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Original article

# Functional outcomes in patients subjected to acetabular revision with reinforcement rings

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**ABSTRACT.** ***Background:*** **total hip arthroplasty is the most successful orthopedic procedure and the frequency of use of revision components has grown exponentially. The increased number of revisions results from the longer life expectancy of the population and the greater frequency of the hip arthroplasty indication among young patients. The purpose of this study is to evaluate the functional results of patients subjected to revision of the acetabular component using reinforcement rings.** ***Material and methods:*** **the study included patients with a diagnosis of septic or aseptic prosthetic loosening and sequelae of acetabular fractures between January 2007 and November 2009 in whom a reinforcement ring was used. The WOMAC scale was used for the functional evaluation.** ***Results:*** **according to the WOMAC scale, the patient functionality results showed a mean preoperative score of 41.89 and a mean postoperative score of 74.26, which represented an improvement of 33.11 points in the median of patients subjected to the surgical intervention, with a statistically significant difference (p = 0.036).** ***Discussion:*** **this study shows an improvement in the functionality of the patients subjected to surgery with a reinforcement ring, as, first and foremost, a statistically significant difference was seen between the preoperative and postoperative values and, secondly, there are papers published in the literature showing that a difference of more than 12 points between the preoperative and postoperative scores in the WOMAC scale indicates a**

**RESUMEN.** ***Antecedentes:*** **La artroplastía total de cadera es el procedimiento más exitoso en ortopedia y la frecuencia del uso de componentes de revisión se ha incrementado exponencialmente, el aumento del porcentaje de revisiones se explica por el aumento de la expectativa de vida de la población y a la mayor indicación de artroplastías de cadera en pacientes jóvenes. El objetivo de este estudio es evaluar los resultados funcionales de los pacientes sometidos a una revisión del componente acetabular utilizando anillos de reforzamiento.** ***Material y métodos:*** **Se incluyeron en el estudio a los pacientes con diagnóstico de aflojamiento protésico séptico o aséptico y con secuelas de fracturas de acetábulo entre Enero del 2007 y Noviembre del 2009 con la colocación de un anillo de reforzamiento. La evaluación funcional se realizó con la escala de WOMAC.** ***Resultados:*** **Los resultados de la funcionalidad de los pacientes registrada según la escala de WOMAC fueron en el preoperatorio un puntaje promedio de 41.89 puntos, mientras que en el postoperatorio el puntaje promedio fue de 74.26 puntos, destacando la mejoría de 33.11 puntos en la mediana que presentan los pacientes con la intervención quirúrgica, siendo esta diferencia estadísticamente significativa (p = 0.036).** ***Discusión:*** **El presente estudio demuestra que existe una mejoría de la funcionalidad de los pacientes operados mediante un anillo de reforzamiento, ya que en primer lugar existe una diferencia estadísticamente significativa entre los valores registrados en el preoperatorio y**



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**significant clinical improvement of patients. *Conclusion:* patients subjected to acetabular revision with a reinforcement ring together with cemented polyethylene have an improved quality of life after the surgical intervention.**

**Key words: arthroplasty, hip, function, evaluation, prosthesis.**

**postoperatorio y en segundo lugar existen trabajos publicados en la literatura que demuestran que cuando las diferencias entre los valores preoperatorio y postoperatorio son mayores de 12 puntos en la escala de WOMAC, la mejoría clínica que experimenta el paciente es significativa. *Conclusión:* Los pacientes sometidos a una revisión acetabular mediante un anillo de reforzamiento asociado a un polietileno cementado, mejoran su calidad de vida con la intervención quirúrgica.**

**Palabras clave: artroplastia, cadera, función, evaluación, prótesis.**

## Introduction

Total hip arthroplasty is a surgical procedure characterized by a high rate of good outcomes and a low complication rate.[1] The prevalence of revision surgery in total hip arthroplasty reported in the literature is 18% in the United States and 8% in the Swedish registry;[2] this high revision rate is explained by the increased life expectancy of the population and the growing number of indications for hip arthroplasty in young patients.[3]

The purpose of revision surgery is to restore in the operated hip a form and function similar to those of the native hip;[4] however, this is not easy since each revision surgery involves multiple problems, which include the loss of bone stock, articular instability, infection, periprosthetic fractures, trochanteric pseudoarthrosis, difficulty to remove the cement or fixed implants, and pelvic discontinuity; the latter represents the greatest challenge for a hip surgeon during acetabular revision.[3-6]

Pelvic discontinuity may be due to traumatic injuries or, more commonly, it may be secondary to osteolysis, both in the cemented and non-cemented acetabular components.[3,7] The risk factors described in the literature for this condition include female gender, massive bone loss and rheumatoid arthritis.[8]

Paprosky et al.,[7] in a series of 147 patients who underwent revision of the acetabular component, proposed a classification of acetabular defects based on the presence or absence of an intact acetabular border and the ability of the latter to provide a rigid support to place an acetabular component. They divided acetabular components into 3 types, among which type III involves considerable bone loss and inability to provide support to the acetabular component; in its most severe form it could constitute pelvic discontinuity, so augmentation with a structural or metal allograft is necessary to replace the lost bone tissue.

