

# Comparative Analysis of PFN vs PFNA2 in Patient above 55 Ages with Intertrochanteric Fractures

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## Abstract

**Introduction:** Intertrochanteric fractures are one of the most common fractures encountered among the people above 55 ages. Although life expectancy has increased but patient has more occurrence of fractures. Both surgical and conservative option are the management of intertrochanteric fractures. PFN have intramedullary nail which consists of one lag screw and other one as antirotational screw. While PFNA2 consists of intramedullary nail and only one screw also known as blade. This study focuses on functional and clinical results of intertrochanteric fractures treated with PFN and PFNA2. **Materials and Methods:** 40 Patients were selected for the Comparative, Prospective and randomized study which was conducted at Janaki Medical College and Teaching Hospital, Janakpurdham, Nepal between September 2022-September 2024. After fulfilling the inclusion criteria, the patients were divided into two groups randomly, with 20 cases in each group. Results: This Study showed PFNA2 has better outcome, and less complication compared with PFN in aspect of blood loss, operative time, radiation exposure and hospital stay. Complications like backing out of screws (z effect and reverse z effect), are not seen with PFNA2. **Conclusion:** PFNA2 is better implant in terms of intraoperative complications, blood loss, union rates and functional outcome.

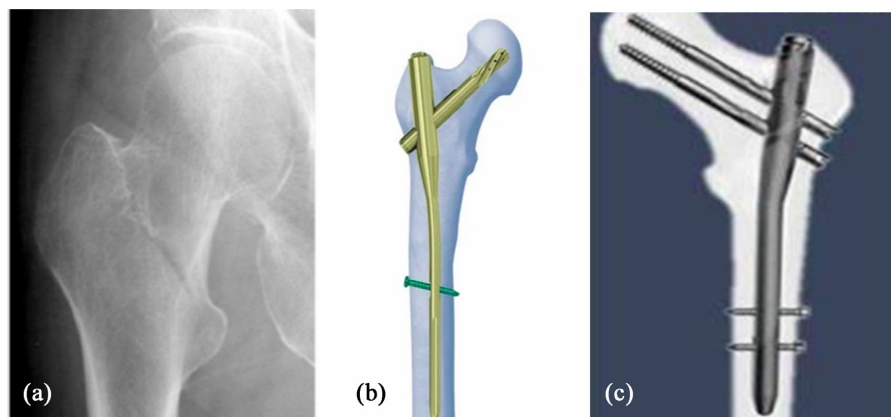
## Keywords

Intertrochanteric Fractures, Janakpurdham, Proximal Femoral Nails, PFNA2

## 1. Introduction

Intertrochanteric fractures (**Figure 1(a)**) are common injuries among the elderly aged population [1] [2]. Non-operative management of hip fracture has higher

mortality rates [3]. Surgical intervention is necessary for better outcome. The main aim of surgery is early rehabilitation for normal functional outcome. Proximal Femoral Nail (PFN) (**Figure 1(b)**) consists of intramedullary nail with two screws. One is lag screw and others act as anti-rotational screw. Proximal Femoral Nail Antirotation for Asia (PFNA2) (**Figure 1(c)**) has intramedullary nail and single proximal screw also known as helical screw. PFNA2 has advantage as it prevent back out of screw and cutting of femoral head which helps in early weight bearing [4] [5]. Biomechanical studies show that helical blade has good bone compaction, superior resistance to both Varus collapse and rotational movement [6]. The quality of reduction, choice of implant and its placement depends on surgeon choice. This study focused on the various aspects of PFN and PFNA2 fixation in Intertrochanteric fractures (AO/OTA as 31A1.2).



**Figure 1.** (a) Intertrochanteric fracture; (b) PFN and (c) PFNA2.

This is a Prospective study with aimed to compare among two groups of Intertrochanteric fractures treated with PFN and PFNA2 where below points are to be emphasized:

- Surgical efficiency.
- Functional outcome.
- Radiological outcome.
- Complications related to surgical techniques.
- Complications related to Implant.

