

A Comparative Study Between the Outcomes of Proximal Femoral Nail Versus Dynamic Hip Screw for the Treatment of Intertrochanteric Fractures of the Hip

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ABSTRACT:

Femur intertrochanteric fractures are frequent injuries, especially in the elderly group of people, which is linked to high morbidity and functional impairment. DHS and Proximal Femur Nail (PFN) are common fixation techniques but the most effective modality of treatment is still under debate. The study aims to compare the results of the operative treatment of Trochanteric Hip Fractures (THF) performed with the help of DHS and PFN concerning the length of operation, period to fracture union and functional outcome. Between March 2024 and March 2026, the Department of Orthopaedics at Sree Balaji Medical College and Hospital in Chennai conducted a prospective comparative study. Thirty intertrochanteric fractured patients were selected and randomly assigned to either DHS (n=15) or PFN (n=15) fixation. Patients were monitored clinically and radiologically at six weeks, twelve weeks, and six months. The outcome measures were the duration of operation, time of fracture union, postoperative complications, pain, mobility, shortening of the limb, range of motion, and functional outcome. PFN fixation recorded shorter operative time, shorter incision, reduced postoperative pain, improved mobility recovery, less limb shortening and greater hip flexion than DHS fixation ($p < 0.05$). Fluoroscopy exposure time was significantly higher in the PFN group ($p < 0.001$). Fracture union time was comparable between the two groups ($p = 0.83$). Although functional outcomes favored PFN, the difference was not statistically substantial. Both DHS and PFN provided satisfactory fracture union and functional recovery. However, PFN offered compensations in operative efficiency and postoperative rehabilitation, suggesting its potential benefit for facilitating earlier functional recovery following intertrochanteric fracture fixation.

Keywords: Intertrochanteric fracture; Dynamic Hip Screw; Proximal Femoral Nail; Fracture union; Functional outcome; Orthopedic fixation.

1. Introduction

One prevalent orthopaedic injury among the elderly population is intertrochanteric femur fracture (IFF), and is also linked to significant morbidity, mortality, and loss of function, highlighting the importance of it as a public health issue. The occurrence of these breakages has steadily enlarged worldwide due to the growing prevalence of osteoporosis and the growing number of elderly people. Most intertrochanteric fractures are the consequence of trauma with limited energy, often from a drop from standing height and are associated with long hospital stays, loss of independence and high health care costs. Surgical stabilisation and mobilisation is therefore believed to be crucial as early as possible following an injury to reduce complications and to get back to functional status as close as possible to that before the injury [1].

The main aim of surgery is to attain a stable fixation with early mobilization and rapid rehabilitation. Dynamic Hip Screw (DHS) has traditionally been considered the standard treatment modality of intertrochanteric fracture in which it is believed that it is suitable, as it allows appropriate fracture impaction and guarantee the union of the fracture [2]. However, issues of overextended fracture collapse, shortening of the legs, loss of stability and implant failures have led to exploration of other ways of fixing the fracture [3].

The Proximal Femoral Nail (PFN), a revolutionary intramedullary fixation device, was developed to address some of the biomechanical drawbacks of extramedullary implants. Since PFN is nearer to the femur's mechanical axis, it is thought to have enhanced load sharing and rotational stability, and decreased bending stresses. Recent systematic review showed favorable clinical and radiographic outcomes and PFN has been on the rise in the management of intertrochanteric fracture [4]. PFN has also been shown to have good functional outcomes and

fracture healing in comparison clinical studies especially in unstable fracture configurations [5].

A number of researchers have remarked on the similarities and differences between PFN and other fixation devices, and have cited the advantages of intramedullary fixation as minimal soft tissue dissection, maintenance of fracture biology and enhanced implant stability [6]. Moreover, the outcomes of stable intertrochanteric fractures have been compared in numerous studies and both DHS and PFN have been proven to be effective yet differences in parameters used in surgery, complication and recovery times are still reported [7].

