

ROUNDUP³⁶⁰

Hip & Pelvis

Hip cartilage and magnets

■ One of the most exciting emerging new technologies is that of higher resolution MRI scanning, and particularly those with modern sequences. At 360, we are constantly amazed with the cleverness of the medical physics boffins, and particularly those who brought us the dGEMRIC sequence which has been applied to orthopaedic applications since the early 2000's.¹ The delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) sequence uses a T1 relaxation time sequence after administration of hydrophilic gadolinium contrast. As the chief hydrophilic content in cartilage is glycosaminoglycan (GAG) the MRI can be used to estimate the GAG content in cartilage. Researchers from **Boston (USA)** designed a study using dGEMRIC sequencing to establish whether patients with hip dysplasia suffered from localised cartilage loss (indicated by a decreased GAG content on the scan) or a more generalised condition. The researchers hypothesised that if hip dysplasia were a purely mechanical phenomenon, localised areas of damage would be seen on the scans. If, however, a more global 'biological cascade' were involved, signal changes would then be noted throughout the joint. The authors designed a cohort study consisting of 32 patients all with established hip dysplasia. All patients underwent a standardised 1.5T dGEMRIC MRI scan with specific scan reformatting to allow the GAG content, and

soft-tissue loss to be established on the femoral and acetabular sides of the joint. They identified that the global dGEMRIC index had strongly positive correlation coefficients (> 0.95 for all patients) between individual areas and the whole joint. This pattern was not completely reflected in the joint space loss measurements. They also recorded lower correlation coefficients ($r = 0.56$ to 0.77) for joint space narrowing with dGEMRIC.² The authors conclude that this indicates there is a more biological than physical explanation for degenerative change in hip dysplasia. They hypothesise that the initial mechanical stimulus may drive more global cartilage degeneration. This is certainly an interesting assertion and one that has been made in other types of degenerative joint disease. However, the authors have not yet quite proven their hypothesis. The addition of some longer-term follow-up patients demonstrating global joint space loss would complete the picture. Here at 360 we do not (yet) quite see the proof of causation; a similarly valid explanation might be that given the localised joint space narrowing, the dGEMRIC sequence changes must represent a joint response to the injury, not an active process leading to degeneration.

Labral repair or resection?

■ Arthroscopic labral surgery is a well established treatment supported by a wide range of limited quality evidence. The practice of labral repair, however, has not previously been shown to have any more

benefit than simple debridement, and although widely practiced this intervention has until this point been lacking in evidence. Researchers from **Rochester (USA)** have reported on their efforts to establish the efficacy of labral repair compared with simple debridement. They designed and conducted a randomised controlled trial (Level I evidence). A total of 36 female patients presenting with pincer or combined pincer and cam type acetabular deformities were enrolled in the study and randomised to either labral repair or debridement at the time of surgical treatment. Randomisation was equal with 18 patients in each group and follow-up was to a minimum of one year post-operatively. The results were assessed with the Hip Outcome Score (HOS) measure. Following treatment and at a mean follow-up of 32 months, the mean HOS for activities of daily living subscale (HOS-ADL) significantly improved in both groups, however, those undergoing repair had a significantly improved post-operative HOS-ADL (91.2 versus 80.9) and sports HOS subscale (88.7 versus 76.3) compared with those undergoing debridement. The post-operative rehabilitation regime was identical in both groups.³ This represents one of very few well designed studies within the field of hip arthroscopy. A study of this nature has been long overdue and until now no studies have proven the benefit of repair over simple resection. The evidence presented here supports labral repair with significantly

better outcomes. While we would add a note of caution that the sample size is small, this is currently the best available evidence on which to base the choice of resection or debridement in hip labral tears.

Who benefits from injection?

■ Intra-articular corticosteroid injection is commonly performed in all forms of osteoarthritis and is used throughout the world in the treatment of pre-arthroplasty osteoarthritis. One of the difficulties faced by clinicians is that there is some evidence that injection followed too closely by arthroplasty can result in higher infection rates, posing a problem for the patient who does not achieve the expected benefits of injection, then having to wait for their arthroplasty. Although previous studies have failed to demonstrate any predictors of pain relief following injection, researchers in **Dudley (UK)** were undeterred and performed their own systematic review in an attempt to pool evidence and establish which patients benefit (in terms of pain relief) from an intra-articular hip or knee injection. The authors searched for suitable papers using MeSH keywords and the most commonly used medical indexing services. Inclusion criteria were defined as papers describing clearly defined outcome measures for intra-articular hip and knee corticosteroid injections and those which contained data pertaining to predictors of outcomes. The review team identified 54 potentially suitable studies of which 21 met the inclusion criteria. These were reviewed by two of the authors.

