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ORIGINAL ARTICLE

# Proximal Femoral Nailing versus 95° Dynamic Condylar Screw Fixation in Subtrochanteric Femoral Fractures: A Comparative Study of 40 Cases

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## ABSTRACT

**Background.** Subtrochanteric femoral fractures present treatment challenges due to complex anatomy and biomechanical stressors. While PFN is associated with shorter surgical time and improved early mobility, DCS may still be the preferred option in specific fracture morphologies or resource-constrained settings like those in India. The objective of this study was to evaluate and compare the clinical, functional, and radiological outcomes of Proximal Femoral Nailing (PFN) versus the 95° Dynamic Condylar Screw (DCS).

**Methodology.** This prospective study was carried out between July 2023 and March 2025 at a tertiary care centre in India. Forty patients aged more than 18 years with closed subtrochanteric fractures were enrolled and randomized into PFN and DCS groups. Perioperative metrics (operation time, blood loss), postoperative pain (VAS), time to mobilization, union rate, complications, and functional outcomes (Harris Hip Score) were assessed at 6, 12, 24 weeks, and 1 year.

**Results.** Operative time (PFN: 53 ± 12.6 min vs. DCS: 75.6 ± 12.3 min, $p$ <0.001) and intraoperative blood loss (PFN: 150.2 ± 20.4 ml vs. DCS: 197.1 ± 45.5 ml, $p$ <0.001) were significantly lower in PFN. Pain scores at 48 hours were also significantly better in PFN ($p$ = 0.005). Hospital stay was shorter in PFN (3 vs. 5.6 days, $p$ <0.001) compared to DCS. At 12 months, both groups achieved 95% radiological union and comparable functional recovery (mean HHS = 92.8, $p$ >0.05). Complications occurred infrequently and did not differ significantly.

**Conclusions.** PFN offers perioperative advantages without compromising functional or radiological outcomes, making it preferable in settings that prioritize faster recovery.

**Keywords.** subtrochanteric fractures, proximal femoral nail, dynamic condylar screw, orthopaedic procedures, treatment outcome

## INTRODUCTION

Subtrochanteric fractures are a complex subset of proximal femoral injuries that occur from the lesser trochanter to about 5 cm distally along the femoral shaft.[1] Representing 10–30% of proximal femoral fractures, they predominantly affect the elderly due to low-energy falls and younger individuals involved in high-energy trauma.[2] These fractures are challenging because of the area's complex anatomy and the significant biomechanical forces involved. High compressive, tensile, and shear forces, often combined with osteoporotic bone and comminution, contribute to instability, delayed healing, and other complications.[3]

Fixation must be stable to facilitate early mobilization and reduce the risks of non-union, malunion, and implant failure.[4] Traditional non-operative approaches like traction and casting have been replaced by operative fixation using intramedullary or extramedullary devices. Among these, Proximal Femoral

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Nailing (PFN) and 95° Dynamic Condylar Screw (DCS) plating are widely utilized techniques, each with specific indications, benefits, and drawbacks.[5]

PFN is an intramedullary technique favoured for its minimally invasive approach, biomechanical advantages, and suitability for osteoporotic bone. It aligns with the femur's mechanical axis and distributes stress more evenly, which is particularly useful in comminuted fractures. Its design reduces surgical trauma, blood loss, and infection risk, and allows early weight-bearing—an important factor for elderly patients.[6] However, PFN demands surgical precision and carries risks such as screw cut-out or migration when improperly placed.[7]

The 95° DCS is an extramedullary fixation method that provides rigid fixation and accurate anatomical reduction, making it suitable for fractures with metaphyseal comminution or diaphyseal extension.[8] It remains useful when intramedullary nailing is contraindicated, such as in fractures involving the piriformis fossa. The 95° dynamic condylar screw (DCS) is still commonly used for subtrochanteric fractures, even in cases without extension to the piriformis fossa. This practice is influenced by prevailing factors such as lower implant cost, greater availability in government institutions, and surgeon preference related to familiarity and experience with the technique. Yet, DCS requires extensive soft tissue dissection, increasing infection risk and potential for delayed healing, especially in osteoporotic bone. Its extramedullary position also exposes it to greater mechanical stresses.[9]

The decision between PFN and DCS is influenced by patient age, bone quality, fracture pattern, and surgeon experience. While PFN is associated with shorter surgical time and improved early mobility, DCS may still be the preferred option in specific fracture morphologies or resource-constrained settings.[10] This study aimed to comprehensively compare PFN and DCS in the treatment of subtrochanteric fractures, focusing on surgical outcomes, complications, and functional recovery.

