

Original Research Article

Closed reduction and proximal femoral nailing in the management of intertrochanteric fractures: a prospective study

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ABSTRACT

Background: Open reduction and dynamic hip screw with plate was considered as the standard method of treatment for intertrochanteric fracture of femur previously. With the introduction of proximal femoral nails, closed reduction and proximal femoral nailing are used extensively for the treatment of intertrochanteric fractures in the last two decades. The purpose of this study was to evaluate the functional outcome in early treatment of intertrochanteric fractures of Femur by closed reduction and proximal femoral nailing.

Methods: Study was conducted in the department of orthopaedics in Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, from August 2014 to August 2016. Forty cases of intertrochanteric fractures are treated with proximal femoral nails. Patients were followed up for a period of 24 weeks. The modified Harris hip score (MMHS) was used to evaluate the functional outcome of surgery.

Results: Forty consecutive patients were included in this study. Fractures were classified according to Boyd and Griffin classification system. According to the classification 16 cases were type I, 14 cases were type II, 5 were type III and 5 were of type IV. After 12 months of follow-up, all 40 patients were available for evaluation. Radiological union was achieved in a mean time of 14.5 weeks. MHHS was excellent in 13 patients good in 16 patients, fair in 8 patients and poor in 3 patients.

Conclusions: Proximal femoral nailing systems are minimally invasive techniques with shorter operative time and good union rate.

Keywords: Intertrochanteric fractures, PFN, MHHS, Boyd and Griffin

INTRODUCTION

Trochanteric fracture is a very common fracture in an elderly population. Now Trochanteric fracture is common also in young population due to increasing frequency of road traffic accidents. Surgical treatment is the preferred method of treatment for intertrochanteric femoral fractures and a variety of implants are used. These implants fall into two main categories, intramedullary and extramedullary. Intramedullary fixation is associated with short operative time, minimal blood loss and has better

biomechanical properties when compared with extramedullary fixation. In our study we have used intramedullary method of fixation for trochanteric fracture using proximal femoral nail. In the recent years proximal femoral nails are most commonly used method of fixation for the trochanteric fractures of the femur.¹ The proximal femoral nail was introduced by A.O/AISF in 1996. Since then various studies were taken in support and against of PFN in the treatment of trochanteric fractures.² Our study was conducted to evaluate the

radiological union and functional outcome following proximal femoral nailing.

The aim of the present study was to evaluate the functional outcome in early treatment of intertrochanteric fractures of femur by closed reduction and proximal femoral nailing.

METHODS

This was a prospective interventional study conducted in the Department of Orthopaedic Surgery, Regional Institute of Medical Sciences (RIMS) and a tertiary care centre lasting 3 calendar years (from August 2013 to August 2016) after attaining due permission from the institutional Research ethics Board. All the adult patients (>18 years age) with intertrochanteric fractures of femur presented were operated by a senior consultant were included in the study. Patients with evidence of pathological fractures were excluded from the study. Patients who were known smokers, suffering from comorbidities like chronic renal diseases, diabetes or any other disease or taking medication which could influence fracture healing were excluded. X-rays were taken after initial vitals stabilization and complete clinical evaluation. Fracture pattern was assessed by using anteroposterior and lateral views. Fractures were classified according to Boyd and Griffins classification (Table 2).³ Fracture immobilized with Thomas splint and skin traction. A detailed history was taken, relating to the age, sex, and occupation, mode of injury, past and associated medical illness. All routine investigations were done and patients were operated as early as possible. After pre-operative anesthetic evaluation, pre-op planning of surgery was made.

The surgery was carried out under general/spinal anaesthesia. A systemic antibiotic was given just before induction of anaesthesia. Patient was put on traction table in supine position with contra lateral uninjured leg is placed on a leg holder. Preliminary reduction was achieved by closed manipulation under C-arm guidance and maintained by traction table. After preparing the parts 3-4 cm skin incision given extending upwards from the tip of greater trochanter. Entry made using bone awl through greater trochanter. Guide wire introduced from the tip of greater trochanter, confirmed by both AP and lateral x-ray views and reaming was done. Standard short PFN (Proximal Femoral Nail) of length 24-28 cm and of diameters 9-12 mm was used in 23 cases. 7 cases long PFN was used. 6.4mm hip screws are used for true rotational stability and 8mm femoral and 8 mm femoral neck screw (Lag screw) which was placed in central and infero medial femoral neck cortex. Lag screw was placed near the subchondral bone. After checking the stability at the fracture site distal dynamic and locking screws are applied as required. Patients were allowed stand on 2nd day. Partial weight bearing allowed on 5th day and full weight bearing was allowed on 7th postoperative day. X-rays were taken at post op, 6 week, and every 2 months till radiological and clinical union is achieved. The modified Harris hip score (MMHS) used to evaluate the

functional outcome of surgery.⁴ Preinjury MMHS is calculated and post-operative MMHS calculated at discharge, 6 weeks, 4 month and one year. The score is reported as 90-100 for excellent results, 80-89 being good, 70-79 fair, 60-69 poor and below 60 a failed result. Statistical analysis is done by using data based programme, descriptive statistics such as mean, proportion, percentage is used. The result of the study is interpreted using SPSS software 2012 version.

