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Original Research Article

FUNCTIONAL OUTCOMES OF DYNAMIC HIP SCREW VERSUS PROXIMAL FEMORAL LOCKING PLATE IN THE SURGICAL MANAGEMENT OF PROXIMAL FEMUR FRACTURES: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT

Background: The optimal extramedullary implant for the management of extracapsular proximal femur fractures remains controversial. Dynamic Hip Screw (DHS) has traditionally been the implant of choice for stable fractures, whereas Proximal Femoral Locking Plate (PFLP) has been advocated for unstable fracture patterns because of its angular stability. This study compared the functional and clinical outcomes of DHS and PFLP fixation in proximal femur fractures.

Materials and Methods: A prospective comparative study was conducted in the Department of Orthopaedics, Narayana Medical College, Nellore, between January 2024 and December 2025. Thirty patients aged 30–70 years with intertrochanteric or subtrochanteric femur fractures were included and allocated into two treatment groups: DHS (n = 15) and PFLP (n = 15). Patients were followed for one year. The primary outcome was functional recovery assessed using the Harris Hip Score (HHS) at 1, 3, 6, and 12 months. Secondary outcomes included duration of surgery, intraoperative blood loss, time to partial and full weight bearing, fracture union, and postoperative complications.

Results: Baseline demographic characteristics and fracture patterns were comparable between the two groups. PFLP fixation required longer operative time and greater intraoperative blood loss than DHS. However, no significant differences were observed in time to partial weight bearing, full weight bearing, or fracture union. Functional outcomes improved progressively in both groups throughout follow-up. Mean HHS at 12 months was 85.0 ± 10.2 in the DHS group and 88.3 ± 11.9 in the PFLP group, without a statistically significant difference (p = 0.426). Similarly, HHS at 1, 3, and 6 months was comparable between the groups. Complication rates, including non-union, implant failure, and varus malunion, were also similar, and no cases of screw cut-out were observed. Patients with unstable fracture subtypes demonstrated delayed union, slower rehabilitation, higher complication rates, and poorer functional outcomes irrespective of the implant used.

Conclusion: Both DHS and PFLP provided satisfactory fracture union and good functional outcomes at one year, with no significant difference in Harris Hip Scores or complication rates. DHS offered the advantages of shorter operative time and lower blood loss, whereas PFLP achieved comparable functional results despite increased operative demands. Implant selection should therefore be guided primarily by fracture morphology and patient-specific factors rather than an expectation of superior functional outcome. For unstable fracture patterns, intramedullary fixation may offer biomechanical advantages and should be considered where appropriate.

Keywords: Dynamic Hip Screw; Proximal Femoral Locking Plate; Proximal femur fracture; Intertrochanteric fracture; Subtrochanteric fracture; Harris Hip Score; Functional outcome.

INTRODUCTION

Proximal femur fractures are among the most common fragility fractures worldwide and are associated with substantial morbidity, mortality, and healthcare costs. Their incidence continues to increase with population ageing and the growing prevalence of osteoporosis. Early surgical fixation remains the standard of care because it facilitates mobilization, reduces complications associated with prolonged immobilization, and improves functional recovery.[1-3]

Dynamic Hip Screw (DHS) has traditionally been considered the standard fixation method for stable intertrochanteric fractures owing to its simplicity, cost-effectiveness, and reliable clinical outcomes.[4] However, its performance in unstable fracture patterns may be compromised by excessive collapse, varus malalignment, limb shortening, and implant failure.[5] Consequently, the Proximal Femoral Locking Plate (PFLP) was developed to provide angular stability and improved fixation, particularly in osteoporotic bone and comminuted fractures.[6] Despite these theoretical biomechanical advantages, PFLP requires greater surgical exposure and is associated with longer operative time and increased blood loss.[7]

Previous comparative studies have reported conflicting results regarding the superiority of DHS or PFLP. While some authors have demonstrated improved maintenance of fracture alignment with locking plates, others have found comparable fracture union, functional outcomes, and complication rates between the two implants.[8-11] Moreover, most available studies have focused primarily on radiological outcomes, whereas prospective data evaluating functional recovery following fixation with these extramedullary implants remain limited, particularly in the Indian population.

