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Functional outcome of proximal femoral nailing in inter trochanteric fractures of femur: A prospective study

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Abstract

Background: The study was conducted to analyse the functional outcome of Proximal Femoral Nailing in Inter-Trochanteric Fractures of Femur.

Methods: Over two years, after obtaining written consent, this prospective study was conducted among 22 patients (age group >18 years) who had Inter-trochanteric fracture treated with Proximal Femoral Nailing. The X-ray of the operated hip was taken whenever it was felt necessary and on 4th week, 8th week, 12th week and at 6th month. Functional outcome measures was done by using Harris Hip Scoring System (Modified) at the end of 6 months.

Results: The present series includes, 14 males and 8 females in the age group of 47-82 years with the mean age of 62.09 years. Unstable inter-trochanteric fractures were commonly seen. Excellent results were seen in 13 patients. Intraoperative and post-operative complications was seen in 9 patients.

Conclusion: From this study, we consider that PFN is an excellent implant for the treatment of trochanteric fractures. With a proper technique, PFN gives excellent clinical results with almost negligible varus collapse even in unstable Inter trochanteric fractures.

Keywords: Inter-trochanteric fractures, proximal femoral nailing, harris hip scoring

Introduction

Inter-trochanteric fractures of femur are one of the commonest injuries sustained by the elderly population. The incidence is growing rapidly due to increase in ageing of human population and lifestyle modifications^[1, 2].

It is commonly associated trivial trauma in older age patient, high energy trauma in younger age patient will result in fractures configuration^[3].

Non operative approach includes reduction via traction and immobilization. However it usually resulted in malunion, varus and external rotation deformities resulting in short limb gait. Due to prolonged immobilization complications like bedsores, deep vein thrombosis, respiratory infections can happen. Since the fracture is more common in older age patients, the aim of treatment is to early stabilization, rigid and stable fixation, thus preventing the complication of prolonged recumbency. This leads to recommendation of surgery by internal fixation.

The advantages of operative treatment are:

1. Decreases hospitalization^[4]
2. Reduces complications of prolong recumbency^[4]
3. Early mobilization and weight bearing
4. Walking exercise is possible with new implant and fixation technology^[5].
5. Helps to achieve anatomical reduction.

There are several implants invented for fixation of Inter-trochanteric fractures both intramedullary and extramedullary. It includes Dynamic Hip Screw (Extramedullary fixation), Gamma Nail and PFN (Intramedullary Fixation). Dynamic Hip screw has been associated with complications such as collapse of Femoral Neck and shortening of leg.

To overcome the disadvantage of dynamic hip-screw, new intramedullary fixation device was introduced for treatment of unstable intertrochanteric fractures. Gamma nail is the earliest version of intramedullary fixation device.

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The proximal femoral nail (PFN) was introduced in 1997 (Mathys Medical, Bettlach, Switzerland) for treatment of unstable inter trochanteric fractures. The fixation of fracture with PFN offers minimal surgical incision and thus reduces the risk of infection [6].

In view of these considerations, the study of surgical management of inter trochanteric fracture is undertaken to study the functional outcome of proximal femoral nail and to evaluate the complications associated with proximal femoral nailing in the trochanteric fractures of femur.

Review of Literature

Endigeri *et al* in 2015 conducted a study on Outcome of Inter trochanteric Fractures treated with proximal femoral nailing. It included 50 cases of inter-trochanteric fractures treated with PFN. Excellent results were seen in 44 patients. Intraoperative and post-op complications were seen in 12 patients. He concluded that proximal femoral nailing was an excellent treatment option for unstable inter-trochanteric fractures.

Mehmet Fatih Korkmaz *et al* in 2014 done a retrospective study in patients who had suffered proximal femoral fractures between January 2002 and February 2007 treated with a proximal femoral nail and concluded that that proximal femoral nail is a reliable fixation with good fracture union, and it is not associated with major complications in any type of trochanteric femoral fracture.

