ROUNDUP360

Hip & Pelvis

X-ref *For other Roundups in this issue that cross-reference with Hip & Pelvis see: Knee Roundups 3 & 7; Research Roundups 3 & 5.*

Is once enough: repeat aspiration and PJI

Prosthetic joint infection (PJI) is a devastating complication following total joint arthroplasty, with an estimated incidence range of 0.2% to 2%. The financial and health-related burden of PJI treatment is significant. When compared with a primary arthroplasty, it has an estimated three-fold increase in cost, hospital stay, and likelihood of readmission. According to the diagnostic guidelines set by MSIS, a patient is diagnosed with a PJI when they present with one of two major criteria, or with three of five minor criteria. Despite the clear definition, the diagnosis of a PJI is not always as straightforward. In cases where patients present with clinical symptoms of an infection and aspiration results are negative, a repeat aspiration has been recommended by the American Association of Orthopaedic Surgeons for some time (since 1993). This suggestion was based on a single study of 31 repeat aspirations before the introduction of synovial cell count, neutrophil percentage, and other modern elements used in the current PJI definition. In this study, the investigators from **Phoenix, Arizona (USA)** set out to re-examine the role of repeat aspiration when diagnosing PJI in the event of a discrepancy between clinical presentation and aspiration.[1] Their study cohort consisted of 60 patients who were retrospectively identified and underwent two aspirations within 90 days of the index surgery. Overall, 52 patients (86.7%) had either a past medical history or clinical findings indicative of infection, and 20 patients (33.3%) had a history of PJI. Following the first aspiration, 15 patients met MSIS criteria for infection, 13 results were negative, and 32 did not have enough clinical or aspiration data for diagnosis. The median time for a repeat aspiration was 17 days (1 to 83), and the diagnosis changed in 26 patients (43.3%; $p < 0.001$). Three of the 15 initially positively infected patients changed diagnosis to negative, while two of the 13 negatively infected patients revealed a positive MSIS diagnosis. In the 32 indeterminate patients, six changed diagnosis to positive. Upon further analysis, it was determined that patients suspected of abnormal local tissue reaction with their spacer were more likely to change to a negative diagnosis ($p < 0.05$) and represented the only group with a higher likelihood of diagnosis change (85.7%). The diagnosis of an initial negative infection was more likely to change in patients with a prior history of PJI (66.7%). Of the entire cohort, 50% of the patients were ultimately treated for infection and 50% were deemed noninfected. This study nicely chronicles the trends of a diagnosis change in patients with a history of PJI, suspicion of adverse local tissue reaction, or a high clinical suspicion of infection. A repeat aspiration may be useful in these specific patient populations. Because of the small sample size, additional research with a larger patient population is needed.

How far have we come with the dual-mobility component?

After the initial flurry of interest in using dual-mobility components to improve stability in total hip arthroplasties, things have quietened down a little in recent years. There is, however, enough literature now to establish, through evidence synthesis, where the current indications and outcomes lie for dual-mobility devices. This review team from **Bologna (Italy)** have designed a search strategy using the usual PubMed, Cochrane Central, and EMBASE libraries but have also supplemented it with Google Scholar (a more inclusive index that contains a more variable quality of articles).[2] The authors state in their aims that they intend to demonstrate a lower rate of dislocation with the dual-mobility design, which raises questions about their potential bias. Notwithstanding this, the authors identified 15 papers that were suitable for meta-analysis, including 2408 total hip arthroplasties, which were split roughly 50:50 into mobile- and fixed-bearing design. This cohort was used to form the basis for comparison of the two types of implant. The authors went on to use a fixed-effects model for meta-analysis, which they report as showing a "slight significant risk ratio of 0.16" in favour of the dual-mobility design. Here at *360*, we do have some concerns about the reporting of this meta-analysis. The authors justify their use of the fixed-effects models based on their calculated heterogeneity scores. However, in patients from different populations or with different diagnoses, or different methodologies (such as here), the use of fixed-effects models is not really appropriate. We have to presume, therefore, that the more powerful nature of the study was the driving force for the selection of statistical model. Given the slight effect seen, it seems likely that if the analysis were repeated with a more appropriate technique, the result may well have shown no differences.

