Proximal Femoral Nail of unstable Trochanteric Fractures

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Abstract: Thirty five patients with unstable trochanteric fractures of the proximal femur were treated with proximal femoral nail between January 2011 to February 2013, 4 patients died due unrelated medical condition and 3 patients were lost fellowup within 8 months were excluded from the study. A Total of 28 patients (16 woman & 12 males) with 28 unstable trochanteric fractures A2 (N= 13) and A3 (n= 15) formed the basis of this study. The average age was 62 with range (55- 86 years). The average time to union was 3 months with range (3-7 months). All the fractures were healed within (3-7 months) except, two cases had nonunion. Fellow up averaged 18 months with range (12-24 months), there were 10 excellent, 12 good, 4 fair, 2 poor. The method proved to be safe and effective with minimal complications.

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Key words: Unstable trochanteric fractures, proximal femoral nail.

1. Introduction:

The incidence of fractures in the proximal femoral area risen with the increasing numbers of elderly persons with osteoporosis [1,2,3].

Before 1960, treatment of trochanteric fractures was of necessity non-operative. In elderly patient this approach was associated with high complication rates[4]. Techniques of operative fixation have changed dramatically since 1960. Operative management has consequently become the treatment of choice for intertrochanteric fractures[5,6,7].

There are two main types of implant available for the treatment of these fractures namely extramedullary and intramedullary implants. Although the most widely used extra-medullary implant in the dynamic hip screw which consists of a sliding neck screw connected to a plate in the lateral femoral cortex which associated with high incidence of fixation failure in unstable trochanteric fractures[8,9], type 31- A2 and type 31- A3 according to AO classification[10]. This has led to the development of intramedullary hip nail devices which offers several potential theoretical advantages.[11]

More efficient load transfer, Incorporates a sliding hip screw mechanism which allows controlled fracture impaction. Theoretically requires shorter operative time and less soft tissue dissection than a sliding hip screw.

Aim of the work: To assess the result and any complications associated with proximal femoral nailing of unstable trochanteric fractures.

2. Material and Methods:

35 patients with unstable trochanteric fractures of the proximal femur were treated with proximal femoral nail between January 2011 to February 2013, 4 patients died due unrelated medical condition and 3 patients were lost fellowup within 8 months were excluded from the study. 28 patients with 28 unstable trochanteric fractures were treated by proximal femoral nail formed the basis of this study. The age of the patients ranged 55-86 years mean (62 years). There were 12 males and 16 females. The right side was affected in 16 cases and the left side in 12 cases.

The cause of trauma were simple fall in 20 cases and 8 cases due to RTA. Anterio posterior and lateral radiographs were requested. The fractures were classified according to the AO/ASIF system [10].

There were unstable intertrochanteric A2 (n=13) and A3 (N=15). 5 patients had associated skeletal injuries were one fracture pelvis, distal radius fracture in 3 cases, fracture ulna in one case. patients were admitted to the hospital and initially stabilized in skin traction (Table 1).

Patients were operated on within 24 to 96 hours (mean 48 hour) when the patient was stable. A third generation cephalosporin was given from time of surgery and continued for 3 days. All patient were given low molecular heparin after admission up to 4 weeks postoperative.

A proximal femoral nails made of titanium alloy, with a length of 200 mm and a proximal diameter of 15mm, with shaft diameter (9,10,11,12), the nail has a 6^{o}mediolateral angle is used for easy insertion and to reduce the risk of the femoral fracture. With one proximal lag screw angle 130^{o} fixed by setscrew

which prevent rotation of the main Lag screw, and two distal locking screws dynamic and static.

Table (1) shows the basic data of the patients and injuries.

Basic data	Number	Percent
Age (average)	62	
Sex		
Male	12	42.5
Female	16	57.5
Type of trauma		
RTA	8	28.5
Simple fall	20	71.5
Side of the fracture		
Right	16	57.5
Left	12	42.5
Type of the fracture		
Closed	28	100
Open	-	
Fracture classification		
Type A2	13	46.5
Type A3	15	53.5
Associated injuries		
Fractures pelvis	1	3.5
Distal radius	3	10
Unla	1	3.5

Surgical technique:

Patient were placed supine position on fracture traction table under spinal or epidural anesthesia, with the trunk deviated to the opposite side. Closed reduction was achieved in 22 patients, with axial traction and 20 degree of internal rotation.

