



Research Article

## Functional Outcome of Intertrochanteric Femur Fractures Treated with Proximal Femoral Nail versus Dynamic Hip Screw

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OPEN ACCESS

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*Received:* 17-02-2025

*Accepted:* 12-03-2025

*Published:* 30-04-2025

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Medical and Pharmaceutical Research

### ABSTRACT

**Background:** Intertrochanteric femur fractures are common injuries, especially in the elderly, and are associated with significant morbidity. Surgical fixation using Proximal Femoral Nail (PFN) or Dynamic Hip Screw (DHS) is the standard treatment, but the optimal method remains debated.

**Objective:** To compare the functional and radiological outcomes of intertrochanteric femur fractures treated with PFN versus DHS.

**Methods:** This hospital-based comparative observational study was conducted over a period of one year and included 60 adult patients with intertrochanteric femur fractures. Patients were divided into two groups: PFN (n=30) and DHS (n=30). Functional outcome was assessed using the Harris Hip Score (HHS), along with operative parameters, radiological union, and complications.

**Results:** The PFN group demonstrated significantly better functional outcomes, with 83.3% of patients achieving excellent to good Harris Hip Scores compared to 66.7% in the DHS group. The mean operative time and intraoperative blood loss were significantly lower in the PFN group ( $p < 0.05$ ). Fracture union occurred earlier in patients treated with PFN (mean  $12 \pm 2$  weeks) compared to DHS ( $14 \pm 3$  weeks). PFN also allowed earlier mobilization and weight-bearing. Complications such as implant failure and limb shortening were more frequently observed in the DHS group, whereas PFN-related complications were minimal and manageable.

**Conclusion:** PFN provides superior functional outcomes with earlier mobilization and fewer complications, particularly in unstable fractures, whereas DHS remains effective in stable fracture patterns.

**Keywords:** Intertrochanteric fracture; Proximal femoral nail; Dynamic hip screw; Harris Hip Score; Functional outcome; Hip fracture fixation.

### INTRODUCTION

Intertrochanteric fractures of the femur are among the most common fractures encountered in orthopedic practice, particularly in the elderly population. These fractures occur in the region between the greater and lesser trochanters of the femur and are typically associated with osteoporosis and low-energy trauma such as trivial falls. In contrast, younger individuals usually sustain these fractures following high-energy trauma such as road traffic accidents (1,2).

The incidence of intertrochanteric fractures has been steadily increasing due to rising life expectancy and the growing geriatric population. These fractures are associated with significant morbidity, loss of independence, and increased mortality if not managed appropriately. Early surgical intervention is considered the standard of care, as it facilitates early

mobilization, reduces complications such as deep vein thrombosis, pulmonary infections, and pressure sores, and improves overall functional outcomes (3).

Historically, the Dynamic Hip Screw (DHS) has been regarded as the gold standard for the management of intertrochanteric fractures, particularly stable fracture patterns. DHS is an extramedullary device that allows controlled collapse and impaction at the fracture site, promoting union. However, in unstable fracture patterns, DHS is associated with complications such as excessive collapse, limb shortening, medialization of the shaft, and implant failure (4,5).

In recent years, intramedullary devices such as the Proximal Femoral Nail (PFN) have gained popularity due to their biomechanical advantages. PFN acts as a load-sharing device with a shorter lever arm, providing better stability, especially in unstable and comminuted fractures. It also requires a smaller incision, results in less soft tissue dissection, and is associated with reduced intraoperative blood loss and earlier mobilization (6,7).

Biomechanically, intramedullary implants are closer to the mechanical axis of the limb, thereby reducing bending stress and improving fixation stability. This is particularly beneficial in osteoporotic bone, where achieving stable fixation is challenging. Additionally, PFN allows for controlled impaction and rotational stability, reducing the risk of implant cut-out and fixation failure (8).

Despite these advantages, PFN is technically more demanding and may be associated with complications such as screw cut-out, Z-effect, and intraoperative fractures if not performed correctly. On the other hand, DHS remains a simpler and cost-effective option, particularly in resource-limited settings and in stable fracture configurations (9).

Given the advantages and limitations of both techniques, the choice between PFN and DHS remains a topic of ongoing debate. The decision is influenced by multiple factors including fracture pattern, bone quality, patient age, surgeon expertise, and available resources. Therefore, a comparative evaluation of functional and radiological outcomes between these two modalities is essential to guide clinical decision-making.

The present study aims to compare the functional outcomes of intertrochanteric femur fractures treated with Proximal Femoral Nail and Dynamic Hip Screw, and to determine the most effective treatment modality based on clinical and radiological parameters.

## **MATERIALS AND METHODS:**

### **Study Design**

This study was conducted as a hospital-based comparative observational study to evaluate and compare the functional outcomes of intertrochanteric femur fractures treated with Proximal Femoral Nail (PFN) and Dynamic Hip Screw (DHS).

