



The Bone & Joint Journal

Formerly known as *JBJS (Br)*

Journal Club: 31 January 2013

Attendees: Mr R.D. Meek, Mr S. Patil, Mr A. Preiss, Miss E. Smith, Miss N. Sciberras, Mr A. Leung, Mr P. Young, Mr A. Marsh, Mr S. Gupta, Mr A.J. Powell, Mr M. Halai, Mr D.F. Russell, Mr J.K. Bryceland
Western Infirmary, Glasgow

Theme: Hip Arthroplasty

1. **Kim Y,-H., Kim J.-S., Park J.-W., Joo J.-H.** Comparison of total hip replacement with and without cement in patients younger than 50 years of age. *J Bone Joint Surg [Br]* 2011;93-B:449-55.
2. **Langton DJ, Sidaginamale R, Lord JK, Nargol AVF, Joyce TJ.** Taper junction failure in large-diameter metal-on-metal bearings. *Bone Joint Res* 2012;1:56-63.
3. **Callanan MC, Jarrett B, Bragdon CR, Zurakowski D, Rubash HE, Freiberg AA, Malchau H.** The John Charnley Award: risk factors for cup malpositioning: quality improvement through a joint registry at a tertiary hospital. *Clin Orthop Relat Res* 2011 Feb;469(2):319-29.
4. **Malviya A, Stafford GH, Villar RN.** Impact of arthroscopy of the hip for femoroacetabular impingement on quality of life at a mean follow-up of 3.2 years. *J Bone Joint Surg [Br]* April 2012 94-B:466-470

1. Comparison of total hip replacement with and without cement in patients younger than 50 years of age. **Reviewer: Miss N Sciberras**

Summary

1. Purpose

The aim of this study was to evaluate the long-term clinical and radiological outcomes as well as the revision rates and implant survival of hybrid and cementless total hip replacement performed in patients less than 50 years old.

2. Methods

A randomised controlled trial that had ethical approval was performed. This involved 166 patients (228 hips) that were recruited over a two year period (January 1991 and February 1993). Patients were randomised using the sealed envelope system, one group having a cemented femoral stem and the other an uncemented one. Both groups had a cementless acetabular component (either press-fit or fixed with one or two screws). Patient demographics were similar in both groups. Randomisation was performed using the sealed envelope system that was opened in theatre. None of the patients lost their randomisation group. The Harris hip score, WOMAC, 10-point visual analogue score and the UCLA activity score were assessed pre-operatively and then at the post-operative review that take place at 3 months, 1 year and then on a yearly basis. Radiological

outcomes including radiolucent lines, implant stability and loosening of implants as well as amount of polyethylene wear (analysed by using a software) were also assessed at the review appointment. A CT scan was performed at the last review appointment. This determined the degree of osteolysis in addition to the anteversion of the acetabular cup. Statistical analysis was performed on these outcomes using SPSS. A Kaplan-Meier survival analysis was also performed.

3. Results

Of the 228 hips, nine (five hybrid, four cementless) were lost to follow-up. Patients were followed-up for a mean of 18.4 years (range 17-19 years). The HHS, the incidence of thigh pain, the WOMAC score and the UCLA activity score improved substantially when compared to the pre-operative scores. However, there was no statistical difference in the clinical scores between the two groups. 2.6% of the hybrid group had transitory thigh pain for up to six months, whereas 11.4% of the cementless group had thigh pain for up to one year post-op.

There was also no significant difference in the radiological outcomes or in the revision rates between the two groups. The survival of the implants was also similar between the two groups. The Kaplan-Meier survival analysis at 20 years showed that the survival of acetabular component with revision as the endpoint was 87% in the hybrid group and 84% in the cementless group. Survival of the femoral component at 20 years' follow-up in the hybrid group was 97% (95% CI 91 to 100) and in the cementless group 96% (95% CI 93 to 100). When radiological failure was taken as the endpoint, the survival rate for the acetabular component was of 83% (95% CI 75 to 91) in the hybrid group and 81% for the acetabular component (95% CI 75 to 89) in the cementless group. The survivorship of the femoral component at 20 years was 97% (95% CI 95 to 100) in the hybrid group and 96% (95% CI 93 to 100) in the cementless group.

4. Conclusions

THR improved the clinical and functional scores when compared to the pre-operative scores. However no statistical significance in clinical, functional or radiological scores was present between the two groups. Furthermore, the survival analysis at twenty years showed that despite THR in patients under 50 years has a worse survival when compared to older patients, the femoral component has excellent results whether cemented or uncemented.

