	<b>ORIGINAL RESEARCH PAPER</b>		<b>Orthopaedics</b>
<b>FUNCTIONAL OUTCOME OF INTERTROCHANTERIC FEMUR FRACTURES TREATED BY PROXIMAL FEMORAL NAILING ANTI-ROTATION-2: A CROSS-SECTIONAL STUDY</b>			<b>KEY WORDS:</b> Intertrochanteric Femur Fractures, PFNA-II, Osteoporosis, Early Mobilization, Surgical Fixation Techniques
<b>Dr Sridhara V Badiger*</b>		Postgraduate, Department Of Orthopaedics Mims, Mandya *Corresponding Author	
<b>Dr Mahendrakumar K L</b>		Associate Professor, Department Of Orthopaedics Mims, Mandya	
<b>Dr Manjappa C N</b>		Professor And Head, Department Of Orthopaedics Mims, Mandya	
<b>ABSTRACT</b>	<b>Introduction:</b> Intertrochanteric femur fractures are common in the elderly and increase with age. Operative treatments aimed at stable reductions with rigid internal fixation have largely replaced conservative methods. The Proximal Femoral Nailing Anti-rotation II (PFNA-II) is effective for early mobilization, weight-bearing, and fracture union, especially in osteoporotic bones. This study was done to assess the functional outcome of intertrochanteric femur fractures treated by PFNA-II. <b>Methodology:</b> A 12-month descriptive cross-sectional study at Mandya Institute of Medical Sciences included patients over 18 with intertrochanteric femur fractures. Data on patient details, intraoperative specifics, and postoperative outcomes were collected and analyzed. <b>Results:</b> The study included 30 patients with a mean age of 63.2 years. Falls were the main injury cause (76.7%). The mean surgery duration was 71.2 minutes with a blood loss of 181.3 ml. The average union time was 12.9 weeks, with Harris Hip Scores improving over time (61.7 at 3 months to 85.2 at 9 months). Time to full weight-bearing averaged 15.2 weeks. <b>Conclusion:</b> PFNA-II offers substantial advantages for treating intertrochanteric fractures in the elderly, including shorter operating time, reduced blood loss, and early mobilization, leading to better functional outcomes and improved quality of life. Proper preoperative planning and surgical techniques are essential to mitigate complications.		
	<b>INTRODUCTION</b> Intertrochanteric femur fractures are an important concern in the elderly population and do increase with age. Half of the hip fractures are trochanteric fractures and are further divided into two equal halves-the stable and unstable types. <sup>[1]</sup> Traditional conservative treatments have largely been replaced by operative treatments that seek to provide anatomical and stable reductions with rigid internal fixation. This reduces complications of prolonged recumbency.  Intertrochanteric femur fractures are challenging for the following reasons: complications occur mainly from fixation rather than nonunion or delayed union because the bone in this region is cancellous. <sup>[2]</sup> The stability of a fracture fragment-implant assembly depends on considerations such as the quality of the bone, geometry of the fragment, reduction, implant design, and placement. In this regard, three of the factors mentioned are under the direct control of the surgeon: quality of the reduction, selection of the implant, and its placement. <sup>[3]</sup>  There are various treatments for the fractures, and the most popular one being the sliding hip screw device is more than a decade old; however, not the most ideal in every case. The technique of Proximal Femoral Nailing (PFN) has the advantages of early postoperative mobilization, weight-bearing, and finally early fracture union. <sup>[4]</sup> The PFNA-II is an evolution of the traditional PFN and possesses a helical blade rather than two screws, thereby giving higher stability as well as possible compression and rotational control. The angle of the mediolateral is reduced to 6 degrees from 5 degrees; hence, PFNA-II reduces the chance of implant failure even more, especially in elderly, osteoporotic bone. <sup>[5]</sup> Hence, PFNA-II provides the best of the two worlds in that it eliminates complications seen with the traditional PFN, yet at the same time provides much more.		
<b>Aims And Objective OfThe Study</b> To assess the Functional outcome of Intertrochanteric femur fractures treated by Proximal Femoral Nailing Anti-rotation-II			
<b>Methodology</b>			
<b>Inclusion Criteria:</b> <ul style="list-style-type: none"><li>• Patients with Intertrochanteric femur fractures.</li><li>• Patients with age of more than 18 years.</li><li>• Patients willing to give informed consent.</li></ul>			
<b>Exclusion Criteria:</b> <ul style="list-style-type: none"><li>• Pathological fractures.</li><li>• Fractures with compartment syndrome or impaired circulation.</li><li>• Compound fracture.</li><li>• If associated with other fractures.</li><li>• Previous surgeries in the affected limb.</li><li>• Co-morbidities affecting muscle strength and walking.</li><li>• Patients below the age of 18 years were excluded</li><li>• Patients who were either unwilling to participate or unable to provide informed consent due to cognitive impairments or other reasons were excluded from the study.</li></ul>			
<b>Study Duration:</b> 12 months from June 2023 to June 2024.			
<b>Sample Size Estimation:</b> The sample size is determined based on an estimate of 15% prevalence using the formula: $n = \frac{4pq}{d^2}$ Where: n = Sample size p = Proportion of prevalence = 85% q = 100 - p = 15% d = Absolute precision = 10%			
Therefore, the sample size is rounded to 30.			
<b>Data Collection:</b> Patient details and intraoperative specifics were collected after obtaining informed consent. Details such as age, gender, mode of injury, comorbidities, and			