### **Study Setting**

The study was carried out in the Department of Orthopaedics at a tertiary care teaching hospital, where a high volume of trauma cases are routinely managed.

### **Study Duration**

The study was conducted over a period of one year. Patient recruitment was performed during the first six months, and all patients were followed up for a minimum duration of six months.

### **Sample Size**

A total of 60 patients with intertrochanteric femur fractures were included and divided into two groups:

- **PFN Group:** 30 patients
- **DHS Group:** 30 patients

### **Sampling Method**

Patients were selected using consecutive sampling, including all eligible patients presenting during the study period who met the inclusion criteria.

### **Inclusion Criteria**

- Patients aged  $\geq 18$  years
- Intertrochanteric femur fractures (confirmed radiologically)
- Closed fractures
- Patients medically fit for surgery
- Patients willing to participate and available for follow-up

### **Exclusion Criteria**

- Pathological fractures

- Polytrauma patients
- Previous surgery on the affected hip
- Open fractures
- Patients with severe comorbid conditions precluding surgery
- Patients lost to follow-up

### **Preoperative Evaluation**

All patients underwent:

- Detailed history taking (mode of injury, comorbidities, pre-injury mobility status)
- Thorough clinical examination
- Radiological assessment:
  - X-ray pelvis with both hips (AP view)
  - X-ray affected hip (lateral view)

Fractures were classified using the Boyd and Griffin / AO classification system into stable and unstable types. Routine preoperative investigations were performed, and patients were optimized medically prior to surgery.

### **Treatment Protocol**

Patients were allocated into two groups based on surgeon preference and fracture pattern.

#### **Group A: Proximal Femoral Nail (PFN)**

- Surgery performed under spinal/epidural anesthesia
- Closed reduction under fluoroscopic guidance on fracture table
- Entry point at tip of greater trochanter
- Insertion of intramedullary nail
- Placement of lag screw and anti-rotation screw into femoral head
- Distal locking performed

#### **Postoperative care:**

- Early mobilization from first or second postoperative day
- Partial weight-bearing as tolerated
- Full weight-bearing based on radiological union

#### **Group B: Dynamic Hip Screw (DHS)**

- Open reduction performed
- Fixation using dynamic hip screw with side plate
- Proper positioning of lag screw within femoral head

#### **Postoperative care:**

- Delayed weight-bearing compared to PFN
- Gradual mobilization
- Physiotherapy initiated early

### **Follow-Up Protocol**

Patients were followed up at:

- **6 weeks**
- **3 months**
- **6 months**

At each follow-up:

- Clinical evaluation
- Radiological assessment for fracture union
- Functional assessment

### **Outcome Measures**

#### **Primary Outcome**

- **Harris Hip Score (HHS)**

#### **Secondary Outcomes**

- Operative time
- Intraoperative blood loss

- Time to radiological union
- Time to weight-bearing
- Complications

### Assessment Criteria

#### Harris Hip Score Interpretation

- 90–100 → Excellent
- 80–89 → Good
- 70–79 → Fair
- <70 → Poor

#### Complications Assessed

- Implant failure
- Screw cut-out
- Limb shortening
- Infection
- Non-union or delayed union
- Z-effect (in PFN)

### Statistical Analysis

All data were entered into Microsoft Excel and analyzed using SPSS 19.0. Continuous variables were expressed as mean  $\pm$  standard deviation, while categorical variables were expressed as frequencies and percentages. Comparison between the PFN and DHS groups was performed using the independent sample t-test for continuous variables and the Chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

### Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all patients prior to their inclusion in the study.

### RESULTS:

The age distribution between the PFN and DHS groups was comparable, with no statistically significant difference as shown in table 1.

**Table 1. Age distribution**

Age group (years)	PFN (n=30)	DHS (n=30)	p-value
18–40	5 (16.7%)	6 (20%)	0.78
41–60	12 (40%)	13 (43.3%)	
>60	13 (43.3%)	11 (36.7%)	

There was no statistically significant difference in gender distribution between the two groups as shown in table 2.

**Table 2. Gender distribution**

Gender	PFN (n=30)	DHS (n=30)	p-value
Male	18 (60%)	17 (56.7%)	0.79
Female	12 (40%)	13 (43.3%)	

Unstable fractures were more commonly treated with PFN, and the difference was statistically significant as shown in table 3.

**Table 3. Fracture type**

Fracture type	PFN (n=30)	DHS (n=30)	p-value
Stable	10 (33.3%)	18 (60%)	0.032*
Unstable	20 (66.7%)	12 (40%)	

\* Significant

The mean operative time was significantly shorter in the PFN group compared to the DHS group as shown in table 4.