Whereas 6 underwent limited open reduction and a circulage wire was used before the nail insertion, a 5 cm incision was made just proximal to the greater trochanter parallel to the femoral shaft. Incision was deepened through fascia lata, splitting the abductor muscle for approximately 3cm immediately above the tip of greater trachanter. The entry site was opened up at the tip of greater trochanter by a cannutlated curved awl and a guide wire was passed through the trochanteric tip across the fracture site. reaming was done in 0.5 mm increments up to 10- 12 mm with flexible reamers. In order to accommodate the proximal end of the nail. The trochanteric region was reamed to 13 mm. the nail of closed size with shaft diameter about 1 mm less than the final reamer was mounted on introducer jig. Nail was then passed manually with rocking motion. Proximal locking was achieved through one lag screw which position central or slightly posterior up to subchondral bone of femoral head in A.P and lateral view to reduce cut out of screw complication in osteoporotic bones and distal locking of both screws were locked to achieve rotational stability through distal Jig.

Wound was closed in layers, postoperatively active quadriceps exercise, ankle and toe movements and knee mobilizing exercises were started on day 2. Stitches were removed on day 12.

Partial weight bearing ambulation with walker is allowed from 2nd day postoperative, full weight bearing was commenced once radiological; evidence of bone union was evident at around 12 weeks. Patients were assessed for pain, limb length discrepancy active and passive movement of hip, knee, ankle joint.

Fellow up radiographs every month were taken to assess the progress of healing and possible implant failure. Clinical outcomes were assessed according to Kyle criteria [12]. (Table II)

Table II: Clinical outcomes according to Kyle criteria

Outcome of cases	Criteria
10 Excellent:	No limp, absence of pain, Full range of motion (ROM)
12 Good:	Mild Limp, Mild occasional pain, full (ROM)
4 Fair:	Moderate limb (needs stick), moderate Pain, limited ROM
2 Poor:	Wheel chair bound, pain on any position Non-ambulatory

3. Results:

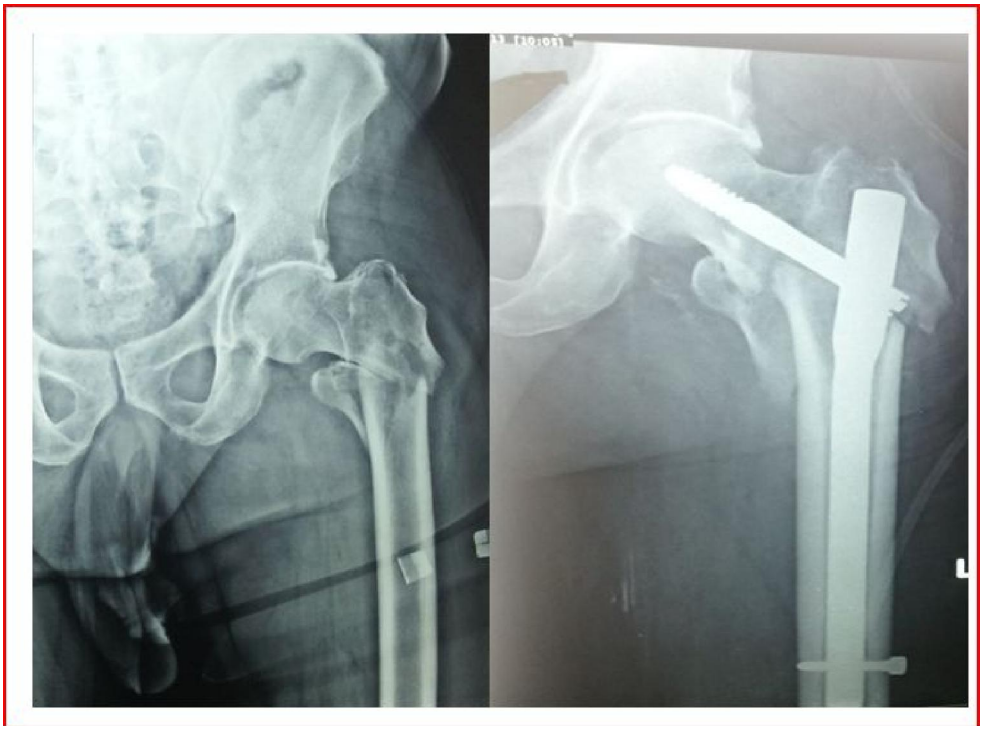
35 patients with unstable trochanteric fractures of the proximal femur were treated with proximal femoral nail between January 2011 to February 2013, 4 patients died due unrelated medical condition and 3 patients were lost fellowup within 8 months were excluded from the study. A total of 28 patient with 28 fractures were available for the outcome analysis with mean age 62 years (55, 86).According to Ao/ AIF classification, there were 13 A2 and 15 A3 fractures.

