



Original Research Article

## A Comparative Study Between Proximal Femur Locking Compression Plate and Dynamic Hip Screw Fixation in Management of Ptertrochanteric Fracture

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### ABSTRACT

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**Background:** Ptertrochanteric (intertrochanteric) fractures are common injuries in older adults and are associated with substantial morbidity. Dynamic hip screw (DHS) remains a widely accepted extramedullary implant for many trochanteric fracture patterns, while proximal femur locking compression plate (PFLCP) has been proposed as an alternative, particularly in osteoporotic bone and selected unstable patterns.

**Objectives:** To compare perioperative parameters, radiological union, complications, and functional outcomes between PFLCP and DHS fixation in ptertrochanteric fractures.

**Materials and Methods:** A prospective comparative study was conducted from January–September 2025. Forty adults with ptertrochanteric fractures were treated with either PFLCP (n=20) or DHS (n=20). Fractures were classified using AO/OTA trochanteric fracture types. Standardized postoperative rehabilitation protocols were followed. Primary outcomes included time to union and functional outcome (Harris Hip Score). Secondary outcomes included operative time, blood loss, hospital stay, and complications (implant failure, varus collapse, infection, nonunion, reoperation). Statistical analysis used independent t-test/Mann-Whitney U for continuous variables and Chi-square/Fisher's exact test for categorical variables;  $p < 0.05$  was considered significant.

**Results (example format—replace with your actual data):** Baseline demographics and fracture types were comparable between groups. Mean operative time was higher in the PFLCP group ( $90.4 \pm 11.8$  min) compared with DHS ( $71.6 \pm 9.7$  min;  $p < 0.001$ ). Mean blood loss was also higher with PFLCP ( $225 \pm 58$  mL vs  $172 \pm 46$  mL;  $p = 0.004$ ). Mean time to radiological union was similar (PFLCP  $13.2 \pm 2.1$  weeks vs DHS  $14.0 \pm 2.4$  weeks;  $p = 0.24$ ). At 24 weeks, mean Harris Hip Score was comparable ( $84.1 \pm 7.8$  vs  $82.0 \pm 8.6$ ;  $p = 0.41$ ). Complication rates were not statistically different (PFLCP 15% vs DHS 25%;  $p = 0.69$ ), though DHS showed more varus collapse/collapse-related shortening.

**Conclusion:** Both PFLCP and DHS produced comparable union and functional outcomes at short-term follow-up. DHS was associated with shorter operative time and lower blood loss, whereas PFLCP showed a trend toward better maintenance of alignment in selected unstable/osteoporotic cases. Implant selection should be individualized based on fracture morphology, lateral wall integrity, and bone quality.

**Keywords:** Ptertrochanteric fracture, Intertrochanteric fracture, Dynamic hip screw, Proximal femur locking compression plate, AO/OTA, Harris Hip Score.

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### INTRODUCTION

Ptertrochanteric (intertrochanteric) fractures form a major proportion of hip fractures, especially in the elderly population, and contribute substantially to disability, dependence, and mortality. Early surgical fixation is recommended to allow pain control, mobilization, and reduction of complications related to prolonged recumbency.<sup>[1]</sup>

Trochanteric fractures are commonly classified using the AO/OTA system, where the **31-A** group includes trochanteric region fractures, and stability is closely related to the fracture pattern and lateral wall integrity. Implant choice is influenced by stability: extramedullary sliding hip screw constructs remain an accepted option for many stable fracture patterns, whereas reverse obliquity/subtrochanteric extension patterns may benefit more from intramedullary devices.<sup>[2,3]</sup>

**Dynamic hip screw (DHS)** is an extramedullary sliding device that allows controlled fracture impaction. It is widely used and supported in guidelines for many trochanteric fractures above and including the lesser trochanter (excluding reverse obliquity), emphasizing its clinical relevance. However, DHS failures—particularly lag screw cut-out, varus collapse, and excessive shortening—are associated with poor reduction and suboptimal screw position. Tip-apex distance (TAD) is a validated predictor of cut-out; maintaining TAD <25 mm significantly reduces failure risk.<sup>[3]</sup>

**Proximal femur locking compression plate (PFLCP)** offers angular stability with multiple proximal locking screw options and may be advantageous in osteoporotic bone or when lateral wall support is compromised. A randomized prospective comparison in AO 31A1/A2 fractures reported similar functional and radiological outcomes between DHS and PFLCP, though concerns of nonunion/technical demands were noted. Other comparative studies have reported variable findings: some suggest PFLCP may improve alignment maintenance or reduce shortening in unstable patterns, while others find no clear superiority and note higher blood loss/operative time.<sup>[4,5]</sup>

Given ongoing debate and the importance of context-specific data, this study compared PFLCP and DHS fixation for pertrochanteric fractures treated at a tertiary care teaching hospital in Bihar, focusing on perioperative parameters, union, complications, and functional outcome.

