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Comparison of clinical and radiological outcomes of a proximal femoral nail with a helical screw versus a proximal femoral nail with two screws in elderly patients with intertrochanteric femur fractures

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ABSTRACT

Background: Intertrochanteric femur fractures in the elderly carry high morbidity and mortality rates, while the Proximal Femoral Nail (PFN) is a standard treatment, debate persists regarding the optimal screw configuration. This study compares the clinical and radiological outcomes of the helical blade versus the two-screw PFN in elderly patients with unstable intertrochanteric fractures.
Methods: A prospective observational study was conducted on 70 patients aged >60 years with unstable intertrochanteric fractures. Patients were randomized into two groups (n=35 each). Functional outcomes were assessed using the Harris Hip Score (HHS) and radiological union time was evaluated. Operative time and postoperative complications were also recorded.
Results: The functional outcomes were comparable between the study groups, most patients demonstrated HHS scores greater than 80, suggestive of favorable functional recovery. A greater proportion of early unions (≤10 weeks) and fewer delayed unions (>16 weeks) were observed in the helical group compared to the 2-screw group. The mean duration of surgery was significantly lower in the helical group (37 minutes) compared to the 2-screw group (45 minutes). Complications occurred in 10 out of 70 patients, a comparatively better complication profile with the helical blade (3 patients) than 2 screw (7 patients) was observed.
Conclusions: Both the helical blade and two-screw are effective. However, the helical blade offers distinct advantages including shorter operative time, faster radiological union, and a lower complication profile, making it a preferable option for early mobilization in elderly patients.

Keywords: Harris hip score, Helical blade, Intertrochanteric fracture, Proximal femoral nail, RUSH score two screws

INTRODUCTION

Hip fractures are among the most prevalent orthopedic injuries, intertrochanteric femur fractures account for nearly 50% of these fractures and primarily affect elderly individuals with osteoporosis who sustain low-energy trauma.[1,2]

Surgical intervention is essential to achieve satisfactory reduction, facilitate early recovery, and enable early mobilization, which is particularly important as many elderly patients cannot adhere to restricted weight-bearing protocols.[3,4]

The dynamic hip screw (DHS) has long been considered the gold standard for stable intertrochanteric fractures. However, in unstable fracture patterns, DHS may fail to provide adequate biomechanical stability, leading to unsatisfactory outcomes.[5-7]

Among intramedullary devices, the proximal femoral nail (PFN) has gained widespread acceptance for the management of trochanteric fractures due to its biomechanical stability and favorable clinical outcomes.[8] The conventional two-screw PFN has shown excellent results; however, complications such as varus collapse, Z-effect, reverse Z-effect, implant cut-out, and femoral shaft fractures have been reported.[9]

To overcome these limitations, the helical blade PFN was developed as a modification of the traditional two-screw design. The helical blade increases the bone-implant interface, compacts cancellous bone, and enhances fixation stability, particularly in osteoporotic bone.Biomechanical studies have demonstrated improved resistance to rotational instability and varus collapse with this design.[8]

Although several studies have compared PFN with DHS and other intramedullary devices. Therefore, the present prospective randomized study aims to evaluate and compare the clinical and radiological, outcomes of two-screw PFN and helical blade PFN in the management of unstable trochanteric fractures in elderly patients.

METHODS

Study design and place

This was prospective, randomized, comparative study of 70 patients conducted in MGM Medical College and M.Y. Hospital, Indore, Madhya Pradesh.

Study duration

This study conducted for 1 year from February 2023 to February 2024).

Follow up

All participants were followed up for a minimum of 6 months.

Inclusion criteria

Patients having age >60 years with unstable Intertrochanteric femur fracture classified according to the AO Classification.

Exclusion criteria

Pathological fractures, previous infections in the affected limb, compound fracture in ipsilateral limb; and any other fracture affecting rehabilitation protocol were excluded.

Patients presenting to ER/OPD with pain in hip region following trauma, all patients underwent thorough clinical and radiological evaluation. The Primary ATLS protocol was followed to ensure hemodynamic stabilization, and skin traction was applied pre-operatively.

Pre-operatively, injectable third-generation cephalosporin was administered 30 minutes prior to incision. Surgery was performed under spinal or epidural anesthesia as per anesthetist discretion. Patients were positioned supine on a radiolucent fracture table, and closed reduction was achieved under C-arm fluoroscopy with traction.

