

# ROUNDUP<sup>360</sup>

## Knee

### Meniscal defects and a polyurethane scaffold

■ The management of painful, irreparable partial meniscal defects has challenged many orthopaedic surgeons. Consequently, *360* was pleased to read a study from **Ghent (Belgium)**, where a novel, bio-degradable, polyurethane scaffold was implanted. The aim was to provide pain relief and improve function. The surgeons took 52 patients with irreparable partial meniscal defects (34 medial and 18 lateral, 88% with one to three previous surgeries on the index meniscus) and implanted a polyurethane scaffold in a prospective, single-arm, multicentre, proof-of-principle study. Safety was assessed by the rate of scaffold-related serious adverse events while the International Cartilage Repair Society (ICRS) articular cartilage scoring system was used to compare MRI findings at 24 months as well as at baseline (one week). Clinical outcomes were measured comparing a visual analogue scale, International Knee Documentation Committee (IKDC), Knee Injury and Osteoarthritis Outcome Score (KOOS), and Lysholm scores at 24 months from entry into the study. There were clinically and statistically significant improvements for all scores between baseline values and those seen at 24 months demonstrating improvements in both pain and function. The incidence of treatment failure was nine (17.3%) patients, of which three (8.8%) had medial meniscal defects

and six (33.3%) had lateral meniscal defects. There were nine serious adverse events requiring re-operation. Stable or improved ICRS cartilage grades were observed in 92.5% of patients between baseline and 24 months.<sup>1</sup> This impressed us at *360* and we hope that these good results continue, although we realise this is only a Level IV study. Nevertheless, at two years after implantation, safety and clinical outcome data from this research support the use of the polyurethane scaffold for the treatment of irreparable, painful, partial meniscal defects. How wonderful it would be if osteoarthritis could be prevented by these means, too.

### Single bundle? Double bundle? Which is best?

■ An interesting paper has appeared from **Ljubljana (Slovenia)** in which three different techniques of anterior cruciate ligament (ACL) reconstruction were studied as part of a Level I investigation. These were conventional (transtibial) single bundle (CSB), anatomical single bundle (ASB), and anatomical double bundle (ADB). The authors' intent was to establish if a double-bundle reconstruction is needed to restore rotational stability or if anatomical placement of a single bundle can yield similar results. The researchers prospectively randomised 320 patients into three groups: ADB, ASB, and CSB reconstruction. The mean follow-up was 51.15 months and by the final follow-up, 281 patients were available. In all groups, hamstring tendons were used with

suspensory fixation on the femoral side and bioabsorbable interference screws on the tibial. An independent blinded observer, using the Lysholm score and the subjective IKDC form, evaluated the outcomes. A KT-1000 arthrometer was used to evaluate anteroposterior stability, and the pivot-shift test was used to determine rotational stability. The researchers established that the ASB resulted in better anteroposterior and rotational stability than the CSB reconstruction. Negative pivot shift was 66.7% *versus* 41.7%, respectively. However, in other parameters, the differences between the groups were not statistically significant. The results of the ADB group were also superior to the ASB group for anteroposterior and rotational stability. Negative pivot shift was 93.1% *versus* 66.7%, respectively, and the range of movement was also significantly different. The Lysholm score was 90.9, 91.8, and 93.0 in the CSB, ASB, and ADB groups, respectively, a difference that was significant only when the authors compared ADB and CSB. Subjective IKDC scores were 90.2, 90.6, and 92.1 in the CSB, ASB, and ADB groups, respectively. This difference was not significant. The authors' conclusions are most helpful, in *360's* view. It appears that the ADB reconstruction is significantly superior to CSB and better than ASB. Meanwhile, an ASB reconstruction was superior to CSB reconstruction. However, these differences are small and may not be clinically relevant.<sup>2</sup> All the same, there is a good direc-

tion given by this paper. Anatomical double bundle here we come.

### OA of the knee – surgeons do sometimes listen

■ *360* feels there has been endless debate on the role of knee arthroscopy in the management of osteoarthritis (OA). The insurers in some parts of the world are having a field day. Yet has all this discussion had any effect at all? Surgeons from **Cleveland (USA)** have looked into this by hypothesising three things: 1) knee arthroscopy for osteoarthritis has decreased; 2) arthroscopy as a percentage of orthopaedic cases has decreased; and 3) the mean age of patients undergoing arthroscopy has also decreased. To answer these queries, the authors undertook a descriptive epidemiological study and examined the American Board of Orthopaedic Surgery (ABOS) database. This includes six-month case logs for each examinee sitting the Part II board examination from 1999 to 2009. Knee arthroscopy cases were identified by Current Procedural Terminology (CPT) code and knee osteoarthritis diagnosis was defined by International Classification of Diseases, 9th Revision (ICD-9) code. A linear regression analysis was used to evaluate knee arthroscopy before and after the 2002 publication of an article by Moseley et al<sup>3</sup> which, *360* recalls, was a randomised controlled trial of arthroscopy *versus* sham surgery that showed no efficacy and challenged the role of arthroscopy for the treatment of osteoarthritis. In this Cleveland study, the authors found that the number of knee

