

# ROUNDUP360

## Hip & Pelvis

**X-ref** For other Roundups in this issue that cross-reference with Hip & Pelvis see: Trauma Roundups 1, 2, 5 and 6; Oncology Roundup 6; Children's orthopaedics Roundup 1 and Research Roundup 7.

### Hip arthroscopy and the evidence

■ Although the number of hip arthroscopies undertaken is increasing steadily across the globe, there are still many who doubt the efficacy of this procedure, or even the existence of femoroacetabular impingement (FAI) as a clinical entity. There is no consensus as to the natural history of FAI and the link to osteoarthritis is difficult to quantify, although most now accept it is probably at least a predisposing condition. A review team based in **Horsens (Denmark)** have conducted a thorough review of the literature and meta-analysis in a very valid attempt to distil the existing literature and shed further light on the value or otherwise of hip arthroscopy for FAI.<sup>1</sup> The authors have employed a fairly robust methodology to identify studies of reasonable quality (albeit low level evidence – only one RCT) using EMBASE, MEDLINE, SportsDiscus, CINAHL, the Cochrane Library and PEDro. They were able to identify 26 studies for inclusion in their meta-analysis. A strength of this study over other similar previously published work is that clinical outcome data were included and analysed at different time points following hip arthroscopy, and then compared against pre-operative clinical scores. The key findings were:

- subjective improvement in hip pain detectable between three and six months following surgery
- improvements to activities of daily living between three and six months following surgery
- improvement to sporting function between six and 12 months following surgery
- ongoing improvement in all of these areas continued up until two to three years post-operatively

This study, which is the strongest evidence to date, would suggest that over two thirds of patients are satisfied with the results of their surgery. That said, the majority of patients do not achieve a functional result that is as good as normal individuals who did not require hip impingement treatment in the first place. The findings of this paper are relevant in that they validate hip arthroscopy as a treatment modality, and also provide valuable evidence to assist in counselling patients with regard to the recovery timescales they can realistically expect post-operatively. Notwithstanding the acknowledged design limitations of the studies available for inclusion, this meta-analysis supports the conclusions drawn by the authors. This should go some way to justifying hip arthroscopy as a treatment to healthcare funders. Until there is a better quality randomised controlled trial with some robust health economic data, this meta-analysis probably represents

the best data there are to support this treatment.

### Hip arthroplasty in femoral neck fracture

■ The body of evidence on the topic of total hip arthroplasty (THA) as a treatment for neck of femur fracture is growing. There are a number of small randomised controlled trials that are suggestive of better functional outcomes with THA. However, despite this, due in part to the fragility of many patients, this remains a relatively infrequently undertaken procedure. This paper from **Edinburgh (United Kingdom)** fills in some of the current gaps in knowledge and describes longer-term follow-up than in much of the existing published work in this area.<sup>2</sup> This study reports the outcomes of 128 consecutive patients undergoing cemented metal-on-polyethylene THA (all undertaken via an antero-lateral approach) for femoral neck fracture over a three-year period and these were all identified and prospectively followed-up. As perhaps would be expected, far more patients were female than male. At a mean follow-up of 5.4 years, 16% had died (although again as would be expected in a total hip cohort, none had died before 90 days post-op) and 9% had sufficiently severe dementia to preclude a meaningful response. Of the remainder, 80% responded. The premise of this paper is that it constitutes a five-year follow-up of a group previously reported up to two years, showing no significant differences in Oxford Hip Score, Visual Analogue Score and SF-12 between two-year results

and five-year results (the present paper). Overall, patient satisfaction levels remained high and clinical outcomes excellent after this longer period of follow-up. The authors conclude that these encouraging results derive from careful patient selection and that all procedures were undertaken by specialist arthroplasty surgeons (this obviously poses logistical challenges in terms of service planning in the majority of centres). Rather contentiously, the authors also attribute their good results to their use of the modified Hardinge approach in all cases (with the aim of lowering dislocation risk). This, however, is not entirely borne out by their own literature review. The overall conclusion here is that THA gives good mid-term results for femoral neck fracture, provided the correct surgeons undertake it in the correct patients. This is substantiated by their results and certainly adds to the increasing body of evidence in this area to suggest that perhaps more patients should receive THA following this injury. Of course, what this paper doesn't help us with is the selection criteria which are still very much up for debate.

