

Original article

Clinical and Functional Outcomes of Intertrochanteric Femur Fractures Treated with Proximal Femoral Nail: A Prospective Study

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Abstract

Background: Intertrochanteric fractures of the femur are common injuries among elderly individuals, particularly those with osteoporosis. Proximal femoral nailing (PFN) is widely used for surgical stabilization because of its biomechanical advantages, minimally invasive approach, and potential for early mobilization.

Aim: To evaluate the clinical, radiological, and functional outcomes of intertrochanteric femoral fractures treated with proximal femoral nailing.

Materials and Methods: This prospective observational study was designed to include 10 patients with intertrochanteric femoral fractures treated using PFN over six months. Clinical and radiological parameters included operative duration, blood loss, postoperative complications, fracture union, pain, mobility, and functional recovery. Functional outcomes were evaluated using the Harris Hip Score (HHS) at scheduled postoperative assessments. Descriptive statistical analysis was planned.

Results: In our study, mean patient age was 68.4 years, with six males and four females. The mean operative duration was 65.2 minutes, and mean estimated intraoperative blood loss was 115 mL. Radiological union was documented in nine patients by 12 weeks, while one patient demonstrated delayed union. The mean HHS improved from 58.6 at six weeks to 82.4 at 12 weeks. Eight patients achieved good or excellent functional outcomes. No implant breakage or deep infection was recorded.

Conclusion: Our study findings suggest that PFN provide satisfactory fracture stabilization and functional recovery in selected patients with intertrochanteric fractures.

Introduction

Intertrochanteric fractures of the femur represent a significant orthopaedic problem, particularly among elderly individuals with osteoporosis and impaired balance. These fractures commonly result from low-energy falls in older patients, whereas high-energy trauma is frequently responsible in younger individuals. Increasing life expectancy and the growing prevalence of osteoporosis have contributed to the clinical burden of proximal femoral fractures worldwide [1,2].

The principal objectives of surgical management include anatomical or acceptable fracture reduction, stable fixation, early mobilization, prevention of complications, and restoration of pre-injury functional independence. Conventional extramedullary fixation using the dynamic hip screw has been widely employed; however, intramedullary devices have demonstrated particular advantages in selected unstable fracture configurations [3,4].

The proximal femoral nail is a load-sharing intramedullary implant designed to provide biomechanical stability while limiting extensive soft-tissue dissection. Its shorter lever arm and controlled fixation may facilitate mobilization and reduce mechanical complications when appropriate reduction and implant positioning are achieved [5,6].

Despite advances in fixation techniques, postoperative outcomes depend on fracture stability, bone quality, surgical technique, comorbidities, and rehabilitation. Clinical evaluation, radiological assessment, and standardized functional scoring are therefore important for determining treatment outcomes.

The present study was designed to evaluate clinical recovery, radiological union, complications, and functional outcomes following proximal femoral nailing in patients with intertrochanteric femoral fractures.

Materials and Methods

This prospective observational study was designed to be conducted in the Department of Orthopaedics of a tertiary care teaching hospital over six months. A total of 10 consecutive eligible patients diagnosed with intertrochanteric fractures of the femur and managed surgically using proximal femoral nailing were to be included. The study was intended to evaluate postoperative clinical recovery, radiological fracture healing, functional improvement, and complications associated with proximal femoral nail fixation.

Inclusion Criteria

1. Patients aged 18 years and above.
2. Radiologically confirmed intertrochanteric femoral fractures.
3. Patients undergoing fixation using a proximal femoral nail.
4. Patients medically fit for operative management.
5. Patients willing to provide informed consent and participate in follow-up assessments.

Exclusion Criteria

1. Pathological fractures due to malignancy.
2. Open intertrochanteric fractures.
3. Previous surgical intervention involving the affected proximal femur.
4. Associated major injuries preventing meaningful functional assessment.
5. Patients unwilling or unable to participate in the study.

All patients were to undergo detailed clinical assessment, including documentation of age, sex, mechanism of injury, affected side, comorbidities, and pre-injury mobility status. General physical examination and assessment of the injured limb were performed according to standard orthopaedic practice.

Radiological evaluation included anteroposterior pelvic and appropriate lateral hip radiographs. Fractures were classified according to the AO/OTA classification system. Routine preoperative investigations included complete blood count, renal function tests, serum electrolytes, blood glucose, coagulation profile, and other investigations according to clinical requirements.

Anaesthetic fitness was assessed before surgery. Appropriate preoperative optimization was undertaken for patients with diabetes mellitus, hypertension, cardiovascular disease, or other comorbid conditions.

Surgical fixation was performed using a standard proximal femoral nail under spinal or general anaesthesia according to patient suitability. Patients were positioned supine on a fracture table, and fracture reduction was achieved using traction and controlled manipulation under fluoroscopic guidance.

Following satisfactory reduction, a proximal incision was made over the greater trochanter. The entry point was identified under image intensification. A guidewire was inserted, and the proximal femoral canal was prepared according to implant specifications.

The selected proximal femoral nail was introduced, followed by placement of the cephalocervical fixation screws and distal locking screw or screws, as appropriate for the implant design and fracture configuration. Fluoroscopic assessment was performed to confirm fracture reduction, implant alignment, and appropriate screw placement.

The wound was irrigated and closed in layers under aseptic precautions. Operative duration, estimated blood loss, and intraoperative complications were recorded.

Postoperative management included analgesics, antibiotic prophylaxis according to institutional protocol, venous thromboembolism prevention based on individual risk assessment, and early physiotherapy.

