

## To Study the Functional Outcome of Proximal Femur Nailing Antirotation-II in Unstable Intertrochanteric Fractures in Elderly Population

Suresh Uikey<sup>1</sup>, Praveen Khatri<sup>2</sup>, Chetan Solanki<sup>3</sup>, Rahul Verma<sup>4</sup>, Suneet Tandon<sup>5</sup>, GopalaRao Mundlapati<sup>6</sup>

<sup>1</sup>Associate Professor Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

<sup>2</sup>Senior Resident, Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

<sup>3</sup>PG Resident, Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

<sup>4</sup>Associate Professor, Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

<sup>5</sup>Professor and Head of Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

<sup>6</sup>PG Resident, Department of Orthopaedics, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh.

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Corresponding author: Dr GopalaRao Mundlapati

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### Abstract

**Background:** Intertrochanteric fractures are a variant of peritrochanteric fracture. Management of intertrochanteric fractures is a major challenge. The focus of surgical research regarding internal fixation in the early 20<sup>th</sup> century was to minimize implant failure and cut-out of the femoral head and neck fixation components with acceptance of loss of reduction of the fracture. The current trend in hip fracture care relates to three main strategies (1)prevention by aggressive screening and treatment of patients at high risk for fracture; (2)standardization of hip fracture centers with early intervention and protocols; (3)optimization of fracture reduction and new implant component fixation in osteoporotic bone.

**Material and methods:** This was a prospective study of 20 cases with intertrochanteric fractures admitted in department of orthopaedics, Gandhi medical College, Bhopal during the period from January 2020 to July 2021. Patients were evaluated clinically and radiologically every 4 weeks for the first 2 months and every 6 weeks thereafter until signs of radiological union appears. Clinical union was observed with the absence of pain and tenderness with full weight bearing and good range of movements.

**Result:** In the present study we had good radiological and functional outcome in all the cases managed by PFNA-II. We had implant related complications in 7 cases. Out of these cases only 1 case had revision surgery. All cases united well and had an average HHS of 83.5. We did not encounter any complication like nonunion and periimplant fracture.

**Conclusion:** The proximal femoral nail antirotation (PFNA-II) was a superior implant for the treatment of intertrochanteric fractures owing to its ease of insertion, reduced blood loss, less complications, stable fixation and satisfactory functional and radiological outcomes.

**Keywords:** Intertrochanteric fracture, PFNA-II

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## Introduction

Intertrochanteric fractures are the fractures at the proximal metaphyseal area of the femur, damaging the trabecular networks and the weak cortical bone, causing displacement of the fracture. This area of femur is similar to other metaphyseal fractures with regard to the difficulty in obtaining stable fixation. Commonly seen in elderly patients, but can also seen in young individuals with high energy trauma. A new paradigm regarding hip fracture care and treatment is currently in evolution, which will advance our treatment goals to optimal functional recovery and prevention of future hip fractures [1]. Gulberg et al in 1997 estimated the future incidence of hip fractures in the world would double in the upcoming years [2].

The focus of surgical research in the present century was to minimise complications related to internal fixation with acceptance of loss of reduction of the fracture. Functional recovery was not considered to be related to the fracture malunion. Since many fractures are associated with osteoporosis, the current trend in hip fracture care relates to three main strategies (1) prevention by aggressive screening and treatment of patients at high risk for fracture; (2) standardization of hip fracture centers with early intervention and protocols; (3) optimization of fracture reduction and new implant component fixation in osteoporotic bone.

Trochanteric fractures can be treated both conservatively and operatively, due to the higher risk of mortality and morbidity associated with conservative management. Therefore fixation of these fractures for early mobilization and better functional outcome [3]. The focus of surgical research in these fractures is to reduce implant

failure and cut out of the femoral head and neck fixation components. Stable fixation with early rehabilitation is the present aim of management in these fractures.

DHS is the gold standard for treating stable fracture even nowadays which is proved in recent articles. The current practice of treatment of a stable variety of intertrochanteric fracture with dynamic hip screw is widely accepted, however, an unstable variety of intertrochanteric fractures are better treated with Cephalomedullary nails. Biomechanically, intramedullary devices are superior for unstable fracture types [3,4].

