

Functional Outcome of Elderly Patients with Intertrochanteric Femur Fractures Following Surgical Management

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Abstract

Introduction: Intertrochanteric femoral fractures are common in elderly patients and are associated with significant functional morbidity and loss of independence. Proximal femoral nailing (PFN) provides stable fixation and facilitates early mobilization, but functional recovery may vary among elderly patients.

Materials and Methods: This retrospective observational study was conducted in the Department of Orthopaedics, GMERS General Hospital, Junagadh, and included 100 patients aged >60 years with radiologically confirmed intertrochanteric femoral fractures treated with PFN. Functional outcome was assessed using the Harris Hip Score (HHS) at 6 weeks, 12 weeks, and 6 months. Radiological union, implant-related complications, postoperative complications, and reoperation were also evaluated.

Results: The mean age of patients was 72.8 ± 7.4 years, with females comprising 64% of the study population. Low-energy fall from standing height was the commonest mechanism of injury (72%), and AO/OTA A2 fractures were predominant (58%). The mean time to surgery was 2.6 ± 1.4 days, mean operative time was 71.4 ± 14.6 minutes, and mean intraoperative blood loss was 262.8 ± 82.5 mL. The mean HHS progressively improved from 61.8 ± 8.7 at 6 weeks to 72.9 ± 8.1 at 12 weeks and 82.4 ± 7.6 at 6 months. At 6 months, 66% of patients achieved good or excellent functional outcomes, while 25% had fair and 9% had poor outcomes. Radiological union was achieved in 96% of patients. Implant failure and loss of reduction/varus collapse occurred in 3% each, while surgical-site infection occurred in 4%, deep infection in 2%, reoperation in 3%, and mortality during follow-up in 5%.

Conclusion: PFN fixation provided satisfactory fracture healing and progressive functional improvement in elderly patients with intertrochanteric femoral fractures. Appropriate fixation combined with early mobilization and postoperative rehabilitation can contribute to favourable functional recovery.

Keywords: Intertrochanteric Femur Fracture; Proximal Femoral Nail; Harris Hip Score; Elderly Patients.

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Introduction

Intertrochanteric femur fractures are common injuries among elderly individuals and represent a major cause of morbidity, functional decline, and loss of independence in this population. [1] With increasing age, osteoporosis and low-energy trauma such as simple falls contribute substantially to the occurrence of these fractures. [2]

Associated medical comorbidities and reduced physiological reserve further increase the risk of postoperative complications and delayed functional recovery. [3]

Surgical fixation is generally preferred to restore mobility, reduce complications associated with prolonged immobilization, and facilitate early

rehabilitation. [4] Proximal femoral nailing (PFN) is widely used for the surgical management of intertrochanteric fractures because of its biomechanical advantages, relatively stable fixation, and suitability for early mobilization. [5]

However, functional recovery after surgery may vary according to patient age, fracture characteristics, pre-existing mobility, comorbidities, and postoperative complications. [6]

Assessment of functional outcome is therefore an important component of evaluating treatment in elderly patients with intertrochanteric fractures. [7] The Harris Hip Score (HHS) provides a standardized assessment of pain, function, mobility,

and activities of daily living. [8] The present study was undertaken to evaluate the functional outcomes and postoperative complications in elderly patients with intertrochanteric femur fractures treated with PFN, with follow-up assessments at 6 weeks, 12 weeks, and 6 months.

Materials and Methods

This retrospective observational study was conducted in the Department of Orthopaedics, GMERS General Hospital, Junagadh, following approval from the Institutional Ethics Committee. The study included 100 patients aged >60 years who presented with radiologically confirmed intertrochanteric fractures of the femur and underwent operative fixation with a proximal femoral nail (PFN). Patients were evaluated clinically and radiologically, and functional outcome was assessed at 6 weeks, 12 weeks, and 6 months after surgery. The primary outcome measure was functional recovery assessed using the Harris Hip Score (HHS).

Patients aged >60 years with an acute intertrochanteric femoral fracture who were considered suitable for operative treatment with PFN were included. Patients younger than 60 years, those with pathological fractures, polytrauma or associated multiple fractures, severe pre-existing neurological or musculoskeletal conditions affecting mobility, and severe comorbid illness likely to interfere with functional assessment were excluded. Patients with incomplete clinical or radiological records and those unavailable for the scheduled follow-up assessments were excluded from the final analysis.

