Is The Dislocation of Hemiarthroplasty Resolved?

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ABSTRACT

Introduction: Hip hemiarthroplasty dislocation is a challenging complication due to patient frailty, associated comorbidities, and poor bone and soft tissue quality. **Materials and Methods:** We studied 28 cases of dislocation after hemiarthroplasty and compared them with 56 control patients, with a follow-up period of one year. Closed reduction under general anesthesia was performed in 26 cases. The study analyzed recurrence episodes of dislocation, considering various factors influencing instability recurrence. **Results:** Among the 28 patients who experienced dislocation after hemiarthroplasty, the overall mortality rate was 42% within the first 12 months, compared to 21% in the control group ($p < 0.001$). Recurrence following the initial reduction occurred in 12 cases (42%). Dislocations resulting from trauma had a lower recurrence risk than those occurring spontaneously or with minor trauma, with an odds ratio (OR) of 11. Similarly, dislocations in patients with moderate to severe cognitive decline had a higher recurrence risk compared to those without cognitive impairment, with an OR of 5.5. **Conclusions:** Hemiarthroplasty dislocation is associated with a significantly increased mortality rate. While closed reduction under general anesthesia is often considered the preferred management approach, it carries a high failure rate, particularly in patients with moderate to severe cognitive decline or in cases of spontaneous dislocation.

Keywords: Hemiarthroplasty; dislocation; reduction; recurrence.

Level of Evidence: III

¿Está la luxación de la hemiartroplastia resuelta?

RESUMEN

Introducción: La luxación de la hemiartroplastia tras una fractura de cadera es una complicación difícil de tratar debido la comorbilidad asociada en este tipo de pacientes, la pobre calidad del hueso y las partes blandas. **Materiales y Métodos:** Se evaluaron 28 casos de luxación tras una hemiartroplastia. Se comparó la mortalidad con la de 56 controles, en un seguimiento mínimo de un año. En todos los casos, se intentó una reducción cerrada bajo anestesia general, que fue exitosa en 26 pacientes. Se analizaron los episodios de recurrencia de la luxación, considerando los diferentes factores que pueden influir en ella. **Resultados:** La tasa de mortalidad global de los 28 pacientes con luxación fue del 42% en los primeros 12 meses frente al 21% en el grupo de control ($p <0,001$). Hubo 12 casos (42%) de recurrencia tras la reducción cerrada inicial. El riesgo de recurrencia es menor cuando las luxaciones se producen por un traumatismo que si ocurren espontáneamente o con traumatismos menores. Asimismo, el riesgo de recurrencia de las luxaciones en pacientes con deterioro cognitivo moderado o severo es más alto. **Conclusiones:** La luxación tras una hemiartroplastia se asocia con un incremento significativo de la mortalidad. Aunque la reducción cerrada bajo anestesia general se considera de elección en la mayoría de los casos, la tasa de fracaso es alta, sobre todo en pacientes con deterioro cognitivo moderado severo o tras luxaciones atraumáticas.

Palabras clave: Hemiartroplastia; luxación; reducción; recurrencia.

Nivel de Evidencia: III

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INTRODUCTION

Partial hip replacement or hemiarthroplasty is the most common treatment for subcapital femur fractures in elderly patients in our setting,[1] primarily because it is less invasive, less demanding surgically, and has a lower complication rate compared to total hip replacement.[2]

Dislocation of hemiarthroplasty is a complication with an incidence ranging from 1% to 14%,[3] but it can have devastating consequences for this type of patient. Studies have shown an annual decline in function,[4] and this complication has been associated with an increase in mortality of up to 65% within the first year, rising to 75% if the dislocation recurs.[5]

Several risk factors have been associated with dislocation, such as cognitive impairment, delayed surgery, surgical approach, and specific anatomical characteristics of the patient, including reduced acetabular depth and a decreased center-edge angle.[6]

The definitive treatment for prosthetic dislocation is often influenced by the high comorbidity rates in these older patients. Treatment options include:

1. Revision surgery of the femoral component (when malpositioning is identified).[7]

2. Conversion to total hip arthroplasty (when stability defects are assumed and implants with greater stability are required). These two procedures are more complex, carry higher postoperative risks, and are not free from the possibility of further dislocation episodes.

3. Girdlestone resection arthroplasty is another, albeit more aggressive, option. It results in a significant loss of function and persistent pain compared to other treatments. .[8] Despite the various treatment options, there is no strong scientific evidence to guide the management of this complication.