102

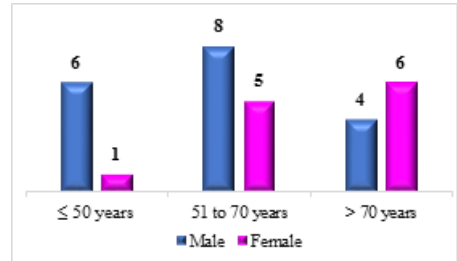
www.worldwidejournals.com

preoperative X-rays were collected. Intraoperative details were documented, including implant specifics, incision, technique, surgery duration, blood loss, and complications.

**Data Analysis:** Statistical analysis was performed using IBM SPSS Statistics, employing descriptive statistics and Chi-square tests to assess associations. A p-value of  $\leq 0.05$  was considered statistically significant for all analyses.

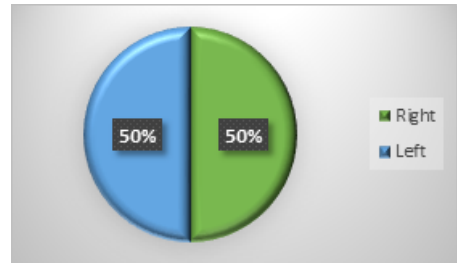
**RESULTS**

The study included 30 patients with intertrochanteric femur fractures with a mean age of  $63.2 \pm 15.9$  years. The study has male predominance with 60% being male. Approximately 50% of the patients had any co-morbidity.



**Figure 1.** Age-gender distribution of the study participants

The study participants were evenly distributed between right and left side injuries. The major cause of injury included falls (76.7%) followed by road traffic accidents (23.3%).



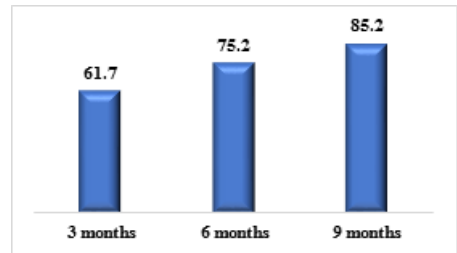
**Figure 2.** Location of Injury

The mean duration of surgery was  $71.2 \pm 16.9$  minutes for the PFN A-II fixation with a blood loss of  $181.3 \pm 66.3$  ml.

**Table 1. Summary of Patient Outcomes**

Variable	Mean	SD
Union Time	12.9	2.1
Harris Hip Score (3 months)	61.7	5.1
Harris Hip Score (6 months)	75.2	4.3
Harris Hip Score (9 months)	85.2	4.3
Time to full weight-bearing	15.2	2.7

The study reveals that the average union time for the fractures was 12.9 weeks with a standard deviation of 2.1 weeks. The Harris Hip Score, which evaluates hip function, showed significant improvement over time: from an average score of 61.7 at 3 months (SD = 5.1) to 75.2 at 6 months (SD = 4.3), and reaching 85.2 by 9 months (SD = 4.3). Additionally, the average time to full weight bearing was 15.2 weeks, with a standard deviation of 2.7 weeks.



**Figure 3.** Trends of Harris Hip Score over 9 months



**Figure 4.** Pre-op and post-op follow-up X-rays of the patients treated with PFN A-II

**DISCUSSION**

Modern advances in chronic disease treatment and improved living standards have significantly increased life expectancy. However, aging correlates with decreased bone quality and a rising prevalence of osteoporosis, leading to more frequent fractures, particularly intertrochanteric femur fractures. This study was conducted to assess the Functional outcome of Intertrochanteric femur fractures treated by PFN A-II.

The mean age in our study was 63.2 years, with a slightly higher number of males. This trend aligns with findings from J. Zou et al.<sup>[6]</sup> and Radaideh et al.<sup>[7]</sup>, with mean ages of 65 and 72.8 years, respectively. The higher male prevalence might be attributed to elderly males being more active and engaging in outdoor activities.

In our study, 76% of fractures were due to indoor falls, indicating limited mobility among the elderly. Road traffic accidents were more frequent in younger patients, while falls were predominant in older patients. We also observed a similar trend in both right and left-sided fractures, potentially due to no differences in bone density.

Our mean operating time was 71.2 minutes, comparable to other studies on PFNA2 but lower than PFN fixations due to the use of a single helical blade, avoiding reaming steps needed for PFN. Mean blood loss was 181 ml, lower than PFN fixations, attributed to shorter surgery duration and smaller incisions.

