

ORIGINAL ARTICLE

Long-term results of hip arthroplasty in patients on dialysis for chronic renal failure. Mortality and implant survival in the National Registry of Uruguay since 2000[☆]



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KEYWORDS

Hemodialyzed;
Arthroplasty;
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Abstract

Objective: To evaluate the incidence of mortality, revision and functional assessment after hip arthroplasty in dialysis patients in Uruguay.

Methods: An observational analytical study of a historical cohort of hip arthroplasties was performed on patients with chronic kidney disease treated with haemodialysis or peritoneal dialysis between 1/1/2000 and 31/12/2013; survival analysis using the Kaplan–Meier method. Functional and radiological evaluation of the live patients was also carried out. One hundred and forty-one hip arthroplasties, 42 for osteoarthritis (29.8%) and 99 for fractures (70.2%), age 72.3 (SD: 12.1) years (18.9–93.1), 72 women (51.1%) and 69 men (48.9%), 75 left arthroplasties (53.2%) and 66 right (46.8%). The anterolateral approach (115, 81.6%) predominated over the posterolateral approach (26, 18.4%).

Results: Mortality at 30, 180 days, 1 and 5 years of patients diagnosed with osteoarthritis was 2.4, 7.1, 9.5 and 47.6%, respectively, and of patients with fracture it was 7.1, 18.2, 29.3 and 82.6%. Five prosthetic revisions were performed, 3 due to recurrent dislocation, one due to aseptic loosening, and one resection arthroplasty due to infection. Twelve patients were alive at the last control, the average score according to the scale of Merle D'Aubigne-Postel was 6.4 preoperatively, and 11 at the end of the follow-up. The average Barthel index at follow-up was 72.8.

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PALABRAS CLAVE

Hemodializados;
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Mortalidad;
Diálisis

Discussion: The mortality in the medium and long term of these patients was very high, much higher than that observed in patients undergoing the same procedure not on dialysis. The review is exceptional, and the functional evaluation of the few living patients shows poor clinical–radiological results.

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Resultados a largo plazo de artroplastia de cadera en pacientes en diálisis por insuficiencia renal crónica. Mortalidad y supervivencia del implante en el Registro Nacional de Uruguay desde el año 2000

Resumen

Objetivo: Evaluar la incidencia de mortalidad, revisión y valoración funcional en la artroplastia de cadera en pacientes dializados en Uruguay.

Métodos: Se realizó un estudio observacional analítico de una cohorte histórica de artroplastias de cadera en pacientes con enfermedad renal crónica tratados con hemodiálisis o diálisis peritoneal entre el 1/1/2000 y el 31/12/2013; análisis de supervivencia mediante el método de Kaplan-Meier. Se realizó además, la evaluación funcional y radiológica de los pacientes vivos. Ciento cuarenta y una artroplastias de cadera, 42 por artrosis (29,8%) y 99 por fracturas (70,2%), edad 72,3 (DE: 12,1) años (18,9-93,1), 72 mujeres (51,1%) y 69 varones (48,9%), 75 artroplastias izquierdas (53,2%) y 66 derechas (46,8%). Predominó el abordaje anterolateral (115, 81,6%) respecto al posterolateral (26, 18,4%).

Resultados: La mortalidad a los 30, 180 días, uno y 5 años en pacientes diagnosticados por artrosis fue del 2,4, 7,1, 9,5 y 47,6%, respectivamente, y en pacientes con fractura del 7,1, 18,2, 29,3 y 82,6%, respectivamente. Se realizaron 5 revisiones protésicas, 3 por luxación recidivante, una por aflojamiento aséptico y una artroplastia resección por infección. Doce pacientes estaban vivos al último control, la puntuación media según la escala de Merle D'Aubigne-Postel fue 6,4 en el preoperatorio y 11 al final del seguimiento. El índice de Barthel promedio en el seguimiento fue 72,8.

Discusión: La mortalidad a mediano y largo plazo de estos pacientes fue muy alta, mucho mayor que la observada en los pacientes sometidos al mismo procedimiento que no están en diálisis. La revisión es excepcional, y la evaluación funcional de los pocos pacientes vivos muestra malos resultados clínico-radiológicos.