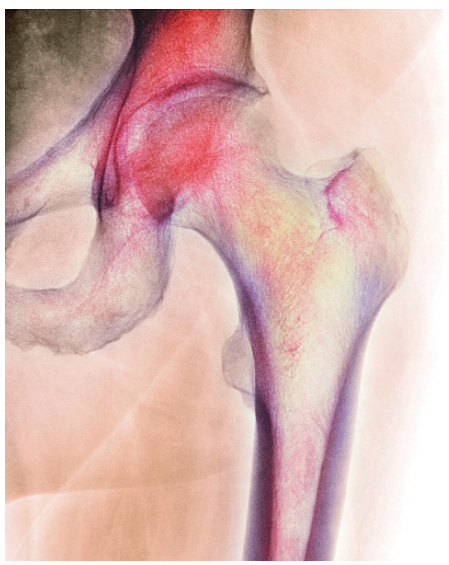
Can we still use conventional polyethylene for total hip arthroplasty?

Total hip arthroplasties (THAs) are highly successful procedures with excellent survivorship and long-term functional outcomes. Conventional polyethylene (CPE) bearings were most often used until the early 2000s, with polywear-related revision rates ranging from 12% to 14% at 15 years postoperatively. However, the demographics of the patient population undergoing THA is changing. Candidates are getting younger with an increasing revision burden. This study from **St. Louis, Missouri (USA)** focused on the long-term evaluation of a modular CPE in cementless acetabular components in an exclusively young population of patients (age $\leqslant$ 50 years old).[3] The authors reported the linear and volumetric wear rates, patient-reported outcomes (modified Harris Hip Scores, University of California, Los Angeles (UCLA) activity scale, and 12-Item Short-Form Health Survey (SF-12) Mental and Physical Component Summaries), implant survivorship, and patient mortality. The study cohort of 101 hips in 84 patients (mean age, 39.8 years) are reported to a mean follow-up of 17.1 years. Within the cohort, 35 hips had undergone previous surgery prior

to THA conversion, including 12 internal fixation procedures, eight core decompressions, seven proximal femoral rotation osteotomies, and three hip arthroscopies. Mean steady-state linear wear rate was determined to be 0.124 mm/year (median 0.106 mm/year), with an increase in wear rate ten years following index arthroplasty that continued to rise above 0.2 mm/year for up to 19 years. Mean volumetric wear was found to be 52.66 mm^3/year, with a median of 43.58 mm^3/year. There was no difference in wear rates between 26 mm and 28 mm femoral heads. Patient-reported outcome scores improved in all aspects other than SF-12 Mental Component Summary. The mean UCLA activity score and the mean Harris Hip Score saw significant increases of 36 points and 2.0 points, respectively. The overall survivorship of CPE for all-cause revision was 81.5% at 15 years and 78.2% at 21 years, with a median revision time of 11.3 years. Wear-related revisions occurred at a median of 14.9 years after index arthroplasty, with no significant difference in revision rates based on preoperative diagnosis. Although the improved overall patient-reported outcomes were sustained at 15 years, the revision rate of 12.8% is a cause for concern. This may suggest a need to follow young THA patients closely for wear-related problems. It is important, of course, to note that more durable polyethylene bearings have been developed.

Can Synovasure solve equivocal diagnoses?

■ An accurate diagnosis of prosthetic joint infection (PJI) is imperative, as treatment is often much longer than aseptic failure and is very different. Technology for the diagnosis of PJI has improved over the years and now includes multiple diagnostic tests, including synovial fluid alpha-defensin, which is naturally released by neutrophils in the presence of pathogens. Synovasure arguably has one of the highest diagnostic odds ratios among all of those currently used for testing, which can be useful in equivocal PJI cases. However, how it fits into the diagnostic pathway is still currently a matter of opinion. This paper from **Chicago, Illinois (USA)** studied the utility of alpha-defensin in cases where the diagnosis of PJI is unclear.[4] The authors used the results of 39 aspirations with uncertain results in 32 patients as the basis for their retrospective diagnostic study. The aspirated samples were overwhelmingly from the knee (85%), with the remainder from hip (15%). In all, 23 primary arthroplasties and 16 revision arthroplasties were included in the study. Alpha-defensin matched the MSIS system diagnosis in 32/39 patients (82%), with five false-positive and two false-negative results. One patient with a false-negative result was on long-term antibiotic suppression for chronic methicillin-susceptible *Staphylococcus aureus* PJI. Two of the false-positive patients had a known diagnosis of inflammatory arthritis and responded well to anti-inflammatory treatment. In borderline cell count samples, alpha-defensin diagnosis was concurrent with the MSIS diagnosis in 91% of samples. The biomarker yielded an overall specificity and sensitivity of 82%, a negative predictive value of 92%, and a positive predictive value of 64%. A total of 23 samples with recent antibiotic exposure were further analyzed (six MSIS positive and 17 negative); alpha-defensin confirmed the correct diagnosis in 19 samples (83%). The results presented here support the use of alpha-defensin in equivocal cases of PJI diagnosis, especially in those patients with borderline lab findings, suspected false positive/negative, and those with recent antibiotic use. We suspect that, given the costs associated with the bedside assay, this is precisely how the test will be used in the future.



