

Original Research Article

Treatment of intertrochanteric femur fracture in elderly patients with the proximal femoral nail antirotation: evaluation in terms of union and functional outcome

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ABSTRACT

Background: Trochanteric fractures almost invariably occur as a result of a trivial fall involving both direct and indirect forces. Fixation in the geriatric population generally consists of weakened, osteoporotic bone; intramedullary devices (PFNA) carry an advantage over other load sharing devices by not having to depend on plate fixation with bone screws purchasing a compromised lateral cortex. The purpose of the present study is to verify the theoretical advantages of the proximal femoral nail in elderly osteoporotic patients and eventually functional outcome of the patient.

Method: A total of 30 patients with age >60 years with intertrochanteric femur fractures managed with proximal femoral nail anti-rotation for prospective study. Harris hip score had been used in our study for regular follow up and evaluation at each and every follow up visit.

Results: Average Harris hip score at the end of study showed mean value of 87, ranged from 65 to 94 with almost 73% patients showing excellent or good outcome. And 100% fractures got united with a good component position and average time to bone healing was 14 weeks.

Conclusions: PFNA are now favored in western countries and there are multiple studies coming from that region to support this. Due to advantages of high union rate, early postoperative mobilization, and short operation time, PFNA osteosynthesis is the method of choice for surgical treatment of stable and unstable osteoporotic intertrochanteric femoral fractures.

Keyword: PFNA, Intertrochanteric femur fracture, Harris hip score

INTRODUCTION

"Fractures involving proximal end of femur through and in between both trochanters with or without extension into upper femoral shaft" are known as intertrochanteric fractures. One of the most frequent injuries is a trochanteric fracture, which mostly affects those over the age of sixty. Women with osteoporosis are three to four times more likely to sustain an injury, with simple falls being the most frequent mechanism of injury.¹ This fracture frequently results in death for many people secondary to cardiac, pulmonary, or renal problems. Between 10 and 30 percent of patients die within a year of

an intertrochanteric fracture.² In the past, these fractures received little attention since they occurred through the cancellous bone, which has a good blood supply, and because they healed on their own without any active therapy. The typical outcome of conservative treatment, however, was malunion with varus and external rotation deformity, which led to a short limb gait and a high probability of mortality from complications related to immobilization and recumbence.

Restoring the patient to their pre-injury status as soon as possible is the aim of treatment for an intertrochanteric fracture. As a result, these fractures were internally fixed

to improve patient comfort, enhance nursing care, shorten hospital stays, and lessen the risks associated with extended recumbency.³ Instability and the fixation complications brought over by comminution are the main issues facing the orthopedic surgeon treating this fracture. Stability relates to the capability of the internally fixed fracture to counter muscle and gravitational forces around the hip that tend to force the fracture into a varus position. Internal fixation failure is caused by both intrinsic variables like osteoporosis and fracture comminution as well as extrinsic factors like choice of reduction, choice of implant, and insertion technique. Fixation issues are significantly influenced by the type of implant used. For fixation, sliding devices like the dynamic hip screw have been widely employed. These devices, however, can enter the head or neck, bend, break, or detach from the shaft if the patient puts weight on the leg too early, particularly in comminuted fractures. The insertion of intramedullary devices like the proximal femoral nail allowed the implant to lie closer to the mechanical axis of the extremity, reducing the lever arm and bending moment on the implant. This has been reported to be advantageous in such fractures. They can also be implanted more quickly, with less blood loss during surgery, and they allow for early weight bearing with less subsequent shortening on long-term monitoring. The purpose of the present study is to verify the theoretical advantages of the proximal femoral nail and also whether it actually alters the eventual functional outcome of the patient. More recently, a new generation of proximal femoral nails with helical blades has been developed, featuring a larger contact area and compression between the blade and the cancellous bone, promoting better stability against varus collapse, especially in patients with osteoporotic bones.

