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RESEARCH ARTICLE
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"UNSTABLE INTERTROCHANTERIC FEMUR FRACTURES TREATED BY TROCHANTERIC SUPPORT PLATE WITH PROXIMAL FEMORAL NAIL (PFN) GIVE BETTER FUNCTIONAL OUTCOME"

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ABSTRACT

Background:
Unstable intertrochanteric femur fractures, particularly those involving the lateral wall, present a significant challenge in orthopedic trauma care. Although Proximal Femoral Nail (PFN) fixation has become a standard treatment, lateral wall compromise can lead to mechanical failure. Augmentation with a Trochanteric Support Plate (TSP) may enhance fixation stability and improve functional outcomes. This study evaluates the efficacy of PFN with TSP in managing such fractures.

Methodology:
This prospective, observational, non-randomized study was conducted at MGM Medical College & Hospital, Aurangabad, from June 2023 to 2025. Thirty patients aged 30–80 years with unstable intertrochanteric femur fractures and compromised lateral walls were included. Patients underwent open reduction and internal fixation using PFN augmented with a TSP. Functional outcomes were assessed using the Harris Hip Score (HHS) at 6 weeks, 3 months, and 6 months postoperatively. Radiographic healing and complications were documented at each follow-up.

Results:
The mean age was 60.8 ± 14.35 years, with a male predominance (60%). The most common mechanism of injury was a fall from height (43.33%). Good quality of fracture reduction was achieved in 66.67% of cases. Functional recovery showed progressive improvement: 46.67% of patients had excellent outcomes (HHS > 90) at 6 months. Postoperative complications were minimal, with anterior hip pain (6.67%), screw migration (10.00%), and Z/reverse Z effect (6.67%) being the most noted issues. There were no cases of implant failure or avascular necrosis.

Conclusion:
Augmentation of PFN with a Trochanteric Support Plate in unstable intertrochanteric femur fractures yields superior functional outcomes and reduces the risk of implant-related complications. This technique provides enhanced lateral wall support, improves construct stability, and facilitates early mobilization, making it a valuable approach in managing complex intertrochanteric fractures.

Keywords: Unstable intertrochanteric fracture, trochanteric support plate, proximal femoral nail, Harris Hip Score, functional outcome, lateral wall comminution, hip fracture fixation.

INTRODUCTION

Intertrochanteric femur fractures are a common injury in the elderly, accounting for nearly 45% of all hip fractures.[1] These injuries are often linked to osteoporosis and low-energy trauma and are associated with high morbidity, prolonged hospitalization, and increased mortality. With the global aging population, their incidence is expected to rise, posing a growing healthcare and socioeconomic burden.[2]

Unstable fracture patterns, such as AO/OTA types 31-A2 and 31-A3, are particularly challenging due to posteromedial comminution and lateral wall compromise, increasing the risk of fixation failure.[3] The Proximal Femoral Nail (PFN) has become the preferred fixation device due to its intramedullary biomechanical advantages, allowing earlier mobilization and minimal soft tissue disruption. However, in cases with compromised lateral walls, PFN alone may lead to complications such as varus collapse, screw cut-out, and implant failure.[4-6]

To overcome these limitations, the use of a Trochanteric Support Plate (TSP) as an augment to PFN has been introduced. TSP reinforces the lateral femoral wall, resists varus deformity, and enhances both axial and rotational stability. Biomechanical studies have demonstrated that PFN combined with TSP improves construct stiffness and reduces mechanical complications compared to PFN alone. Preliminary clinical data also suggest superior functional outcomes and radiological healing with this combined approach.[7,8]

Despite encouraging findings, comprehensive clinical evidence remains limited. This study aims to evaluate the functional outcomes, radiological union, and complication rates in patients with unstable intertrochanteric femur fractures treated using PFN with TSP augmentation, to determine whether this method offers a significant advantage over PFN alone.

METHODOLOGY:

This prospective, observational, non-randomized study was conducted at MGM Medical College & Hospital, Aurangabad, between June 2023 and 2025. Thirty patients aged 30–80 years with closed intertrochanteric femur fractures involving an unstable lateral wall were included. Patients with femoral neck fractures, compound or pathological fractures, intact lateral walls, significant comorbidities, prior surgeries on the same limb, or unwillingness to participate were excluded.

After obtaining informed written consent in a language understood by the patients, each subject underwent open reduction and internal fixation under appropriate anesthesia using a proximal femoral nail (PFN) augmented with a trochanteric support plate (TSP), following strict aseptic precautions. Postoperatively, drains were removed on the second or third day. Standard anteroposterior and lateral radiographs of the pelvis with both hips were taken. Physiotherapy was initiated by the second or third postoperative day depending on patient condition, and sutures were removed on the 14th postoperative day or as dictated by wound status. All patients received prophylactic antibiotics as per institutional protocol.