Baseline variables including age, sex, side of involvement, mechanism of injury, pre-existing comorbidities, pre-injury ambulatory status, and fracture pattern according to the AO/OTA classification were recorded.

All patients underwent routine preoperative clinical and radiological evaluation and were medically optimized before surgery. Following appropriate anaesthesia, closed or limited open reduction was performed under fluoroscopic guidance and the fracture was stabilized using a proximal femoral nail according to the fracture configuration and surgeon preference.

Operative duration, estimated intraoperative blood loss, need for blood transfusion, and intraoperative complications were recorded. Postoperatively, patients received standard analgesia, wound care, thromboprophylaxis when indicated, and supervised physiotherapy. Mobilization was initiated as early as clinically feasible using appropriate walking assistance, with progression of

weight bearing determined by fracture stability, quality of fixation, radiological findings, and the treating surgeon.

Functional outcome was assessed using the Harris Hip Score, which evaluates pain, function, gait, walking ability, activities of daily living, and hip-related mobility. The HHS was recorded at 6 weeks, 12 weeks, and 6 months after surgery. Pre-injury ambulatory status was documented to provide a reference for postoperative functional recovery. At each follow-up visit, patients were assessed for pain, walking ability, hip function, and postoperative complications. Anteroposterior and lateral radiographs of the operated hip were obtained to evaluate fracture alignment, maintenance of reduction, progression of fracture union, and implant position. Complications including surgical-site infection, delayed or non-union, malunion, loss of reduction or varus collapse, implant failure, reoperation, thromboembolic events, and other relevant medical complications were documented.

The planned sample size was 100 patients, based on the expected functional recovery proportion reported in previous studies [9] of elderly patients with hip fractures and the feasibility of recruiting consecutive eligible cases at the study centre. A target sample of 100 patients was considered adequate for estimating the functional outcome of PFN fixation with acceptable precision while allowing assessment of postoperative complications and changes in HHS during follow-up. Statistical analysis was performed using SPSS or equivalent statistical software. Continuous variables were expressed as mean $\pm$ standard deviation (SD) for normally distributed data and as median with interquartile range (IQR) where appropriate, while categorical variables were summarized as frequencies and percentages. Changes in HHS across the postoperative follow-up assessments were analysed using repeated-measures analysis, with an appropriate post-hoc test when required. Associations between functional outcome and relevant demographic, fracture-related, or clinical variables were assessed using suitable comparative tests. A two-sided p-value <0.05 was considered statistically significant.

Results

A total of 100 elderly patients with intertrochanteric femoral fractures treated with proximal femoral nailing were included in the analysis. The mean age of the study population was 72.8 ± 7.4 years, with a predominance of female patients. Most fractures occurred following a low-energy fall, consistent with the pattern described in previous elderly hip-fracture cohorts.

Table 1: Demographic and baseline characteristics of patients

Variable	Number (n=100)	Percentage (%)
Age group (years)		
60–69	38	38.0
70–79	42	42.0
≥80	20	20.0
Mean age (years)	72.8 ± 7.4	—
Sex		
Male	36	36.0
Female	64	64.0
Side involved		
Right	52	52.0
Left	48	48.0
Mechanism of injury		
Fall from standing height	72	72.0
Fall from height	8	8.0
Road-traffic accident	14	14.0
Other trauma	6	6.0
Pre-existing comorbidities		
Hypertension	55	55.0
Diabetes mellitus	31	31.0
Cardiovascular disease	18	18.0
Cerebrovascular disease	12	12.0
Chronic pulmonary disease	16	16.0
Chronic kidney disease	9	9.0
No major comorbidity	24	24.0

The majority of patients were aged 70–79 years, and females constituted 64% of the study population. A low-energy fall was the predominant mechanism of injury, occurring in 72% of patients. Hypertension and diabetes were the most frequently recorded comorbidities.

Table 2: Fracture characteristics and perioperative parameters

Variable	Number / Mean ± SD	Percentage (%)
AO/OTA fracture classification		
A1	28	28.0
A2	58	58.0
A3	14	14.0
Fracture side		
Right	52	52.0
Left	48	48.0
Anaesthesia		
Spinal	78	78.0
General	22	22.0
Mean time from injury to surgery (days)	2.6 ± 1.4	—
Mean operative time (min)	71.4 ± 14.6	—
Mean intraoperative blood loss (mL)	262.8 ± 82.5	—
Intraoperative complication	3	3.0
Blood transfusion required	21	21.0

A2 fractures constituted the largest fracture subgroup (58%), followed by A1 fractures (28%). Surgery was performed after medical optimization, with a mean interval of 2.6 days from injury. The mean operative duration was 71.4 minutes and mean intraoperative blood loss was 262.8 mL.

