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Long-term results of metal on metal total hip arthroplasty in younger patients (< 55yrs)

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ABSTRACT

Introduction: Metal on Metal (MoM) hip arthroplasty saw a new era of popularity with development of its second generation bearing surfaces, in the first decade of this century. However, by the end of that decade, concerns had been raised due to metal debris related complications.

We aimed to determine the survival of MoM stemmed hip replacement in younger population. We also studied the rate of revision related to adverse reaction to metal debris (ARMD) along with reviewing the clinical and radiological progress of MoM hip arthroplasty in younger age (< 55 yrs) group.

Patients & Methods: This is a retrospective cohort study of patients 55 yrs old or younger, who had metal on metal (MoM) hip arthroplasty for osteoarthritis. We had 109 procedures performed on 90 patients with a mean follow up of 10 years. All patients were reviewed as per MHRA guidelines in planned follow-up clinics. Data analyses were performed using SPSS.

Results: Survival of implant in our younger cohort was 88.1% at a mean age if 10 years, with revision for any cause as an endpoint. Most of the patients were happy with the outcome of their hip replacement as they were able to perform activities of daily living and work without compromise. Mean Oxford hip score was 43.

Altogether, there were 12 revisions, 7 of these were for metallosis and associated symptoms. Average time to revision was 7 years. Other analysis revealed mean acetabular cup inclination angle to be 49 degrees but no significant correlation was found between this angle and serum metal ion levels. Serum Chromium and Cobalt levels were significantly higher in revision group.

Discussion: Metal on metal hip arthroplasty prime popularity time has gone. In younger population, although revision rates are higher, the surviving implants give a very good outcome in terms of patient satisfaction. Most of the patients report a desired outcome of 'forgotten hip'.

1. Introduction

Metal on Metal (MoM) hip arthroplasty saw a new era of popularity with the development of its second-generation bearing surfaces, in the first decade of this century.[1] The main object of this shift was to avoid complications of polyethylene wear.[2] Very soon it became a desirable option, especially in younger individuals due to good functional outcomes.[1]

However, by end of the decade, many reports emerged highlighting significantly high early failure rates of this articulation.[3] Main reason attributed to early failures was attributed to adverse reactions to metal debris (ARMD).[4,5] These concerns lead to a shift in choice from metal on metal bearing surfaces to alternatives like metal on ultra-high molecular weight polyethylene and ceramic on ceramic implants.[6] Worldwide, government agencies (like MHRA in the UK) have recommended surveillance and follow-up of patients with MoM hip replacements.

We aimed to determine the survival of MoM hip replacement in the younger population. We also studied the rate of revision related to adverse reaction to metal debris (ARMD) along with reviewing the clinical and radiological progress of MoM hip arthroplasty in younger age (< 55 yrs) group.

1.1. Materials & methods

This is a retrospective single centre cohort study of consecutive primary metal on metal total hip replacements performed on patients of 55 yrs or younger age, between 2003 and 2009. This series consists of

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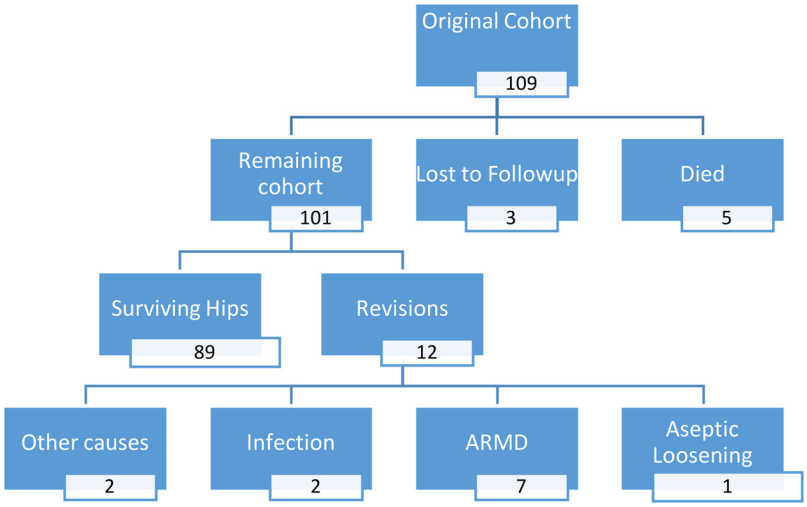

Fig. 1. Our cohort patient distribution at final follow-up.

