

Hemiarthroplasty versus Proximal Femoral Nailing: Intertrochanteric Fractures

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ABSTRACT

To compare the functional outcomes of elderly patients with intertrochanteric femoral fractures treated with proximal femoral nail (PFN) and partial hip prosthesis (PHP).

A total of 51 patients who underwent surgical treatment for intertrochanteric femoral fractures between January 2016 and January 2020 were included in the study. The patients' demographic characteristics, surgical method, operative details, comorbidities, perioperative hemoglobin levels, transfusion requirements, and follow-up scores [Harris Hip Score (HHS) and Oxford Hip Score (OHS)] were evaluated.

The study included a total of 51 patients, comprising 32 men (62.7%) and 19 women (37.3%), with a mean age of 72.84±12.02 years. The mean age was 79.92±6.88 years in the PHP group and 65.48±11.87 years in the PFN group. Patients treated with PHP were older than those treated with PFN, whereas no statistically significant difference was found in terms of sex distribution ($p=0.021$ and $p=0.083$, respectively). No statistically significant difference was found between the groups with respect to operative time, perioperative hemoglobin levels, hemoglobin decrease, erythrocyte suspension requirements, or comorbidity distribution ($p>0.05$). In terms of Oxford Hip Score distribution, normal and mild scores were more frequent in the PHP group, whereas moderate-severe and severe scores were more frequent in the PFN group ($p=0.003$). In terms of Harris Hip Score distribution, excellent and good scores were more frequent in the PHP group, whereas fair and poor scores were more frequent in the PFN group ($p<0.001$).

Both PFN and PHP were used in the surgical treatment of intertrochanteric femoral fractures in this cohort. Although more favorable functional score distributions were observed in the PHP group, the retrospective design and baseline differences between the groups preclude conclusions regarding the superiority of either treatment. Treatment selection should be individualized according to patient and fracture characteristics.

Keywords: Partial hip prosthesis, proximal femoral nail, intertrochanteric femoral fracture, Harris Hip Score, Oxford Hip Score

Introduction

Intertrochanteric femoral fractures are common injuries in the elderly population and are associated with substantial morbidity and mortality. Their incidence increases with advancing age and osteoporosis, and falls represent an important mechanism of injury in this population (1-6).

Surgical treatment aims to achieve stable fixation and facilitate early mobilization. Proximal femoral nailing is widely used for intertrochanteric fractures, whereas arthroplasty may be considered in selected elderly patients, particularly in the presence of unstable fracture patterns and poor bone quality (15-18). Treatment selection should

therefore take both patient- and fracture-related factors into consideration.

The aim of this study was to compare the functional outcomes of patients aged 65 years or older with intertrochanteric femoral fractures treated with partial hip prosthesis or proximal femoral nail.

Materials and Methods

This retrospective case study was conducted in accordance with the revised Declaration of

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Fig. 1. Preoperative positioning and preparation of the lower extremity prior to surgical intervention



Fig.2. Longitudinal surgical incision performed parallel to the femoral shaft during the operative procedure

Helsinki (2000). The study was carried out at the Department of Orthopedics and Traumatology, Dursun Odabaşı Medical Center, Van Yüzüncü Yıl University Faculty of Medicine. Approval for the study was obtained from the Turkish Medicines and Medical Devices Agency of the Republic of Türkiye and the Non-Interventional Clinical Research Ethics Committee of Yüzüncü Yıl University, with the decision dated October 8, 2021, and numbered 2021/11-15.

The medical records of patients treated with proximal femoral nail (PFN) or partial hip prosthesis (PHP) for intertrochanteric femoral fractures between January 2016 and January 2020 were retrospectively reviewed. The inclusion criteria were as follows: age of 65 years or older, presence of an intertrochanteric femoral fracture, availability of preoperative and postoperative anteroposterior pelvic radiographs, a minimum postoperative follow-up period of 6 months, and absence of a pathological fracture. Patients with a history of previous ipsilateral or contralateral hip fracture were excluded. The exclusion criteria

were as follows: age younger than 65 years, presence of subtrochanteric, femoral shaft, or femoral neck fracture, use of any additional implants other than PFN or PHP, lack of radiographs adequate for evaluation, previous surgery of the contralateral hip, previous ipsilateral or contralateral hip fracture, and pathological fracture.