METHODS

This was a prospective interventional study included 30 patients with intertrochanteric fractures having age >60 years, conducted from December 2020 to July 2022 in King George medical university, Lucknow. Informed written consent was taken and study was approved by institutional ethical board (IEB). Intertrochanteric fracture in an adult patient was assessed preoperatively, and functional outcomes were reviewed postoperatively. According to the history and the type of injury, the patients were assessed. On admission, the necessary radiological tests and a haematological profile were performed. Details about the type of surgery and patient profile were noted. The x-rays taken immediately following surgery were assessed. At 6 weeks, 12 weeks, 6 months, and 1 year, all cases underwent a second clinical and radiological evaluation to check for any morbidity or mortality. The research was done between December 2020 and July 2022. proximal femoral nail antirotation was used to treat 30 patient's intertrochanteric femur fractures in elderly patients for the purpose of a prospective study.

The study included all adult patients with intertrochanteric fractures having age >60 years who could walk before

their fractures. The study excluded patients with pathological fractures, active infections, unstable medical conditions, and non-traumatic disorders. Based on whether the injury was caused by a minor fall, a serious fall, or a fall from a height, the method of injury was divided into three groups. Trivial fall was the most common mode of injury. The patients' ages ranged from 54 to 86, with an average age of 69 and the most common decade for fractures being the fifth and sixth. The classification of Sahlstrand was used to record the pre-injury level of walking ability⁴. Anteroposterior and lateral radiographs of the affected hip were obtained. The patients were then placed on a Bohler-Braun frame with skin traction. All of the patients were initially assessed for their overall health, and corrective measures were taken, pre anesthetic checkup were done. The fractures were categorized in accordance with Evans' classification of intertrochanteric fractures as modified by Jensen and Michealsen. Type I and type II fractures were thought to be stable fractures, but types III, IV, and type V were thought to be unstable fractures. In this series, there were no open fractures found.

On the next day of elective OT, patients were taken for surgery. Depending on the patient's preoperative health and the amount of blood lost during surgery, an appropriate blood transfusion and additional supportive measures were administered. Proximal femoral nail antirotation was used to treat the intertrochanteric fractures in 30 osteoporotic individuals. Incision size, operation time, blood loss, and fluoroscopy duration were all tracked intraoperatively.

Cephalosporins, an injectable antibiotic, were given to all patients an hour prior to surgery and continued for two to three days following. Oral cephalosporins were continued for next 3 to 4 days. If the procedure took longer than expected, aminoglycosides were administered intraoperatively. Analgesic was first administered via IV or IM for two to three post-operative days, and then orally for a short period of time. Only a small number of our patients received low molecular weight heparin as a preventative measure against deep vein thrombosis.

All patients received preoperative antibiotics for 24 to 48 hours as well as deep vein thrombosis prevention; however, there was no set postoperative patient protocol. On the second post-operative day, patients may sit up in bed. Starting on the second and third post-operative days, static quadriceps exercises were performed. After 10 to 14 days, stitches were removed. As soon as the pain or general condition permitted, patients were moved into a non-weight bearing position. Depending on the stability of the fracture and the quality of the fixation, weight bearing was started; however, for patients with unstable or inadequate fixation, it was delayed. For a total of six months, all patients were followed up at intervals of six weeks, three months, and six months. Check x-rays were taken to evaluate fracture union and signs of fixation failure. The results were presented in frequencies, percentages and mean \pm SD. The Chi-square test was used to compare

categorical variables. The one way analysis of variance was used to compare continuous variables. The $p \leq 0.05$ was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA). In our study, the Harris hip score was employed for frequent follow-up and evaluation at each follow-up visit.

RESULTS

The thirty intertrochanteric femur fracture in elderly patients were included in this study. Utilizing proximal femoral nail antirotation, all cases were treated. The study was done between December 2020 and July 2022. The patients' ages ranged from 54 to 86, with an average age of 69 and the most common decade for fractures being the fifth and sixth. Due to osteoporosis being a major issue among postmenopausal women, there were significantly more women than men among the 30 patients, with 17 (57%) being female and 13 (43%) being male.

