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Clinical and X-ray comparison between a reamed *versus* an unreamed acetabulum in hip hemiarthroplasty

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SUMMARY. Every year about 20,000 people suffer hip fractures in Mexico. A high proportion of these fractures is resolved by hip hemiarthroplasty. *Purpose:* to clinically and radiologically compare a reamed versus an unreamed acetabulum in this kind of surgery. *Material and methods:* All patients, 66 in total, having undergone a hip hemiarthroplasty between January 1987 and December 1996 were assessed. Of these 66 patients, 25 were treated with acetabular reaming and 41 without reaming. *Results:* there were no clinically (Harris) or radiologically (Sotelo-Garza and Charnley) significant differences at six weeks, six months, one year, two year, or three years ($p=0.06$). The mean Harris testing score improved over time in both groups. The results according to the fracture location showed that the more proximal the fracture was, the better the outcome in both groups. *Discussion:* these results are significant as only patients with the proper indication and good surgical technique were included with the understanding that the main purpose was to assess pain and acetabular erosion caused by the implant.

Key words: acetabulum, arthroplasty, hip, X-ray.

RESUMEN. En México existen alrededor de 20,000 fracturas de cadera al año, de las cuales un alto porcentaje es resuelto por hemiarthroplastia de cadera. *Objetivo.* Comparar clínica y radiológicamente el fresar y no fresar el acetábulo en este tipo de cirugía. *Material y métodos.* Se estudiaron todos los pacientes en los que se realizó hemiarthroplastia de cadera de enero de 1987 a diciembre de 1996, reuniéndose un total de 66 pacientes, de los cuales se fresó el acetábulo en 25 y no se fresó en 41. *Resultados.* No hubo diferencia significativa en la clínica (Harris) ni en las radiografías (Sotelo-Garza y Charnley) ni a las seis semanas, seis meses, un año, dos y tres años ($p = 0.06$). El promedio de las calificaciones de la prueba de Harris mejoró con el paso del tiempo en ambos grupos. Los resultados de acuerdo a la localización de fractura mostraron que entre más proximal fue la fractura, mejores fueron los resultados en ambos grupos. *Discusión.* Estos resultados resultan relevantes, ya que se incluyó solamente a pacientes con indicación apropiada y buena técnica quirúrgica, a sabiendas que el objetivo principal era evaluar el dolor y la erosión acetabular ocasionados por el implante.

Palabras clave: acetábulo, artroplastía, cadera, radiografía.

Introduction

About 11.3% of the Mexican population is older than 50 years of age and this group will suffer some 20,000 hip fractures per year.¹ A high rate of them is resolved by hip hemiarthroplasty, whose purposes of hemiarthroplasty are simple: to relieve fracture-related pain, to allow for motion with stability, and to make rehabilitation easier.

Partial Austin Moore and Thompson hip prostheses have been reported to have excellent results. However,

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problems such as thigh pain, chondrolysis, erosion, and occasionally acetabular protrusion have been found albeit recent studies suggesting that the current generation of partial prostheses results in a lower incidence of complications.²⁻⁶ Placing the prosthesis at 140° of valgus is recommended to prevent erosion and allow the head to rest on a stronger area. Some authors recommend reaming the acetabulum with two purposes in mind. First, to eliminate the joint cartilage and thus prevent chondrolysis from occurring. Chondrolysis is a painful syndrome due to the pressure that the femur head exerts on the acetabular cartilage, which gives rise to a fibronectic membrane with metallosis in the case of unipolar prostheses and to more severe metallosis and osteolysis in the case of bipolar prostheses.⁷ Second, to stimulate fibrocartilage formation to prevent erosion.^{4,8}

In our setting, depending on the preferences of the treating physician on whether to ream or not the acetabulum, we decided to compare the clinical and X-ray outcomes of a reamed versus an unreamed acetabulum in patients who underwent hip hemiarthroplasty.

