reduced the percentage of outliers, from 46% to 21% when using the Lewinnek safe zone (abduction angle 30° - 50°, anteversion angle 5° - 25°), and from 64% to 25% when using the Callanan criteria (abduction angle 30° – 45°, anteversion 5° – 25°). In addition, there was no significant increase in the length of the operative time. While this technique was not as accurate as CT-based navigation, it was quick and relatively cheap. The authors postulated that the use of custom, patient-specific, acetabular alignment guides may improve accuracy further, but this would obviously add to the cost. Conventional navigation in the hip is expensive and time-consuming. The authors should be applauded for performing a prospectively randomised study looking into the advantages of 3D planning. Increasingly, hip surgeons pre-operatively template total hip arthroplasties on plain radiographs to judge optimal implant size, but why not perform a low dose CT scan so that we can accurately template component position?

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Knee

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

Bariatric surgery effective pre-TKA X-ref

World literature is full of reports on the health economic burden, outcomes and complication rates associated with the obesity epidemic in the Western world. However, there is little data to support decision making surrounding pre-arthroplasty bariatric surgery. Using the now 'gold standard' computer modeling techniques, taking into account health economic data, complications data and outcomes data from other studies, researchers in **New York (USA)** set out to establish the most cost-effective approach to tackling the growing worldwide obesity epidemic, and the associated osteoarthritis.[1] It is well established that obese patients have a high rate of failed non-operative treatment and that these patients are candidates for total knee arthroplasty (TKA). What is not clear, on the other hand, is the impact of greater risks associated with infection, implant failure, and poorer clinical outcomes. Previous studies have evaluated outcomes of bariatric surgery before TKA, and the results are conflicting. Some studies have shown fewer complications, while other studies have not been able to establish an improvement in outcomes. The use of a Markov modeling approach to study the health economics of pre-arthroplasty bariatric surgery should help to unpick this puzzle. The authors established that morbidly obese patients undergoing bariatric surgery prior to arthroplasty had higher quality-adjusted life year (QALY) improvements, with an incremental cost-effectiveness ratio (ICER) of around $14 000 per QALY, well below the cost-effectiveness threshold. Given that morbidly obese patients who underwent pre-operative bariatric surgery prior to TKA had, overall, increased savings per QALY, it would seem to make sense that morbidly obese patients should be encouraged to undergo bariatric surgery two years prior to TKA in order to maximise the benefits of their arthroplasty.

Repair of the medial collateral ligament? A safe and effective approach

Like all operations, total knee arthroplasty (TKA) is fraught with its own specific range of complications. The extensive medial release often required in order to perform TKA can on occasion be associated with iatrogenic injury to the medial collateral ligament (MCL). The traditional teaching for management of this complication is to address the resultant instability with the use of increasing constrained implants – achieving stability with, of course, appropriate balance. However, increasing the constraint in implants, even when performed well, will reduce the longevity with higher surface wear at the articulations and greater transmission of torsional forces to the bone-implant interfaces. Clinically, this results in unwanted increased failures and fewer options for future reconstruction. The group at Rush University Medical Center, **Chicago (USA)**, report their own experience of directly repairing iatrogenic MCL injuries using either end-to-end suture repair (MCL mid-substance tears), or direct repair (with screw-and-washer or other constructs) in the case of MCL avulsions.[2]
In their series of 3922 TKAs, 1.2% (n = 48) were treated this way for an iatrogenic MCL injury. Post-operative rehabilitation included the use of an unlocked hinged knee brace for six weeks, and patients were encouraged to weight-bear as tolerated. Outcomes here were reported to a minimum of two-year follow-up, and the authors report no findings of secondary instability, with patients reporting the expected post-operative improvement in clinical outcomes. The only complications were stiffness and revision for aseptic loosening. The authors have effectively shown that constrained implants may not be required to address intra-operative MCL injury, and primary repair is possible in the setting of a primary total knee arthroplasty. This is a good clinical pearl when a rare complication occurs.

Minimally invasive approaches to the knee

Minimally invasive surgical approaches are the subject of increasing patient interest. While there are raised expectations from newer minimally invasive knee approaches (conveniently requiring costly equipment), there is very little in the way of objective evidence to support quadriceps- sparing approaches over the traditional medial parapatellar approaches, but on the face of it muscle sparing seems to make sense. A surgical research team in **Seoul (South Korea)** have reported their experience of both approaches in their

carefully designed, randomised controlled trial.[3] Patients undergoing simultaneous bilateral total knee arthroplasties were randomised to one of two different surgical approaches; one knee received the medial parapatellar, and the other a subvastus ('quad sparing'), approach. The authors report the results of a 50-patient study population, including their pain and WOMAC scores, patient preference of approach, isokinetic muscle strength, range of motion, and Knee Society scores. Despite the carefully designed nature of this study, and in support of other studies with a poorer evidence base, there were no differences in patient-reported and clinician-assessed measures. The only reportable difference between the two groups was greater quadriceps strength at one week after surgery in the subvastus knee approach. Given the minimal improvement in function after surgery with either approach, it seems that this is very much a case of 'dealer's choice'. As with many innovations pushed by the constant evolution of technology and implants, the subvastus approach does look to be more a marketing device than real innovation.

