

ROUNDUP³⁶⁰

Knee

Mobile-bearing TKRs confer little advantage

■ Researchers in **Irvine (USA)** reported the results of 47 339 total knee replacements (TKR) performed over an eight-year period. The researchers used a community arthroplasty register which was compiled prospectively to investigate the revision rates of mobile-bearing TKRs. This very large population study (Level II therapeutic evidence) provides the outcomes of the TKRs with up to ten years of follow-up. The authors sought to determine the survivorship and predictors of failure of both fixed- and mobile-bearing knees. The investigators recorded all potentially relevant patient demographics including age, ASA grade, BMI, gender, race, and underlying diagnosis. They also recorded the surgical technique including implant type, surgical approach, laterality, fixation, patellar resurfacing, hospital and surgeon volumes. Overall revision rates were very low for both groups, however, revision rates were higher in the mobile-bearing group. Confounding factors such as the average age of TKR may impact on the revision rates. Longer-term follow-up is required to prove whether reduced wear leads to fewer revisions in the mobile-bearing group. The overwhelming majority of procedures were performed with a fixed bearing design (88.5%, n = 41 908) or mobile-bearing design (10.2%, n = 4830). Of the mobile-bearing 3112 were rotating-platform cruciate-substituting, 1053 were low

contact stress (LCS) and the remainder were cruciate-retaining rotating platforms. The aseptic revision rate was 1.1% over ten years (n = 515) and the overall survival was 97.8%. Cox regression modelling was used to determine the revision rates for each prosthesis allowing for confounders. This established that the LCS had a rate of revision 2.01 times higher than expected. There was no association with surgeon or hospital volume, although there was a greater proportion of older patients in the fixed bearing group.¹ Studies like this are immensely powerful, being true population studies of a specific geographic nature, but by their very design exhibit profound selection bias. The researchers have attempted to adjust for any confounders, and have still been unable to explain the excessively high revision rate seen in the LCS group. It seems likely to us at 360 that this is a genuine observation; the same results were not seen with the rotating platform design which one would expect to suffer the same selection biases.

Arthroscopic ACL reconstruction has the edge

■ There are many potential advantages to arthroscopic surgery, and here at 360 we prefer to do as much minimally invasive surgery as possible. The potential benefits are multiple with small incisions, less soft-tissue damage and the potential for more accurate surgery. The standard in the majority of centres for ACL reconstruction is an arthroscopic approach and has been for many

years. However, there is little evidence to support this practice over the traditional open approach. Many surgeons tackling knee dislocations and combined ligament injuries will often take an open approach. Twelve years ago arthroscopic ACL surgery was relatively new and a well-conducted randomised controlled trial (Level II evidence) was set up by researchers from **Oslo (Norway)** to establish the benefits of an open or arthroscopic approach. The researchers have revisited the trial 12 years after surgery to attempt to establish the effects of operative approach on osteoarthritis or subsequent functional outcomes. The researchers hypothesised that there were no differences in functional or clinical outcomes between either technique. A total of 67 patients underwent ACL reconstruction and after trial enrolment were randomised to receive a bone-tendon-bone patellar tendon autograft through either an open or arthroscopic approach. Clinical outcomes were assessed using the Cincinnati knee score and functional tests (single leg hop test and isokinetic muscle test). Patients were followed up clinically and with radiographs (classified using the Kellgren and Lawrence score). In this revisit of the trial the research team were able to follow up an impressive 79% (n = 53/67) of patients at a minimum of 12 years. There were no differences in clinical or radiological outcomes in either group. There was a startlingly high rate of osteoarthritis in both groups (79% versus 80%), which was

markedly higher than the unoperated knee (36% and 21%).² On the face of it the results of this study do not support one treatment modality over the other, however, we here at 360 would venture that the other added benefits of arthroscopic surgery (potentially reduced operating time, faster rehabilitation and lower infection rates) give arthroscopic surgery an edge. What is extremely worrying is the high rate of osteoarthritis reported. Here at 360 we are well and truly disappointed to see ACL reconstruction does not appear to avoid subsequent degenerative joint disease and are slightly concerned given the high event rates that there is a chance it may actually hasten it.

