complications. As healthcare funding has become more squeezed, we are likely to see more and more focus on results and complications. One potential approach to combat poor results is to screen patients and only offer surgery to those without significant risk factors for complications. This is precisely what a team in **Houston, Texas (USA)** have done.[8] The paper reports an overall complication rate for both total hip and total knee arthroplasties pre- and post-implementation of guidance. The screening criteria used were haemoglobin (Hb) ⩾11, glycated haemoglobin (HbA1c) ⩽7, body mass index (BMI) ⩽35, and albumin ⩾3.5. The authors reported 520 patients prior to, and 475 patients after, the introduction of screening criteria. The groups were analyzed for complications as their primary endpoint. The authors established that there was a significant benefit in terms of complication rates. For knees, complications were significantly reduced to around half (33% to 15.0%); for hips, the complication rate fell more dramatically still (42.4% to 14.2%). A similar picture was seen with infection rates, with overall surgical site infection rates falling from 4.4% to 1.3%. Although they are significantly reduced in this study, it is important to note that the complication rates initially reported in this series are on the seriously high side, with two in five patients undergoing knee arthroplasty suffering a complication. That said, the effect of the screening programme does seem to have improved the complication rates dramatically.


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# Knee


**X-ref** ***For other Roundups in this issue that cross-reference with Knee see: Children's orthopaedics Roundup 6; Hip & Pelvis Roundups 1 & 8; Research Roundups 2 & 5.***


## Is manipulation under anaesthesia really a solution?

A significant number of patients find rehabilitation following total knee arthroplasty (TKA) challenging, with an appreciable proportion of patients developing some stiffness leading to a poor range of movement. We know that a loss of 90° of flexion and fixed flexion deformities lead to poor outcomes and functional impairment associated with significant dissatisfaction. The aetiology of such a complication is multifactorial, including poor preoperative range of movement, large body habitus, previous knee trauma, and non-compliance with postoperative rehabilitation regimens. But for all of this, even in the best hands with the best postoperative regimes, some patients just get stiff. Intraoperative surgical errors should not, of course, be overlooked, including inadequate bone resection, failure to balance the flexion and extension gaps, and component malrotation. However, even when a surgically satisfactory TKA has been performed, persistent stiffness may still develop secondary to arthrofibrosis. Despite intensive physiotherapy and continuous passive motion (CPM) devices, some patients still require manipulation under anaesthesia (MUA) to break down some of the fibrous adhesions formed within the knee that limit range of movement. There have been a number of studies published on MUA for stiffness post-TKA but there appears to be little consensus on patient demographics that predict success and when the MUA should be performed. The authors of this study reviewed all of the relevant literature to date in order to arrive at a conclusion to help guide the management of patients with a stiff TKA. This review team from **New York, New York (USA)** undertook a review of 22 papers reporting the outcomes of 1488 patients in an attempt to identify the expected outcomes and predictors (if any) of success.[1] In this series, the mean time between TKA and MUA was 9.9 weeks (2 to 22) and there was a significant improvement in flexion, on average, following MUA in all studies. There was an overall complication rate of less than 1% associated with MUA. Complications included supracondylar fractures, haemarthrosis, wound dehiscence, and deep vein thrombosis. Four studies reported on the outcomes of repeat MUAs, with the majority reporting an improvement in the range of movement but an increased risk of complication. The authors concluded that the current literature supports intensive physical therapy, and CPM with MUA reserved for those patients who fail to improve with more conservative measures. With similar failure rates for MUA reported at different times from the index operation, the authors suggested that it is safe to allow a longer trial of conservative management for patients who are keen to avoid a MUA. However, this also assumes that there is easy access to 'aggressive' physiotherapy, which is not always the case in the outpatient setting. This may lead to patients being admitted for an earlier intervention due to the lack of outpatient physiotherapy services. The authors did add that, although there was no clear benefit to performing a MUA within 30 days of TKA, there is an added benefit when it is done within the first 12 weeks. On the whole, patients find TKA much more painful than total hip arthroplasty (THA), which directly affects their compliance with postoperative rehabilitation. More studies are needed to understand better the causes of this increased pain and how best to address it. This would hopefully see a reduction in those patients needing a MUA post-TKA.