PFNA2 usage was associated with reduced surgery duration, complication rates, postoperative fixation failure, and intraoperative blood loss, consistent with findings by Zeng et al.<sup>[8]</sup> and Takigami et al.<sup>[9]</sup> The average Harris Hip Scores in our patients were 61.7 (3 months), 75.2 (6 months), and 85.2 (9 months), like studies by Swaroop et al.<sup>[10]</sup>, Radaideh et al.<sup>[7]</sup>, and Sharan Mallya et al.<sup>[11]</sup>

Notably, no non-union cases were reported, consistent with Levent Karapinar et al.<sup>[12]</sup> Thus, PFNA2 proves to be an effective and reliable option for treating intertrochanteric femur fractures.

## CONCLUSION

Intramedullary nailing with PFN A-II offers substantial advantages over conventional PFN or DHS for treating both stable and unstable trochanteric fractures in elderly patients with osteoporotic bones. The key benefits include shorter operating time and reduced blood loss, which facilitate early mobilization and weight-bearing. Early mobilization subsequently reduces the risk of complications such as bedsores, uremia, and hypostatic pneumonia. The significantly shorter operative time and minimal blood loss also enhance overall patient outcomes.

Proper preoperative planning, precise surgical techniques, adequate reaming of the femoral canal, accurate implant insertion, and meticulous placement of distal locking screws can mitigate the incidence of postoperative femoral shaft fractures and non-union rates. PFN A-II represents a significant advancement in treating trochanteric fractures, offering unique advantages such as closed reduction, preservation of fracture hematoma, minimal soft tissue damage during surgery, early rehabilitation, and a swift return to daily activities. These features collectively contribute to better functional outcomes and improved quality of life for all patients.

## REFERENCES

1. T J, Kwek EBK. Are Intertrochanteric Fractures Evolving? Trends in the Elderly Population over a 10-Year Period. *Clin Orthop Surg* 2022;14(1):13-20.
2. Wakefield SM, Rodham PL, Giannoudis PV. The management of intertrochanteric hip fractures: an update. *Orthopaedics and Trauma* 2024;38(2):70-7.
3. Loya DrLS, Kollur DrRV. A prospective study of management of intertrochanteric fractures of femur by modified intramedullary implant. *Int J Orthop Sci* 2022;8(1):127-34.
4. D' Almeida DrVR. PFN: A definite advantage over the DHS: A comparative Meta-Analysis. *Int J Orthop Sci* 2017;3(3b):104-8.
5. Ingishetty NM, Bulagond A, Bagewadi RM, Rajesh G, Venkat M. Surgical management of intertrochanteric fractures of femur with Proximal Fixation Nail Anti-Rotation-II. *ijhs* 2022;11100-10.
6. Zou J, Xu Y, Yang H. A comparison of proximal femoral nail antirotation and dynamic hip screw devices in trochanteric fractures. *J Int Med Res* 2009;37(4):1057-64.
7. Radaideh AM, Qudah HA, Audat ZA, Jahmani RA, Yousef IR, Saleh AAA. Functional and Radiological Results of Proximal Femoral Nail Antirotation (PFNA) Osteosynthesis in the Treatment of Unstable Pertrochanteric Fractures. *J Clin Med* 2018;7(4):78.
8. Zeng C, Wang YR, Wei J, Gao SG, Zhang FJ, Sun ZQ, et al. Treatment of trochanteric fractures with proximal femoral nail antirotation or dynamic hip screw systems: a meta-analysis. *J Int Med Res* 2012;40(3):839-51.
9. Takigami I, Matsumoto K, Ohara A, Yamanaka K, Naganawa T, Ohashi M, et al. Treatment of trochanteric fractures with the PFNA (proximal femoral nail antirotation) nail system - report of early results. *Bull NYU Hosp Jt Dis* 2008;66(4):276-9.
10. Swaroop S, Gupta P, Bawari R, Marya SK, Patnaik S. Factors Affecting the Outcome of Unstable Intertrochanteric Fractures Managed With Proximal Femoral Nail Anti-Rotation 2: A Prospective Outcome Study in Elderly Indian Population. *Cureus* 2020;12(12):e11973.
11. Mallia S, Kamath SU, Madegowda A, Krishnamurthy SL, Jain MK, Holla R. Comparison of radiological and functional outcome of unstable intertrochanteric femur fractures treated using PFN and PFNA-2 in patients with osteoporosis. *Eur J Orthop Surg Traumatol* 2019;29(5):1035-42.
12. Karapinar L, Kumbaraci M, Kaya A, Imerci A, Incesu M. Proximal femoral nail anti-rotation (PFNA) to treat peritrochanteric fractures in elderly patients. *Eur J Orthop Surg Traumatol* 2012;22(3):237-43.