Even though a plethora of fixation means can be used in intertrochanteric fracture, no agreement exists as to the most effective. Countless comparative trials have been conducted with varying results in terms of time to surgery, fracture healing rates, rates of complication and functional outcome after surgery (so it is hard to say which implant is best) [8]. Large heterogeneity between the published studies has also been found with systematic reviews and meta-analysis, with different patient populations and fracture characteristics, surgical techniques and outcome parameters, which has resulted in discrepancies in conclusions [9]. Many studies have evaluated both functional and radiological outcome following DHS and PFN, but it is unclear what the size and significance of these differences are [10]. The results of meta-analysis of the fixation of unstable fractures of the intertrochanteric region have suggested the potential advantage in intramedullary fixation but the heterogeneity of the studies in regard to the type of fixation and the results reported has cast doubt over the generalizability of the results [11]. In addition, some comparative studies comparing DHS and PFN with other fixation methods exist, which minimizes the evidence of direct comparison of these two most popular fixation methods under comparable clinical conditions [12]. With the rising incidence of intertrochanteric fractures and

the continued uncertainty about which fixation technique is best, there remains a need for comparative assessment of DHS versus PFN. The choice of implant is of great importance in achieving successful surgery and in the postoperative recovery and the long-term functional results, especially in elderly patients with poor bone quality [13].

Recent research has highlighted the need to consider patient-centred outcomes, including pain relief, mobility and ability to resume daily activities after surgery as well as fracture healing. In addition, comparative studies have shown conflicting findings with respect to the efficiency of the operation, the rate of complications and the functional recovery of DHS and PFN, so further evaluation is needed in comparable patient cohorts [15].

Therefore, comparing both the groups for the surgical treatment of trochanteric hip fractures (THF) was the goal of the current study. The study compares the operative time, fracture union and functional outcome to determine if the theoretical biomechanical benefits of PFN can be translated into actual clinical benefits, which can help guide evidence-based decision-making in the management of intertrochanteric fractures [16].

Research Objectives

1. To compare the duration of operation in the operative treatment of THF using DHS and PFN.
2. To compare the time to fracture union in patients with THF treated with DHS and PFN.
3. To compare the functional outcomes of THF treated with DHS and PFN.

2. Methodology

2.1 Study Setting and Design

The prospective comparative research was done in the Department of Orthopaedics, Sree Balaji Medical College and Hospital, Chennai, from March 2024 to March 2026. Thirty patients with a diagnosis of IFF were employed and assessed for the comparison of the results of DHS and PFN fixation.

2.2 Study Population and Sampling

The study used purposive sampling, and patients with IFF during the study period were employed for the sample. Thirty patients were chosen, fifteen of whom received DHS fixation and fifteen of whom received PFN fixation. Random selection was used to allocate to the treatment groups.

2.3 Inclusion and Exclusion Criteria

IFF of less than two weeks duration and ambulatory before fracture among individuals over the age of 21 were the eligible for the study. Stable and unstable fracture patterns were evaluated. Patients with pathological fractures, active infection, severe systemic disease or non-traumatic disease of the proximal femur were excluded.

2.4 Preoperative Assessment and Fracture Classification

Detailed clinical assessment, including history taking, assessment of the mechanism of injury, hematologic investigations and radiological examination, was carried out in all patients. Conventional X-rays (plain X-rays) of the anterior and lateral aspects were taken. Fractures were categorized by the Jensen and Michaelsen modification of the Evans classification, where Types III, IV, and V are regarded as unstable and Types I and II as stable. Patients were optimized preoperatively with regards to general condition, hydration, and correction of co-morbidities. Blood transfusions and supportive care were given as necessary.

2.5 Surgical Procedure

The patients were positioned on a fracture table in a supine position for all treatments. Fluoroscopic-guided traction and rotational manoeuvres were used for closed reduction. The DHS group attempted lateral fixation by inserting a lag screw into the femoral head and neck. Side-plate fixation was then performed, and a tip-apex distance of less than 25 mm was considered ideal. In the PFN group, the nails were inserted through a proximal lateral incision in the greater trochanter and the hip and stabilization screws

were inserted into the femoral head and neck and distal locking screws were inserted under fluoroscopy.

2.6 Perioperative and Postoperative Management

Intravenous cephalosporins were given to all patients an hour prior to the procedure and lasted for 2-3 days post-surgery before being switched to oral antibiotics for a further 3-4 days. Aminoglycosides were used as required during the long procedures. Thromboprophylaxis was provided using low molecular weight heparin, analgesics were administered intravenously at first and then orally. Early mobilisation was encouraged with sitting on postoperative day 2 and quadriceps exercises started soon after. Sutures were removed from the 10th to 14th postoperative day and weight bearing was started based on fracture stability and the quality of fixation.