### Dual mobility a favourable option in revision arthroplasty

■ The use of dual mobility cups has seen a steady increase. Reassured by more modern bearing surfaces with better tribology, the trade-off of increased wear but improved stability seems to be moving in many surgical practices towards a favourable one - particularly in the case of revision surgery where it



may not be too difficult to justify the potential for reduced longevity in return for improved stability. There are, however, few reasonable-sized studies on the topic and this study from the Swedish Hip Arthroplasty Register adds a huge amount to what was previously known. The authors from **Gothenburg (Sweden)** have reviewed the outcomes of 984 hip revision procedures undertaken for dislocation and recorded on the registry between 2005 and 2015.<sup>3</sup> Although 523 of these were undertaken using a dual mobility bearing, this study - quite sensibly - only analyses the 436 of these which were undertaken with the most commonly used prosthesis (the ZimmerBiomet Avantage cup). The outcomes from this group are compared against 355 revisions also undertaken using a standard cemented polyethylene cup. A note of caution should of course be injected here – it is highly possible there will be a moderate selection bias, with surgeons in general likely to use the dual mobility cup in the more severe cases of instability. It is therefore all the more heartening that the key take-home message from this study is that both re-revision specifically for dislocation and all-cause re-revision are more likely in the fixed bearing group than the Avantage group ( $91\% \pm 3.7\%$  vs  $86\% \pm 4.1\%$ ). Although there was a statistical difference in ages between the groups, the cohorts otherwise appeared well matched and the comparison is probably a valid one. The findings of this study support the use of dual mobility acetabulum

as a favourable option in revision hip arthroplasty surgery, specifically where instability is the indication for revision. Although registry-based studies are by no means beyond criticism, the large numbers and clear statistical differences with these two bearings from an internationally well respected joint registry certainly merit consideration.

### The dual mobility in systematic review

■ We would draw readers' attention to a highly relevant systematic review on the same topic of dual mobility acetabular components and their benefits, or otherwise, with regard to dislocation. This review group from **New York, New York (USA)** have undertaken a very detailed systematic review of the existing literature, looking at dislocation rates for dual mobility hips used in both primary and revision contexts.<sup>4</sup> An English language search was undertaken, including all publications between 1974 and 2016, and yielded 59 articles, reporting the outcomes of a total of 17 908 hip arthroplasties (12 844 primaries, 5064 revisions). The mean follow-up in the primary group was 6.8 years, *versus* 4.4 years for revision cases. The mean dislocation rate for the primary hip group was 0.9%; for revisions, the value was 3.0%. The authors also looked at intra-prosthetic dislocation (separation of inner and outer heads) which was reported as 0.7% *versus* 1.3% in primary and revision cohorts, respectively. While the authors acknowledge that the dislocation rate in primary hips is not substantially lower than that now widely expected with fixed bearing implants, they explain this by suggesting that many papers describing the use of dual mobility hips for primary implantation describe high-risk patient cohorts that might otherwise be expected to show above-average dislocation rates. Looking carefully at the included papers, this may well be a valid conclusion. The dislocation rate they describe following

revision surgery with dual mobility components is, as the authors suggest, lower than many series describe following fixed bearing revision surgery. Despite the introduction of a potentially additional complication (that of intra-prosthetic dislocation), it would appear that in the revision setting, at least, the dual mobility does offer a significant benefit over traditional arthroplasties. All of the established joint registries demonstrate that instability is one of the most common causes for further surgery after both primary and revision hip arthroplasty. Even allowing for the fact that, as the authors themselves acknowledge, the majority of the studies included are fairly low level evidence, the findings of this review certainly support the use of this bearing type as a means of potentially reducing this burden, and they triangulate well with the previous study, both suggesting a benefit in terms of revision rates.