Post-operatively, all patients received intravenous antibiotics (Ceftriaxone + Sulbactam 1.5 g and Amikacin 500 mg) 12 hourly for at least 48 hours, followed by oral antibiotics. Patients were allowed to sit up immediately after surgery. Early knee bending, isometric quadriceps exercises, and ankle physiotherapy were initiated, and non-weight-bearing ambulation with walker or crutches was started on the second postoperative day. The first wound inspection was performed on the second postoperative day, and patients were discharged after satisfactory wound assessment. Sutures were removed on the 14th postoperative day. Weight-bearing was initiated based on fracture stability and adequacy of fixation.

Patients were followed up at 6-week intervals until fracture union and subsequently at 3 and 6 months with radiographic evaluation to evaluate radiological union time. Radiological union was also assessed using the Radiographic Union Score for Hip (RUSH) at 3 and 6 months.

Functional outcome was assessed using the Harris Hip Score (HHS) at 3 and 6 months post-operatively. Post-operative complications such as anterior thigh pain, limb shortening, impingement, infection, non-union, and implant failure were recorded and analyzed.

RESULTS

A total of 70 patients were enrolled in the study, equally distributed between the two-screw PFN (n=35) and helical PFN (n=35) groups. The demographic analysis revealed a comparable age distribution across both cohorts, with an overall mean age of 65.84±5.25 years (Table 1).

Table 1: Age based distribution between the two study groups.

Mean age	In years
PFN-2 screw	65.1±5.08
PFN-helical screw	66.97±5.40

The majority of the study population (60%) fell within the 60-65 years age, comprising 62.8% of the two-screw group and 57.1% of the helical group. Patients aged 66-70 years represented 21.4% of the total cohort. Older age subgroups were less frequent, with patients aged 71-75 years accounting for 11.4%, and those over 76 years comprising only 7.1% of the total population (Table 2).

At 3 months, the mean HHS was 60.45±2.09 in the PFN (2 Screw) group and 62.82±2.63 in the PFN (Helical) group. At 6 months, the mean HHS improved in both groups, with

82.74±6.80 in the PFN (2 Screw) group and 85.85±3.27 in the PFN (Helical) group (Table 3).

Table 2: Sex based distribution between the two study groups.

	PFN-2 screw	PFN-helical screw
Male	24	26
Female	11	9
Total	35	35

Table 3: Fracture pattern distribution between the two study groups.

AO	PFN-2 screw	PFN-helical screw
A1	24	26
A2	11	9
A3	35	35

At the 3-month follow-up, the mean Radiological Union Score for Hip (RUSH Score) was similar between the 2-screw PFN group 17.54 and the helical PFN group 18.91. The 6-month RUSH scores also showed minimal difference between the two groups: 25.91 for the 2-screw PFN group and 26.94 for the helical PFN group (Table 4).

The comparison of radiological union time between the two study groups. Majority of the patients in both the study groups showed union between 10-16 weeks, with Mean union time 14.2 weeks in PFN Helical group and 15.8 weeks in PFN-2 Screw group (Table 5).

Table 4: Comparison of clinical and radiological outcome between the two study groups.

Follow up at	Type	HHS	RUSH
3 months	PFN-2 screw	60.45	17.54
	PFN-helical screw	62.82	18.91
6 months	PFN-2 screw	82.74	25.91
	PFN-helical screw	85.85	26.94

Table 5: Comparison of mean union time.

Type	Mean duration (weeks)
PFN-2 screw	15.8
PFN-helical screw	14.2

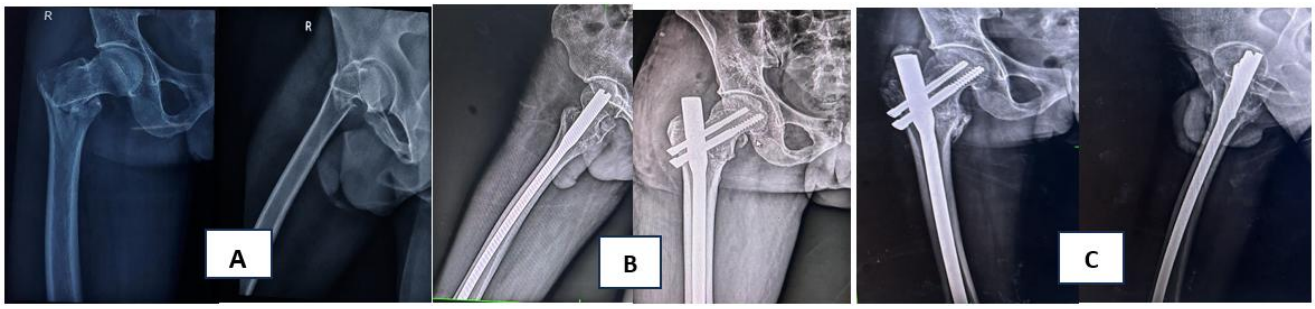

Figure 1: Case-PFN-2 screw: (A) Pre-op X-ray; (B) Immediate post op X-ray; (C) X-ray at 6 months follow up.