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Introduction

Hip arthroplasty (HA) has been one of the most successful orthopaedic operations in the last 50 years, since patents report high satisfaction and improvement in daily life activities.¹ It is also the therapeutic option of choice both for osteoarthritis and for displaced fractures of the neck of the femur in patients over 70 years of age.²

Mineral and osseous metabolism disorders associated with chronic renal disease (CRD) include biochemical changes; changes from replacement, mineralisation, volume, lineal growth and osseous resistance, in addition to the presence of vascular and soft tissue calcifications.³ This alters the quality and structure of the bone, with a reduction in its resistance, predisposing the patient both to an increased risk of more fractures of the neck of the femur or early changes to the joints, including necrosis due to the use of corticoids. Patients with CRD suffer

from significant comorbidities and long term survival is lowered in proportion to the severity of the kidney disease,⁴ associated with complications after total hip arthroplasty,⁵ including septic loosening, aseptic loosening and recurrent dislocations described by Lieu et al.¹⁹ in their revision article.

Although the increased risk of complications is acknowledged and even mortality of the CRD and the dialysis in patients subjected to HA, the long term mortality rate of this surgery in these patients has not yet been well quantified.

The aim of this study was to assess the long term outcomes of patients with CRD on dialysis, who undergo hip arthroplasty for different reasons, with the inclusion of the radiological clinical status of the live patients, revision surgery rates, and essentially, midterm and long term mortality rates compared with those of the same procedure in the general population.

Material and methods

In 1980, law 14897 was passed in Uruguay. A non state public fund was thus created which was called the National Resources Fund (NRF), which by means of a small quota (US\$ 6/month) paid by all the inhabitants of the country, offers total cover for highly complex and highly expensive procedures (e.g., kidney, heart and liver transplants; oncology treatments; heart surgery, etc.), including all dialysis, arthroplasties and revision surgery. The latter involve over 4000 procedures each year, which are centralised, regardless of whether the patient comes from the private or public health sector, in 5 laminar flow theatres.⁶

This also allows for data collection on a national register of all procedures made through the NRF, since health institutions and doctors have the obligation to provide data requested from them. Arthroplasty surgery outside the NRF domain, and outside the country is absolutely exceptional (although it does exist).

Through the NRF data, the MARIA system, a primary search was carried out with diagnosis of chronic renal disease in the therapeutic stage of haemodialysis and peritoneal dialysis. These patients were subjected to hip replacement procedures during the period between 01/01/2000 and 31/12/2013. We conducted an analytical observational study of a historical cohort. Procedure and mortality data were obtained from the NRF data base procedure register. For functional follow-up patients were interviewed and the most recent X-rays were reviewed.

The following variables were analysed: sex, age, dialysis admission date, date of arthroplasty, therapeutic indication of arthroplasty, hip operated on, approach used and mortality date relating to the surgery considered.

The patients who were alive during follow-up (November to December 2016) were assessed from a functional viewpoint with the Barthel⁷ index and Merle D'Aubigne⁸ scale. Hodkinson et al.⁹ criteria were used to assess radiology of the acetabular component. This differentiates between 4 types of delimitation: Type 0: no radiolucent lines; Type 1: radiolucent line of any thickness in zone 1 of De Lee/Charnley; Type 2: radiolucent lines in zone 1 and 2; and Type 3: radiolucent lines in the 3 zones.¹⁰ The acetabular component with a radiolucent line in any zone was considered loose and considered firm when there were no radiolucent lines. The femoral component was assessed in accordance with the Harris et al.,¹¹ classification, which defines 3 loosening categories: Definite: radiographic evidence of migration of the component or the cement; Probable: complete evidence of a radiolucent zone 100% around the cement mantle in one or more radiographs and possible: a radiolucent zone that occupied more than 50% but under 100% of the cement-bone interface in one or more radiographs.

Analysis of implant survival was carried out using the Kaplan–Meier method.