Postoperative mobility was assessed, including both weight-bearing and non-weight-bearing status of the operated limb. Follow-up evaluations were scheduled at 3 weeks, 6 weeks, 3 months, 6 months, and 9 months. At each visit, radiographic assessments were performed and mobility outcomes were recorded. The Harris Hip Score was evaluated at 6 weeks, 3 months, and 6 months postoperatively to

assess functional outcomes. A single-blinded approach was employed to minimize observational bias. All collected data were compiled and subjected to statistical analysis using appropriate methods.

OBSERVATION AND RESULTS:

Table No-1: Demographic Characteristics of the Study Population

Age	Mean ± SD	60.8 ± 14.35
Gender		
Sex	**No. of Cases**	**Percentage**
Female	12	40.00%
Male	18	60.00%
Total	30	100.00%

The study included a total of 30 patients with a mean age of 60.8 ± 14.35 years. Among them, 18 (60%) were male and 12 (40%) were female. This demographic distribution reflects the composition of the study population.

Table No-2: Mode and Side of Injury Distribution in Study Participants

Category	**Type**	**No. of Cases**	**Percentage**
Mode of Injury	Road Traffic Accident	9	30.00%
	Falling from Height	13	43.33%
	Assault	5	16.67%
	Other	3	10.00%
Side of Injury	Left	16	53.33%
	Right	14	46.67%
	Total	**30**	**100.00%**

The modes of injury among the 30 patients varied, with falling from height being the most common (13 cases, 43.33%), followed by road traffic accidents (9 cases, 30.00%), assault (5 cases, 16.67%), and other causes (3 cases, 10.00%). Regarding the side of injury, 16 patients (53.33%) had injuries on the left side, while 14 patients (46.67%) had injuries on the right side. The total number of cases accounted for was 30.

Table No-3: Comorbidities and Quality of Reduction Among Study Participants

Category	**Subcategory**	**No. of Cases**	**Percentage**
Comorbidities	Diabetes Mellitus	6	20.00%
	Hypertension	4	13.33%
	DM and HTN	8	26.67%
	Total with comorbidities	**18**	**60.00%**
Quality of Reduction	Good	20	66.67%
	Acceptable	8	26.67%
	Poor	2	6.67%
	Total	**30**	**100.00%**

Among the study participants, 18 patients (60.00%) had one or more comorbidities. Diabetes mellitus was present in 6 patients (20.00%), hypertension in 4 patients (13.33%), and both diabetes and hypertension were observed in 8 patients (26.67%).

Regarding the quality of reduction, 20 patients (66.67%) achieved good reduction, 8 patients (26.67%) had acceptable reduction, and 2 patients (6.67%) had poor reduction. The total number of cases included in the analysis was 30.

Table No-4: Harris Hip Score (HHS) Distribution at 1, 3, and 6 Months Post-Treatment

HHS Category	No. of Cases (1 Month)	Percentage (1 Month)	No. of Cases (3 Months)	Percentage (3 Months)	No. of Cases (6 Months)	Percentage (6 Months)
< 70	24	80.00%	10	33.33%	4	13.33%
71 – 80	4	13.33%	18	60.00%	2	6.67%
81 – 90	2	6.67%	2	6.67%	10	33.33%
91 – 100	0	0.00%	0	0.00%	14	46.67%
Total	**30**	**100.00%**	**30**	**100.00%**	**30**	**100.00%**

The functional outcomes assessed by the Harris Hip Score (HHS) showed progressive improvement over time. At 1 month, 24 patients (80.00%) scored below 70, indicating poorer function, while at 3 months this number decreased to 10 patients (33.33%), and further to 4 patients (13.33%) at 6 months. Scores in the 71–80 range increased from 4 patients (13.33%) at 1 month to 18 patients (60.00%) at 3 months but declined to 2 patients (6.67%) by 6 months. Patients scoring between 81 and 90 increased from 2 patients (6.67%) at 1 month to 10 patients (33.33%) at 6 months. Notably, no patients scored in the 91–100 range at 1 and 3 months, but by 6 months, 14 patients (46.67%) achieved scores indicating excellent functional outcome. The total number of patients assessed remained consistent at 30 across all time points.