Does metal-on-metal affect your heart?

■ The significance of cobalt and chromium wear debris in metal-on metal (MoM) hip arthroplasty has been the subject of much debate over the past ten years. Such debris has been postulated to lead to both local and systemic effects, and there have been worrying post-mortem studies that suggest the presence of metal ion debris in solid organs. These systemic effects may rarely include cardiac cobalt toxicity, which can result in symptomatic patients presenting with cardiac failure, and has been described in patients with poorly performing MoM implants. The authors of this paper from **Ottawa (Canada)** were interested in establishing whether there was any change in cardiac function or structure in patients with well-functioning MoM hip resurfacings using cardiac MRI.[5] A total of 20 carefully selected patients (ten unilateral, ten bilateral) were included in the study who had undergone a MoM hip resurfacing with a minimum follow-up of five years. These patients were compared with a case-matched (body surface area and age at time of cardiac MRI) control group of ten patients with a unilateral or bilateral total hip arthoplasty with non-MoM implants (nine ceramic-on-ceramic and one metal-on-polyethylene). There was no difference in the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores between the study groups either preoperatively or at the time of the cardiac MRI. The mean serum Co and Cr levels were 1.3 μg/l and 1.8 μg/l, respectively in the MoM hip resurfacing group compared with 0.18 μg/l and 0.11 μg/l in the control group ($p < 0.001$). The levels were higher in the bilateral MoM group compared with the unilateral group. There were no differences in results from the cardiac functional imaging between the two groups; however, higher blood Cr and Co levels were associated with larger left ventricular end diastolic volumes. This study is extremely helpful in ascertaining whether surveillance of patients with MoM hip resurfacing needs to include cardiac and liver imaging. None of the patients in the MoM hip resurfacing group exhibited impaired cardiac function compared with the control. However, there was an increase in the left ventricular and right ventricular end diastolic volume as well as some changes in both cardiac and liver tissue characteristics. These changes moderately correlated with metal ion levels. Based on the information presented, it would appear that systemic surveillance is not necessary in asymptomatic MoM hip resurfacing patients in their first few years following implantation. However, the cardiac MRI in this study was performed at a single timepoint and the authors took some pains to highlight that, as there were some changes noted on the cardiac MRI that were statistically significant but not clinically significant, patients could go on to develop cardiac changes at a later date. Many patients who undergo a MoM hip resurfacing are under the age of 50 years and hence could be exposed to many years of metal debris. Therefore, further studies are needed to assess the long-term consequences of exposure to metal debris systemically, as all of the studies to date are in the early follow-up period.

How should we follow up total hip arthroplasties?

■ The significant increase in the number of patients who have undergone a total hip

arthroplasty has been well documented. In the United Kingdom, there is expected to be a 134% incidence increase between 2012 and 2030. With patients living longer, this will place a significant burden on our outpatient clinics if we continue to follow the widely adopted standard advocated by the British Orthopaedic Association: radiographs in the first year, at seven years, and every three years after that in asymptomatic patients with Orthopaedic Data Evaluation Panel (ODEP)-rated 10A implants and no worrying radiological features. The justification for this guideline is that asymptomatic osteolysis may get missed, leading to a more complex revision once the patient presents with problems. However, with the majority of surgeons now using highly crosslinked polyethylene, this should be less of a problem. In order to assess whether the current guidelines are fit for purpose, the authors of this paper from **Belfast (UK)** wanted to establish how patients whose hip arthroplasties required revision surgery managed to find their way into the revision hip service.[6] Of the 4802 patients who had implanted 10A* cementless implants in this series, 80 patients required revision surgery. Indications for revision included instability (27.5%), infection (25%), metallosis (21.3%), aseptic loosening (18.8%), and fracture (7.5%). The majority of revisions (86.3%) occurred within six years of the primary surgery; 31/80 revisions took place in the first year. A total of 36 patients (45%) were reviewed following self-referral by a telephone helpline or booking an appointment in the outpatients clinic. In all, 15 patients were referred via their GPs, 13 were referred from other hospitals, six were inpatient referrals, six were referred via the Emergency Department, two were readmissions, and two were referred via a routine clinic review. Importantly, all of the revision patients presented with symptoms. Previously, one of the greatest concerns of hip arthroplasty surgeons was asymptomatic osteolysis, which was one of the leading causes for revision. However, with better bearings, this is no longer the case. None of the patients in this series required a revision for asymptomatic osteolysis. The leading causes for revision hip surgery have been documented as dislocation and mechanical loosening. Just two of the revised patients presented via clinic, although one was for infection and the other for a liner dissociation. The authors argued that if the patients had not been seen in clinic, they would have presented by some other means, such as self-referral, the Emergency Department, or via their GPs. The vast majority of the patients presented via self-referral, which highlights the need in all orthopaedic departments to have a clear pathway for patients to contact the department should they be having problems. The authors advocate that when using 10A* rated implants, asymptomatic patients can be discharged following their first six-week postoperative review. This system only works, however, if patients are able to self-refer themselves back to the department and can be reviewed reasonably quickly. In addition, patients are asked to complete a postal Oxford Hip Score questionnaire at one year. For those who do not respond, a telephone follow-up is organized. Clearly, in the light of newer implants with better wear characteristics, a review of the current guidelines is long overdue. There is much food for thought in this excellent study.