During the period studied, in accordance with the data provided by the NRF, a total of 31,253 primary hip arthroplasties were performed in Uruguay, 18,615 for osteoarthritis and 12,638 for fractures. In dialysis patients from this total during this period 144 were arthroplasties. Three patients were excluded due to kidney transplants prior to surgery, with the remaining 141 hip arthroplasties. 130 patients were

in chronic dialysis at the time of surgery, 42 for osteoarthritis (29.8%) and 99 for fractures (70.2%). Age ranged between 72.3 years (SD: 12.1), range between 18.9 and 93.1 years. There were 72 females patients, 51.1% and 69 male patients (48.9%). Seventy five operations were performed on left hips (53.2%) and 66 on right (46.8%). An anterolateral approach was used in 115 cases (81.6%) and posterolateral in 26 (18.4%). Of the 141 arthroplasties performed, all of them were cemented, 85 were Charnley type prosthesis, 48 Thompson type and the other 8 were bipolar.

Results

The median follow up was 9 years. General mortality of the whole sample at 30, 180 days, one year and 5 years, was 5.7%, 14.9%, 23.4% and 82.1%, respectively. In those operated on for osteoarthritis, mortality during the same periods was 2.4%, 7.1%, 9.5% and 47.6%; and in people with fractures it was 7.1%, 18.2%, 29.3% and 82.6%, respectively. In the Appendix B graphics 1 and 2 the accumulated rate was shown for the total population and the reason for the arthroplasty, respectively (see Appendixes Table 1 and 2, and graphics 1 and 2).

Removal of the implant due to deep wound infection was performed on one patient and 4 prosthetic revisions, 3 due to dislocation and another due to aseptic loosening, with a period of 1, 3, 5 and 12 months after primary surgery. Table 3 and graph 3 (see Table 3 and graph 3) show the accumulated incidence of revisions for fracture, osteoarthritis and total population in dialysis estimated using competitive risk analysis. The accumulated rate of revisions was similar among those patients operated on for fractures and those operated on for osteoarthritis ($p = .62$).

At the end of follow-up, 12 patients were alive in the final control (time from surgery between 5.2 and 9.5 years), with totally cemented arthroplasty, the pre operative Merle D'Aubigne scale was 6.4 (3–14) and postoperative was 11 (4–16). The average Barthel index in follow up was 72.8 (35–90). Of the radiological evaluation, 10 acetabular components were loose and one firm without radiolucent lines. At femoral component level: 7 femoral stems with radiological elements of loosening and 4 firm femoral stems. Both prosthetic components were removed due to uncontrolled deep wound infection in the postoperative period in the other living patient.

Discussion

Several therapeutic options exist for terminal end stage patients affected by chronic renal disease, who are on both haemodialysis (HD) and peritoneal dialysis (DP). These patients may develop osteoarthritis or secondary osteonecrosis as a consequence of the prolonged use of corticoids in previous stages of their treatment, or if they are previously the recipients of kidney transplants.

According to Abbott et al.¹² there is a rate of 35/10,000 hip arthroplasties per year in dialysed patients, compared with 5.3/10,000 people in the general population. In turn these patients have a higher risk of hip fractures. The estimated relative risk has been established at 4.4 times higher than the general population.¹³ These patients present with

medical comorbidities which complicate the peri-fracture period and contribute to an increase in morbidity and mortality.¹⁴

A mild or moderate degree of kidney function based on the rate of glomerular filtration is associated with a higher percentage of mortality in the short and long term, of 5.9–22.9%, 19.8–45.2% for the said periods referred to by Li et al.¹⁵

The mortality rate in these patients, including for osteoarthritis and fractures, of 14.9% at 6 months is much higher than that of the general population. Here we can compare mortality of our register of the NRF for 2009 which is 1.8% at 4 months postoperative,¹⁶ significantly higher in cases of fracture, 5.6% (against 14.2% at 6 months, in this series), compared with that of 0.3% (against 7.1% at 6 months in this series) in the case of osteoarthritis.

In hip arthroplasty, early mortality rate is $\leq .55\%$,¹⁷ at the general population level.