A total of 75 percent of the patients had significant comorbidity, mainly cardiopulmonary inefficiency, diabetes mellitus and a history of stroke or deep vein thrombosis – mean operation time was 50 minutes range (40 to 200 min). hospital stay ranged between 7 to 12 days with an average 4 days. The average time from injury to surgery was 2 days (range 2 to 7 days).

The estimated intra operative blood loss was 0.5 to 1units. The mean time for bone union was 12 weeks (12- 21w). At one year fellow up 90% of the patients had good or excellent outcome. Fig (1.2). Two patient had nonunion which is due to lag cut out and migration, and underwent a revision condylar plate fixation (Fig 3).

Four patients had lateral thigh discomfort attributed to irritation of the protruding screws rubbing against the tensor fascialata, non had fracture of the femoral shaft or nail breakage.

The end result were found excellent in 10, good in 12 fair in 4, poor in 2 cases.



A **B**

Fig1A: preoperative radiographs of unstable trochanteric fracture
Fig 1B: Immediate postoperative radiographs following P.F.N treatment

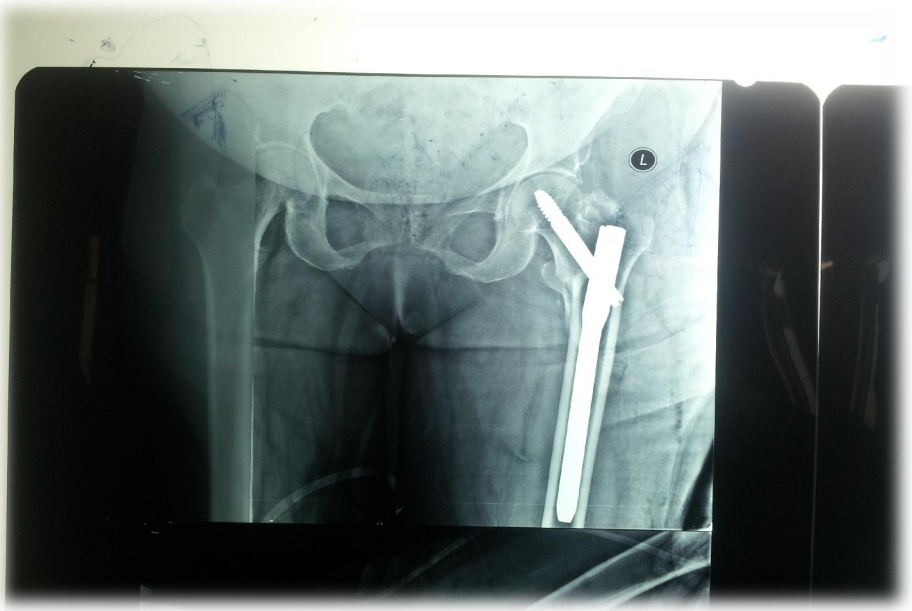
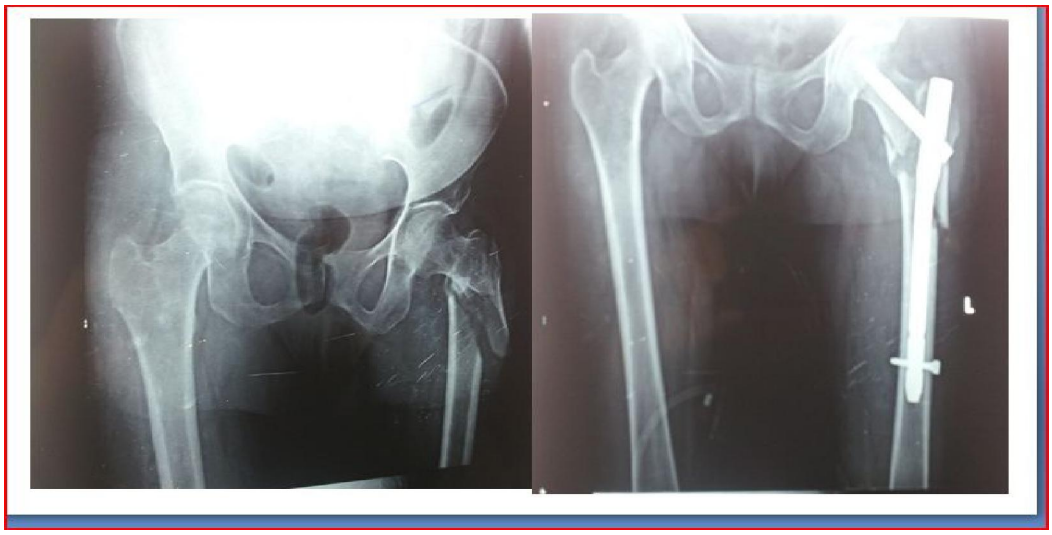


