

Management of intertrochanteric femur fracture by proximal femoral nail and its functional outcome: A prospective study



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ABSTRACT

Background: Intertrochanteric fractures are commonly encountered in orthopedics practice. Achieving early mobilization in patients with intertrochanteric fractures is the cornerstone of management. Proximal femoral nailing (PFN) is gaining popularity because of better tolerance of this procedure as well as minimal complication rates. We conducted this study to find out the functional outcome of patients with intertrochanteric fractures treated by PFN. **Aims and Objectives:** The objectives are as follows: (1) To find out the functional outcome of patients with intertrochanteric fractures treated by PFN. (2) To find out complications in patients treated by PFN. **Materials and Methods:** 60 patients with intertrochanteric fracture were included in this prospective study on the basis of a predefined inclusion and exclusion criteria. Under spinal anesthesia closed reduction and internal fixation by PFN were done. Open reduction was done in cases where closed reduction was not possible. Functional outcome as assessed by Harris hip score. Statistical analysis was done using SPSS 21.0 Software and $P < 0.05$ was taken as statistically significant. **Results:** Out of 60 studied cases there were 37 (61.67%) males and 23 (38.33%) females with a M: F ratio of 1:0.62. The most common type of fracture was AO A3.2 (simple transverse fracture) which was seen in 28 (46.67%) patients followed by AO A3.1 (Simple Oblique fracture) and AO A3.3 (wedge fracture or multi-fragmentary fracture). Functional outcome was excellent to good in 41 (68.33%) patients whereas fair and poor outcome was seen in 12 (20%) and 5 (8.33%) patients, respectively. Very poor outcome was seen in 2 (3.33%) patients. **Conclusion:** PFN is an excellent technique for management of intertrochanteric fractures. It is associated with excellent outcome in majority of the cases and is associated with minimal complications.

Key words: Functional outcome; Harris hip score; Intertrochanteric fractures; Proximal femoral nailing

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INTRODUCTION

Intertrochanteric fractures of femur are one of the common causes for which orthopedic consultations are made.¹ These fractures are more common in elderly and can occur consequent even to trivial trauma. With improved medical care and increased life expectancy, as the population of elderly individuals is increasing there is an increase in the incidence of intertrochanteric fractures also. Although these fractures are known to heal on their own, there is very high and unacceptable incidence of

malunion and varus deformity resulting into limping.² Due to this unacceptably high risk of deformities conservative management of intertrochanteric fractures is unacceptable and surgical interventions are done in almost all cases of intertrochanteric fractures. Moreover, as these fractures are more common in elderly, they are also associated with secondary complications associated with prolonged incumbency and osteoporosis.³

Intertrochanteric fractures are usually secondary to high energy trauma such as road traffic accidents, falling from

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height, or high-speed collisions however in elderly patients in whom bones are osteoporotic a low energy trauma such as a simple fall may also result in intertrochanteric fracture.⁴ Overall incidence of these fractures is more in elderly female patients above 60 years of age.⁵ However, when these fractures occur in young individuals (usually secondary to high energy trauma) then they predominantly occurs in males. Patients usually present with fracture following either high energy trauma as seen in young individuals or following trivial trauma such as a simple fall in older individuals.⁶ In cases of young patients having Intertrochanteric fractures there is a strong possibility of coexisting multiple other injuries including multiple fractures, head injury, or abdominal trauma. Possibility of co-existing life-threatening injuries must be excluded particularly in young patients presenting with intertrochanteric fractures.⁷

The diagnosis of these fractures is made on the basis of Hip X-ray anteroposterior as well as cross-table lateral views. Computerized tomography helps in accurately defining the fracture and its extent in detail and helps in planning of surgical procedure however its availability and affordability remains restricted particularly in developing countries.⁸ Once the diagnosis of intertrochanteric fracture is made, the management is essentially surgical and may consist of techniques such as screw-plate fixation, dynamic hip screw, or proximal femoral nail (PFN). The ultimate aim of the treatment is stable fixation as well as early mobilization of the patients because these fractures are usually seen in elderly patients who are likely to be having co-morbid systemic illnesses such as diabetes, hypertension as, or chronic obstructive airway diseases. Prolonged immobilization in these patients may be associated with serious complications including pneumonia, sepsis, and thromboembolic events.⁹