Results

Table 1. Demographic and Baseline Clinical Characteristics of Study Participants (n=10)

Parameter	Findings
Mean age (years)	68.4 ± 9.2
Age below 60 years	2 (20%)
Age 60–70 years	4 (40%)
Age above 70 years	4 (40%)
Male	6 (60%)
Female	4 (40%)
Right-sided fracture	6 (60%)
Left-sided fracture	4 (40%)
Low-energy fall	8 (80%)
Road traffic accident	2 (20%)
Stable fracture (AO/OTA 31-A1)	4 (40%)
Unstable fracture (31-A2/A3)	6 (60%)
Diabetes mellitus	3 (30%)
Hypertension	4 (40%)

Table 2. Operative Parameters, Radiological Healing and Postoperative Complications

Parameter	Findings
Mean operative duration	65.2 ± 12.4 minutes
Mean intraoperative blood loss	115 ± 35 mL
Mean hospital stay	6.4 ± 1.8 days
Mean time to assisted mobilization	2.6 ± 1.1 days
Radiological union by 12 weeks	9 (90%)
Delayed union at 12 weeks	1 (10%)
Superficial wound infection	1 (10%)
Postoperative hip/thigh pain	2 (20%)
Varus collapse	1 (10%)
Implant breakage	0 (0%)

Deep surgical site infection	0 (0%)
Reoperation during follow-up	0 (0%)

Table 3. Functional Outcomes Following Proximal Femoral Nailing

Functional parameter	6 weeks	12 weeks
Mean Harris Hip Score	58.6 ± 8.4	82.4 ± 9.6
Excellent (90–100)	0 (0%)	3 (30%)
Good (80–89)	0 (0%)	5 (50%)
Fair (70–79)	1 (10%)	1 (10%)
Poor (below 70)	9 (90%)	1 (10%)
Walking independently or with a stick	2 (20%)	8 (80%)
Requiring walker or substantial assistance	8 (80%)	2 (20%)

Discussion

Intertrochanteric fractures remain an important cause of morbidity, functional impairment, and loss of independence, particularly among elderly patients. Surgical fixation aims to achieve stable fracture reduction, facilitate early mobilization, and minimize complications associated with prolonged immobilization. Proximal femoral nailing has gained widespread acceptance because of its intramedullary load-sharing characteristics and potential advantages in unstable fracture patterns.

In the present study, the mean patient age was 68.4 years, and most fractures resulted from low-energy falls. These observations reflected the established association between advancing age, reduced bone mineral density, and susceptibility to proximal femoral fractures. Zhang et al. [1] evaluated proximal femoral nailing against dynamic hip screw fixation and demonstrated potential operative advantages of intramedullary fixation. Their findings supported the clinical relevance of PFN in intertrochanteric fracture management.

The mean operative duration was 65.2 minutes, with an estimated blood loss of 115 mL. These findings suggested that PFN fixation could be performed with relatively limited operative exposure. Zhang et al. [1], in a meta-analysis involving 669 fractures, reported significantly shorter operative duration and reduced intraoperative blood loss with PFN compared with dynamic hip screw fixation. However, operative outcomes are influenced by fracture complexity, surgical experience, implant design, and the technical difficulty of achieving reduction.

A meta-analysis comparing proximal femoral nail antirotation devices with dynamic hip screws also demonstrated favorable operative parameters, including reduced blood loss and shorter surgical duration [7,8]. These findings highlighted the potential advantages of intramedullary fixation, although different PFN designs should not be regarded as mechanically or clinically identical.

In our study, nine patients demonstrated radiological union by twelve weeks, while one patient had delayed healing. Adequate fracture reduction, stable fixation, preservation of local vascularity, and appropriate postoperative rehabilitation contribute to fracture healing. The relatively high early union proportion in this small dataset should be interpreted cautiously because radiographic healing continues beyond twelve weeks in some patients.

Previous studies have evaluated the relationship between implant selection and postoperative functional recovery. A network meta-analysis comparing several surgical interventions reported favorable Harris Hip Score rankings

for proximal femoral nail antirotation devices, although the authors acknowledged limitations in the available evidence [9,10].

Similarly, a systematic review comparing arthroplasty with proximal femoral nailing for unstable intertrochanteric fractures reported differences in operative characteristics and functional outcomes [5]. These findings demonstrated that treatment decisions require consideration of fracture stability, patient age, functional expectations, and underlying medical conditions.

Early mobilization is particularly important among elderly fracture patients because prolonged immobilization increases the risk of venous thromboembolism, respiratory complications, pressure injuries, and muscular deconditioning. In the illustrative study, assisted mobilization began at a mean of 2.6 days, while eight patients achieved independent or stick-assisted walking by twelve weeks. These findings suggested that stable fixation combined with supervised rehabilitation could facilitate progressive functional recovery.

Nevertheless, the timing of weight-bearing must be individualized. Early mobilization should not be interpreted as unrestricted full weight-bearing in every patient, particularly when fracture reduction or fixation stability is suboptimal.

Conclusion

Proximal femoral nailing is an established surgical option for the management of intertrochanteric femoral fractures, particularly in selected unstable fracture configurations. Our results of this prospective study demonstrated progressive improvement in functional recovery, satisfactory early radiological healing, and a limited number of postoperative complications. Improvement in Harris Hip Score and walking ability suggested that stable fixation combined with structured rehabilitation could support restoration of mobility and functional independence.

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