## Exercise in patients living with knee osteoarthritis

Knee osteoarthritis (OA) is common and is responsible not only for pain, but also for functional

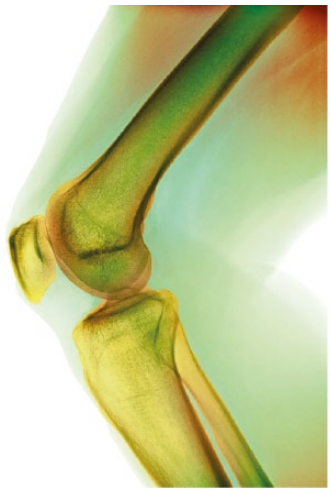
impairment. Essential activities of daily living become increasingly difficult with progressive arthritis, such as walking, squatting, and tackling stairs. Nonoperative measures have a significant and, in these days of austerity, an increasing role in the management of knee OA. The mainstay of conservative treatment is physical activity, modification of daily activities, weight loss, and analgesia. However, the authors of this study highlight that ineffective exercise can exacerbate the patient's symptoms, resulting in the early abandonment of physical activity and increasing dependence on pharmacological agents to address symptoms. The authors from **Winnipeg (Canada)** describe a new treadmill that utilizes a technology called lower body positive pressure (LBPP).[2] They sought to examine the effect of a 12-week, LBPP-supported, low-load walking exercise regimen on knee pain, joint function, thigh strength, and ability to perform normal activities of daily living in patients with knee OA. The authors studied 31 overweight patients (mean body mass index (BMI) 32.8 kg/m$^2$) aged between 50 and 75 years with symptomatic mild-moderate OA. Each participant completed a 12-week, LBPP-supported treadmill walking regimen that included exercising twice a week for 30 minutes at a speed of 3.1 mph. The LBPP support was then added in 5% increments each minute. Patients then underwent a post-exercise test in the week immediately following each walking exercise regimen. The authors noted a significant increase in quadriceps strength and a significant decrease in visual analogue scale (VAS) scoring of acute knee pain. There was also an improvement in knee outcome scores following completion of the 12-week walking regimen and a corresponding improvement in activities of daily living. It is common in the orthopaedic outpatient department that patients feel unable to do much in the way of exercise as it exacerbates their pain. Therefore, this study is to be commended for suggesting methods for patients with knee pain to undertake an exercise regimen that aims to reduce their discomfort without resorting to pharmacological measures. However, not all centres will have access to a LBPP treadmill, and one of the chief benefits to the healthcare system funder is that exercise advice is usually very low-cost. As the population ages and knee arthritis becomes more common, more high-quality research such as this is needed to review the effectiveness of nonoperative measures in order to win the confidence of both patients and surgeons alike.

## The accuracy of alpha-defensin testing X-ref

Point-of-care diagnostic modalities for periprosthetic joint infection (PJI) have been lacking for many years, with clinicians relying on preoperative culture samples exposing the patients to a second surgery in combination with preoperative imaging, blood tests, and a thorough clinical examination and history. In recent years, we have seen the advent of several 'in-theatre' bedside tests that purport to offer rapid in-theatre diagnosis of infection. This, of course, would provoke significant confidence in the surgeon when undertaking revision arthroplasty that he or she was indeed dealing with a straightforward revision or revision for infection. One of the most commonly used, and certainly the most studied of these, is the Synovasure test (Zimmer Biomet, Warsaw, Indiana), which relies on measurement of alpha-defensin levels. The defensins are a group of human peptides that are produced in response to pro-inflammatory cytokines or microbial presence. They have an effect to 'punch holes' in the bacterial phospholipid layer and thereby kill or inactivate the bacteria. Synovial fluid testing of leukocyte esterase (LE) had been the only point-of-care testing available, but now an alpha-defensin lateral flow test can be performed in the operating room or in the clinic for a fast test result. Investigators in **Hamburg (Germany)** set out to determine the diagnostic accuracy of Synovasure in relation to the current gold standard of joint aspiration and C-reactive protein (CRP) measurement.[3] The authors report the outcomes of a total of 223 patients, all presenting with a painful knee or hip arthroplasty. The authors collected joint aspirates (for leukocyte cell count with granulocyte percentage, microbiology cultures, and LE tests), CRP, and the Synovasure Alpha-Defensin Test with a lateral flow device. Complete data were available for 191 patients and, using the Musculoskeletal Infection Society (MSIS) criteria, there were 119 joints with an aseptic revision and 76 joints with PJI. The overall results for the Synovasure test were very promising, with 92.1% sensitivity and 100% specificity, giving an overall accuracy of the Synovasure test of 96.9% (a correct diagnosis in 189 of 195 cases). This study validated a high sensitivity and specificity for diagnosing PJI, but this diagnosis should be considered with other laboratory test values (both serum and synovial fluid) before initiating treatment. Routine cultures are still recommended to identify the organism present so that the proper antibiotics can be administered.