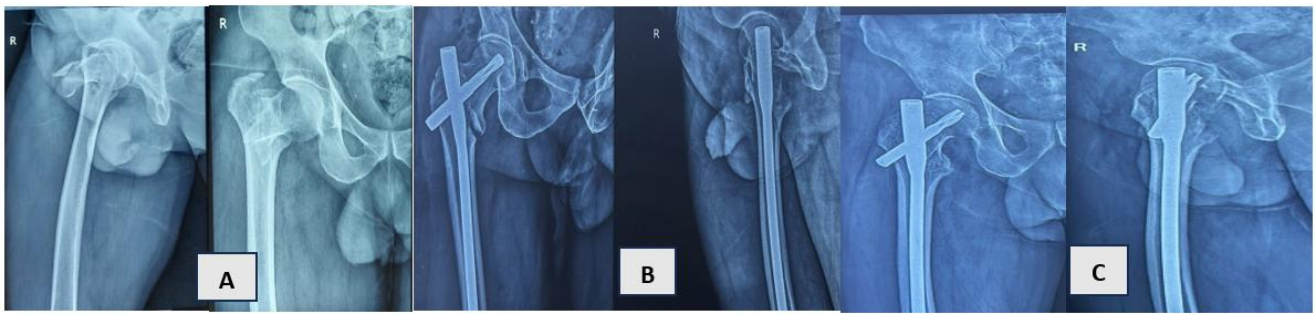

Figure 2: Case-PFN-Helical screw: (A) Pre-op X-ray; (B) Immediate post op X-ray; (C) X-ray at 6 months follow up.

DISCUSSION

The management of intertrochanteric femur fractures in the elderly remains a cornerstone of geriatric orthopaedics. As life expectancy increases, the burden of these fractures grows, exacerbated by systemic frailty and diminished bone mineral density. Our study aimed to compare two common fixation strategies the PFN-Helical and the PFN-2 Screw to determine if the mechanical advantages of the helical blade translate into superior clinical outcomes.

The mean age of our cohort (65.84±5.25 years) reflects the global trend of hip fractures occurring in the "young-old" and "old-old" populations. While some literature, such as Sharma et al, shows a higher mean age in PFNA2 groups (74.12 years), our demographic was more homogeneous, allowing for a direct comparison of the implants without the confounding variable of extreme senility.[10]

We observed a distinct male predominance (2.5:1), which contrasts with several Western studies that report higher incidences in females due to postmenopausal osteoporosis. However, our findings align with recent regional studies by Kale et al and Singh et al.[11,12] This may be attributed to higher activity levels and exposure to high-energy trauma (such as road traffic accidents) or domestic falls in elderly men within this specific demographic.

The Harris Hip Score (HHS) served as our primary metric for functional recovery. PFN with a helical blade provides similar functional outcomes at the end of 6 months compared to PFN with 2 screws in the management of intertrochanteric femur fractures (p=0.42).

While the meta-analysis by Huang et al suggested no significant difference in HHS between the two implants across 1,146 patients, our results lean toward the findings of Sharma et al, suggesting that in specific clinical settings, the helical screw's resistance to rotation and varus collapse offers a functional edge.[13,8]

A significant finding in our study was the reduction in operative time for the PFN-Helical group 35.83 minute vs. 45.57 minute ($p<0.05$). This 10-minute difference is clinically significant in elderly patients with multiple comorbidities, as reduced anesthesia time correlates with lower risks of intraoperative cardiovascular stress and postoperative complications.

Radiologically, the helical group also showed a faster mean union time (14.2 weeks) compared to the 2-Screw group (15.8 weeks). This is likely due to the "bone-compacting" effect of the helical blade, which, unlike the material-removing nature of traditional drilling for lag screws, preserves bone stock and enhances the bone-implant interface.

Table 6: Duration of surgery.

	PFN-2 screw	PFN-helical screw
Duration (min)	45.57	35.83
Mean union time (weeks)	15.8	14.2

Regarding complications (Table 6), the incidence of infection was similar between both groups (1 case each). However, a significant difference was observed in screw back out, with 3 cases in the PFN-2 screw group and none in the PFN-Helical screw group. This finding suggests that the design of the helical screw may offer superior rotational and axial stability, reducing the risk of screw migration, which is a common complication impacting patient recovery and requiring revision surgery. Nail impingement also showed a slight difference, with three cases in the PFN-2 screw group compared to one in the PFN-Helical screw group (Table 7).