The PFN is a relatively new technique and found to have distinct advantages such as reduced blood loss during surgery, reduced duration of surgical procedure, early mobilization, and reduced average hospital stay. Early mobilization is also associated with reduced risk of complications such as deep vein thrombosis, bed sores, and chances of nosocomial infections.¹⁰

We undertook this study to analyze the functional outcome in cases of intertrochanteric fractures treated by PFN.

Aims and objectives

(1) To find out the functional outcome of patients with intertrochanteric fractures treated by PFN. (2) To find out complications in patients treated by PFN.

MATERIALS AND METHODS

This was a prospective cohort study conducted in the Department of Orthopaedics - Bharati Vidyapeeth (Deemed to be University) Medical College and Hospital, Sangli. The institutional ethical committee approved the study. Patients presented with intertrochanteric fracture and were treated by PFN. Total 60 patients were included in this study on the basis of a predefined inclusion and exclusion criteria.

Demographic details such as age, gender, and area of residence were asked and noted down. A detailed history was taken in all the cases with respect to cause as well as mechanism of injury and time duration since injury. Detailed history as well as clinical examination was done to exclude possibility of polytrauma and multiple fracture particularly in young patients in whom the cause is more likely to be high energy trauma. The diagnosis of intertrochanteric fracture was made on the basis of X-ray both hips anteroposterior as well as cross table lateral views. X-rays were also assessed for the presence of osteoporosis, as it is one of the common causes of intertrochanteric fractures in elderly following trivial trauma. The intertrochanteric fractures were classified using AO/OTA Classification into A3.1 (simple oblique fracture), A3.2 (simple transverse fracture), and A3.3 (wedge fracture or multi-fragmentary fracture). First dose of intravenous antibiotics (third generation cephalosporin, that is, Ceftriaxone) was given just before the procedure and was continued till 3 days postoperatively. Patients were followed up at 3, 6, and 12 weeks and finally at 6 months postoperatively for functional outcome as assessed by Harris hip score. The presence of pain, limping, or any complications was also noted. The statistical analysis was one using SSPS 21.0 score.

Inclusion criteria

The following criteria were included in the study:

- Patients presenting with intertrochanteric femur fracture and treated by PFN.
- Informed written consent obtained from patients.
- Age more than 18 years.

Exclusion criteria

The following criteria were excluded from the study:

- Those who refused consent.
- Age <18 years.
- Patients having polytrauma and multiple fractures.
- Patients having serious co-morbid conditions likely to affect the assessment of functional outcome such as patients with neoplastic diseases, stroke.

Patients with rheumatoid arthritis, Psoriatic arthritis, or any other type of arthritis likely to affect functional assessment during follow-up.

RESULTS

Out of 60 studied cases having intertrochanteric fractures there were 37 (61.67%) males and 23 (38.33%) females with a M: F ratio of 1:0.62 (Figure 1).

The analysis of age distribution of the studied cases showed that maximum number of patients (6 cases) was in the age group between 19 and 70 years. The mean age of male patients was found to be 44.10 ± 15.34 years whereas mean age of female patients was 59.60 ± 11.71 years. The comparison of age groups of male and female patients showed that male patients were likely to have intertrochanteric fracture at a relatively younger age as compared to female patients. The difference in age distribution of male and female patients was found to be statistically significant ($P=0.0001$) (Table 1).

In this study, the most frequent cause of fracture was road traffic accidents (42 cases) followed by fall (18 cases). Most of the patients were affected in the right side (38 cases) of the femur, followed by left side (22 cases) (Table 2).