Table 3: Functional outcome according to Harris Hip Score

Follow-up	Harris Hip Score (Mean ± SD)	Mean improvement from baseline
6 weeks	61.8 ± 8.7	—
12 weeks	72.9 ± 8.1	11.1
6 months	82.4 ± 7.6	20.6

The mean Harris Hip Score demonstrated progressive improvement during follow-up. The score increased from 61.8 ± 8.7 at 6 weeks to 72.9 ± 8.1 at 12 weeks and 82.4 ± 7.6 at 6 months. Thus, functional recovery continued throughout the follow-up period, with the greatest overall improvement observed by six months.

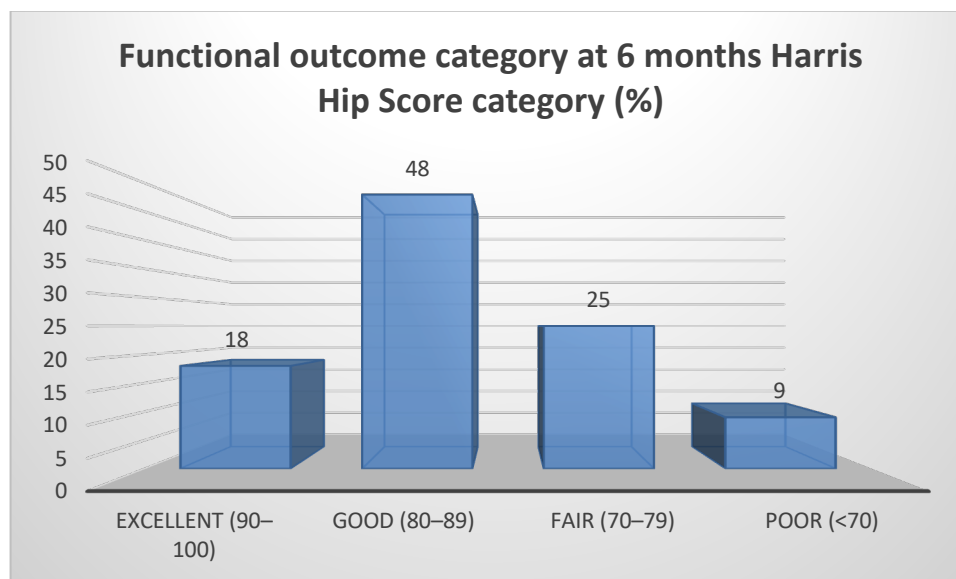


Figure 1: Functional outcome category at 6 months Harris Hip Score category (%)

At six months, 66% of patients achieved good or excellent functional outcomes, while 25% had fair and 9% had poor functional outcomes. Radiological union was achieved in 96% of patients by six months. Implant-related complications were uncommon, with implant failure occurring in 3% of patients and loss of reduction in 3%. Three patients required reoperation.

Table 4: Radiological outcome and postoperative complications

Outcome	Number (n=100)	Percentage (%)
Radiological union by 6 months	96	96.0
Delayed union	3	3.0
Non-union	1	1.0
Loss of reduction/varus collapse	3	3.0
Implant failure	3	3.0
Surgical-site infection	4	4.0
Deep infection	2	2.0
Reoperation	3	3.0
Deep-vein thrombosis	2	2.0
Pressure sore	3	3.0
Mortality during 6-month follow-up	5	5.0

Discussion

The present study evaluated the functional and clinical outcomes of 100 elderly patients with intertrochanteric femoral fractures treated with proximal femoral nailing (PFN). The mean age was 72.8 ± 7.4 years, and females constituted 64% of the cohort. A low-energy fall was the predominant mechanism of injury (72%), reflecting the typical fragility-fracture pattern in the elderly. These findings are comparable with previous studies. Fidan and Polat [10] reported a mean age of 74.9 ± 5.4 years with 63.6% females among elderly patients undergoing intramedullary fixation, while Zalavadiya et al. [11] also reported hypertension and diabetes as common comorbidities in their elderly proximal femoral fracture population. The

predominance of low-energy falls in our study is also consistent with the geriatric intertrochanteric fracture population described by Adulkasem et al. [12], in which restoration of pre-injury ambulation was identified as an important determinant of successful treatment.