There are several options to reconstruct the acetabular component during a revision; they may be divided into biologic and non-biologic.[3] The former are those requiring a close contact between the implant and the viable bone to favor osteointegration; the latter correspond to any reconstruction method providing stability to an acetabular component, without the need for osteointegration. The biologic reconstruction forms described in the literature are the use of uncemented components with the hip rotation center in a non-anatomical position (medial or superior), jumbo cups (66 to 80 mm), an uncemented acetabular component supported by a structural allograft, and uncemented modular implant systems, while the non-biologic methods described include the use of cemented polyethylene cups, a superior structural allograft associated with a cemented polyethylene cup with or without an antiprotrusio ring, impacted crushed graft with an antiprotrusio ring, and the placement of a total acetabular allograft.[2]

The objective of this paper is to assess the functional outcomes of the acetabular component revisions using non-biologic fixation methods with reinforcement rings.

## Material and methods

This is a cohort study, undertaken between January 2007 and November 2009. Patients included were those with a diagnosis of loosening of total hip arthroplasty, whether septic or aseptic, and those with sequelae of acetabular fractures *(Figure 1)* with Paprosky type IIIA or IIIB acetabular defects, all of them managed at the Joint Reconstruction service with placement of a RecoveryTM Biomet® (Biomet, Warsaw, IN, USA) reinforcement ring and a Bioclad Biomet® (Biomet, Warsaw, IN, USA) cemented polyethylene cup *(Figure 2)*.

During the preoperative period the demographics, the diagnosis leading to acetabular revision and the functionality according to the WOMAC scale were recorded for the 19 patients included in the study.[9] During the postoperative period, clinical and radiologic follow-up was done at one month, and at 3, 6, 12 months and every year thereafter, recording functionality according to the WOMAC scale and the presence of signs of loosening, defined as a 2 mm

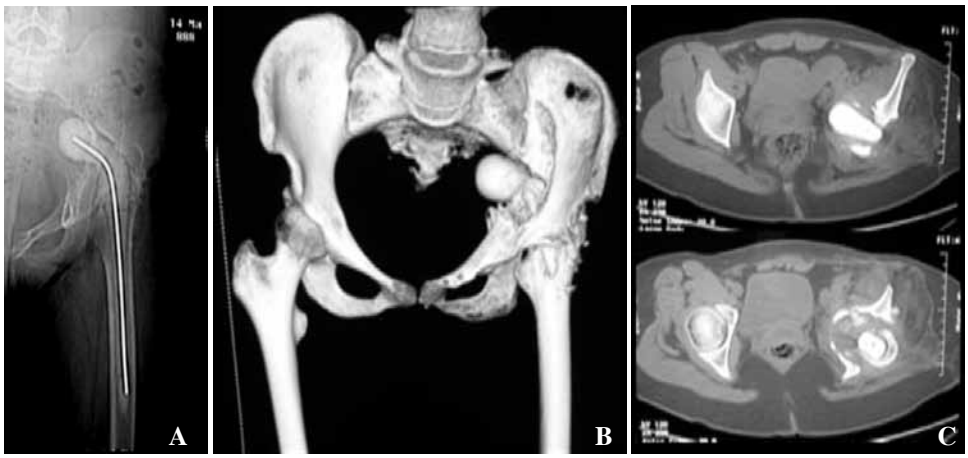


**Figure 1.** A) Female patient with a spacer in the left hip, B) Tridimensional reconstruction, C) Axial sections with a lesion in the quadrilateral lamina and absence of walls.

**Figure 2.** AP and lateral X-rays of the left hip with acetabular reconstruction with a reinforcement ring with hook.

migration of the acetabular component, an angulation >5° compared to the previous X-ray or a radiolucent line >2 mm in the Charnley and De Lee zones;[10] however, the latter was not analyzed in the results obtained as it was not part of the study objective.

The Kolmogorov-Smirnov (K-S) test was performed to explore the distribution of the WOMAC scores obtained in our population. These data were found to have a normal distribution, so a Student t test was applied to the related samples; the statistical evaluation was done with the SPSS software, Windows version 17.