## Tranexamic acid superior to tourniquet

We were delighted, here at *360*, to see this randomized controlled trial (RCT) from **Sichuan (China)** that investigates the use of tourniquet and tranexamic acid (TXA) in total knee arthroplasty (TKA).[4] The authors reason that tourniquet use has found a place historically in TKA to reduce the intraoperative blood loss. However, the management of blood loss during TKA has undergone a significant change over the past few years, with TXA now considered the norm in many centres for large joint arthroplasty. Perhaps in the light of the TXA revolution, it is



time to re-evaluate tourniquet use? The authors report their RCT, which was designed to test the use of both TXA and tourniquet, in isolation and in combination, on blood loss during TKA. They recruited 150 patients to their study and randomized them into three groups, one with a tourniquet and intravenous TXA, one with the tourniquet alone, and one with TXA alone. The authors report that a similar level of intraoperative blood loss was seen in all three groups; however, there was a significant difference seen in postoperative blood loss. There was a difference favouring the TXA-alone group in terms of 'hidden' blood loss. When looking at other outcomes such as total blood loss, drain volumes, and haemoglobin (Hb) changes, there were no differences between the two groups that received TXA, and both performed better than the tourniquet-alone group. In terms of postoperative evaluations, there were differences in postoperative swelling ratio, levels of inflammatory biomarkers, visual analogue scale (VAS) pain scores, range of motion at discharge, Hospital for Special Surgery (HSS) score, and patient satisfaction favouring the TXA-alone group. Prior to this study, it was customary to use a tourniquet with TXA, the idea being that the combination would provide better results. However, this study demonstrates that multiple doses of intravenous TXA, along with topical

TXA, provide better results than when using TXA and tourniquets in combination. Perhaps the era of using tourniquets during TKA is coming to a close!

### Meniscal allograft transplantation: a pilot randomized controlled trial

There are some treatments that, on the face of it, are very attractive, but, when the details are worked out, have never been widely adopted. This may be due to costs, complications, or lack of hard data. Meniscal transplantation is one of those procedures. We know that absence of a functional meniscus hastens the onset of knee arthritis and we also know that it is possible to transplant a meniscus; however, the technique – probably for logistical and technical reasons – is still a rarely used treatment. Due to the rarity of its application, there is little conclusive literature as to whether meniscal transplantation is a viable solution for all but the most specialized of surgeons in the most select of patients. We were delighted to read this pilot randomized controlled trial (RCT) from **Coventry (UK)** that aims to evaluate the potential for meniscal transplantation in a small cohort of patients, all with a symptomatic meniscal deficient knee compartment.[5] The authors sought to compare the meniscal transplantation with personalized physiotherapy at 12 months of follow-up. Outcomes were assessed primarily using patient-reported outcome measures (PROMs): the Knee injury and Osteoarthritis Outcome Score (KOOS), International Knee Documentation Committee (IKDC) score, and Lysholm scale. These were administered at baseline, four, eight, and 12 months to both groups. In addition, complications and adverse events were collected and reported. The treatment allocations were something of a mixed bag, with 36 patients entering the study; just 21 were randomly allocated and the remainder chose their treatments. The authors, however, argue that as the outcomes were similar in the randomized and preference groups, the data could be pooled for final analysis. Within the constraints of a pilot study, this is more reasonable than in a fully powered trial, when considering that pilot studies are primarily for effect size calculations, although, with nearly half of the patients wishing to choose their treatment, this does have impact on the feasibility of a larger study. Ultimately, at 12 months, the KOOS composite score and KOOS subscales of pain and activities of daily living were significantly better in the meniscal transplantation group. We should consider these results very carefully. Although meniscal transplantation has been eyed with suspicion in parts of the orthopaedic community, this pilot trial would suggest that in the right patients it likely has an application. Clearly, a larger trial is needed, and one with longer follow-up. In order to reach the threshold for the incremental cost-effectiveness ratio (ICER) and funding in the National Health Service (NHS), this would need to be a long-lasting and relatively effective treatment. Here at *360* we are watching this space.

