



## FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL NAIL ANTIROTATION-2 (PFNA2) IN THE TREATMENT OF INTERTROCHANTERIC FEMUR FRACTURE: PROSPECTIVE STUDY

### Orthopaedics

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### ABSTRACT

**Background:** Intertrochanteric femur fractures are common injuries in the elderly population and are associated with significant morbidity and mortality. Stable internal fixation enabling early mobilization is essential to reduce postoperative complications. Proximal Femoral Nail Antirotation 2 (PFNA2) is an intramedullary implant designed to improve fixation in osteoporotic bone. **Aim:** To evaluate the functional and radiological outcomes of intertrochanteric femur fractures treated with PFNA2. **Materials and Methods:** This prospective observational study included 50 patients with intertrochanteric femur fractures treated with PFNA2 between February 2023 to February 2026. Patients were followed for 12 months. Functional outcome was assessed using the Harris Hip Score (HHS). Operative time, intraoperative blood loss, time to weight bearing, radiological union, and complications were recorded. **Results:** The mean age was  $74.1 \pm 10.8$  years with female predominance. Mean operative time was  $58.2 \pm 10.6$  minutes and mean blood loss was  $108.4 \pm 21.3$  ml. Partial weight bearing was initiated at a mean of 5.4 weeks. Radiological union was observed in the majority by 6 months and in all cases by 12 months. The mean HHS improved from 21.3 at 6 weeks to 91.8 at 12 months. Only one superficial infection was noted. **Conclusion:** PFNA2 provides stable fixation, allows early mobilization, and results in excellent functional recovery with minimal complications in intertrochanteric femur fractures.

### KEYWORDS

Hip Fractures, Femoral Fractures, Internal Fixators, Treatment Outcome, Functional Recovery.

### INTRODUCTION

Intertrochanteric fractures are extracapsular fractures of the proximal femur occurring in the region between the greater and lesser trochanters. They constitute approximately half of all hip fractures and are encountered most frequently in elderly individuals, particularly those with diminished bone quality due to osteoporosis [1]. As global demographics shift toward an aging population, the burden of these fractures continues to escalate, contributing significantly to morbidity, mortality, and healthcare expenditure.

Management of these injuries is primarily surgical, with early stabilization forming the basis of modern treatment protocols. Prompt fixation enables early mobilization, alleviates pain and minimizes the systemic complications that accompany prolonged recumbency, including thromboembolic events, respiratory infections, pressure-related skin breakdown, and progressive muscle atrophy [2]. Therefore, achieving stable fixation that permits early functional rehabilitation is a fundamental objective in treating these fractures.

Implant evolution has played a critical role in improving outcomes. Compared with extramedullary devices, intramedullary fixation systems are biomechanically advantageous because of their central alignment within the mechanical axis of the limb. This positioning reduces bending stresses on the implant and promotes more effective load transfer across the fracture site, which is particularly beneficial in unstable fracture patterns [3]. Nevertheless, earlier generations of intramedullary nails were not without complications, as mechanical failures such as lag screw cut-out, excessive collapse, and rotational instability of the head-neck fragment were reported.

The Proximal Femoral Nail Antirotation 2 (PFNA2) was subsequently introduced to overcome these mechanical limitations. Its distinctive helical blade design compacts cancellous bone during insertion, thereby increasing bone-implant interface stability and enhancing resistance to rotational displacement, especially in osteoporotic bone [4]. These refinements are intended to improve fixation security while reducing implant-related complications.

Given the increasing incidence of intertrochanteric fractures and ongoing advancements in fixation technology, it is essential to critically evaluate clinical and functional outcomes associated with newer implant systems. The present study was therefore undertaken to analyse the functional outcome of intertrochanteric femur fractures treated with PFNA2.

### MATERIALS AND METHODS

**Study Design** - Prospective observational study.

**Study Duration**- 3 years February 2023 to February 2026

**Sample Size**- 50 patients.

#### Inclusion Criteria

- Age  $\geq 18$  years
- Closed intertrochanteric femur fractures
- Medically fit for surgery

#### Exclusion Criteria

- Pathological fractures
- Polytrauma patients
- Previous ipsilateral hip surgery
- Non-ambulatory patients prior to injury

#### Surgical Technique

Closed reduction was performed on a fracture table under spinal or general anesthesia. After confirming satisfactory reduction under fluoroscopy, entry was made through the tip of the greater trochanter. The PFNA2 nail was inserted over a guide wire, followed by placement of the helical blade into the femoral head and distal locking screw fixation.