2.7 Follow-up and Outcome Assessment

Six weeks, twelve weeks, and six months after surgery, clinical and radiological follow-up was conducted. Follow-up evaluation included evaluation of fracture union, infection, implant integrity, screw loosening/ cut-out and overall functional recovery. Incision length, surgery time, fluoroscopy time, fracture union time, postoperative complications, the range of hip motion, pain score, mobility score, limb shortening, and functional conclusion were the outcome measures. Pain was calculated on a four-point scale, with malunion being defined as a varus angulation of $> 10^\circ$.

2.8 Functional Outcome Assessment

Functional outcome was assessed based on walking ability, ROM, pain, and LLD, and defined as excellent, good, fair or poor. Excellent outcome (no pain, shortening ≤ 0.5 cm, more than 80% hip mobility, able to walk independently); good outcome (mild pain, 60-80% hip mobility, shortening of 0.5-1.5 cm, walking with minimal support); fair outcome (moderate pain, 40-60% hip mobility, shortening of 1.5-2.5 cm, walking with aids); poor (severe pain, less than 40% mobility, shortening > 2.5 cm, bedridden or wheelchair bound).

2.9 Statistical Analysis

The obtained data were entered and analysed using statistical methods as appropriate. Continuous variables were reported as mean and categorical variables as frequencies and percentages. The DHS and PFN groups were compared using the independent t-test for continuous variables and the Chi-square test for categorical variables. Statistically significant alteration was defined as a p-value of < 0.05 .

3. Results

3.1 Demographic Features

Thirty patients with IFF were studied and were divided into DHS and PFN groups. Most of the study population were elderly women (Table 1). To check the demographic comparability of the groups, baseline demographic characteristics were compared, which revealed no variance among the groups with respect to age or sex distribution.

Table 1. Demographic Profile

Variable	DHS	PFN	Total
Age (years)			
21–30	0	1	1
31–40	1	2	3
41–50	2	3	5
51–60	4	5	9
61–70	8	4	12

Sex			
Female	10 (33.3%)	8 (26.7%)	18 (60.0%)
Male	5 (16.7%)	7 (23.3%)	12 (40.0%)

Statistical significance: Age: $\chi^2 = 1.82$, $p = 0.87$; Sex: $\chi^2 = 0.53$, $p = 0.46$

Figure 1 shows the schematic representation of demographic profile of the subjects in the study in terms of age and sex.

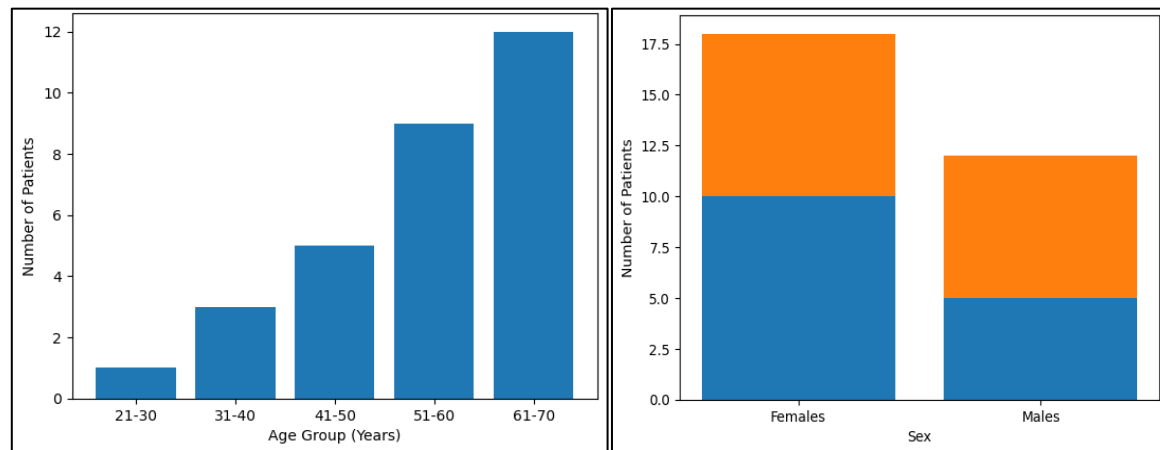


Figure 1. Demographic Profile

Demographic features of the enrolled patients are revealed in above figure. Both the study population and the number of female patients were higher among older persons. The DHS and PFN groups did not vary significantly in terms of demographic characteristics.