Following anesthetic evaluation, the American Society of Anesthesiologists (ASA) risk scores of the patients were recorded. Patients were categorized into two groups: a relatively low anesthesia risk group (ASA I-II) and a relatively high anesthesia risk group (ASA III-IV). In patients who presented to the emergency department with hip pain, surgical preparation was initiated after physical examination and radiological evaluation. Low-molecular-weight heparin prophylaxis was started in all patients after confirmation of the absence of active bleeding. Surgery was then performed under general or spinal anesthesia after completion of the required consultations. Treatment selection



Fig.3. Intraoperative view demonstrating femoral head removal and placement of partial hip prosthesis during surgery

was based on patient age, fracture stability, and radiographic assessment of bone quality. PHP was generally preferred in older patients with unstable fracture patterns and radiographic signs of poor bone quality, including reduced cortical thickness, whereas PFN was generally preferred in relatively younger patients with better preserved cortical bone quality.

Intramedullary Nailing: PFN was performed after closed reduction under fluoroscopic guidance, followed by intramedullary nail insertion and distal locking. Postoperative weight-bearing was allowed according to clinical and radiographic findings.

Partial Hip Prosthesis Surgical Technique: In the PHP group, all patients underwent cemented partial hip prosthesis. Early postoperative functional exercises and weight-bearing mobilization were encouraged.

Patients with a minimum postoperative follow-up of 6 months were included. Functional outcomes were assessed using the Harris Hip Score (HHS) and Oxford Hip Score (OHS) at the final outpatient follow-up visit. The evaluation systems defined by Harris and Murray et al. were used, respectively (19,20).

Statistical analyses were performed using SPSS version 26.0. The distribution of the data was assessed using the Shapiro-Wilk test, and homogeneity of variances was evaluated using Levene's test. For comparisons of quantitative variables between two independent groups, the independent samples t-test or the Mann-Whitney U test was used. Categorical variables were analyzed using the chi-square test. A p value of less than 0.05 was considered statistically significant.

Results

A total of 51 patients were included, comprising 26 patients treated with PHP and 25 treated with PFN. The PHP group was significantly older than the PFN group ($p=0.021$), while sex distribution did not differ significantly between groups ($p=0.083$) (Tables 1 and 2). No significant between-group differences were observed in operative time, perioperative hemoglobin measures, transfusion requirements, or comorbidity distribution (all $p>0.05$) (Tables 1 and 2). Functional score distributions differed significantly between groups: OHS categories differed between the PHP and PFN groups ($p=0.003$), as did HHS categories ($p<0.001$) (Table 3).

Discussion

The principal finding of this study was that the distributions of both Oxford Hip Score and Harris Hip Score were more favorable in patients treated with PHP than in those treated with PFN. However, these findings should be interpreted cautiously because of the retrospective, non-randomized design and the marked age difference between the treatment groups. Therefore, the observed differences in functional outcomes should not be interpreted as evidence of superiority of one surgical technique over the other.

Hip fractures are among the most common traumatic injuries in the elderly population (1,4). In many previous series, female patients have been reported to predominate (21,22). Kyle et al. reported that 58% of 622 patients were female and 42% were male (21). Similarly, Pan et al. reported that 69.3% of 212 patients were female (22). In contrast, the number of male patients was higher than that of female patients in our study. This difference may be related to regional

Table 1: Age and perioperative findings of patients treated with PHP and PFN

Variable	PHP	PFN	Total	p-value
Age (years) [Mean $\pm$ St. Dev.]	79.92 $\pm$ 6.88	65.48 $\pm$ 11.87	72.84 $\pm$ 12.02	0.021
Operative time (min) [Mean $\pm$ St. Dev.]	81.26 $\pm$ 24.08	92.88 $\pm$ 36.8	86.96 $\pm$ 31.21	0.092
Preoperative Hb (g/dL) [Mean $\pm$ St. Dev.]	12.53 $\pm$ 1.66	13.7 $\pm$ 2.04	13.1 $\pm$ 1.93	0.266
Postoperative Hb (g/dL) [Mean $\pm$ St. Dev.]	11.31 $\pm$ 1.8	11.82 $\pm$ 1.93	11.56 $\pm$ 1.86	0.828
Hemoglobin decrease (g/dL), [median (min-max)]	1.2 (0-4.1)	1.6 (0-5.7)	1.3 (0-5.7)	0.113
Erythrocyte suspension transfusion (units), [median (min-max)]	0 (0-3)	0 (0-2)	0 (0-3)	0.290