The present prospective comparative study was therefore undertaken to compare the functional outcomes of proximal femur fractures treated with Dynamic Hip Screw and Proximal Femoral Locking Plate fixation. Secondary objectives included comparison of operative time, intraoperative blood loss, fracture union, weight-bearing progression, and postoperative complications.

MATERIALS AND METHODS

Study design and participants: This prospective comparative study was conducted in the Department of Orthopaedics, Narayana Medical College and Hospital, Nellore, India, between January 2024 and December 2025. Thirty consecutive patients with proximal femur fractures who fulfilled the eligibility criteria were included after obtaining written informed consent. Ethical approval for the study was obtained from the Institutional Ethics Committee prior to commencement.

Patients aged 30–70 years with intertrochanteric fractures (Boyd and Griffin classification) or subtrochanteric fractures (Seinsheimer classification) requiring operative fixation were eligible for inclusion. Patients younger than 30 years or older than 70 years, those with pathological or open fractures, and patients who were medically unfit for surgery were excluded from the study.

Study groups

Thirty patients were divided into two treatment groups based on the implant used:

- Group A (n = 15): Open reduction and internal fixation using Dynamic Hip Screw (DHS).
- Group B (n = 15): Open reduction and internal fixation using Proximal Femoral Locking Plate (PFLP).

The choice of implant was based on fracture configuration, bone quality, and surgeon preference.

Surgical procedure: All patients underwent preoperative clinical and radiographic evaluation, including anteroposterior radiographs of the pelvis with both hips and anteroposterior and lateral radiographs of the affected femur. Routine laboratory investigations and anaesthetic assessment were performed before surgery.

All procedures were performed by experienced orthopaedic surgeons under spinal or general anaesthesia with the patient positioned supine on a fracture table. Fracture reduction was achieved under fluoroscopic guidance.

Patients in the DHS group underwent fixation using a standard dynamic hip screw and side plate through a lateral approach. In the PFLP group, fixation was performed using a proximal femoral locking plate with multiple proximal locking screws after achieving satisfactory reduction. Intraoperative fluoroscopy was used in both groups to confirm fracture reduction and implant position.

Postoperative protocol and follow-up: All patients received standard postoperative antibiotic prophylaxis, thromboprophylaxis when indicated, analgesia, and physiotherapy. Hip and knee range-of-motion exercises were initiated as tolerated. Weight-bearing progression was guided by fracture stability and radiographic evidence of healing. Patients were followed at 1 month, 3 months, 6 months, and 1 year after surgery for clinical and radiological assessment.

RESULTS

Thirty patients with proximal femur fractures were included in this prospective comparative study, with 15 patients treated using a Dynamic Hip Screw (DHS) and 15 treated using a Proximal Femoral Locking Plate (PFLP). All patients completed the one-year follow-up. Baseline demographic and clinical characteristics, including age, sex, side of injury, mode of injury, and fracture pattern, were comparable between the two groups, indicating adequate baseline matching.

The mean operative time was significantly longer in the PFLP group than in the DHS group (85.67 ± 5.94 vs 63.00 ± 5.28 minutes; p = 0.032). Similarly, mean intraoperative blood loss was significantly greater in the PFLP group (373.33 ± 53.00 mL) compared with the DHS group (272.00 ± 58.94 mL; p < 0.001).

The mean time to initiation of partial weight bearing (7.73 ± 3.28 vs 7.07 ± 2.60 weeks; p = 0.543), full weight bearing (11.07 ± 5.12 vs 10.27 ± 5.06 weeks; p = 0.670), and radiological fracture union (14.77 ± 4.66 vs 12.83 ± 3.86 weeks; p = 0.268) did not differ significantly between the DHS and PFLP groups.

Functional outcome assessed using the Harris Hip Score (HHS) demonstrated progressive improvement in both groups throughout follow-up. At 1 month, the mean HHS was 71.67 ± 4.10 in the DHS group and 71.20 ± 5.29 in the PFLP group (p = 0.789). At 3 months, the corresponding scores were 77.80 ± 3.34 and 78.20 ± 3.75 (p = 0.760). At 6 months, the mean HHS increased to 83.20 ± 4.69 and 83.27 ± 5.91, respectively (p = 0.973). At the final one-year follow-up, the mean HHS was 85.00 ± 10.20 in the DHS group and 88.27 ± 11.89 in the PFLP group, with no statistically significant difference (p = 0.426).