### Medial pivot *versus* condylar knee designs

Implant design may not be the major factor in outcomes following knee arthroplasty; however, there are some fundamentally different approaches to implant design and postoperative alignment. The discussion surrounding kinematic and traditional alignment, unicompartmental *versus* total knee, and posterior-stabilized *versus* not, has been, and continues to be, explored and debated, with research studies conducted often to support the point of view of the originating unit. One such debate that has never been quite as well-explored in the literature is that of the medial pivot knee, which promised more accurate matching of the normal knee biomechanics, perhaps with a more favourable polyethylene wear profile due to decoupling of rotational and linear motion. Researchers from **London (UK)** have reported a subgroup analysis of patients who were recruited to a prospective randomized controlled trial that compared medial pivot and condylar resurfacing designs.[6] The outcomes of the main trial are not presented here but the authors do report an interesting subgroup analysis of patients' biomechanical characteristics having undergone either an anatomical single radius design or a medial pivot design. Outcome measurements included clinical scores (Knee Society Score (KSS) and Oxford Knee Score (OKS)); however, the most interesting outcome reported was the gait analysis using an instrumented treadmill. The bottom line with this study was that the authors were unable to report any real differences between the two groups. With no statistically significant difference for either clinical score (KSS and OKS) or in a broad range of gait analysis factors (cadence, walking speed, stride length and stance time, peak stride, mid-support, and push-off forces), we are led to the conclusion by the authors that, despite the dramatically different design features of these two devices, the biomechanical design in this paper does not seem to have much of a role to play in either.

### Thirty-day mortality after weekend *versus* weekday arthroplasty

There has been much interest in the weekend effect and the potential for excess mortality. The authors of this study from **Bristol (UK)** look at the outcomes of elective arthroplasty following weekend surgery, which has become a hot political topic with allegations of excess deaths being used as a political tool to argue for seven-day hospital services.[7] The other side of the coin, usually argued by clinicians, is that the excess deaths at the weekend can be explained by patient differences rather than staffing level differences, and a combination of increased comorbidity and the excess of emergency work explains the variation seen in large observational studies. This very interesting study using National Joint Registry Data examines the potential weekend effect and its effect on mortality in patients who are admitted for an elective joint arthroplasty with 30-day mortality as the primary endpoint. As is commonplace with registry studies, the numbers examined here are eye-watering. Over the lifetime of the registry there were 118 096 episodes undertaken at the weekend, and 1 233 882 joint arthroplasties performed during the week. There is, nonetheless, a rather low event rate at 30-day mortality for hip arthroplasty, at 0.15% for weekend operation and 0.20% for weekday operating. The equivalent figures for the knee were 0.14% and 0.18%, respectively, again lower at the weekend. This does, however, only equate to just over 170 deaths over the entire period of the study at the weekend. It seems unlikely that there will be a better study that looks at planned elective surgery over a weekend, with sufficiently high numbers from which to establish mortality figures, but it does identify the problems, and this study probably goes as far as it is possible to go in order to show that weekend elective surgery is not more dangerous than weekday surgery.



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# Foot & Ankle

**X-ref** ***For other Roundups in this issue that cross-reference with Foot & Ankle see: Research Roundup 5; Trauma Roundup 1.***