Table 1: MMHS.

Pain:
1. None/ignores (44 points)
2. Slight, occasional, no compromise in activity (40 points)
3. Mild, no effect on ordinary activity, pain after activity, uses aspirin (30 points)
4. Moderate, tolerable, makes concessions, occasional codeine (20 points)
5. Marked, serious limitations (10 points)
6. Totally disabled (0 points)
Function: Gait
Limp
1. None (11 points)
2. Slight (8 points)
3. Moderate (5 points)
4. Severe (0 points)
5. Unable to walk (0 points)
Support
1. None (11 points)
2. Cane, long walks (7 points)
3. Cane, full time (5 points)
4. Crutch (4 points)
5. 2 canes (2 points)
6. 2 crutches (1 points)
7. Unable to walk (0 points)
Distance Walked
1. Unlimited (11 points)
2. 6 blocks (8 points)
3. 2-3 blocks (5 points)
4. Indoors only (2 points)
5. Bed and chair (0 points)
Functional activities
Stairs
1. Normally (4 points)
2. Normally with banister (2 points)
3. Any method (1 points)
4. Not able (0 points) Socks/Shoes
5. With ease (4 points)
6. With difficulty (2 points)
7. Unable (0 points)
Sitting
1. Any chair, 1 hour (5 points)
2. High chair, ½ hour (3 points)
3. Unable to sit, ½ hour, any chair (0 points)
Public transportation
1. Able to enter public transportation (1 points)
2. Unable to use public transportation (0 points)

Table 2: Boyd and Griffins classification.

Type I	Simple fracture that extend along the intertrochanteric line from the greater to the lesser trochanter
Type II	Comminuted fractures, the main fracture being along the intertrochanteric line, but with multiple fractures in the cortex
Type III	Fractures that are basically sub trochanteric with at least one fracture passing across the proximal end of the shaft just distal to or at the lesser trochanter. Varying degrees of comminution are associated (reverse sub trochanteric).
Type IV	Fractures of the trochanteric region and the proximal shaft (fracture in two planes).

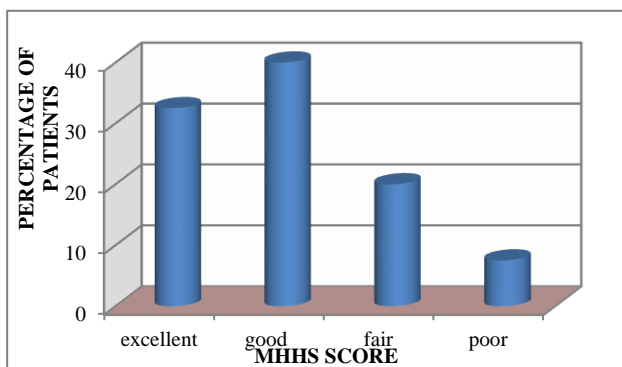
RESULTS

Forty consecutive patients were included in this study. Twenty two patients (55%) were male and 18 patients (45%) were female. The age distribution was from 18 to 85 years and Mean age was 45.4 years, mean weight was 65.7±12 kilograms, and mean height was 161.1±8.6 centimeters. Fractures were classified according to Boyd and Griffin classification system. According to the classification 16 cases were type I, 14 cases were type II, 5 were type III and 5 were type IV. Road traffic accidents - accounted for 18 patients (45%) and 22 were due to domestic fall.

Average time to fixation was 10.3 days and average hospital stay was 21.5±5.6 days. Mean operative time was 69 minutes. At the end of one year all the patients were available for follow up and all the fractures achieved union; average union time was 14.5 weeks, Ranging from 10 weeks to 19 weeks. Three patients (7%) had major complications. In one patient had reverse Z effect, shortening of more than 2 cm was seen in 2 patients. Minor complications include superficial wound infection (2 patients), limb length discrepancy of 1 cm (2 patients) and knee joint stiffness (3 patients). MHHS was excellent in 13 patients good in 16 patients, fair in 8 patients and poor in 3 patients.