## 2. Material and Methods

### • Study Design

It is a Prospective and comparative Study involving 40 patients.

### • Study Site

The study was conducted at Janaki Medical College and Teaching Hospital, Janakpurdham, Nepal.

### • Study Period

This study was done between September 2022 - September 2024. The case was randomly selected on the basis of inclusive and exclusive criteria.

- **Follow up**

The Patients followed up was at 6 weeks, 3 months and 6 months.

- **Inclusive Criteria**

- Age > 55 years.
- Patient with I/T fractures.
- Patient with close fractures.
- Patient willing to undergo Surgical intervention.
- AO/OTA as 31A1.2. Pertrochanteric, two-part.

- **Exclusive Criteria**

- Pathological Fractures.
- Non-ambulatory Patients before the injury.
- Patient with preexisting Osteoarthritis or other pathology.
- Comminuted Fractures excluded since the study is to compare PFN and PFNA2 in similar types of fractures.

- **Evaluation**

- **Pre-Operative**

- Patient meeting the criteria were included in the study.
- Ethical approval was obtained from Patient and Institution.
- Pre-Anesthesia Checkup were performed.
- Randomly assigned in two groups with each of 20 cases for PFN and PFNA2.

- **Intraoperative**

- Blood loss.
- Radiological Exposure.
- Surgery Time (Skin to Skin).

- **Postoperative**

- Clinical and Radiological evaluation of fracture union on 6 weeks, 3 months and 6 months.
- Functional Assessment was done by using Harris Hip Score.

- **Statistical Evaluation**

Statistical evaluation was done with SPSS Software-Version 20. The statically analysis was done using the student's t-test. Comparison between the groups was based on chi-square test (x2 test). P-value of 0.05 or less was statically significant.