Table 7: Duration of surgery.

	PFN-2 screw	PFN-helical screw
Infection	1	1
Screw back out	3	0
Nail impingement	3	1

The 2-Screw PFN is traditionally susceptible to the "Z-effect" or "reverse Z-effect," where the screws migrate in opposite directions. The helical blade circumvents this by providing a single, large surface area for load distribution. While Huang et al noted a risk of "cut-through" with helical blades, our adherence to an optimal Tip-Apex Distance (TAD) mitigated this risk, reinforcing the principle that surgical technique is as vital as implant choice.[13]

CONCLUSION

Both helical screw and two-screw proximal femoral nails achieved satisfactory fracture union and functional recovery in elderly patients with unstable intertrochanteric femur fractures. However, the helical blade PFN was associated with shorter operative time, earlier radiological union, improved functional outcomes, and fewer implant-related complications. The superior biomechanical stability and resistance to cut-out offered by the helical blade design support its preferential use in the geriatric population. These findings reinforce the growing evidence favoring helical blade PFN in osteoporotic bone.

Recommendation

Helical screw PFN may be preferred for fixation of unstable intertrochanteric femur fractures in elderly osteoporotic patients due to its favorable operative and radiological outcomes. Meticulous fracture reduction and optimal implant positioning should be ensured irrespective of the implant design to minimize complications. Larger multicentric prospective studies with longer follow-up are recommended to further evaluate long-term functional outcomes and implant related complications.

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REFERENCES

1. Yalın M, Golgelioglu F, Key S. Intertrochanteric Femoral Fractures: A Comparison of Clinical and Radiographic Results with the Proximal Femoral

Intramedullary Nail (PROFIN), the Anti-Rotation Proximal Femoral Nail (A PFN), and the InterTAN Nail. Medicina (Kaunas). 2023;59(3):559.
2. Date A, Panthula M, Bolina A. Comparison of clinical and radiological outcomes in intertrochanteric fractures treated with InterTAN nail against conventional cephalomedullary nails: a systematic review. Future Sci OA. 2020;7(1):FSO668.
3. Parker MJ, Bowers TR, Pryor GA. Sliding hip screw versus the Targon PF nail in the treatment of trochanteric fractures of the hip: a randomised trial of 600 fractures. J Bone Joint Surg. 2012;94(3):391-7.
4. Pavelka T, Matejka J, Cervenkova H. Complications of internal fixation by a short proximal femoral nail. Acta Chir Orthop Traumatol Cech. 2005;72(6):344-54.
5. Willoughby R. Dynamic hip screw in the management of reverse obliquity intertrochanteric neck of femur fractures. Injury. 2005;36(1):105-9.
6. Zhang K, Zhang S, Yang J, Dong W, Wang S, Cheng Y, et al. Proximal femoral nail vs. dynamic hip screw in treatment of intertrochanteric fractures: a meta-analysis. Med Sci Monit. 2014;20:1628-33.
7. Kulkarni GS, Limaye R, Kulkarni M, Kulkarni S. Intertrochanteric fractures. Ind J Orthop. 2006;40:16-23.
8. Sharma A. Comparison of two screws versus single helical screw in proximal femoral nailing for treatment of intertrochanteric fractures of femur. Int J Life Sci Biotechnol Pharma Res. 2018;7(2):15-8.
9. Pavelka T., Matejka J., Cervenkova H. Complications of internal fixation by a short proximal femoral nail. Acta Chir Orthop Traumatol Cech. 2005;72(6):344-54.
10. Sharma A, Mahajan A, John B. A Comparison of the Clinico-Radiological Outcomes with Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation (PFNA) in Fixation of Unstable Intertrochanteric Fractures. J Clin Diagn Res. 2017;11(7):RC05-RC09.
11. Kale A, Sharma P, Kulkarni K, Kuity K, Shah M, Kaneria S. Comparative study between proximal femoral nail anti rotation and proximal femoral nail anti rotation Asian to assessing functional outcome. J Orthopaed Case Rep. 2024;15(11): 273-83.
12. Singh K, Aggarwal RK, Dewan A, Jasrotia C. Comparison of the Radiological and Functional Outcome of Proximal Femoral Nail with Helical Blade versus Lag Screw in Intertrochanteric Fractures. J Orthoped Sports Med. 2023;5(1):47-55.
13. Huang Y, Zhang C, Luo Y. A comparative biomechanical study of proximal femoral nail (InterTAN) and proximal femoral nail antirotation for intertrochanteric fractures. Int Orthopaed. 2013;37(12):2465-73.

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