Fig 1C: follow–up radiographsafter 3 monthsshowing good fracture union.



A B

Fig 2A: preoperativeradiographs of unstabletrochantericfracture
Fig 2B: ImmediatepostoperativeradiographsfollowingP.F.Ntreatment

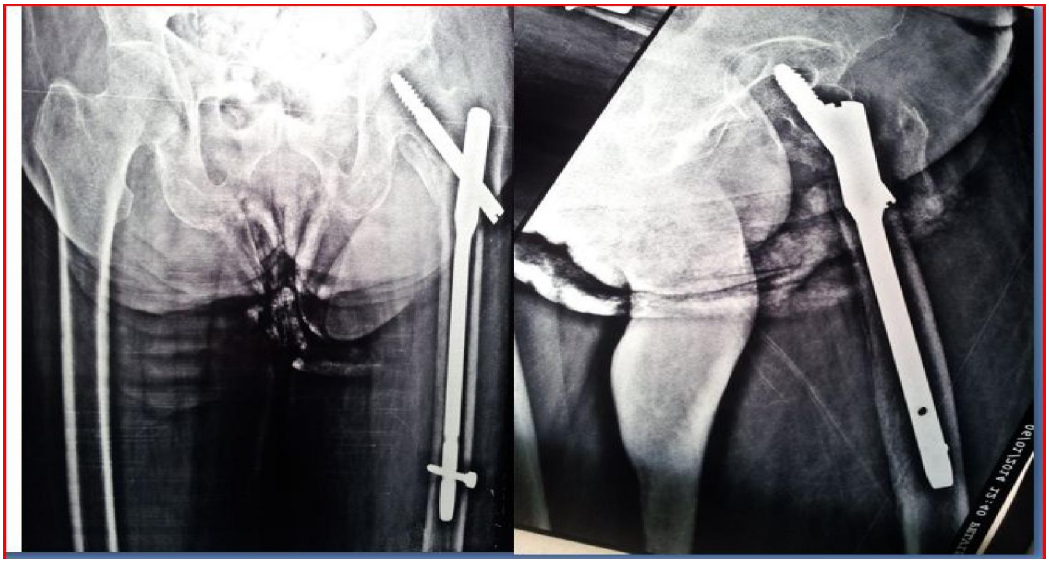


Fig 2C: follow–up radiographsafter 3 monthsshowing good fracture union.

4. Discussion:

The need for internal fixation and early mobilization of patients with trochanteric fractures of the femur is generally accepted, not only to reduce the morbidity and mortality rates associated with prolonged immobilization, but also to improve the functional result through avoiding malunion and encouraging mobility.[13,14].

Successful treatment of intertrochanteric fractures depend on bone quality, patient age, general health, interval from fractures to treatment, treatment adequacy, comorbidities and fixation stability[15,16].

