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The Comparison of Arthroplasty and Internal Fixation for Proximal Femur Fractures

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ABSTRACT

Objective: Increasing life expectancy has led to an increase in the incidence of femoral neck and intertrochanteric fractures. These fractures are becoming a major health problem with high mortality and morbidity rates. The aim of treatment is to enable early mobilization of the patient and to reduce complications. Today, arthroplasty and internal fixation are the most commonly used treatments. The choice of treatment depends on the patient's age, fracture stability, and bone quality. The aim of this study was to compare the functional and radiological outcomes of patients treated with arthroplasty or internal fixation for femoral neck and intertrochanteric femoral fractures.

Materials and Methods: Between 2007 and 2009, 62 patients treated for femoral neck and intertrochanteric fractures were retrospectively evaluated. Functional outcomes were analyzed using the Harris Hip Score and bone quality using the Singh Index.

Results: The mean age of the patients included in the study was 67.8 years for intertrochanteric fractures and 60.5 years for femoral neck fractures. The Harris Hip Scores of patients who underwent arthroplasty for femoral neck fractures were statistically higher than those who underwent arthroplasty for intertrochanteric fractures ($p<0.05$). Harris Hip Scores of patients with femoral neck fractures were statistically higher than those with intertrochanteric femoral fractures in patients who underwent internal fixation ($p<0.05$).

Conclusion: This study evaluates the efficacy of arthroplasty and internal fixation in different patient groups. The results are generally consistent with the literature. Arthroplasty may be a more appropriate option for femoral neck fractures than for intertrochanteric fractures based on functional outcomes. However, given the limitations of the study, the results should be supported by more comprehensive and prospective studies.

Keywords: Arthroplasty, Femoral neck fracture, Internal fixation, Intertrochanteric femur fracture

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INTRODUCTION

Proximal femur fractures have become a significant public health concern due to their high prevalence and the mortality and morbidity they cause. In the elderly population, these fractures typically result from low-energy trauma, while in younger patients; they are often caused by high-energy trauma. The primary objective in the management of these fractures is to minimize complications by facilitating early mobilization of

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the patient. Treatment approaches are tailored to the patient's age, fracture stability, general health, and bone quality. The most common treatment options currently include internal fixation and arthroplasty. However, the literature is inconclusive regarding the superiority of one method over another.[1-3]

Our hypothesis is that the choice of treatment method significantly impacts functional and radiological outcomes in patients treated with internal fixation or arthroplasty for intertrochanteric femoral and collum femoris fractures. The primary objective of this study was to systematically compare the functional and radiological outcomes of these two treatment methods in patients with femoral neck and intertrochanteric femoral fractures.

MATERIALS AND METHODS

This retrospective study included patients who underwent internal fixation and arthroplasty for a collum femoris fracture and an intertrochanteric femur fracture between 2007 and 2009 at the 1st Orthopaedics and Traumatology Clinic of the Ministry of Health Dışkapı Yıldırım Beyazıt Training and Research Hospital. Patients lacking regular follow-up and those with incomplete data were excluded from the study. The clinical data and radiological images of all patients were evaluated retrospectively.

Pre-operative Preparation

All patients were treated with low molecular weight heparin for the prophylaxis of deep vein thrombosis and antibiotic prophylaxis with a first-generation cephalosporin was initiated before the surgical procedure. The antibiotic prophylaxis was continued for a further two post-operative days.

Surgical Technique

All fractures were treated with internal fixation or arthroplasty. The arthroplasty was performed in the lateral decubitus position with a posterior approach. The choice of cemented or uncemented prostheses was made according to the status of the patient. In the internal fixation group, collum femoris fractures were stabilized with 6.5 mm cannulated screws, while intertrochanteric femur fractures were stabilized with dynamic hip screw or proximal femoral nail (PFN), depending on the fracture type.

Post-operative Evaluation

All patients were evaluated with their radiological and functional results at 12 months post-operatively. Radiographic evaluation was performed with hip and pelvis radiographs. Harris Hip Score was used to evaluate function. The extent of osteoporosis was quantified using the Singh index.

Statistical Analysis

The variables were expressed as a percentage and the mean. For data sets that exhibited normality, an independent sample t-test was employed for intergroup comparisons, whereas for data sets that did not exhibit normality, a Mann–Whitney U-test was used. Before analysis, a sample size calculation was not performed, as this study sample comprised all eligible patients with data collected from 2007 to 2009.

The ethics committee of our institution approved the study protocol (Protocol number: 2827), and the study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Demography and Trauma Mechanism

Twenty-one patients were excluded from the study because they did not attend regular follow-up assessments, and 15 patients were excluded because they died for various reasons.

A total of 62 patients were included in the study. Of these patients, 32 were male and 30 were female. The mean age of patients with an intertrochanteric femur fracture was 67.8 years, while the mean age of patients with a collum femoris fracture was 60.5 years (Table 1).

The most common mechanism of trauma was a simple fall, occurring in 83.9% of cases. The remaining causes were traffic accidents, occupational accidents, and falls from height.

Table 1. Results summary table: Comparison of intertrochanteric and femoral neck fractures

Category	Intertrochanteric fractures (%)	Femoral neck fractures (%)	p
Total patients	42 patients	20 patients	
Mean age	67.8 years	60.5 years	
Treatment (arthroplasty)	53	60	
Treatment (internal fixation)	47	40	
Mean Harris Hip Score (arthroplasty)	67.41	74.75	<0.05
Mean Harris Hip Score (internal fixation)	75.8	83	<0.05

Fracture Types and Surgical Procedures

The most prevalent types of femoral neck fractures were classified as Garden type 3 (40%) and type 4 (40%). For patients with collum femoris fractures, 60% underwent arthroplasty, while 40% underwent internal fixation. According to the Evans classification, intertrochanteric femur fractures were considered unstable in 52% of cases. In the case of intertrochanteric femur fractures, arthroplasty was performed in 53% of patients, while internal fixation was performed in 47%.