Table 3: The demographic and clinical characteristics of subjects (n=40).

Clinical variables	Total number of patients (n=40) (%)
Age in years	
18-45	11 (27.5)
45-65	15 (37.5)
65-85	14 (35)
Gender	
Male	22 (55)
Female	18 (45)
Mode of injury	
RTA	18 (45)
domestic Fall	22 (55)
Fracture classification (Boyd and Griffins)	
Type I	16 (40)
Type II	14 (35)
Type III	5 (12.5)
Type IV	5 (12.5)

**Figure 1: Outcome of the study.**

DISCUSSION

Trochanteric fractures were once considered fracture of old age due to trivial domestic falls now it is seen among the younger population due to high energy trauma due to road traffic accidents. These fractures will be more comminuted and requires better method of fixation. There are changing concepts regarding the method of fixation of intertrochanteric fractures in the last two decades. There is increase in tendency towards intramedullary fixation for trochanteric fractures over extramedullary devices with clear advantage of former devices due to biomechanically stable fixation. We have picked intramedullary fixation system for our study. Our study

was conducted to evaluate the efficacy of proximal femoral nailing in all the age group and assess the functional outcome and quality of fixation achieved.

In our study, average age was 45.4 years ranging from 18 to 85 years. Kumar et al, in their study assessing 60 cases ranged from 21-85 years with a mean age of 52.66 years.⁵ In the series 295 patients with trochanteric fracture were treated with PFN by Domingo et al the average age of the patient in their study was 80 year.⁶

In our study, most common mode of injury was domestic

fall which constituted 55% of patients and rest were due to road traffic accidents. Kumar et al, in their study, the most frequent cause of injury was domestic fall; this was recorded in 42 patients (70%).⁵ Yadav et al, in their study assessing 96 cases road traffic accidents constituted 50.8% of cases.⁷

In our study average union time was 14.5 weeks, ranging from 10 weeks to 19 weeks. Gadegone et al in their study comprising 82 fractures average time for union was 14.2 weeks.⁸ Yadhikar et al in their study of 39 cases Average fracture union time was 16 weeks.⁹

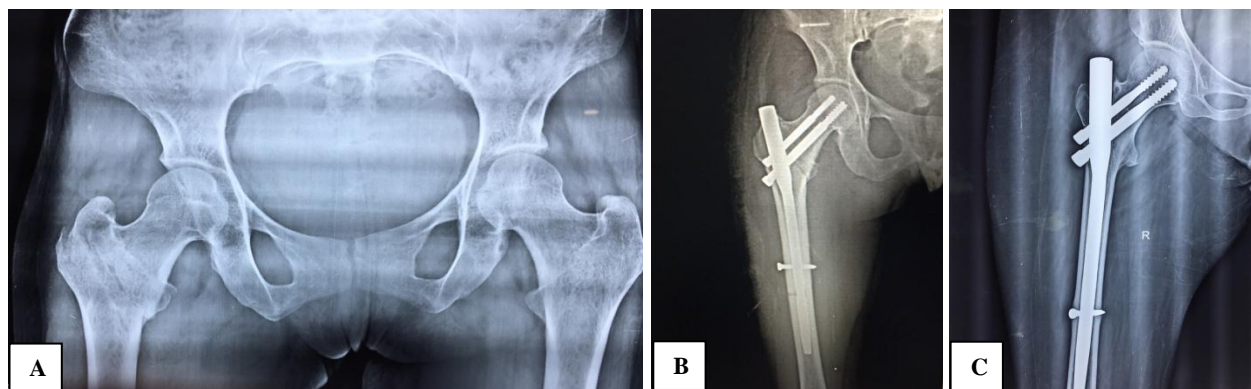


Figure 1 (A and B): Type II Boyd and Griffins intertrochanteric fracture fixed with proximal femoral nail.

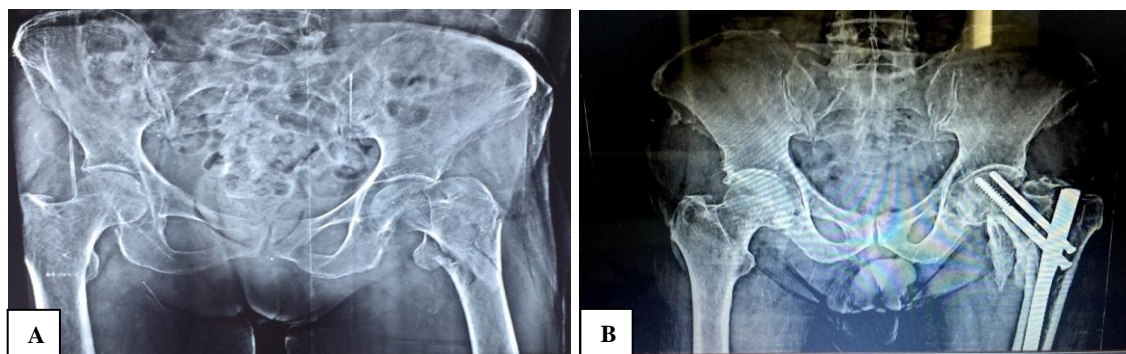


Figure 2 (A and B): Type II Boyd and Griffins intertrochanteric fracture fixed with proximal femoral nail showing union.