109 MoM total hip arthroplasty performed in 90 patients at our unit. Five patients died of unrelated reasons and three patients were lost to follow up (Fig. 1). We assumed that the patients, who were lost to follow up, are performing well. All patients received uncemented Corail (Depuy) femoral stems and uncemented Pinnacle (Depuy) metal cups with metal liners and metal heads.

All patients were reviewed as per Medicines and Healthcare products Regulatory Agency (MHRA)[7] guidelines and functional outcomes assessed using OHS. Clinical information was obtained from follow-up clinic notes. Assessments included history, clinical examination and patient-reported outcome measures (PROM) using Oxford Hip Score (OHS). OHS is scaled from 0 to 48. A higher number indicates better functioning joint.[8]

Plain radiographs were reviewed for measurement of acetabular cup inclination angles and to find any evidence of osteolysis. Serum metal ions levels (Cobalt and Chromium) were measured for all the patients on yearly basis. Patients with significant hip related symptoms (groin or thigh pain or symptoms of instability) were investigated with further imaging. Among asymptomatic patients, serum metal ion levels of 7 ug/l or above (MHRA acceptable threshold)[7] was an indication for further imaging. Metal artefact reduction sequence magnetic resonance imaging (MARS-MRI) was done to assess ARMD (pathological hip effusion or pseudo-tumour formation).[9] If investigations were reported normal, patients were followed up on yearly basis. Positive investigations lead to more frequent follow-ups. The decision for a revision was made if there were persistent hip symptoms with local tissue reaction to metal debris on MRI of hips, with increasing or substantially high serum metal ion levels. All the revisions were undertaken by a single surgeon (KB).

Patient list was populated from our hospital metal on metal (MoM) hip arthroplasty database. Initial data collected from the database included patient demographics and details related to primary surgery.

The primary outcome of this study was a revision for any cause. A revision was labelled when any component implanted at primary surgery was exchanged. We also studied evidence of ARMD in all symptomatic patients.

Statistical analyses were performed using SPSS version 24.0 (Mac). All tests were performed with a significance level of p-value < 0.05. Kaplan Meier curve was used for survival analysis. Two-tailed Student's *t*-test was used for continuous variables comparison.

2. Results

In our cohort of patients, mean age was 49.9 (SD 5.1) years (Table 1). Predominant indication for the primary procedure was osteoarthritis. Majority of patients (66 (81%)) had Medium (36 mm) size head, while, only 14 (17%) received small (28 mm) head. There was one patient each with large 40mm and 44mm heads.

Table 1
Demographics and primary indications.

Demographics & Diagnoses	Male	Female	Total
Number of procedures, %	46 (46%)	55 (54%)	101 (100%)
Age at time of procedure, SD	49.9 (5.5)	49.9 (4.7)	49.9 (5.1)
Right:Left:Bilateral			37:26:19
Osteoarthritis, No. (%)			82 (82%)
Other Causes: Post-traumatic OA / CDH / AVN, No. (%)			18 (18%)

At ten years mean follow up, twelve patients had revisions (Table 2). One patient was revised for symptoms of instability soon after the index procedure. The reason for instability was subsidence and in this case, a collarless stem was used. Head was revised to larger neck and patient had good relief of his symptoms and the hip is still well functional at the time of conclusion of this study. One patient had aseptic loosening of femoral stem at about 3 years post op, so required single-stage revision. Two patients had two stage revisions for deep infections at 2 and 6 years post operatively. One patient had a change of articulations for persistent hip symptoms and MR findings of trochanteric area cyst, although no significant evidence of metallosis was found at the time of surgery. She recovered well with good relief of symptoms.

Seven patients (all with 36 mm heads) had revisions for ARMD and findings were confirmed at time of surgery. All patients had debridement and change of articulations to other than metal on metal, with good results. The mean age for revision was 7 years.

Clinically, most of the patients are happy with their hip replacement, demonstrated by the reported objective outcome, measured with validated Oxford hip score (mean score 40.5) (Fig. 2). There are significant differences in the mean scores of revised and non-revised patients (25.4 and 43.2 respectively with $p < 0.05$). On enquiry, the majority of patients (66%) reported 'forgotten hip' as they did not have any restriction of daily living including work.

At final follow up (mean of 10 years), 13 patients had radiographic signs of osteolysis (a lucent zone devoid of trabecular bone with a sclerotic border, not visible on the immediate postoperative radiographs[2]). Out of these patients, 7 had revisions following further investigations.

Radiographic evaluation revealed mean cup inclination angle of 49° (SD 6.6). There was no significant correlation ($p = 0.16$) found between inclination angle and level of serum metal ions.

Thirty-three other patients had further imaging in the form of MARS