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COMPARISON OF TOTAL HIP ARTHROPLASTY IN OSTEARTHRITIS OF MECHANICAL AND RHEUMATOLOGIC CAUSES

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ABSTRACT
Objective: To compare the use of uncemented implants in total hip arthroplasty in patients with rheumatologic diseases and mechanical osteoarthrosis. Methods: We retrospectively evaluated 196 patients who were operated by the Hip and Arthroplasty Surgery Group of the IOT-HCFMUSP between 2005 and 2009. Patients were divided into two groups: mechanical causes (165 patients) and rheumatologic causes (31 patients). Groups were compared between each other in age, gender and follow-up time. Osseointegration rate and percentage of failure in arthroplasty were evaluated. Results: No statistically significant difference was found in osseointegration rates (in both femoral and acetabular components) in both groups. The rates of revision surgery and implant survival also did not show statistically significant differences. Conclusion: The use of uncemented total hip arthroplasty did not show worse results in rheumatologic patients. Level of Evidence III, Retrospective Case Control Study.

Keywords: Arthroplasty, replacement, hip. Arthritis, rheumatoid. Cementation. Osseointegration.

INTRODUCTION
Osteoarthritis of the hip leads to chronic pain that generates functional disability. Its incidence is estimated to be 500,000 new cases per year in the Caucasian American population.\textsuperscript{1} The goal of the treatment of osteoarthritis of the hip is to reduce pain and improve function. Initially, the treatment is done conservatively, by changes in lifestyle, weight loss, physical therapy and drugs such as analgesics, non-steroidal anti-inflammatory drugs and chondroprotectors. However, in a number of cases, conservative treatments are not successful and there is a need of surgical treatment. Among established surgical treatments, the first method of choice is total hip arthroplasty, approximately 170,000 total hip arthroplasties being performed annually in US.\textsuperscript{2} Hip arthroplasties were, at the beginning, all performed by the cemented technique. However, studies with long term follow-up evaluating cemented acetabular components showed rates of aseptic loosening of this component varying between 1% and 42%, tending to increase over time, especially after ten years of surgery.\textsuperscript{3,4} These facts motivated the emergence and development of uncemented acetabular components, which have been used in total hip arthroplasty for nearly two decades. An extensive published literature supports the use of uncemented implants, although the follow-up time in these papers is shorter than the case series with cemented prostheses. In a literature review, considering a uncemented implant, totaling 2428 arthroplasties with a mean follow-up period of 7 years, the results obtained were 0.4% of loosening; 0.3% revision for aseptic loosening; 4.7% total reoperation; and 5% periacetabular osteolysis.\textsuperscript{5,6}

When assessing the durability of femoral components, uncemented arthroplasties allow implant survival of 10 to 20 years, depending on the adequacy of form and materials developed in the course of technological medical advances. This time span is comparable to cemented femoral arthroplasties, with the additional advantage of greatly reducing the risk of intraoperative hemodynamic complications arising from the cementing process.\textsuperscript{7-9}

Despite the advances of uncemented prosthesis, there is still a discussion in the literature regarding the use of this model in patients with osteoarthritis from rheumatologic causes, mainly...
rheumatoid arthritis.\textsuperscript{10,11} However, there is consensus that the results of arthroplasty in these patients are worse.\textsuperscript{12} The experience of our service is that uncemented implant can be used in such patients.\textsuperscript{13} The objective of this study is to compare the osseointegration of the acetabular and femoral components, and acute complications of 196 patients operated of osteoarthritis of the hip due to rheumatic and non-rheumatic causes in our department.

**CASES AND METHODS**

Were evaluated, retrospectively, 196 patients through analysis of medical records and imaging tests. They underwent total hip arthroplasty with the same prosthesis type and same surgical technique used by the Hip Surgery Group, Instituto de Ortopedia e Traumatologia, Hospital das Clínicas da Faculdade de Medicina, Universidade de São Paulo in the period 2005-2009. These patients were divided into two groups according to the cause of hip osteoarthritis: mechanical or rheumatic osteoarthritis. As mechanical causes of osteoarthritis of the hip the following conditions were considered: primary osteoarthritis, osteonecrosis of the femoral head, sequela of development dysplasia of the hip, sequela of epifisiotasis, Perthes sequela, sequelae to trauma and infection. The following conditions were considered rheumatologic causes of osteoarthritis of the hip: rheumatoid arthritis, juvenile rheumatoid arthritis, ankylosing spondylitis, systemic lupus erythematosus and psoriatic arthritis. Patients who underwent arthroplasty with prosthesis models other than patients with femoral neck fracture, and revision arthroplasties were not included. Were also excluded from the study patients who failed follow for any reason within one year. The present study is two-tailed, being our H0 null hypothesis equality of osseointegration of the arthroplasty components of both patient groups, and our alternative hypothesis H1 a difference between them.