Overall, 17 patients (56.7%) achieved an excellent functional outcome, eight (26.7%) had a good outcome, none had a fair outcome, and five (16.6%) had a poor outcome, indicating satisfactory (excellent or good) results in 83.4% of the study population.

Postoperative complications were comparable between the two groups. Non-union occurred in two patients (13.3%) in the DHS group and three patients (20.0%) in the PFLP group (p = 1.000). Implant failure was observed in two DHS patients (13.3%) and one PFLP patient (6.7%) (p = 1.000). No cases of screw cut-out were encountered in either group, while varus malunion occurred in two DHS patients (13.3%) and none of the PFLP patients (p = 0.483).

Table 1: Baseline demographic and clinical characteristics

Variable	DHS (n=15)	PFLP (n=15)	Total (n=30)	p-value
Age 30–40	2 (13.3%)	1 (6.7%)	3 (10.0%)	0.430
Age 41–50	3 (20.0%)	3 (20.0%)	6 (20.0%)	
Age 51–60	5 (33.3%)	2 (13.3%)	7 (23.3%)	
Age >60	5 (33.3%)	9 (60.0%)	14 (46.7%)	
Male	9 (60.0%)	10 (66.7%)	19 (63.3%)	1.000
Female	6 (40.0%)	5 (33.3%)	11 (36.7%)	
Right	8 (53.3%)	9 (60.0%)	17 (56.7%)	1.000
Left	7 (46.7%)	6 (40.0%)	13 (43.3%)	
RTA	8 (53.3%)	7 (46.7%)	15 (50.0%)	1.000
Trivial fall	7 (46.7%)	8 (53.3%)	15 (50.0%)	
Intertrochanteric I	2	2	4	1.000
Intertrochanteric II	3	3	6	1.000
Intertrochanteric III	2	3	5	1.000
Intertrochanteric IV	1	2	3	1.000
Subtrochanteric I	1	0	1	1.000
Subtrochanteric II	2	1	3	1.000
Subtrochanteric III	2	1	3	1.000
Subtrochanteric IV	1	2	3	1.000
Subtrochanteric V	1	1	2	1.000

Table 2: Operative variables

Variable	DHS	PFLP	p-value
Operative time (min)	63.00 ± 5.28	85.67 ± 5.94	0.032
Blood loss (mL)	272.00 ± 58.94	373.33 ± 53.00	<0.001

Table 3: Rehabilitation and fracture union

Variable	DHS	PFLP	p-value
Partial Weight-bearing (weeks)	7.73 ± 3.28	7.07 ± 2.60	0.543
Full Weight-bearing (weeks)	11.07 ± 5.12	10.27 ± 5.06	0.670
Union (weeks)	14.77 ± 4.66	12.83 ± 3.86	0.268

Table 4: Harris Hip Score

Follow-up	DHS	PFLP	p-value
1 month	71.67 ± 4.10	71.20 ± 5.29	0.789
3 months	77.80 ± 3.34	78.20 ± 3.75	0.760
6 months	83.20 ± 4.69	83.27 ± 5.91	0.973
1 year	85.00 ± 10.20	88.27 ± 11.89	0.426

Table 5: Complications

Complication	DHS	PFLP	p-value
Non-union	2 (13.3%)	3 (20.0%)	1.000
Implant failure	2 (13.3%)	1 (6.7%)	1.000

Screw cut-out	0	0	-
Varus malunion	2 (13.3%)	0	0.483

Table 6: Final functional outcome

Outcome	n (%)
Excellent	17 (56.7)
Good	8 (26.7)
Fair	0
Poor	5 (16.6)

