*International Journal of Health Sciences and Research*
*[Indexed, Peer-Reviewed Journal]*
*Volume 15; Issue: 12; December 2025*
*Website: www.ijhsr.org*
*Original Research Article* *ISSN: 2249-9571*

# Comparative Study of Functional and Radiological Outcome of Closed Intertrochanteric Fracture Femur Managed by PFN and PFNA2

**Soumyadeep Pandit[1], Lakhan Singh Maravi[2], Sparsh Naik[3]**

[1]Post Graduate Student, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur (M. P.)
[2]Professor and Head, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur (M. P.)
[3]Assistant Professor, Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur (M. P.)

Corresponding Author: Dr. Lakhan Singh Maravi

**DOI: https://doi.org/10.52403/ijhsr.20251221**

## ABSTRACT

**Background:** Intertrochanteric fractures occur in the proximal femur extending from the extracapsular basilar neck region to the region along the lower border lesser trochanter. Intramedullary fixation with Cephalomedullary nail (CMN) is the current gold standard for managing intertrochanteric fractures. This study aims to compare functional and radiological outcome of intertrochanteric fracture managed by Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation for Asian Population (PFNA2).
**Methodology:** This prospective study was conducted on 50 patients with intertrochanteric femur fractures, among them 25 patients were managed by PFN and 25 patients were managed by PFNA2 at N.S.C.B. Medical College, Jabalpur, between April 2023 and March 2025. Patients were followed up at 1, 3, and 6 months postoperatively for clinical and radiological assessment, using the Harris Hip Score (HHS).
**Results:** Of the 50 patients enrolled, 48 patients had a complete follow up of 6 months postoperatively. Majority of patients were in age group of 61-70 years in both PFN and PFNA2 group. Mean duration of surgery for PFN was 90.28±8.28 min and for PFNA2 was 72.40±6.31 min and mean amount of blood loss in PFN was 125.4±9.23 ml and in PFNA2 was 98.4±8.26 ml. Differences between average HHS of PFN and PFNA2 group after 1 month, 3 months and 6 months are statistically significant.
**Conclusion:** PFNA2 has emerged as a superior implant for management of intertrochanteric femur fractures. It offers better functional outcome and fewer complications compared to PFN.

***Keywords:*** Intertrochanteric femur fracture, CMN, PFN, PFNA2, HHS

## INTRODUCTION

Intertrochanteric fractures involve those occurring in the region extending from the extracapsular basilar neck region to the region along the lower border lesser trochanter proximal to the development of the medullary canal, often associated with significant functional impairment and morbidity. Incidence of these fractures has increased primarily due to increasing life

span and more sedentary life style brought about by urbanization. In younger patients' intertrochanteric fractures occur due to high velocity trauma like road traffic accidents, whereas in older patients it is due to trivial trauma [1]. Intertrochanteric fractures are globally viewed as an injury best treated with surgical repair. Intramedullary fixation with Cephalomedullary nail (CMN) is the current gold standard for managing intertrochanteric fractures due to its minimally invasive approach which minimizes blood loss and duration of surgery. Mainly two types of CMN are most commonly used in India for intertrochanteric femur fracture- Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation for Asian population (PFNA2). PFN has two screws for proximal locking: the lower 8mm load bearing screw and a proximal thinner 6.5 mm antirotation screw to counter the rotational tendency [2]. In PFNA2 only a single helical blade is inserted into the proximal femur which provides stability, compression as well as rotational control of the fracture. Theoretically it compacts the bone during insertion into the neck and hence there is less chance of implant failure especially in elderly, osteoporotic bones [3]. In this study we are intending to compare functional and radiological outcome of intertrochanteric fracture managed by PFN and PFNA2.

## MATERIAL AND METHODS

This prospective study was done in the Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, (M.P), from 1st April 2023 to 31st march 2025. This study included 50 patients with intertrochanteric fracture femur; among them 25 patients underwent internal fixation with PFN and 25 patients underwent internal fixation with PFNA2.

### METHOD OF SAMPLING

All patients with intertrochanteric femur fractures who fulfilled the inclusion criteria and presented during the study period were included until the required sample size was reached. Implants were decided for the patients by simple randomization.

### Selection of the Patients:

**Inclusion Criteria-**

- Patients aged between 20-70 years
- Clinical diagnosis of closed intertrochanteric femur fracture of Type 31A3 (31A3.1- Simple oblique fracture, 31A3.2- Simple transverse fracture, 31A3.3- Wedge or multi fragmentary fracture) according to AO Classification
- Patients who arrived hospital within 3 weeks of injury
- Patients who were medically fit for surgery
- Ambulatory before the trauma

**Exclusion Criteria-**

- Fractures associated with vascular injuries, open fractures
- Pathological fractures
- Associated pelvic injury
- Patients who were not willing for surgery
- Cognitive impairment

## METHODOLOGY

All selected patients were provided with a detailed explanation of the study objectives and procedures. Written informed consent was obtained prior to their participation. Demographic and clinical information, including age, sex, details of injury, and duration of symptoms, were systematically recorded. Data on disease progression were collected through structured patient interviews. Each participant underwent thorough clinical and local physical examinations to ensure comprehensive assessment of their condition.

