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Knee

X-ref ***For other Roundups in this issue that cross-reference with Knee see: Hip & Pelvis Roundups 2 & 7; Research Roundups 1, 3 & 5.***

Fixed- *versus* mobile-bearing total knee arthroplasty

The mobile-bearing total knee arthroplasty (TKA) is an attractive prospect that offers the combination of lower wear rates, by decoupling sliding and rotating bearings, and the potential benefit of a more anatomical flexion arc. The promise of improved functional scores and lower revision rates in the longer term has been a draw for surgeons the world over, with many of these prostheses implanted. Whilst the early indications from joint simulator studies were of lower wear rates, to date these indications have not translated to a clear clinical research base supporting either fixed- or mobile-bearing TKA in routine use. We were delighted to read this randomized trial from **Rochester, Minnesota (USA)**, which reports the outcomes of fixed- and mobile-bearing knee arthroplasties out to ten years of follow-up.[1] The authors recruited 240 patients to their randomized controlled trial and patients were randomized to one of three tibial component designs: an all-polyethylene fixed-bearing component, a modular metal-backed fixed-bearing component, or a mobile-bearing tibial component. Patients were reviewed at a median follow-up of ten years, and outcomes were assessed based on longevity, apparent range of movement, and functional scores at ten years of follow-up. There was no difference in durability of the knee arthoplasties, as measured by survivorship free of revision for any reason, nor in mean measured maximal range of movement at ten years. From the clinical outcomes perspective, there was also no difference in functional scores, as measured by Knee Society (KS) function scores, nor the prevalence of radiologically observed patellar tilt, which is a surrogate marker for rotational abnormality.

Robot-assisted total knee arthroplasty

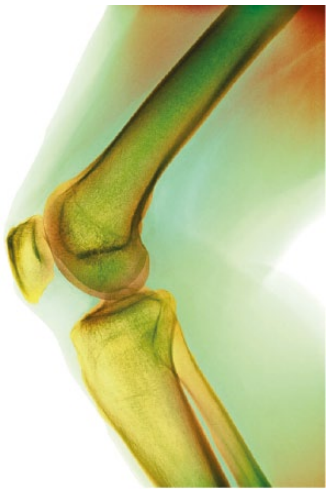
There is perhaps nothing more fashionable and unproven in our discipline at present than robot-assisted surgery. The potential benefits of robot-assisted surgery are obvious, with its facility for fine precision, access in tight spaces, and high-level investment from major medical device companies. Thus far, robotic-assisted surgery has found its niche mostly in low rectal surgery and urology. There are, however, a range of potential applications in orthopaedics, and most research and clinical focus in this area has been on joint arthroplasty. The current study from **London (UK)** aimed to assess the early postoperative period in patients who undertook conventional jig-based total knee arthroplasty (TKA) and those who had a robotic-arm assisted TKA.[2] The authors of this study report on the outcomes of 40 consecutive patients undergoing conventional jig-based TKA followed by 40 consecutive patients receiving robotic-arm assisted TKA. This single-surgeon series had a standardized medial parapatellar approach with use of identical implant designs and postoperative inpatient rehabilitation. The robotic-arm assisted TKA group had reduced postoperative pain, decreased analgesia requirements, reduction in postoperative haemoglobin levels, shorter time to straight leg raise, decreased physiotherapy requirement, and improved maximum knee flexion at discharge. There was a marked difference in time to discharge (77 hours *vs* 105 hours), which carries with it associated capacity and cost benefits. Although this is a short-term follow-up of a small number of patients, there are clearly some exciting data presented here. Whilst this series does not prove any long-term benefits, a larger series with longer follow-up could assess the apparent hospital benefits and the potential for a sustained longer-term improvement.

How fast should a total knee arthroplasty be performed?

