ABSTRACT
Objective: To check the acetabular remodeling through the methods described by Sotelo-Garza and Charnley, as well as the Köhler Line or ilio-ischiatic line on patients submitted to total hip arthroplasty with threaded cup CO-10. Results: Concerning the classification by Sotelo-Garza and Charnley, preoperatively, we had 6 patients on group I (mild) and 14 patients on group II (moderate), not classifying any patient with severe acetabular protrusion or above 15 mm. Postoperatively, group I was constituted of 17 patients, and only 3 on group II, with group III remaining with no patients included. The patient who presented the best acetabular remodeling was the one with the longest follow-up time (10 years), reducing 9 mm by the LK method and 5 mm by Sotelo-Garza and Charnley’s method. Materials and Methods: 20 cases of Otto pelvis patients treated between 1996 and 2005 submitted to total hip arthroplasty with threaded cup CO-10 were retrospectively described. We checked for acetabular remodeling through the methods by Sotelo-Garza and Charnley and Köhler or ilio-ischiatic line. Conclusion: We found a significant acetabular remodeling with the proposed treatment approach, which advocates the use of non-cemented prosthesis for equatorial acetabular support for treating Otto pelvis.

Keywords: Acetabulum/pathology, Acetabulum/surgery, Arthroplasty replacement hip. Bone remodeling.
RESULTS

By exploring data, we observed a phenomenon that should be considered. We evidenced the presence of a severe outlier case in the postoperative group assessed by the KL method (which uses the Köhler line). In this sense, intending to assure a better symmetrical distribution of the results, we chose to exclude it from the sample. The significance level associated to the test on correlations in both cases was p = 0.000, with a correlation of 0.83 for method C and 0.78 for method KL. These values evidence the existence of a strong positive linear association between scores obtained in both moments in both groups. From this, considering that high correlation, the use of the proposed statistical test could be justified.

Concerning the classification by Sotelo-Garza and Charnley, in the preoperative period, we had 6 patients included on group I (mild), and 14 patients in group II (moderate), with no patient being classified as with severe acetabular protrusion or above 15 mm. Postoperatively, group I had 17 patients, and only 3 on group II, with group III remaining with no patients included. The patient showing the highest level of acetabular remodeling was the one with the longest follow-up time (10 years), being reduced by 9 mm by the KL method, and 5 mm by the method of Sotelo-Garza and Charnley.

Table 1 and Figure 3 show the description of the results for both groups. Then, we provide examples on figures 4, 5 and 6 of pre- and postoperative X-ray images evidencing major acetabular remodeling.

Table 1 – Descriptions of the results, considering the suggested measurements

<table>
<thead>
<tr>
<th>MEASUREMENT METHODS</th>
<th>n</th>
<th>Intervention</th>
<th>Mean (S.D.)</th>
<th>S.E.M.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHOD C</td>
<td>19</td>
<td>Preoperative</td>
<td>6.79 (3.19)</td>
<td>0.73</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postoperative</td>
<td>4.05 (2.74)</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>METHOD KL</td>
<td>20</td>
<td>Preoperative</td>
<td>11.35 (4.43)</td>
<td>0.99</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postoperative</td>
<td>8.85 (3.92)</td>
<td>0.88</td>
<td></td>
</tr>
</tbody>
</table>

¹S.E.M. – Standard Error of the Mean.