### OPERATIVE TECHNIQUE

All surgeries were done under spinal/epidural/general anaesthesia. Surgeries completed on a radiolucent OT table under C-arm guidance with fracture table attached to it. The fracture was reduced before starting the operative

procedure with adduction, internal rotation of the femur and traction.

**Incision -** A 5 to 6 cm oblique skin incision was given starting from tip of the greater trochanter, and then continued proximally and medially. Fascia of the gluteus maximus was incised along with its fibers. Tip of greater tuberosity and piriformis fossa were palpated.

**The entry point -** Bony entry was made from tip of the greater trochanter by using bone awl due to 5-degree mediolateral bend of both PFN and PFNA2. Then guide wire was inserted from the bony entry point.

Reaming of medullary canal- Depending upon the broadness of the medullary canal, sequential reaming was done with reamers of appropriate sizes from 8mm to 12mm. Then proximal reaming was done by using proximal reamer to accommodate the wider proximal part of the nails.

**Insertion of the nail-** The nail was loaded with the jig with appropriate angle guide attached to it, the angle of the nail and angle guide was again reconfirmed. The nail was inserted over the guide wire and pushed downward under C-arm guidance. Hammering was avoided during the procedure. After inserting the nail properly, guide wire was taken out.

**Proximal locking-** At first correct positioning of the nail was confirmed under C-arm guidance. For PFN, two drill sleeves were attached to the angle guide, skin incision given. Sleeves were approximated to the lateral cortex. Guide wires were passed, then reaming was done for 8mm lag screw and 6.5 mm derotation screw. Then the lag screw was selected in such a way that tip of lag screw lies within 5 to 10mm of the articular surface of the femoral head. Then derotation screw was selected 15-20mm shorter than the lag screw and inserted.

For PFNA2, single drill sleeve was attached and after giving skin incision it was forwarded upto the lateral cortex. Then guide wire was passed, lateral cortex over the proximal locking site was removed by lateral cortex breaker. Reaming may or may not be done. Appropriate size of helical blade was chosen such that tip of blade lies within 5 to 10mm of the articular surface. The blade was attached with blade impactor and inserted. After inserting the helical blade, blade impactor was rotated clockwise to detach from the blade and achieve compression.

**Distal locking-** Distal locking was done using bolts of 4.9mm under C-arm guidance for both nails.

## OPERATIVE IMAGES

**Figure 1**

**Figure 2**


**Figure 3**

**Figure 4**

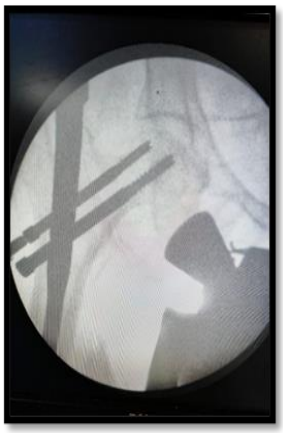

**Figure 5**

**Figure 6**

**Figure 7**

**Figure 8**

**Figure 9**

**Figure 1 shows marking of incision site**
**Figure 2 & 3 show making of entry point for proximal femoral nailing**
**Figure 4 & 5 show Proximal locking in PFN**
**Figure 6 & 7 show Proximal locking in PFNA2**
**Figure 8 & 9 show Distal locking in PFN and PFNA2**

## Statistical Analysis

All the data were analyzed by using IBM SPSS (Statistical Package for Social Sciences) software version 29.0.2.0. Unpaired t-test was applied to compare data like mean duration of surgery, mean amount

of blood loss, average Harris Hip Score between PFN and PFNA2 groups, where P-value of <0.05 was considered to be statistically significant.

## RESULTS

Majority of patients were in age group of 61-70 years in both PFN and PFNA2 group. Mean age of PFN group is 53.28 years and mean age of PFNA2 group is 54.48 years. In PFN group, 56% are male, 44% are female and in PFNA2 group, 52% are male and 48% are female. Among the cases, 52% of PFN group and 56% of cases of PFNA2 group had right sided intertrochanteric femur fracture. Accidental fall was the most common mode of injury in both groups followed by road traffic accident. Mean duration of surgery for PFN was 90.28±8.28 min and for PFNA2 was 72.40±6.31 min, the difference is statistically significant. Mean amount of blood loss in PFN was 125.4±9.23 ml and in PFNA2 was 98.4±8.26 ml; the difference is statistically significant. Average HHS after 1 month was 63.72±5.53 for PFN group and 67.80±4.34 for PFNA2 group. Average HHS after 3 months was 75.67±5.19 for PFN group and 79.16±4.41 for PFNA2 group. Average HHS after 6 months was 84.91±4.80 for PFN group and 88.20±3.62 for PFNA2 group. The above differences in HHS were found to be statistically significant. Complications like Proximal screw out/ Z-effect were seen significantly lesser in PFNA2 group, compared to PFN group.