Complications and Revisions

Three patients who had undergone internal fixation subsequently required revision surgery. The fractures were successfully stabilized with internal fixation. One patient developed deep vein thrombosis in the post-operative period.

Functional Results

The mean Harris Hip Score was 74.75 in patients who underwent arthroplasty for a femoral neck fracture. In patients who underwent arthroplasty for intertrochanteric femur fracture, the mean score was 67.41, with a statistically significant difference between the two groups ($p<0.05$) (Table 1). The mean Harris Hip Score for patients who underwent internal fixation was 83 for those with a collum femoris fracture and 75.8 for those with an intertrochanteric femur fracture. The Harris Hip Scores for patients who underwent arthroplasty following intertrochanteric femur fractures were found to be lower than those who underwent internal fixation ($p<0.05$) (Table 2). No statistically significant difference was observed in Harris Hip Scores between patients who underwent arthroplasty and internal fixation after a collum femoris fracture ($p>0.05$) (Table 2). The mean Singh index of the patients was 2.7. Patients with a low Singh index exhibited significantly lower Harris Hip Scores compared to those with a high Singh index ($p<0.05$).

DISCUSSION

The objective of our study was to compare the functional results of arthroplasty and internal fixation methods applied for collum femoris and intertrochanteric femur fractures. The findings indicate that the selection of treatment modality has a substantial impact on the functional recovery trajectory and the ultimate outcomes for patients.

It has been documented in the existing literature that the posterior approach is associated with a higher incidence of dislocation compared to the anterior and lateral approaches following total hip arthroplasty.[4] Furthermore, the incidence of hip dislocation or instability was reported to be 2.4% in patients who underwent hemiarthroplasty, irrespective of the approach employed.[5] The literature indicates that the risk of dislocation after arthroplasty increases with age.[1] However, no dislocation was observed in arthroplasties performed with the posterior approach in our study. This result suggests that the careful application of surgical technique plays an important role in preventing dislocation.

Previous studies have indicated that between 40 and 70% of patients with hip fractures are able to perform basic daily activities with minimal assistance.[6] The functional outcomes assessed using the Harris Hip Score in our study are in alignment with these findings.

In the study conducted by Cheng and Sheng, which compared various surgical techniques for treating intertrochanteric femur fractures, it was observed that the PFN antirotation procedure resulted in lower blood loss and superior functional outcomes.[7] It has been documented in the literature that the incidence of reoperation is higher in patients with intertrochanteric femur fractures who have undergone intramedullary nailing than in those who have received hemiarthroplasty.[8] Despite the preference for internal fixation as the primary treatment for intertrochanteric femur fractures, arthroplasty may be considered for patients with multi-segmented, unstable fractures and poor bone quality.[8] In our study, the Harris Hip Scores of patients who underwent arthroplasty for intertrochanteric fractures were found to be lower than those of patients who underwent internal fixation.

In their meta-analysis, published in 2020, Deng et al. compared the results of arthroplasty and internal fixation in elderly patients with displaced femoral neck fractures.[9] The findings indicated a reduced risk of reoperation and diminished post-operative discomfort in the arthroplasty cohort. Bonnevialle et al. conducted a comparative analysis of trochanteric nailing and arthroplasty in patients aged 75 years and above with unstable trochanteric fractures.[10] The study revealed that mechanical complications were more prevalent in patients who underwent nailing. The authors reported that the functional outcomes were superior in the arthroplasty group. In a study conducted by Parker and Grusamy in 2006, it was reported that the necessity for reoperation was greater in patients who

Table 2. Results summary table: Comparison of mean Harris Hip Score arthroplasty and internal fixation

Category	Mean Harris Hip Score (arthroplasty)	Mean Harris Hip Score (internal fixation)	p
Intertrochanteric fractures	67.41	75.8	<0.05
Femoral neck fractures	74.75	83	>0.05

underwent arthroplasty than in those who underwent internal fixation in patients operated on for femoral neck fracture.[2] In our study, when all patients were evaluated, the reoperation rate was found to be lower in the arthroplasty group than in the internal fixation group.

It is important to note that this study is subject to a number of limitations. The first limitation of this study is that it is retrospective and based on a limited sample size. The absence of age-based categorization may have an impact on the study's findings. Furthermore, no differentiation was made between the various internal fixations techniques employed in patients who underwent such procedures. In patients who underwent arthroplasty, the evaluation of both hemiarthroplasty and total hip arthroplasty together has an effect on the results, which must be considered when interpreting the findings. A further limitation is the failure to evaluate fracture types according to their classification. It is evident that these findings require confirmation through prospective studies involving larger sample groups.

CONCLUSION

The objective of this study is to evaluate the efficacy of arthroplasty and internal fixation methods in different patient groups. The findings are in general agreement with the existing literature, indicating that arthroplasty may be a more favorable option for treating femoral neck fractures than intertrochanteric fractures in terms of functional outcomes. Nevertheless, in light of the study's inherent limitations, it is imperative to substantiate these findings through more comprehensive and prospective investigations.

DECLARATIONS

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Ethics Committee Approval: The study was approved by Sisli Hamidiye Etfal Training and Research Hospital Ethics Committee (No: 2827, Date: 03/12/2024).

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