

PRELIMINARY OUTCOMES OF HIP METAL-ON-METAL RESURFACING ARTHROPLASTY: AN ANALYSIS OF THE FIRST 40 CASES WITH MEAN FOLLOW-UP TIME OF 3 YEARS

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SUMMARY

Forty hips (39 patients) were submitted to metal-on-metal hip replacement (resurfacing) between 2002 and 2005. Evaluation was provided by clinical examination and X-ray tests. The authors performed clinical evaluations before and after surgery. The specific criterion applied was the D'Aubigné and Postel's classification. X-ray images showed radiolucent lines around the acetabular component on the zones described by DeLee and Charnley and around the femoral component on the zones described by Amstutz et al. The

mean age was 54.40 years. The minimum follow-up period was 14 months (range:12 to 51 months). The outcomes of 94.44% of the patients in the study were postoperatively rated as satisfactory. There were 2 cases of aseptic loose and no neck-femoral fractures during the follow-up period. The authors concluded that this technique and implant alternative is satisfactory, with good early outcomes in a mean follow-up time of three years.

Keywords: Total hip replacement. Hip; Humans

Citation: Moraes M, Rodrigues R, Barr R, Ono NK, Fujiki EN, Milani C. Preliminary outcomes of hip metal-on-metal resurfacing arthroplasty: an analysis of the first 40 cases with mean follow-up time of 3 years. *Acta Ortop Bras.* [serial on the Internet]. 2008; 16(1):19-22. Available from URL: <http://www.scielo.br/aob>.

INTRODUCTION

Total hip arthroplasty in young (below the age of 65) and active individuals remains as a challenge to an orthopaedic surgeon. The excellent outcomes in older individuals are not confirmed in the younger ones^(1,2,3).

Over the last decade, an increasing interest has been noticed on the hip resurfacing technique for treating younger and more active patients with hip diseases. This technique is aimed to the preservation of the femoral neck and of the bone stocks, targeting better biomechanical outcomes, similar to the original hip^(4,5).

Previous studies using this technique found early loosening of such prostheses due to a strong wear-off and to the intensive debris production⁽⁴⁾.

Experiments addressing metal-on-metal resurfacing arthroplasty in active patients younger than 65 years showed promising outcomes, with a mean implant 4-5 years duration rate above 90%.^(2,4,5) Another favorable argument is the reduction of particles generated from rubbing (debris) when a metal-on-metal surface is employed, with reduced osteolysis, which is a major indication for review in those patients⁽⁶⁾.

Recent publications reported that, with the advancements of the metal industry and of prosthesis components, which are increasingly valuing hip biomechanics, indications and previous outcomes with this procedure have improved for individuals below the age of 65^(7,8).

This retrospective study assessed early, clinical and X-ray outcomes using this technique and the total metal-on-metal resurfacing prosthesis.

MATERIALS AND METHODS

Between 2002 and 2005, the Traumatology and Orthopaedics Center (a private practice) operated 40 hips (39 patients) using the total metal-on-metal resurfacing hip arthroplasty technique.

The decision about offering this technical option to patients was based on patients' age, bone stocks (as measured on X-ray images), and on their expectations towards activities of daily life, including some sports.

In general, this procedure was indicated to ≤ 65 year-old men and ≤ year-old women. The mean age of patients was 54.40 years (ranging from 21 to 72 years).

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Received in: 01/12/07; approved in: 04/01/07

Patients included in the study were required to sign a free and informed consent term, describing the risks inherent to the procedure, problems associated to components' metal parts, and serum levels of metal ions.

All patients were followed up after surgery for a period of at least 12 months, ranging from 14 to 51 months.

Of the 39 patients in total (40 hips), we lost track of 2, and other 2 showed early septic loosening (before the period of 12 months), being thus excluded from the study. In these cases, a single-step arthroplasty review was made using the hybrid conventional technique with antibiotic cement on the femur (primary components of a prosthesis).

Therefore, 35 patients (36 hips) presenting with variable etiologies were assessed (Table 1, Figure 1). Nineteen patients were males (1 bilateral) and 16 females.

Kind	N	%
Osteoarthritis	25	69.44
Osteonecrosis sequel	5	13.89
Hip Congenital Dysplasia sequel	1	2.78
Post-trauma arthrosis	4	11.11
(hip fracture-dislocation)		
Rheumatoid arthritis sequel	1	2.78
	36	100.00

Table 1 – Distribution of the 36 hips according to etiology



Figure 1 – Clinical case – 55 years old, left side, osteoarthritis

SURGICAL TECHNIQUE

The access port employed was the anterolateral (*Hardinge* modified), with anterior dislocation of the femoral head, followed by bone preparation and components placement. In the 36 patients, a metal-on-metal hybrid Cormet model prosthesis (Corin-Group/UK) was used (Figure 2). Hips were prepared with 1-mm progressive milling and press-fit fixation, preferably at 45 degrees of abduction with anatomic anteversion. The size of the hip prosthesis ranges from 44 mm to 66 mm and each head



Figure 2 – Metal-on-metal prosthesis, model CORMET r

hinges with the hip 6-8 mm larger. Prepared femurs were preferentially placed on a slightly valgus position, with economic cementation, avoiding nail's metaphyseal region.