Chondrocytes may save the day in osteochondral defects

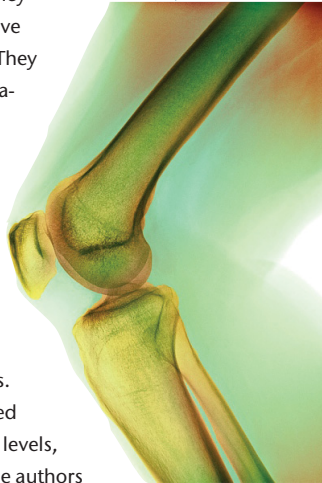
■ Despite the high media, professional and scientific profile afforded them, there is little evidence to support the practice of autologous chondrocyte implantation. Indeed, there is some evidence it may actually be a poorer choice compared with other options. Despite the high costs of the treatment, the requirement for two operations, and the murky evidence base, the practice continues unabated although concerns have been raised about donor site morbidity and technical difficulties for little perceived benefit. Little attention is currently paid to other options such as osteochondral autologous transplantation (OATS). Probably because it sounds like such a good idea, we are all agreed at 360 HQ that implanting autologous chondrocyte-

bone plugs ought to work. It was heartening then to finally see some high quality research to back up our (and others') prejudices. A research team in **Kaunas (Lithuania)** have reported a ten-year follow-up of a randomised controlled trial (Level I evidence) evaluating the two approaches for treatment of osteochondral defects of the knee; the microfracture approach and a form of OATS procedure. With the OATS technique chondrocytes were harvested from a donor site and a mosaicplasty carried out to transplant them to the symptomatic area. Sixty athletic patients with osteochondral defects of the knee were randomised to either the OATS or microfracture technique. The study design used a combination of scores (International Cartilage Repair Society, Tegner activity score), radiological outcomes and MRI over a mean follow-up of ten years. The research team identified with regular review that, between a period of three and ten years post-operation, all patients had significant clinical improvement compared with pre-operatively, but these were most marked in the OATS group where patients had significantly better clinical outcomes in the long-term follow-up. In addition to improved clinical results there were lower failure rates (14% *versus* 38%) and osteoarthritis incidence (25% *versus* 48%) in the OATS group. The main, and most significant, finding of the trial was that 75% of patients treated with OATS maintained their pre-injury level of activity compared with only 37% in the microfracture group.³ It stands to reason to us here at 360 that your own cartilage, matrix, and cells supported on a subchondral bone plug must be better than cultured chondrocytes or microfracture-induced fibrocartilage. We were delighted to find such a high quality paper that supports our preconceived prejudices.

ACL reconstruction may not help return to pivoting sports

■ One of the most difficult interventions to assess is that of

ACL reconstruction. In a field with few poorly validated objective and subjective outcome measures it is still difficult to objectively assess the efficacy of ACL surgery and interventions. The key indication for most orthopaedic surgeons for operative intervention is patients with symptomatic instability. Researchers from **Oslo (Norway)** have potentially upturned this apple cart. They asked this simple question: are patients more likely to return to pivoting sports by a year if they undergo an operative treatment course? They designed a comparative cohort series (Level III evidence) to establish whether ACL reconstruction improves the rate of return to high-performance sports and activities. The authors matched patients for activity levels, age and gender. The authors recruited 69 patients treated nonoperatively and matched them in a pairwise manner to 69 patients treated operatively. Outcomes were determined primarily by return to sporting activity and the secondary outcomes of functional tests (hop test), stability testing (KT1000 arthrometer) and patient reported outcome measures (PROMs). The researchers found their groups to be well matched with no significant differences at baseline. The researchers were unable to find any significant differences between the two interventions at final review. Their rates of return to pivoting sport were 68% in both groups, with slightly more returning to level 1 sports in the operative group (62% *versus* 55%). Interestingly, the authors found the nonoperative cohort to have higher levels of joint laxity but significantly better hop test indexes, Knee Outcome Survey Activities of Daily Living scores, and International Knee Documentation Committee Subjective



Knee Form 2000 scores.⁴ Here at 360 we are slightly perturbed to read this report, which turns on its head our understanding of the indications for, and outcomes of, ACL reconstructive surgery. We would, however, inject a note of caution; all case-matched studies, by definition, suffer from selection biases. There is likely to be a profound selection bias in this paper with the more symptomatic patients wishing to undergo surgical intervention. While thought provok-

ing, we won't be abandoning ACL reconstruction in favour of physiotherapy just yet at 360 HQ.