## Results

Patients in the study had a mean age of 51.1 years (median 53 years, range 16-83). Thirteen patients (68.4%) were female and 6 (31.6%) were male. The preoperative diagnosis of septic or aseptic loosening was made in 13 (68.4%) patients, while the diagnosis of sequelae of acetabular fracture was made in 6 (31.6%) patients.

None of the patients had any radiologic signs of loosening during the postoperative period. Complications were observed in 4 of the 19 patients, representing a 21% postoperative complication rate; they included superficial surgical wound infections in 2 patients and prosthetic dislocations in 2 patients. Infections were treated with antibiotic therapy and 3 surgical lavages in each of the cases, while dislocations were approached with closed reduction and immobilization with an abductor brace in one case, and reorientation of the insert in the other case; after this, none of the patients had a new episode of dislocation.

Patient functionality results according to the WOMAC scale are summarized in *chart 1*. The latter shows a preoperative mean score of 41.89 points (median 39 points, range 34.5-49.24), and a postoperative mean score of 74.26 points (median 75 points, range 70.19-78.33). A 33.11 point improvement was observed in the median of patients who underwent surgery *(Chart 1)*, with a statistically significant difference (p = 0.036).

## Discussion

The acetabular implant is the component with the most complications during the postoperative period of total hip arthroplasty, particularly after revision surgery. Failure rates as high as 5% have been reported and all of them warrant a new revision. That is why proper preoperative planning is so important.[4]

Reinforcement rings for Paprosky type III A or III B defects are a good treatment option among the non-biologic methods; however, one should consider that the goal is to find a biologic method that may be definitive and that can be used after a non-biologic method.[2]

Acetabular reconstruction with reinforcement rings involves a failure rate of 25% at 5 years; this rate doubles in cases of pelvic discontinuity[11,12] and, since it is a non-

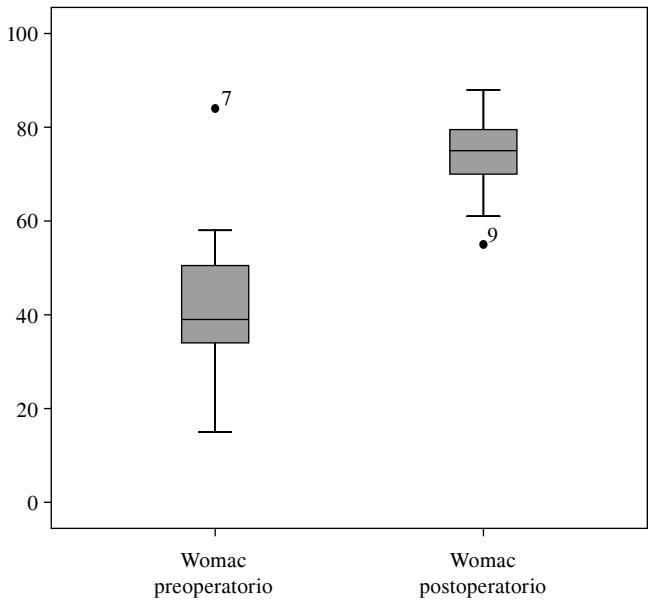


**Chart 1.** Box chart showing the distribution of the scores of the WOMAC scale applied pre- and postoperatively to the patients. The box in each of the charts represents the distribution of 50% of cases, the inner part of the horizontal line represents that median, and the upper (upper mustache) and lower (lower mustache) prolongations represent the 3rd and 1st quartiles, respectively. The two points correspond to two outliers.

biologic fixation method, it does not have osteointegration, which increases the risk of failure of the ring material, screw rupture, and migration of the hook fixed in the ischium.[11,12]

Due to these high rates of complications and surgical reinterventions, hip surgeons should have objective arguments allowing them to tell the patients that, despite the fact that this is high risk surgery, the clinical outcomes are good and will allow them to improve their quality of life.

This study shows an improvement in the functionality of the patients subjected to surgery with a reinforcement ring, as, first and foremost, a statistically significant difference was seen between the preoperative and postoperative values and, secondly, there are papers published in the literature showing that a difference of more than 12 points between the preoperative and postoperative values in the WOMAC scale indicates a significant clinical improvement of patients.[13] We think that these good outcomes are due to a proper preoperative planning and the use of an appropriate surgical technique by expert surgeons.

The complication rate observed in our series is similar to the one reported in the literature; however, it is important to mention that the 2 cases of superficial infection corresponded to minor complications that, to a great extent, are explained by the longer operative time seen in these patients, while the cases of prosthetic dislocations could be due to the fact that the large bone defects of these patients at times forces surgeons to place components in a less than optimal position, with important compromise of the soft tissues and polyethylene, making it impossible to use large heads.

Patients subjected to acetabular revision with a reinforcement ring associated with cemented polyethylene have an improved quality of life after the surgical intervention.

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