Surgical approaches used in surgery were the direct lateral approach (Hardinge) and the posterior approach. An uncemented acetabular component made of a porous titanium alloy coated with hydroxyapatite (MBA, Lépine\textsuperscript{9}) was used. The used femoral component was the uncemented stem made of porous titanium alloy coated with hydroxyapatite (Targos, Lépine\textsuperscript{9}) proximal cover. A polyethylene insert and a 28mm stainless steel modular femoral head were used. Infectious prophylaxis was achieved in all patients with cefuroxime 1.5 mg administered intravenously at induction of anesthesia, and repeated every 12h for 24h. Antithrombotic mechanical prophylaxis was done through motor and drug physiotherapy with subcutaneous enoxaparin 40mg per day for 30 days.

After discharge patients were evaluated at 3 weeks, 6 weeks, 12 weeks, 6 months, 1 year, and annually thereafter. The analysis was made by reviewing medical records. Preoperative radiograph was used for the assessment of bone quality by Dorr et al.\textsuperscript{14} classification. Radiographs of the immediate postoperative period and radiograph of the last postoperative follow up were evaluated by three independent senior surgeons for the presence of signs of occurrence of osseointegration and implant migration, suggesting its loosening. (Table 1)

Acetabular osseointegration was considered through the presence of three of the five signs listed below,\textsuperscript{15} in asymptomatic patients in the first year postoperatively evaluation, concomitant to the absence of radiographic signs of acetabular migration:

1. Presence of bone condensation in the superolateral region of the surface of the acetabular component (zone 1 of DeLee and Charnley);
2. Presence of bone condensation in the lower inferomedial region of the surface of the acetabular component (zone 3 of DeLee and Charnley);
3. Absence of radiolucent lines thicker than 1mm and involving at least two adjacent zones of the surface of the acetabular component;
4. Presence of decreased radiographic density in the medial region of the surface of the acetabular component (zone 2 of DeLee and Charnley); and
5. Presence of radial trabecular bones, perpendicular to the surface of the acetabular component in zones 1 or 2 of DeLee and Charnley.

The migration of the acetabular component was defined by the change in the abduction angle greater than 5° and change in the position of the implant in the horizontal or vertical axis, equal or greater than 3 mm,\textsuperscript{16} considering as an horizontal parameter the bilacrimal line and as vertical parameter Kohler’s line (Kohler’s bisector tear). The evaluation of the femoral component is performed as described by Engh et al.\textsuperscript{17} (Table 2)

**Table 1.** Dorr\textsuperscript{14} Classification for bone quality.

<table>
<thead>
<tr>
<th>Dorr</th>
<th>Radiographic aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Thick femoral cortical in two radiographic views (anteroposterior and lateral &quot;cross table&quot;)</td>
</tr>
<tr>
<td>B</td>
<td>Thick cortical in anteroposterior view and tapering of posterior cortical in lateral view</td>
</tr>
<tr>
<td>C</td>
<td>Narrow cortical in all views</td>
</tr>
</tbody>
</table>

**Table 2.** Engh\textsuperscript{17} criteria for osseointegration of uncemented femoral stems.

| Fixation scales | 1. Presence of lines or lucence on the porous interface | - Present in >50%: 5 points less  
- Absent: 5 points more  
- Present in <50%: 0 points  
- Undetermined: 0 points |
|----------------|-----------------------------------------------------|
| 2. Presence of “spot welds” | - Present: 5 points more  
- Absent: 2.5 points less  
- Undetermined: 0 points |