The aim of this study was to describe mortality and associated factors, particularly in cases of prosthesis dislocation. We also analyzed the outcomes of the treatments applied in each case to provide new insights into the individualized management of these patients.

MATERIALS AND METHODS

A retrospective case-control study was conducted involving 84 patients, including 28 cases of patients who underwent surgery in our center for dislocation after receiving a cemented hip prosthesis with a bipolar dome. The data were extracted from our center's digital database, and the study was approved by the hospital's Ethics Committee.

Cases

Patients included were those who had sustained an acute subcapital hip fracture and had undergone prosthetic surgery following the fracture. Patients who had undergone arthroplasty following failed osteosynthesis were excluded. All patients received a cemented hip prosthesis with a single 132° cervico-diaphyseal angle implant of the Coron type (Exactech®), with a bipolar dome. The surgeries were performed by various surgeons, including specialty residents. The surgical approach was posterior (Moore type in 26 cases) or anterolateral (modified Hardinge type in 2 cases).

Controls

A cohort of 56 consecutive patients who did not experience dislocations was selected from 2019 to 2021. These patients underwent surgery with the same implant and surgical approach (posterior or Hardinge) during the same period.

Clinical features

Data collected from our center's electronic clinical database included: age, cognitive impairment, sex, side of the fracture, comorbidities, time to surgery after hip fracture, time to dislocation, morbidity, *American Society of Anesthesiologists* (ASA) score, mortality, and affected side.

Physicians from the Orthogeriatrics Service assessed neuromuscular impairment, classifying patients with a score of ≥3 on the FRAIL scale (Fatigue, Resistance, Ambulation, Illnesses, Loss of Weight) as having neuromuscular impairment.

All patients were assessed during hospital admission and postoperatively by the Orthogeriatrics Service using a modified version of the Global Deterioration Scale (GDS). Patients were classified into four groups: 1) no cognitive

impairment; 2) mild cognitive impairment: evident memory decline and difficulties in daily activities, orientation, information retention, and maintaining attention; 3) moderate cognitive impairment:severe memory and functional issues, requiring assistance with instrumental daily activities; 4) severe cognitive impairment: constant dependence for basic activities, cognitive and functional decline, behavioral issues, ambulation disturbances, and delirium.

Indicated treatment

The time (in days) until dislocation and the number of dislocations were recorded. The different therapeutic strategies included: non-surgical management (leaving the dislocation untreated), closed reduction under general anesthesia, revision of the partial replacement, and conversion to a total hip replacement.

Cause of Dislocation

We analyzed the circumstances of the dislocations and classified them as either: *traumatic*, occurred due to a fall, sudden movement, or any incident involving abrupt adduction and rotation of the hip; and *atraumatic* or *spontaneous*, when the dislocation occurred without any significant trauma, such as during a transfer, changing beds, standing up from a chair, or when the dislocation went unnoticed, with no adduction or rotation involved.

Statistical Analysis

The statistical analysis was performed using SPSS version 26. Based on the hypothesis and the primary objective, the sample size was calculated using the GRANMO calculator for the estimation of two independent proportions. Equal numbers of patients were considered for each group, assuming a mortality rate of 29% in patients operated on for hip fractures without dislocation, and 44% in those who experienced dislocation.[9] A bilateral contrast was used, with an alpha risk of 0.05, a beta risk of 0.20, and a loss rate of 0.10. With this data, it was estimated that 21 patients would be required in each group to detect a statistically significant difference between the two proportions.

Descriptive Analysis. Qualitative variables are presented as absolute and relative frequencies. Quantitative variables are described as mean (± standard deviation) if they follow a normal distribution, or as median and interquartile range if they do not. For all variables, 95% confidence intervals (95% CI) are provided.

Bivariate Analysis. The SPSS program was used for bivariate analysis. Qualitative variables are described as percentages and analyzed using contingency tables. Statistical significance was calculated using the chi-square test (χ^2) and Fisher's exact test, with a p-value <0.05 considered significant. Quantitative variables are expressed as means and standard deviations, and comparisons were made using Student's t-test. Kaplan-Meier survival curves were also constructed.

RESULTS

A total of 84 patients were included in the study: 28 with dislocated hemiarthroplasties and 56 with non-dislocated hemiarthroplasties.