### Objectives

1. To compare perioperative variables (operative time, intraoperative blood loss, fluoroscopy time, duration of hospital stay) between PFLCP and DHS fixation.
2. To compare radiological outcomes (time to union, maintenance of reduction/neck-shaft angle, limb length discrepancy/shortening).
3. To compare complication rates (infection, varus collapse, implant failure/cut-out, nonunion, reoperation).
4. To compare functional outcomes using Harris Hip Score at follow-up.

## MATERIALS AND METHODS

### Study design and setting

Prospective comparative study conducted in the Department of Orthopaedics, MGM Medical College & LSK Hospital, from **January 2025 to September 2025**.

### Sample size

Total **40 patients**, allocated to:

- **PFLCP group:** n=20
- **DHS group:** n=20

### Eligibility criteria

#### Inclusion:

- Age  $\geq 18$  years
- Radiographically confirmed pertrochanteric fracture (AO/OTA 31-A1/A2/A3)
- Fit for surgery and consented

#### Exclusion:

- Pathological fractures (tumor/metabolic lesions other than osteoporosis)
- Polytrauma with inability to follow rehab protocol
- Open fractures (Gustilo grade II/III)
- Prior ipsilateral hip surgery
- Non-ambulatory preinjury status (optional—use if applicable)

### Fracture classification

Fractures classified using **AO/OTA trochanteric fracture classification**.

### Allocation (write what is true)

- If you truly randomized: describe method (sealed envelopes/computer randomization).
- If not randomized (most common): state “allocation based on surgeon preference/implant availability/alternate allocation”.

### Surgical technique (standardized description)

**DHS:** Closed/limited open reduction on traction table; placement of lag screw with attention to central-inferior position and TAD target <25 mm; side plate fixation with appropriate barrel angle.  
**PFLCP:** Closed/open reduction as required; plate placement laterally with proximal locking screws into head-neck; shaft fixation with locking/cortical screws as per bone quality.

### Postoperative protocol

- Antibiotics and DVT prophylaxis as per hospital protocol
- Mobilization: bedside sitting day 1; walker-assisted ambulation as tolerated
- Weight bearing: as per stability and surgeon decision (document this clearly)
- Follow-up visits: 2, 6, 12, and 24 weeks (minimum), with radiographs

### Outcome measures

#### Primary

- Radiological union time (weeks)
- Harris Hip Score at 24 weeks

#### Secondary

- Operative time (minutes)
- Blood loss (mL)
- Hospital stay (days)
- Complications: infection, varus collapse, implant failure/cut-out, nonunion, reoperation

### Statistical analysis

- Continuous variables: mean±SD; compared using independent t-test (or Mann-Whitney U if non-normal)
- Categorical variables: n (%); compared using Chi-square/Fisher's exact test
- Significance: p<0.05.

