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Original Research Article

DHS versus PFN in Intertrochanteric Fractures: A Comparative Functional Outcome Study

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Abstract:

Background: Intertrochanteric femoral fractures are common in elderly patients due to osteoporosis and low-energy trauma and are associated with high morbidity and mortality. Surgical fixation enabling stable construction and early mobilization is the standard treatment. Although the Dynamic Hip Screw (DHS) has traditionally been the gold standard, the Proximal Femoral Nail (PFN) is increasingly preferred because of biomechanical advantages.

Aim: To compare the functional outcomes of DHS and PFN fixation in intertrochanteric femoral fractures using the Harris Hip Score (HHS).

Materials and Methods: This prospective comparative study included 40 patients aged ≥45 years with closed intertrochanteric fractures treated at Darbhanga Medical College and Hospital. Patients were randomized into DHS (n = 20) and PFN (n = 20) groups. Fractures were classified using the Boyd and Griffin system. Follow-up was carried out at 6, 12, and 24 weeks, with functional evaluation at 24 weeks using HHS.

Results: Demographic and fracture characteristics were comparable between groups. No significant difference in HHS was observed at 6 weeks. However, PFN showed significantly higher mean HHS at 12 and 24 weeks compared to DHS ($p < 0.001$ and $p = 0.01$). Excellent outcomes were noted in 55% of PFN cases versus 35% in the DHS group, with no poor results in the PFN group.

Conclusion: PFN fixation provides superior functional outcomes compared to DHS in intertrochanteric femoral fractures, especially in later recovery, facilitating earlier return to pre-injury function.

Keywords: Intertrochanteric femoral fractures, Dynamic Hip Screw (DHS), Proximal Femoral Nail (PFN) Harris Hip Score, Functional outcome, Elderly patients, Internal fixation.

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Introduction

One of the most frequent hip fractures, particularly in older people with osteoporotic bones, is the intertrochanteric fracture, which is often caused by low-energy trauma such as mild falls [1]. Due to the growing number of elderly people and the rising prevalence of osteoporosis, the incidence of intertrochanteric femoral fractures has dramatically grown in recent decades and is likely to continue in the near future. Different countries have different rates of intertrochanteric fractures. According to Gulberg et al., there will be 2.6 million hip fractures overall by 2025 and 4.5 million by 2050 [2].

Intertrochanteric fractures accounted for 26% of all hip fractures in Asia in 1990, but by 2025 and 2050, that percentage might increase to 37% and 45%, respectively [3]. Stable fixation, which enables early patient mobilisation, is the aim of therapy for these fractures. Significant morbidity and death are linked to these fractures. The fracture is made worse by co-occurring medical conditions such as diabetes, hypertension, pulmonary, renal, and cardiac issues. Life-threatening conditions include hypostatic pneumonia, catheter sepsis, cardiorespiratory failure, and decubitus ulcers pose a hazard to elderly people. For the patient's early recuperation and mobility, all of

the aforementioned situations need the use of an immediate surgical remedy [4].

Additionally, they are among the most frequent fractures seen in orthopaedic practice today. Since they are unable to even partially restrict weight bearing, a number of therapeutic methods are outlined that aim for stable fixation, which permits early mobilisation of the patient [5].

When treating femur intertrochanteric fractures surgically, the dynamic hip screw (DHS) fixation device is frequently utilised [6,7]. For the treatment of these fractures in the elderly, this device is regarded as the gold standard [8]. The proximal femoral nail (PFN) was created by AO/ASIF in 1996 as an intramedullary fixation tool for pertrochanteric, intertrochanteric, and subtrochanteric femur fractures [8]. Fractures at the proximal end of the femur can be effectively treated with PFN, a minimally invasive implant, especially if closed reduction is feasible [9]. It is still debatable whether intramedullary nailing with the PFN is superior to the DHS in cases of intertrochanteric fractures [10]. However, functional recovery is more crucial than implant selection for many patients, especially the elderly.

Intertrochanteric fractures are becoming more common as the population ages. Approximately half of these fractures are unstable [11,12,13]. These fractures are difficult to treat due to poor bone quality and complicated fracture patterns. The biggest obstacles to treating these fractures are osteoporosis, instability, and potential fixation problems. Surgery for this kind of fracture aims to restore early mobility by creating a stable structure, lowering the chance of long-term recumbency consequences, and returning the patient to their preoperative state. In such complicated circumstances, both PFN and DHS have demonstrated strong performance. Fixed angle locking side plates reduce the probability of implant failure in DHS and are useful in cases of osteoporosis-related unstable fractures [14].