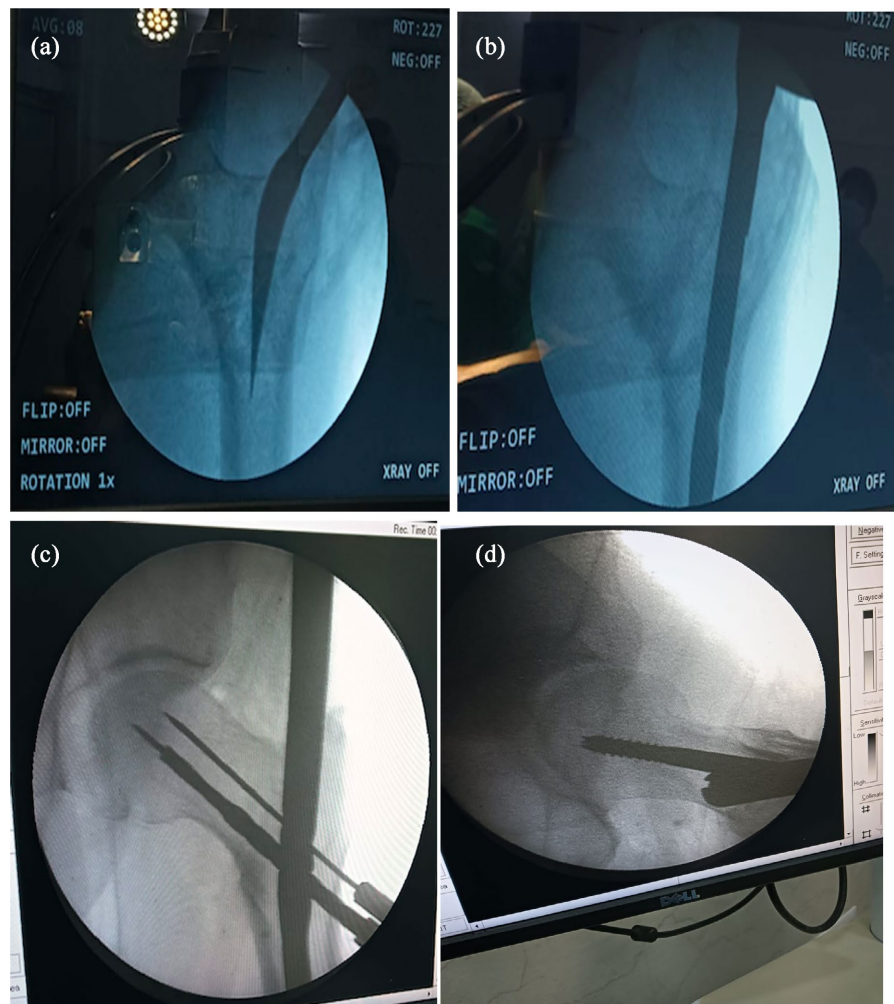
### 3. Surgical Procedure

All the Patient after admission where kept under skin traction. After pre-Anesthetic evaluation, patients were accessed for surgery. Informed consent was taken for surgery. Surgical intervention was done under spinal Anesthesia over operating traction table. Surgical approach for all patients were similar with reduction achieved and confirmed under fluoroscopy. Maintaining sterility, incision of 2 - 3 cms was made around tip of greater trochanter of femur. Tensor Fascia lata was incised and using awl entry point (**Figure 2(a)**) was made followed by guide wire

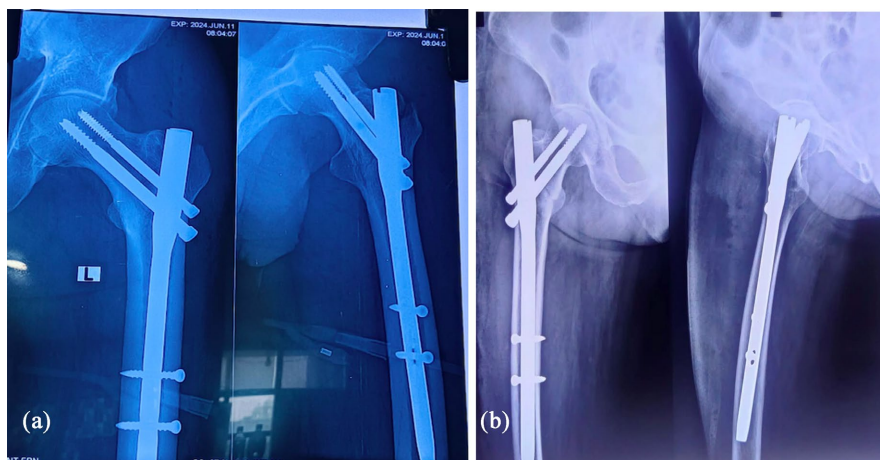
insertion. All the above steps were under fluoroscopy guidance. Further Proximal reaming was done with proximal reamer and PFN or PFNA2 inserted using jig (**Figure 2(b)**). Finally reaming with 8mm and 6.4mm reamers for PFN done (**Figure 2(c)**). Lag and de-rotation screws are kept (**Figure 2(d)**). On another hand for PFNA2 appropriate size helical blade is fixed with help of impactor and locked with clockwise turns. The Helical screw size was confirmed under C-arm. In some cases, Helical screw were immediately changed during intraoperative period if the size appeared larger or if the screw is loosening. Lastly Distal locking was done. After implant placement, operated site was washed and closure done in layers. Postoperative x-rays of both PFN (**Figure 3(a)** and **Figure 3(b)**) and PFNA2 (**Figure 4(a)** and **Figure 4(b)**) were taken on 1<sup>st</sup> postoperative day of surgery.