In the present series, the mean operative duration was 71.4 ± 14.6 minutes and mean intraoperative blood loss was 262.8 ± 82.5 mL. These findings are comparable to the PFNA results reported by Cho et al., who observed an operative time of 67.8 ± 12.7 minutes and blood loss of 249.5 ± 146.2 mL. Their study demonstrated that PFNA required significantly less operative time and blood loss than DHS. Similarly, Ucpunar et al. [13] reported shorter operative duration and lower blood loss

with PFN compared with hemiarthroplasty, although PFN was associated with slower early restoration of ambulation in their very elderly population. These findings support the practical advantages of PFN in elderly patients, particularly where minimizing operative stress and blood loss is important.

Functional recovery was the principal outcome in our study, with the mean Harris Hip Score increasing progressively from 61.8 ± 8.7 at 6 weeks to 72.9 ± 8.1 at 12 weeks and 82.4 ± 7.6 at 6 months. At six months, 66% of patients achieved good or excellent functional outcomes. The overall six-month HHS in our study was higher than the mean HHS of 70.6 ± 4.1 reported by Fidan and Polat [10] following intramedullary fixation. Their cohort, however, specifically included patients with pre-existing hip osteoarthritis, and the HHS was 71.3 ± 4.3 in those with mild osteoarthritis and 69.5 ± 3.5 in those with severe osteoarthritis. The difference may therefore reflect variations in patient characteristics, fracture pattern, comorbidity burden, rehabilitation and follow-up methodology rather than differences in the effectiveness of PFN alone. Importantly, Fidan and Polat [10] also demonstrated that increasing age was associated with poorer functional and quality-of-life measures, emphasizing the influence of patient-related factors on postoperative recovery.

The radiological and complication outcomes in our study were generally favourable, with 96% achieving radiological union by six months, while implant failure occurred in 3%, loss of reduction/varus collapse in 3%, and reoperation in 3%. These findings are broadly comparable with published outcomes. Cho et al. [14] reported a 98.8% union rate in their PFNA group, with only two fixation-related failures among 81 patients; they also emphasized that satisfactory radiological healing does not necessarily translate into complete restoration of walking ability. Zalavadiya et al. [11] reported somewhat higher complication rates, including implant failure of 4.5%, deep infection of 2.8% and non-union of 3.4%, although their study included both intertrochanteric and subtrochanteric fractures and had a substantially longer five-year follow-up.

Thus, the relatively low complication rate observed in our six-month cohort appears consistent with the favourable short-term radiological outcomes reported after surgical fixation.

The progressive functional improvement observed in our study also highlights that successful treatment of elderly intertrochanteric fractures depends on factors beyond fracture union. Ucpunar et al. [13] found that although PFN patients had greater impairment of ambulation and greater need for walking aids at three months, these differences

were no longer significant at six months, supporting the importance of continued rehabilitation during the early postoperative period. Adulkasem et al. [12] similarly identified pre-injury ambulatory status as a very strong predictor of good functional recovery at one year. More recently, Zhang et al. [15] demonstrated that lower preoperative grip strength was associated with poorer HHS, delayed ambulation, more postoperative complications and higher mortality, further emphasizing the importance of baseline physiological reserve in elderly fracture patients. Taken together, our findings suggest that PFN provides reliable fracture stabilization and good functional recovery in elderly intertrochanteric fractures, particularly when combined with early mobilization and appropriate postoperative rehabilitation.

Limitations

This study was limited by its retrospective, single-centre design and relatively short follow-up period. The absence of a comparative surgical group limits direct assessment of PFN against alternative fixation methods. Functional recovery may also have been influenced by comorbidities, pre-fracture functional status, fracture characteristics, and variations in rehabilitation, which could not be completely controlled.

Conclusion

Proximal femoral nailing provides effective surgical stabilization of intertrochanteric femoral fractures in elderly patients, with progressive improvement in hip function and satisfactory radiological healing. Early mobilization, appropriate postoperative rehabilitation, and careful management of patient-related risk factors are important for achieving optimal functional recovery.

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