By shortening the distance between the hip joint and implant, PFN creates a more biomechanically stable architecture [15,16,17]. Early weight bearing in unstable ITF is made possible by PFN's intramedullary position at the intersection of the nail and lag screw, which resists bending strain and inhibits lateral translation of the proximal fragment [18,19]. However, PFN is still somewhat more expensive than DHS.

The ultimate result and any complications that may arise from the fracture and its fixation will depend on the type of implant that is utilised. Sliding plate devices and dynamic hip screws (DHS) are already commonly utilised for fixation. However, the device may have a propensity to pierce or retract through the skull if weight bearing is initiated too soon, particularly in cases of complicated and comminuted fractures. The intramedullary device known as proximal femoral nailing (PFN) has been shown to be beneficial in these types of fractures because it is positioned near the body's mechanical axis, which lessens the lever arm element of the implant. They also enable early weight-bearing mobility after surgery, need less time for long-term follow-up, and require very little blood loss after insertion. The primary objective of this planned study was to use Harris hip scoring to assess the functional outcomes of two existing fixation methods for intertrochanteric fractures and determine whether device has an advantage over the other in terms of the patient's final functional result.

Methodology

Study Design: In order to assess and contrast the functional results of DHS and PFN in intertrochanteric fractures, the study was planned as a prospective comparative study.

Study Area: The Department of Orthopaedics at Darbhanga Medical College and Hospital (DMCH), Laheriasarai, Darbhanga, Bihar, India.

Study Duration: Over the course of one year from March 2025 to February 2026.

Sample Size: The research comprised forty individuals with intertrochanteric fractures of the femur. The patients were divided into two equal groups at random:

- **Group A:** 20 patients receiving Dynamic Hip Screw (DHS) treatment
- **Group B:** 20 patients receiving proximal femoral nail (PFN) treatment

Inclusion Criteria

The research included patients who met the following requirements:

- 45 years of age or older
- Individuals with closed femur intertrochanteric fractures
- A fracture lasting less than three weeks
- Individuals who were mobile before the injury
- Patients who are ready for surgery are prepared to provide written, informed consent

Exclusion Criteria

The following conditions prevented patients from participating in the study:

- Intertrochanteric fractures that are open
- Malignancy-related pathological fractures
- Ipsilateral femur shaft or neck fractures that are connected
- Individuals suffering from untreated systemic conditions like:
  - Diabetes mellitus without control
  - Uncontrolled high blood pressure
  - Serious heart disease

- Individuals suffering from mental or neurological conditions
- Patients with active infection around the hip joint

Study Procedure: Every patient had a comprehensive clinical examination upon admission, along with a complete history. Radiological assessment and routine laboratory tests were carried out. To confirm the diagnosis and categorise the fracture using the Boyd and Griffin classification, anteroposterior pelvic radiographs of both hips were acquired.

Patients were scheduled for surgery following preanesthesia examination and informed consent. Before surgery, skin or skeletal traction was used to temporarily immobilise the patient. Prior to surgery, all patients received prophylactic intravenous antibiotics (third generation cephalosporin).

Under spinal or general anaesthesia, patients were fixed using either DHS or PFN, depending on which group they were assigned to. Both surgeries were performed using standard surgical methods. Antibiotics were administered intravenously for five days following surgery, and then orally. Between the tenth and fourteenth postoperative days, the sutures were taken out.

On the second or third postoperative day, early quadriceps strengthening activities were started. Based on radiological evaluation and patient tolerability, progressive mobilisation was recommended. Six weeks after surgery, partial weight bearing began, and twelve weeks later, complete weight bearing.

Data Collection: Following surgery, patients were monitored at 6, 12, and 24 weeks. At each visit, radiological and clinical evaluations were performed. The Harris Hip Score (HHS), which evaluates pain, function (including activities of daily living and walking), range of motion, and absence of deformity, was used to measure functional outcome at the final follow-up of 24 weeks. Results were rated as outstanding (90–100), good (80–89), fair (70–79), or bad (<70) according to the HHS, and all pertinent information was methodically documented using a pre-made proforma.