#### 4. Result

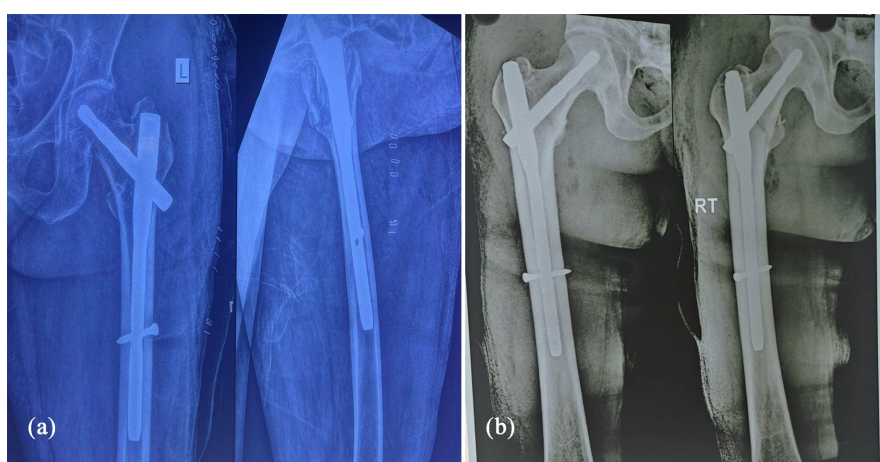
The mean age of the patients in PFN and PFNA2 groups were 63.4 and 62.6 respectively. The mean age group were almost similar in both groups. In PFN



**Figure 2.** Intraoperative C-Arm images: (a) Entry with Awl; (b) PFN insertion; (c) Lag screw and guide wire; (d) Lateral view of Lag and anti-Rotational screws.



**Figure 3.** Post-operative X-rays of PFN.



**Figure 4.** Post-operative X-rays of PFNA2.

group 12 Patients had injury due to road traffic accident while 8 patients were admitted resulting from fall injury. In PFNA2 group 14 cases were from Road traffic accident and 6 cases were of fall injury. In both PFN and PFNA2 groups more cases were resulted from road traffic accident. In PFN group 14 cases have right side injured limb and 6 cases have left limb injury. In PFNA2 group 12 cases have injured right side limb and 8 cases have left limb injury. Prominent side affected were right intertrochanteric fracture of femur. Mean operative time in PFN was 58.09 whereas in PFNA2 it was 46.54. Blood loss was 90.37 ml in PFN and 69.27ml in PFNA2. Average Fluoroscopy shots number was 54.39 and 32.55 in case of PFN and PFNA2. There was statically significant in Operative time, blood loss, Fluoroscopy exposure shots and weight bearing time in case of PFN and PFNA2 patient groups. Duration of hospital stay was almost similar in both groups and has no any significant difference statistically. Early weight bearing was in case of PFNA2 *i.e.* 5 days (**Table 1**). Delayed weight bearing was in case of PFN to prevent from Z-effect and screw back out due to osteoporotic nature of bone. Mean Neck shaft angles achieved were 130.78 and 130.49 in PFN and PFNA2 groups patients respectively. Mean Neck shaft angles achieved was almost similar

in both groups.

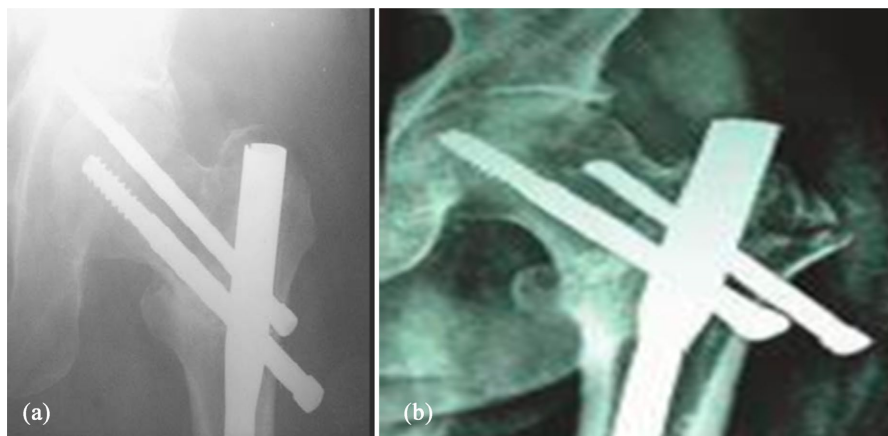
**Table 1.** Operative Details of PFN and PFNA2 group Patients.