## METHODOLOGY

### Study design and setting

This prospective observational analytical study was conducted at the Department of Orthopaedics, GMERS Medical College and General Hospital, Gotri, Vadodara, over a period extending from July 2023 to March 2025. The aim was to compare the outcomes of two surgical implants—Proximal Femoral Nail (PFN) and 95° Dynamic Condylar Screw (DCS)—in the management of subtrochanteric femur fractures.

### Inclusion Criteria

- Age more than 18 years
- Closed subtrochanteric femoral fractures
- No other associated skeletal injuries
- Medically fit for surgery

### Exclusion Criteria

- Pathological fractures
- Open fractures
- Medically unfit for anaesthesia or surgery
- Patients with a follow-up duration of less than six months

A consecutive sampling technique was used. Patients who fulfilled the eligibility criteria and consented to participate were randomized into either the PFN or DCS group through a computer-generated randomization sequence. This sequence was prepared in advance using random number tables, ensuring that the allocation process was objective and free from investigator influence. To maintain concealment, the randomization codes were sealed in opaque, serially numbered envelopes that were opened only after the patient was deemed fit for surgery and formally enrolled in the study. This approach prevented any prior knowledge of the treatment assignment and helped reduce allocation bias.

All patients underwent standard preoperative evaluation and preparation. All surgeries were done by the same team of surgeons, using spinal anaesthesia, a traction table, and image intensifier television (IITV) guidance.

For DCS fixation, a lateral incision was made, and the fracture was anatomically reduced. A guide pin was inserted and confirmed under IITV, followed by a Richards screw. The dynamic condylar plate was then fixed to the femoral shaft with cortical screws. Final fixation was verified under IITV, and the incision was closed in layers after saline wash and sterile dressing.

For PFN fixation, closed reduction was performed under fluoroscopy guidance following gentle traction. An approximately 2–3 cm incision was made near the greater trochanter. Entry into the medullary canal was started with an awl, followed by a guidewire and sequential reaming. The PFN was inserted, and fixation was completed using proximal lag screws, a de-rotation screw, and distal locking screws. Wound closure and dressing followed.

Intraoperative details, including operative time and estimated blood loss, were recorded. Postoperative management was standardized for both groups. Patients were monitored and followed up at 6, 12, 24 weeks, and 12 months post-surgery. Key outcome measures included union time, incidence of implant failure, postoperative pain assessed via Visual Analog Scale (VAS), and functional outcome assessed using the Harris Hip Score (HHS) at each follow-up point.

A sample size of 40 patients (20 in each group) was calculated based on a previous study by Ahmad et al.,[11] considering non-union rates with a 95% confidence level and 10% allowable error. Data were entered into Microsoft Excel and analysed using SPSS version 22. Descriptive statistics were used to summarize data. Continuous variables were expressed as mean and standard deviation, while categorical data were presented

as percentages and frequencies. Comparisons between groups were conducted using the chi-squared test for categorical variables, and a *p*-value less than 0.05 was considered statistically significant. Ethical approval was obtained from the institutional review board, and informed written consent was secured from all participants before their inclusion in the study.

Institutional Human Ethics Committee Number: IHEC/23/OUT/SRPG094

## RESULTS

A total of 40 patients were included in the study, equally divided into two groups: 20 patients were treated with the 95° DCS (Figure 1), and 20 with the PFN (Figure 2). There were no significant differences in demographics between the two groups (Table 1).

