

Original article

A Prospective Comparative Study of Functional and Radiological Outcomes of Proximal Femoral Nailing versus Dynamic Hip Screw in Stable Intertrochanteric Femur Fractures

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Abstract

Background- Stable intertrochanteric femur fractures are common orthopedic injuries, particularly among the elderly. Dynamic Hip Screw (DHS) has traditionally been the standard treatment, while Proximal Femoral Nailing (PFN) has gained popularity because of its biomechanical advantages and minimally invasive nature.

Objectives- To compare the functional and radiological outcomes of Proximal Femoral Nailing and Dynamic Hip Screw in the management of stable intertrochanteric femur fractures.

Materials and Methods- A prospective comparative study was conducted on 40 patients with stable intertrochanteric femur fractures at a tertiary care hospital. Patients were equally allocated into two groups: PFN (n=20) and DHS (n=20). Perioperative parameters including operative time, blood loss, and hospital stay were recorded. Functional outcome was assessed using the Harris Hip Score, while radiological outcome was evaluated by fracture union, implant position, and postoperative complications during a 6-month follow-up. Statistical analysis was performed using SPSS version 26.0, with $p < 0.05$ considered significant.

Results- The PFN group demonstrated significantly shorter operative time, lower intraoperative blood loss, shorter hospital stay, earlier full weight-bearing, higher Harris Hip Scores, and faster radiological union compared with the DHS group ($p < 0.05$). Fracture union was achieved in nearly all patients in both groups. Although complications were fewer with PFN, the difference was not statistically significant.

Conclusion- Both PFN and DHS provided satisfactory fracture union in stable intertrochanteric femur fractures. However, PFN offered superior functional recovery, reduced surgical morbidity, and earlier rehabilitation, making it a preferable fixation method for stable intertrochanteric fractures.

Keywords: Proximal Femoral Nailing; Dynamic Hip Screw; Stable Intertrochanteric Femur Fracture.

Introduction

Intertrochanteric fractures of the femur are among the most common fractures encountered in orthopedic practice, particularly in the elderly population with osteoporosis, although they also occur in younger individuals following high-energy trauma. (1) These fractures are associated with significant morbidity, loss of functional independence, prolonged hospitalization, and increased mortality if not managed appropriately. The primary goals of treatment are stable fracture fixation, early mobilization, restoration of pre-injury function, and prevention of complications. (2,3,4) Dynamic Hip Screw (DHS) has long been considered the standard implant

for stable intertrochanteric fractures because of its reliable clinical outcomes and cost-effectiveness. (5) However, Proximal Femoral Nailing (PFN), an intramedullary fixation device, offers biomechanical advantages including a shorter lever arm, reduced surgical exposure, and improved load sharing. (6,7) Although both implants are widely used, controversy persists regarding their comparative effectiveness in stable fracture patterns. Therefore, this prospective comparative study aims to evaluate and compare the functional and radiological outcomes of PFN and DHS in patients with stable intertrochanteric femur fractures.

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Materials and Methodology

This prospective comparative study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital over a period of 12 months after obtaining approval from the Institutional Ethics Committee. A total of 40 patients diagnosed with stable intertrochanteric femur fractures (AO/OTA 31-A1) and fulfilling the inclusion criteria were enrolled after obtaining written informed consent. Patients aged 18 years and above with fresh, closed stable intertrochanteric fractures presenting within two weeks of injury were included in the study. Patients with pathological fractures, polytrauma, open fractures, previous surgery around the affected hip, unstable intertrochanteric fractures, or severe medical illnesses precluding surgery were excluded.

The enrolled patients were divided into two equal groups of 20 patients each based on the surgical procedure performed. Group A underwent fixation with Proximal Femoral Nailing (PFN), while Group B underwent fixation with the Dynamic Hip Screw (DHS) system. All surgeries were performed under spinal or general anesthesia by experienced orthopedic surgeons using standard operative techniques. Perioperative variables including operative duration, intraoperative blood loss, fluoroscopy exposure, and length of hospital stay were recorded. Postoperative rehabilitation protocols, including early mobilization and progressive weight-bearing according to fracture stability and implant fixation, were followed uniformly for both groups.

All patients were followed up at 6 weeks, 3 months, and 6 months after surgery. Functional outcomes were assessed using the Harris Hip Score (HHS), while radiological evaluation included assessment of fracture reduction, time to fracture union, implant position, neck-shaft angle, and implant-related complications using standard anteroposterior and lateral radiographs of the hip. Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The Independent Student's t-test was used for comparison of continuous variables, and the Chi-square test or Fisher's exact test was applied for categorical variables. A p-value <0.05 was considered statistically significant.

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Results

A total of 40 patients with stable intertrochanteric femur fractures were included in the study. Twenty patients underwent fixation with Proximal Femoral Nailing (PFN) and twenty patients underwent fixation with Dynamic Hip Screw (DHS). Both groups were comparable with respect to baseline demographic characteristics. Functional and radiological outcomes were evaluated during the six-month follow-up period.