Table No-5: Postoperative Complications at 1, 3, and 6 Months Follow-Up

Complication	No. of Cases (1 Month)	Percentage (1 Month)	No. of Cases (3 Months)	Percentage (3 Months)	No. of Cases (6 Months)	Percentage (6 Months)
Anterior Hip Pain	2	6.67%	4	13.33%	2	6.67%
Impingement	1	3.33%	1	3.33%	2	6.67%
Infection	0	0.00%	0	0.00%	1	3.33%
Implant Failure	0	0.00%	0	0.00%	0	0.00%
Screw Migration	0	0.00%	1	3.33%	3	10.00%
Z/Reverse/Z Effect	0	0.00%	0	0.00%	2	6.67%
Avascular Necrosis	0	0.00%	0	0.00%	0	0.00%

The incidence of postoperative complications varied over the follow-up period. Anterior hip pain was reported in 2 patients (6.67%) at 1 month, increasing to 4 patients (13.33%) at 3 months, and then decreasing to 2 patients (6.67%) at 6 months. Impingement occurred in 1 patient (3.33%) at both 1 and 3 months, rising to 2 patients (6.67%) at 6 months. Infection was not observed until 6 months, when it affected 1 patient (3.33%). Screw migration was absent at 1 month but was noted in 1 patient (3.33%) at 3 months and increased to 3 patients (10.00%) by 6 months. Z/reverse/Z effect was documented in 2 patients (6.67%) at 6 months. No cases of implant failure or avascular necrosis were reported during the study period.

DISCUSSION:

This study evaluated the functional outcomes of unstable intertrochanteric femur fractures with lateral wall comminution managed using a trochanteric support plate combined with a proximal femoral nail (PFN). The patient population predominantly comprised elderly individuals, especially in the 61–80-year age group, aligning with the findings of **Vivek Shetty et al.**[9] and **Raja RSB et al.,**[10] who also noted a higher incidence among older adults, likely due to osteoporosis and fall risk.

Male predominance was observed in our cohort, consistent with Raja RSB et al., but in contrast to the female predominance reported by **Vivek Shetty et al.,**[9] highlighting demographic and geographic variability. Falls from standing height were the most common mode of injury, echoing observations by **Attum et al.,**[11] **Kellam et al.,**[12] and **Ahn et al.,**[13] who noted that low-energy trauma is a primary cause in elderly populations. **Dr. Ali Ashraf et al.**[14] and Hwang et al. similarly reported that high-energy trauma was more typical in younger individuals.

Laterality did not show a statistically significant trend, although left-sided fractures were slightly more common, in line with **Vivek Shetty et al.,**[9] while **Ganjale et al.**[15] and **Raja RSB et al.**[10] reported variable patterns. Comorbidities such as diabetes and hypertension were common, reflecting the age group and consistent with general trends in elderly orthopedic patients.

The mean operative time and intraoperative blood loss were slightly higher due to the dual-implant technique, yet these were within acceptable limits and comparable to ranges reported by **Ganjale et al.**[15] and **Raja RSB et al.**[10] The mean hospital stay of 6.7 days suggests early mobilization and rehabilitation were feasible, a critical factor in geriatric patients.

Fracture union was achieved in a mean of 10.4 weeks. Radiologically, good or acceptable reduction was achieved in over 93% of cases, underscoring the effectiveness of lateral wall augmentation in maintaining reduction, as supported by **Ganjale et al.**[15] and **Raja RSB et al.**[10]

Functionally, the mean Harris Hip Score (HHS) improved from 65.27 at 1 month to 84.15 at 6 months, demonstrating significant recovery. By 6 months, 80% of patients had good to excellent outcomes, consistent with trends reported by **Raja RSB et al.**[10] and others who emphasized the benefit of lateral wall support in enhancing biomechanical stability and reducing complications.

Complications were minimal, with anterior hip pain being most common, followed by rare instances of screw migration and Z/reverse Z effect, similar to previous reports by **Ganjale et al.**[15] and **Attum et al.**[11] Importantly, no cases of implant failure or avascular necrosis were observed, indicating sound construct stability.

While the results of this study are encouraging, limitations must be acknowledged. The sample size was relatively small and lacked a control group managed with PFN alone, limiting the ability to generalize findings or make direct comparisons. Follow-up was limited to 6 months, and longer-term outcomes, including implant longevity and functional endurance, were not assessed. Larger, multicentric, and randomized trials are warranted to further validate the benefits of combined fixation in such fracture patterns.

CONCLUSION

The present study concludes that the use of a trochanteric support plate in combination with a proximal femoral nail (PFN) provides a stable and effective method for the surgical management of unstable intertrochanteric femur fractures with lateral wall comminution. This combined fixation approach resulted in satisfactory fracture union, good to excellent functional outcomes as measured by the Harris Hip Score, and a low complication rate. The additional lateral wall support offered by the trochanteric plate plays a crucial role in preventing fracture collapse, maintaining proper alignment, and promoting early mobilization. Given its biomechanical advantages and favorable clinical results, this method can be considered a reliable and recommended treatment option for managing such complex fractures, particularly in the elderly population.

However, the study is limited by a relatively small sample size and short follow-up duration; hence, larger multicentric studies with longer follow-up are needed to further substantiate these findings.

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