Significant differences were observed in intraoperative parameters (Table 2). The mean operative time was significantly shorter in the PFN group (53 ± 12.6 minutes) compared

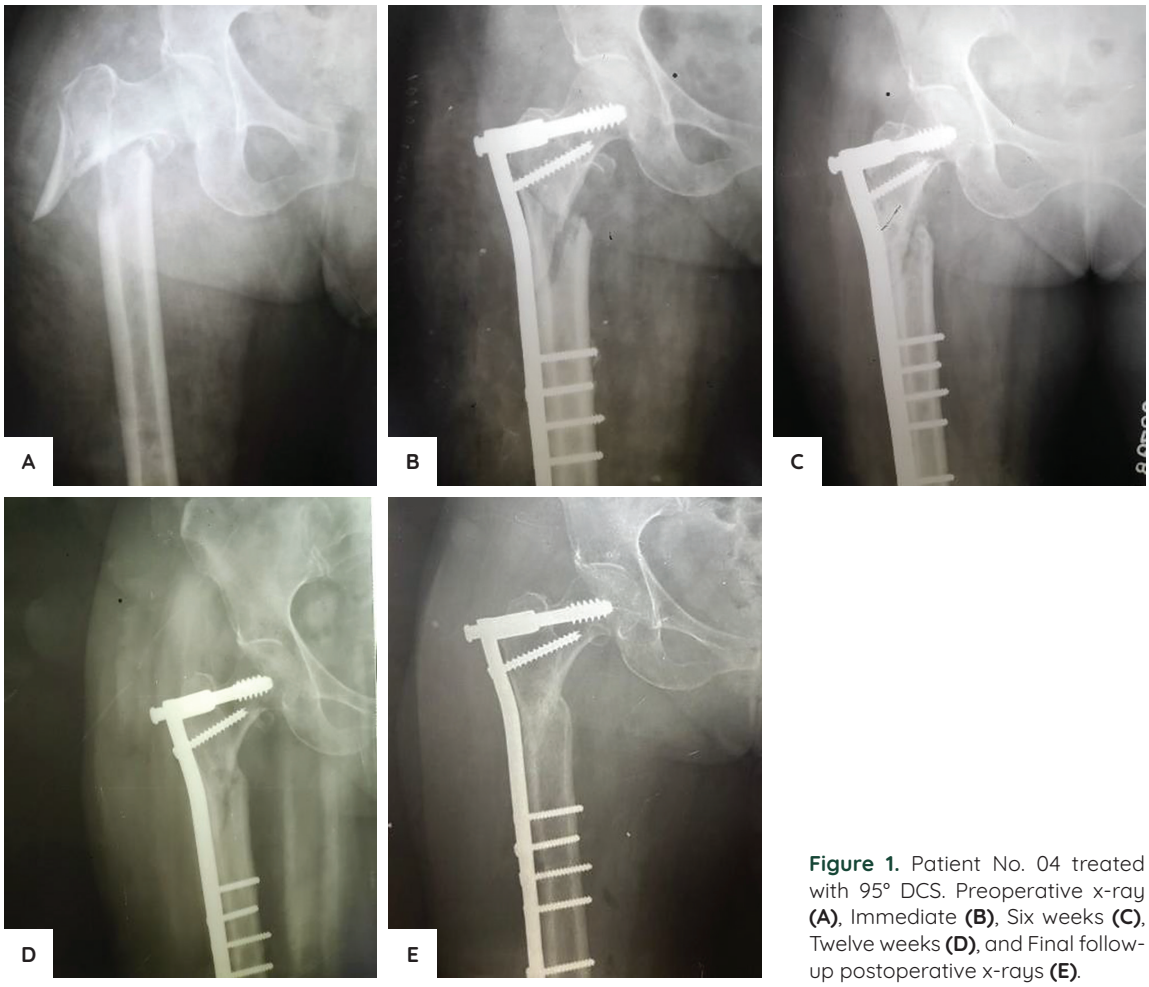


**Figure 1.** Patient No. 04 treated with 95° DCS. Preoperative x-ray **(A)**, Immediate **(B)**, Six weeks **(C)**, Twelve weeks **(D)**, and Final follow-up postoperative x-rays **(E)**.