Güvenir Okcu MD *et al* in 2013 done a study to find Which Implant Is Better for Treating Reverse Obliquity Fractures of the Proximal Femur: A Standard or Long PF Nail and the results suggested that reverse obliquity fractures of the trochanteric region of the femur can be treated with either standard or long intramedullary nails.

Janardhana Aithala P *et al* in 2013 done a study to understand technical difficulties involved in proximal femoral nailing and specifically analyses neck shaft angle at follow-up indicating varus collapse and also to compare results of stable and unstable fractures and it was concluded Although PFN is technically required, with a proper technique PFN gives excellent clinical results with almost negligible varus collapse even in unstable trochanteric fractures. Regarding the techniques, reaming the proximal part of femur adequately and observing the nail passage with image carefully are important in placing the nail correctly, while, placement of lag screw in the inferior part of neck in anterior posterior projection and central in lateral projection reduces risk of implant failure.

Orcun Sahin *et al* in 2012 compared the clinical and radiographical results of Dynamic hip screw (DHS) and Proximal femoral nail (PFN) for the treatment of trochanteric hip fractures and the results as follows Total duration of surgery was significantly lower for PFN than it was for DHS. A comparison of time to union and overall mortality demonstrated no statistically significant differences. They detected no differences between the two treatment groups in

regard to early versus late complications, time to union, and overall mortality; however, with its shorter operative period, PFN is a good alternative to the DHS. For this reason, They believed that it might be the implant of choice for the treatment of trochanteric fractures by surgeons who have an experience in interlocked femoral nailing systems.

Methods and materials

This is a Prospective study of 22 patients who had a history of trauma to hip and suspected to have a inter-trochanteric fracture who came to casualty or Orthopaedic out patient department from August 2014 to August 2016 and got admitted under department of Orthopaedics at Sri Lakshmi Narayana Institute of Medical Sciences. The study was done after getting the clearance from the Ethical Committee and informed written consent from the study participants. Patients were included in this study after satisfying inclusion and exclusion criteria made for this study.

Inclusion criteria

All patients who gave their willfull consent to participate in the study

1. Stable and unstable intertrochanteric fractures
2. Age > 18 yrs

Exclusion criteria

1. Open hip fractures
2. Pathological fractures
3. Peri prosthetic fractures
4. Paediatric fractures [before physal closure]

Patient was shifted to the ward with traction which was applied to the affected limb Foot end was elevated, to provide counter-traction. This was followed by routine pre-operative investigations. The fractures were classified according to Orthopaedic Trauma Association (OTA). All the patients were operated at an average interval of 7 days from the date of trauma.

Design of Proximal Femoral Nail implants used in our study:

In our study we used a standard length Proximal Femoral Nail (250mm) which is made up of either 316L stainless steel or titanium alloy. The distal diameter is of 10, 11, 12 mm as it prevents stress concentration at the end of the nail and the proximal diameter of nail is 14mm which increases the stability of the implant. There is 6° mediolateral valgus angle, which prevent varus collapse of the fracture even when there is medial comminution. The proximal derotation screw of 6.5mm and distal lag screw of 8mm. Distal locking is done with self tapping 4.9mm cortical screws one in static mode and the other in dynamic mode allowing 5mm dynamisation. The nail is universal with 6 degrees mediolateral angulation and with a neck shaft angle of 135 degrees.