Metaphyseal ingrowth sleeves in revision TKA

■ One of the most promising technologies to emerge in orthopaedic revision arthroplasty surgery in recent years is the metaphyseal sleeve. With very few long-term reports of outcomes in large numbers of patients, we were delighted here at *360* to read this report from **Schwandorf (Germany)** of 121 patients, all undergoing revision total knee arthroplasty with tibial or femoral defects addressed with the metaphyseal sleeve.[4] The cementless metaphyseal sleeve provides a convenient solution for large defects without the requirement for addressing the bony defects with interlocked stems or bone grafting. The authors reported a prospective series of 193 sleeves (119 tibial and 74 femoral) and were able to report clinical and radiographic outcomes to just over 3.5 years' follow-up. Outcome measures were reported with outcome measures (KSS and Functional Score), clinical and radiographic assessment. The authors report generally good clinical and radiographic outcomes. Although the overall revision rate was 11.4%, it is important to remember that, in cohorts of patients like these, there are many causes for failure of salvage surgery. The authors conclude that, in their opinion, it is likely that only two implants were revised for implant failure at an average follow-up of 3.5 years. We would agree that metaphyseal sleeves offer a significant advantage in those patients with bone loss. Nonetheless, in a revision series with such a high revision rate for other causes, it does beg the question as to whether a secure metaphyseal ingrowth is a help or a hindrance for the one in ten patients requiring further revision surgery within three and a half years.

When is a single-stage appropriate? X-ref

■ The vast majority of research would support the 'two-stage' joint revision as gold standard in arthroplasty revision of the hip or knee for established infection, but there is an equally large volume of literature suggesting that the single-stage option is just as good, even in the presence of infection. Offering the obvious advantages of less morbidity and cost, single-stage revision is gaining in popularity. What then is a reasonable framework for decision making? Authors from **London (UK)** provide an excellent framework and outline specific criteria to establish when a single-stage exchange for PJI might be considered, in an article that is well worth a read for all surgeons regularly revising infected joints.[5] The authors propose a simple evidence-based selection algorithm for identification of those patients who are suitable for a single-stage revision. It is clear from the paper presented that, essentially, single-stage revision is most suitable for good hosts with few comorbidities and an easily treated offending micro-organism.

Addressing fixed flexion deformity

■ There is a temptation to think of soft-tissue knee balancing in terms of the individual nine degrees of freedom, and that addressing one will not affect the other. Trainees are taught simple, well described steps for addressing soft-tissue balance and gap balancing in the commonly seen deformities of the knee. An additional distal femoral resection offers a potentially simple solution to the fixed flexion deformity in the knee. Adjusting the distal femoral resection cut potentially improves fixed flexion deformities – the difficulty is knowing how much an increased resection will improve the fixed flexion deformity. Given the cam shape of the distal femur and that the fixed flexion deformity is not always in plane or axis, the answer to this seemingly simple question might be more complex than expected. Noting that previous investigators have reported conflicting results on the corrective effect of increased distal femoral resection on fixed flexion deformity in TKA, the authors in **Queensland (Australia)** set out to establish a simple, easy to use algorithm.[6] Their *in-vivo* study used a modified femoral trial component to which augments could be added variably to measure the effect of different in-plane alterations to the distal femoral resection level. The authors produced a balanced knee and then utilised the spacers and a computer navigation system to measure the effects of smaller resections. They established that a smaller correction was achieved than could be traditionally considered, with approximately 3.5 mm of additional distal femoral resection required to achieve each 10 degrees of deformity correction.

Do more, get better: the unicompartmental knee under the spotlight

■ There have been some high-profile papers recently concerning surgical volume and outcomes following total joint arthroplasty. While these have established '30' as the magic number for large joint replacement, this may not relate to the more complex procedures such as unicompartmental knee, resurfacing hip and elbow, or ankle, replacements). This NJR study from investigators in **Oxford (UK)** sets out to establish what the effects are of surgical caseload on outcomes following a unicompartmental knee arthroplasty (UKA).[7] The authors evaluated the nearly 450 000 knee replacements recorded on the National Joint Registry. These included the records of 37 000 unicompartmental knee replacements. Outcomes in terms of prosthesis survival were analysed by arthroplasty volume. In short, surgeons' caseload affected patients' outcomes, with a steep drop in survival if fewer than ten cases were performed per year. Overall survival for the UKA was poorer than that for the TKA at eight years (87.9% *vs* 92.4%). The revision rates in those patients whose surgeons were performing high rates of UKA were similar to those for the total joint group. This paper highlights the importance of volume when performing all types of arthroplasty. We were surprised, here at *360*, with the low threshold volume of just ten arthroplasties. Like

the authors of this paper, we would advocate that these more specialist arthroplasties are undertaken by specialist surgeons in order to improve outcomes.

