Original Article

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A Comparative Analysis of Posterior and Lateral Approaches in Hip Hemiarthroplasty of Patients Older than 65 Years Regarding Dislocation and Periprosthetic Fracture Rates

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Abstract

Aim: The two most commonly used approaches for hip hemiarthroplasty operations are the lateral and posterior approaches (PAs). The PA is claimed to have a higher risk of dislocation. In this context, we aimed to investigate if there is a difference between posterior and lateral approaches (LAs) in terms of postoperative dislocation rates. Mortality rates and the risk of operative periprosthetic fracture were also analyzed.

Methods: A retrospective investigation was conducted of patients who underwent hip hemiarthroplasty for a femur neck fracture at our hospital between 2010 and 2020. The operation notes, medical records in the hospital electronic records system, and the Turkish national health record system (E-nabız personal health system) were reviewed. Patients with additional severe diseases or trauma that may affect the risk of dislocation were excluded from the study. Patients were grouped into the PA group and the LA group. PAs were performed using the Moore technique, and LAs were performed using the modified Hardinge technique. Dislocation, periprosthetic fractures, and mortality rates were noted.

Results: There were 321 females and 147 male patients in the study. The PA group included 262 patients, and the LA group, 206. There were 6 dislocations and 5 periprosthetic fractures in the PA group and 2 dislocations and 1 periprosthetic fracture in the LA group, with a minimum of 1-year follow-up. The difference was not statistically significant. The mortality rates in postoperative years 1 and 10 were 26.4% and 82.1%, respectively. The lateral versus PA had no statistically significant effect on these rates.

Conclusion: Since there was no significant difference between these approaches in terms of dislocation, periprosthetic fracture, and mortality rates; it was concluded that the choice of approach should depend on surgeon preference and experience.

Keywords: Hip dislocation, hemiarthroplasty, postoperative complications, femoral neck fractures, periprosthetic fractures

Introduction

Hip fractures occur most commonly in patients older than 70 years due to decreased bone mass and are more common in females. Femoral neck fractures are slightly less common compared with intertrochanteric fractures and account for approximately 40% of proximal femur fractures (1). These fractures are associated with high mortality rates, and the 1-year mortality rate for operated patients can range from 4% to as high as 48% (2,3). For treating displaced femoral neck fractures in elderly and low demand patients, the literature supports cemented hemiarthroplasty, because of the lower risk of complications, less blood loss, and shorter operating time, compared to total and cementless arthroplasty (4).

Different surgical approaches can be used for hip hemiarthroplasty, including the anterior, antero-lateral, lateral, and posterior approaches. Although the two most commonly used are the lateral and posterior approaches, the best approach remains controversial (5,6). The

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posterior approach (PA) is claimed to have a higher risk of dislocation (7), while it has been suggested that the lateral approach (LA) leads to worse functional outcomes depending on gluteus medius muscle damage and hip abductor dysfunction (6,8).

This study aimed to investigate any difference between the posterior and LAs in terms of postoperative dislocation rates. During this investigation, the mortality rates and risk of operative periprosthetic fracture were also analyzed.

Methods

Study Design

Ethical approval for this study was obtained from the University of Health Sciences Turkey, Istanbul Haseki Training and Research Hospital Clinical Research Ethics Committee (150-2022; 10.08.2022). The study was retrospective, so no informed consent form was applicable.

From the hospital database, patients older than 65 years who underwent hip hemiarthroplasty operations for displaced femoral neck fractures between 2010 and 2020 were identified. The operation notes and medical records in the hospital electronic records system of all patients were reviewed. It was also noted from the records whether any procedures such as reduction of dislocation, revision, or debridement had been performed after the initial surgery.

The study exclusion criteria were defined as revision operations of previous osteosynthesis, cementless prosthesis operations, patients with iatrogenic fracture, Alzheimer's disease, Parkinson's disease, epilepsy, hemiplegia, stroke, malignant oncological disease, lytic or blastic bone lesion involving the fracture site, concomitant trochanter major fracture, contralateral hip prosthesis, knee prosthesis before or after the surgery, other concomitant fractures (distal radius, proximal humerus etc.), the development of postoperative deep surgical site infection or those who were immobile or bedbound before the hip fracture.

After the exclusion of these patients from the 684, the study sample comprised 468 patients. A record was made of age, surgery date, surgery side, approach type, prosthesis type, dislocations, and periprosthetic fractures.

