

Role of PFN Antirotation II in Osteoporotic Intertrochanteric Fractures, its Clinical and Functional Outcome: A Retrospective StudySyed Azher Hussain¹, Mohammed Ibrahim², Akshayraj B Patil³¹Assistant Professor, Dept. of Orthopaedics, Gulbarga Institute of Medical Sciences, Kalaburagi²Professor, Dept. of Orthopaedics, Gulbarga Institute of Medical Sciences, Kalaburagi³Senior Resident, Dept. of Orthopaedics, Gulbarga Institute of Medical Sciences, Kalaburagi

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Conflict of interest: Nil

Abstract:

Fractures around the hip are the most common osteoporotic fractures in geriatric patients. 35-40% of these fracture being unstable. Trochanteric fractures, especially unstable ones are associated with high rates of mortality and morbidity. Surgical fixation is accepted for managing inter-trochanter fractures to attain acceptable reduction and early mobilization after surgery in elderly patients.

Materials and Methods: This was a retrospective study held in Department of Orthopedics Gulbarga Institute of Medical Sciences, Gulbarga. A total of 98 patients between from November 2019 to November 2022. Both Male and female patients were retrospectively included. Written informed consent was taken from all those included in the study.

Results: Among 98 cases, 66 cases (67.34 %) were males and 32 cases (32.65%) were females. According to Boyd and Griffin classification, the most common Type of fracture is Type-4. Most common mode of injury was trivial fall. The mean duration of surgery was 39.45 min. The mean blood loss was 80.9ml. The mean value of fluoroscopic images used 28.2. The mean value of length of hospital stay was 6.1 days. The average Harris Hip Score obtained at final follow-up was 77.85. It's a good compare to PFN gives good fixation, short operative time, less blood loss, less fluoroscopy image, less scar mark, less hospital stay.

Conclusion: PFNA2 has a superior performance in the setting of osteoporosis, which is attributed to compaction of cancellous bone by the helical blade.

Keywords: Proximal Femoral Nail, Intertrochanteric Fractures, Proximal Femur Fracture.

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Introduction

The proximal femoral nail anti-rotation II (PFNA 2) is an implant designed for unstable osteoporotic intertrochanteric fractures in Asians as the PFNA was designed for Caucasians and had various complications when applied to the Asian population due to the femoral geometrical mismatch. This study observes the functional outcomes and complications associated with PFNA 2 in unstable intertrochanteric fractures in the elderly Indian population. Surgical fixation is accepted for managing inter-trochanter fractures to attain acceptable reduction and early mobilization after surgery in elderly patients[1]. Achieving proper reduction and successful fixation thus remain an inordinate challenge for surgeon to treat these fractures. Because implant failure will lead to complications like revision surgery as the bone is osteoporotic in elderly patients with poor general condition. Hip fractures are common in this group of elderly population and 50% of hip fractures in elderly patients are intertrochanteric[2]. For fixation of unstable fractures, the use of an intramedullary nail coupled with a dynamic femoral head/neck

stabilization implant is the ideal method [3]. The aim of our study is to analyze clinical and functional outcome of surgical management of inter-trochanteric fractures by PFN-A2. Intramedullary load sharing device, namely, PFN, helps in early postoperative mobilization, weight-bearing, and ultimately the early fracture union. The proximal femoral nail anti rotation II (PFN A-II) utilizes a helical blade instead of the conventionally used two screws. The helical blade is believed to provide stability, compression as well as rotational control of the fracture. Theoretically it compacts the bone during insertion into the neck and hence has higher cutout strength as compared to other devices. The differences are that the mediolateral angle is reduced from 6° to 5°. Hence, there is less chance of implant failure especially in elderly, osteoporotic bones. Thus, PFN A-II is a modification of the conventional PFN, which reduces even the minimal complications associated with conventional PFN and also provides additional advantages.

Materials and Method:

This was a retrospective study held in Department of Orthopedics Gulbarga Institute of Medical Sciences, Gulbarga. A total of 98 patients between from November 2019 to November 2022. Both Male and female patients were retrospectively included. Written informed consent was taken from all those included in the study.