Cemented acetabular components

■ Cemented acetabular components are used in the minority of total hip arthroplasties across the majority of joint registries. What was once the venerable standard for many arthroplasty surgeons has been consigned to the least preferred option in many healthcare systems. The evidence, however, has not really supported the diminishing use of cemented acetabular components. The authors of this study from various centres in **Australia** and the **United Kingdom** conducted a retrospective review of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) data to review cemented acetabular components and whether outcome correlates with surgeon volume.[7] As part of this study, three groups of surgeons were identified based on their mean annual volume of cemented acetabular components. The first group included surgeons who performed fewer than ten procedures per year (630 surgeons), the second group included those who performed between ten and 25 procedures per year (31 surgeons), and the third group included those who performed more than 25 procedures per year (nine surgeons). A review of the AOANJRR revealed that there were a total of 22 956 hips that had a cemented acetabular component with results for review. Unsurprisingly, the results demonstrated that the outcomes following a cemented acetabular component improve with surgeon volume. The revision rate was higher for surgeons who perform fewer than ten procedures per year, and those who performed more than 25 procedures did much better. The authors identified a minimum proficiency threshold of ten procedures per year to convey a revision benefit, as well as a minimum of 25 cases per year for younger patients (< 65 years). They were also able to confirm that as surgeon volume increases, there is decreased frequency of lysis/loosening and dislocation. The reduction in loosening could be attributed to improved cementing technique and better acetabular preparation in higher-volume surgeons. The authors highlighted that only nine of the surveyed surgeons performed more than 25 cemented acetabular components per year. In addition, less than 5% of all THAs involve a cemented acetabular component. With an increasingly ageing population, the demand for THA is increasing. Some would argue that the elderly patient with porotic bone and a sclerotic acetabular rim would benefit most from a cemented acetabular component. This paper raises a number of important points. The outcomes following cemented acetabular components are comparable to the cementless components and, perhaps, are possibly superior in the right patient. However, there are fewer surgeons performing cemented acetabular components, meaning that there are fewer opportunities for the next generation of hip surgeons to learn the technique. Indeed, there has been a continuous decline in the use of cemented acetabular components for some years. With Tim Briggs of Getting It Right First Time (GIRFT) also advocating the greater use of cemented acetabular implants, perhaps more emphasis needs to be placed on ensuring that this important surgical technique is back on the rise.

Hydroxyapatite-coated femoral stems: what are the results?

■ The hydroxyapatite (HA)-coated stems have become the benchmark for uncemented stems, providing a ready surface for bone in-growth and on-growth. It has proven successful in a range of stem designs, from the JRI stem through to the Corail, among others. The coating has gained widespread traction, although it is difficult to establish if the success of HA is due to the coating or the stems themselves. The authors of this paper from **Adelaide (Australia)** set out to address this question.[8] The study design was to compare all HA-coated and non-HA-coated stems, and then to compare cases with both coated and uncoated options. The authors queried the Australian Orthopaedic Association National Joint Replacement Registry and identified nearly 150 000 cases over a five-year period that fit the inclusion criteria. Just over 80% of these were HA-coated stems. There were five stems with outcomes that had both a HA and non-HA components. These were: Zimmer's VerSys/Trilogy (Zimmer, n = 3924); Mallory-Head/Mallory-Head (Biomet, n = 2538);