The Turkish National Health Record System (e-nabız personal health system) was checked for the records of the deaths of these patients and to check if the patients had undergone any intervention at another hospital for complications.

Surgical Technique

The operations were performed by different experienced surgeons or by registers under the supervision of experienced surgeons. The surgeon who performed the surgery had decided which approach to use according to his own experience. In the PA group, repair of the capsule and external rotators was always performed; in the LA group, repair of the capsule and gluteus medius tendon was always performed. A single cemented monobloc stem design with a high-offset and a 135° neck-shaft angle was used. The head was bipolar or unipolar depending on the surgeon's preference. Three hundred and ninety-four were bipolar and 74 were unipolar. Unipolar heads are generally used in older patients.

LA (modified Hardinge): In the lateral decubitus position, a curved incision was made centered over the greater trochanter. After retracting the tensor fasciae latae anteriorly and the gluteus maximus posteriorly, the gluteus medius was split longitudinally at its anterior third and the tendinous insertions of the anterior portion were elevated to expose the joint capsule (Figure 1). At the end of the procedure, the capsule and the split flap were repaired (Figure 2).

PA (Moore): In the lateral decubitus position, a curved incision was made over the posterior margin of the greater trochanter. After dividing the deep fascia, the gluteus maximus muscle was split in line with its fibers and retracted to expose short external rotator muscles

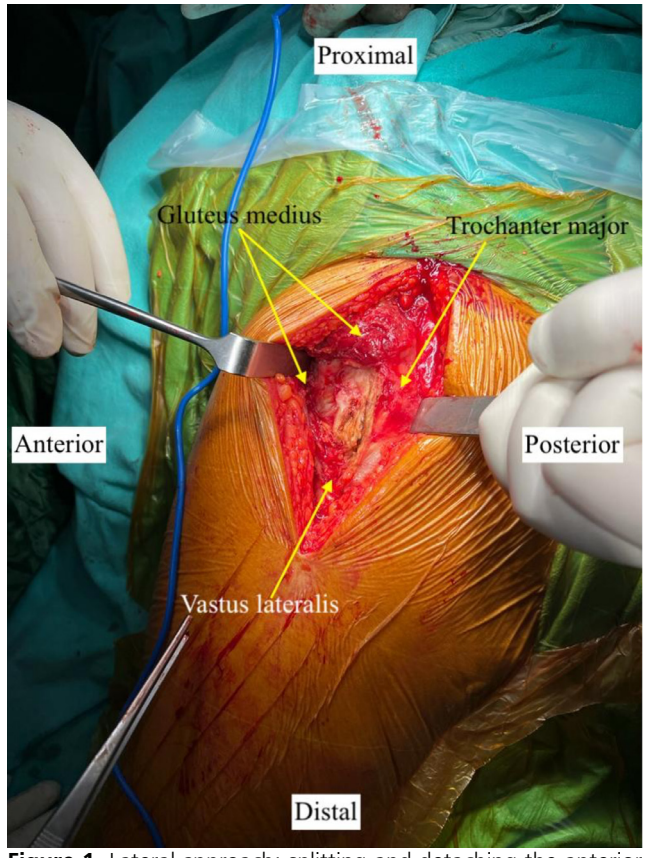

Figure 1. Lateral approach; splitting and detaching the anterior part of the gluteus medius muscle

(Figure 3). These external rotator muscles were, then freed from femur insertion and the capsule incised. After the implantation, detached posterior structures were repaired (Figure 4).

Statistical Analysis

Data obtained in the study was statistically analyzed using computer software. Categorical variables were expressed as numbers and percentages, and continuous variables as average, standard deviation, minimum, maximum, and median values. Continuous outcomes for the two independent groups were analyzed using the Student t-test and binary outcomes with the chi-square test. A value of $p<0.05$ was considered statistically significant.

Results

An evaluation was made of 468 patients, comprising 321 (69%) females and 147 (31%) males, with a median age of 80.3 years (range, 65-94 years). All the patients underwent surgery in the lateral decubitus position with cemented hemiarthroplasty implants. The operated hips were right-side in 215 (46%) cases and left-side in 253 (54%). The PA was applied to 262 (56%) patients and the LA to 206 (44%) (Table 1).