In these patients, mortality is high and variable depending on the postoperative period.

Mortality during the early postoperative period is the most devastating complication that can occur in conjunction with any surgery in patients with dialysed CRD, according to Erkocak et al.¹⁸ In their study they refer to a significantly higher hospital mortality rate of 2% compared with patients without CRD (.6%). In a revision carried out by Lieu et al.,¹⁹ they refer to mortality one year after of 6.3% in haemodialysis patients. Wolfe et al.²⁰ refer to a higher mortality rate of 16.1%. Other authors refer to respective mortality rates which vary between 0% and 14%.^{21,22} Sakalkale et al.²³ refer to a higher rate than the others, of 58%. In their analysis of arthroplasty in dialysed patients Karthikeyan et al.²⁴ refer to a mortality rate of 1.88%.

Analysis of our series, reveals that postoperative mortality at one year is of 23.4%, which is considered very high and which varies in accordance with therapeutic indication, in the case of fracture being 29.3%, 3 times higher than that of osteoarthritis which is 9.5%. Different authors refer to mortality one year after surgery as being high in fractures. Tierney et al.²⁵ refer to it as 50%. Other authors present mortality figures of 44.4%,²⁶ 23%²⁷ and 37%²⁸ after one year in fractures in these patients. In contrast, Sakabe et al.²⁹ and Blacha et al.³⁰ show in their studies a mortality rate after one year of 6.9% and 4.4%, respectively, with the idea that these results are due to a correct management by the nephrology team in the postoperative period.

In osteoarthritis, our mortality one year after surgery was 9.5%, which is a high rate compared with that of the general population without CRD. Studies such as that of Illingworth et al.³¹ refer to a mortality incidence of .13% in the population without CRD; the publication of the NRF in 2009 refers to rate of .3% in the case of osteoarthritis.¹⁶

It is the first study we are aware of where long term mortality was assessed in a large series and where mortality was 82% after 5 years (average 9 years) with a maximum of 14 years. Very few patients remained alive (only 12 cases), and revision rate was almost nil (4 cases), compared with the high mortality.

With regard to functional evaluation of the live patients, we appreciated a moderate improvement with regard to the preoperative period, with a preoperative average of 6.4 (0–14) and postoperative average of 11 (4–16). Several

patients did not present with long term clinical improvement, due to the low functional aspect of their baseline disease and its comorbidities, and because some presented with aseptic loosening of the implant and one of them had a Girdlestone operation due to infection, which lowered the average.

Our results are on average a little lower than those found in the different studies in the literature, such as those of Li et al.³² who refer to a preoperative average of 10 and postoperative average of 15 on the Merle D'Aubigne scale. Nagoya et al.²¹ refer to preoperative values of 6.8 and 15.3, Sakalkale et al.²³ to 12 and 15.6, respectively. In their study Fukunishi et al.³³ refer to values closer to ours of 6.2 and 12.8, respectively.

In our series there were 4 prosthetic revisions and one extraction of both components with definitive Girdlestone due to postoperative deep wound infection, with poor evolution. We suggest that there were few revisions, since early mortality was high, but the durability of the arthroplasty was not really assessed.

An average Barthel⁷ index in follow up of 72.8 (35–90) was obtained, which corresponded to a degree of mild dependence, with no articles in the literature being found to refer to said index in CRD with degenerative articular disease or fracture which required hip arthroplasty.

The strength of this study resides in the fact that the series (fairly large compared with other reports published) includes all the patients of the country, with these combined treatments (dialysis and HA) without the loss of patients and the only weakness is the evaluation of other postoperative complications of the same, including dislocation, loosening and infections in the patients involved in the study.

Conclusions

This historical cohort series of the National Register of the National Registers Fund, of over 140 arthroplasties in dialysis patients, operated on for osteoarthritis and fractures with HA over 14 years, showed a very high rate of mortality in the short, medium and long term, with a very low rate of revision, and with a very low functional capacity in the few patients who survived over time.

Conflict of interests

The authors have no conflict of interests to declare

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.recote.2018.12.007>.

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