Material and methods

Between January 1987 and December 1996, 246 hemiarthroplasties were performed in our hospital due to proximal fracture of the femur. Patients of both genders, over 60 years of age, were included in this study. They had undergone hip (partial or bipolar) hemiarthroplasty due to proximal femur fracture. Ninety patients were excluded for being under 60 years of age, sustaining a fracture that involved a pathological field, having a bone quality that could bias the outcome due to added pathologies – grade II or higher rheumatic or arthritic bones –, and other patients because the prosthesis was left in a varus position. Ninety patients were excluded for having periprosthetic infection, postoperative dislocation, or because they were not able to walk again after the arthroplasty was performed, and other patients because their case history did not show a follow-up of at least three years.

Patients were divided into two groups. The first group included 25 patients whose surgical procedures involved reaming the acetabulum. The second group included the 41 control patients with an unreamed acetabulum. As for the patient characteristics (*Table 1*), no significant differences were found in terms of age, gender, type of fracture, or type of prosthesis implanted.

For the clinical assessment of patients we used Harris’ functional scale and considered pain, claudication, weight bearing, gait, and activities such as climbing the stairs or putting a sock as a reference. The lowest score, 65 points, was considered as poor; a score of 65 to 75 points was considered as average; a score of 75 to 85 points was considered as good; and a score higher than 85 points was considered as excellent. For the X-ray assessment we used the Sotelo-Garza and Charnley score⁹ where the distance be-

tween the medial acetabular wall and the ileopectineal line was used as reference. A distance loss of 5 mm or less is rated as Grade I acetabular erosion; a the distance loss of 6 to 15 millimeters is rated as Grade II acetabular erosion; and greater losses or a prosthesis that exceeds the ileopectineal line and protrudes out of the pelvic cavity, is rated as Grade III or severe acetabular erosion.

We designed a retrospective case-control study and we used the Mann-Whitney’s U test. An expected 5% frequency was considered for pain in the reamed group vs. 50% in the non-reamed group, with a 0.05 alpha level and a 95% power of the test.

Results

The results (*Table 2*) showed no clinically (Harris test) or X-ray (Sotelo-Garza and Charnely score) significant differences at six weeks, six months, one year, two years, or three years. The average score for the Harris test improved over time from 75.75 to 86.8 in the group with acetabular reaming, and from 78.95 to 83.37 in the control group. We specifically analyzed the pain parameter compared according to the Chi square method and saw no significant differences between both groups after three years ($p>0.06$). Acetabular erosion was first seen after one year. In all cases it was grade I erosion and accounted for 16% of cases and 19.51% of controls. At two years we saw grade I and grade II acetabular erosion in 60.86% and 62.06% of patients, respectively, with no significant differences. The results, depending on the fracture location (*Table 3*), showed that the more proximal the fracture, the better the outcome in both groups.

Discussion

In elderly patients fractures in the proximal region of the femur are a serious health problem.¹ This is a population demanding permanent care to meet its basic needs, which disturbs the family setting economically and emo-

	Cases	Controls
No. of patients	25	41
Age	75.9 (SD 10.8) (60-96)	(74.9 (SD 7.6)
Gender		
Males	3	8
Females	22	33
Subcapital fracture	7	5
Transcervical fracture	7	14
Basicervical fracture	5	10
Transtrochanteric fracture	5	12
Subtrochanteric fracture	1	0
Austin-Moore	7	15
Thompson	17	25
Bipolar	1	1

Table 2. Results.

	Harris			Sotelo-Garza and Charnely		
	Cases	Controls	P	Cases	Controls	P
6 weeks	75.75 SD 5.6	77.45 SD 0.12	0.06	0	0	
6 months	77.45 SD 6.12	78.95 SD 5.94	0.14	0	0	
1 year	82.04 SD 8.05	81.07 SD 5.15	0.33	Grade I = 4 (16%)	Grade I = 8 (19.5%)	0.84
2 years	86.8 SD 6.22	83.37 SD 5.31	0.29	Grade I = 5 (60%) Grade II = 4 (16%) Grade III = 0	Grade I = 26 (63.4%) Grade II = 8 (19.5%) Grade III = 0	0.58
3 years	82.78 SD 8.52	83.76 SD 6.71	0.44	Grade I = 15 (60%) Grade II = 6 (24%) Grade III = 0	Grade I = 28 (68.2%) Grade II = 8 (19.5%) Grade III = 0	0.92

Table 3. Results.