## Safety of the posteromedial approach for fixation of the posterior malleolus X-ref

■ Direct reduction and fixation of the posterior malleolus fracture is increasing in popularity in the United Kingdom and throughout the world. Proponents argue that an anatomical reduction can only be achieved through the posterior approach, that accurate reduction of the posterior sheer fragment may be more important than we first thought, and that, in many units, the traditional anteroposterior lag screw no longer suffices. Literature to date has focused mostly on the safety of the posterolateral approach, and a number of papers have been published that have described this technique, which is now becoming the standard of care. A group of surgeons from **Bristol (UK)** have now reported on their experience of using the posteromedial approach.[1] This was used for fixation of the Haraguchi type 2 posterior malleolar fracture. They present a review of a series of 15 cases, describing the surgical approach and fixation technique, along with a review of the accuracy of reduction and the incidence of complication. The accuracy of reduction was assessed using postoperative plain radiograph and not CT, a potential limitation of this study. The authors found no wound complications in any of their patients. There was a single patient with paraesthesia in the medial aspect of the foot, which was transient. At final follow-up, the authors report a median Olerud and Molander score of 72 and anatomical reduction in ten, with a median step of 1.2 mm in the remaining five patients. The authors conclude that this is a safe approach for fixation of the Haraguchi type 2 posterior malleolar fracture. They report a low complication rate when utilizing this approach and achieve good visualization of the medial component of this fracture. This paper certainly adds to the growing evidence base to support the increasing trend towards direct visualization and fixation of the posterior malleolar fracture. The choice between posterolateral and posteromedial will, of course, depend on fracture type. Those patterns that involve the posterolateral portion of the posterior malleolus will likely be technically easier through a posterolateral approach, as the posterior fibres of the syndesmosis tend to rotate the fragment in that direction, while those that are extended medial malleolar fractures will likely be best addressed from the posteromedial approach.

## The potential benefits of a CT scan for the posterior malleolar fracture

■ Staying with the highly topical posterior malleolar fracture, this paper from **Los Angeles, California (USA)** caught our eye here at *360*.[2] There has been an increased interest in surgical fixation of the posterior malleolus when addressing the unstable ankle fracture. Surgeons now commonly perform posterior approaches to this fracture for direct visualization of the fragments and subsequent internal fixation. However, although practice is changing, there are still several matters left 'unresolved' – in this case, the need, or otherwise, for CT scanning in these fractures. There are two papers in the literature that recently examined the benefits of preoperative CT scan for surgical planning of this fracture. In the first paper, from **Los Angeles, California (USA)**, a group of surgeons performed an interesting investigation to try to establish the effect of a CT scan on the surgeon's understanding of the fracture pattern and subsequent pre-surgical planning. The authors identified 25 patients from a total cohort of 376 ankle fractures involving the posterior malleolus, all of whom had preoperative radiograph and CT imaging. In a random order, the plain radiograph imaging was presented to three fellowship-trained orthopaedic surgeons (two trauma, one foot and ankle). The following questions were asked: 1) Is the posterior malleolar fracture simple or complex, where 'simple' refers to an intra-articular split only, and 'complex' refers to impaction, comminution, or intra-articular debris? 2) Does the fracture require direct visualization and articular reduction? 3) If the fracture requires direct visualization and articular reduction, what operative approach and patient positioning would be used at the time of surgery? In random case order, the images from axial, coronal, and sagittal CT scans were then reviewed by the same surgeons and the same questions were asked. To ensure reproducibility, the same images were reviewed on a second occasion by the same surgeons, at least six weeks apart. Overall, 20% of the fractures (n = 5/25) were classified as complex on plain radiographs but determined to be simple on CT imaging. In eight of 25 fractures, the examiners failed to identify a complex pattern on plain radiograph where there was evidence of impaction or comminution on CT. The fracture classification was changed in 56% of cases (14/25) based on CT findings. There was a change in the decision to visualize directly and reduce the articular surface of the posterior malleolar fracture in four of the 25 cases. However, participants changed their operative approach and patient positioning in 44% of cases (11/25) based on the review of the CT imaging. The authors readily accept that there are limitations within their study design. Among these, they comment that routine use of CT scanning was not commonplace in their unit, meaning a potential selection bias towards the more complex cases for this study. The study was also underpowered to detect a statistically significant difference in fracture pattern or preoperative management plan. All this said, this study provides some food for thought, as cross-sectional imaging is becoming increasingly available and newer protocols have reduced radiation dosage. Perhaps surgeons should be considering CT scanning for patients who require operative fixation of their posterior malleolus.

## Effect of CT on management plan in malleolar ankle fractures

■ In a similar study, a group of surgeons from **Delhi (India)** have reported a second paper examining the role of CT imaging in malleolar fractures.[3] This was a prospective study of 56 consecutive patients