Although the articles reported variable responses to intra-articular steroid use, when subjected to systematic review no factors identified as potential predictors of response were found. The authors were able to exclude radiological grade, inflammatory disease (indicated by either clinical or sonographic evidence) and synovial hypertrophy as potential predictors of response to corticosteroid administration.⁴ It appears to us here at 360 that, based on the data presented in this review, there is currently no way of knowing which patients will benefit from corticosteroid injections. The authors conclude that for such a common intervention better studies are required. While this is possibly the most popular conclusion of any systematic review or meta-analysis, it has to be said that for this particular intervention we are inclined to wholeheartedly agree with them.

Rotational osteotomy for osteonecrosis?

■ A reliable early intervention for osteonecrosis of the femoral head still eludes modern medicine. Some patients seem to recover with any of a number of treatments, while others do not. With any multifactorial disease with a range of treatment options, matching suitable treatments to suitable patients is key to optimising outcomes. Researchers from **Fukuoka (Japan)** aimed to establish the radiological factors predictive of progression of joint collapse following a trans-trochanteric rotational osteotomy of the proximal femora performed for osteonecrosis of the femoral head. The research team were able to report a prognostic study involving 51 hips treated in 47 patients, followed up for an impressive mean of 11 years. The patients were divided according to their outcomes, as successful (no evidence of progression) and unsuccessful (collapse and joint space narrowing). The study team collated as many radiological and clinical factors as they could in order to establish what the predictive factors were for placing patients into each group. Amazingly,

for a series with such long-term follow-up the authors only report six patients (11.7%) with progression of their disease. Although the investigators examined a range of factors, only their pre-operative stage of disease and post-operative intact ratio (measured from a neutral post-operative ratio) were predictive of disease progression. They recommend the rotational osteotomy only when a post-operative intact ratio is around a third.⁵ These results certainly look superb for this operation in these cases.

However, while we were enthusing about the results, we came across a similar paper from the same research group, with a broadly similar message. This cohort was followed up to ten years, but included more patients (125 patients) with double the failure rate (22%) of progressive collapse. It leaves us all a little confused here at 360; it is clear that the post-operative intact ratio is predictive of outcome but we are a little unclear as to what the expected success rate is.

Unconventional thinking

■ Conventional thinking for hip osteoarthritis indicates joint-preserving surgery in the early stages and for younger patients, and THR for the more advanced stages of disease. This follows the logic that ‘nothing beats a tin hip’. Surgeons in **Hirosaki (Japan)** have challenged our thinking, and aimed to establish if a peri-acetabular rotational osteotomy combined with an intra-articular debridement (including central osteophyte and head debridement) is a successful treatment for advanced osteoarthritis. The surgical team convinced seven patients with a mean age of 39 at the time of surgery to undergo the procedure. The surgeons included debridement



of the head osteophytes alone in five patients, and combined with removal of the intra-articular osteophytes in two. During follow-up nearly half the patients had progression of their osteoarthritis and the JOA hip score improved from 53 points to 69 points. Radiological assessment was improved (as would be expected, centre-edge angles and femoral head medialisation improved) but range of movement decreased across the cohort.⁶ The authors conclude that this procedure does not prevent disease progression and they have abandoned the operation. We do not think anyone will be arguing with this conclusion.

Risking fracture: ceramic revisited

■ The venerable metal-on-polyethylene articulation beloved of Sir John Charnley has fallen out of favour in recent years, with surgeons turning to ceramic-on-ceramic (CoC) and metal-on-metal (MoM) articulations. Each offers a number of potential advantages including increases in longevity, but both hard-on-hard bearing options also introduce their own unique problems. Early ceramic articulations suffered from relatively high rates of phase transformation and fracture was not uncommon. Researchers in **Bologna (Italy)** felt it was high time to look again at the risk factors for ceramic liner fracture. The authors undertook a comparative case series (Level III evidence) in order to investigate this question by comparing 26 joints with ceramic liner fracture with a series of 49 without. They examined a range of factors including patient demographics, implant factors (liner type, component sizes, neck length) and surgical factors (acetabular anteversion and abduction, off-set and centre of rotation) along with the recorded

incidence of noisy articulations. The chief finding of the study was a higher incidence of malposition of the components in the fracture group with regards to anteversion (outside the authors' preferred range of 5° to 25°) and startlingly different rates of hip squeak between the two groups (80.7% versus 6.1%).⁷ The authors hypothesise that the increased combination of altered anteversion results in head neck impingement, squeaking, macroscopic liner damage and subsequent failure. While this seems like an attractive explanation for the problem, there is no evidence to support this presented in the paper – only conjecture.