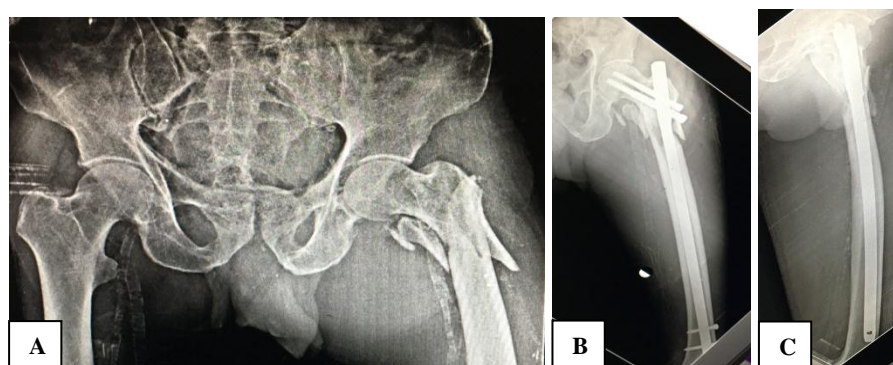


Figure 3 (A-C): Type III Boyd and Griffins intertrochanteric fracture fixed with proximal femoral nail showing union.

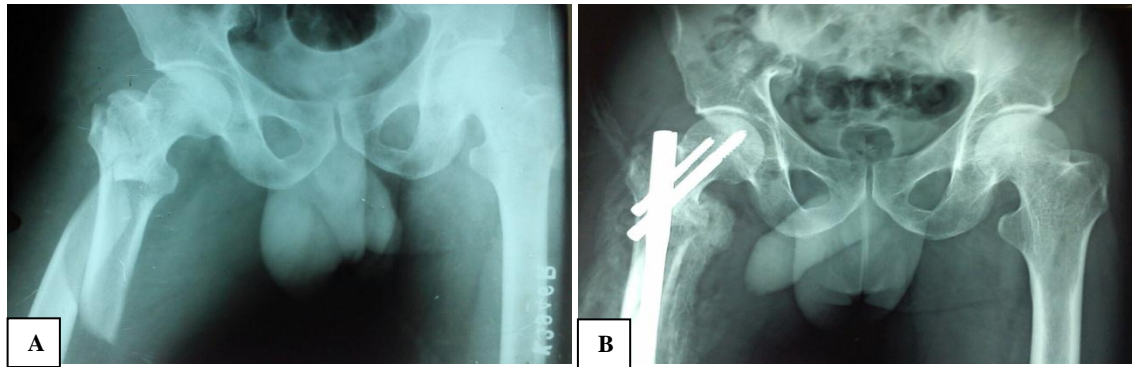


Figure 4 (A and B): Type IV Boyd and Griffins intertrochanteric fracture fixed with long proximal femoral nail.

The mean pre-injury MHHS was 74 (Maximum of which was 91). Percentage in the return to pre-trauma activity was assessed with this. Mean value reached to 71 gradually over 6 month post-operative period. MHHS was excellent in 13 (32.5%) patients good in 16 (40%) patients, fair in 8 (20%) patients and poor in 3(7.5%) patients. Kumar et al used Harris hip score for the assessment they received excellent in 32(53%) patients good in 15 (25%) patients, fair in 8(13%) patients and poor in 5 (9%) patients.⁵ El-Mowafi et al study involved 20 patients with trochanteric fracture fixation with proximal femoral nail. They studied both clinically and radiographically. The age group was between 20 to 70 years of age and used Merle D Aubigne scoring system. They received excellent 25%, good (40%), fair (20%) and poor (15%) which was comparable to our study.¹⁰

CONCLUSION

From our study it can be concluded that proximal femoral nailing system are minimally invasive techniques with shorter operative time and good union rate. Being the load sharing device with short lever arm the proximal femoral nails gives biomechanically sound fixation with less implant related complications and can be considered as gold standard of treatment for intertrochanteric fractures among the available implants in the market.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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