The PA group comprised 174 (66%) females and 88 (34%) males with a mean age of 80.6 years. The LA group comprised 147 (71%) females and 59 (29%) males with a mean age of 79.9 years. No significant difference was determined between the groups with respect to gender or age ($p=0.252$, $p=0.572$, respectively) (Table 1).

Dislocation Rates

Postoperative hip dislocation occurred in 8 patients, 6 (2.3%) in the PA group and 2 (1%) in the LA group (Figure 1). The difference was not statistically significant ($p=0.475$) (Table 2). The mean time from surgery to the first dislocation was 58.5 days (2-166 days). Six of those eight dislocations occurred within the first seven weeks of surgery (days 2, 22, 33, 35, 42, and 46), and two late dislocations occurred on days 122 and 166 (Table 3).

The reported results were from a mix of operations performed with unipolar and bipolar designs, but mostly bipolar (394/468), and all the patients who experienced complications (8 dislocations and 6 periprosthetic fractures) had bipolar implants.

In the PA group, 2 patients' hips were reduced under sedation, and the other 4 patients underwent open surgery for the reduction. In 2 of these open reduction cases, the anteversion of the femoral stem was normal and the repair of the short external rotator muscles and the capsule were done properly. In 1 patient, the anteversion was normal but the external rotator muscles were necrotic and non-functional. In the other patient, the anteversion of the femoral stem was less than the normal range.

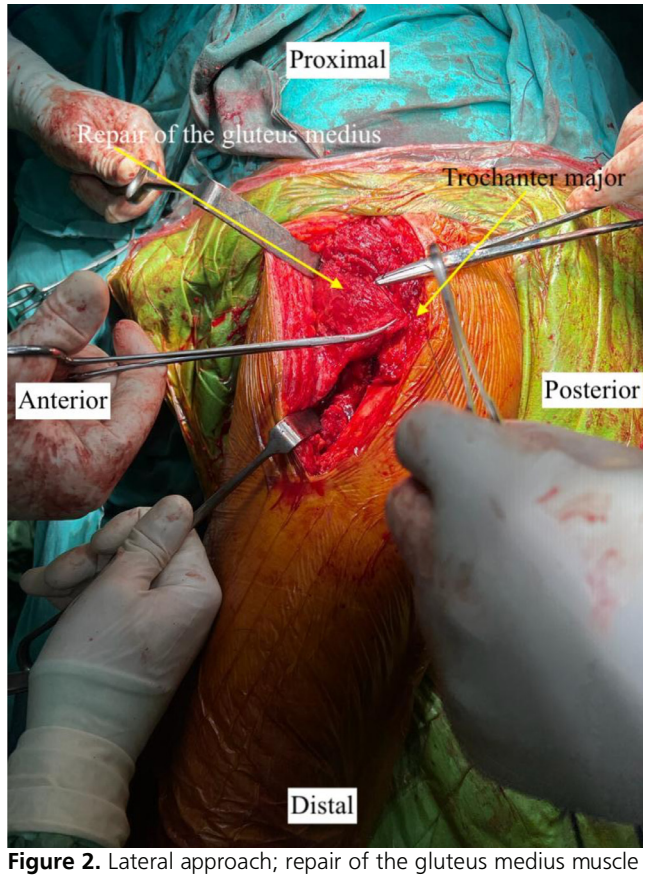

Figure 2. Lateral approach; repair of the gluteus medius muscle

In the LA group, both patients underwent open reduction. In 1 patient, the capsule and the gluteus medius muscle repair and the anteversion of the femoral component were normal. In the other patient, the capsule had been repaired but was loose and some capsule tissue was absent.

Postoperative Periprosthetic Fracture Rates

Periprosthetic fractures in the postoperative period occurred in 5 patients (2%) in the PA group and in 1 patient (0.5%) in the LA group (Figure 5). The difference was not statistically significant ($p=0.236$) (Table 2).

This complication occurred 524 days postoperatively in the LA group patients, and on days 92, 112, 224, 274, and 350, respectively, in the 5 cases in the PA group. All these patients were treated with open reduction and internal fixation using plates and cables.

Mortality Rates

The mortality rates in postoperative years 1 and 10 were 26.4% and 82.1%, respectively, and the lateral versus PA had no statistically significant effect on these rates (Table 2 and Figure 6).