3.2 Injury and Fracture Characteristics

The most frequent cause of injury was trivial falls, which is followed by car crashes and falls from

heights. Compared to right-sided fractures, left-sided fractures were somewhat more frequent. The most prevalent fracture pattern was Type 2 fractures, followed by Type 3 fractures (Table 2). There were no substantial alterations between groups DHS and PFN in mode of injury ($\chi^2 = 0.00$, $p = 1.00$), side of injury ($\chi^2 = 1.20$, $p = 0.27$), or type of fracture ($\chi^2 = 2.87$, $p = 0.57$).

Table 2. Injury and Fracture Characteristics

Variables	Category	DHS n (%)	PFN n (%)	Total n (%)
Mode of Injury	Fall from Height	1 (6.7)	1 (6.7)	2 (6.7)
	Road Traffic Accident	2 (13.3)	2 (13.3)	4 (13.3)
	Trivial Fall	12 (80.0)	12 (80.0)	24 (80.0)
Side of Injury	Left	7 (46.7)	10 (66.7)	17 (56.7)
	Right	8 (53.3)	5 (33.3)	13 (43.3)
Fracture Type	T1	1 (6.7)	0 (0)	1 (3.3)
	T2	7 (46.7)	8 (53.3)	15 (50.0)
	T3	5 (33.3)	3 (20.0)	8 (26.7)
	T4	2 (13.3)	3 (20.0)	5 (16.7)
	T5	0 (0)	1 (6.7)	1 (3.3)

A graphical representation of the characteristics of injuries and fractures for patients of both groups is revealed in Figure 2.

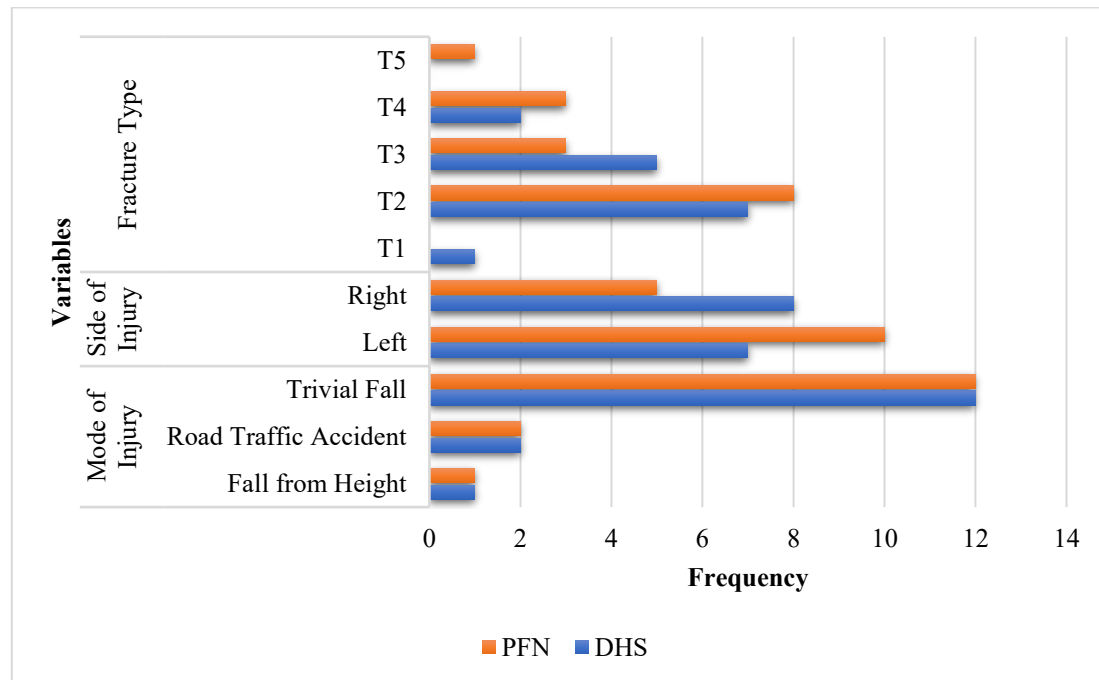


Figure 2. Injury and Fracture Characteristics of the Study Population

Figure 2 shows a graphical comparison of the fracture characteristics and injury patterns of both treatment groups. The distribution of these variables was similar for the both groups and no statistically substantial variance between the groups was found.