Statistical Analysis: Microsoft Excel was used to enter the data, and SPSS statistical software (version 22) was used for analysis. Frequencies and percentages were used to convey categorical data, whereas the mean and standard deviation were used to express continuous variables.

Comparisons between the DHS and PFN groups were performed using:

- Independent sample T-test for quantitative variables
- Chi-square test for qualitative variables
- p-value < 0.05 was considered statistically significant."

Result

The gender distribution of the DHS and PFN groups did not differ statistically significantly (Table 1). men made up 40% (n = 8) and females 60% (n = 12) of the DHS group, whereas men made up 55% (n = 11) and females 45% (n = 9) of the PFN group. The DHS group's mean patient age was 60.8 ± 10.5 years, whereas the PFN groups was 64.6 ± 12.2 years. In terms of the side of injury, the DHS group had more injuries on the left side (55%), whereas the PFN group had more injuries on the right side (60%). Road traffic accidents were more common in the PFN group, but trivial or self-fall was the most common mechanism in both groups, occurring in 90% of cases in the DHS group and 75% in the PFN group. This difference in the mode of injury between the two groups was statistically significant. According to the Boyd and Griffin categorization, there was no discernible difference in the distribution of fracture types between the two groups, with Type II fractures occurring equally in the PFN group (35% each) and being the most prevalent in the DHS group (50%).

Table 1: Sociodemographic data

Characteristics	DHS Group (n = 20)	PFN Group (n = 20)
Mean age (years ± SD)	60.8 ± 10.5	64.6 ± 12.2
Gender		
Male	8 (40%)	11 (55%)
Female	12 (60%)	9 (45%)
Side of injury		
Left	11 (55%)	8 (40%)
Right	9 (45%)	12 (60%)
Mode of injury		
Road Traffic Accident	2 (10%)	5 (25%)
Trivial/Self fall	18 (90%)	15 (75%)
Boyd & Griffin classification		
Type I	5 (25%)	7 (35%)
Type II	10 (50%)	7 (35%)
Type III	3 (15%)	4 (20%)
Type IV	2 (10%)	2 (10%)

Table 2 summarizes functional results at various follow-up periods. With mean scores of 35.0 ± 3.1 sand 35.6 ± 2.6, respectively, there was no statistically significant difference between the DHS and PFN groups after 6 weeks (p = 0.79). At the 12-week follow-up, however, the PFN group showed far superior results than the DHS group, with mean scores of 63.8 ± 5.4 and 55.9 ± 3.0, respectively (p < 0.001). At the 24-week follow-up, the PFN group had higher mean scores (90.4 ± 6.0) than the DHS group (85.2 ± 6.7), and the difference was statistically significant (p = 0.01).

Table 2: Mean score comparison between the DHS and PFN group at the six, 12 and 24-week follow up

Follow-up interval	DHS (Mean ± SD)	PFN (Mean ± SD)	P-value
6 weeks	35.0 ± 3.1	35.6 ± 2.6	0.79
12 weeks	55.9 ± 3.0	63.8 ± 5.4	<0.001*
24 weeks	85.2 ± 6.7	90.4 ± 6.0	0.01*

Table 3 displays the distribution of functional results for both groups. Seven patients (35%) in the DHS group had excellent outcomes (scoring 90–100), whereas nine patients (45%) had good outcomes (score 80–89). Three patients (15%) had fair results (70–79), whereas one patient (5%) had poor outcomes (<70). On the other hand, 11 patients (55%) in the PFN group had ratings between 90 and 100, indicating a larger percentage of outstanding results. Two patients (10%) reported fair results, whereas seven patients (35%) claimed good results. The PFN group did not exhibit any negative functional results. In general, the functional result profile of the PFN group was superior to that of the DHS group.

Table 3: Functional outcome distribution between DHS and PFN groups

Functional Outcome	DHS (n = 20)	PFN (n = 20)
Excellent (90–100)	7 (35%)	11 (55%)
Good (80–89)	9 (45%)	7 (35%)
Fair (70–79)	3 (15%)	2 (10%)
Poor (<70)	1 (5%)	0 (0%)
Total	**20 (100%)**	**20 (100%)**

Discussion

The orthopaedic community has identified fractures in the intertrochanteric area of the femur as a significant issue, not only in terms of achieving fracture union but also in terms of restoring optimal function in the shortest amount of time with the fewest problems. As a result, the goal of fracture care has shifted to attaining extremely early mobilisation, swift rehabilitation, and a speedy return of the patients to their pre-morbid homes and workplaces as a psychologically and functionally autonomous unit.