The 28 cases of hemiarthroplasty dislocation were treated as follows (Figure 1):

- 26 underwent closed reduction:
  - 14 reductions were successful.
  - 12 dislocated again, leading to the following definitive treatments:
    - One remained palliatively dislocated due to comorbidities precluding further anesthesia.
    - Five experienced another dislocation and underwent closed reduction again.
    - One underwent dome and stem replacement due to a technical defect.
    - Two underwent conversion to a total hip arthroplasty.
    - Three underwent Girdlestone resection arthroplasties.
- Two were not treated with closed reduction:
  - One patient with dislocation was treated with open reduction followed by revision surgery to a total hip arthroplasty.
  - One patient with dislocation died

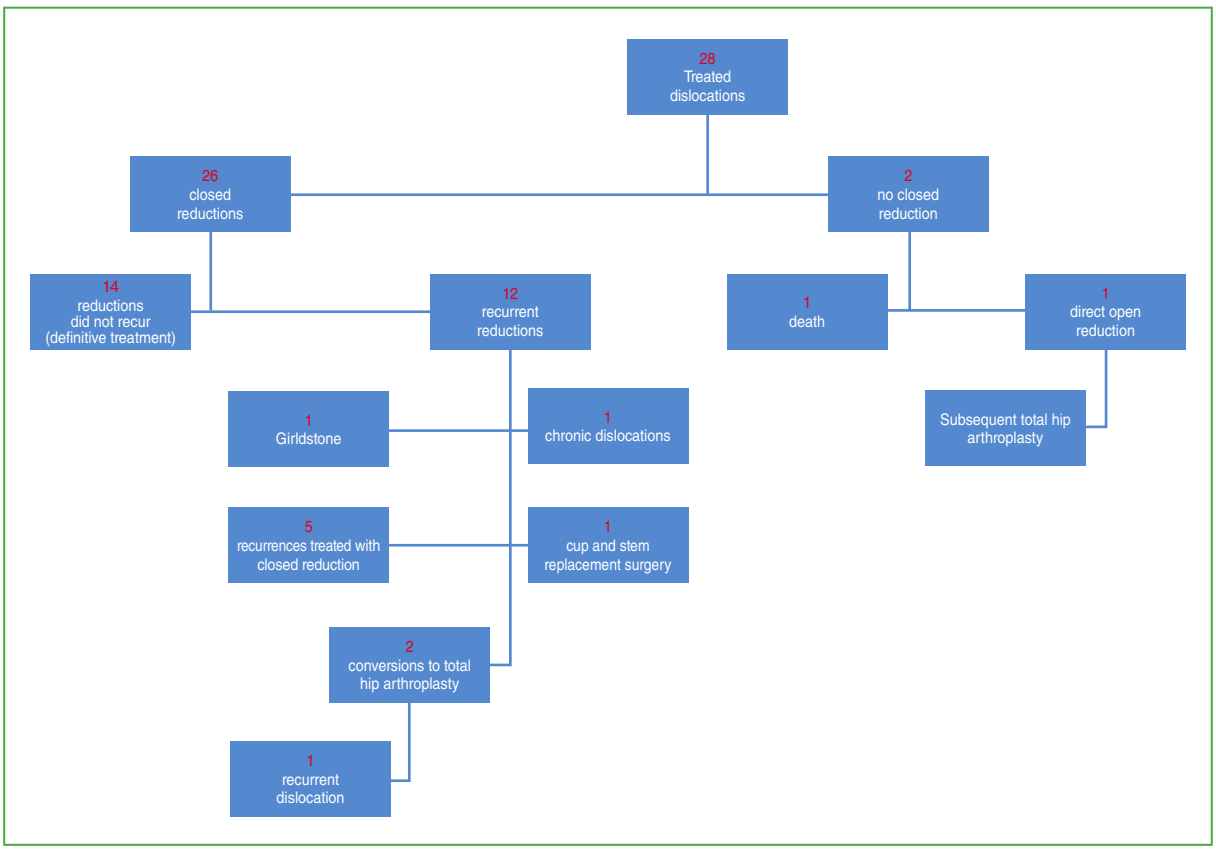

Figure 1. Acute and definitive treatment of hip hemiarthroplasty dislocations.

In the non-dislocated hemiarthroplasty group, 70% (n = 39) were women, compared to 68% (n = 19) in the dislocated group, with no statistically significant difference between the groups (p = 0.87). The mean age of patients with dislocations was 86.5 years (± 1.4), and 85 years (± 1.1) for those without dislocations, with no significant difference (p = 0.201). The operated side did not influence the occurrence of dislocation, with 50% (n = 28) of the non-dislocated group having right-sided hemiarthroplasties and 50% left-sided. In the dislocated group, 57% (n = 16) were right-sided and 43% (n = 12) left-sided, with no statistical significance. Seventy percent (n = 39) of patients without dislocation had no neuromuscular impairment, compared to 71% (n = 20) in the dislocated group, again with no statistical significance (p = 0.918). The percentage of prostheses operated on using the anterior (Hardinge) approach was 11% in both groups, with no significant difference between dislocated (n = 3) and non-dislocated cases (n = 6) (p = 1).