**TABLE-1 MEAN DURATION OF SURGERY (MIN)**

| DURATION OF SURGERY (MIN) | MEAN | STANDARD DEVIATION |
|---|---|---|
| PFN | 90.28 | ±8.48 |
| PFNA2 | 72.40 | ±6.31 |

Unpaired t-test applied, P-value < 0.05, so the difference is statistically significant

**TABLE- 2 MEAN AMOUNT OF BLOOD LOSS (ML)**

| BLOOD LOSS (ML) | MEAN | STANDARD DEVIATION |
|---|---|---|
| PFN | 125.4 | ±9.23 |
| PFNA2 | 98.4 | ±8.26 |

Unpaired t-test applied, P-value < 0.05, so the difference is statistically significant

**TABLE- 3 MEAN HARRIS HIP SCORE**

| Time Point | PFN | PFNA2 | P-value |
|---|---|---|---|
| 1 month | 68.4 | 69.8 | < 0.05 |
| 3 months | 76.7 | 80.2 | < 0.05 |
| 6 months | 88.1 | 92.9 | < 0.05 |

**CASE- 1**

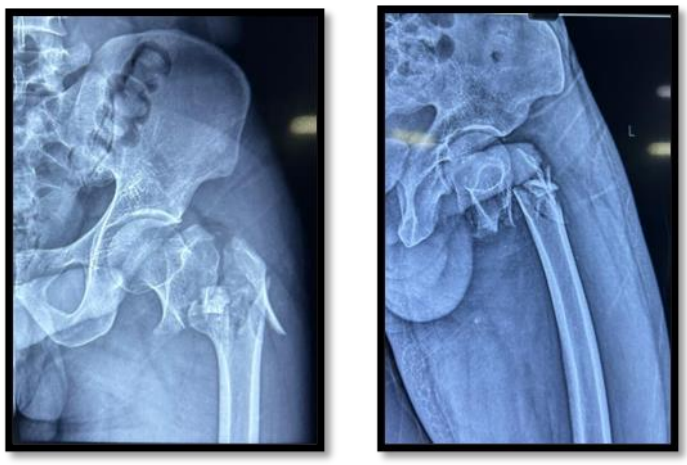

**Fig- 10 Pre-operative X-ray AP & Lateral view**

**Fig- 11A**

**Fig- 11B**

**Fig-11(A&B) Immediate Post Op X-ray**

**Fig- 12A**

**Fig- 12B**

**Fig-12(A&B) Follow up X-ray at 6 months**

**Fig 13A- Squatting**

**Fig 13B- Cross leg sitting**

**Fig 13C- Straight leg raising**

## CASE- 2

**Fig- 14 Pre-operative X-ray AP & Lateral view**

**Fig- 15A**

**Fig- 15B**

**Fig-15(A&B) Immediate Post Op X-ray**

**Fig- 16A**

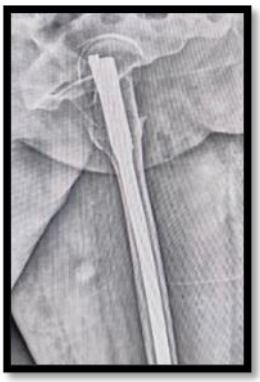

**Fig- 16B**

**Fig-16(A&B) Follow up X-ray at 6 months**

**Fig 17A- Squatting**

**Fig 17B- Cross leg sitting**

**Fig 17C- Straight leg raising**

## DISCUSSION

In our study, mean duration of surgery of PFN group was 90.28±8.48 min and mean duration of surgery of PFNA2 group was 72.40±6.31 min. In a similar study by Dr. Bijendra Kumar Meena et al. [4] mean duration of surgery in PFN was 85.44±11.08 min and mean duration of surgery in PFNA2 was 65.24±6.57 min. In this study, mean amount of blood loss for PFN was 125.4±9.23 ml and mean amount of blood loss for PFNA2 was 98.4±8.26 ml. In a study by Dr Pradeepa G et al. [5] the mean amount of blood loss in PFN was 112ml and PFNA2 was 98.72ml.