Inclusion criteria were all unstable inter-trochanteric fracture cases classified on the basis of Boyd and griffin classification and skeletally mature patient with fracture Duration < 3wks presenting to the institute during the study period after applying the excluding criteria were included in the study.

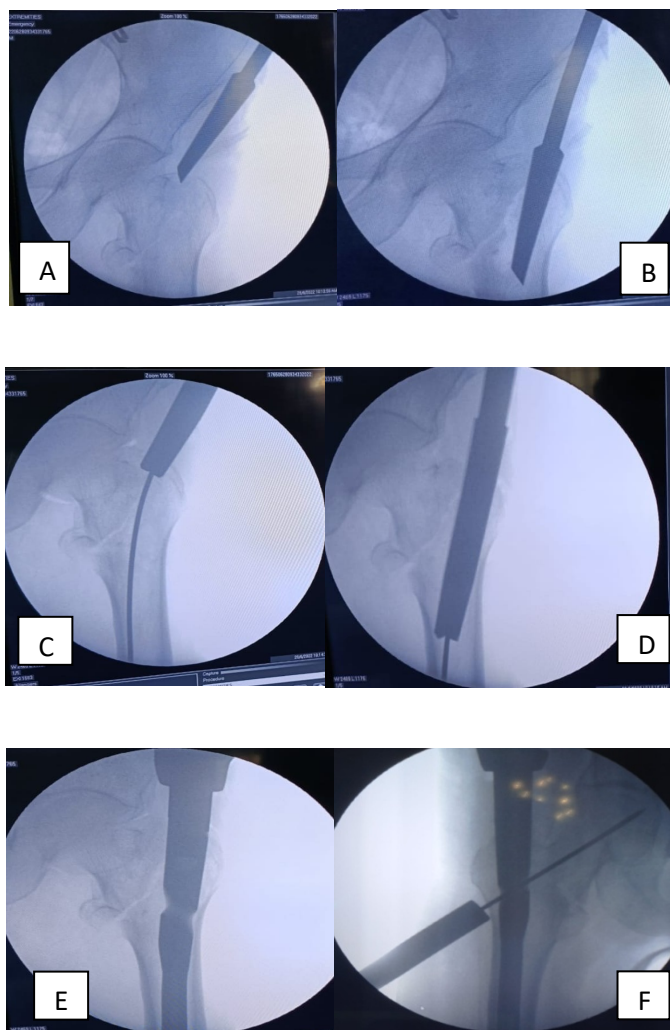
The Exclusion criteria were fracture with more than 3 weeks, patients with osteo arthritis of hip before injury, those non ambulatory or bed ridden prior to injury, those with previous implant in the fractured hip or femur were excluded from the study.

Preoperative radiograph pelvic with hip was used to assess the above parameters. Fractures pattern was

classified according to the Boyd and griffin classification. Blood investigation was done and physician fitness was obtained for all the patient before surgery. The pre operative and post operative haemoglobin and units of blood transfused were recorded, intra operative the amount of blood loss, duration and number of fluoroscopic images were noted down. The length of hospital stay was noted. Post-operatively, quality of reduction was assessed by comparing neck shaft angle of operated hip to that of normal hip from the radiographs. Quality of fixation was assessed using Tip Apex Distance (TAD). And the Modified Harris Hip score was calculated at final follow up to assess hip function post-surgery.

Surgical technique

Surgical technique of PFN-A2 insertion –figure 1: A) Nail entry point, B) Owl for the nail entry C) Insertion of guide pin, D) Proximal reamer, E) Insertion of PFN-A2, F) Placement of guide wire to drill for helical blade G) placement of helical blade and H) Placement of 4.9mm distal cortical screws





Results

Among 98 cases, 66 cases (67.34 %) were males and 32 cases (32.65%) were females. All the patients belong to age between 25 to 85 years of age. The maximum age limit in the study was 81-90 years and minimum age was 18 years.