#### Postoperative Protocol

- Early mobilization from postoperative day 2
- Quadriceps strengthening exercises
- Partial weight bearing after 4-6 weeks
- Full weight bearing after radiological signs of union

#### Outcome Measures

**Primary Outcome**- Harris Hip Score (HHS) [5] - at 6 week, 3 month, 6 month, 12 month.

- Radiological union

#### Secondary Outcomes:

- Operative time
- Blood loss
- Time to weight bearing
- Complications

#### Statistical Analysis

Data were analyzed using descriptive statistics and expressed as mean  $\pm$  standard deviation.

#### Ethical Clearance

The study was conducted after obtaining approval from the Institutional Ethics Committee of GMERS Medical College and Hospital. The study protocol complied with the ethical principles

outlined in the World Medical Association Declaration of Helsinki for research involving human participants.

Written informed consent was obtained from all patients prior to inclusion in the study. Confidentiality of patient data was strictly maintained throughout the study.

**RESULTS**

**Demographic Profile**

- Mean age: 74.1 ± 10.8 years
- Female predominance
- Majority of fractures resulted from trivial fall

**Operative Parameters**

- Mean operative time: 58.2 ± 10.6 minutes
- Mean blood loss: 108.4 ± 21.3 ml
- Mean hospital stay: 7.1 ± 1.5 days

**Time of mobilization and weight bearing**

- Time for Mobilization (days): 2.2 ± 0.7
- Partial Weight Bearing (weeks): 5.2 ± 0.8
- Complete Weight Bearing (weeks): 12.3 ± 1.2

**Functional Outcome (Harris Hip Score)**

- Follow-up Mean HHS
- 6 weeks 21.3
- 3 months 72.5
- 6 months 84.6
- 12 months 91.8

There was progressive improvement in functional outcome over the follow-up period, with most patients achieving excellent results at 12 months.

**Radiological Union**

- Majority achieved union by 6 months
- All fractures united by 12 months
- No implant failure or screw cut-out observed

**Complications**

- Superficial infection – 1 case
- No non-union
- No implant breakage
- No reoperation required

**DISCUSSION**

The primary objective in the management of intertrochanteric fractures is to achieve stable internal fixation that enables early mobilization while minimizing postoperative morbidity. Intramedullary devices have gained widespread acceptance owing to their biomechanical advantages, including improved load-sharing characteristics and reduced bending stress compared with extramedullary implants [3].

In the present study, fixation with PFNA2 resulted in favorable functional recovery, demonstrated by progressive improvement in Harris Hip Scores during follow-up evaluation [5]. The helical blade mechanism of the PFNA2 is designed to compact cancellous bone within the femoral head, thereby enhancing rotational stability and fixation strength, particularly in osteoporotic bone [4]. These biomechanical principles may explain the absence of screw cut-out and implant failure observed in our series.

Operative time and intraoperative blood loss were within acceptable limits and comparable to previously published reports evaluating PFNA2 and similar intramedullary systems [6,7]. Furthermore, the low complication rate observed in this study aligns with findings from other clinical investigations assessing radiographic and functional outcomes following PFNA fixation [8,9].

Overall, the results of this study support the reliability of PFNA2 as an effective intramedullary implant for achieving stable fixation and satisfactory functional outcomes in intertrochanteric femur fractures.

**Table 1. Operative Parameters**

Parameter	Mean ± SD
Operation Time (mins)	56.8 ± 11.8
Blood Loss (ml)	104.7 ± 19.9

**Table 2. Mobilization And Weight Bearing**

Parameter	Mean ± SD
Time for Mobilization (days)	2.2 ± 0.7
Partial Weight Bearing (weeks)	5.2 ± 0.8
Complete Weight Bearing (weeks)	12.3 ± 1.2

**Table 3. Harris Hip Score**

Time Point	Mean ± SD
At discharge	19.1 ± 3.2
6 weeks	71.4 ± 3.8
3 months	74.5 ± 3.2
6 months	84.5 ± 2.1
12 months	92.6 ± 2.2

**Table 4. Complications**

Complication	n (%)
Wound dehiscence	0 (0%)
Wound infection	1 (3.3%)
Non-union	0 (0%)
Cut-out	0 (0%)
Screw migration	0 (0%)



**Figure 1.** Preoperative X-ray Showing Intertrochanteric Fracture of Femur.



**Figure 2.** Immediate Postoperative X-ray Showing Fixation with Proximal Femoral Nail.



**Figure 3.** Follow-up X-ray Showing Maintained Reduction and Implant in Situ and Union

**CONCLUSION**

PFNA2 is a safe and effective implant for the treatment of intertrochanteric femur fractures. It provides:  
Stable internal fixation, Early mobilization, High union rate, Excellent functional recovery, Low complication rate

It can be considered a preferred intramedullary device in elderly osteoporotic patients.

**Conflict of Interest**

The author declares that there is no conflict of interest regarding the publication of this paper.

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