No differences (p = 0.112) were found in the mean weight of patients with non-dislocated hemiarthroplasties (64 ± 9 kg) and those with dislocated hemiarthroplasties (78 ± 85 kg). The mean height of patients with non-dislocated hemiarthroplasties was 156 cm (± 9), compared to 158.5 cm (± 12) in patients with dislocated hemiarthroplasties, with no statistically significant differences (p = 0.184).

The mean number of days from hip fracture to surgery was 3.18 in the non-dislocated group and 3.23 in the dislocated group, with no statistical significance (p > 0.05).

Sixty-nine percent (n = 20) of patients with dislocation experienced it within the first month after surgery, and all dislocations occurred within 90 days postoperatively.

The percentage of patients with mild, moderate, and severe cognitive impairment was higher in the dislocated group (Table 2). Twenty-nine percent (n = 16) of patients with non-dislocated arthroplasties had cognitive impairment versus 65% (n = 18) of those with dislocation, a statistically significant difference (p = 0.017) (Table 2). Additionally, 20% (n = 11) of patients without dislocation had moderate or severe impairment, versus 46% (n = 13) of those with dislocation, also a statistically significant difference (p = 0.01).

Table 1. Qualitative variables

Variables		Non-dislocated hemiarthroplasty		Dislocated hemiarthroplasty		p
Side	Right	28	50%	16	57%	0.537
	Left	28	50%	12	43%	
Sex	Male	17	30%	9	32%	0.87
	Female	39	70%	19	68%	
Approach	Posterior	50	89%	25	89%	1
	Lateral	6	11%	3	11%	
Neuromuscular impairment	Yes	17	30%	8	29%	0.918
	No	39	70%	20	71%	
Average age (years)		85		86.5		0.763
Total patients		56	100%	28	100%	

Table 2. Cognitive impairment.

Patients		Cognitive impairment			
		No	Mild	Moderate	Severe
No dislocation	Number	40	5	4	7
	%	71	9	7	13
Dislocation	Number	10	5	6	7
	%	36	18	21	25

Moreover, 67% (n = 8) of patients with recurrent dislocations and 19% (n = 3) of those without recurrence had moderate or severe cognitive impairment (odds ratio [OR] 5.5; 95%CI 1.047-28.9) (p = 0.027).

In terms of the cause of dislocation, spontaneous dislocations (due to minor trauma or postural changes) recurred in 55% of cases, while dislocations following trauma recurred in only one patient (14%). This difference was statistically significant (p = 0.04) (OR 1.9; 95%CI 1.1-3.4) (Table 3).

Table 3. Number and percentage of patients who suffered a single or recurrent dislocation, either traumatic or spontaneous.

Cause of dislocation		Recurrence		Total (100%)	
		No recurrence	Recurrence		
Traumatic	Number of patients	7	1	8	OR 1.9 (95%CI 1.1-3.4)
	Percentage	86%	14%	100%	
Spontaneous	Number of patients	9	11	20	
	% within recurrence	45%	55%	100%	
Total	Percentage	16	12	28	p = 0.04

OR = *odds ratio*; 95%CI = 95 % confidence interval.

Table 4 shows the mortality rate following hip hemiarthroplasty as a function of dislocation incidence. The 1-year mortality rate was higher in patients with dislocated prostheses (61%) compared to non-dislocated prostheses (23%) ($p < 0.001$) (OR 5; 95%CI 2-13.6). The 3-month mortality rate was also higher in patients with dislocation (36%) than in those without dislocation (21%) ($p = 0.04$) (OR 3.4; 95%CI 1.25-9.5). However, no difference was observed in the 1-month mortality rate, with 11% of dislocated patients and 7% of non-dislocated patients dying, which was not statistically significant.

By the end of the follow-up, 28.6% (n = 16) of patients with non-dislocated hemiarthroplasties and 68% (n = 19) of patients with dislocated prostheses had died ($p < 0.001$).

Table 4. Mortality 365 days, 90 days, and 30 days after dislocation of hip hemiarthroplasty.