Table 1: Distribution of cases according to age

Age in years	No. of patients (% , n=98)
18-30	04 (4.08%)
31-40	10(10.2)
41-50	09(9.18%)
51-60	15(15.3%)
61-70	40(40.81.%)
71-80	16(16.32%)
81-90	04(4.08%)
Total	98(100%)

Table 2: Distribution of cases according to sex and side

Sex	No. of patients (% , n=98)	Side	No. of patients (% , n=98)
Female	32(32.65%)	Right	69 (70.40%)
Male	66(67.34%)	Left	29 (29.59%)
Total	(100%)		(100%)

Table 3: Distribution of cases according to functional results in present study:(According modified Harris hip score)

Clinical results	Total points	No. of Patients (% , n=93)
Excellent	81-100	28(29.6%)
Good	61-80	41 (40.9%)
Fair	41-60	14 (14.2%)
Poor	<40	10 (10.2%)
Total		93 (100%)

Table 4: Distribution of cases according to body and graffin classification and mode of injury.

Types	No. of Patents	
Type-1	08	Most common is type -4
Type-2	23	
Type-3	10	
Type-4	55	
Mode of Injury		Most common is Trivial fall
Road traffic accident	21	
Fall from height	25	
Trivial fall	52	

A total of 21 cases (21.4 %) sustained injury due to road traffic accident, 25 cases (25.5%) fall from height and 52 cases (53.06 %) due to trivial fall.

According to Boyd and Griffin classification, out of 98 cases of unstable intertrochanteric fractures, the pattern of fractures was Type 1 in 8 cases, Type 2 in 23 cases, Type 3 in 10 cases and Type 4 in 57 cases.

The mean duration of surgery was 39.45 min. The mean blood loss was 80.9 ml. The mean value of fluoroscopic images used 28.2. The mean value of length of hospital stay was 6.1 days. The average Harris Hip Score obtained at final follow up was 77.85. The average score in patients with complications of PFN group was 58.5.

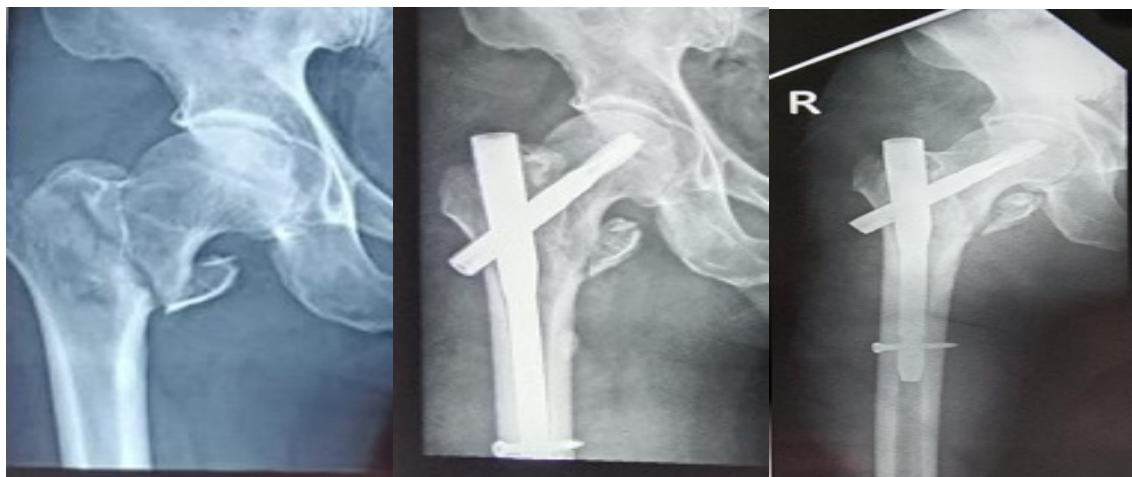


Figure 2 : Fracture treated with PFNA2 shows good union at 7.5 month.

Comparison of fracture reduction and fixation.

Reduction could not be accurately assessed in two patients (due to previous implants in the opposite hip, not allowing assessment of neck shaft angle). Post-operative neck shaft angle compared to normal hip 22/98 had excellent reduction. 62/98 of patient had good reduction. Fourteen patient had poor reduction. The average Tip Apex Distance (TAD) was well within the described safe limit of 25 millimetres. The average was 21.13 mm (range 11.08–36.1 mm). The mean radiological union of

unstable intertrochanteric fractures were 11.23 ± 2.67 weeks.