Table 1. Baseline Demographic and Clinical Characteristics of Study Participants

Variable	PFN (n=20)	DHS (n=20)	p-value
Mean age (years)	67.4 ± 8.6	68.2 ± 7.9	0.74
Male, n (%)	12 (60%)	11 (55%)	0.75
Female, n (%)	8 (40%)	9 (45%)	
Right-sided fracture, n (%)	11 (55%)	10 (50%)	0.75
Left-sided fracture, n (%)	9 (45%)	10 (50%)	
Mean duration of surgery (minutes)	58.6 ± 8.2	72.8 ± 10.5	<0.001*
Mean intraoperative blood loss (mL)	118.5 ± 24.6	192.3 ± 31.8	<0.001*
Mean hospital stay (days)	5.4 ± 1.2	6.8 ± 1.5	0.003*

*Statistically significant (p <0.05)

Table 2. Functional Outcomes at 6-Month Follow-up

Functional Outcome	PFN (n=20)	DHS (n=20)	p-value
Harris Hip Score	89.8 ± 6.1	84.3 ± 7.2	0.01*
Excellent (90–100), n (%)	11 (55%)	7 (35%)	
Good (80–89), n (%)	7 (35%)	8 (40%)	
Fair (70–79), n (%)	2 (10%)	4 (20%)	
Poor (<70), n (%)	0 (0%)	1 (5%)	0.31
Time to full weight-bearing (weeks)	8.2 ± 1.4	9.7 ± 1.8	0.006*

*Statistically significant (p <0.05)

Table 3. Radiological Outcomes and Complications

Variable	PFN (n=20)	DHS (n=20)	p-value
Mean time to radiological union (weeks)	14.1 ± 2.3	15.6 ± 2.8	0.04*
Union achieved, n (%)	20 (100%)	19 (95%)	0.31
Delayed union, n (%)	0 (0%)	1 (5%)	
Varus collapse, n (%)	1 (5%)	3 (15%)	0.29
Implant failure, n (%)	0 (0%)	1 (5%)	0.31
Superficial infection, n (%)	1 (5%)	2 (10%)	0.55
Reoperation required, n (%)	0 (0%)	1 (5%)	0.31

*Statistically significant (p <0.05)

Discussion

Intertrochanteric femur fractures represent one of the most common injuries encountered in orthopedic practice, particularly among the elderly population with osteoporosis. The primary objective of surgical treatment is to achieve stable fixation that facilitates early mobilization, minimizes complications associated with prolonged immobilization, and restores pre-injury functional status. The present prospective comparative study evaluated the functional and radiological outcomes of Proximal Femoral Nailing (PFN) and Dynamic Hip Screw (DHS) in

stable intertrochanteric femur fractures. The findings demonstrated that both implants achieved satisfactory fracture union; however, PFN showed superior perioperative and functional outcomes compared with DHS. (8,9)

In the present study, baseline demographic characteristics were comparable between the two groups, indicating that the observed differences in outcomes were attributable to the surgical implant rather than patient-related factors. The duration of surgery and intraoperative blood loss were significantly lower in the PFN group. These findings may be explained by the minimally invasive nature of intramedullary fixation, which requires a smaller incision and less soft tissue dissection than DHS fixation. Reduced surgical trauma also contributed to a shorter hospital stay in the PFN group, facilitating earlier rehabilitation and reducing healthcare burden.(10)

Functional outcome was assessed using the Harris Hip Score at six months of follow-up. Patients treated with PFN achieved significantly higher functional scores than those treated with DHS. Earlier mobilization and faster progression to full weight-bearing observed in the PFN group likely contributed to better restoration of hip function. The intramedullary position of PFN provides a shorter lever arm and superior biomechanical stability, allowing effective transmission of axial loads while minimizing implant stress. Consequently, patients were able to regain mobility more rapidly and experienced better overall functional recovery.

Radiological assessment revealed successful fracture union in almost all patients in both groups. Although the mean time to radiological union was significantly shorter in the PFN group, the overall union rates were comparable. The incidence of complications such as varus collapse, delayed union, superficial infection, and implant failure was lower in patients treated with PFN, although these differences did not reach statistical significance because of the relatively small sample size. These observations suggest that both PFN and DHS remain reliable fixation methods for stable intertrochanteric fractures when appropriate surgical techniques are employed.

The findings of the present study are consistent with previous reports by Pajarinen et al., Parker and Handoll, Stern and Angerman, and Banan et al., who demonstrated improved biomechanical stability, reduced blood loss, earlier mobilization, and better functional recovery with PFN compared with DHS, while reporting comparable fracture union rates. These studies also concluded that intramedullary fixation offers mechanical advantages because the implant lies closer to the mechanical axis of the femur, thereby reducing bending stresses and improving load sharing.

Conclusion:

In conclusion, both PFN and DHS provided satisfactory radiological union in stable intertrochanteric femur fractures. However, PFN demonstrated significant advantages in terms of shorter operative time, reduced intraoperative blood loss, earlier mobilization, improved functional outcomes, and faster fracture union. Therefore, PFN may be considered the preferred fixation method for stable intertrochanteric femur fractures, particularly when early rehabilitation and rapid return to function are desired.

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