Diagram showing guide wire insertion



Diagram showing instruments

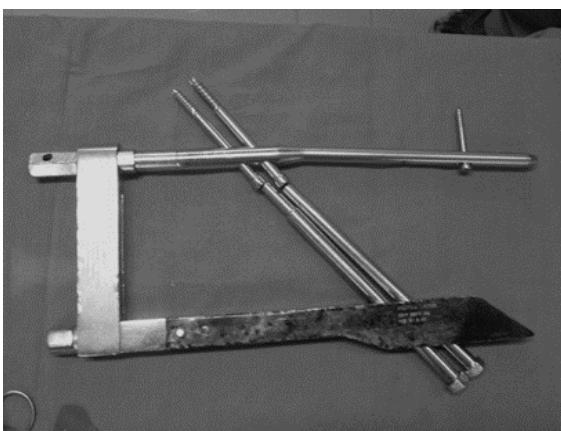


Diagram showing intraoperative reduction



Postoperatively the patients were put on Intravenous Antibiotics and analgesics. Foot end elevation was advised for all patients. Sutures removed on 12th to 14th postoperative day. Patients were taught quadriceps strengthening exercises and knee mobilization in the immediate post operative period. For all stable fractures partial weight bearing was started on 4th week, for unstable fracture weight bearing was delayed upto 6 weeks or even later. Full weight bearing was started at 6 to 8 weeks for stable fractures, in case of unstable fracture weight bearing was started at the end of 10-12 week. Patients were advised to follow up on 4th week, 8th week, 12th week and at 6th month. Functional outcome measures was done by using Harris Hip Scoring System (Modified) at the end of 6 months.

Results

The study included 22 cases of Inter trochanteric fractures among which 14 were males (63.64%) and 8 were females (36.36%). The age distribution was from 47 to 82 years (mean age =62.09 years). The incidence of Inter-trochanteric fractures were commonly seen in age group of more than 60 yrs with the (Fig 1)

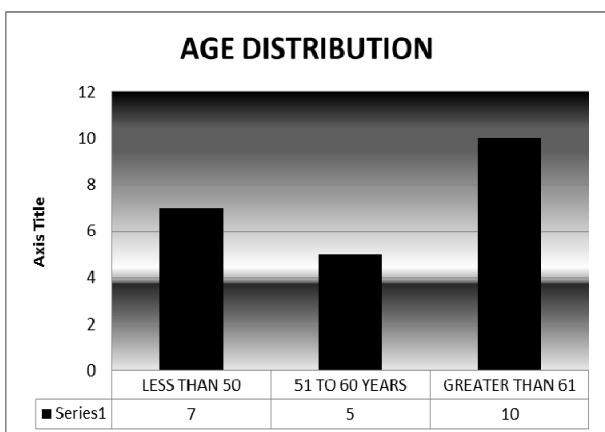


Fig 1

11 patients (50%) sustained a fracture due to slip and fall, 7 patients (31%) due to RTA and the Remaining 4 Patients(18.18%) due to Fall from Height.(fig 2)

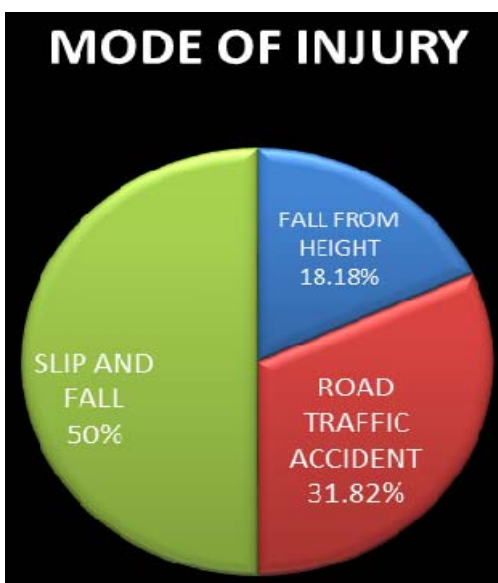


Fig 2

Right side was involved in 12 (54.54%) cases and left in 10 (45.45%), Right side was more commonly involved than Left side.