In this day and age, in which the costs of health care are subjected to ever greater scrutiny, there has been much focus on increasing the productivity of expensive resources such as theatres. Some strategies revolve around parallel lists, several anaesthetists, or simply cutting the operative time itself. While a shorter operative time reduces the risks of infection and blood loss, reducing care taken at critical points will not help maintain safety or optimize the patient's result. Using the example of knee arthroplasty in a large sample of patients, this paper from **Cleveland, Ohio (USA)** set out to examine a very large number of cases.[3] The authors used registry data to analyze the outcomes of 140 199 total knee arthroplasties. Their data revolved around the National Surgical Quality Improvement Program (NSQIP) data and attempted to relate the effect of operative time (skin-to-skin) on various medical and surgical complications within 30 days of surgery. The authors utilized a multivariable logistic regression model with spline regression models to attempt to adjust for the effects of any covariates. The authors report that, in their study, longer operative times were associated with higher risks of readmission, reoperation, surgical site infection, wound dehiscence, and transfusion. There was a steady increase in the likelihood of complications; however, the authors established a slightly pronounced increase when the operative time was longer than 80 minutes. Whilst this is an interesting observational study, there are some dangers in taking the result truly at face value. Although the increased operative time is associated with these complications due to the way the data were collected, it is not possible to say if the increased time was as a result of slow surgery or whether it was due to more complex surgery (such as bone loss or fixed flexion deformity), which in itself is associated with a higher complication rate.

Prepatellar fat thickness and infection risk after total knee arthroplasty

Inherently, we all know that both comorbidity and body habitus are associated with specific complication profiles, and experienced surgeons are able to work out which patients are likely to do well and which are not. However, pinning down which factors lead a surgeon to know subconsciously that the patient is not likely to do well, or is likely to suffer a complication, is not always that easy. We were delighted to see this innovative study from **Fort Worth, Texas (USA)**, in which the authors hypothesized that a ratio of the comparative amount of tissue in front of the patella could be used to establish how much fat there is at the front of the knee.[4] They then went on to design a study to test the score and to establish if there was a relationship between their score and risk of infection. The study is retrospective in design and the authors reviewed the records and radiographs of 572 patients who underwent primary total knee arthroplasty (TKA) at their institution over a four-year period. The method they developed with this study, and to a certain extent validated, was the prepatellar fat thickness ratio (PFTR), which is measured on the lateral radiograph. The authors then went on to assess the PFTR's ability to predict the risk of developing surgical site infection following TKA. In this group of over 500 patients, the take-home message is that the PFTR was a better predictor of surgical site infection than body mass index. This paper adds, in our opinion here at *360*, significantly to what is already known about body habitus and complications. Whilst body mass index is an easy measure to establish, it is known to be a rather poor marker of metabolic status, and for this reason there have been difficulties getting a straight answer about the importance of obesity in terms of post-arthroplasty complications. As the research is getting smarter,



we will see more and more of these sorts of studies that investigate local body habitus, more that look at metabolic measures as a marker of obesity, and other methods, such as CT body density measures and soft-tissue dual-energy X-ray absorptiometry, to quantify more exactly what is going on with patients' body measurements.

ACL reconstruction: is it always required?

This article aims to evaluate the benefit or otherwise of anterior cruciate ligament (ACL) reconstruction. The technique has come under increasing pressure over the past few years, with more and more high-quality studies taking aim at ACL reconstruction, not all of which have demonstrated the benefit for our patients over conservative management that, as surgeons, we might all hope to see. This paper from **Newark, Delaware (USA)** adds some important corroborative information to the bigger picture of ACL reconstruction.[5] The authors focus on the five-year outcomes of patients with and without ACL reconstruction who have all followed a progressive criterion-based rehabilitation protocol. They assessed outcomes in terms of long-term strength and performance measures, and the study design was that of a prospective cohort study. The authors identified 144 patients with an acute ACL rupture, of whom 105 went on to complete a comprehensive functional assessment, including measures of strength and control (quadriceps strength, single-legged hop), along with patient-reported outcomes. At the final five-year follow-up, the ACL reconstruction cohort did not outperform those who underwent rehabilitation alone in terms of strength measures (quadriceps strength, single-legged hop test). There were also no differences in reported activity level, pain, activities of daily living, or knee-related quality of life. However, operative ACL reconstruction did yield a significant improvement in global ratings of knee function and lower anxiety levels. This is a realistic paper, which, whilst not a randomized trial, does represent high-quality prospective data. The inclusion of a global knee function and anxiety/fear scores related to knee function, both of which favour ACL reconstruction, may give a basis for further trials.