### Improving on the anterior approach

■ Although the direct anterior approach to the hip is gradually gaining popularity in the context of total hip arthroplasty, it is still widely perceived by many to confer a higher potential risk of dislocation during the learning curve, longer surgical time and to potentially limit access. The perceived lack of extensibility creates a significant potential problem for those who are looking to use it for more complex procedures. Conversely, the perceived advantages include the ability to obtain intra-operative radiographs (allowing accurate reconstruction of offset and leg-length), reportedly quicker return to normal function following surgery and potentially lower dislocation rates in the hands of surgeons experienced in this approach. This paper from a group in **Genk (Belgium)**, experienced in hip arthroplasty through an anterior approach, is interesting in that it specifically describes some of the difficulties faced on a day-to-day

basis by those trying to use the anterior approach for more complex indications.<sup>5</sup> While this is a retrospective series, it consists of a series of all young surgically complex patients presenting with either congenital or paediatric hip problems resulting in secondary osteoarthritis. The paper describes techniques to make use of various releases, both to allow a more extensile approach, with optimal visualisation of the acetabulum in particular, and to correct contractures and limitations in range of motion. The authors report their experience of 37 hip arthroplasties in 29 patients, all retrospectively recruited and all of whom had a history of either previous trauma, cerebral palsy, septic arthritis, Perthes' disease or a metabolic bone disorder resulting in arthritic change. The authors describe a fair number of intra-operative (8%) and early post-operative (11%) complications. These are comparable with rates published in other series reporting outcomes in similarly high-risk patient groups undergoing surgery via more widely used surgical approaches. Perhaps the most striking finding of the paper is that 70% of patients described the outcome as either 'good or very satisfied'. This again compares encouragingly with other published work in these patient subgroups. The authors acknowledge that there is a learning curve for these procedural modifications, even in surgeons familiar with the anterior approach. Nevertheless, the data presented in this small series undoubtedly support the authors' contention that this approach is a safe and effective means of accessing the hip in this challenging patient cohort, and can give results that, at the very least, do not seem inferior to work published in similar cohorts treated via a more widely used 'conventional' approach.

### The direct anterior approach and cementless total arthroplasty

■ Every total hip arthroplasty approach has risks and

benefits – and taking another look at the direct anterior approach this month, researchers from across the **United States** report the potential complications associated with three different approaches: the direct lateral; posterior; and anterior approaches to the hip.<sup>6</sup> The authors collated information on 478 early revisions performed within five years of the primary joint arthroplasty, a case-controlled series. The authors evaluated the surgical approach undertaken for the primary joint arthroplasty, establishing that the majority of these early revisions were from primaries undertaken using the anterior approach (51%), with lower numbers of direct lateral (35%) or the posterior (14%) approach. The authors went on to perform a multivariate regression analysis controlling for age, sex, laterality, Dorr bone type, body mass index (BMI) at revision, bilateral procedure, and femoral stem type. They report that the approach still remained a significant predictor of early revision. This multicentre retrospective study compared complications after the direct lateral, posterior and anterior hip approaches. There is no such thing as a free lunch – the direct anterior approach had more early femur failure, the posterior approach had more dislocations, and the direct lateral had more infections. This information should be taken with a large pinch of salt as there is of course no denominator. It is somewhat misleading to undertake multivariate analysis for predictors of an outcome if all patients have had that outcome. All we have here, sadly, is a description of association of risk factors. Within the total population, had the anterior approach been the most commonly undertaken approach, then clearly these results would be poorer than fact, where if the counter were true and just a few hips were undertaken in the wider population with an anterior approach then these results are truly awful. Some more work is definitely

required here before conclusions can be reached one way or the other. All that can be said is that the pattern of failure appears to differ according to surgical approach.

### Dislocation and arthroplasty

■ Dislocation following a revision total hip arthroplasty (THA) is reported as one of the most common complications, with an incidence rate in various series reported as being between 4% and 30%. The risk of dislocation varies, and patient, implant and surgery-specific factors are all indicated. The most common risk factors discussed are size of the femoral head, abductor deficiency, surgical approach utilised and component malposition. Other factors known to contribute include small head:neck ratios, alcohol use, dysplastic pre-operative geometry, and social activities. The identification and quantification of these risk factors is obviously important and a key factor in minimising the risk of dislocation post-operatively. Previous publications on this topic have been somewhat limited by their small sample size, with inconsistent conclusions often based on a single unit or single surgeon's experience. The authors of this paper from **Hebei (China)** performed the first meta-analysis on the topic with the aim of summarising and quantifying the risk factors of dislocation following revision THA.<sup>7</sup> The initial literature search identified 221 articles and, after the authors applied their inclusion and exclusion criteria, a total of eight studies were included in the meta-analysis. The authors were able to include a total of 4656 patients, with an incidence of 9.04% of dislocation ( $n = 421$ ). Within the population considered in the meta-analysis, the most significant risk factors for dislocation were perhaps unsurprisingly a prior history of instability and prior revisions. Factors that had previously been unrecognised or underappreciated as a risk factor included age at surgery, femoral head size and those revisions that were not performed