- Measures in mm

Figure 3 – Behavior of both groups

Figure 4 - X-ray images at AP plane and focused on the right hip of a patient with bilateral Otto pelvis treated with total hip arthroplasty (THA), non-cemented, with threaded cup CO-10, right. A – Preoperative hip X-ray image. B – Focused preoperative X-ray image. C – Postoperative hip X-ray image. D – Focused postoperative X-ray image evidencing clear acetabular remodeling.
Acetabular protrusion was first described by Otto in 1824, from studies conducted in cadavers, being characterized by deformity of the acetabular wall with progressive migration of the femoral head into the pelvis. The etiopathogenesis of acetabular protrusion is regarded as multifactorial, suspected to present a familial trend. It can be idiopathic or secondary to conditions such as rheumatoid arthritis, Paget's disease, infections, etc. Sotelo-Garza and Charnley, in a study conducted on 182 patients, found 75.3% of primary etiology and 24.7% of secondary etiology. However, other authors such as McCollum et al., report in their articles primary acetabular protrusion as extremely rare, occurring in a very small percentage of cases. If left untreated, this condition tends to evolve with progressive protrusion, with the great trochanter reaching acetabular edge. Diagnosis is mainly based on radiologic measurements obtained from pelvic X-ray images at anteroposterior plane, which not only enable us to identify, but also grade protrusion. These measurements are obtained from methods using, in most times, anatomical references on X-ray tests. Some simpler methods serve only for detecting protrusion, and not for grading it: tear sign inversion, increased Wiberg angle, Shenton line discontinuity. Others, as the one by Sotelo-Garza and Charnley, measuring the distance from real pelvis edge to a projected line extending the upper edge of public branch, allow us to grade it according to the above-mentioned authors as mild, moderate and severe.

Gates et al. assessed 12 kinds of pre- and postoperative X-ray measurements to quantify acetabular protrusion in patients treated with total hip arthroplasty and medial acetabular support with bone grafting. Their results show that the method using the Köhler line may be useful, although measurements can vary according to some pelvic obliquity degrees. The method shown to be more effective was the one using a system of coordinates x and y based on tears. The authors emphasize this method's ability to check acetabular protrusion at horizontal and vertical planes, and they assess tears as a quite constant parameter on X-ray examinations. However, the authors mention that this method can be impaired in some cases when the visualization of the tear is impossible on the X-ray image.

Due to the uncommon nature of Otto pelvis in the general population, there are few studies in literature describing long follow-up times for better investigating the best and most effective treatment method for this pathology. Nevertheless, the surgical indication of total hip arthroplasty and autologous or homologous bone grafting aimed to provide further support to medial acetabular wall, to restore femoral head's rotation center and to preserve hip joint's range of motion, seems to be a consensus among authors. Most articles point out to the use of spherical cemented prostheses and autologous femoral head grafts. Despite of the questionable and disappointing results of straight threaded prostheses, several papers highlight the fixation of threaded prostheses covered with hydroxyapatite.

Sharp et al. call attention for the use of non-cemented prostheses with equatorial acetabular support. The authors show in their article that these models are able to restore hip stability by reducing protrusion and providing a more accessible future review, if necessary. The explanation for this trend to solve the defect on the medial acetabular wall consists of changing the orientation of the resulting force, which represents load support on hip joint caused by equatorial support prostheses. Thus, in cases of medial failure, the indication of a threaded acetabular component is recommended, because, in theory, all support and fixation is provided on acetabular edges, not requiring force transfer on the bottom of the acetabulum. This fact allows for a better integration of the graft, forces distribution and the potential remodeling to a more anatomical pattern.

Based on the results previously described hereon, we also found that acetabular remodeling in cases of protrusion treated with non-cemented equatorial support prostheses is significant. The analysis of reported data allow us to notice a statistically significant difference both in the group of cases assessed by the method of Sotelo-Garza and Charnley and in those in which the Köhler line method was employed, considering pre- and postoperative measurements. Data suggest that, regardless of both measurement techniques proposed here, a similar behavior is seen at both moments studied.

CONCLUSION

By assessing 20 Otto pelvis cases, with 14 grade II and 6 grade I cases according to the classification by Sotelo-Garza and Charnley, treated with total hip arthroplasty with CO-10, we conclude that, after a mean follow-up time of 4 years (+/- 2.7), we obtained a statistically significant acetabular remodeling with both measurement methods proposed.

DISCUSSION


Figure 6 – Acetabular remodeling after THA CO-10-type in a patient with Otto pelvis (left). A – Preoperative hip X-ray image. B – Postoperative hip X-ray image.
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