PFNA-II utilizes a helical blade instead of the two screws (compression and derotation screw) system. The helical blade gives rotational stability, compression at the fracture site as it compacts the bone during insertion into the neck & head of the femur, hence it has higher cut-out strength as compared to other devices. The mediolateral angle is reduced from 6 degrees to 5 degrees compared to PFN leading to reduced implant failure in old & osteoporotic bones [5]. The change to the Helical blade design is mainly to eliminate the occurrence of cut-out or Z-effect mode of failure of the conventional PFN. Several biomechanical studies have supported this [6].

## Material and methods

The study was conducted from July 2019 to June 2021 at the Department of Orthopaedics, Gandhi Medical College, Bhopal. Patients were selected from among the admissions to the Orthopaedic ward and recruited into the study prospectively based on the inclusion and exclusion criteria.

## Inclusion criteria:

1. Patients with intertrochanteric fractures.
2. Patients who were independently mobile before sustaining injury.
3. Both men and women above 18 years

**Exclusion criteria:**

1. Patients with pathological fractures.
2. Patients who were terminally ill, with severe life-threatening diseases, who were not fit for surgery.
3. Paediatric patients.
4. Patients with Open fractures

All patients Physical and radiological examination was done. All patients were operated using a standard prescribed surgical technique in supine position on traction table with fracture reduced by close reduction with traction and internal rotation.

Operating time was calculated (in seconds) from the start of surgical incision to wound. Intra-operative blood loss was calculated from by the number of mops and gauze piece soaked with blood. Each mop's corresponding to 50ml of blood.

Patients were evaluated clinically and radiologically every 4 weeks for the first 2 months and every 6 weeks thereafter until signs of radiological union appears. Harris Hip Score (HHS) was calculated with the standard scoring sheet. According to the score, the patient's outcome are graded as poor (if HHS is <70), Fair (if HHS is 70-80), Good (if HHS is 80-90), and Excellent (if HHS is 90-100).

In each visit their functional outcome analysed by ROM at injured Hip, VAS score, Harris Hip Score, and also digital x-ray of the operated Hip taken to assess the union of fractures. Time for fracture

healing was evaluated according to radiographic and clinical criteria. Clinically Union was assessed by the absence of Tenderness (or) pain with full weight-bearing. Radiologically union of the fracture was assessed by the Standard Digital Antero-posterior & Lateral Radiograph of the Pelvis with the operated hip.

Mean and standard deviation were computed for the quantitative variable i.e., age. Frequency and percentage were calculated for qualitative variables like gender, mode of admission, type of fracture, and functional outcome (Excellent to poor). Effect modifiers were controlled by stratification of age, gender, type of fracture and mode of admission to observe the effect of these modifiers on outcome by using chi square test and p value ≤ 0.05 was considered significant.

**Observation and result**

In our study most of the cases were Boyd and griffin type II fractures. 2 cases were type I and 4 cases belonged to type III.

In our study 57 percent of patients were males and 43 percent were females. In our study 63 percent cases had right side fractures and 37 percent had left side fractures. In our study 4 patients belonged to the age group above 80 years.

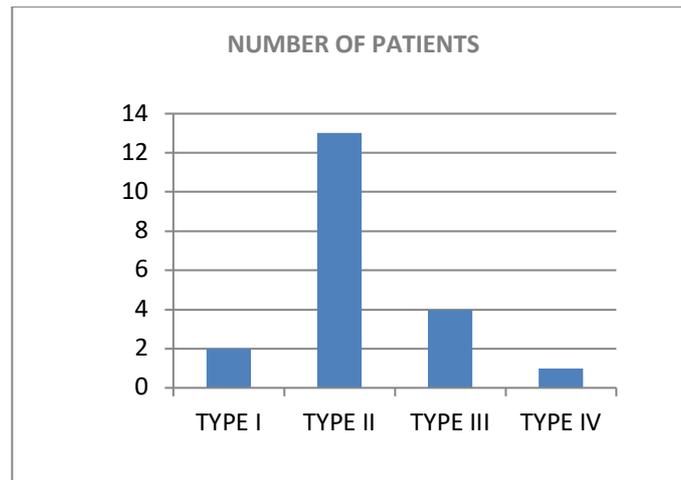
In our study three patients had Diabetic mellitus and five patients had Systemic hypertension and all others did not have any co-morbidities.

In our study in 30 percent of patients injury was due to RTA and in 70 percent of patients the injury was due to self-fall.