	Final mortality		Mortality after 365 days		Mortality after 90 days		Mortality after 30 days		Total patients
	n	%	n	%	n	%	n	%	
Dislocated prostheses	19	68	17	61	10	36	3	1%	28 (100%)
Non-dislocated prostheses	16	29	13	23	12	21	4	7	56 (100%)
p	<0.001		<0.001		0.014		0.577		84

The cumulative 1-year survival of both groups was analyzed (Figure 2), showing a statistically significant reduction in survival function for patients with dislocated prostheses. Survival was significantly lower in patients with dislocation than in those without (log-rank < 0.001).

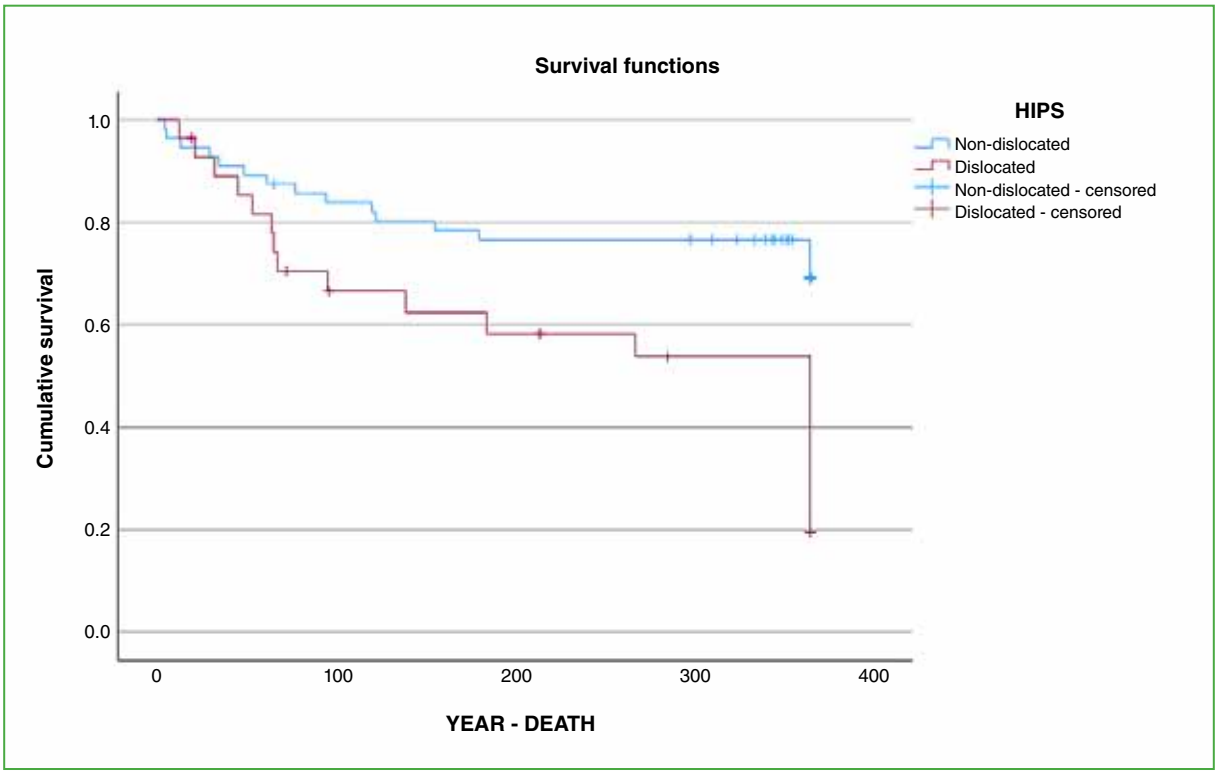

Figure 2. Kaplan-Meier curve comparing the survival of patients who suffered one or more episodes of dislocation and those without dislocation.

DISCUSSION

Dislocation of a partial hip replacement is an occasional complication, with a prevalence ranging from 1% to 14%, depending on the series.[2-5] Limited data on risk factors have been published, and factors such as the surgical approach[3,5,10] and the experience of the primary surgeon have been mentioned. Unwin and Thomas[11] even advised against the routine use of the posterior approach for this procedure, citing dislocation rates as high as 14.2% in the hands of inexperienced surgeons compared to 3.6% with the anterolateral approach. Several studies attribute this difference to the failure to repair the joint capsule and external rotators. In any case, no study has demonstrated that the posterior approach results in a lower dislocation rate than the anterolateral or anterior approaches. Furthermore, the use of total hip replacements appears to be associated with higher dislocation rates than hemiarthroplasty.[12] In a recent meta-analysis, none of the 12 randomized studies showed a dislocation rate favoring total hip replacements.