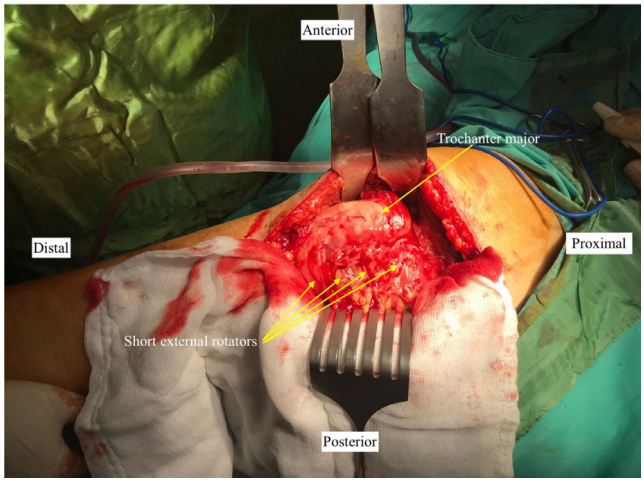

Figure 3. Posterior approach; exposure of the short external rotator muscles

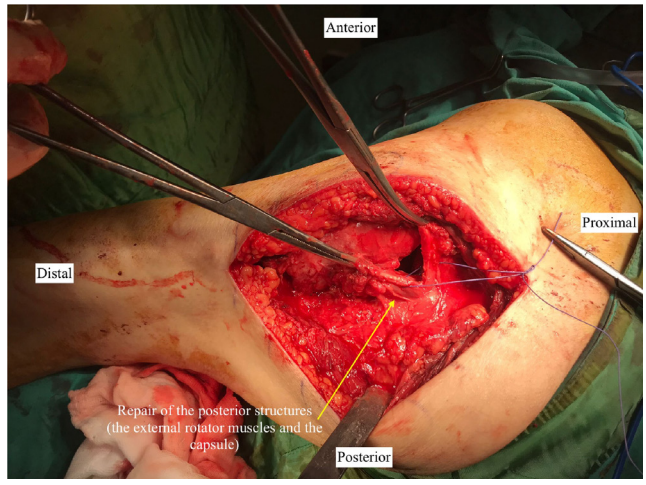

Figure 4. Posterior approach; repair of the posterior structures (the external rotator muscles and the capsule)

Discussion

Many complications can be seen after hip arthroplasty operations, such as dislocation, infection, and periprosthetic fracture, which are devastating for these elderly and vulnerable patients, and have high mortality rates (9-11).

Gill et al. (12) stated that an increased dislocation risk was associated with a posterior approach; with the use of bipolar prosthesis, and with the use of cement. Hongisto et al. (8) and Parker (13) reported that there was no significant difference in mobility level or pain between the LA and PA groups, despite an increased need for mobilization assistance in patients operated on using the LA.

There are also studies reported that the risk of dislocation after the PA is significantly decreased as there is minimal dissection, repair of the capsule and anatomical reattachment of the short external rotators and that there is no statistically significant difference between the PA and LA (13-18).

In a recent study by de Vries et al. (14), 1009 hemiarthroplasty cases were evaluated retrospectively. Five hundred sixteen patients were operated on via a PA and 493 were via a LA. There were 15 (2.9%) dislocations in the PA group and 7 (1.4%) in the lateral group. The authors stated that this difference was not statistically significant.

Graulich et al. (17) retrospectively analyzed patients who had dislocated bipolar hemiarthroplasty, which was performed after a femur neck fracture. A total of nine met the inclusion criteria. These patients were matched to 30 femoral neck fracture patients who had undergone hip hemiarthroplasty but didn't experience a dislocation. Seven (78%) patients out of 9 with a dislocated hip were

