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## Clinico-radiological and functional outcome of intertrochanteric femur fractures treated by proximal femoral nail antirotation Asia 2(PFNA2) in Indian patients

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### Abstract

Intertrochanteric femur fractures were one of the most common fracture of the hip especially in the elderly patients usually due to low energy trauma and in young patients due to high velocity trauma. Intertrochanteric femur fractures were treated by extramedullary as well as intramedullary implants. Intramedullary implants have better functional outcome and stable anatomical fixation than extramedullary implants. Among intramedullary implants, proximal femoral nail antirotation Asia 2(PFNA2) is become much popular due to better functional outcome. Purpose of this study is to analyze clinico-radiological and functional outcome of intertrochanteric femur fractures treated by proximal femoral nail antirotation Asia 2(PFNA2). A prospective study of 50 intertrochanteric femur fractures treated with proximal femoral nail antirotation Asia 2 (PFNA2) at SSG hospital, Vadodara were taken up and followed up for 2 years between October 2017 to September 2019. The functional outcome was assessed with Harris hip score. The mean Harris hip score was 86 at final follow-up. Proximal femoral nail antirotation Asia 2 (PFNA2) is safe and effective fixation implant for treatment of intertrochanteric femur fracture in Indian patients due to less blood loss, less intraoperative complications, minimal soft tissue damage and good union rate.

**Keywords:** Proximal femoral nail antirotation Asia (PFNA2), Harris hip score, intertrochanteric femur fracture

### Introduction

Intertrochanteric fracture is the fracture of the proximal femur, in which the fracture line extends from the greater trochanter to lesser trochanter. Intertrochanteric fractures are common in elder population due to osteoporosis. Ninety percent of the patients are in elder population. Intertrochanteric fracture can be treated conservatively and operatively. Earlier intertrochanteric fracture was treated conservatively. Morbidity and mortality was found higher with this treatment modality so operative treatment in the form of rigid internal fixation is become much popular for early mobilization to avoid complications<sup>[1]</sup>. Extramedullary implants versus intramedullary implants for intertrochanteric femur fracture stabilization were extensively reported in various literatures<sup>[2,3]</sup>.

Proximal femoral nail antirotation (PFNA) devices have been introduced as an intramedullary option in recent years. These devices were developed to obtain better fixation strength in the presence of osteoporotic bone. PFNA is available in short and long versions. Compaction of cancellous bone by the helical blade into the femoral head increases rotational stability of cervicotrochanteric fragments and decreases load on the femoral head. The helical blade has a significantly higher cut-out resistance than other commonly used screw systems.

The proximal femoral nail antirotation Asia 2 (PFNA2) device was recently introduced and appears to be better suited to the typical Asian patient who has smaller femurs.

### Materials and methods

From October 2017 to September 2019, 50 patients with intertrochanteric femur fractures treated by means of PFNA2 were included at Sri Sayajirao Gayakwad Hospital, Vadodara.

**Inclusion criteria**

- 1) Age older than 18 years
- 2) Intertrochanteric femur fracture
- 3) Follow up time more than 1 year
- 4) Treated with PFNA2

**Exclusion criteria**

- 1) Pathological fracture
- 2) Treatment with other intramedullary or extramedullary implants
- 3) Follow up time less than 1 year

A detailed clinical history of patient regarding the nature of fall, the associated medical comorbidities and Harris hip score of all patients were documented. All patients were evaluated preoperatively with the use of two standard plain radiographs, an anterior-posterior radiographs and lateral radiographs. Proper preoperative evaluation was done and patients were posted for operation after medical condition within normal limits.

Surgery was carried out under general or spinal anaesthesia in all patients. The patient was positioned supine on traction table. The unaffected leg was abducted as possible so that fluoroscopic examinations were easily carried out. The proper reduction was achieved by closed manipulation on a fracture table with traction under fluoroscopy guidance in anteroposterior and lateral view. After achieving good reduction, 5cm skin incision was made approximately 5 cm proximal from the tip of the greater trochanter. The correct entry point and angle were essential for a successful result. The guide wire should be inserted on the tip or slightly laterally of the greater trochanter. With the soft tissue protector, the proximal femur is manually opened with a 17mm reamer and appropriate nail was inserted. The helical blade was inserted using light blows with the hammer. With the tip about 10 mm from the joint surface, the neck blade was locked. Distal locking is performed by the freehand technique for the long PFNA2 and by using the jig for standard PFNA2.

Intravenous antibiotic Cefuroxime (1.5 g) was given for 5 days followed by oral antibiotics for 5 days. Intraoperative and postoperative events were recorded. The intraoperative time was recorded from the time that close reduction was started to the time that wound was sutured. All patients were followed up at the end of 1, 2, 6, 12 and 24 months. At every follow up, the postoperative x-rays were taken to assess the radiological fracture union. Postoperative functional outcome was assessed using Harris hip score at final follow up.

