were no comparison studies of proximal *versus* mid-substance repairs that the authors could identify, and they observed that the general quality of the studies reviewed was poor. However, there does appear to be sufficient evidence to support the current renewed interest in ACL repair, specifically for more proximal injuries. This could be explained by the vascularity of the ACL, as it gets most of its blood supply via a synovial membrane covering the ACL. The middle genicular artery is the main contributory vessel but the distal end is also vascularized by the inferior genicular artery. Previous studies have identified that the richest blood supply is found in the proximal part of the ACL and that there is an area of avascularity at the junction of the middle and distal one-thirds, which is the watershed area between the middle and inferior genicular arteries. This may explain why, on occasion at arthroscopy, it is noted that the proximal ACL ruptures can spontaneously heal or 'reattach' to the femoral condyle. While the majority of ACL ruptures are mid-substance tears (50% to 60%), it does appear that there is a subgroup of patients who may benefit from a repair rather than a reconstruction. The historical papers quoted in this study all involved open ACL repairs rather than arthroscopic repairs. More recent studies using arthroscopic techniques have also supported the ACL repair but the numbers are small. Certainly, further study is warranted not only of the location of the tear and its

bearing on outcome, but also of the timing of the repair.

Surgeon preferences, posterior-stabilized total knee arthroplasty and survival

■ Whether you are a surgeon who routinely performs a posterior-stabilized (PS) total knee arthroplasty (TKA) or a cruciate-retaining (CR) TKA, the outcomes have, for 20 years, been very reliable. Those who resect the posterior cruciate ligament (PCL) and perform a PS TKA argue that the design compensates kinematically for the ligament's absence. Those who preserve the PCL perform a CR TKA. Unless the PCL is already deficient, or a large coronal plane deformity is being corrected, the decision to sacrifice the PCL or preserve it is based on surgeon preference. While PS TKAs have a higher revision risk when compared with CR TKAs in national and multinational registry data, randomized control trials comparing the two designs have not shown a difference in survivorship. The authors postulate that this may be due to short follow-up or under-powered studies. Proponents of PS TKA argue that the differences in the joint registries may be due to a selection bias where PS TKAs are used in more complex cases. In addition, failing to resurface the patella in PS TKAs confers a higher revision risk than not resurfacing in CR TKAs. The authors of this study avoided a direct comparison between the two TKAs but aimed to perform an instrumental variable analysis based on surgeon preference for either of the two prostheses. From the **Australian Orthopaedic Association National Joint Registry**, a total of 63 416 primary TKAs undertaken by 138 surgeons were included in this analysis, and a total of 67% of surgeons exhibited a preference for the CR TKA.² At 13 years,

the cumulative revision rate was 5% for CR TKA, compared with 6% for the TKA PS cohort. The authors quoted a revision risk that was 45% higher for the PS TKA cohort for all causes; it was 93% higher for loosening or lysis and 51% higher for infection. This increased revision risk was only evident in male patients. The tibia-only revisions were four times greater for the PS TKA cohort compared with the CR TKA cohort. Those patients who were under 65 years of age and had a PS TKA were at greater risk of revision compared with the under-65 CR TKA cohort. Regardless of the type of polyethylene used, the PS TKA cohort had a higher revision risk compared with the CR TKA. Although the cause of this finding is still not known, the authors hypothesized that the higher revision risk in the PS TKA group, particularly in the younger patient, could be due to greater wear particle generation from the polyethylene post, leading to loosening or lysis. This very interesting study gave a completely different perspective on long-held discussions about whether one should retain or sacrifice the posterior cruciate ligament. The authors pointed out that previous comparison studies could certainly be accused of selection bias, and that this study, while not without its faults, did make some noteworthy observations.

Effect of obesity on pain and functional recovery following total knee arthroplasty

■ In the move towards rationing in the NHS and other large global healthcare providers, the issue of obesity just will not go away in arthritis surgery. The evidence is that weight loss reduces hip and knee pain without needing to resort to arthroplasty, and there is increasing evidence that obesity is associated with increased complications following surgery. The public perception

of obesity is somewhat like that of smoking – that it is a lifestyle choice and therefore discrimination within the healthcare system is more acceptable. While a debatable point, the obese patient in clinic with symptomatic significant arthritis is in just as much pain and is just as deserving as the non-obese patient. The question is, what is the best and most reliable treatment for an obese patient in pain? A further piece of the evidence puzzle caught our eye, here at 360, with this paper from **Boston, Massachusetts (USA)**, which asks the question: aside from those factors that have already been investigated (longevity and complications), what are the outcomes of total knee arthroplasty in terms of pain and functional scores in the obese patient?³ This is an area of literature that is surprisingly understudied. This study reports the outcomes of 633 patients stratified by body mass index (BMI) (19% were normal weight, 32% overweight, 27% were class I obese, 12% were class II obese, and 9% were class III obese). The study was designed to establish how the class of obesity affected the clinical outcomes of pain and function. The evaluation between functional outcomes and obesity was undertaken at three, six, and 24 months using a patient-reported outcome score, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Interestingly, at baseline the obese patients had poorer functional outcome scores; however, the improvement was better during the first three months following surgery. By the final 24-month follow-up, there was little difference between groups, with similar absolute improvement in outcomes.