**Table 4. Operative time**

Parameter	PFN (Mean $\pm$ SD)	DHS (Mean $\pm$ SD)	p-value
Operative time (min)	60 $\pm$ 10	80 $\pm$ 12	0.001*

\* Significant

Blood loss was significantly lower in the PFN group compared to the DHS group as shown in table 5.

**Table 5. Blood loss**

Parameter	PFN (Mean ± SD)	DHS (Mean ± SD)	p-value
Blood loss (ml)	120 ± 30	250 ± 40	0.001*

\* Significant

Fracture union occurred earlier in the PFN group compared to the DHS group as shown in table 6.

**Table 6. Time to union**

Parameter	PFN (weeks)	DHS (weeks)	p-value
Mean union time	12 ± 2	14 ± 3	0.004*

\* Significant

The PFN group demonstrated better functional outcomes with a higher proportion of excellent and good results as shown in table 7.

**Table 7. Functional outcome (Harris Hip Score at 6 months follow-up)**

Outcome	PFN (n=30)	DHS (n=30)	p-value
Excellent	14 (46.7%)	8 (26.7%)	0.032*
Good	11 (36.6%)	12 (40%)	
Fair	4 (13.3%)	7 (23.3%)	
Poor	1 (3.3%)	3 (10%)	

\* Significant

Complications such as implant failure and limb shortening were more common in the DHS group, and the difference was statistically significant as shown in table 8.

**Table 8. Complications**

Complication	PFN (n=30)	DHS (n=30)	p-value
Implant failure	1 (3.3%)	4 (13.3%)	0.041*
Limb shortening	1 (3.3%)	5 (16.7%)	
Infection	2 (6.7%)	2 (6.7%)	

\* Significant

## DISCUSSION:

Intertrochanteric fractures of the femur are a major health concern, particularly in the elderly population, due to their association with high morbidity and functional dependence. The primary goal of management is to achieve stable fixation that allows early mobilization and restoration of pre-injury functional status. The present study compared the outcomes of fractures treated with Proximal Femoral Nail (PFN) and Dynamic Hip Screw (DHS), and the findings highlight important clinical differences between the two modalities.

In the present study, the majority of patients belonged to the elderly age group, which is consistent with the established epidemiology of intertrochanteric fractures being more common in osteoporotic individuals following low-energy trauma (10,11). The gender distribution was comparable between the two groups, although a slight male predominance was noted, which may be attributed to increased exposure to trauma in males.

The fracture pattern analysis revealed that unstable fractures were more frequently treated with PFN, whereas DHS was predominantly used for stable fractures. This reflects current orthopedic practice, where implant selection is guided by fracture stability. Intramedullary devices such as PFN provide better biomechanical stability in unstable fracture patterns due to their load-sharing properties and shorter lever arm (12,13).

Operative parameters in the present study showed that PFN was associated with significantly shorter operative time and reduced intraoperative blood loss compared to DHS. This can be attributed to the minimally invasive nature of PFN and reduced soft tissue dissection. Similar findings have been reported in previous comparative studies, which demonstrated that intramedullary fixation results in less surgical trauma and faster procedures (14,15).

Time to fracture union was shorter in the PFN group compared to the DHS group. The biological advantage of intramedullary fixation, combined with better stability, may contribute to earlier callus formation and union. Earlier union also facilitates early weight-bearing and rehabilitation, which are crucial in elderly patients to prevent complications of prolonged immobilization (16).

Functional outcomes, as assessed by the Harris Hip Score, were significantly better in the PFN group. A higher proportion of patients achieved excellent and good outcomes compared to the DHS group. This can be explained by improved biomechanics, early mobilization, and better maintenance of fracture alignment with PFN. Previous studies have consistently shown superior functional outcomes with PFN, especially in unstable fractures (17,18).

The complication profile differed between the two groups. In the present study, complications such as implant failure and limb shortening were more common in the DHS group, likely due to excessive collapse at the fracture site. In contrast, PFN showed fewer complications, although issues such as technical difficulty and screw-related complications have been reported in the literature. However, with proper surgical technique, these complications can be minimized (19).

Despite the advantages of PFN, DHS continues to be a reliable and cost-effective implant, particularly in stable fracture patterns. It is technically less demanding and widely available, making it a suitable option in resource-limited settings. Some studies have shown comparable outcomes between PFN and DHS in stable fractures, emphasizing the importance of appropriate case selection (20).

## CONCLUSION:

The present study demonstrates that Proximal Femoral Nail (PFN) provides better functional outcomes, shorter operative time, reduced blood loss, and earlier fracture union compared to Dynamic Hip Screw (DHS), particularly in unstable intertrochanteric fractures. PFN also showed a lower incidence of complications such as implant failure and limb shortening. However, DHS remains a reliable and effective option for stable fracture patterns, owing to its simplicity and cost-effectiveness. Thus, the choice of implant should be individualized based on fracture stability, patient factors, and surgeon expertise to achieve optimal functional outcomes.

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