No aspiration tubes were used. A rigorous hemostasis was provided and, mobilization and rehabilitation were started as early as possible.

Rehabilitation: patients were encouraged to place partial loads on the second postoperative day, being discharged from hospital within 4 and 14 days postoperatively (average: 5.20 days). Active exercises and progressive load were indicated until the third postoperative week, when total load was allowed. After the fourth week, the patients were recommended to use only a cane, whenever they felt pain. The return to low-impact sports activities and was allowed for those who used to practice these kind of sports after 12 weeks (three months).

Clinical analysis: preoperatively and postoperatively, according to the criteria by D'Aubigné and Postel^(9,10) with minimum follow-up of 12 months (postoperative). These criteria consider pain, gait (ability to ambulate) and hip motion. Each item is graded 1-6, with 6 representing normality. For the statistical analysis of clinical results, we used the methodology by Ono et al.⁽¹¹⁾, starting from the score obtained with the application of D'Aubigné and Postel's criteria, being satisfactory (equal or superior to 50 for pain at gait and superior to 4 for joint motion) and unsatisfactory for inferior values compare to the previous ones.

X-ray analysis: controls by simple X-ray images taken at frontal and lateral planes, were taken on the first, third, sixth and twelfth postoperative months. After the first year, annual X-ray controls were provided. Radiolucent lines around the hip were graded according to DeLee and Charnley *apud* Amstutz et al.⁽²⁾ (I,II,III) and, on the femur, at the zones described by Amstutz et al.⁽²⁾ which are divided into 3 (around the short metaphyseal nail) using a score ranging from 0 to 9 (no changes until migration) (Figure 3).

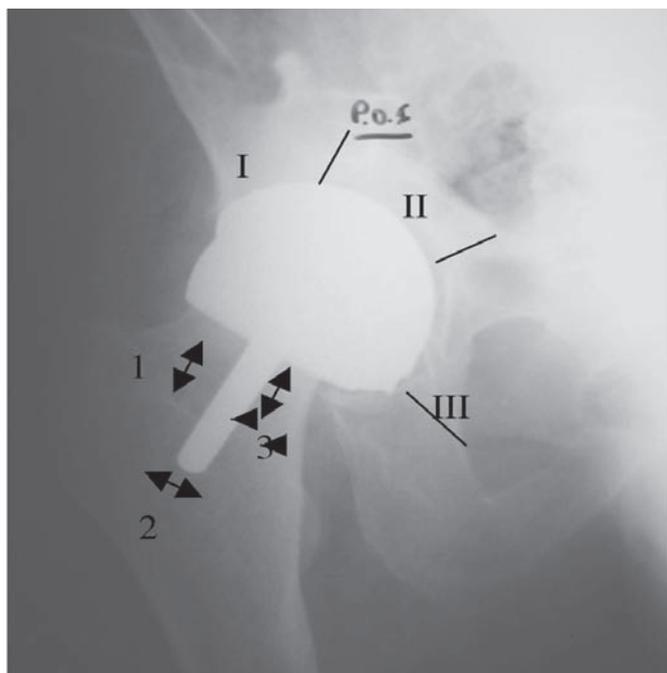


Figure 3 - Femoral and hip components of the prosthesis

femur	hip
0 = no radiolucence	0 = no radiolucence
1 = zone 2	1 = zone I
2 = zone 1	2 = zone II
3 = zone 3	3 = zone III
4 = zones 1 and 2	4 = zones I and II
5 = zones 2 and 3	5 = zones I and III
6 = zones 1 and 3	6 = zones II and III
7 = zones 1 - 3 (incomplete)	7 = zones I - III (incomplete)
8 = zones 1 - 3 (complete)	8 = zones I - III (complete)
9 = migration	9 = migration

RESULTS

Clinical: 2 patients reported persistent pain on the operated hip. No clinical and laboratory signs of infection were found, with aseptic loosening being considered as a diagnostic hypothesis. Control X-ray images showed a radiolucent femoral component: 1 case with score 8 and another one with a score 9. The prosthesis was removed and replaced by conventional hybrid prosthesis with antibiotic cement on the femoral component. These patients are currently asymptomatic. No technical challenges were seen for removing resurfacing prostheses, and no local metallosis was found.