Knee arthroscopy and long-term total knee arthroplasty outcomes and survivorship

■ In an era where knee arthroscopy is seen less favourably, this is a valuable research study of over 1000 total knee arthroplasties (TKA) performed

in the Mayo Clinic in **Rochester, Minnesota (USA)**, with the aim of establishing if there is an effect on the survival of knee arthroplasty if a previous arthroscopy has been performed. Although this topic has been investigated previously to some extent, the authors here offer a long-term follow-up on a large number of patients and, as such, this is currently the definitive paper on the topic.⁴ The paper concerns the outcomes of 1315 primary TKAs performed in 2003 and 2004. Outcomes reported were the ten-year Knee Society Score, survival, and postoperative or subsequent complications. Subgroup analysis was undertaken on the 160 patients who had undergone a pre-arthroplasty arthroscopy. The comparison was performed using a 2:1 matched cohort with 320 patients from the main study. Essentially, analysis of five-year complication-free survival (arthroscopy group 94.3% versus 95.3%) and ten-year loosening, revision, and reoperation were all similar in the arthroscopy and control groups. There were no real differences seen at all, and this paper shows conclusively that revision rates after a previous arthroscopy are no different to when no arthroscopy has been performed in TKA patients. Finally, there is some good news for the arthroscopists in our community. Although we are still struggling to demonstrate the efficacy of arthroscopy in many diagnoses in terms of the longer-term picture, undertaking an arthroscopy does not muddy the waters for the eventual knee arthroplasty in patients with degenerative arthrosis of the knee.

Unhappy knees: what does the literature say?

■ This interesting paper from **Denton, Texas (USA)** and various institutions in **Western Australia (Australia)** sought to determine where we stand with patient satisfaction rates following total knee arthroplasty (TKA) and, perhaps most importantly, what drives dissatisfaction.⁵ The authors

undertook a wide-ranging literature review and included papers where the study aimed to investigate dissatisfaction following either primary or revision TKA. As with all systematic reviews of this nature, the review is narrative; however, the authors undertook a form of the meta-analysis and divided studies into those that reported factors in the socioeconomic, preoperative, intraoperative, and postoperative domains. The authors were able to draw some modest conclusions from what data there are available. Their analysis suggests that dissatisfaction is driven by expectations, proportionate pre- to postoperative improvement in function, and pain relief. There were few associations found between socioeconomic and surgical factors. Although the authors were not able to draw any solid conclusions, they were able to establish that there are patterns to dissatisfaction. This is an interesting way to look at the available research, and we hope that the authors will act on their own recommendation that “further research [is] needed to better quantify dissatisfaction, so that the causal links underpinning dissatisfaction can be more fully appreciated and strategies employed to target them”.

Prevention of lateral hinge fracture in opening wedge high tibial osteotomy

■ High tibial osteotomy (HTO) is a tried and tested approach to deal with isolated medial compartment osteoarthritis (OA) of the knee. It has had a somewhat chequered past with regard to popularity. Although HTO has a long history and reliably relieves medial compartment pain, it does adjust the mechanics of the knee joint, moving the physiological axis laterally to the anatomical axis. This has a number of potential ramifications, including when eventual knee arthroplasty is undertaken with difficulties associated with ligament balance. These concerns have resulted in the falling from favour



of the HTO in the early part of this century, with the unicompartmental knees becoming the ‘go to’ choice for medial compartment OA. However, the pendulum has now started to swing back with a resurgent interest in HTO, as it has become apparent that a unicompartmental knee may be a trickier revision than first thought, and certainly the longevity is not what was initially promised in the design surgeon series. As the spotlight returns to HTO, there has been renewed enthusiasm in how to undertake the procedure without risk of complications. The key to a successful opening wedge HTO is to maintain an intact lateral hinge in the correct plane, so as to correct just the coronal axis, and not introduce re- or procurvatum. One of the more difficult things to deal with is a fracture of the lateral hinge that results in an unstable metaphyseal fracture of the proximal tibia. Surgeons in **Komatsu (Japan)** have undertaken a review of 111 consecutive patients undergoing HTO to establish what the risk factors are for lateral hinge fracture.⁶ The study authors reviewed the multiplanar CT images and identified the position of the hinge based on their relationship to the proximal tibiofibular joint (PTFJ). In this series, a surprising one in five patients (n=22/111) sustained a lateral hinge fracture. In the 89 patients who underwent HTO without a lateral hinge fracture, 70 had hinges in the

zone within the PTFJ and lateral to the medial margin of the PTFJ. The authors proposed their own classification of 'hinge zone' and rather elegantly demonstrate that the position of the hinge as described by their classification is directly related to the actual risk of fracture.