Laboratory tests and two stages

The approval needle is fluctuating between the three options for infected joint arthroplasty: DAIR (debridement, antibiotics, implant retention), single-stage revision, and two-stage revision. It seems likely that there is no 'best' treatment for infected joint arthroplasty, and that the choice of revision procedure should be a careful one, based on microbiology, laboratory, clinical, and implant information. The decision-making process between these three is important, as are the predictors of success of the two-stage procedure. There are some predictors of failure after two-stage exchange arthroplasty, and the current state of play would suggest that laboratory tests are the most useful, as they are obtained in each case. This paper from **Boston, Massachusetts (USA)** has gone on to evaluate whether straightforward laboratory tests are able to predict the longer-term outcomes of prosthetic joint infection.[6] The authors based their study on the results of 205 patients across four institutions, all undergoing two-stage revision. The surgical, patient demographic, and laboratory data were collated in each case with the intention of establishing the diagnostic accuracy of each laboratory test in predicting successful treatment. The authors had access to serum erythrocyte sedimentation rate (ESR), serum C-reactive protein (CRP) level, synovial fluid white blood-cell (WBC) count and neutrophil percentage, synovial fluid with or without tissue culture, and Gram stain. In this very large series, the overall success rate of two-stage exchange was 72.7%. As raw predictors, the ESR, synovial fluid WBC count, and neutrophil percentage were found to be higher in recurrent infection. The overall receiver operating characteristic curve analysis suggested a threshold of $>60\,000$ cells/μl for synovial fluid WBC count (relative risk (RR) 2.5), $>92\%$ for synovial fluid WBC neutrophil percentage (RR 2.0), and >99 mm/hr for serum ESR (RR 1.8). This study indicates that elevated synovial WBC, neutrophil percentage, and serum ESR may lead to increased failure. In these patients, repeat spacer exchange or additional antibiotic treatment may be beneficial, along with the usual caveats about successfully counselling the patient. It would seem to make sense that, in those patients with these poor predictors, two-stage revision should not be undertaken until a firm tissue diagnosis has been reached (through either aspiration or open biopsy) to ensure the best possible perioperative antibiotic cover.

Adductor canal block *versus* periarticular bupivacaine injection for total knee arthroplasty

Many patients struggle at times to manage the pain caused by total knee arthroplasty (TKA) successfully, which can result in considerable difficulty doing their postoperative

rehabilitation and can delay their discharge from hospital. To this end, considerable research has been carried out to establish the most beneficial pain management regimen. A particular focus has been placed on a multimodal protocol with the aims of a more rapid functional recovery and reduced length of hospital inpatient stay, whilst minimizing the side effects of the painkillers. Regional anaesthesia has made a considerable difference to the management of postoperative pain, particularly after TKA. Femoral nerve blocks have been shown to make a positive difference but, in more recent years, an adductor canal block (ACB) has become more popular. The ACB has the added benefit of maintaining a sensory block for good pain control but avoiding, or at least minimizing, a motor block to the quadriceps. A denser motor block is typically seen following a more proximal femoral nerve block compared with an adductor canal block. Whilst regional nerve blocks have been gaining in popularity, so has high-volume local anaesthetic infiltration performed intraoperatively. Typically, this is performed with bupivacaine, either in conjunction with regional anaesthesia or on its own. By performing periarticular anaesthetic injection (PAI) in isolation, enthusiasts suggest that this avoids the risks of quadriceps weakness whilst acting on the local sensory nerve endings, giving good pain relief. The authors of this very helpful study carried out a randomized controlled trial from **New York, New York (USA)** comparing the efficacy of ACB and PAI performed with bupivacaine in the management of postoperative pain following a TKA.[7] There were three groups to which the patients enrolled in the study were randomized: ACB alone, PAI alone, and a combination of PAI and ACB. Importantly, the PAI was performed with just 50 ml of 0.25% bupivacaine; 20 ml was injected into the posterior capsule and the remaining 30 ml was injected into the tissues around the medial collateral ligament, lateral collateral ligament, medial meniscal border, medial aspect of the capsule, lateral aspect of the capsule, quadriceps tendon, prepatellar tissues, and subcutaneous tissues. The results revealed that patients receiving ACB alone had significantly higher pain scores and required more opiates compared with those who received a combination of PAI and ACB. However, there was no significant difference in pain scores between the PAI group and the combination group, or between the ACB group and the PAI group. Interestingly, opioid consumption was noted to be significantly higher in the ACB group compared with the PAI group, as well as the combination group, on postoperative day 2. There was, however, no significant difference in daily opioid consumption between the PAI group and the combination group on any postoperative day. Excluding one patient who had a complication, the mean length of hospital stay was significantly longer in the ACB group compared with the combination group. In addition, those patients in the ACB group were less active than those in the PAI group, as well as those in the combination group. Despite some limitations, this study is otherwise well designed and adds further evidence to support the use of a combined approach or multimodal approach to achieve adequate analgesia postoperatively. Certainly, there appeared to be little evidence from this paper to use ACB alone but, surprisingly, the authors did not show a difference between PAI and a combination of PAI and ACB with regard to any particular outcome measure throughout the course of the study. The authors suggested that any benefits of a combination of PAI and ACB over PAI alone were likely to be small, although larger studies may discover a difference. Similar to previous studies, the authors highlighted the very real phenomenon of a rebound pain response occurring when regional anaesthesia wears off, which may be another reason why the ACB group did not do as well as the other groups. PAI is a simple technique, although correct infiltration is important to ensure that the volume of anaesthetic used is not only effective but also safe. ACB is a skilled procedure requiring considerable expertise, which not all anaesthetists are able to perform. On the basis of this study, there appears to be increasing support for isolated PAI.