ACLs and the MOON study

■ The second of our selected ACL reconstruction papers this month is the multicenter orthopaedic outcomes network (MOON) cohort which was set up

to establish the value of ACL reconstruction in American collegiate and high school football athletes wishing to return to high-performance pivoting sports. The researchers from **Nashville (USA)** used a retrospective analysis of a prospectively recruited cohort methodology (Level III evidence) to identify the likelihood of return to the same level of competitive play after surgery. They also wished to establish the athlete's subsequent performance level and determine why those who did not return to competitive play were unable to do so. Patient data was collated from the MOON cohort. A total of 147 patients who identified football as their primary or secondary sporting activity were enrolled into the study. They underwent a structured interview covering aspects of their pre-injury activity levels, factors associated with return to play, and current activity levels. The study included 68 high school and 26 collegiate football

players, with follow-up to two years following reconstructive surgery. This study identified surprisingly poor rates of return to play, which were similar between both cohorts (63% high school *versus* 69% collegiate). Of those who returned to play, 27% reported that this was not at the same level as prior to the injury, with a further 30% not able to return to play at all. The study team found no differences in patient reported outcomes (IKDC score, Osteoarthritis Outcome Score Knee and Marx activity score) at two years of follow-up, suggesting factors other than knee performance were important in determining their eventual outcomes. Of the players who were unable to return to play after their injury, two thirds cited other contributing factors in addition to the injury and 50% reported fear of re-injury as a key factor in their decision not to return to play.⁵ Here at 360 we were particularly interested in the poor return-to-play rate following ACL injury, especially in light of identical clinical scores. Qualitative research, in this case in the form of a structured interview, is rarely used in orthopaedic studies. Perhaps we should adopt this technique more often? The research team clearly identified several possible explanations for the low rates of return to play, and, if accurate, this research would suggest that it is mainly a fear of re-injury which prevents return to play.

Plastic fantastic?

■ All plastic components, whether an all-polyethylene tibial component or a home stereo system, are cheap, easy to manufacture, and often controversial. The orthopaedic community is divided on the benefits, or otherwise, of the all-polyethylene tibial component. On the one hand, proponents of all-polyethylene components argue that the lack of modulus mismatch and the fact that there is no possibility of backside wear provides for a long lasting arthroplasty at minimal cost. The counter argument is that with better stress distribution and modular changeable components, the metal-backed tibia

has not only better wear characteristics but offers flexibility at revision and primary surgery. Here at 360 we have always eyed all polyethylene tibial components with a certain amount of suspicion, being worried about subsidence and high wear rates. Researchers in **Leiden (The Netherlands)** have undertaken a thorough systematic review of the available evidence and performed a meta-analysis (Level II evidence) with the aim of establishing which variety of component has the best longevity and functional outcomes. The authors performed a comprehensive literature review, including all articles comparing plastic and metal tibial base plates. They included articles with outcomes involving revision rates, clinical scores, and radiological analysis. They screened 1557 references for eligibility, and found 26 eligible articles relating to over 12 500 TKRs and 231 revision procedures. Meta-regression analysis was used to establish factors associated with revision surgery. The authors were unable to find any evidence of differences in longevity or clinical outcomes between the two tibial component designs, although RSA analysis suggested better fixation with the all-polyethylene components.⁶ While this study raises an interesting point, here at 360 we are uncertain of the validity of their conclusions. The authors included a high number of non-randomised trials and many only had two years' follow-up or less. When an event rate rises with time (such as revision) it is crucially important to report studies at appropriate time points; one might not expect to see any significant differences in revision rates for modern knee replacements at two years of follow-up. The authors note that less than 1% of all primary TKRs are performed with an all-polyethylene tibial component despite evidence that they are cheaper, and have similar long-term outcomes. Is this perhaps evidence of inflexible thinking or ignorance across the orthopaedic community? Here at 360 HQ we think there may be another explanation;

perhaps this study highlights some of the problems of meta-analysis when including a range of variable quality studies with short-term follow-up.

Knee navigation of little benefit

■ The question of navigation, or rather whether to navigate or not has been vexing arthroplasty surgeons since the advent of the technology. On the surface it seems silly not to use a technology where a computer can check the alignment of the prosthesis with little time penalty to avoid those occasional 'whoops' moments when the post-operative radiographs are reviewed. Proponents argue that the quality of arthroplasty may be improved for all patients, and navigation could offer training and quality improvement benefits as well as quality assurance. Yet there is a significant amount of uncertainty in the scientific literature with little evidence that navigation improves radiographic, let alone clinical, outcomes in this area. Yet again a research team from **Seoul (South Korea)** have stepped up to help clarify things in a difficult and unclear area of research. They designed a randomised controlled trial (Level I evidence), comparing the clinical and radiological outcomes of 520 osteoarthritis patients undergoing bilateral total knee replacement; one knee performed with navigation and the other with traditional jigs. Their cohort was predominantly women (452 versus 68) with a mean age of 68. Impressively, the surgeons report a mean follow-up of 10.8 years. The headline result from this study is that the surgeons were unable to find any difference in outcomes (radiological alignment, and knee performance, function, pain, WOMAC, motion or activity scores). There were no differences between the groups pre-operatively or at any measured time point. The surgical team achieved an impressive 98.8% (non-navigated) and 98.2% (navigated) survival at nearly 11 years of follow-up.⁷ So in light of a well conducted RCT including 1040 knees followed up to over ten years,