Table 2: Sex and comorbidity distributions of patients treated with PHP and PFN

Variable	Subgroup	PHP n (%)	PFN n (%)	Total n (%)	p-value
Sex	Female	13 (50)	6 (24)	19 (37.3)	0.083
	Male	13 (50)	19 (76)	32 (62.7)	
Hypertension	Absent	10 (38.4)	16 (64)	26 (50.9)	0.061
	Present	16 (61.5)	9 (36)	25 (49)	
Diabetes mellitus	Absent	20 (76.9)	16 (64)	36 (70.5)	0.241
	Present	6 (23)	9 (36)	15 (29.4)	
Coronary artery disease	Absent	15 (57.6)	16 (64)	31 (60.7)	0.431
	Present	11 (42.3)	9 (36)	20 (39.2)	

Table 3: Distribution of Oxford Hip Scores and Harris Hip Scores

Variable	Subgroup	PHP n (%)	PFN n (%)	Total n (%)	p-value
Oxford Hip Score	Normal	5 (19.2)	5 (20)	10 (19.6)	0.003
	Mild	19 (73)	5 (20)	24 (47.0)	
	Moderate-severe	2 (7.6)	8 (32)	10 (19.6)	
	Severe	0 (0)	7 (28)	7 (13.7)	
	Excellent	23 (88.4)	3 (12)	26 (51.0)	
Harris Hip Score	Good	2 (7.6)	1 (4)	3 (5.9)	0.001
	Fair	1 (3.8)	12 (48)	13 (25.5)	
	Poor	0 (0)	9 (36)	9 (17.6)	

characteristics, patient profile, and the specific features of our center.

In patients with hip fractures, factors related to the surgical process and accompanying comorbidities may affect morbidity and mortality (15,26-28). In addition, preoperative anemia and postoperative transfusion requirements have negative effects on prognosis. Potter et al. reported higher mortality in hip fracture patients with preoperative anemia who underwent blood transfusion, whereas Erçin et al. reported increased mortality in patients who received blood

transfusions (23,24). Kadar et al. also identified factors predicting transfusion requirements in patients with hip fractures (25). In our study, however, no statistically significant differences were found between the groups in terms of operative time, perioperative hemoglobin levels, hemoglobin decrease, or erythrocyte suspension requirements.

Elderly patients with intertrochanteric fractures are usually accompanied by multiple medical problems. Advanced age, male sex, high ASA score, the presence of more than one systemic

disease, and functional insufficiency have been reported as important risk factors for early mortality (26-28). In our study, 49% of the patients had hypertension, 29.4% had diabetes mellitus, and 39.2% had coronary artery disease. The absence of a significant difference in comorbidity distribution between the PHP and PFN groups suggests that the difference in functional outcomes cannot be explained solely by comorbidity burden.

Over the last 30 years, substantial changes have occurred in the implants used for the treatment of intertrochanteric femoral fractures (16,18). Although osteosynthesis remains the main treatment approach today, arthroplasty represents an important alternative, particularly in selected cases (16,17,29). Kesmezacar et al. compared internal fixation and hemiarthroplasty in elderly patients with intertrochanteric femoral fractures and reported that internal fixation may be considered the primary option (29). Nevertheless, arthroplasty may provide important advantages, especially in elderly patients with osteoporotic bone structure and in those in whom early mobilization is desired.

Various scoring systems have been defined for the functional evaluation of patients after hip surgery. In our study, the Harris and Oxford scoring systems were used because of their ease of application (19,20). In the literature, among series treated with PFN, postoperative Harris Hip Score results indicate that approximately one in three patients has an excellent outcome, whereas another one in three patients has a fair or poor outcome (34). In contrast, in arthroplasty series, Klein et al. reported a mean Harris score of 82.4 at 5-year follow-up (30). Lizaar-Utrilla et al. reported a mean Harris score of 87.8 (31). Mouzopoulos et al. and Blomfeldt et al. similarly reported high Harris scores (32,33). In our study, based on Table 3, most patients treated with PHP had excellent and good Harris Hip Scores, whereas patients treated with PFN more commonly had fair and poor Harris Hip Scores. Similarly, in terms of Oxford Hip Score, normal and mild scores were more frequent in the PHP group, whereas moderate-severe and severe scores were more frequent in the PFN group.