Dual articulation: like buses

■ Here at 360 we were delighted to see this paper on our desk, filling a slight hole in the evidence base we highlighted in the previous issue, namely the potential for use of dual articulations in hip fracture patients. Potentially, this may offer all the benefits of a THR without the down sides of increased dislocation risk. Researchers in **Kaunas (Lithuania)** have reported their experience with the dual mobility system, adding another piece to the jigsaw. Reasoning that the functional results were likely to be similar, but with a reduced risk of dislocation, the authors designed a comparative cohort series of patients with a femoral neck fracture, treated either with a THR or dual articulation cup (DAC). The study was followed up to one year and the clinical outcomes were assessed at four and 12 months. Patients' outcomes were assessed using a quality of life score (EQ-5D) and the hip disability and osteoarthritis outcome score (HOOS). As this was not a randomised or matched trial the group sizes were different and the trial reported the outcomes of 125 patients (58 DAC and 67 THR). The authors were unable to establish any differences in clinical outcome measures between the two groups at any time point. There were no dislocations in the DAC group, but 10% suffered dislocations in the THR group (seven patients, five requiring

revision).⁸ The authors conclude that the dual mobility cup offers an identical functional result to a THR without the excess dislocation risk. Here at 360 HQ we are starting to see more and more articles reporting good results with dual articulation cups, now at mid-term follow-up. Although many surgeons are naturally cautious of a departure from a traditional design, the evidence is starting to accumulate that dual articulations may offer a robust 'higher stability' option.

Hydroxyapatite: an essential ingredient?

■ The rise in popularity of un cemented implants has led to ever more careful scrutiny of implant coatings. Many of the most successful implants incorporate plasma-sprayed hydroxyapatite (HA) into their design. However, given time, the HA is completely resorbed leaving an uncoated surface. There is little data to determine the importance of the HA coating in maintaining the initial stability. Researchers from

Zurich (Switzerland) undertook a prospective randomised controlled radiostereometric analysis (RSA) study (Level I evidence), designed to establish the contribution of the HA coating to the initial stability of a flattened pole porous titanium press-fit acetabular component (the EP-FIT PLUS). The study recruited 42 patients (44 hips), all post-menopausal women, to reduce the potential confounder of hormonal differences which may affect bone metabolism. The primary outcome measure was cup migration in all 9 degrees of freedom, measured at six weeks and then at regular intervals until 24 months. Both designs of acetabular component, with and without HA coating, were extremely stable with less than 1 mm and 1° of early migration. Interestingly, there were absolutely no early differences between the two groups.⁹ It is rare to see randomised controlled trials of this type examining one single aspect of what are a constellation

of design features (and sometimes fads) with what is an extremely robust methodology. We are delighted to see that these components performed quite so well, and we wonder how much excellent surgical technique may have played a role in these results.

REFERENCES

1. **Tiderius CJ, Svensson J, Leander P, Ola T, Dahlberg L.** dGEMRIC (delayed gadolinium-enhanced MRI of cartilage) indicates adaptive capacity of human knee cartilage. *Magn Reson Med* 2004;51:286-290.
2. **Hingsammer A, Chan J, Kalish LA, Mamisch TC, Kim YJ.** Is the damage of cartilage a global or localized phenomenon in hip dysplasia, measured by dGEMRIC? *Clin Orthop Relat Res* 2013;471:301-307.
3. **Krych AJ, Thompson M, Knutson Z, Scoon J, Coleman SH.** Arthroscopic labral repair versus selective labral debridement in female patients with femoroacetabular impingement: a prospective randomized study. *Arthroscopy* 2013;29:46-53.
4. **Hirsch G, Kitas G, Klocke R.** Intra-articular corticosteroid injection in osteoarthritis of the knee

and hip: factors predicting pain relief: a systematic review. *Semin Arthritis Rheum* 2013;(Epub ahead of print) PMID: 23374502.

5. **Zhao G, Yamamoto T, Motomura G, et al.** Radiological outcome analyses of transtrochanteric posterior rotational osteotomy for osteonecrosis of the femoral head at a mean follow-up of 11 years. *J Orthop Sci* 2013;(Epub ahead of print) PMID: 23344931.

6. **Nakamura Y, Ohishi H, Kishiya M.** Rotational acetabular osteotomy with resection of the capital drop and double floor for advanced osteoarthritis of the hip. *Hip Int* 2013;(Epub ahead of print) PMID: 23397195.

7. **Traina F, De Fine M, Bordini B, Toni A.** Risk factors for ceramic liner fracture after total hip arthroplasty. *Hip Int* 2012;22:607-614.

8. **Tarasevicius S, Robertsson O, Dobozinskas P, Wingstrand H.** A comparison of outcomes and dislocation rates using dual articulation cups and THA for intracapsular femoral neck fractures. *Hip Int* 2013;23:22-26.

9. **Munzinger U, Guggi T, Kaptein B, et al.** A titanium plasma-sprayed cup with and without hydroxyapatite-coating: a randomised radiostereometric study of stability and osseointegration. *Hip Int* 2013;21:33-39.