arthroscopy cases for patients with osteoarthritis had greatly decreased by 2009 after peaking in 2001 (1621 versus 966 total cases, 2.36 versus 1.40 cases per surgeon). Cases classified as chondroplasty also decreased from 10.0% to 5.8% of knee arthroscopies. In addition, the total number of knee arthroscopy cases per surgeon decreased from a high of 11.9 in 2003 to a low of 8.6 in 2009. As expected, knee arthroscopy as a percentage of total orthopaedic cases decreased from a high of 9.9% in 2003 to 6.6% in 2009.<sup>4</sup> It thus appears that knee arthroscopy for patients with osteoarthritis among orthopaedic surgeons during their ABOS examination case-collection period has decreased after the publication of the 2002 Moseley et al paper. However much we may complain, concludes 360, we do also listen.

#### **Resolving anterior knee pain – surgery does not always help**

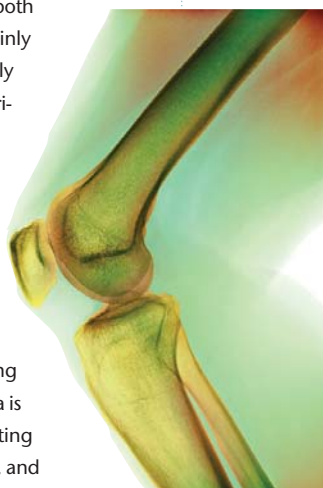
■ Resolving anterior knee pain with the arthroscope can be an uphill struggle. Consequently, a paper from **Helsinki (Finland)** on this topic is very timely. The authors undertook a randomised controlled trial to study the long-term outcome of arthroscopy in patients with chronic patellofemoral pain syndrome. They also investigated factors predicting the outcome. They looked at 56 patients in total and randomised them into two groups: an arthroscopy group (n = 28) treated with knee arthroscopy and an eight-week home exercise programme, and a control group (n = 28) treated with a similar eight-week home exercise programme only. The primary outcome was the Kujala score for pain and function at five years. Secondary outcomes were visual analogue scales to assess activity-related symptoms. According to the Kujala score, both groups showed a marked improvement during the five-year follow-up; a mean improvement of 14.7 in the arthroscopy group and 13.5 in the controls. There were no differences between the groups for the mean improvement in the Kujala score or in the visual analogue scores.

None of the investigated factors predicted the long-term outcome, but in most of the cases the treatment result immediately after the exercise programme remained similar to that seen after the five-year follow-up. This randomised controlled trial, being the first of its kind in this situation, indicates that the five-year outcome in most patients with chronic patellofemoral pain syndrome treated with knee arthroscopy and a home exercise programme, or with a home exercise programme alone, is equally good in both groups.<sup>5</sup> That certainly matches 360's totally uncontrolled experience.

#### **Yoga can be bad for your menisci**

■ Of course, we all try to stay out of the surgeon's clutch as long as we can and yoga is one way of attempting this. Unfortunately, and as researchers from **Lishui (China)** say, yoga itself is not without hazard. They report that the activity is becoming increasingly popular, particularly in the female population. Many clinicians have noted that yoga may result in knee problems, so an investigation was conducted to ascertain the relationship between yoga and meniscal injury. The authors looked at a total of 819 women aged between 20 and 49 years, who practised yoga or other popular sports including badminton, jogging, hill climbing, etc., for at least one hour each day. The subjects were required to complete a questionnaire and were then examined. MRI of the knee was recommended if there was anything to find clinically. A subject with an abnormal meniscal MRI signal was defined as a case and matched with two controls in terms of age and body mass index (BMI). This brought together 273 cases and 546 controls. The results were fascinating. In brief, yoga was associated

with a higher risk of meniscal injury than badminton, jogging and hill climbing. Subjects with longer-term yoga practice had a lighter weight but lower Lysholm scores. 360 reminds the reader that the lower the Lysholm score, the worse the result. It thus appears that yoga exerts a destructive effect on the knee menisci of Chinese women, although this clearly requires further verification.<sup>6</sup> At 360, this paper has made the decision for us. We will stick to stationary cycling.