Intramedullary alignment and coronal/sagittal alignment during total knee arthroplasty

Accuracy in component positioning is an essential part of performing a successful joint arthroplasty. In total knee arthroplasty (TKA), it is recommended that femoral and tibial components should be positioned less than 3° of varus or valgus malalignment to balance the forces through the polyethylene. Generally, the distal femoral cut is made perpendicular to the mechanical axis in the coronal plane. The valgus angle between the mechanical axis and the anatomical axis of the distal femur can be estimated using a full-length radiograph of the femur or a CT scan. An intramedullary (IM) rod attached to the distal femoral cutting block can then be used to adjust for the valgus angle with the aim of restoring the mechanical axis. The objective of this novel paper from **Fukuoka (Japan)** was to establish the result of a medial/lateral or anterior/posterior deviation of the IM rod in the femoral canal and its ability to influence the femoral component alignment.[8] The authors recruited 30 patients with varus knee deformities undergoing a TKA, all of whom had a preoperative CT scan to recreate a 3D image of the lower limb. Using a 3D computer simulation based on the CT, a virtual IM rod was deviated at maximum to touch each side of the intramedullary canal in the coronal and sagittal planes at a level of 20 cm proximally from the knee joint. The results of this study revealed that the mean mediolateral deviation in the coronal plane was just 0.8° in each direction (1.4° maximum) and the mean anteroposterior deviation in the sagittal plane was 1.1° in each direction on average (1.6° maximum). The change in thickness of the distal femoral bone cut was 0.58 mm and 0.53 mm with medial or lateral deviation of the IM rod. When performing the distal femoral bone cut in a TKA, there is always a possibility of a deviation away from the mechanical axis when using the IM rod. As a result, surgeons often confirm the femoral coronal alignment by the mediolateral difference of the thickness of the distal femoral cut. If the mediolateral difference is not what had been expected from the preoperative planning, then the rod needs reinserting in the correct direction or an adjustment needs to be made to the valgus angle setting so that the distal femoral cut is perpendicular to the mechanical axis. The authors of this study suggested that if an adjustment is made to the valgus setting rather than reinserting the rod, the adjustment would need to be no more than 1° of valgus angle and the change in thickness of the resultant distal bone cut would be 1 mm. In the sagittal plane, the maximum deviation from extension to flexion was 2.2°. As the anteroposterior dimension of the distal femur has previously been shown to be influenced by the sagittal alignment, any sagittal deviation of the IM rod could result in upsizing or downsizing of the femoral component. Whilst it is not always possible to obtain preoperative CT scans, radiographs taken with correct rotation are helpful and adequate preoperative planning can be performed. This paper highlighted the importance of preoperative planning in TKA and paying attention to the mediolateral difference in the distal femoral cut thickness. If it is not what you were expecting, then a simple adjustment of 1° valgus angle will restore the mechanical axis.