3.3 Intraoperative Outcomes

Intraoperative variables were compared, and there were substantial alterations between the two fixation techniques (Table 3). The DHS group had a significantly larger incision size compared to PFN group, and longer operation time compared to PFN group. However, the exposure time for fluoroscopy was pointedly increased in the PFN group.

Table 3. Comparison of Intraoperative Outcomes

Variable	DHS Mean (N=15)	PFN Mean (N=15)	Statistical Significance
Incision Length (cm)	16.15	8.10	$t = 9.21, p < 0.001$
Duration of Surgery (minutes)	87.25	69.50	$t = 5.48, p < 0.001$
Fluoroscopy Time (seconds)	57.50	73.75	$t = 4.12, p < 0.001$

3.4 Postoperative Clinical Outcomes

The postoperative recovery parameters were in favour of PFN fixation. Patients who had PFN had significantly lower postoperative pain scores, greater postoperative hip flexion and improved mobility recovery, and decreased limb shortening

than patients who had DHS fixation (Table 4). Preiop mobility scores were similar between the two groups, but postoperative mobility recovery was pointedly higher in PFN group. There was also a substantial improvement in 3-month

recovery of mobility status to preoperative levels for the PFN-treated patients.

Table 4. Comparison of Postoperative Clinical Outcomes

Variable	DHS	PFN	Statistical Significance
Postoperative Mobility Score	2.25	1.45	$t = 3.67, p = 0.001$
Limb Shortening (cm)	0.5	0.1	$t = 4.89, p < 0.001$
Hip Flexion (°)	110	130	$t = 3.95, p < 0.001$

3.5 Pain and Complications

The postoperative pain score of the PFN group was significantly lower. Of patients treated with PFN, 86.7% reported no or mild pain versus 46.6% of those treated with DHS, and this difference was statistically significant. There were relatively few postoperative complications in

either group. One patient in each group (DHS and PFN) experienced malunion, and two DHS and one PFN patients experienced wound infection. The alteration among the two groups was not statistically substantial although complications were numerically more frequent in the DHS group (Table 5).

Table 5. Postoperative Pain Scores

Pain Score	DHS n (%)	PFN n (%)	Total n (%)
1	2 (13.3)	6 (40.0)	8 (26.7)
2	5 (33.3)	7 (46.7)	12 (40.0)
3	5 (33.3)	2 (13.3)	7 (23.3)
4	3 (20.0)	0 (0.0)	3 (10.0)

Statistical significance: $\chi^2 = 7.92, p = 0.048$

Follow-up was conducted, and any complications were documented to assess the safety and clinical outcomes of the two fixation techniques. The

complications in the both groups are presented in Figure 3.