**Table 1.** Socio-demographic and clinical characteristics (n = 40)

| Parameters | 95° DCS (n = 20) | | PFN (n = 20) | | *p*-value |
|---|---|---|---|---|---|
| | Mean/n | SD/% | Mean/n | SD/% | |
| *Mean Age (years)* | 67.4 | 15.9 | 66.1 | 14.5 | 0.710 |
| *Male sex* | 10 | 50% | 14 | 70% | 0.197 |
| *Female sex* | 10 | 50% | 07 | 30% | |
| *Right sided injuries* | 13 | 65% | 09 | 45% | 0.204 |
| *Left sided injuries* | 07 | 35% | 11 | 55% | |
| *Müller classification*<br>A<br>B<br>C | <br>4<br>9<br>7 | <br>20%<br>45%<br>35% | <br>8<br>10<br>2 | <br>40%<br>50%<br>10% | 0.125 |
| *History of hypertension* | 5 | 25% | 5 | 25% | 1.000 |
| *History of diabetes* | 7 | 35% | 5 | 25% | 0.490 |
| *Mean time from injury to presentation (days)* | 3.3 | 2.3 | 3.2 | 2.6 | 0.513 |

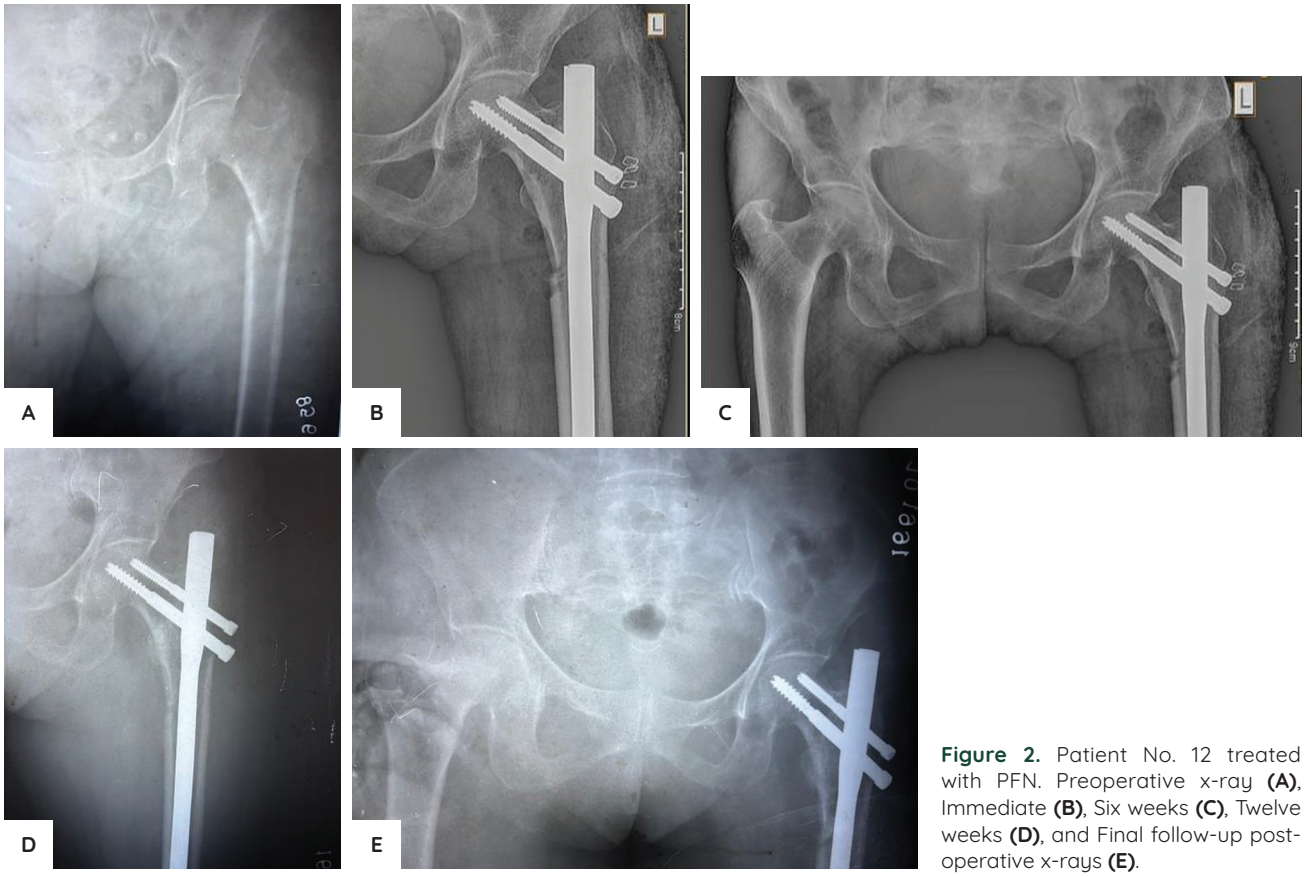


**Figure 2.** Patient No. 12 treated with PFN. Preoperative x-ray **(A)**, Immediate **(B)**, Six weeks **(C)**, Twelve weeks **(D)**, and Final follow-up post-operative x-rays **(E)**.

**Table 2.** Surgery-related characteristics (n = 40)

| Parameters | 95° DCS | | PFN | | *p*-value |
|---|---|---|---|---|---|
| | Mean/n | SD/% | Mean/n | SD/% | |
| *Mean operation time (min)* | 75.6 | 12.3 | 53 | 12.6 | <0.001* |
| *Mean blood loss (ml)* | 197.1 | 45.5 | 150.2 | 20.4 | <0.001* |
| *Mean VAS at 0 hours postoperatively (cm)* | 3.7 | 1.5 | 3.8 | 1.3 | 0.639 |
| *Mean VAS at 24 hours postoperatively (cm)* | 3.6 | 1.2 | 3.9 | 1.1 | 0.305 |
| *Mean VAS at 48 hours postoperatively (cm)* | 1.6 | 0.6 | 1.1 | 0.8 | 0.005* |
| *Mean time to mobilisation (days)* | 1.05 | 0.2 | 1.03 | 0.1 | 0.282 |
| *Mean hospital stay (days)* | 5.6 | 1.9 | 3 | 1.8 | <0.001* |
| *Mean time to partial weight bearing (days)* | 6.1 | 1.5 | 5.7 | 1.1 | 0.109 |