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Foot & Ankle

X-ref *For other Roundups in this issue that cross-reference with Foot & Ankle see: Hip & Pelvis Roundups 2 & 7; Knee Roundup 3; Research Roundup 1.*

How should we fix the Lisfranc fracture dislocation? X-ref

The optimal fixation technique for the Lisfranc fracture dislocation remains unclear. It is a universally accepted goal of treatment to achieve surgical stabilization of these injuries by anatomical reduction and stabilization of the disrupted tarsometatarsal joints (TMTJs). To achieve this, some surgeons prefer a bridge plating technique across the TMTJs, whilst others use a transarticular screw for joint stabilization, or undertake a primary fusion. Bridge plating has become increasingly popular over recent years. The benefit of minimizing additional joint surface damage that occurs when using transarticular screws is appealing to many, as is the perceived ability to achieve better reduction, particularly maintaining length. However, although there is biomechanical data supporting the use of dorsal plating methods, there is limited information available to compare the surgical outcome of dorsal plating and screws. In this retrospective study from **Melbourne (Australia)**, a total of 108 patients who underwent Lisfranc fracture open reduction internal fixation (ORIF) were grouped by fixation method and compared in functional outcome (American Orthopaedic Foot and Ankle Society (AOFAS) and Manchester-Oxford Foot Questionnaire (MOX-FQ) score) and radiological outcome (analysis of anatomical reduction).[1] Of the cohort, 38 patients underwent transarticular screw fixation, 45 underwent dorsal bridge plating, and 25 underwent a combination technique of both methods. The demographics of the groups were comparable, apart from there being a greater percentage of open fractures in the bridge-plating group, along with a shorter mean follow-up. All patients were from the same institution. The variation in fixation technique was primarily due to surgeon choice, although this was also reflective of a change in practice in the department as the technology, as well as the evidence for differing fixation techniques, evolved. In measuring the primary functional outcome, dorsal bridge plating was statistically superior to both other groups. Good or anatomical reduction was achieved in 82% of the bridge-plating group, 68% of the screw group, and 56% of the combination group. This was not significant. There was a gradual loss of quality of reduction over time in all groups, which was greater in the screw and combination groups compared with the plate groups (24% *vs* 11%), although this did not reach statistical significance. Overall, whilst this study has certain design flaws, it does increase our knowledge about treatment outcomes for Lisfranc injuries. This is especially helpful given the lack of good evidence available to guide our treatment choices for this injury. In what appear to be relatively well-matched groups, the functional outcome is improved with bridge plate fixation. However, as is always the case in retrospective grouped studies of this type, one must accept that there may be some selection bias in the surgeon's decision on treatment type based on patient and injury factors. This is one of only a small handful of papers comparing outcomes after bridge plate fixation for Lisfranc fractures, and as such is a welcome addition to the literature on this difficult-to-treat injury.

The use of a single dorsal incision for fixation of Lisfranc fractures X-ref

This paper from **Melbourne (Australia)**, again regarding the Lisfranc fracture, deals with the use of a single dorsal incision for fixation.[2] As fixation methods evolve, it is important that we also consider the surgical approach and soft-tissue management. Incisions on the dorsum of the foot, especially in the presence of significant soft-tissue trauma, need careful planning to preserve blood supply, respect the soft tissues, and allow adequate visualization of the fracture in order to achieve good surgical fixation. Many surgeons now utilize a single dorsal incision for fixation of the Lisfranc complex, carefully mobilizing the soft tissues to make use of multiple deep-tissue windows to access the tarsometatarsal joints (TMTJs) and the midfoot columns. This is often a preferred technique to minimize wound complications and maximize exposure to the midfoot. The authors describe a technique utilizing this single dorsal approach in a retrospective case note review that includes a large number (150) of cases. The authors made use of a single dorsal incision for the creation of three separate deep windows, allowing access to the first, second, and third TMTJs. Subsequent plate and screw fixation was performed. After the primary procedure, 14% of patients experienced wound-related complications, including delayed healing (3%), superficial infection (5%), dehiscence (3%), complex regional pain syndrome (1%), and impaired sensation (1%). In this large cohort of patients, the authors present a reassuring picture regarding the safety of this dorsal, single-incision approach to the Lisfranc fracture fixation. These are challenging injuries that frequently have sustained high-energy trauma and significant soft-tissue injury associated with the disruption to the midfoot joints. This is a valuable addition to the literature and certainly provides evidence