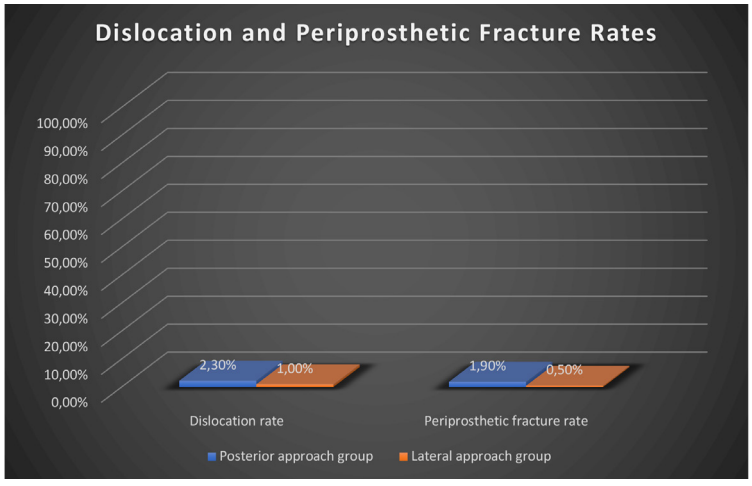

Figure 5. Dislocation and periprosthetic fracture rates in the PA and LA groups

PA: Posterior approach, LA: Lateral approach

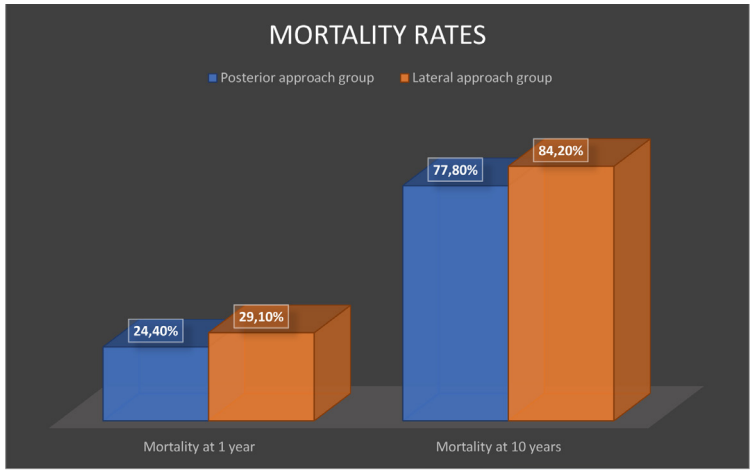

Figure 6. Mortality rates in the PA and LA groups

PA: Posterior approach, LA: Lateral approach

operated via a LA, while 2 (22%) were operated via a posterior approach. In the non-dislocated control group, there were 19 (63%) lateral versus 11 (37%) PA patients. According to these results, the authors concluded that the rates of lateral and posterior approaches were not statistically different in both groups and that surgical approaches were not associated with a higher risk of dislocation in bipolar hemiarthroplasty.

In contrast, a meta-analysis by van der Sijp et al. (19), which was published in 2018, concluded that the risk of dislocation after a hip hemiarthroplasty is significantly higher with a posterior approach. In this meta-analysis, 2646 cases from 9 studies were collected as the PA group and 3394 cases as the LA group. There were 133 dislocations in the PA group (5%) and 61 dislocations in the LA group (1.8%). The difference was statistically significant, and the authors reported that the PA should not be used. Similar results were reported by Jobory et al. (20) including 25678 hemiarthroplasty patients in 2021. They concluded that a PA and dementia were linked to an increased risk of dislocation (20).

In this study also, the percentage of dislocated hips was slightly higher in the PA group (2.3% vs 1%); but this difference did not reach statistical significance. Although dislocation rates as high as 13-16% with PA have been reported (9,10), we do not see such high rates in our hospital. It may be because the lifestyles of the elderly people in our service area are more sedentary than in the region in which these studies were conducted. Besides, studies reported similar dislocation rates to our study. For example, Parker (13) reported the dislocation rate of the PA group in his study as 0.9% (1/108) and Sierra et al. (16) reported it as 2% (5/245). Therefore, in our opinion, it is not necessary to completely abandon the posterior approach, but in patients with high dislocation risk, such as hip flexion contracture or acetabular dysplasia, a LA may be more appropriate. In contrast, if limping is an important concern for an individual, a PA may be more appropriate

Table 1. Patient characteristics

	Posterior approach group	Lateral approach group	p-value
Number of patients	262	206	
Mean age	80.6 (65-94)	79.9 (65-93)	0.572
Male	88 (33.6%)	59 (28.6%)	0.252
Female	174 (66.4%)	147 (71.4%)	0.252
Right/Left	Right: 119 (45.4%)/Left: 143 (54.6%)	Right: 96 (46.6%)/Left: 110 (53.4%)	0.799

Table 2. Dislocation, fracture and mortality rates

	Posterior approach group	Lateral approach group	p-value
Mortality at 1 year	64/262 (24.4%)	60/206 (29.1%)	0.253
Mortality at 10 years	14/18 (77.8%)	32/38 (84.2%)	0.711
Dislocations	6 (2.3%)	2 (1%)	0.475
Periprosthetic fractures	5 (1.9%)	1 (0.5%)	0.236