Table 1: Demographic details of study.

Variables	Percentages (%)	
Mean age (Years)	69	
Age range (Years)	54 to 86	
Gender	Male	43
	Female	57
Side involved	Right	47
	Left	53
Mode of injury	Fall on ground	73
	Fall from stairs	17
	RTA	10
Average duration from injury to surgery	5.3 days	

Based on AO classification for intertrochanteric femur fractures, the fracture pattern was categorized. Lumbar spinal anesthesia was used for all 30 patients. With the assistance of fluoroscopic control, all of the cases underwent closed reduction and proximal femur nail antirotation fixation. 3 (10%) of the 30 patients treated with PFNA took 80 minutes. The average time duration was 63 minutes with ranging from 45-85 minutes. Out of the 30 patients treated with PFNA, 9 (30%) bled between 60 and 79 ml, 6 (20%) bled between 80 and 99 ml, 4 (14%) bled between 100 and 119 ml, 7 (23%) bled between 120 and 139 ml, and 1 (3%), patient, bled more than 160 ml, required intraoperative blood transfusion. The blood loss, which ranged from 60 to 180 ml, was 96 ml on average. 10 cases suffered shortening in affected side averaged about 0.22 cm ranged from 0 to 1 cm.

A total of 30 patients had their fractures reduced and fixed with proximal femur nail antirotation within the period under review. Most of the cases fixed with PFNA size 90 mm and 95 mm blade size and 170 mm nail length weremost frequently. All distal locking procedures were performed using static/dynamic instrument by using one

4.9 mm screw. Insertion of nail perceived to be easy all patients were reamed except two proximal ends of nail matched well in most patients. Radiographs of affected hip were obtained in AP and lateral planes at each follow up visit and any changes in position of implant and extent of fracture union were noted. Fractures were judged to be heal-radiographically; if bridging callus was evident on 3-9 cortices as noted on 2 views. 100% fracture united with a good component position and average time healing was 14 weeks (range 12-22weeks).

At the completion of the study, 30 cases had a 14.3-month follow-up period, ranging from 11 to 18 months. Out of 30 cases of osteoporotic intertrochanteric femur fractures managed by proximal femoral nail antirotation 6 (20%) patients had excellent outcome, 16 (53%) had good results, 6 (20%) had fair outcome and 2 (7%) patients had a poor result.

Table 2: Harris hip score at the end of study.

Grade	Score	No. of patients	Percentage (%)
Excellent	90 to 100	6	20
Good	80 to 89	16	53
Fair	70 to 79	6	20
Poor	<70	2	7
Total		30	100

Average Harris hip score at the end of study showed mean value of 87, ranged from 65 to 94 with almost 22 (73%) patients showing excellent or good outcome. The average amount of time for bone to heal was 14 weeks (range 12-22 weeks), and 100% of fractures were successfully united with proper component positioning Both intraoperative complications and mortality were absent. In our patients, perioperative complications including ARDS and DVT were not seen. Only one patient needed an intraoperative blood transfusion, and that patient had polytrauma. There was no femoral fracture intraoperatively. None of the patients experienced a deep infection, implant failure, or breakage from implant fatigue. There were no reports of mechanical failure, such as implant bending or breaking, intraoperative or postoperative fracture, or screw cutting. One patient overall had a superficial infection that was treated with medication. Ectopic new bone formation was observed in 4 patients at the site of the compression and stabilizing screws; however, this had no impact on the patients' health.

Table 3: Postoperative complications.