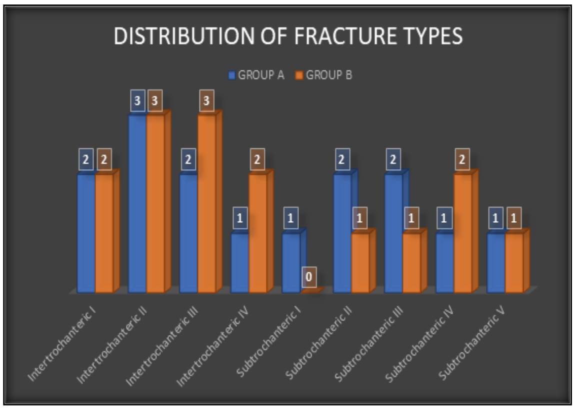


Figure 1: Distribution of Fracture Types

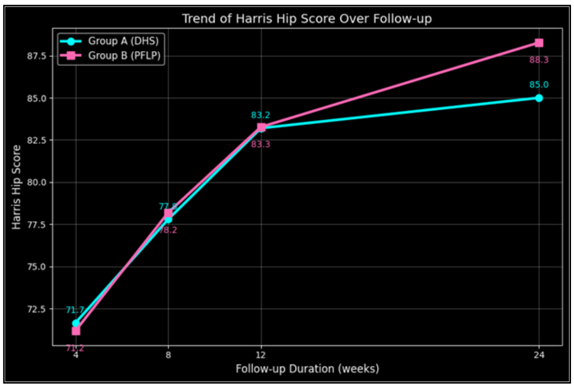
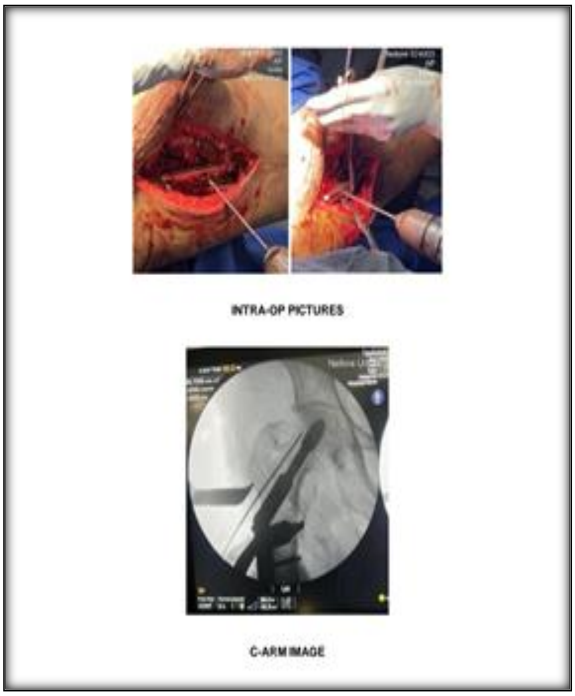
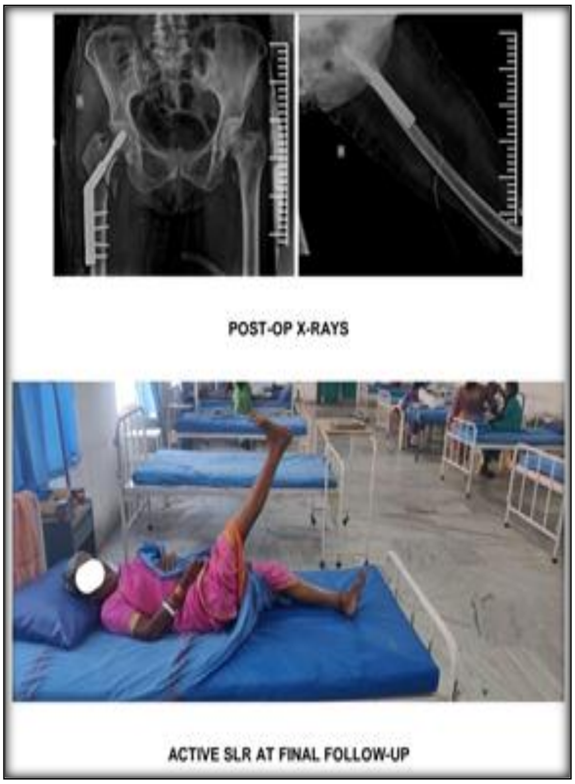


Figure 2: Functional Outcome (HHS)