5. Critique

Strengths

Randomised Controlled Trial with all patients being done by the same surgeon.

All patients followed the randomisation

High volume of patients – 228 hips done

Long term follow-up (mean follow-up of 18.4 years) with only few patients lost to follow-up

Blinded - Assessors independent to research team.

Methodological Concerns

No power analysis given

Study describes outcomes of implants no longer in use

Patients blinded to implant

2. Taper junction failure in large-diameter metal-on-metal bearings. **Reviewer: Mr A.J. Powell**

Summary

1. Purpose

This study aimed to quantify the material wear from tapers in metal-on-metal (MoM) total hip replacements (THR) in order to identify risk factors for taper failure at the trunnion-taper junction.

2. Methods

This is an interim report of an ongoing prospective study of failed MoM THRs commenced at the University of Newcastle School of Mechanical Engineering in 2008. Between 2008 and 2011, 126 failed implants were recruited. 2 different DuPuy implant tapers were studied – the ASR XL and the Pinnacle system. Of the 111 tapers that met radiograph inclusion criteria, 63 ASR XL and 48 Pinnacle components formed the study cohort. Research was limited exclusively to DePuy products to exclude variations in metallurgy and engineering tolerances as study variables. The majority of implants (104) were revised secondary to adverse reactions to metal debris. All components underwent full volumetric and linear wear assessment of the femoral and acetabular bearing surfaces as well the articular surface of the taper junctions. This was achieved with the coordinate measuring machine (CMM) to determine site of maximum wear – deemed the taper engagement level (TEL). Using AP radiographs of implants in situ the horizontal lever arm (HLA) acting on the TEL in the superior/inferior direction was calculated. Once taper wear rates were quantified, spearman rank correlation was used to determine the relationship between taper wear and multiple study variables and statistical significance was sought.

3. Results

38 tapers exhibited no identifiable surface changes visually. Volumetric and linear wear analysis showed little or no distinction between unused sterile control tapers. These components were all revised secondary to effects of surface bearing wear, unexplained pain or femoral/acetabular loosening.

73 tapers were found to have grossly abnormal macroscopic surfaces with wear patterns remarkably uniform. Authors describe findings as a localised circumferential band corresponding with the insertion of the base of male trunnion. Usage of the CMM and radiographs allowed calculation of both TEL and HLA. Volumetric and Linear wear levels were recorded for each taper. The effect of bearing surface wear, clearance and offset showed no statistically significant effect on taper wear but a trend toward increased taper wear with increasing offset was noted. The effect of bearing diameter showed ASR tapers to have significantly greater rates of volumetric and linear wear than Pinnacle tapers. When grouping both implants together, there was a statistically significant relationship between the HLA distance and linear wear rate of the tapers. Spearman rank = 0.527, P value <0.001.

The effect of orientation of the acetabular component showed no significant relationship between both cup inclination and degree of anteversion with taper wear.

4. Conclusions

The authors conclude that quantifiable taper wear correlates positively with large diameter heads, larger head offsets and varus stems that act to increase the lever arm on the level of engagement of the taper. They propose these variables as risk factors for failure at the taper junction in MoM THRs.

5. Critique

This is the largest study into the modular junction of failed MoM THRs and the first to quantify taper wear and risk factor correlation. The methodology has yielded powerful statistically significant results. It is prospective and ongoing. As it reports results from a failed sample group it is inherently biased.

Strengths

Large series of components

First paper to quantify volumetric loss of debris from MoM THRs

Statistically significant results

Aims of study achieved with taper wear risk factors identifiable

Ongoing prospective study will show increase in cohort size and statistical power once commenced

Methodological Concerns

Selection bias as reports from failed sample group – impossible to compare wear rates with functioning in vivo DuPuy MoM THRs.

Results for taper wear only applicable to the two implants analysed.

61% of components obtained by 1 unit of three consultants including an author.

3. The John Charnley Award: risk factors for cup malpositioning: quality improvement through a joint registry at a tertiary hospital. Reviewer: Mr M Halai

Summary

1. Purpose

To assess the percent of optimally positioned acetabular cups in a large series, and determine whether patient or surgical factors affected acetabular component position.

