ROUNDUP360

Hip & Pelvis

For other Roundups in this issue that cross-reference with Hip & Pelvis see: Knee Roundup 7; Trauma Roundup 4; and Children's Orthopaedics Roundup 3.

Functional acetabular orientation: a new concept

x-ref Research

■ One of the significant limitations of orthopaedic assessment for all pathologies is that it is static. Both imaging and most clinical assessment are undertaken in a static non-weight bearing manner. As our understanding of more subtle pathologies such as femoroacetabular impingement (FAI) is improving, the relevance of dynamic assessment of pathology with investigations such as weight-bearing MRI scan is becoming ever more important. Researchers in **Ann Arbor (USA)** hypothesised that FAI is likely to be defined at least in part by a combination of dynamic changes in pelvic tilt and functional acetabular orientation.[1] As dynamic imaging technologies are in their infancy, the research team undertook a laboratory study utilising pre-acquired CT scans of the pelvis for patients with FAI undergoing arthroscopic surgical debridement. The study population consisted of 50 patients with a mean age of 25.7 years. The study protocol used generated 3D models of the hip, allowing for simulated manipulation of pelvic tilt and range of movement to assess osseous contact. Outcomes assessed included analysis of simulated plain radiographs for the crossover sign, prominent ischial spine and a posterior wall sign. The range of achievable hip movement was assessed to the end-point of confirmed bony impingement during hip flexion, internal rotation in flexion and flexion adduction. These outcomes were assessed for a range of pelvic tilts including -10° (posterior), 0° (native), and +10° (anterior) pelvic orientations. The authors identified a significant influence of pelvic tilt on acetabular version. In normal orientation the cranial version was 3.3° and central version 16.2°. Introducing just 10° of anterior pelvic tilt resulted in significant acetabular retroversion and a higher proportion of crossover signs, posterior wall, and ischial spine signs. This translated into decreases in clinical range of movement, which were particularly pronounced in flexion with loss of 5.9° internal rotation in flexion and 8.5° in flexion adduction. This loss of movement was associated with a shift in the location of osseous impingement to a more anterior position. As would be expected with what is essentially a geometric computer simulation, exactly the counter occurs with posterior pelvic tilt (which is associated with an increase in range of movement and a superolateral shift in the location of osseous impingement). While not earth shatteringly new as a concept, this paper nicely describes the effects of dynamic changes in pelvic tilt and the associated loss of range of movement. It certainly seems that dynamic tilt changes may be a missing piece in understanding the pathophysiology of FAI.

Predicting re-admission following THR

x-ref Knee

■ In the United States, the healthcare system is following suit with many European systems and moving more and more towards an environment in which re-admission is seen as an 'adverse event' and, as such institutions are financially penalised for re-admissions. In these austere times this serves to focus the mind on prevention of re-admission, which in turn drives down total healthcare costs, the motive behind the healthcare funders' focus on re-admission. However, knowing which patients are likely to be re-admitted and taking steps to ameliorate that risk is not always as straightforward as it might seem. As time goes on, it will be more and more important to understand what factors are predictive of re-admission in order to avoid them. Researchers in **Chicago (USA)** have gone a long way to providing this information in total hip replacement (THR). In their cross-sectional study they reviewed nearly 10 000 primary THRs using the American College of Surgeons National Surgical Quality Improvement Program.[2] The baseline re-admission rate was 3.65% (n = 345) within the first 30 days following surgery. The authors undertook a stratified analysis of patients with and without a re-admission and investigated the potential contribution of a range of factors including pre- and post-operative factors that may have a bearing on outcomes. Data collated included demographics, comorbidities, operative variables, laboratory results and surgical outcomes. All of this data were analysed using a multivariate model to adjust for potential confounders and interactions between the individual factors. The risk of re-admission following THR was chiefly determined by patient and co-morbidity factors. Re-admission rate was increased in patients who had a body mass index of ≥ 40 kg/m^2, a history of corticosteroid use, and low pre-operative albumin. Patient co-morbidities and complications that increased the likelihood of re-admission included diabetes, COPD, clotting disorders, transfusion requirement and dyspnoea. From a post-operative standpoint, patients with surgical site infection, a thromboembolic event or sepsis also had a high risk of re-admission. This information could be used to create risk-adjusted profiles of patients. In addition, it keys the clinician into which patients are at the highest risk for re-admission. Ultimately, modifiable risk factors must be addressed prior to any surgical intervention to reduce the financial and health burden associated with failed discharge.