Recent evidence also emphasizes that treatment selection for unstable intertrochanteric fractures should be individualized. A systematic review and network meta-analysis comparing PFN, dynamic hip screw, and bipolar hemiarthroplasty reported differences among treatment modalities in operative failure, reoperation, and functional

outcomes, with functional results varying according to follow-up duration (35). Current AAOS clinical practice guidelines recommend cephalomedullary fixation for unstable intertrochanteric fracture patterns (36). These data support cautious interpretation of comparative functional outcomes in the context of patient selection and fracture characteristics.

This study has several limitations. First, it was designed retrospectively. Second, the study was conducted at a single center, and the number of patients was limited, which reduces the generalizability of the findings. Third, the marked age difference between the groups may have influenced the comparison of postoperative outcomes and should be considered when interpreting the results. Nevertheless, the comparative evaluation of patients operated on in the same center may be considered one of the strengths of this study.

Both PFN and PHP were used in the surgical treatment of intertrochanteric femoral fractures in this cohort. Although more favorable functional score distributions were observed in the PHP group, the retrospective design and baseline differences between the groups preclude conclusions regarding the superiority of either treatment. Treatment selection should be individualized according to patient and fracture characteristics.

Ethical Approval: Ethical approval details are provided in the Materials and Methods section.

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References

1. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: Worldwide geographic variation. *Indian J Orthop.* 2011;45(1):15–22.
2. Panula J, Pihlajamäki H, Mattila VM, Jaatinen P, Vahlberg T, Aarnio P, et al. Mortality and cause of death in hip fracture patients aged 65 or older: a population-based study. *BMC Musculoskelet Disord.* 2011;12:105.

3. Schnell S, Friedman SM, Mendelson DA, Bingham KW, Kates SL. The 1-year mortality of patients treated in a hip fracture program for elders. *Geriatr Orthop Surg Rehabil*. 2010;1(1):6–14.
4. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. *Bone*. 1996;18(1):S57–63.
5. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis and Therapy. Osteoporosis prevention, diagnosis, and therapy. *JAMA*. 2001;285(6):785–95.
6. Cummings SR, Melton LJ. Epidemiology and outcomes of osteoporotic fractures. *Lancet*. 2002;359(9319):1761–7.
7. Fuller GF. Falls in the elderly. *Am Fam Physician*. 2000;61(7):2159–68, 2173–4.
8. Nyberg L, Gustafson Y, Berggren D, Brännström B, Bucht G. Falls leading to femoral neck fractures in lucid older people. *J Am Geriatr Soc*. 1996;44(2):156–60.
9. Järnlo GB, Thorngren KG. Background factors to hip fractures. *Clin Orthop Relat Res*. 1993;(287):41–9.
10. Luukinen H, Koski K, Hiltunen L, Kivelä SL. Incidence rate of falls in an aged population in Northern Finland. *J Clin Epidemiol*. 1994;47(8):843–50.
11. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med*. 1988;319(26):1701–7.
12. Jensen J, Lundin-Olsson L, Nyberg L, Gustafson Y. Falls among frail older people in residential care. *Scand J Public Health*. 2002;30(1):54–61.
13. O'Loughlin JL, Robitaille Y, Boivin JF, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. *Am J Epidemiol*. 1993;137(3):342–54.
14. Sadigh S, Reimers A, Andersson R, Laflamme L. Falls and fall-related injuries among the elderly: a survey of residential-care facilities in a Swedish municipality. *J Community Health*. 2004;29(2):129–40.
15. Khan SK, Kalra S, Khanna A, Thiruvengada MM, Parker MJ. Timing of surgery for hip fractures: A systematic review of 52 published studies involving 291,413 patients. *Injury*. 2009;40(7):692–7.
16. Kaplan K, Miyamoto R, Levine BR, Egol KA, Zuckerman JD. Surgical management of hip fractures: An evidence-based review of the literature. II: Intertrochanteric fractures. *J Am Acad Orthop Surg*. 2008;16(11):665–73.
17. Parker MJ, Handoll HH. Replacement arthroplasty versus internal fixation for extracapsular hip fractures in adults. *Cochrane Database Syst Rev*. 2006 Apr 19.
18. Parker MJ, Handoll HH. Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults. *Cochrane Database Syst Rev*. 2010 Sep 8.
19. Ramadanov N, Voss M, Hable R, Hakam HT, Prill R, Salzmann M, et al. Postoperative Harris Hip Score Versus Harris Hip Score Difference in Hip Replacement: What to Report? *Orthop Surg*. 2025;17(1):3–21.
20. Murray DW, Fitzpatrick R, Rogers K, Pandit H, Beard DJ, Carr AJ, et al. The use of the Oxford hip and knee scores. *J Bone Joint Surg Br*. 2007;89-B(8):1010–4.
21. Kyle R, Gustilo R, Premer R. Analysis of six hundred and twenty-two intertrochanteric hip fractures. *Orthop Trauma Dir*. 2010;8(06):25–9.
22. Pan S, Liu XH, Feng T, Kang HJ, Tian ZG, Lou CG. Influence of different great trochanteric entry points on the outcome of intertrochanteric fractures: a retrospective cohort study. *BMC Musculoskelet Disord*. 2017;18(1):107.
23. Potter LJ, Doleman B, Moppett IK. A systematic review of pre-operative anaemia and blood transfusion in patients with fractured hips. *Anaesthesia*. 2015;70(4):483–500.
24. Ercin E, Bilgili MG, Sari C, Basaran SH, Tanriverdi B, Edipoglu E, et al. Risk factors for mortality in geriatric hip fractures: a comparative study of different surgical procedures in 785 consecutive patients. *Eur J Orthop Surg Traumatol*. 2017;27(1):101–6.
25. Kadar A, Chechik O, Steinberg E, Reider E, Sternheim A. Predicting the need for blood transfusion in patients with hip fractures. *Int Orthop*. 2013;37(4):693–700.
26. Hu F, Jiang C, Shen J, Tang P, Wang Y. Preoperative predictors for mortality following hip fracture surgery: A systematic review and meta-analysis. *Injury*. 2012;43(6):676–85.
27. Edelmuth SVCL, Sorio GN, Sprovieri FAA, Gali JC, Peron SF. Comorbidities, clinical interurrences, and factors associated with mortality in elderly patients admitted for a hip fracture. *Rev Bras Ortop (English Ed.)*. 2018;53(5):543–51.
28. Lunde A, Tell GS, Pedersen AB, Scheike TH, Apalset EM, Ehrenstein V, et al. The role of comorbidity in mortality after hip fracture: A nationwide Norwegian study of 38,126 women with hip fracture matched to a general population comparison cohort. *Am J Epidemiol*. 2019;188(2):398–407.
29. Kesmezacar H, Oğüt T, Bilgili MG, Gökay S, Tenekecioğlu Y. Treatment of intertrochanteric femur fractures in elderly