Trochanteric fractures were classified as described by the AO/ASIF classification proposed by Muller *et al.*[10] into three main groups (Types 31A).

- A1 with stable pertrochanteric fracture.
- A2 unstable pertrochanteric fracture with medial comminusion.
- A3 unstable pertrochanteric fracture with reversed fracture line, transverse fracture, dorsolateral comminusion

The dynamic hip screw is an extramedullary implant for trochanteric fractures. It provides controlled compression at the fracture site. Common causes of fixation failure include fracture instability,

osteoporosis, lack of anatomic reduction, Implant failure and incorrect placement of the lag screw in femoral head (leading to cutting out of the screw). Excessive medialisation in the osteoporotic bone causes pain and deformity. In osteoporotic patients with unstable trochanteric fractures, complication rates have been reported to be 14% and 38%, in patients with reverse oblique fracture, a Failure rate 56% has been reported.[17,18,19]

Proximal femoral nail with a trochanteric entery point are biomechanically stronger than extra-medullary implants. With Control of axial telescoping and rotational stability which are essential in unstable trochanteric fractures.[20,21] Intramedullary implants inserted in a less-invasive manner are better tolerated by the elderly. Proximal femoral nail prevent the fractures of the femoral shaft by having a smaller distal shaft diameter which reduces stress concentration at the tip [22,23,24].

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 medialisation of the shaft. The entery portal of the PEN through the trochanter limits the surgical insult to the tendinous hip abductor musculature unlike those nails which require entery through the priformis fossa [25,26,27].

In this study. The technique proved to be simple and safe. It had the advantage of short operative time average (50 minutes), minimal trauma and blood loss with minimal complications.

All the patients were allowed to resume ambulation with crutches or walker on the second postoperative day with partial weight bearing whenever possible which progress to full weight bearing once satisfactory callus of the fracture and the patient can tolerate it.

There were no femoral shaft fracture or nail breakage. Two patients had nounion of the fracture which treated By revision condylar plate fixation and 4 patients had lateral thigh discomfort which not affect the final outcome and treated by removal the lag screw.

Conclusion:

Proximal femoral nail is a versatile implant for fixation of unstable trochanteric fractures of the femur in the hand of surgeons who are well familiar with its technique. It gives advantage of closed technique, allows early mobilization and early weight-bearing. With minimal complications. Rehabilitation is easier with this device. Proximal lag screw insertion allows dynamic osteosynthesis at fractures site.

The proximal femoral nail reduces stress concentration at the TIP and the smaller distal shaft diameter may prevent femoral shaft fractures. It also acts as a buttress to prevent medialisation of the shaft and provides more efficient load transfer than does a sliding hip screw. It is a superior implant for unstable trochanteric fractures in terms of operating time, surgical exposure, blood loss, and complication rates.

References

1. Marks R: Hip fracture epidemiological trends, outcomes, and risk factors,1970–2009. Int J Gen, 3:1–17, 2010.
2. Kanis JA, Odén A, McCloskey EV, *et al.*: Asystematic review of hip fracture incidence and probability of fracture worldwide. Osteoporos Int 23(9):2239–2259, 2012.
3. Bertram M, Norman R, Kemp L, *et al.*: Review of the long-term disability associated with hip fractures. Inj Prev 17(6):365–370, 2011.
4. Becker C, Gebhard F, Fleischer S, *et al.*: [Prediction of mortality, mobility and admission to long-term care after hip fractures]. Unfallchirurg 106(1):32–38, 2003.
5. Al-Ani AN, Samuelsson B, Tidermark J *et al.*: Early operation on patients with a hip fracture improved the ability to return to independent living. A prospective study of 850 patients. J Bone Joint Surg Am 90(7):1436–1442, .2008.
6. Holt G, Smith R, Duncan K, *et al.*: Outcome after surgery for the treatment of hip fracture in the extremely elderly. J Bone Joint Surg Am 90(9):1899–1905, 2008.
7. Kammerlander C, Gosch M, Kammerlander-Knauer U, *et al.*: Long-term functional outcome in gaeriatric hip fracture patients. Arch Orthop Trauma Surg 131(10):1435–1444, 2011.
8. Baumgaertner MR, Curtin SL, Lindskog DM. Intramedullary versus extramedullary fixation for the treatment of intertrochanteric hip fractures. Clin Orthop. pp. 87–94, 1998.
9. Davis TR, Sher JL, Horsman A, *et al.*: Intertrochanteric femoral fractures. Mechanical failure after internal fixation. J Bone Joint Surg Br72(1):26–31, 1990.
10. Muller ME, Nazarian S, Koch P, *et al.*: The AO Classification of Fractures of Long Bones. new York: Springer; 1990.
11. Schipper IB, Bresina S, Wahl D, *et al.*: Biomechanical evaluation of the proximal femoralnail. Clin Orthop Relat Res 405:277–86, 2002.
12. Kyle RF: Analysis of six hundred and twenty-two intertrochanteric hip fractures. J Bone Joint Surg Am 61:216–21, 1979.
13. Ekström W, Miedel R, Ponzer S, *et al.*: Quality of life aftera stable trochanteric fracture–a prospective cohortstudy on 148 patients. J Orthop Trauma 23(1):39–44, 2009.