**Table 1: Shows the demographic data of the patients involved in the study**

Type of fracture				Gender		Side		Age				Mode of injury		Co-morbidities	
I	II	II I	V	Male	Female	Right	Left	50-59	60-69	70-79	80-89	RT A	Self fall	DM	HTN
2	13	4	1	11	9	13	7	3	2	11	4	2	14	3	5

DM-Diabetismelitus, HTN-Hypertention



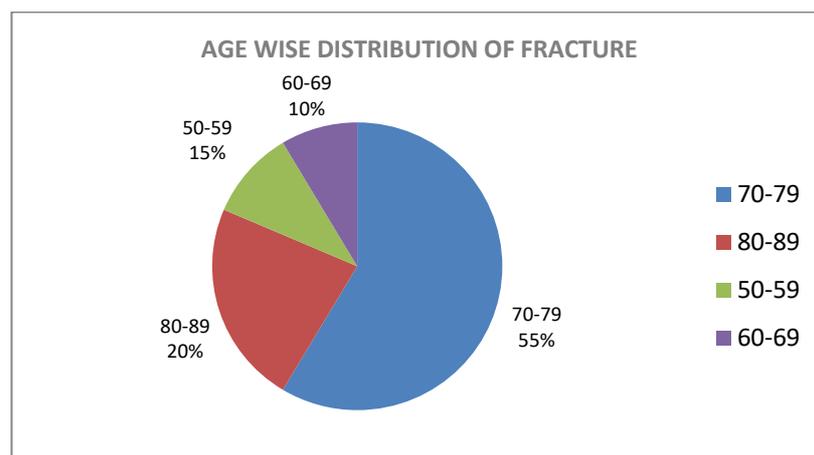
**Figure 1: Bar diagram showing patient distribution for type of fracture**

The average time for Union was 13.35 weeks. The mean duration of operation was 39.25 minutes. The mean blood loss was 78.25 mL. The mean duration of hospital stay was 10 days.

**Table 2: Shows the different variables of patients involved in the study**

S.NO	Variables	
1	Mean duration of surgery (min)	39.25
2	Mean blood loss (ml)	78.25
3	Average union time (wk)	13.35
4	Mean HARRIS HIP SCORE	83.05

Two patients were in their 7th decade, 11 patients in their 8th decade and 3 patients in their 6th decade.



**Figure 2: Pie chart showing age wise distribution of fracture**

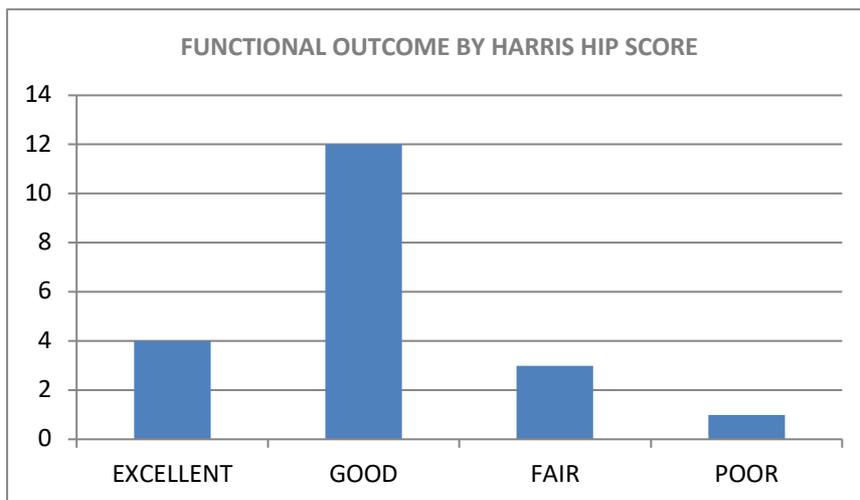
In our study out of the 20 cases 1 case had superficial wound infection. Cut out of the helical blade was seen in 1 case. 1 case had medial migration of the helical blade into the acetabulum. Back out of the blade was

seen in 3 cases. No case of non-union was reported in our study. None of the patients had preimplant fractures. Shortening less than 2 cm was seen in 3 cases which includes 2 cases with varus collapse.

**Table 3: Shows the complications occurred in the patients involved in the study**

S.NO	Complications	Number of patients
1	Superficial wound infection	1
2	Shortening<2cm	3
3	Back out	3
4	Varus collapse	2
5	Non union	0
6	Blade cut out	1
7	Medial migration of screw	1
8	Peri implant fracture	0

In our study 12 patients had GOOD HHS, 4 had EXCELLENT HHS, 3 had FAIR HHS and one patient had POOR HHS. The mean HHS was 83.05 in our study.