Single-step cartilage repair in the knee X-ref

The management of chondral defects in young to middle-aged patients has challenged orthopaedic surgeons for many years. Ever since Pridie wrote his paper on a method of resurfacing osteoarthritic knee joints by drilling the subchondral bone in the late 1950s, the challenge has been to recreate an articular surface repair which relieves patients' symptoms and is durable. A number of surgical techniques have been described with varying success. The two-stage autologous chondrocyte implantation technique (ACI) has provided some very encouraging results, although only a 'hyaline-like' repair has been achieved. The repair does, however, usually achieve chondrocytes enveloped within an extracellular matrix which stains with a type 2 collagen stain (Safranin O). Surgeons and scientists have struggled to recreate the zonal differentiation of normal articular cartilage; the results in some studies have been comparable with microfracture. Unpredictable results, combined with the need for two operations and high rates of chondrocyte cell death following re-implantation have limited the uptake of ACI as a technique. There are therefore a number of attractions in utilising a bone marrow aspirate concentrate (BMAC) containing mesenchymal stem cells (MSCs) loaded onto a hyaluronic acid (HA) scaffold. There have been several early encouraging studies to date but none have looked at the potential application of this technique in the slightly older patient. Knee surgeons in **Milan (Italy)** report their study treating grade IV chondral defects treated with BMAC and HYAFF®11 (Hyalofast, Anika Therapeutics Inc., Bedford, MA), a hyaluronic acid-based scaffold.[8] Their paper reports the outcomes of 20 patients aged 45 to 60 years old, treated with this technique and compared with a control group of 20 patients who were 20 to 44 years old. The authors established that at four years of follow-up, there were significant improvements in KOOS scores, activity scores and the IDKC score with little differences between patient groups. Follow-up MRI scans suggested a cartilage defect filling of around 80% in the study group. The authors report good outcomes for the treatment of grade 4 defects and, encouragingly, increasing age did not appear to affect the outcome. Interestingly, the older age group had better outcomes than the younger group at two years, however, as the authors point out, this probably reflects the fact that the older population may be less active. This is an exciting study as there has been a considerable focus on the literature to date on the management of chondral injuries in the younger patient, however, this would suggest that surgeons with an interest in cartilage regeneration techniques should not necessarily consider older patients as unworthy candidates for regenerative cartilage technique studies.

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Foot & Ankle

X-ref ***For other Roundups in this issue that cross-reference with Foot & Ankle see:*** *Children's Orthopaedics Roundup 2, 7; Trauma Roundup 8.*

Improving safety in the medial calcaneal osteotomy

The medial displacement calcaneal osteotomy is a workhorse for a range of hindfoot pathologies, including tibialis posterior insufficiency. The osteotomy is effected usually from the lateral side and as such, the medial neurovascular structures cannot be identified and protected. There isn't a universally-agreed 'safe zone' for effecting the osteotomy and surgeons potentially risk iatrogenic injury. A cadaveric study of 40 feet reported by researchers in **Baltimore (USA)** aims to improve on safety by identifying a radiographic 'safe zone' to perform the osteotomy.[1] In the first part of their study they dissected the medial neurovascular structures, marked with radiopaque wire and took a true lateral radiograph providing visualisation of these structures. The landmark of a line from the origin of the plantar fascia to the apex of the calcaneal tuberosity was used. Whilst the investigators established that a 'safe zone' as such does not really exist, with iatrogenic nerve injuries seen after osteotomy even within their 'safe zone', they were able to describe the best position for minimising risk to the neural structures. This information is useful as an intraoperative guideline to minimise neural complications. They established that an osteotomy placed 11 mm anterior to their 'landmark' line was in all likelihood the safest position to minimise neurological injury. However, they do make the valid point that iatrogenic nerve injury with this procedure may be more common than we think.

Operative treatment of Freiberg disease X-ref

Freiberg disease (idiopathic osteonecrosis of the head of the second metatarsal) is a relatively common condition which for the most part is treated conservatively. There are however some severe or refractory cases in which operative intervention can be considered. Like many conditions in which just a small proportion are treated operatively, there is a surprising paucity of evidence to support operative treatment, and even less long-term outcome data to inform patients and clinicians of their likely outcomes. Surgeons in **Braga (Portugal)** present their long-term follow-up of 20 paediatric patients, all presenting with refractory Freiberg disease at a mean of 23 years of follow-up.[2] The surgical teams undertook a dorsal intra-articular