Complication	No. of patients	Percentage (%)
Varus collapse	1	3
Calcification at tip of greater trochanter	4	13
Sensitivity over TFL	2	7
Medial thigh pain	3	10
Femoral shortening	10	34

DISCUSSION

The study's objective was to assess how intertrochanteric femur fractures treated with proximal femoral nail anti-rotation (PFNA) fared in an elderly individual. Instances of unstable intertrochanteric fractures are on the rise, and this pattern is probably here to stay. Treatment options include cephalomedullary nails, dynamic hip screws, osteosynthesis, and, in some circumstances, arthroplasty. The best implant for unstable intertrochanteric fractures is still up for debate, though. Numerous research originating from the west have shown that PFNA are currently preferred.⁵⁻⁷ In our assessment of unstable intertrochanteric fractures treated with PFNA, we found positive outcomes with low complication rates, high union rates, quick surgical times, and prompt post-operative mobilization. It is commonly acknowledged that there is a larger risk of complication and poor outcome with increasing security of fracture pattern (from stable to unstable), as results of management for stable and unstable fractures have typically been reported jointly in the literature. In our study, all 30 cases of osteoporotic intertrochanteric fractures united with appropriate component positioning, and the typical duration for fracture union was 14 weeks. None of the patients in our study of intertrochanteric fractures treated had a deep infection or implant failure or breaking from implant fatigue. There were no reports of mechanical failure, such as implant bending or breaking, intraoperative or postoperative fracture, or screw cutting. One patient out of the total had a superficial infection that was treated with antibiotics. Six patients had successful surgical wound bleeding resolution; there was no screw migration into the acetabulum. Ectopic new bone growth occurred at the location where the compression and stabilizing screws were inserted in 4 patients, although this had no impact on the patients' conditions. Sadic et al had two deep and one superficial infection.⁸ Intraoperatively, it was found that the placement of the nail had caused lateral greater trochanter fracture in two patients. In five cases, the proximal end of the nail reached the top of the trochanter. Four patients underwent reoperation to address implant-orfracture-related problems (infection, reimplantation and two extractions). At the time of the last follow-up, all 30 patients had experienced fracture union, were fully weight-bearing, and had returned to their pre-injury activity levels. Ten patients (11.5%) could only walk with two crutches, and two patients (2.3%) needed a wheelchair. Eight patients (9.2%) died while being followed up due to reasons unrelated to the fracture. In their investigation of Indian patients with unstable intertrochanteric femur fractures treated with PFNA, Kumar et al found no instances of infection, cut out, or implant breakage. During the observation period, no femoral shaft fractures were discovered.⁹ The mean Caput-collum-diaphyseal angle ranged from 126 to 145 degrees. On final follow-up radiographs, two patients (or 4.7% of the total) had secondary varus. Harris hip score was used for clinical evaluation. 78% of the cases had excellent or good outcomes. The mean Harris hip score was 77.8. Harris hip

scores were very good in 11 patients (24.4%), good in 19 patients (42.2%), moderate in nine patients (20%), and poor in six patients (13.3%). Harris hip score of our study of excellent and good results was (20+53) 73 % which is comparable to Sahin et al.¹⁰ Study which was 66.6% (24.4+42.2) and also with Kumar et al study where HHS for excellent and good results was found in about 78%.^{9,10}

Limitation of this study includes small sample size; however, the results could have been more promising if a large sample was taken.

CONCLUSION

All 30 of the osteoporotic inter trochanteric fracture cases in our study united with appropriate component positioning, and the average union period was 14 weeks. Even though there weren't enough follow-up periods in this study to get long-term results, the PFNA fixation results after 18 months were satisfactory. The outcomes demonstrated that the PFNA offered older patients reliable and efficient fixation. The operative procedure for the PFNA was easily performed, thus reducing the blood loss and operative time. At the final follow-up, all patients had healed fractures, and the majority of patients (73%) had recovered with Harris hip scores of excellent to good. There were few postoperative complications related to mechanical failure. During the follow up period, no instances of implant breakage and fatigue were observed. The incidence of cut-out was significantly less by the helical blade. The preferred surgical approach for treating stable and unstable osteoporotic intertrochanteric femoral fractures is PFNA osteosynthesis due to its advantages of a high union rate, early postoperative mobilization, and a shorter operation time.

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