- patients: internal fixation or hemiarthroplasty. *Acta Orthop Traumatol Turc.* 2005;39(4):287–94.
30. Klein GR, Parvizi J, Vegari DN, Rothman RH, Purtill JJ. Total hip arthroplasty for acute femoral neck fractures using a cementless tapered femoral stem. *J Arthroplasty.* 2006;21(8):1134–40.
 31. Lizaaur-Utrilla A, Sanz-Reig J, Miralles-Muñoz FA. Cementless total hip arthroplasty after acute femoral neck fracture in active patients. Prospective matched study with a minimum follow-up of 5 years. *Rev Esp Cir Ortop Traumatol.* 58(3):152–9.
 32. Mouzopoulos G, Stamatakos M, Arabatzi H, Vasiliadis G, Batanis G, Tsembeli A, et al. The four-year functional result after a displaced subcapital hip fracture treated with three different surgical options. *Int Orthop.* 2008;32(3):367–73.
 33. Blomfeldt R, Törnkvist H, Eriksson K, Söderqvist A, Ponzer S, Tidermark J. A randomised controlled trial comparing bipolar hemiarthroplasty with total hip replacement for displaced intracapsular fractures of the femoral neck in elderly patients. *J Bone Joint Surg Br.* 2007;89(2):160–5.
 34. Shah A, Badade K, Kadam A, Chhallani G, Sharma SP. Clinical, functional and radiological outcomes of proximal femoral nail (PFN) with proximal femoral nail antirotation Asia (PFNA2) in the treatment of intertrochanteric and peritrochanteric femur fracture. *Int J Orthop Sci.* 2020;6:1156–1160.
 35. Hongku N, Woratanarat P, Nitiwarangkul L, Rattanasiri S, Thakkestian A. Fracture fixation versus hemiarthroplasty for unstable intertrochanteric fractures in elderly patients: A systematic review and network meta-analysis of randomized controlled trials. *Orthop Traumatol Surg Res.* 2022;108(1):102838. doi:10.1016/j.otsr.2021.102838.
 36. American Academy of Orthopaedic Surgeons. Management of Hip Fractures in Older Adults: Evidence-Based Clinical Practice Guideline. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2021.