#### **Metal ions in the serum – knees are not exempt**

■ So who said that high serum metal levels were the sole domain of hip arthroplasties of various designs? How about the knee? 360 discovered a small but interesting paper from **Graz (Austria)** in which the authors took blood from 25 patients treated either with megaprotheses (n = 17) or standard rotating-hinge devices (n = 8) and analysed the samples using electrothermal graphite furnace atomic absorption spectrometry. There was a mean follow-up of 35 months. The concentrations of cobalt and chromium ions rose after rotating-hinge knee arthroplasty although this did not apply to molybdenum. Metal ion release was significantly higher in patients with megaprotheses compared with a standard rotating-hinge knee device. It thus appears that knee replacements can also cause an elevation in metal ion levels. The authors believe there might be additional metal ion release from the surface of the prosthesis, not just from the articulating surfaces. This is because, in patients with a rotating-hinge knee prosthesis, there is a metal-on-polyethylene articulation and not a direct metal-on-metal interface.<sup>7</sup>

Nevertheless, and 360 agrees, longer-term studies are required to elaborate on this further and to determine if there are any adverse effects of cobalt, chromium and molybdenum after total knee replacement.

#### **So is ACI any good?**

■ Autologous chondrocyte implantation (ACI) has attracted much interest in recent years. Does it work or not? Consequently, a paper from **Hiroshima (Japan)** has been most helpful. In 2009, the authors had previously reported several basic studies through a multicentre clinical trial. In this more recent study, they evaluated the patients' clinical scores and MRI findings before and after tissue-engineered cartilage implantation. They then compared the data obtained at one year and approximately six years post-implantation. A total of 14 patients underwent implantation of tissue-engineered cartilage to repair cartilage defects of the knee. The tissue-engineered cartilage was produced by culturing autologous chondrocytes three-dimensionally in atelocollagen gel. The patients were evaluated clinically using the Lysholm score pre-implantation, and one year and approximately six years post-implantation. MRI scans were obtained at the same time. A modified magnetic resonance observation of cartilage repair tissue (MOCART) system was used to quantify clinical efficacy based on MRI findings. The results were good. After approximately six years of follow-up, none of the 14 patients reported any subjective symptoms of concern. The mean Lysholm score improved significantly at one year after implantation and was maintained until the six-year point. However, some patients showed deterioration of their Lysholm score between one year post-implantation and the final follow-up. The MOCART scores at one and six years were significantly higher than the pre-implantation score, although there was no significant difference between the scores at one and six years.<sup>8</sup> So ACI appears to work, thinks 360. What excellent news.

## A better understanding of the ACL

■ The ACL is a complex ligament at the best of times, so anything that improves our understanding of it must be welcomed. Consequently, 360 was pleased to read the review article from **London (UK)** on the functions of the ligament's fibre bundles. The functional anatomy of the ligament shows a parallel array of collagen fascicles that usually divide into two bundles; anteromedial and posterolateral, according to their tibial attachment sites. The posterolateral bundle has shorter fibres, and so is exposed to greater tensile strains than the anteromedial bundle should the whole ACL be stretched. Its oblique orientation in the coronal plane gives it a greater ability to resist tibial rotation than the more vertical anteromedial bundle. Most studies have found that the anteromedial bundle is close to isometricity when the knee flexes, while the posterolateral bundle slackens approximately 6 mm. There is little evidence of significant fibre bundle elongation in response to tibial rotation. Selective bundle-cutting studies have been performed that show the function of the posterolateral bundle to be dominant near knee extension in some studies, particularly when resisting anterior drawer, and that its contribution reduces rapidly with knee flexion through 30°. There has been little study of the contributions of the fibre bundles in controlling tibial internal-external rotation or pivot shift. One study found that the anteromedial bundle had greater tensions than the posterolateral bundle during a simulated pivot shift, but another study found that cutting the posterolateral bundle allowed a larger increase in coupled tibial anterior translation than cutting the anteromedial bundle. It was concluded that the anteromedial bundle is most important for resisting tibial anterior drawer – the primary function of the ACL – while

the posterolateral bundle is tight near knee extension, when it has a role in controlling tibial rotational laxity.<sup>9</sup> Although 360 has read much of this before in other texts over the years, this is an excellent review article that does also advance general understanding further. As the authors state, there is a clear need for more in-depth study of dynamic knee instability, in order to gain a better understanding of how best to reconstruct the ACL and associated tissues.