**Figure 3: Bar diagram showing functional outcome of patients**

**Table 4: Shows the HARRIS HIP SCORE at the final postoperative follow up**

S.NO	HHS Score	Grade
1	90-100	Excellent
2	80-89	Good
3	70-79	Fair
4	60-69	Poor

**Discussion**

PFNA-II uses the helical blade to achieve fixation into the femoral neck and it compacts the cancellous bone thus making it best for osteoporotic fractures. The blade has a high resistance to screw back out.

A study by Simmermacher et al [7] suggests that, by controlling the metaphyseal impaction, the helical blade may prevent penetration through the femoral head in unstable fractures.

A study by Garg b, malhotra R, marimuthu k, kumar V, kotwal P showed that the PFNA-II is biomechanically and biologically superior to dynamic hip screw for fixation of unstable inter-trochanteric fractures as it provides stable intramedullary fixation resistant to varus collapse and fixation failure, with relatively less operation time, fluoroscopy exposure and blood loss [8]. Liu Y et al suggested that PFNA-II is a very effective implant in the treatment of intertrochanteric fractures of femur. The

newly designed device is safe and user-friendly. Nonetheless, it is technically demanding, otherwise obstacles and complications will ensue [9]. Weiguang Yuet al suggested that in those cases with unstable fracture patterns the PFNA-II could be a better option [10]. Kumar et al [11] from their prospective suggested that PFNA-II as an effective implant in treating intertrochanteric fractures with proper operative techniques.

In the present study of 20 patients the mean age was 70.8 years, it was similar to the study conducted by Ahmad et al [12] in which the mean age was 72 years. In our study the number of males were 55 percent and only 45 percent were females. A study by Sharanmallaya et al [13] had a male predominance of 56 percent. In our study the side of involvement of fracture was 63 percent on the right and 37 percent on the left, which was similar to the study conducted by kasha et al [14] where the left to right ratio was 36:42.

The mean duration of hospital stay in our study was 10 days which is similar to the study conducted by simmermacher et al [15] which had a mean duration of 12 days in the hospital. The average blood loss during the surgery was 78.25 ml which was similar to the study conducted by Manoj et al [16] which had a average blood loss of 59.80 $\pm$ 14.96 mL .

In our study the mean operating time was 39.2 mins which is less when compared to a study conducted by Takigami et al [17] also showed similar results with less blood loss and operating time.

In our study the average union time was 13.35 weeks .It is similar to the results obtained in a study by kasha et al [14] in which the average union time was 14 weeks. Another study by Akhilesh Singh Kushwaha et al [18] showed a union time of 18 to 20 weeks.

The mode of injury in our study was due to self fall in 70 percent of cases and due to RTA in 30 percent of cases. This is similar to the study conducted by Ahmad et al [12] where 92 percent of injuries was due

to trivial fall.

In our study the average harris hip score was 83.05 which is better than the mean HHS in a study done by Singh et al [19] which had a mean HHS of 78.

In our study all the cases united well with no evidence of non union. Blade back out was seen in 3 cases. In a study conducted by Soucanye de landevoisin et al [20] 15 percent of the cases had blade back out which is similar to the incidence in our study. In his study the cause for Blade back out was due to impaction at the Fracture site. In a study by Ashok Sunil Gavaskar et al [21] there were two cases of back out without any clinical symptoms. In the present study 1 case had a complication of blade cut out. A study by Mora marimon et al [22] showed that there is less chance of blade cut out in PFNA-II compared to other implants.

In the present study we had 1 case of medial migration of blade into the acetabulum that was similar to the study by Anirudh Sharma et al [23] where there was 1 case reported.

Varus collapse was seen in 2 cases in our study, which is similar to the incidence in a study conducted by Ashok sunilgavaskar et al [21] where they had 14 cases of varus collapse among 122 cases. In our study shortening was seen in 3 cases .all of them had shortening less than 1cm. One case had superficial skin infection in the immediate post operative period which was treated with i.v antibiotics. [24]

### Conclusion

The proximal femoral nail antirotation (PFNA-II) is a superior implant for the treatment of intertrochanteric fractures because of its ease of insertion, operating time, less incidence of complications, good functional and radiological outcomes. The blade design offered the additional benefits in patients with osteoporotic bone by cancellous bone impaction. A proper pre operative planning, good anatomical reduction and skillful surgical technique are important in achieving a good

outcome. According to our study PFNA-II is an optimal implant for the treatment of intertrochanteric fractures, especially in older age groups.

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