| Stabilization scales | 1. Presence of lines or lucence on the interface | - Present in >50%: 3.5 points less  
- Absent: 5 points more  
- Present in <50%: 0 points |
|---------------------|------------------------------------------------|
| 2. Presence of pedestal | - Unstable: 3.5 points less  
- Absent: 2.5 points more  
- Stable: 0 points |
| 3. Remodeling of the calcaneum | - Hypertrophic: 4 points less  
- Atrophic: 3 points more |
| 4. Stem migration | - Present: 5 points less  
- Absent: 3 points more  
- Undetermined: 0 points |
| 5. Loose particles of the porous surface | - Present: 5 points less  
- Absent: 1 point more |
After application of the score system proposed by Engh, the femoral stems were considered osseointegrated (score equal or greater than 0 points) or not osseointegrated (score lower than 0 points).

The groups were also compared for the presence of complications: pain, neurologic injury, vascular injury, presence of post-operative infection, presence of arthroplasty dislocation, need for revision of any components, deep vein thrombosis, and/or pulmonary thromboembolism and periprosthetic fractures. Data with normal distribution were analyzed using parametric tests. Nominal data were divided into 2x2 contingency tables and evaluated by Pearson’s chi-square test or Fisher exact test, when necessary. The significance level was 0.05. The Epiinfo® 3.5.4 software (CDC - U.S./Atlanta) was used to perform the statistical analyzes.

RESULTS

Total hip arthroplasties were performed in 196 patients, and of these 31 had osteoarthrosis of the hip due to rheumatic diseases. The patients’ overall mean age was 52.43 years old with standard deviation of 16.15 years old. The mean age of patients with osteoarthrosis of the hip due to rheumatic diseases was 42.03 years old with a standard deviation of 13.46. In patients with hip mechanical disease, the mean age was 54.98 years old and standard deviation 14.18. The difference between both groups was statistically significant (P <0.05).

Of the total sample 44.38% were women, among rheumatologic patients, 41.93% were females and in the group of mechanical diseases, 44.84% belonged to this gender. There was no statistically significant difference between the two groups (p = 0.46).

The disease had bilateral presentation in 25.51% of the sample group, and the occurrence of bilateralism was 38.70% among rheumatoid patients and 23.03% in the control group. This difference was not statistically significant (p = 0.06).

The mean follow-up time of patients in the mechanical disorders group was 39 months with a standard deviation of 16.1 months. In the group of rheumatic diseases the mean follow-up was also 39 months, but with a standard deviation of 16.4 months. These data showed no statistical difference.

Among the causes considered rheumatologic, fourteen patients had ankylosing spondylitis, twelve had rheumatoid arthritis, two had juvenile rheumatoid arthritis, two had psoriatic arthritis and two had systemic lupus erythematosus. (Figure 1)

Among the mechanical causes, the distribution obtained showed 70 cases of primary osteonecrosis, 60 of osteonecrosis of the femoral head, nine posttraumatic, five post-infection, fifteen sequelae of developmental dysplasia of the hip five sequelae of Legg-Calvé-Perthes and one sequela to epifisiolistesis. (Figure 2)

Bone quality presented in the total sample group observed was 37.24% Dorr A; 34.18% Dorr B; and 28.57% Dorr C. Among rheumatologic patients, none showed bone quality considered type A by the Dorr Classification system, 29.03% showed Dorr B and 70.96% Dorr C. Among rheumatologic patients, none showed bone quality considered type A by the Dorr Classification system, 29.03% showed Dorr B and 70.96% Dorr C. Among the mechanical causes 44.24% were Dorr A, 35.15% Dorr B and 20.60% Dorr C. The difference between the distributions of bone quality between the groups was statistically significant, with p<0.05. (Figure 3)

Regarding osseointegration of the acetabular component, there were four failures of osseointegration (2 % of the total), three in the group of mechanical disorders (1.8%) and one in the
The result of this study suggests that there are no differences between the results obtained in uncemented total hip arthroplasty, among rheumatologic patients and not rheumatic, although this result is contrary to the consensus on the use of cemented hip prostheses in patients with poor bone quality.

In our experience, we observed a successful osseointegration of similar components in both groups, a similar prevalence of immediate and late complications, as well as the prosthesis survival. With these data, we suggest that more studies are performed to determine the equivalence of outcomes between the use and cemented and uncemented prostheses in rheumatologic patients, since no cementing represents a decrease of operative risks.
REFERENCES