| *Mean time to complete weight bearing (days)* | 12.6 | 1.2 | 12.3 | 0.8 | 0.112 |
| *Final Harris Hip Score* | 92.9 | 1.8 | 92.7 | 2.2 | 0.749 |

*Statistically significant ($p$ <0.001)

to the DCS group (75.6 ± 12.3 minutes), with a highly significant $p$-value (<0.001). Patients in the PFN group experienced less intraoperative blood loss (150.2 ± 20.4 ml) than those in the DCS group (197.1 ± 45.5 ml), and the difference was statistically significant ($p$ <0.001).

Pain scores, assessed via the VAS at 48 hours, were significantly lower in the PFN group (1.1 ± 0.8) compared to the DCS group (1.6 ± 0.6), with a $p$-value of 0.005.

Total hospital stay was significantly shorter in the PFN group (3 ± 1.8 days) compared to the DCS group (5.6 ± 1.9 days), and this difference was statistically significant ($p$ <0.001).

## DISCUSSION

The study aimed to compare treatment outcomes of subtrochanteric femoral fractures managed using PFN and 95° DCS. Both groups were demographically comparable, with no significant differences in age, sex, or comorbidities, ensuring unbiased outcome assessment. These observations correspond with those of prior studies, such as those by Patel et al. and Sahito et al., who reported similar patient profiles in comparable cohorts.[8,12]

Operative parameters significantly favoured PFN. The PFN group had a shorter mean operative duration (53 minutes vs. 75.6 minutes for DCS) and less intraoperative blood loss

(150.2 ml vs. 197.1 ml). These results are consistent with studies by Sahin et al. and Kulkarni et al., who observed shorter operative durations and reduced blood loss with PFN.[13,14] The minimally invasive nature of PFN, requiring less soft tissue dissection, contributes to these advantages, particularly in elderly or comorbid patients.