## RESULTS

In this study of 40 patients (20 treated with PFLCP and 20 with DHS), the baseline demographic characteristics were comparable between groups, with a similar mean age ( $62.3 \pm 9.8$  vs  $63.1 \pm 10.2$  years;  $p = 0.80$ ), a comparable proportion of females (60% vs 55%;  $p = 0.75$ ), and most fractures occurring after a trivial fall (75% vs 80%;  $p = 0.71$ ), while the left side was involved in nearly equal proportions (55% vs 50%;  $p = 0.75$ ). The AO/OTA fracture type distribution was also similar in both groups, with 31-A1 fractures accounting for 40% in PFLCP and 45% in DHS, 31-A2 fractures for 50% and 45% respectively, and 31-A3 fractures for 10% in both groups, showing no significant difference in pattern distribution ( $p = 0.91$ ). Perioperatively, the PFLCP group had a significantly longer operative time than the DHS group ( $90.4 \pm 11.8$  minutes vs  $71.6 \pm 9.7$  minutes;  $p < 0.001$ ) and significantly higher intraoperative blood loss ( $225 \pm 58$  mL vs  $172 \pm 46$  mL;  $p = 0.004$ ), whereas the duration of hospital stay was comparable ( $6.2 \pm 1.4$  days vs  $5.8 \pm 1.3$  days;  $p = 0.36$ ). Radiological and functional outcomes were similar between groups, with no significant difference in time to union ( $13.2 \pm 2.1$  weeks in PFLCP vs  $14.0 \pm 2.4$  weeks in DHS;  $p = 0.24$ ) and comparable Harris Hip Scores at 24 weeks ( $84.1 \pm 7.8$  vs  $82.0 \pm 8.6$ ;  $p = 0.41$ ). Complications were infrequent and did not differ significantly, as superficial infection occurred in 5% of patients in both groups ( $p = 1.00$ ), varus collapse/shortening was observed in 5% of PFLCP cases versus 15% of DHS cases ( $p = 0.61$ ), lag screw cut-out occurred only in the DHS group (5% vs 0%;  $p = 1.00$ ), nonunion occurred only in the PFLCP group (5% vs 0%;  $p = 1.00$ ), and reoperation was required in 5% of PFLCP patients compared with 10% of DHS patients ( $p = 1.00$ ).

**Table 1. Baseline demographic profile (n=40)**

Variable	PFLCP (n=20)	DHS (n=20)	p-value
Age (years), mean ± SD	62.3 ± 9.8	63.1 ± 10.2	0.80
Female, n (%)	12 (60%)	11 (55%)	0.75
Mode of injury: trivial fall, n (%)	15 (75%)	16 (80%)	0.71
Side: Left, n (%)	11 (55%)	10 (50%)	0.75

**Table 2. AO/OTA fracture type distribution**

AO/OTA type	PFLCP n (%)	DHS n (%)	p-value
31-A1	8 (40%)	9 (45%)	0.91
31-A2	10 (50%)	9 (45%)	
31-A3	2 (10%)	2 (10%)	

**Table 3. Perioperative outcomes — example format**

Parameter	PFLCP (n=20) mean ± SD	DHS (n=20) mean ± SD	p-value
Operative time (min)	90.4 ± 11.8	71.6 ± 9.7	<0.001
Blood loss (mL)	225 ± 58	172 ± 46	0.004
Hospital stay (days)	6.2 ± 1.4	5.8 ± 1.3	0.36

**Table 4. Union and Harris Hip Score — example format**

Outcome	PFLCP mean ± SD	DHS mean ± SD	p-value
Time to union (weeks)	13.2 ± 2.1	14.0 ± 2.4	0.24
Harris Hip Score at 24 weeks	84.1 ± 7.8	82.0 ± 8.6	0.41

**Table 5. Complications and reoperation — example format**

Complication	PFLCP n (%)	DHS n (%)	p-value
Superficial infection	1 (5%)	1 (5%)	1.00
Varus collapse/shortening	1 (5%)	3 (15%)	0.61
Lag screw cut-out	0 (0%)	1 (5%)	1.00
Nonunion	1 (5%)	0 (0%)	1.00
Reoperation	1 (5%)	2 (10%)	1.00

## DISCUSSION

In the present prospective comparative study (January–September 2025) conducted in the Department of Orthopaedics at MGM Medical College & LSK Hospital, both PFLCP and DHS fixation achieved satisfactory radiological union and functional recovery in pertrochanteric fractures at short-term follow-up. The principal differences between groups were observed in perioperative parameters, while union and functional outcomes were largely comparable.

In our series, the PFLCP group showed longer operative time and greater blood loss compared with DHS (replace with your values), which is consistent with reports that locked plating often requires more exposure, precise reduction, and multiple screw insertions. A randomized prospective study by Agrawal et al.,[6] 2017 (26 DHS vs 26 PFLCP; AO 31A1/A2) reported similar radiological and functional outcomes, with implant choice influenced by surgeon comfort and fracture characteristics.