Complication:

Implant failure occurred in two cases with good reduction. And one with poor reduction, Which had poor functional outcome. one had screw cut out, two complication i.e. screw back out, one had superficial infection which had been treated with antibiotic and regular dressing. one female patient had abductor lurch, and in two patients (one male and one female) had postoperative hip pain. Five patient died due to COVID.



Figure 3: Fracture treated with PFN A2 shows union at 8th month.



Fig 4: clinical picture with functional outcome.

Discussion

Various methods are being used in attempt to improve fixation in elderly inter-trochanteric fractures. The search for an ideal implant for these osteoporotic fractures continues and is evidenced by the variety of nail designs available today. The intramedullary device has many advantages in terms of small surgical wound, easy implant insertion and stable fixation. The pre-operative morbidity was assessed by noting the duration of surgery, blood loss and number of fluoroscopic images taken. Our results are consistent with other studies Bhatti et al. [4] concluded Proximal Femoral Nail was associated with reduced blood loss, shorter hospital stays, less morbidity compared with Dynamic Hip Screw. Gardenbroek et al., [5] in their study found that the risk of a secondary late complication and re-surgery is much higher with a PFN than the helical blade device. Other advantages of the helical blade device over a two-screw design reported in literature include its ease of insertion, lesser operative time and lesser fluoroscopic exposure. Similar to the findings in these studies, we found the average time of surgery shorter when a helical blade was used. Zeng et al. and Takigami et al. found that operative time and blood loss were lower with PFNA2 as compared to PFN. The results of our study are comparable with these studies [6]. Nikoloski et al. recommended a tip apex distance of 20–30 mm in case of PFNA-2. They observed a higher incidence of cut out/cut through, when TAD was more than 30 mm or less than 20 mm [7] Similarly, Xie et al. compared outcome of PFN and PFNA2. PFNA2 had advantage of less duration of surgery, blood loss and fluoroscopy time, but functional results were

similar. We compared PFN. We got similar functional results in PFN and PFNA2 group, but PFNA2 had less perioperative morbidity [8]. Surgical fixation of unstable fractures of the proximal femur is often technically demanding and poor surgical technique may lead to failure of primary fixation [9] The best treatment for these fractures remains controversial. DHS fixation is widely preferred but failure of fixation still occurs in up to 20% of cases [10]. Common causes of fixation failure include fracture instability, osteoporosis, lack of anatomic reduction, implant failure, and incorrect placement of the lag screw in the femoral head leading to cutting out of the screw [11]. Intramedullary implants inserted in a less-invasive manner are better tolerated by the elderly. PFN has all the advantages like decreasing the moment arm, it can be performed by closed technique, preserving the fracture haematoma which is an important consideration in fracture healing. It also decreases blood loss, infection risk, minimizes soft tissue dissection and wound related complications [12]. The Proximal Femoral Nail (PFN) System offers some major biomechanical advantages [13]. Axial loading in A1 and A2 fractures leads to fracture impaction, whereas in A3 fractures such impaction doesn't occur and medial displacement of the distal fragment of the fracture is common due to the instability. Proximal Femoral Nail for A3 type unstable fracture has superior results; PFN prevents the fractures of the femoral shaft by having a smaller distal shaft diameter which reduces stress concentration at the tip [14]. Due to its position close to the weight-bearing axis, the stress generated on the intramedullary implants is negligible. The PFN

implant also acts as a buttress in preventing the medializations of the shaft. The entry portal of the PFN through the trochanter limits the surgical insult to the tendinous hip abductor musculature, only unlike those nails which require entry through the piriformis fossa [15,16].

Conclusion

An intra-medullary PFN A2 device is the implant of choice in an unstable inter-trochanteric fracture in an osteoporotic elderly patient. It has less scar mark, less blood loss, shorter operative time, less fluoroscopic exposure, patient with short neck can be fixed with a single helical blade, less complication and less hospital stay.

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