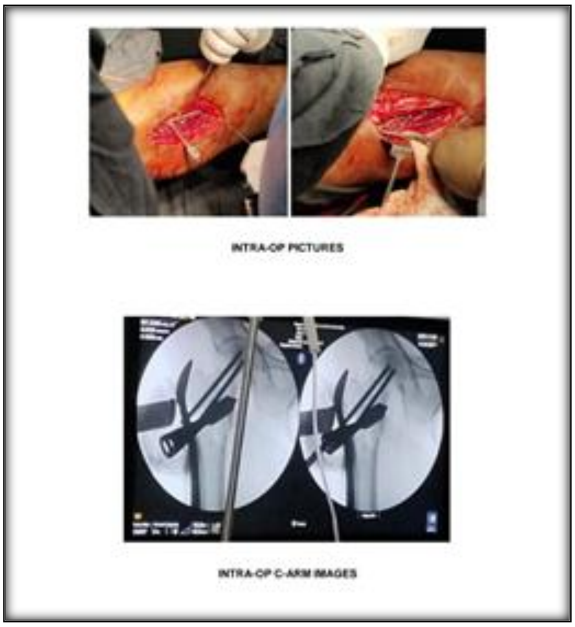
Case illustrations

Case – 1





Case – 2



DISCUSSION

The optimal fixation method for proximal femur fractures continues to be debated because treatment outcomes are influenced by fracture morphology, bone quality, implant biomechanics, and surgical technique rather than implant selection alone. The present prospective comparative study evaluated perioperative variables, fracture healing, functional outcomes, and complications following fixation with Dynamic Hip Screw (DHS) and Proximal Femoral Locking Plate (PFLP). The principal findings of this study were that PFLP fixation was associated with significantly longer operative time and greater intraoperative blood loss, whereas fracture union, functional recovery measured using the Harris Hip Score, and complication rates were comparable between the two groups.

The baseline demographic characteristics were well matched between the treatment groups. There were no statistically significant differences in age, sex distribution, fracture laterality, mechanism of injury, or fracture pattern, minimizing selection bias and allowing reliable comparison of outcomes between implants. Nearly half of the patients were older than 60 years, reflecting the increasing incidence of proximal femur fractures with advancing age and osteoporosis. Similar demographic profiles have been reported by Dhamangaonkar et al. and Yadav et al., whose comparative studies also demonstrated balanced baseline characteristics between treatment groups.[12,13]

The present study demonstrated that operative time was significantly longer in patients treated with PFLP. This finding is expected because locking plate fixation requires more extensive exposure, accurate contouring and positioning of the plate, insertion of multiple locking screws, and greater fluoroscopic guidance. In contrast, DHS fixation is technically less demanding and follows a standardized surgical technique. Comparable findings have been reported by Dhamangaonkar et al., who observed significantly prolonged operative duration with locking plate fixation, and by several Indian comparative studies evaluating DHS and locking plate constructs.[12,14]

Similarly, intraoperative blood loss was significantly higher in the PFLP group. The greater blood loss is likely attributable to wider surgical exposure, increased periosteal stripping, and longer operative duration. Blood loss is an important consideration in elderly patients with multiple comorbidities, where perioperative anemia may delay rehabilitation and increase postoperative morbidity. Previous comparative studies have consistently demonstrated greater blood loss with plate fixation than DHS, supporting the findings of the present study.[12,15]

Despite differences in operative parameters, rehabilitation milestones were comparable between the two groups. Time to initiation of partial weight bearing and full weight bearing did not differ significantly, suggesting that both implants provided sufficient stability to permit similar rehabilitation protocols. Rehabilitation after proximal femur fracture depends not only on implant stability but also on fracture reduction, patient compliance, muscle strength, and associated medical conditions. Similar observations have been reported by Yadav et al., who found that postoperative mobilization was determined more by fracture stability than implant design.[13]

Radiological union occurred at similar intervals in both treatment groups. Although the PFLP group demonstrated a numerically shorter union time, the difference did not reach statistical significance. Fracture healing depends on biological preservation, quality of reduction, and stable fixation rather than implant choice alone. DHS allows controlled collapse and compression across the fracture site, whereas locking plates provide angular stability, particularly in osteoporotic bone. These differing biomechanical principles may ultimately produce similar healing rates when appropriately applied. Comparable union rates have been reported in randomized and prospective comparative studies evaluating DHS and locking plate fixation.[12,16]

Functional recovery showed progressive improvement throughout follow-up in both treatment groups. Harris Hip Scores increased steadily from one month to one year, with no statistically significant differences between implants at any assessment interval. Early postoperative function primarily reflects pain control and rehabilitation, whereas later outcomes depend on fracture union, restoration of biomechanics, and muscle recovery. The comparable functional outcomes observed in this study suggest that when satisfactory reduction and stable fixation are achieved, implant selection has limited influence on medium-term hip function.