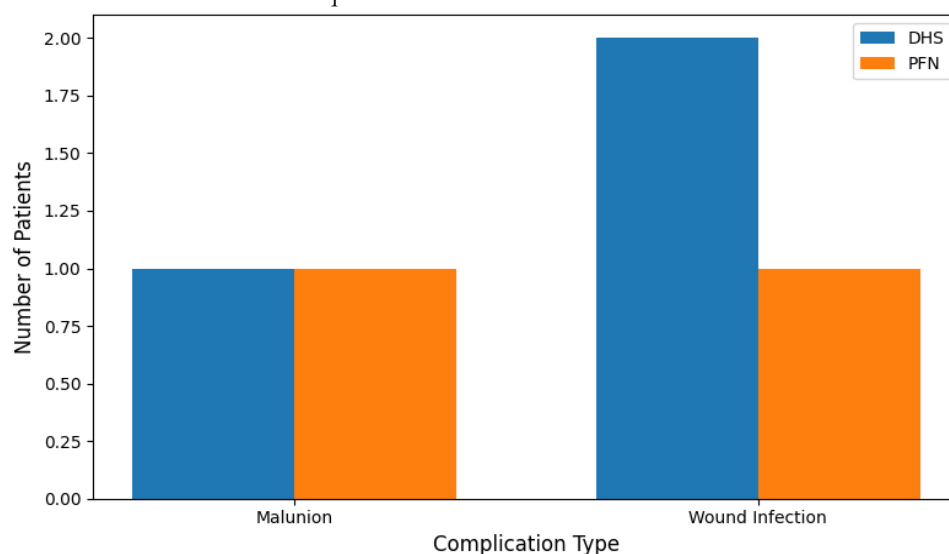


Figure 3. Postoperative Complications in DHS and PFN Groups

As illustrated in Figure 3, there were a few postoperative complications in both treatment groups. The overall complication profile was similar between the two groups, although there was a higher incidence of complications related to the wound in those treated with DHS fixation. In the present study, statistical analysis showed that there was no substantial correlation amongst the type of fixation and the postoperative

complication rate ($\chi^2 = 2.11$, $p = 0.35$), indicating that DHS and PFN were equally safe.

3.6 Functional Outcomes

The overall functional results were good in both treatment groups. Associated to the DHS group, the group of PFN produced more good to exceptional results (Table 6). There was no substantial alteration, however, among the two groups in overall functional outcome.

Table 6. Functional Outcome Distribution

Outcome	DHS n (%)	PFN n (%)	Total n (%)
Excellent	4 (26.7)	4 (26.7)	8 (26.7)
Good	8 (53.3)	10 (66.7)	18 (60.0)
Fair	2 (13.3)	1 (6.7)	3 (10.0)
Poor	1 (6.7)	0 (0.0)	1 (3.3)
Total	15 (100)	15 (100)	30 (100%)

Statistical significance: $\chi^2 \sim 1.44$, $p > 0.05$

Patients receiving PFN and DHS treatment were distributed by functional outcome category as shown in Figure 4.

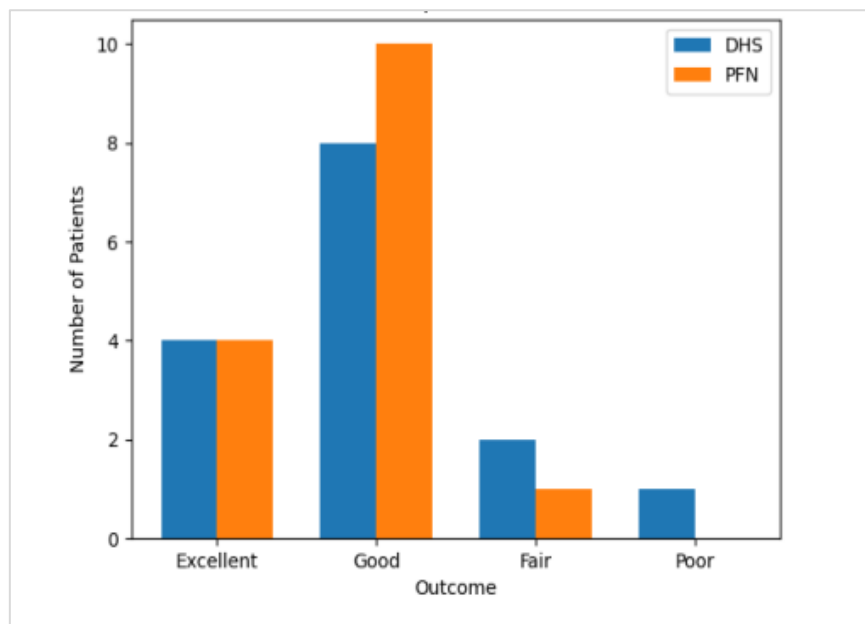


Figure 4. Functional Outcome Distribution

The distribution of patients in four classes of functional outcome after surgical treatment is shown in Figure 4. The graph shows that most patients had their results in the good categories and not too many results in the less good ones.