In our study out of the 22 Intertrochanteric fractures, majority were Type 3 -10(45.45%), Type 2- 7 (31.82%) and Type 4 - 3 (13.64%) and Type 1 was 2(9.09%) according to Boyd and Griffin classification (Fig 3)

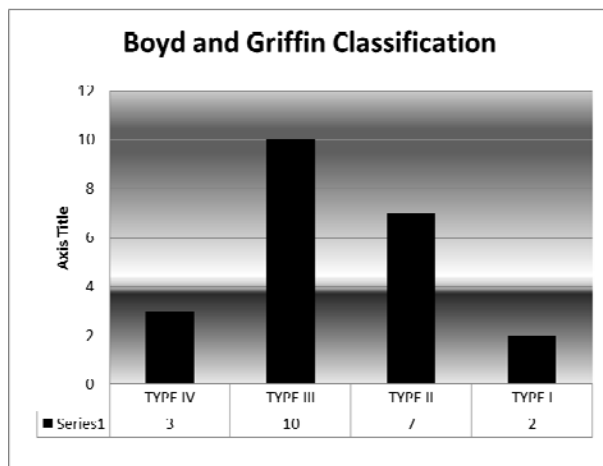


Fig 3

In our study of 22 intertrochanteric fractures, stable fractures were 9 and unstable fractures were 13 according to Boyd and Griffin classification. (Fig 4)

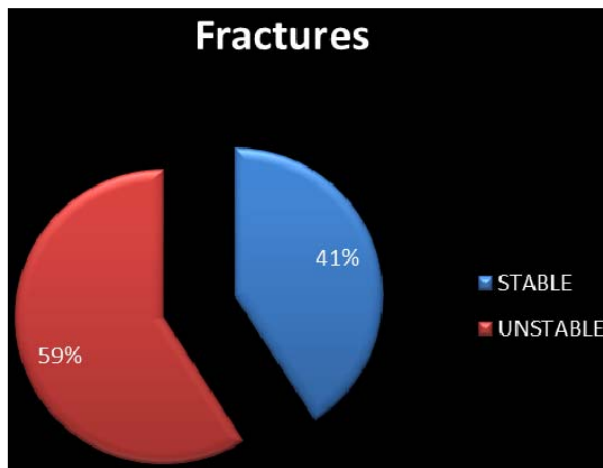


Fig 4

In our study all patients were operated under spinal anaesthesia except one patient who underwent General anaesthesia due to associated D12 #. The average duration of surgery was 90 minutes. Blood loss-measured by mop count (each fully soaked mop containing 50ml blood) average was about 100ml.

In our study the average duration of hospital stay was 15.4 days. It was more in Patients with co-morbid conditions with the highest of 21 days.

We encountered one case of delayed union and one case of mal union (varus <10 degree).Two cases had shortening more than 1 cm who were treated with shoe raise. One patient had knee stiffness on operated limb on 6th week follow up which improved after rigorous physiotherapy on 18th week follow up. We had one case of delayed deep wound infection which happened at 12th week. Patient came with complains of pain

over the proximal screw site scar. Thorough clinical, radiological and laboratory investigations were done and he was diagnosed to have proximal screw site bursitis. Then patient was managed with wound debridement, appropriate I.V antibiotics and regular dressing. Screws backout was seen in one patient which was probably due to early mobilization and severe osteoporosis due Post Polio Residual Paralysis. (Table 1)

Table 1

Complications	Number	Percentage
Delayed union	1	4.5%
Non union	0	0%
Varus alunion	2	9%
Implant failure	1	4.5%
Shortening	2	9%
Knee stiffness	1	4.5%
Infection	2	9%

In our study of 22 patients x-ray assessment was done at 6 weeks, 12 weeks, 6 months and whenever necessary. For all patients bridging callus was seen at 6 weeks except one patient which was seen at 14 weeks and another one lost follow up. Obliteration of fracture line was seen at end of 12 weeks for 19 patients, at 20weeks for 1 patient and 2 patients lost follow up. Complete fracture union was seen at end of 24 weeks for 19 patients, and at end of 32 weeks for 1 patient (Table 2)