with an elevated rim liner. Based on the robust data presented here, patients with a history of a prior dislocation were 2.74 times more at risk of a further dislocation compared with those patients who had no history of a previous dislocation. Those patients who had in excess of three revisions were 2.23 times more at risk of a dislocation compared with those patients who hadn't. This study also confirmed that the incidence of dislocation was consistently higher in those revisions that had a femoral head size of  $\leq 28$  mm compared with those who had a larger diameter femoral head size of  $\geq 32$  mm. Interestingly, those patients who had a dislocation post-revision were younger but only by a year (64.25 vs 65.3 years), and elevated rim liners were also found to reduce the overall risk of dislocation (patients that did not have an elevated rim liner were 1.8 times more likely to have a dislocation). In this meta-analysis, a constrained liner, trochanteric osteotomy, cup inclination and anteversion, BMI, and single component revision were not found to be risk factors for revision. This is somewhat surprising, although this may be in part due to the other factors, some of which may be confounding. Despite the limitations of the data available to perform this meta-analysis, it does provide some very useful information regarding the potential risk for dislocation following revision of a THA. This information will be particularly valuable when discussing potential options for a patient who is considering a revision of their THA. It also confirms the advantage of using larger femoral heads and elevated rim liners to help reduce the risk of dislocation.

### A more than 20-year follow-up of the hydroxyapatite-coated stems

■ The fully hydroxyapatite (HA)-coated stem has become one of the gold standard stem options. With a range of different manufacturers and designs, the concept of a fully

HA-coated stem has been proven in a variety of clinical settings and there are enviable outcomes reported in a range of registries and independent series. While this study from **Oslo (Norway)** is not without its weaknesses, it has immense value as a 'super long-term' follow-up of one of the most widely used HA-coated hip systems.<sup>8</sup> The Corail stem already has long-term data published which prove the grit-blasted and extensively HA-coated femoral stem design. However, in some quarters, loosening of the femoral stem, as well as stress shielding, has been a concern with fully HA-coated uncemented femoral stems. Additional issues with stems designed in this manner include the porosity, potential for low fatigue strength, degradation and delamination of the HA coating. This study with 28-year follow-up will hopefully shed some light on these concerns – after all, this is one of the longest follow-ups published in the arthroplasty literature, and certainly for a stem still in regular use. A total of 323 primary THAs, all with the Corail femoral stem, were performed in 276 patients with a mean age of 48 years. In 195 cases a hemispherical cup, and in 128 cases a hemispherical screw cup was used, both of which were uncemented, grit-blasted and coated in HA. This was matched to a gamma-irradiated polyethylene liner. The majority of patients received a stainless steel head (300 in total) and 23 received an alumina head. As with many long-term studies, a number of patients either died or were too old to attend for follow-up, however, the authors had access to the results of an impressive 255 hips in 212 patients, with a follow-up of 20 to 28 years. Over the course of this period there were just two cases of mechanical loosening of the femoral stem, a single patient had a periprosthetic fracture and three patients presented with late deep infection. There was no apparent incidence of stem subsidence exceeding 5 mm in any patient other than the two