## Hyaluronic acid delays collagen degradation

■ The arguments for and against the use of hyaluronic acid in orthopaedic surgery seem to ebb and flow monthly, and one might be forgiven for thinking that many health insurers have simply given up even acknowledging its existence. Consequently, a paper from **Pierre-Bénite (France)** on the early effect of intra-articular injections of hyaluronic acid on serum and urine biomarkers in patients with OA of the knee is particularly well timed. This was a prospective open-label study. There were 51 patients with unilateral symptomatic OA of the knee who received intra-articular injections of 2 ml of hyaluronic acid (HA) on days 1, 7 and 14 and were followed for three months. On day -15, that is 15 days before injection, patients were examined and radiographs taken. They were excluded if they had bilateral OA of the knees, or if they had more than three symptomatic OA joints. Walking pain, assessed by a visual analogue scale, was obtained at each visit. Urine (U) and serum (S) samples were obtained at days -15, 1, 30, and 90. S-C2C, S-Cartilage oligomeric matrix protein, S-HA, S-CS 846 epitope, S-type II collagen propeptide, and U-type II collagen C telopeptide (U-CTX II/creatinin) were assayed. Between days -15 and 1 there was no difference for any biomarker. After adjustment for confounding

variables there was a significant correlation between clinical response and the U-CTX II/creatinin variation. U-CTX II and S-HA at baseline were independently predictive of clinical response. This study showed that 90 days after intra-articular HA injections, U-CTX II levels significantly decreased compared with baseline, suggesting a slowdown of type II collagen degradation.<sup>10</sup> This is an excellent finding, thinks 360. Maybe, just maybe, hyaluronic acid does some good after all. Now where was the telephone number for that health insurer?

## Hyaluronan and patellar tendinopathy

■ Hyaluronic acid does not always have to go into a joint; it can also be put in a tendon, as highlighted by a paper from **Tokyo (Japan)**, which reported on the use of hyaluronan injections for athletic patients with patellar tendinopathy. The authors treated 50 patients from January 1999 to December 2006. Their observation period was a mean of 25.7 months. All patients were graded stage 2 or 3 by Blazina's classification (Blazina was the one who coined the term 'jumper's knee'). Hyaluronan was injected into the interface between the patellar tendon and the infrapatellar fat pad at the proximal insertion, or into the region of maximum tenderness. The total number of injections was 135, and there was a mean of 2.0 injections per case. After treatment, 54% of the cases were rated excellent, as they were able to return to their previous athletic activities with little difficulty. However, 40% were rated as good (patients who were able to return to their previous sporting activities with some degree of limitation).<sup>11</sup> So, we conclude at 360, hyaluronan injection therapy for athletic patients with patellar tendinopathy is clearly one option for treatment. Excellent news.

## REFERENCES

1. **Verdonk P, Beaufils P, Bellemans J, et al.** Successful treatment of painful irreparable partial meniscal defects with a polyurethane scaffold: two-year safety and clinical outcomes. *Am J Sports Med* 2012;40:844-853.
2. **Hussein M, van Eck CF, Cretnik A, Dinevski D, Fu FH.** Prospective randomized clinical evaluation of conventional single-bundle, anatomic single-bundle, and anatomic double-bundle anterior cruciate ligament reconstruction: 281 cases with 3- to 5-year follow-up. *Am J Sports Med* 2012;40:512-520.
3. **Moseley JB, O'Malley K, Petersen NJ, et al.** A controlled trial of arthroscopic surgery for osteoarthritis of the knee. *N Engl J Med* 2002;347:81-88.
4. **Potts A, Harrast JJ, Harner CD, Miniaci A, Jones MH.** Practice patterns for arthroscopy of osteoarthritis of the knee in the United States. *Am J Sports Med* 2012;40:1247-1251.
5. **Kettunen JA, Harilainen A, Sandelin J, et al.** Knee arthroscopy and exercise versus exercise only for chronic patellofemoral pain syndrome: 5-year follow-up. *Br J Sports Med* 2012;46:243-246.
6. **Zhu JK, Wu LD, Zheng RZ, Lan SH.** Yoga is found hazardous to the meniscus for Chinese women. *Chin J Traumatol* 2012;15:148-151.
7. **Friesenbichler J, Maurer-Ertl W, Sadoghi P, et al.** Serum metal ion levels after rotating-hinge knee arthroplasty: comparison between a standard device and a megaprosthesis. *Int Orthop* 2012;36:539-544.
8. **Takazawa K, Adachi N, Deie M, et al.** Evaluation of magnetic resonance imaging and clinical outcome after tissue-engineered cartilage implantation: prospective 6-year follow-up study. *J Orthop Sci* 2012;(Epub ahead of print) PMID:22580965.
9. **Amis AA.** The functions of the fibre bundles of the anterior cruciate ligament in anterior drawer, rotational laxity and the pivot shift. *Knee Surg Sports Traumatol Arthrosc* 2012;20:613-620.
10. **Conrozier T, Balblanc JC, Richette P, et al.** Early effect of hyaluronic acid intra-articular injections on serum and urine biomarkers in patients with knee osteoarthritis: an open-label observational prospective study. *J Orthop Res* 2012;30:679-685.
11. **Muneta T, Koga H, Ju YJ, Mochizuki T, Sekiya I.** Hyaluronan injection therapy for athletic patients with patellar tendinopathy. *J Orthop Sci* 2012;(Epub ahead of print) PMID:22526713.