14. Magaziner J, Fredman L, Hawkes W, *et al.*: Changes in functional status attributable to hip fracture: a comparison of hip fracture patients to community-dwellingaged. Am J Epidemiol 157(11):1023–1031, 2003.
15. Tidermark J, Zethraeus N, Svensson O, *et al.*: Quality of life related to fracture displacement among elderly patients with femoral neck fractures treated with internal fixation. J Orthop Trauma 16(1):34–38, 2002.
16. Ingh M, Nagrath AR, Maini PS. Changes in trabecular pattern of the upper end of the femur as an index of osteoporosis. J Bone Joint Surg Am 52(3):457–467, 1970.
17. Pervez H, Parker MJ, Vowler S. Prediction of fixation failure after sliding hip screw fixation. Injury35(10):994–998, 2004.
18. Schipper IB, Steyerberg EW, Castelein RM, *et al.*: Treatment of unstable trochanteric fractures. Randomised comparison of the gamma nail and the proximal femoralnail. J Bone Joint Surg Br 86(1):86–94, 2004.
19. Anglen JO, Weinstein JN. Nail or plate fixation of intertrochanteric hip fractures: changing pattern of practice. A review of the American Board of Orthopaedic Surgery Database. JB one Joint Surg Am. 90(4):700–707, 2008.
20. Sadowski C, Lübbeke A, Saudan M, *et al.*: Treatment of reverse oblique and transverse intertrochanteric fractures with use of an intramedullary nail or a 95 degree screw plate: A prospective randomised study. J Bone Joint Surg Am. pp. 372–81, 2002.
21. Goldhagen PR, O'Connor DR, Schwarze D, *et al.*: A prospective comparative study of the compression hip screw and the gamma nail. J Orthop Trauma 8:367–72, 1994.
22. Boldin C, Seibert FJ, Fankhauser F, *et al.*: The proximal femoralnail (PFN)—a minimal invasive treatment of unstable proximal femoral fractures: a prospective study of 55 patients with a follow-up of 15 months. Acta Orthop Scand 74:53–8, 2003.
23. Schipper IB, Steyerberg EW, Castelein RM, *et al.*: Treatment of unstabletrochanteric fractures. Randomised comparison of the gamma nail and the proximal femoralnail. J Bone Joint Surg Br 86(1):86–94, 2004.
24. Leung KS, Chen CM, So WS, *et al.*: Multicenter trial of modified Gamma nail in East Asia. Clin Orthop Relat Res 323:146–54, 1996.
25. Halder SC. The Gamma nail for peritrochanteric fractures. J Bone Joint Surg Br 74:340–4, 1992.
26. Pannikar V, Samsani SR, Venu KM, *et al.*: Intramedullary fixation of complex unstable proximal femoral fractures: A district general hospital experience. Injury Extra 38 : 26, 2007.
27. Westacott D, Bould M: Outcomein 36 elderly patients treatedwith the Gamma 3 Long Nail for unstable proximal femoral fracture. Acta Orthop Belg 77(1):68–72, 2011.

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