Metal ions and resurfacing: another piece in the revision jigsaw

x-ref Research

■ Over the past decade, one of the most controversial areas of hip surgery has been that of the use of metal-on-metal (MoM) bearing surfaces. Following initial enthusiasm and mass implantation, the unexpected early failures associated

with a range of adverse MoM reactions has sparked widespread concern about a large potential revision burden. One of the difficulties with this type of failure has been how can surgeons best diagnose these potentially silent failures and what is the best method of monitoring asymptomatic patients? While there are a host of diagnostic modalities, the value of serum cobalt and chromium ion levels remains unknown. The attraction of a diagnostic laboratory test that could either 'rule in' or 'rule out' failure is easy to see. Researchers from **Stanmore (UK)** set up a prospective study and followed 597 patients with MoM hip resurfacings and THRs.[3] The aim of the study was to evaluate if serum ion levels were predictive of failed THR. Patients with a minimum of 12 months' follow-up were recruited into the study and the blood metal ion levels of patients with failed implants and non-failed implants were compared. Patients with failed implants had significantly higher blood ion levels of both cobalt and chromium, and cobalt levels were disproportionately raised in patients with a THR rather than a resurfacing (8.2 µg/L *versus* 2.5 µg/L). The authors undertook ROC analysis to quantify the specificity and sensitivity of both serum ion levels. While the use of a peak value of both metal ions was found to have a good discriminatory value (AUC 0.76), a threshold of 7 µg/L had fair positive and negative predictive values. More importantly, for each increase in 1 µg/L in THR patients, there was a 23% increase in the odds of them being in the failed group (5% for resurfacing patients). While this study does not create a diagnostic threshold value, it provides another data point for the clinician. The use of serum metal ion levels is clearly an important part of the puzzle in determining which patients should undergo revision surgery, but is not sensitive or specific enough to be used in isolation as a single test.

It's not all in the head size!

While large-head metal-on-metal (MoM) revision rates for both resurfacing and replacement arthroplasties are causing concerns and raising eyebrows throughout the world, the small-head MoM articulation has enjoyed some previous success which has not been revisited for some time. Like many things in medicine, however, the MoM debate continues and this paper is sure to spark some controversy.[4] Authors from **Geneva (Switzerland)** conducted a prospective cohort study of 3341 THRs to investigate small-head (28 mm) MoM and compare them with a separate cohort of ceramic-on-polyethylene (CoP) THRs. The mean age of the cohort was nearly 70 years and follow-up was to almost 12 years (minimum 18 months). The cohorts were not matched and consisted of 883 MoM and 2458 CoP bearings. There were no significant differences in the incidence of common complications including infection (1.3% *versus* 0.8%) and dislocation (3.3 *versus* 3.1%). Survivorship analysis was undertaken and there was a significantly higher risk of revision in the MoM group (OR 9.4) which was most pronounced after ten years. The authors found that there was a significantly higher revision rate beyond ten years in the MoM group. In addition, ten of 26 patients presented with adverse local tissue reactions at revision. As such, the authors concluded that adverse responses to metal debris can be seen in small-head MoM patients at the time of revision and should be a cause for concern.

Lipped liners increase stability

One of the most feared complications of THR is instability. Patients presenting with recurrent instability are some of the most unsatisfied patients, and addressing the causes of a currently unstable hip can be very difficult. Increasing numbers of dislocations cause soft-tissue disruption and occasionally damage to the articular surface, usually leading to revision. The fear of instability was one of the major reasons many surgeons and patients were initially attracted to the large metal-on-metal (MoM) THRs. Increasing head size (and therefore jump distance, and sometimes head:neck ratio) is, however, only one piece in the puzzle of avoiding instability. The incidence of instability can also be decreased via a host of other implant and technique modifications; surgeons primarily concentrate on correct component positioning. However, there are other factors at play contributing to instability, including patient factors (neurologic disorders, alcoholism, dysplasia, social habits), and component technology and designs are now being aimed at minimising instability. In this study from **Grafton (New Zealand)**, authors set up a registry analysis of the New Zealand Joint Registry to explore the effect of lipped liners in combination with a modular uncemented acetabular component on post-operative instability.[5] Even after adjusting for the size of the femoral head, the surgical approach, age and gender of the patient, the use of lipped liners was strongly associated with a significantly decreased rate of revision for instability. Like many registry studies, it is important to remember that the data presented is only that recorded in the study and that there are a host of other complications with lipped liners that were not evaluated or discussed in this study.