with formal loosening. There was, however, some radiological evidence of lucent zones, presumably representative of fibrous ingrowth, with a thickness from 1 mm to 3 mm in 17 cases, most commonly affecting zone 1. There was also some evidence of bone atrophy and resorption in 41 cases, most commonly in zone 7. The most significant complication here was mechanical failure of the less-than-impressive acetabular component, with 58 press-fit cups and 31 screw-fit cups affected and requiring revision over the nearly three decades of follow-up. While on the face of it the results look impressive for the stem, there are some misgivings. As the authors point out, there was a very high rate for revision of the acetabular component which may result in lower activity for patients post-operatively. The authors concluded that there was a low incidence of distal cortical hypertrophy and minimal proximal bone loss, suggesting no significant net transfer of stress from proximal to distal. This, they hypothesised, suggested that the weight distribution from the stem to the bone was physiological. However, looking more carefully at the radiographic results, not all was as rosy as the authors suggest. From a total 255 THAs, there was evidence of bone atrophy in 41 cases (16%), fibrous ingrowth in 17 cases (7%), and 21 cases (8%) of endosteal condensation (pedestalling). Although the follow-up length is impressive, these findings could reasonably be used to argue the contrary. There is much to commend this study and while it will have done much to allay the concerns remaining regarding the durability of uncemented, fully HA-coated femoral stems, and the high rate of failure seen in the acetabular components somewhat clouds the message here. However, these results are as good as any published, and until there are reports of longer-term follow-up in randomised studies these will stand as "as good as it gets".

### Supporting decision making in metal-on-metal hips

■ It is no secret that the metal-on-metal (MoM) debacle will continue to haunt surgeons, device manufacturers and patients for many years to come. The Medicines and Healthcare Products Regulatory Agency (MHRA) has published guidelines for managing patients with MoM total hip arthroplasty (THA). Current evidence suggests that hip surgeons should avoid 'hanging their hat' on just one single parameter for decision making in patients following MoM THA. The literature suggests that a number of risk factors are implicated, and many are widely accepted as risks for failure of MoM THA. The picture, however, has become increasingly confused on how best to manage these patients as more and more guidelines are issued. The objective of this study from **Boston, Massachusetts (USA)** was to design an easy-to-use method of assessing the risk of revision that could help guide the management of this patient group.<sup>9</sup> The authors performed a prospective multicentre, multinational follow-up study of 1301 patients (1434 hips), all of whom had an ASR hip resurfacing or an ASR XL THA with a mean follow-up of 6.5 years. They then undertook scoring using criteria and clinical recommendations based on the risk stratification criteria of a consensus algorithm. This risk stratification required the following criteria: (1) gender and evidence of hip dysplasia; (2) patient activity; (3) local hip symptoms; (4) systemic symptoms; (5) hip function; (6) femoral head size; (7) recalled MoM implant; (8) acetabular cup inclination; (9) acetabular cup anteversion; (10) evidence of osteolysis and/or loosening; and (11) blood metal ion levels. Each criterion was then graded as 'low', coded as 1, 'moderate', coded as 2 or 'high' risk, coded as 3 (Harris hip score (HHS) low risk 80 to 100, moderate risk 70 to 79, high risk <70; Cobalt or chromium ppb low risk

< 3, moderate risk 3 to 10, high risk > 10). An analysis was then made to assess which of the 11 criteria were the significant predictors of revision surgery. This analysis revealed that the minimum set of variables that were predictive of revision surgery were hip function as determined by the HHS and blood metal ion levels. Reasons for revision included pain, adverse local tissue reaction, osteolysis, patient demand, component loosening and osseous tissue necrosis. The proposed MoM risk score is calculated by multiplying the HHS group (either 1, 2 or 3) by 1.96 and by multiplying the cobalt or chromium group (either 1, 2 or 3) by 2.34, with the result averaged. A low risk in this paper is indicated by a score of < 2.16; moderate risk, a score of 2.16 to 4.10; and high risk, a score of > 4.10. The authors have been able to design a simplistic MoM risk score which they have proven to be an effective tool for stratifying patients into groups by risk of implant failure. A high MoM risk score can therefore support a surgeon's decision to revise an implant, a moderate risk score can justify frequent follow-up, and a low risk score, annual follow-up. Perhaps the development into an easy-to-use smartphone App would be the best possible outcome for all patients. The MoM risk scoring system is one of the first to address the lack of data behind other previously published guidelines. It also clears up any confusion on how best to stratify patients that fall within different risk groups. However, injecting a note of caution, a number of patients in this study did not have a metal artefact reduction sequence MRI and as a result there were no MRI characteristics included in the analysis. Although the authors point out that an adverse local tissue reaction can occur in well functioning hips, as well as those that are not functioning well, this is a significant omission. Testing of this score is required for accuracy, reliability and responsiveness before it can be used with

complete confidence. Nonetheless, it is certainly a step closer to accurately and efficiently assessing the risks for revision in MoM hip bearings.

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