2. Methods

This tertiary US centre collected postoperative radiographs retrospectively from the dates 2004 to 2008. The data was from a local joint registry and yielded 2061 consecutive hips which had a primary THA, Birmingham hip resurfacing or a revision THA. Of these, 1823 had version and abduction angles measured. Exclusions were due to incomplete radiographs and cemented PE cups that could not be read by this system. The two digital systems used were correlated with each other. Acceptable ranges were 30-45 degrees for abduction and 5-25 degrees for version. Then they correlated these cases with BMI, age, femoral head size, screw usage, surgical approach, preoperative diagnosis and surgical experience. For this they used the multivariate logistic regression which yielded an odds ratio for each factor to give rise to cup malpositioning.

3. Results

Of 1823 hips, 50% were in the acceptable range for both version and abduction. Anterolateral and MIS trended towards higher abduction and low version whilst the posterolateral approach gave the highest combined success. High BMI and low surgeon volume were the only other factors that predicted malpositioned cups. For version alone, head size larger than 32mm was also an independent risk for malpositioning.

4. Conclusions

The authors believe that they have shown that the following factors correlate to malpositioned cups: BMI>30, MIS and low volume surgeons.

5. Critique

A well written paper with clear intentions and data presentation. It addresses a clinical problem. It would have been nice to also include which patients actually dislocate or need revision. Compared to previous studies, it has the largest numbers by far.

Strengths

Very large series of patients
Good comprehensive inclusion and exclusion criteria
Looked at relevant factors

Methodological Concerns

Over half the cases are by one surgeon
Did not declare which approach was used by the main surgeon.
All uncemented cups.
Carried out at specialist centres

4. Impact of arthroscopy of the hip for femoroacetabular impingement on quality of life at a mean follow-up of 3.2 years. Reviewer: Mr JK Bryceland

Summary

1. Purpose

To determine the benefit of hip arthroscopy for femoroacetabular impingement using the quality of life score as an outcome measure, and explore the influence of confounding variables on the score.

2. Methods

This prospective series of 612 patients undergoing hip arthroscopy for FAI, were all operated on by a single surgeon in a tertiary centre. All patients had a minimum of 1 year follow-up. Patients with bilateral procedures were excluded to reduce the impact of the other side on scores. Data on intra-operative findings were recorded prospectively. Patients were asked to provide a modified Harris Hip Score (HHS), in the form of a questionnaire, immediately pre-op and at 6 weeks, 6 months and 1 year post-op. All patients undertook a standardised post-op regimen with 4 weeks of partial weightbearing and physiotherapy for 4 months. The results of the modified HHS were translated, using the Rosser Index Matrix, to give a numerical quality of life score. Complete data was available for all 612 patients. Patients were also asked at 1 year whether they were happy with the results of their surgery, giving a simple 'yes' or 'no' answer only.

3. Results

The mean quality of life score of all 612 patients increased from 0.946 – 0.974 at one year following surgery. This was found to be statistically significant using the t-test ($p < 0.001$). The QoL score showed improvement in 469 (76.7%), no change in 88 (14.4%) and deteriorated in 55 (8.9%). At 1 year 450 (73.5%) of patients were happy with the results of their surgery and all of these patients had an improvement in their QoL score. 19 patients had an improvement in the QoL score but were not happy with the surgery either because outcomes were below expectations or the extended rehabilitation involved. Men had higher mean QoL score both pre-op (0.962:0.924) and at 1 year (0.982:0.964). The patients were divided into those > 50yrs of age and those <50yrs, but no significant difference was seen in QoL scores pre or post-op. Pre-operative QoL score (lower leading to a greater gain) and gender were found to be significant predictors of QoL score using

linear regression analysis. Age, type of impingement lesion, type of chondral repair and associated pathologies did not have a significant influence on the QoL score at one year.

4. Conclusions

The authors believe hip arthroscopy benefits patients with femoroacetabular impingement in terms of their Quality of Life Score. They also conclude that the best predictor of post-operative QoL score is pre-operative QoL score ($p < 0.001$) followed by gender ($p < 0.4$).

5. Critique

The primary aim of showing the effect of hip arthroscopy using QoL as an outcome measure has been achieved. Presently, there are no other similar series using QoL as an outcome measure. However its scientific value may have been improved by introducing some form of control group and randomization.

Strengths

Relatively large series of patients

Validated outcome measures

Thorough statistical analysis and rational for tests given

Aims of study were clear and were addressed by conclusions

Methodological Concerns

No randomisation or blinding – selection bias due to tertiary nature of centre

No control group to compare results to

Comment is made to the mean follow up of 3.2 years – this seems largely irrelevant as the focus is on the outcome measure at 1 year. No mention is made of scores at later follow up.

Outcomes at 2 year follow up would be preferable