All anaesthetics equal in hip fracture surgery

x-ref Trauma

With high mortality rates and a massive health economic burden, the hip fracture is set to become the 'signature problem' of the next decade of healthcare provision. Unsuitable for rationing and more expensive if done poorly, there is no option but to treat these patients as well and as safely as possible. It is curious given the mortality rates associated with this surgery that anaesthetic practice varies so wildly between clinicians and institutions. Investigators in **Boston (USA)** set out to establish in a nationwide sample if there are any discernible differences in outcomes between different anaesthetic modalities.[6] The authors undertook a retrospective cohort study of 73 284 patients from across the US using the Premier Research database. The majority of the study population received a general anaesthetic (n = 61 554, 84.0%), with smaller proportions managed with regional (n = 6939, 9.5%) and combined (n = 4791, 6.5%) anaesthetic modalities. The primary outcome measure was all cause in-hospital mortality which was around 2% in all groups and did not differ significantly by anaesthetic modality. Even when adjusting for potential confounders between the two groups, there was no difference in long-term outcomes with anaesthetic type. A further mixed-effects model analysis was undertaken to account for differences between institutions; again, no significant differences could be found.Despite the large sample size and relatively high event rates of in-hospital mortality, the researchers were unable to establish any differences between anaesthetic types. Specifically, they were unable to find any beneficial effect from regional anaesthesia with regard to the risk of mortality. The authors conclude that if any benefit exists it is likely to be a small effect. Here at *360* we are inclined to agree with them.

Revision hip surgery in very young patients

End stage osteoarthritis in young patients is a significant treatment challenge, not at the time of initial therapy, but years later when further problems arise. What is usually a straightforward hip replacement in a 25-year-old can become a difficult and challenging revision in a 35-year-old. Despite the ticking time bomb nature of these joint replacements, they are necessary, restoring function and quality of life to patients with significant morbidity. Despite patients being consented for early revision and a relatively large number of patients undergoing revision worldwide, there is a paucity of data surrounding the long-term outcomes of such revisions. A collaborative effort from surgeons in **London (UK)**, **Holon (Israel)** and **Monterey (Mexico)** has drawn together a long-term follow-up of over 180 such young hip replacements performed in patients under the age of 50 years.[7] Impressively, the revisions were all performed using a similar treatment algorithm with allograft restoration of bone stock when required. The study team were able to report the results of just over 150 hips performed in patients with a mean age of 43 years, at 11 years follow-up after revision surgery. Outcomes were assessed using survivorship analysis with further revision as an endpoint. Impressively, the surgical team achieved a 71% ten-year and 54% 20-year acetabular survival, with a slightly better 80% ten-year and 64% 20-year stem survival. Clinical outcomes were reported for the most part as good, with the Harris hip score rising from 41 pre-operatively to 77 at final follow-up, and the usual spread of complications associated with revision surgery including dislocation (6.6%), periprosthetic fracture (5.5%), infection (1.1%) and sciatic nerve palsy (2.2%). While not ground breaking science, this paper does shed light on the concerning world of young revision hip surgery, and the results appear not too bad at all.

Uncemented hips: use with caution in octogenarians

As the unending tide of 'progress' brings us more and more surface technologies in total joint replacements, the proportion of patients receiving cementless implants has increased significantly. Concerns have been raised in the past that in the older patient with less biological capacity to remodel their thinner bones, the rate and security of bony ingrowth is potentially compromised. Despite these concerns, there is little clinical data to support this. Hip surgeons in **Tampere (Finland)** have decided to revisit the question of what implant is best in the octogenarian. They designed a prospective registry study examining the outcomes of 4777 primary THRs.[8] These were performed in just over 4500 patients in a ten-year period. The outcome data were obtained from the Finnish arthroplasty register, and analysis undertaken to establish whether the method of fixation (cemented, uncemented or hybrid) had any bearing on the rates of, causation for, and mortality associated with, revision. The authors also included national comorbidity data from a separate database and mortality data through data linkage. The analysis was undertaken with a competing risks model for survival and follow-up achieved to an average of four years. This study demonstrates unequivocally that in octogenarian patients, uncemented hip replacements are associated with a higher rate of failure with a hazards ratio of nearly 3. The competing risks model was unable to explain this difference through comorbidity- or provider-related factors and the majority of the early revisions were associated with periprosthetic fractures. This difference was only seen in the first year, with marginally higher failure rates with later follow-up but no impact on mortality seen with the uncemented implants. The authors of this study make the firm conclusion that their data do not support the use of uncemented implants in older patients as there is a significantly higher failure rate and no improvement in long-term survival.

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