Table 3. Details of the patients with dislocated hips

	Age	Gender	First dislocation day	Intervention	Note	Second dislocation day	Second intervention
Posterior approach group							
Patient 1	85	Male	42	Femoral length was increased	The short rotators were necrotic and non-functional	_____	_____
Patient 2	87	Female	22	Closed reduction	There was an adductor stiffness	54	Anteversion was normal but femoral stem was changed and placed in a more anteverted position
Patient 3	79	Female	46	Open reduction	Anteversion and capsule-muscle repair were normal	_____	_____
Patient 4	94	Male	33	Femoral length was increased	Anteversion and capsule-muscle repair were normal	_____	_____
Patient 5	92	Female	122	The femoral stem was changed and placed in a more anteverted position	Anteversion was less than normal	_____	_____
Patient 6	87	Male	35	Closed reduction	_____	_____	_____
Lateral approach group							
Patient 1	88	Female	2	Open reduction	Anteversion was normal but the capsule was partially repaired	26	Femoral length was increased but a third dislocation occurred on day 38 and a girdlestone procedure was performed
Patient 2	90	Female	166	Open reduction	Anteversion and capsule-muscle repair were normal	_____	_____

for this patient; the LA is associated with problems related to hip abductor dysfunction, altered gait, limping, and a positive Trendelenburg sign due to gluteal muscle damage, avulsion of the gluteal flap after the operation, the failure of the reattachment of the aponeurosis, or damage to the superior gluteal nerve (6,21,22). Ramesh et al. (22) reported 11% persisting damage to the superior gluteal nerve after this approach.

Like postoperative prosthetic hip dislocation, periprosthetic fracture is also a devastating complication after hip hemiarthroplasty operations and is associated with increased morbidity and mortality (23). The literature correlates the periprosthetic fractures mostly with the fixation methods (cemented versus uncemented) (9,14,23,24), but there are also several studies that have investigated the correlation between periprosthetic fractures and the types of approach (11,13,14). de Vries et al. (14) reported no difference in periprosthetic fracture rates between the PA and the LA. Parker (13) noted a tendency for periprosthetic fractures to occur more with the posterior approach, but it was not significant. Keene and Parker (11) reported significantly higher rates of periprosthetic fracture with the posterior approach. In this study, there were more periprosthetic fractures in the PA group (5 vs 1), but not to a statistically significant level.

The 1-year mortality rate in this study was a little high at 26.4%, even though patients with other injuries or fatal diseases were excluded. In the literature, it ranges from 4% to 48% (2,3).

The long-term (>10 years) mortality rates for these patients have been reported to be very high. There are few studies on this point, most probably because it is

thought that most of the long-term deaths of this elderly population are natural and there would be little value in studying the long-term mortality rates. Ravikumar and Marsh (25) reported a mortality rate of 86% for hemiarthroplasty patients at 13 years, while Parker et al. (26) found the rate to be 93% at 11 years. In this study, the 10-year mortality rate was 82.1%, which was similar to the data in those studies.

Study Limitations

The limitations of this study were the small number of patients, the lack of analysis of surgeon grade, the lack of a radiographic assessment, and the lack of evaluation of functional outcomes. The retrospective design of the study prevented the evaluation of functional outcomes to determine whether the LA leads to an increased need for mobilization assistance or any other functional disadvantages. The operations were performed by experienced surgeons or by registers under the supervision of experienced surgeons, and previous studies have demonstrated that there is no correlation between the grade of the surgeon and dislocation rates (27).

The study's strength is the exclusion of patients with additional disease, trauma, or any other condition that could have affected the risk of dislocation. Therefore, a more homogenous population was obtained.

Conclusion

The results of this study showed no significant differences in the rates of postoperative dislocations, periprosthetic fractures, and mortality between the lateral and posterior surgical approaches for hip hemiarthroplasty surgery. Therefore, it can be concluded that the choice of the approach should depend on surgeon preference and experience.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the University of Health Sciences Turkey, Istanbul Haseki Training and Research Hospital Clinical Research Ethics Committee (150-2022; 10.08.2022).

Informed Consent: Retrospective study.

Authorship Contributions

Concept: S.O.S., Design: S.O.S., Data Collection and/or Processing: M.E., Analysis and/or Interpretation: M.Y., Literature Research: M.M.S., Writing: S.O.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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