While postoperative pain scores were initially comparable, they were significantly reduced in the PFN group at the 48-hour mark. This may be attributed to less periosteal stripping and muscle trauma, as supported by Sensoz et al., who reported better early pain control in PFN patients.[15] Reduced postoperative pain can facilitate earlier mobilization and rehabilitation, as reflected in our findings.

Although both groups showed early mobilization (~1 day), the PFN group had a significantly shorter hospital stay (3 days vs. 5.6 days). This mirrors findings from Ahmad et al. and D'Mello et al., who associated PFN with quicker postoperative recovery and discharge readiness.[11,16] Shorter hospitalization can reduce healthcare costs and minimize hospital-related complications, especially in older adults.

Functional outcomes, measured by the HHS, improved progressively in both groups and were statistically similar at all follow-up points (Figure 3). At 12 months, both groups had comparable scores, indicating that both fixation methods are effective in restoring hip function. These results are supported by D'Mello et al. and Singh et al., who found no long-term differences between PFN and DCS.[16,17]

Time required for partial and full weight bearing did not differ significantly between groups; however, earlier loading was more commonly observed in the PFN group. Studies like those by Kulkarni et al. and Patel et al. have highlighted PFN's biomechanical benefits, including load sharing and axial stability, which can support earlier mobilization.[12,14]

Radiological healing was excellent in both groups, with 95% callus formation by 12 months. This reinforces that both implants, when properly applied, can achieve union (Table 3). Complication rates were low and comparable. PFN had a higher rate of screw migration, while DCS had a slightly higher infection rate due to the more invasive surgical approach. These results are consistent with those of Ahmad et al., who reported similar outcomes.[15]

Although the 95° DCS is traditionally indicated for fractures with piriformis fossa involvement, metaphyseal comminution, or diaphyseal extension, in our series, it was used across all Müller types. This was because randomization in our study was not based on fracture pattern, and thus, implant allocation was independent of specific fracture morphology. The continued use of DCS across different fracture types reflects prevailing local practice patterns, where factors such as implant cost, limited access to proximal femoral nails,