In our study, mean HHS after 6 months was 84.91±4.80 in PFN group and 88.20±3.62 in PFNA2 group. The difference is statistically significant (p-value 0.01). In a study by Dr. Jayant Kumar et al. [6] mean HHS was 76.23±3.18 for PFN and 88.57±2.24 for PFNA2 after 6 months of follow up with P-value of 0.014 (<0.05), which indicates significant difference between the values. In another study by Balasubramanian Santharam et al. [7] at the end of 6 months, mean HHS of PFN group was 83.15±14.00 and PFNA2 group was 86.80±11.05, with P-value of 0.366 (>0.05), which concludes there is no significant difference in HHS after 6 months.

In present study, in PFN group out of 25 patients, 1 (4%) patient developed superficial infection, 6 (24%) patients developed proximal screw back out/ Z-effect and 18 (72 %) patients did not develop any complications. In PFNA2 group out of 25 patients, 1 (4%) patient developed superficial infection, 1 (4%) patient developed back out of helical blade and 23 (92 %) patients did not develop any complications. In a similar study by Kaushal et al. [8] out of 20 patients managed by PFN, 3 patients developed deformity, 6 patients developed superficial infection, 6 patients developed screw back out and 5

patients were without any complications. On the other hand, out of 20 patients managed by PFNA2, 1 patient developed superficial infection and 19 patients were without any complication.

## CONCLUSION

PFNA2 offers advantages of lesser surgical time, smaller surgical incision resulting in lesser amount of blood loss, compared to PFN. PFNA2 shows better functional outcome compared to PFN. PFNA2 also offers significant benefit over PFN in terms of post-operative complications. It offers lesser chance of screw cutout or Z-effect as helical blade of PFNA2 can be inserted without drilling through the neck of femur which provides better compaction of cancellous bone in the femoral head and neck and provides mechanical impaction to the fracture.

So, from this study, we can conclude that, PFNA2 has emerged as a superior implant for management of intertrochanteric femur fractures, particularly in elderly patients with osteoporotic bones. It offers better functional outcome and fewer complications compared to PFN.

### *Declaration by Authors*

**Ethical Approval:** Approved
**Acknowledgement:** None
**Source of Funding:** Nil.
**Conflict of Interest:** None declared

## REFERENCES

1. Mundla MKR, Shaik MR, Buchupalli SR, Chandranna B. A prospective comparative study between proximal femoral nail and dynamic hip screw treatment in trochanteric fractures of femur. Int J Res Orthop 2018; 4:58-64.
2. Kashid MR, Gogia T, Prabhakara A, Jafri MA, Shaktawat DS, Shinde G. Comparative study between proximal femoral nail and proximal femoral nail antirotation in management of unstable trochanteric fractures. Int J Res Orthop 2016; 2:354-8.
3. Gadhe SS, Bhor P, Patel I, Vatkar AJ, Kale S, Kanade G. Comparative study of PFNA vs PFNA 2 in unstable intertrochanteric fractures: A randomised control study of 50 cases. Int J Orthop Sci. 2019;5(3):162-164. doi: 10.22271/ortho.2019.v5.i3c.1525.
4. Meena BK, Bhaskar SK, Harshwardhan H, Rao BS. Prospective randomised comparative study of PFN and PFNA2 proximal femoral nails for the treatment of intertrochanteric fractures. Int J Sci Res. 2021;10(4):51–52. doi:10.36106/ijsr.
5. Pradeepa G, Patil VB, Masgal E. Clinical, functional and radiological outcomes of proximal femur nail (PFN) in comparison with proximal femur nail antirotation for Asians (PFNA2) in the treatment of intertrochanteric femur fracture. Int J Adv Res. 2024;12(8):509–516. doi:10.21474/IJAR01/19279.
6. Kumar J, Vatsa G, Suman S, Sindhu V. Comparative study of the clinico-radiological outcomes of fixation of unstable intertrochanteric fractures with standard proximal femoral nail (PFN) and proximal femoral nail antirotation for Asia (PFNA2). J Orthop Sports Med. 2024;6(4): 227–230. doi:10.26502/josm.511500166.
7. Santharam B, Mohammed KF, Ratnam S, Madhav A. A comparative study of intertrochanteric fractures of hip treated with PFN & PFNA 2. Int J Orthop Sci. 2019;5(4):426-429.
8. Kaushal A, Anand A, Sethy P, Priyadarshi S. Comparative study of functional and radiological outcome of pertrochanteric fracture fixation by proximal femoral nail antirotation 2 and old proximal femoral nail. J Orthop Dis Traumatol. 2023;6(3):228–233. Doi: 10.4103/jodp.jodp_38_23.

How to cite this article: Soumyadeep Pandit, Lakhan Singh Maravi, Sparsh Naik. Comparative study of functional and radiological outcome of closed intertrochanteric fracture femur managed by PFN and PFNA2. *Int J Health Sci Res.* 2025; 15(12):159-166. DOI: *https://doi.org/10.52403/ijhsr.20251221*

******