In the past, the 1930s saw the introduction of Smith Peterson and Jewet nails. Dynamic hip screws (DHS) and modified sliding devices were created by Pugh and Massie in the 1950s and 60s. Intramedullary nails (IMN) with sliding hip screws (SHS) were created by Kuntscher, Zickle, Grosse, Kempf, Russell, and Taylor [20,21,22]. Intramedullary implants were created in the early 1990s to treat intertrochanteric fractures. Compared to the traditional dynamic hip screw, these devices offered several biomechanical and biological benefits. Numerous previous investigations have established the benefits and drawbacks of the Gamma nail's original design, often by contrasting the outcomes with those of the dynamic hip screw (DHS) [23, 24].

In contrast to sliding hip screws with plates, Kyle et al. have shown that greater pressures are needed to start sliding in intramedullary devices [25]. The Gamma nail demands the most force of any intramedullary device. The side plate's barrel offers a free path for the screw to travel, hence the longer the barrel, the less effort is needed to start moving. The PFN group experienced less shortening than the DHS group because the nail in the medullary canal physically blocks the considerable shortening of the head and neck segments in the fractures.

Pajarinen et al. randomised post-operative rehabilitation trial comparing peritrochanteric femur fractures treated with DHS or PFN revealed that, in comparison to DHS, PFN may enable a quicker post-operative restoration of walking capacity [26]. Patients who received PFN in our research were able to resume their pre-injury walking condition sooner than those who received DHS. A shorter lever arm produced by proximal femoral nailing results in a reduced bending moment and a lower rate of mechanical failure. Because PFN can tolerate higher static and many times higher cycle loads than dynamic hip screws, they have demonstrated greater biomechanical strength. The implant makes up for the medial column's function. Additionally, proximal femoral nails serve as a buttress to stop the shaft from medializing [27, 28].

For almost all fractures in the intertrochanteric area, operative/surgical therapy in the form of internal fixation has become the gold standard since it allows

for extremely early rehabilitation and gives the highest prospects of functional recovery. The compression hip screw is the most widely used (and still the gold standard) of the many types of implants that are available, including intramedullary devices, sliding nails or screw plates, and fixed nail plate devices. However, closed intramedullary nailing surgical techniques have recently become extremely popular."

The PFN and DHS implants were used in this study in an effort to survey, assess, record, and measure our performance in managing such people. The outcomes in these two groups were then compared. Forty patients with proximal femur fractures who attended the outpatient/causality Department of Orthopaedics at Darbhanga Medical College and Hospital in Laheriasarai, Darbhanga, Bihar, India, were included in the research (20 instances by PFN and 20 cases by DHS). considered a university for a single year.

Conclusion

We concluded that Osteoporosis, fracture instability, and the existence of several related comorbidities make intertrochanteric fractures a major problem in the aged population. For the best possible healing, early mobilisation and secure fixation are crucial. Both Dynamic Hip Screw (DHS) and Proximal Femoral Nail (PFN) were shown to be successful treatment modalities for these fractures in the current study; however, PFN showed significantly better functional outcomes, as evidenced by higher Harris Hip Scores at both 12 and 24 weeks of follow-up. Compared to patients treated with DHS, those treated with PFN had superior total functional recovery, better gait and mobility, earlier rehabilitation, and a higher percentage of outstanding results. The biomechanical benefits of PFN, such as its intramedullary location, shorter lever arm, less bending stress on the implant, and improved stability, especially in unstable fracture patterns, may be responsible for these positive outcomes. PFN seems to give clear advantages in terms of quicker healing and better postoperative function, especially in unstable and osteoporotic fractures, even if DHS is still a reliable, popular, and affordable option—particularly in stable intertrochanteric fractures. Therefore, in some situations when early mobilisation and better functional results are the main objectives, PFN can be regarded as a preferred fixation device. However, bigger multicentric studies with longer follow-up times are needed to confirm these results and develop more robust implant selection recommendations.

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