However, fragments of the synovia and capsule removed from hips showed immunoallergenic changes on the anatomicopathological study, consistent to reports by other authors^(12,13). The study of heads removed after loosening did not show necrosis of the tissue around the prosthesis or on femoral neck.

Thus, with the use of a specific questionnaire by D'Aubigné and Postel, and with the analysis based on Ono et al, we reached to the results, according to Table 2.

	N	%
Satisfactory	34	94.44
Unsatisfactory	2	5.56
Total	36	100.00

Table 2 - Postoperative outcomes according to the criteria by D'Aubigné and Postel

There were no episodes of non-trauma dislocation, with 1 car accident case with dislocation of the operated hip, where a bloodless reduction was provided; this patient is currently asymptomatic. Except for 2 cases, the remaining 34 patients did not show infection before 1 year of follow-up. No femoral neck fracture, "Trendelenburg" gait and postoperative neurological changes were seen so far.

X-ray: 2 cases with varus position of the femoral nail and 1 case with excessive valgus. In spite of that, there was no femoral neck fracture so far. For the two patients with aseptic loosening, we found a femoral score of 8 and 9.

Femoral and acetabular radiolucence are depicted on Table 3.

	acetabular score	number of hips/%	femoral score	number of hips/%
no radiolucence	0	25 (69.44)	0	26 (72.22)
1 zone	1.2 or 3	10 (27.78)	1.2 or 3	6 (16.67)
2 zones	4.5 or 6	1 (2.78)	4.5 or 6	1 (2.78)
3 zones and incomplete	7	0	7	1 (2.78)
3 zones and complete	8	0	8	1 (2.78)
migration	9	0	9	1 (2.78)

Table 3 - X-ray analysis

Patients showing changes on X-ray images remain asymptomatic (including 1 with femoral score 7 – 3 zones incomplete), were guided regarding initial clinical or gait changes.

DISCUSSION

Successful total hip arthroplasties have been reported over the last 2-3 decades. However, the outcomes usually seen in elderly individuals cannot be reproduced in the younger ones. Perhaps, the higher demand showed by the latter is the leading factor for these results^(1,2,3).

Former generations of hip resurfacing, with polyethylene hip and metal femoral head have been tested, with disappointing results⁽¹⁴⁾. Early results reported by Amstutz et al., Freeman et al. *apud* Villar⁽³⁾ with the same characteristics have also evidenced early failure within 2 years of follow-up⁽⁹⁾. Nevertheless, the advancements and improvements of the metal industry, combined with modern concepts of biomechanics and tribology employed on the last generations of these prostheses have demonstrated better and encouraging early results^(15,16).

Despite of the mean follow-up time of three years, our study demonstrated satisfaction and survival rates of 94.44%, consistently to current studies by Amstutz et al.⁽²⁾, McMinn et al.⁽⁴⁾, Daniel et al.⁽⁵⁾ and Beaulé et al.⁽¹⁷⁾. There were two cases of aseptic loosening, with immunoallergenic response to the material, a fact also described on literature^(12,13). Although we did not measure the presence of serum metal ions, literature describes these components levels of up to five times higher in the first year in individuals with metal-on-metal arthroplasties when compared to the general population, but there are no clinical evidences of deleterious effects resultant from this fact⁽¹²⁾.

Pain, gait and motion have all showed improvements, with scores > 4 according to the criteria by D'Aubigné and Postel, showing that the procedure accomplished its primary objective, i.e., function and pain improvement.

We found relatively high femoral and acetabular radiolucence signs (almost 30%, in variable degrees); however, these signs were not a determinant factor for high loosening and surgical review so far.

Despite of the cases observed at undesirable positions (extreme valgus and varus), we did not see neck fractures with displacement, which is the major early complication^(18,19).

For both patients requiring prosthesis replacement, no bone necrosis was found on the tissue removed from femoral nail and from the neck, after anatomicopathological analysis,

evidencing that the technique caused no damages to femoral head flow^(20,21).

It was our own decision to use the anterolateral access port, based on surgeons' experience, but it is scientifically validated as less favorable to femoral neck flow injury⁽²²⁾.

The follow-up period on this series was short, with an insufficient number to be able to provide final conclusions, but it was proven to be a good treatment alternative, with success and complication rates consistent to those of the largest reference centers.

Prospective randomized double-blind studies comparing total arthroplasty techniques in youngsters with different joint surfaces should potentially provide important results, thus contributing to our study.

We realize there is a learning curve to be followed. Undesirable femoral positions occurred on the first cases of this series, with femoral nail valgus being currently more easily achieved. We started using femoral nail with hydroxyapatite, without cement, aiming to reduce femoral radiolucence and the resultant loosening.

CONCLUSION

We conclude that metal-on-metal resurfacing hip arthroplasty showed satisfactory clinical results, with a low rate of associated complications, thus constituting a potential option for young patients.

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