4. Discussion

The investigation aimed to relate the clinical outcome of DHS and PFN fixation in IFF. Baseline demographics and fracture characteristics were similar across the two groups,

enabling a valid assessment of treatment differences. The results showed PFN was linked to a decrease in incision length, less surgical time, reduced postoperative pain scores, faster recovery of mobility, less limb shortening, and higher postoperative hip flexion. Fracture union times and functional outcomes were similar for both methods, though. The outstanding intra-op and post-op outcomes for PFN may be attributed to the intramedullary nature of the PFN; it can offer stability with limited invasion. Not only that, but smaller incisions were made in the PFN group, with shorter surgery times, which resulted in less soft tissue damage and surgical trauma. In addition, the lower postoperative pain scores, improved recovery of mobility, lesser limb shortening, and improved hip flexion suggest that PFN could allow earlier rehabilitation and restoration of functional independence. Although these benefits exist, fracture union times were similar for both groups, suggesting that both DHS and PFN are operative fixation methods for achieving satisfactory fracture union.

The findings of the investigation are in line with past research. Mansukhani et al. reported good clinical results using PFN for unstable intertrochanteric fractures and noted the biomechanical benefits of PFN over standard fixation methods [17]. In the same manner, Naushad Hussain and Kamat found that the operative time was shorter and functional recovery better in patients treated by PFN than in patients treated by DHS fixation [18]. A recent systematic review and meta-analysis performed by Rasul et al. revealed that PFN can be useful for improving efficiency in surgery and rehabilitation following surgery without compromising the rate of fracture union with DHS [19]. Pehlivanoglu et al. also achieved good results with either implant but did find some functional advantages with PFN fixation [20]. Although Alessio-Mazzola et al. reported similar healing results of intramedullary nailing and DHS fixation, they highlighted differences in the perioperative parameters and the healing profiles of the two procedures [21]. Parikh et al. [22] and Shishodia et al. [23] have reported similar results

of functional and radiological outcome with PFN. In addition, Kassem et al. reported good functional outcomes after intramedullary fixation of unstable trochanteric fractures [24]. These combined studies collectively corroborate the outcomes of the study and hint at several clinical benefits to PFN without compromising the success of fracture healing compared to DHS.

The present study has clinical implications of importance to orthopedic practice. IFF are common among the older people and have a lot of morbidity and independence loss. Thus, the choice of the implant that will allow early mobilisation and functional recovery is crucial. The observed benefits of PFN in terms of reduced postoperative pain, improved mobility, and better range of motion suggest that it may contribute to enhanced postoperative rehabilitation and improved quality of life. However, there is no difference in the rate of union of the fractures or the functional outcome of the patients, suggesting that DHS can still be used as an effective treatment choice if it is carefully selected based on fracture characteristics and patient factors.

There are several gaps in the study. It was a single-centre investigation with a small numbers of patients, and therefore, the results may not be applicable to other institutions. In addition, the follow-up was limited (6 months), and long-term functional outcome, implant survival and late complications were not assessed. The presence of both stable and unstable fracture patterns may also have led to some variation in outcomes of treatment.

More trials with larger multicenter groups and extended term of follow-up are essential to gain a greater sympathetic of the comparative effectiveness of DHS vs PFN. The stratification of

fracture stability and age groups could be useful in the consideration of the implant selection. Future research should also concentrate on functional long-term recovery, quality of life, cost-effectiveness, and patient-reported outcome

metrics, to provide additional evidence of the treatment of IFF.

5. Conclusion

This research aimed at the comparison of clinical and functional outcomes of DHS fixation and PFN fixation of IFF. Results indicated that the both fixation technique had good functional outcome and union of the fracture. However, a few alterations were seen among the two methods of treatment in terms of surgical and post-surgical outcomes. PFN fixation patients had a much shorter incision length, shorter operation duration, reduced postoperative pain index, higher mobility recovery, reduced shortening of the limbs and increased hip flexion angle compared to DHS fixation. These results indicate that the minimally invasive nature and biomechanical benefits of PFN may help improve postoperative rehabilitation and a return

to function. In the PFN group, the duration of the fluoroscopy exposure is higher, but that was not associated with any adverse effects on the outcome. The postoperative complications were also rare in both groups and no substantial alteration was found between the number of complications in both modes of fixation. Both groups attained fracture union rate and the average time to union was comparable indicating that both DHS and PFN are reliable in fracture union. Likewise, there was no statistically substantial alteration in the overall functional outcome although a higher percentage of favorable functional outcomes was seen in the PFN group. Conclusively, IFF is equal between DHS and PFN. PFN has certain benefits in terms of operative effectiveness and post-operative recovery, and can be used to fixate, especially when an early mobility and functional restoration are the treatment objectives of patients.

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