At the final one-year follow-up, patients treated with PFLP achieved a slightly higher mean Harris Hip Score than those treated with DHS; however, the difference was not statistically significant. This observation is consistent with previous reports suggesting that although locking plates may theoretically provide better maintenance of alignment in unstable fractures, these biomechanical advantages do not necessarily translate into superior functional outcomes. Dhamangaonkar et al. similarly demonstrated comparable Harris Hip Scores despite improved radiographic parameters with locking plates, while Yadav et al. found no significant difference in functional recovery between the two implants.[12,13]

Postoperative complications were comparable between the two treatment groups. Rates of non-union, implant failure, and varus malunion did not differ significantly, and no cases of screw cut-out were encountered. The absence of screw cut-out probably reflects careful surgical technique, satisfactory fracture reduction, and appropriate implant positioning. The comparable complication profile suggests that both implants can be used safely when proper indications and operative principles are followed. Similar findings have been reported in several prospective studies and systematic reviews comparing extramedullary fixation methods.[13,17]

An important observation from the present study was that unstable fracture patterns, particularly intertrochanteric type III and IV fractures and Seinsheimer type III–V subtrochanteric fractures, demonstrated inferior functional recovery and higher complication rates irrespective of implant choice. Although the study was not powered for subgroup analysis, these findings support the growing evidence that unstable fracture morphology may be better managed using intramedullary fixation. Modern cephalomedullary nails provide shorter lever arms, improved load sharing, and superior resistance to varus collapse compared with extramedullary implants. Recent meta-analyses have therefore recommended intramedullary fixation as the preferred treatment for unstable proximal femur fractures.[18,19]

The present study has several strengths. It employed a prospective design, standardized follow-up for one year, uniform outcome assessment using the Harris Hip Score, and direct comparison of two commonly used extramedullary implants. Baseline characteristics were comparable between the groups, minimizing important confounding factors.

Nevertheless, certain limitations should be acknowledged. The relatively small sample size limited statistical power to detect small differences between implants. This was a single-center study, which may reduce the generalizability of the findings. Bone mineral density was not objectively measured, although osteoporosis is known to influence fixation stability and fracture healing. Finally, the follow-up period of one year may not adequately evaluate long-term implant survival, late complications, or functional deterioration. Future multicenter randomized studies involving larger patient cohorts and longer follow-up are required to validate these findings and to better define implant selection according to specific fracture morphology.

Overall, the findings of the present study suggest that both DHS and PFLP provide satisfactory clinical and radiological outcomes when appropriately selected. Although PFLP fixation requires longer operative time and results in greater blood loss, these disadvantages did not adversely affect fracture union or long-term functional recovery. Implant selection should therefore be individualized according to fracture configuration, bone quality, and surgeon expertise rather than an expectation of superior functional outcome with either implant.

CONCLUSION

In this prospective comparative study, Dynamic Hip Screw (DHS) and Proximal Femoral Locking Plate (PFLP) fixation demonstrated comparable radiological and functional outcomes in the management of proximal femur fractures. Although

PFLP fixation was associated with significantly longer operative time and greater intraoperative blood loss, these differences did not adversely affect fracture union, postoperative rehabilitation, or one-year functional outcomes as assessed by the Harris Hip Score. Postoperative complication rates were also comparable between the two treatment groups.

The findings suggest that implant selection should be individualized according to fracture morphology, bone quality, and surgeon expertise rather than the expectation of superior functional outcomes with either implant. While DHS remains an effective and less invasive option for stable fracture patterns, PFLP provides an acceptable alternative in selected unstable fractures. However, considering the relatively poorer outcomes observed in unstable intertrochanteric and subtrochanteric fracture patterns, intramedullary fixation using proximal femoral nails may be preferable whenever biomechanically indicated.

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