Uncemented versus cemented total knee arthroplasty under the radiostereometric analysis spotlight

■ Total knee arthroplasty (TKA) is a slightly different beast, from the fixation perspective, to total hip arthroplasty. Knee prostheses are almost universally cemented, as there have been difficulties with the fixation of uncemented prostheses, particularly in the tibial baseplate where early loosening has plagued a number of uncemented designs. We were delighted to see this mid-term follow-up (five years) from **Hässleholm (Sweden)** of a randomized controlled trial (RCT) using radiostereometric analysis (RSA) of 60 patients randomized to either a cemented or peri-apatite-coated implant.⁷ The outcome of interest was component migration as measured by the RSA analysis. There was a single revision (in the cemented group) for ligament instability. The results themselves were fascinating. The authors identified a higher rate of component migration in the peri-apatite group at five years' follow-up. However, for the most part, this was occurring in the first three months. After this, the cemented components had a significantly higher rate of migration.

These two different migration patterns – subsidence then stabilization in the uncemented group, but continuous migration in the cemented group – is an important difference between the two methods. Overall, the migration in both groups was rather small (0.62 mm at five years in the cemented component versus 0.97 mm in the uncemented component). This paper essentially reported the results of a five-year randomized controlled trial showing no difference in outcomes, using uncemented versus cemented total knee arthroplasties. An important point to remember when interpreting the results of this study is that the manufacturer (Stryker, Mahwah, New Jersey) has subsequently changed their tibial baseplate, so the relevance of this study to their implant is not as straightforward as perhaps they might have you believe.

Preoperative vitamin D periprosthetic joint infection X-ref

■ Treatment of periprosthetic joint infection (PJI) is, of course, a perennial cause of angst for the orthopaedic arthroplasty surgeon, as is any musculoskeletal infection. The difficulty with treatment of these conditions is the lack of efficacy for most antibiotics, either due to reduced bioavailability in the musculoskeletal tissue, or the effects of biofilm formation. When antibiotics are not effective, the surgeon must rely on debridement and local delivery of antibiotics to treat musculoskeletal infection. Aside from the traditional

antibiotics, there are some potential adjuncts that might aid matters, and this paper from **California (USA)** caught our eye.⁸ It is a basic science paper using a mouse model of periprosthetic infection and the authors sought to determine whether supplementation of 25-hydroxyvitamin D would improve outcomes of surgical treatment for PJI. The mouse model used (lys-EGFP) was modified to include fluorescent neutrophils. A cohort of 60 mice were fed either a vitamin D₃-sufficient (n=20) or vitamin D₃-deficient (n=40) diet for six weeks, after which half of the deficient mice (n=20) were 'rescued' with one intraperitoneal dose three days prior to surgery. The surgical model included insertion of a stainless-steel implant into the knee joint and simultaneous contamination with a bioluminescent strain of *Staphylococcus aureus* culture. Outcomes were assessed *in vivo* with bacterial burden and neutrophil migration monitored prior to killing the mice at day 21. Essentially, this paper demonstrates that vitamin D deficiency does contribute to post-operative infection in this model with greater bacterial bioluminescence and neutrophil fluorescence. This also translated into higher colony-forming unit (CFU) counts from the joint and implant-associated tissue. The 'rescue' group had lower rates of neutrophil infiltration and lower bacterial counts than the deficient group. This paper is interesting in that it further highlights the importance of vitamin D levels, and also questions whether preoperative supplementation could improve outcomes in

both primary joint arthroplasty and revision for infection.

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Foot & Ankle

X-ref For other Roundups in this issue that cross-reference with Foot & Ankle see: **Knee Roundup 8**

Complications following ankle arthrodesis versus ankle arthroplasty

■ The comparison between arthrodesis and arthroplasty of

the ankle continues. There is now ample research comparing the functional outcomes of the two, although the large randomized trials are ongoing and have yet to report. The state of play for most mainstream surgeons is that in selected patients who do not have

too much deformity and whose functional demands are not too high, ankle arthroplasty can be considered. In the other patients who are young, are high-demand, or have significant preoperative deformity or bone loss, the majority of surgeons favour ankle

arthrodesis. One of the things that does steer decision-making in conditions such as ankle arthritis, where there are two potentially effective treatments, is the side-effect and complication profile. This study from **Charlotte, North Carolina (USA)** sets out to