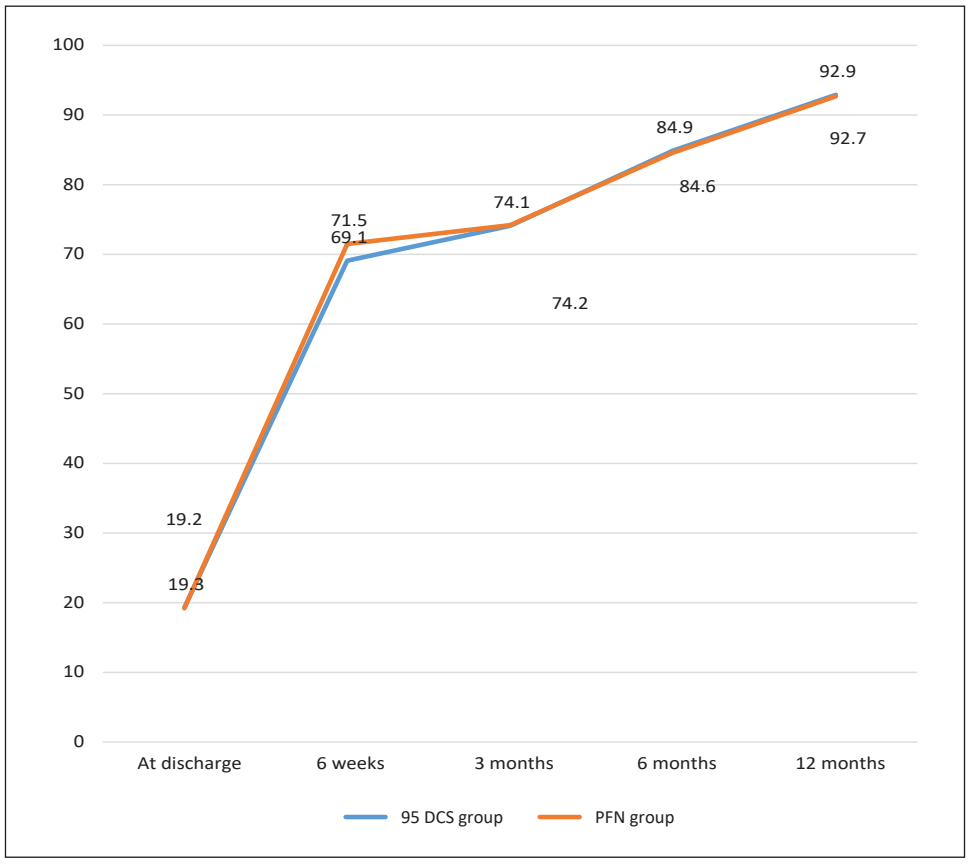


**Figure 3.** Distribution of study participants according to their mean Harris Hip Score (HHS) scores at discharge, 6 weeks, 3 months, 6 months, and 12 months postoperatively (n = 40).

**Table 3.** Postoperative recovery-related characteristics (n = 40)

| Parameters | 95° DCS | | PFN | | *p*-value |
|---|---|---|---|---|---|
| | Mean/n | SD/% | Mean/n | SD/% | |
| ***Callus formation at 12 months*** | 19 | 95% | 19 | 95% | 1.000 |
| ***Complications*** | | | | | |
| Wound dehiscence | 0 | 0 | 0 | 0 | - |
| Wound infection | 3 | 15% | 2 | 10% | 0.633 |
| Non-union | 1 | 5% | 1 | 5% | 1.000 |
| Cut-out | 0 | 0 | 1 | 5% | 0.311 |
| Screw migration | 0 | 0 | 3 | 15% | 0.072 |
| Implant breakage | 1 | 5% | 0 | 0 | 0.311 |
| Nerve Palsy | 0 | 0 | 0 | 0 | - |
| Limb length discrepancy | 1 | 5% | 2 | 10% | 0.548 |

occasional unavailability of a fracture table, and greater surgeon familiarity with plating techniques influence implant choice. These considerations were beyond the control of the study and are reported here to provide an unbiased representation of real-world practice.

## CONCLUSION

This study compared the clinical, functional, and radiological outcomes of Proximal Femoral Nailing (PFN) and 95° Dynamic Condylar Screw (DCS) fixation in the management of subtrochanteric femoral fractures. Both techniques were effective in achieving fracture union and restoring hip function. However, PFN demonstrated significant perioperative advantages, including shorter operative time, reduced intraoperative blood loss, lower postoperative pain at 48 hours, and shorter hospital stay. Functional outcomes measured using the HHS, and radiological healing were comparable in both groups at the one-year follow-up. Although the complication profiles were not significantly different, PFN showed a trend toward fewer infections and quicker recovery, while DCS had a slightly higher incidence of wound complications. Based on these findings, PFN may be preferred, especially in elderly or high-risk patients requiring early mobilization.

### Limitations

The study has several limitations, including its small sample size and single-center design. In addition, the short follow-up period of one year limits the ability to assess long-term outcomes, implant longevity and late complications. Future research involving larger, multicenter randomized trials with extended follow-up durations is recommended to validate and strengthen these findings.

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## STATEMENT OF AUTHORSHIP

All authors certified fulfillment of ICMJE authorship criteria.

## CREDIT AUTHOR STATEMENT

**RV:** Conceptualization, Software, Data Curation, Writing – original draft preparation; **PA:** Methodology, Visualization, Supervision; **SS:** Investigation, Resources; **MSD:** Methodology, Validation, Writing – original draft preparation; Writing – review and editing, Project administration; **MP:** Conceptualization, Software, Data curation, Writing – original draft preparation.

## DATA AVAILABILITY STATEMENT

Datasets generated and analyzed are included in the published article.

## AUTHOR DISCLOSURE

The authors declared no conflict of interest.

## FUNDING SOURCE

None.

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