	PFN	PFNA2	P value
Mean Operative Time	58.09 ± 5.82	46.54 ± 5.48	<0.001
Mean Blood Loss	90.37 ± 14.98 ml	69.27 ± 12.92 ml	<0.001
Mean Image Shot (Fluoroscopy no.)	54.39 ± 2.54	32.55 ± 2.99	<0.001
Post Op reduction in HB%	0.9 ± 0.5	0.5 ± 0.4	>0.001
Length of Hospital Stay	7.3 ± 1.67	5.9 ± 1.48	>0.001
Post Op partial Weight bearing	3 weeks	5 day	<0.001

9 complication cases in PFN and 5 complication cases in PFNA2 were seen related to surgery (**Table 2**). Implant related complications as z-effect (**Figure 5(a)**), Reverse Z-effect (**Figure 5(b)**), screw cut out, implant breakage and guide wire breakage were noted in 4 cases of PFN. No any implant related complication seen in PFNA2 group (**Table 3**). Harris Hip Score was measured in both groups at 3 weeks, 3 months and 6 months. Comparatively better outcome noticed in PFNA2 groups than PFN groups patients (**Table 4**).

**Table 2.** Complications related to surgery in PFN and PFNA2 group patients.

Surgery Related	PFN		PFNA2	
	No	%	No	%
Superficial Infection	3	15	1	5
Limb length discrepancy	2	10	1	5
Mal-union	2	10	0	0
Deep vein Thrombosis	0	0	1	5
Urinary tract infection	2	10	2	10
Total	9	45	5	25



**Figure 5.** (a) Z-effect; (b) Reverse Z-effect in case of PFN groups.

**Table 3.** Complications related to surgery in PFN and PFNA2 group patients.

Implant Related	PFN		PFNA2	
	No	%	No	%
Z-effect/Reverse Z-effect/Screw Cut out	2	10	0	0
Guide wire Breakage	1	5	0	0
Implant breakage	1	5	0	0
Total	4	20	0	0

**Table 4.** Comparison of Hip Harris Score of PFN and PFNA2 group patients.

Harris Hip Score	PFN	PFNA2	P
3 Weeks	60.24 (44 - 71)	66.47 (47 - 73)	0.497
3 months	67.23 (49 - 74)	77.37 (59 - 89)	0.036
6 months	75.74 (58 - 88)	82.42 (63 - 91)	0.015

## 5. Discussion

Treatment of intertrochanteric femur fracture is a challenging issue [7] [8]. Proximal Femoral nail is a standard method for treating these types of fractures. Generally, Intertrochanteric femur fracture occurs in age above 55years where there is high probability of implant failures and other complications if proper treatment is not done. Technical errors like intraoperative implant placements, screw cut out, Z-effects and Reverse Z-effects seen in many cases and were reported in literature as well [9]. PFNA2 is designed basically to minimize these complications. Helical screw prevents it as there is more surface contact between the cancellous bone of femur head and the holding device [4] [10]. Therefore, it has more bio-mechanical advantages than PFN.

In our study, PFNA2 group has less blood loss, less surgical duration and less number of fluoroscope shots which supports similar studies which have been done before. Functional results also favor PFNA2 over PFN. There were complications related to surgery and implant noticed more in cases with treatment done with PFN. Early weight bearing and rehabilitation were seen in case of PFNA2. Other studies and literature have also similar result compared to our study [5] [10]-[13].

## 6. Limitation of the Study

As the study was time bound, the patients were followed up for a period of 6 months only and the long term effects of these interventions have to be assessed in future. In this study, the radiological union of fractures was assessed only for 6 months. Hence, the comparison as to which implant provides earlier fracture union cannot be commented from this study. A longer follow-up study would shed light in this matter. Though the scoring system employed in the present study is used widely all over the world, it is inadequately described.

## 7. Conclusion

PFNA2 is better implant in terms with less intraoperative complications, blood loss, union rates and functional outcome.

## 8. Clinical Message

For Orthopedic Surgeon, PFNA2 has made easier to perform surgery of Intertrochanteric fracture of femur with less complication encountered during and after surgery with early rehabilitation for the patient.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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