**Results**

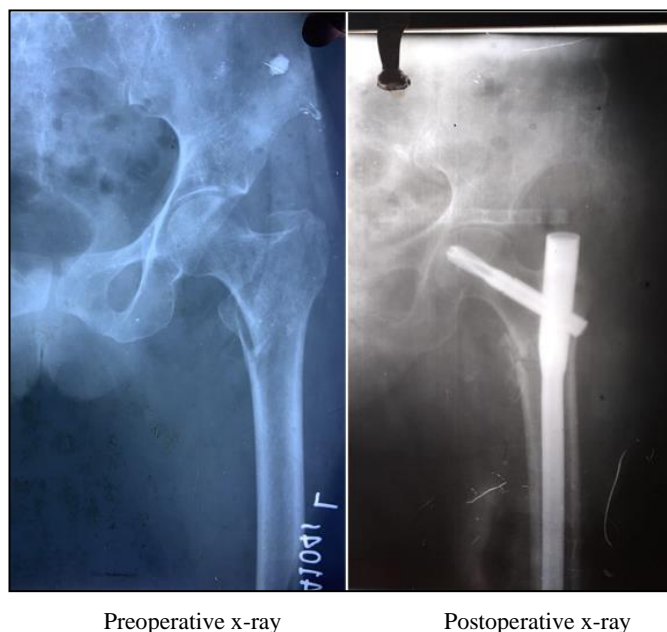
50 patients were included in this study. There were 22 males and 28 females with a mean age of 70 years (range 23- 95 years). A total of 38 cases (76%) sustained injury due to trival trauma, 9 cases (18%) due to road traffic accident and 3 cases (6%) due to fall from height. In this study, 45 patients (90%) were treated with close reduction and internal fixation with PFNA2 while only 5 patients (10%) were operated by open reduction and internal fixation with PFNA2. The average operative time was 40 minutes (range 30-55 minutes). The average intraoperative blood was 100 ml (80-150 ml). The long PFNA2 was used in 22 cases and the short PFNA2 was used in 28 cases. Postoperative X-rays showed good or acceptable reduction in 48 patients (96%). The mean tip apex distance was 15mm. The mean duration of hospitalization was 7 days (range 5-10 days).

The average bone union time of intertrochanteric femur fracture was 20 weeks (18- 24 weeks). Removal of implants were done in 5 patients (10%). This procedure was simple and less invasive. In our study, anatomic or slightly valgus reduction is preferred in majority of patients. The helical blade is consistently placed centrally from both the anteroposterior view and lateral view [4].

Mechanical failures of implant were not seen in any of the patients. Femoral head penetration and helical blade cut-out was not seen in our study. During follow up period, femoral shaft fracture at nail tip was not observed.

In our study, one patient (2%) developed superficial infection after 15 days. Patient was treated with injectable antibiotics according to culture and sensitivity. There was no deep infection in this study. At final follow-up, majority of the patients were able to do his routine work normally. 2 patients (4%) developed anterior hip pain after exertion.

At final follow-up, 40 patients (80%) were able to do their preoperative mobility. Functional outcome was evaluated using Harris hip score (Table 1). At final follow-up, the mean postoperative Harris hip score was 86 points (range 60-100 points).



Preoperative x-ray

Postoperative x-ray

**Fig 1.****Table1:** Functional outcome using Harris hip score

Harris Hip score	Number of patients	Percentage (%)
Excellent	40	80
Good	7	14
Fair	3	6
Poor	0	-

**Discussion**

Trochanteric fractures are described as nemesis for the elderly and responsible for a high degree of morbidity and mortality in this fragile age group. Conservative treatment of intertrochanteric femur fracture has high morbidity and mortality. Intertrochanteric femur fractures are treated by extramedullary or intramedullary devices. Extramedullary fixation has disadvantages of extensive surgical dissection, longer operative time, more blood loss, delayed union, high rates of infection. Intramedullary devices are the preferred treatment of choice because of mechanical and biological advantages [5]. Intramedullary devices like Proximal femoral

nail and Gamma nails are not used commonly as they are associated with an unacceptable rate of cutout and femoral shaft fractures<sup>[6,7]</sup>. Among intramedullary implants, proximal femoral nail antirotation (PFNA) is become popular among orthopaedic surgeons. Despite the wide use of PFNA and satisfactory outcomes with low major complication rates, lateral cortex impingement in Asian patients has been reported<sup>[8]</sup>. A new design of PFNA2 has been made for Asian patients because PFNA2 has following advantages over PFNA:

- a) The medio-lateral angle is reduced from 6 degree to 5 degree.
- b) The proximal femoral nail is reduced from 17 mm to 16.5 mm.
- c) A flat proximal lateral surface is adapted to avoid impingement of femoral lateral cortex.

According to Gururagavendra *et al.*, PFN and PFNA2 have comparable radiological and functional outcome for intertrochanteric femur fracture except for less surgical time and less blood loss in PFNA2. The operative procedure for the PFNA2 was easily performed, thus reducing the blood loss and operative time<sup>[9]</sup>. According to Macheras *et al.*, PFNA2 avoided lateral cortex impingement experienced with PFNA, providing fast and stable fixation of intertrochanteric femur fractures<sup>[10]</sup>. In our study, 94% patients had excellent to good functional outcome according to Harris hip score. 3 patients (6%) had fair outcome because these patients had developed other systemic illness after operation. Majority of patients were able to do their routine physical activities at final follow up in our study. At final follow-up of intertrochanteric femur fractures treated by PFNA2, excellent clinico-radiological and functional outcome were seen in majority of these patients. According to this study, proximal femoral nail antirotation Asia 2 is an ideal implant for fixation of intertrochanteric femur fractures leading to high rate of union as well as decrease the postoperative morbidity by increasing the functional quality of life.

### Conclusion

PFNA2 is safe and effective fixation implants in the treatment of intertrochanteric femur fracture in Indian patients due to less blood loss, less intraoperative complications, minimal soft tissue damage and good union rate. PFNA2 has excellent clinico-radiological and functional outcome in majority of these patients with proper preoperative planning, good intraoperative reduction on fracture table under fluoroscopy guidance. The limitations of this study are small sample size (50 patients) and relatively short follow-up time (2years). A longer follow-up period and further study with large sample size are needed.

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