Table 2

Radiological features	Apperance	Number of patients
Bridging callus	6 weeks	20
	14 weeks	1
Oblitartion of fracture line	12weeks	19
	20 weeks	1
Complete fracture union	24weeks	19
	32 weeks	1
Varus malunion	24 weeks	1

In our series of 22 operated cases, 2 cases lost follow up. Functional results are assessed taking the remaining 20 cases into consideration using Harris Hip Scoring System (Modified) (Table 3)

Table 3

Functional result	Number	Percentage
Excellent	8	40%
Good	9	45%
Fair	1	5%
Poor	2	10%

Discussion

Inter-trochanteric fractures are globally viewed as an injury best treated with surgical repair. The goals of operative treatment are Strong and stable fixation of the fracture fragments, Early mobilization of the patient, Recovery of the patient to his or her pre-operative status at the earliest and to maintain the limb length.

Since Inter-trochanteric fracture is most commonly seen in elderly patients, osteoporosis was taken into consideration. Osteoporosis is a condition characterized by low bone mineral density and compromised microarchieture integrity leading to structural failure of skeleton even at low load. Singh's Grading of osteoporosis is used to evaluate the quality of bone. However for outcome surgery, the combined influence

of osteoporosis and fracture pattern is considered. The most stable fracture pattern is the two part fracture in normal (non osteoporotic bone). An intermediate level of instability is seen in four-fragment fracture of normal bone and two part fracture of osteoporotic bone. The four fragment fracture of osteoporotic bone is the least stable among inter-trochanteric fractures [7].

Several types of compression hip-screws with a plate have been used for treatment of intertrochanteric fractures. They provide stable fixation and controlled impaction over the fracture. But their use in intertrochanteric fractures has not been satisfactory due to excessive sliding of lag screw and medialization of distal fragment and subsequent fixation failure [8].

In order to overcome the disadvantages of Dynamic Hip screw, intramedullary devices were developed. The first successful intramedullary device was developed by Zickel in the early 1960s. The disadvantages of the procedure are, it has an open operating technique and the design does not provide any compression mechanism for the femoral neck component of the implant and also does not provide distal locking facility [9].

In 1996, the AO/ASIF developed the proximal femoral nail (PFN) as an intramedullary device for the treatment of unstable per-, intra- and sub-trochanteric femoral fractures. Proximal femoral nail has all the advantages of an intramedullary device, such as decreasing the moment arm, can be inserted by closed technique, which retains the fracture hematoma an important consideration in fracture healing decreases blood loss, infection, minimizes the soft tissue dissection and wound complications [10].

In addition to all advantages of a nail to be implanted intramedullarily, it has several other favorable characteristics. Pre-drilling is not necessary, it can be dynamically locked, it has a high rotation stability, and mechanical stress concentration on the implant-bone interface is low [11]. The currently used Gamma nail as an intramedullary device also has a high learning curve with technical and mechanical failure rates of about 10% [12, 13].

In this present study, we used proximal femoral nail for treatment of 22 cases of inter trochanteric fractures. Males were more common affected than females, males accounting to 14 cases contributing to 63.64 % of cases and females contributed to 8 cases making 36.36% of cases rohit and roland [14] *et al* studied 25 patients of trochanteric fracture in that 17 are male patients.

Minos Tyllianakis [15] *et al* in 2004 done a retrospective study of the treatment of unstable intertrochanteric fractures of the proximal femur using proximal femoral nail in 45 patients. In that a fall at home was the commonest mode of injury (67% of the patients). Similarly in our study also slip and fall was the common mode of injury 50 % of patients. In his study the average time from injury to surgery was 3 days (range: 0 to 7 days) which was 7 days in our study. The mean operative time (skin to skin) in our study was 75 minutes compared to 68 minutes in his study.

Inger B. Schipper [16] *et al* 2004 using PFN & gamma nail in 413 patients found superficial infections was 25/413: deep infection in 11/413: hematoma in 17/413. In our study we had 2 patients of deep infection out of that one patient had deep infection on 4th post operative day and it was healed on 22nd post operative day. Another patient had developed pain on the proximal screw suture site and we found to have screw bursitis. Both of them managed with wound debridement, parenteral antibiotics, regular dressings.