SL-Plus/EP Fit-Plus (Smith & Nephew, n = 2028); Taperloc/Exceed (Biomet, n = 1668); and Taperloc/Mallory-Head (Biomet, n = 1240). Overall, there was a lower all-cause revision rate associated with HA stems (hazard ratio (HR) 0.83). The VerSys/Trilogy, Mallory-Head/Mallory-Head, Taperloc/Exceed, and Taperloc/Mallory-Head did not have a lower risk of any-cause revision with HA-coated stems compared with non-HA-coated stems. Only the SL-Plus/EP Fit-Plus subgroup showed a lower risk of revision for loosening (HR 0.17); however, this observation was coupled with a much higher risk of early revision. Overall, these authors concluded that HA coating of femoral stems was found to be associated with a 17% lower risk of revision for any reason. Sadly, the authors were not able to tease out the contribution of the HA itself, partly due to the relatively low numbers of components with both a HA and non-HA option. For the moment, then, the benefit of HA remains. However, whether this benefit is due to the coating itself, or because the sensible stem designs are HA-coated, is still an unanswered question.

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Knee

X-ref ***For other Roundups in this issue that cross-reference with Knee see: Hip & Pelvis Roundup 4; Sports Roundups 2 & 3; Research Roundups 3 & 5.***

Kinematic knees at a decade

■ Total knee arthroplasty (TKA) innovations undergo years of scrutiny before becoming standard of care for patients. Given the success rates of large joint arthroplasty, it is usually at least ten years before we are happy to report a technique or implant as a 'success'. In the case of kinematic knee alignment (KA), we were delighted, here at 360, to read this ten-year follow-up from the team in **Davis, California (USA)**.[1] The principle behind KA is that the postoperative knee is orientated as closely to the patient's native alignment as possible. Randomized trials for kinematic KA have previously shown a normal-feeling knee and better pain relief, function, and flexion compared with those treated with a mechanically aligned (MA) knee. However, these trials do all have some weaknesses. The long-term effects of using KA are still unknown and are of concern, given the alignment being outside the design parameters for the prostheses. Advocates of MA believe that alignment outside of those set values poses a higher risk of implant failure than those in range. This study focuses on the long-term results of the KA TKA by noting implant survival, yearly revision rate, and patient-reported outcomes, including the Oxford Knee Score (OKS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores. In this single-centre cohort series, 207 TKAs performed in 2007 were retrospectively reviewed; the mean age for the cohort was 77 years (SD 10 years; 49 to 97) and 38% of patients were male. The yearly revision rate was 0.3%, with an implant survival of 97.4% for all-cause revision. Five patients were revised for aseptic failure and two were revised for postoperative infection. Tibial component loosening occurred in one revision patient; the component subsided posteriorly associated with a reverse tibial slope of 8°. Patellar complications were found in four knees: one underwent a full revision, two were treated with arthroscopic lateral releases for lateral patellofemoral instability, and one had a patellar revision for a loose patellar implant. Ten-year function scores were available for 144 knees. OKS had a mean score of 43 (0 to 48, with 48 being the best) and the mean score for WOMAC was found to be 7 (0 to 96, 0 being the best). There was no significant difference between the in-range and outlier aligned knees. Patients who are kinematically aligned at the time of TKA do well at a long-term follow-up of ten years, suggesting it to be an appropriate surgical technique for surgeons to use.

Predicting satisfaction after total knee arthroplasty

■ Bundled payments have become more popular as the payment method for a total knee arthroplasty (TKA). As the United States population grows older, the number of TKAs performed annually is expected to rise, with the revision and readmission rates increasing proportionally with it. The current rate of dissatisfaction after TKA remains surprisingly high, with percentages ranging from 17% to 41%. The need for additional postoperative care for unsatisfied patients will ultimately put a strain on the healthcare system's economy, because of the financial burden incurred from bundled payments. The payers hope this will drive efficiency, although this is not always the case. Identifying factors that are indicative of TKA dissatisfaction may be helpful in potentially improving postoperative outcomes, in order to offset the financial burden of revisions and rehospitalizations. This study analyzed the answers given by patients on an 11-item TKA questionnaire to identify potential indicators of complications and dissatisfaction following surgery. The knee survey took into account modifiable risk factors (body mass index (BMI), diabetes, opioid use, comorbidities, smoking status), and the patient's medical history (drug allergies, osteophyte score, patellar thickness to soft-tissue