we at 360 are scratching our heads wondering if there is any clinical application for navigation? Although there is clearly (in light of this study) no benefit to patients, here at 360 we have found a number of unexpected benefits to navigation. It is a great training tool, allowing a supervising surgeon to adequately see how the trainee is doing, and provides an additional level of visual-motor feedback which appears to improve surgical skill much more rapidly than traditional methods. Navigation (in knee replacement at least) will continue to be pushed hard by the orthopaedic device community, but in light of this study can the costs really be justified? We suspect not.

Trabecular metal not "pie-in-the sky"

■ It has been a bit of a bumper couple of months for evaluation of tibial trays, and knee fixation in general (see Research Roundup). Trabecular metal is yet another new technology where the evidence is significantly lagging behind the enthusiasm and perceived applications. If it wasn't confusing enough to choose between polyethylene and modular tibial trays the trabecular metal option is being enthusiastically adopted by some surgeons. With sound basic evidence to demonstrate bony 'through growth' (the unique highly porous multi-pore size structure allows bone to completely integrate with the implant) the temptation of a complete biological fix is a very tempting one. Researchers from **Preston (UK)** have reported the longest follow-up to date of this tempting new device. They report a consecutive non-selected series of 109 patients having undergone the procedure (Level III evidence). Outcomes were assessed using the Oxford Knee Score, Knee Society Score and the physical component of the SF-12. The team were only able to evaluate around 70% of implanted devices at six years of follow-up. They reported excellent and maintained Oxford scores (mean 36.1) and knee society scores (87.2) with no evidence of loosening in any implants, and

a single revision for unexplained pain.⁸ The authors conclude that this implant does as well as any reported at this stage, with excellent functional scores. However, this study highlights to us at 360 the difficulties of performing cohort-based research with the highly mobile western populations. With a 30% loss to follow-up at six years, a worst case scenario analysis would make eyebrow-raising reading.

REFERENCES

1. **Namba RS, Inacio MC, Paxton EW, et al.** Risk of revision for fixed versus mobile-bearing primary total knee replacements. *J Bone Joint Surg [Am]* 2012;94-A:1929-1935.
2. **Holm I, Oiestad BE, Risberg MA, Gunderson R, Aune AK.** No Differences in Prevalence of Osteoarthritis or Function After Open Versus Endoscopic Technique for Anterior Cruciate Ligament Reconstruction: 12-Year Follow-up Report of a Randomized Controlled Trial. *Am J Sports Med* 2012;40:2492-2498.
3. **Gudas R, Gudaite A, Pocius A, et al.** Ten-year follow-up of a prospective, randomized clinical study of mosaic osteochondral autologous transplantation versus microfracture for the treatment of osteochondral defects in the knee joint of athletes. *Am J Sports Med* 2012;40:2499-2508.
4. **Grindem H, Eitzen I, Moksnes H, Snyder-Mackler L, Risberg MA.** A pair-matched comparison of return to pivoting sports at 1 year in anterior cruciate ligament-injured patients after a nonoperative versus an operative treatment course. *Am J Sports Med* 2012;40:2509-2516.
5. **McCullough KA, Phelps KD, Spindler KP, et al.** Return to high school- and college-level football after anterior cruciate ligament reconstruction: a multicenter orthopaedic outcomes network (MOON) cohort study. *Am J Sports Med* 2012;40:2523-2529.
6. **Nouta KA, Verra WC, Pijls BG, Schoones JW, Nelissen RG.** All-polyethylene tibial components are equal to metal-backed components: systematic review and meta-regression. *Clin Orthop Relat Res* 2012;470:3549-3559.
7. **Kim YH, Park JW, Kim JS.** Computer-navigated versus conventional total knee arthroplasty: a prospective randomized trial. *J Bone Joint Surg [Am]* 2012;(Epub ahead of print) PMID: 23052635.
8. **Ghalayini SR, Helm AT, McLauchlan GJ.** Minimum 6 year results of an uncemented trabecular metal tibial component in total knee arthroplasty. *Knee* 2012;19:872-874.