Ekstr Am *et al* ^[17] 2007 studied 203 patient with PFN and medoff sliding plate he found that varus union was about 4.7% in PFN and 1.02% with medoff sliding plate. In our study we had 2 cases with varus deformity probably due to non anatomical reduction.

Overall, we had good to excellent results in 95 % of cases, Fair results in 5 % of cases. We had two (10%) case with poor results. Our Results are comparable with other studies.

Conclusion

With good understanding of fracture biomechanics, good preoperative planning, accurate instrumentation and surgical technique, PFN is an excellent implant in the management of Inter-trochanteric fractures.

References

1. Cummings SR, Rubin SM, Black D. The future of hip fractures in the United States. Numbers, costs, and potential effects of postmenopausal estrogen. *Clin Orthop Relat Res*, 1990; 252:163-66.
2. Kannus P, Parkkari J, Sievänen H *et al*. Epidemiology of hip fractures. *Journal of Bone and joints*, 1996; 18(1):57-63.
3. Terry canale S, James Beaty H. *Campbell's Textbook of Operative orthopaedics*. 2008; 3(11):3237.
4. Kaufer H, Mathews LS, Sonstegard D. Stable Fixation of Intertrochanteric fractures. *J Bone Joint Surg*. 1974; 56A:899-907.
5. Robert Bucholez W, James Hechman D, Charles court Brown M. *Rockwood Greens fracture in adults Volume 2*, 6th Edition 2006 Lippincott Williams and Wilkins Co. 1827-1844
6. Halder SC. The gamma nail for peritrochanteric fractures. *JBJS (Br)* 1992; 74:340-4.
7. Laros GS. The role of osteoporosis in intertrochanteric fracture. *Othop clin North America*. 1980; 11:479.
8. Dominique Hardy CR, Pierre-Yves Descamps, Panagiotis Krallis *et al*. Use of intramedullary hip screw compared with a compression hip screw with a plate for intertrochanteric femoral fractures. A prospective, randomized study of one hundred patients. *JBJS*. 1998; 80-A:5.
9. Pertochanteric fractures of the femur treated with Zickel nail'. *Archortho. Bleg*, 1994;(60):129-33.
10. Kaufer H, Matthews LS, Sonstegard D. Stable Fixation of Intertrochanteric Fractures. *Journal of Bone and Joint Surgery*. 1974; 56A:899-907.
11. McKibbin B. The biology of fracture healing in long bones. *J Bone Joint Surg (Br)* 1978; 60:150-62.
12. Albareda J, Laderiga A, Palanca D *et al*. Complications and technical problems with the gamma nail. *Tnt Orthop*. 1996; 20:47-50.
13. Valverde JA, Alonso MG, Porro JG, Rueda D, Larrauri PM, Soler JJ. Use of the Gamma nail in the treatment of fractures of the proximal femur. *Clin Orthop* 1998; 350:56-61.
14. *International Journal of Health and Sciences*. 3(1):417-425
15. Tyllianakis M, Panagopoulos A, Papadopoulos A, Papasimos S, Mousafiris K. Treatment of extracapsular hip fractures with the proximal femoral nail (PFN): long term results in 45 patients. *Acta Orthop Belg*. 2004; 70(5):444-54.
16. Schipper Ib, Bresina S, Wahl D, Linke B, Van Vugt Ab, Schneider E. Biomechanical evaluation of the proximal

femoral nail. *Clin orthop relat res*. 2002; 405:277-86.

17. Ekstram W, Karlsson-Thur C, Larsson S *Et Al*. Functional Outcome in Treatment of Unstable Trochanteric and Subtrochanteric fractures with the proximal femoral nail and the med off sliding plate. *J orthop trauma*. 2007; 21:21:18-25.