	Cases %	Controls %
Harris Scale		
Excellent	48	49
Good	40	39
Fair	8	12
Poor	4	0
% Of Excellent and Good Results		
Subcapital fracture	100	100
Transcervical fracture	85	93
Basicervical fracture	80	90
Transstrochanteric fracture	40	66
Subtrochanteric fracture	1 poor case	

tionally. It is, therefore, essential to try and rehabilitate the patient as soon as possible.

These fractures are the main indication for a hip hemiarthroplasty. Both partial Austin-Moore and Thompson prostheses will continue to be the most widely used, having shown their efficacy since Thompson¹⁰ first published in 1954 his experiences of two and a half years and Moore¹¹ reported in 1957 the outcome of his endoprosthesis in 60 non-institutional patients with a minimum follow-up of two years, with good or excellent results in 75% of them. When these models were designed there was no methyl methacrylate to fix cemented prostheses, a condition improving the outcome. Wesley and McMaster⁶ found an average score of 77 with the Harris test after a follow-up of 32 months. In their 1998 study, Zuckerman et al.¹² evaluated the capacity of patients to return to their daily activities after a hemiarthroplasty and found that 77% of them could return to their daily activities within 3 months; 81%, within 6 months; and 86.2%, within 12 months. Our results indicate a good clinical

course in both groups, at three years, with 88% of excellent and good results. These results are significant; as for the purpose of this study only patients with the proper indication and a good surgical technique were included with the understanding that the main purpose of our study was to assess pain and acetabular erosion caused by the implant.

Acetabular erosion and protrusion has always been a problem with this kind of implants. D'Arcy and Devas² conducted a study in 1976 reporting acetabular erosion or stem loosening in 17% of cases. Kobayashi et al.¹³ reviewed a series of 527 hemiarthroplasties in 1997 and found a mean < 0.04 mm protrusion within a two-year period. In an assessment by Kofoed and Kofod¹⁴ of 71 patients in 1983, two years after hip hemiarthroplasty with Austin-Moore cementless prosthesis, 37% of cases were managed with total hip replacements because of pain. Our study reports that after three years, erosion was not higher than Grade II (*table 2*) and no prosthesis was replaced. This shows that, when properly indicated, prostheses last at least for this period of time.

The relationship between the metal femur head and joint cartilage deterioration has been studied in the laboratory. Marjolein et al.⁴ examined the joint cartilage of sheep after a hemiarthroplasty. After one year, they found a loss of as much as 90%. Cook et al.¹⁵ studied acetabular cartilage deterioration in 45 dogs using 3 kinds of materials (carbon, titanium, and cobalt-chrome-molybdenum). Animals were sacrificed at intervals ranging from two weeks to 8 months. At eight months, they found major joint degeneration in all three kinds of prosthesis. Cruess et al.¹⁶ replaced the femur head with a Vitalium (cobalt-chrome) component in 26 dogs. Animals were sacrificed at about 24 week intervals. Gradual progression of the cartilage deterioration was found. In studying the long-term results of Vitalium cups, Aufrank^{1,8} found a healthy fibrocartilage had developed in the acetabulum where the cartilage had been resected in

contrast to the necrotic membrane found when the joint cartilage had not been resected. Lazcano et al.^{1,5} reported that out of 22 patients with a reamed acetabulum, 21 had no pain postoperatively; 9 recovered an excellent range of motion with more than 90° flexion; and 13 patients achieved a 75° to 85° flexion. In terms of gait, 9 patients had a normal, unlimited gait while 13 required a cane to walk long distances. After three years we found no differences in terms of pain, function, or acetabular erosion when comparing the patients with a reamed versus an unreamed acetabulum.

Conclusions

Excellent and good clinical and X-ray short term results were obtained in patients who underwent hip hemiarthroplasty due to proximal femur fracture, provided their arthritis was not rated higher than Grade I and that, technically, the prosthesis had been properly placed.

At the 3-year follow-up no clinically significant or radiological differences were seen regardless of whether a reamed or an unreamed acetabulum was used.

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