Delayed surgery has also been identified as a factor contributing to the increased risk of dislocation. Salem et al. reported that the risk of dislocation quadrupled when surgery was delayed for more than 24 hours.[9] However, in our series, a delay before primary surgery was not associated with an increased risk of dislocation.

It has been reported that patients with cognitive disease have a higher rate of postoperative dislocation. Ninh et al.[13] found a strong association between cognitive impairment and dislocation, with 54% of patients with dislocation having cognitive impairment, compared to 18.8% of those without dislocation. Our findings support this: 64% of patients with cognitive impairment experienced dislocation, compared to 29% of those without. Additionally, there was a significant association between moderate to severe dementia and the likelihood of recurrent dislocation (OR 5.5; 95%CI 1.04–28.9) after closed reduction.

Mortality associated with hip fractures has been linked to age, surgical delay, and comorbidities in these patients. Recent studies have found that hemiarthroplasty dislocation and residual instability increase mortality,[14] prolong hospitalization, and often require revision surgeries. Our results support these findings, with the mortality rate significantly higher at 3, 12, and 18 months in the dislocated group, especially at 3 months postoperatively.

Some studies attribute this to persistent dislocation and the use of procedures like resection arthroplasty, which result in significant loss of mobility and more intense pain. In our series, differences in mortality were observed between patients who experienced a single episode of dislocation and those who had multiple episodes, though the underlying reasons remain unclear. It is possible that the heterogeneity of treatments across different studies contributes to these differences.[7] There is limited data on how best to manage this complication, possibly due to the significant comorbidities associated with these patients, which restrict treatment options. Some series report dislocation recurrence rates exceeding 70% following closed reduction, even with post-reduction care.[2,10] Additionally, many patients are not candidates for reduction under general anesthesia. However, we believe these data should be interpreted cautiously, as reduction was successful in 26 out of 28 attempts (92%) in our series, though revision surgery was not free from further episodes of dislocation. Furthermore, it is important to note that 12 (42%) of the 26 patients who experienced multiple dislocations had greater comorbidities, including moderate or severe cognitive impairment (OR 4.4).

Resection arthroplasty was only performed in cases where both dislocation and infection were present, not as a treatment for isolated recurrent dislocation. This procedure has not been effective in relieving postoperative pain or improving function. In fact, it is associated with high mortality rates, persistent postoperative pain, and limited functional improvement compared to patients with chronic dislocation.

In our series, the traumatic context of dislocation emerged as a key factor in predicting recurrence. The risk of recurrence was significantly higher in patients who experienced spontaneous or unnoticed dislocations (OR 6.6). We believe that the occurrence of dislocation without trauma, or after minor trauma, may be due to malpositioning of components and substantial soft tissue defects. When cognitive impairment is factored in, as many as 63.9% of patients relapse after closed reduction.

Thus, we believe that efforts should focus on minimizing the risk of dislocation to improve patient outcomes. This requires selecting an appropriate surgical technique, avoiding the posterior approach, and favoring approaches that provide greater stability, such as the anterior and anterolateral approaches. Although the literature does not fully support the use of total hip replacements, we believe that acetabular implants, particularly dual-mobility implants, may be indicated, especially in patients with intraoperative instability. Additionally, we consider closed reduction under general anesthesia to be the initial treatment of choice in all patients, as it presents the lowest risk given the comorbidities common in this patient population.

One limitation of our study is that we could not determine the overall incidence of this complication. The routine use of the posterior approach at our center also prevented us from making comparisons in this regard. We were also unable to assess whether there was deterioration in functional status, as many of the patients who experienced dislocation had died. Another limitation is that it was not always possible to gather reliable data on the circumstances of the dislocation, as many patients were cognitively impaired and institutionalized, making their accounts less reliable.

CONCLUSIONS

We found a high risk of mortality associated with hemiarthroplasty dislocation, independent of patient comorbidities. Therefore, it is essential to employ a technique that ensures implant stability. Closed reduction under general anesthesia is successful in most cases and should be the first treatment option, particularly for frail patients. Patients with severe cognitive impairment who experience dislocation due to minor trauma, or no trauma at all, may benefit from revision surgery.

Conflict of interest: The authors declare no conflicts of interest.

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