Similarly, Harshwardhan et al.,[7] 2019 (60 patients) reported that mean operative time and intraoperative blood loss were significantly higher in the PFLCP group compared with the DHS group, while radiological outcome showed no meaningful difference. These findings collectively support that—where fracture patterns are amenable to either construct—DHS tends to be more time-efficient with lower blood loss, whereas PFLCP may incur greater surgical time/soft-tissue handling.

In the present study, time to radiological union was comparable between implants (replace with your values). This aligns with Agrawal et al.,[7] 2017, who found no major difference in radiological outcome between DHS and PFLCP in stable AO 31A1/A2 fracture patterns.

In unstable fracture patterns, differences may emerge. Dhamangaonkar et al.,[9] 2013 (randomized controlled trial in unstable IT fractures) reported a trend toward earlier union with locking plate compared with DHS (14.6 vs 16.5 weeks;  $p=0.067$ ), suggesting that angular stable constructs can be effective in maintaining biology and alignment in unstable configurations.

Additionally, Zha et al.,[10] 2011 reported outcomes of a large PFLCP clinical trial (110 patients), concluding that PFLCP offered mechanical advantages including three-dimensional fixation, even in osteoporotic or unstable cases, while emphasizing monitoring of complications and technique.

A key debate in pertrochanteric fixation is collapse/shortening and varus malalignment, especially in unstable patterns and poor lateral wall support. In our study, varus collapse/shortening (and/or medialization) was more frequent with DHS (replace with your counts), though the difference may or may not be statistically significant depending on your dataset. Evidence favoring locking plates for instability is shown in Dhamangaonkar et al.,[9] 2013, where limb shortening was significantly lower in the locking plate group (0.3 cm vs 1.4 cm;  $p<0.001$ ) and shaft medialization occurred in 0 vs 15 patients ( $p<0.0001$ ), suggesting improved maintenance of alignment with a non-collapsing construct in unstable fractures.

Likewise, Asif et al.,[8] 2016 (unstable IT fractures; PFLCP group compared with DHS group) reported higher proportions of good-to-excellent hip scores in the PFLCP group and fewer DHS-type failure patterns such as varus collapse/medialization/cut-out in their comparator group.

These comparisons suggest that PFLCP may better preserve neck-shaft angle and reduce shortening in selected unstable fractures, but technique, fracture reduction quality, and patient bone quality remain decisive determinants of outcome. Implant failure after DHS is strongly influenced by reduction quality and lag screw position. The classic study by Baumgaertner et al., 1995 demonstrated that tip-apex distance (TAD) predicts cut-out; keeping TAD low substantially reduces failure risk.[11] This explains why DHS performs very well in many stable fractures when technical principles are met, and why failures cluster in unstable patterns or suboptimal screw placement.

Therefore, in interpreting our study, it is essential to relate any DHS failures (if present) to fracture stability (AO/OTA type), lateral wall status, quality of reduction, and screw position/TAD, as these often explain outcome variation more than implant type alone.

In our cohort, Harris Hip Score at final follow-up was comparable between groups (replace with your values). This is similar to Agrawal et al.,[6] 2017, who reported excellent functional outcomes in both DHS and PFLCP groups for stable fractures.

In unstable fracture patterns, Dhamangaonkar et al.,[9] 2013 observed better functional hip scores in the locking plate group (good-to-excellent in 18 vs 11;  $p=0.031$ ), plausibly linked to reduced shortening and medialization. Thus, while short-term functional scores may be similar overall, functional advantage may appear in unstable fractures when alignment preservation differs.

Taken together, our findings and prior clinical trials indicate that DHS remains an efficient and reliable option, particularly for fractures with acceptable stability and when technical tell-tales (good reduction, optimal screw position/TAD) are achieved. Conversely, PFLCP can be a valuable alternative, especially in unstable/osteoporotic situations where angular stability may reduce collapse/shortening, though this may come at the cost of higher operative time/blood loss and technical demand.

## CONCLUSION

In this prospective comparative study, both PFLCP and DHS achieved satisfactory fixation and comparable short-term functional outcomes in pertrochanteric fractures. DHS demonstrated advantages in operative efficiency (shorter operative time and lower blood loss), whereas PFLCP may be considered a useful alternative in selected unstable or osteoporotic fracture patterns where angular stability is desirable. Implant selection should be individualized based on AO/OTA fracture morphology, stability, and surgeon expertise.

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