The analysis of the cases on the basis of AO/OTA classification of intertrochanteric femoral fractures showed that the most common type of fracture was AO A3.2 (simple transverse fracture) which was seen in 28 (46.67%) patients followed by AO A3.1 (Simple Oblique fracture) and AO A3.3 (wedge fracture or multi-fragmentary fracture) which were seen in 20 (33.33%) patients and 12 (20%) patients, respectively (Figure 2).

In 46 (76.67%) cases closed reduction and PFN was done whereas in 14 (23.33%) cases open reduction was required. Duration of surgery was <90 min in majority (73.33%) cases whereas in 16 (26.67%) cases duration of surgery extended beyond 90 min. The mean duration of surgery was found to be 52.56 min (Table 3 and Figure 3).

Partial weight bearing and walking with support was allowed from the outset and gradually was increased on the basis of follow-up radiographs for callus formation. The patients were followed up for functional outcome on the basis of modified Harris hip score. At the end of last follow-up functional outcome was excellent to good in 41 (68.33%) patients whereas fair and poor outcome was seen in 12 (20%) and 5 (8.33%) patients, respectively. Very poor outcome was seen in 2 (3.33%) patients (Figure 4).

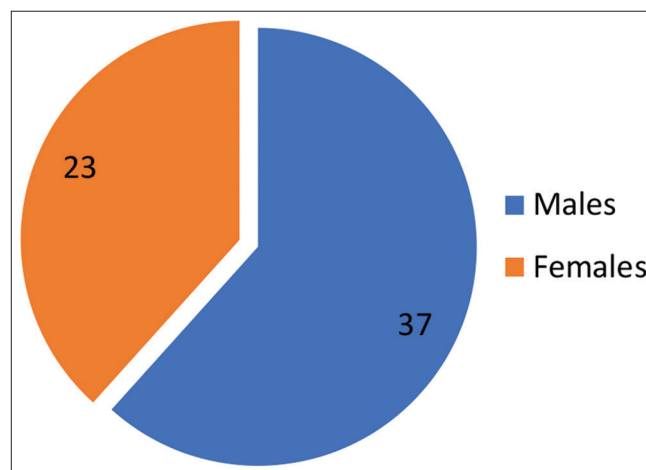


Figure 1: Gender distribution of studied cases

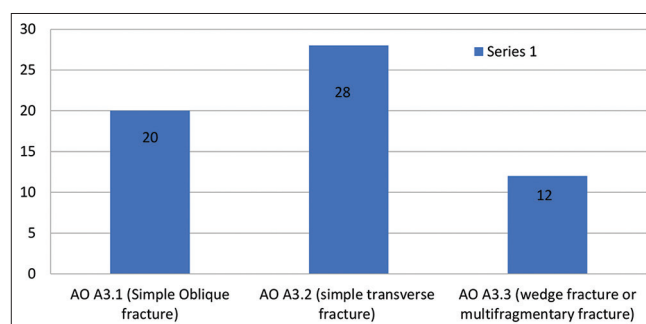


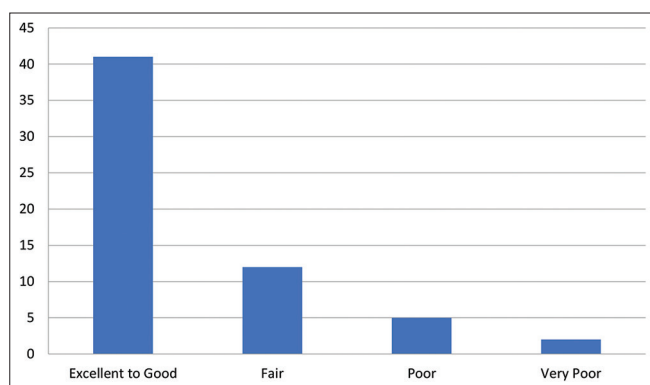
Figure 2: Type of fracture according to AO/OTA classification

Age in years	Gender distribution			
	Males		Females	
	No	%	No	%
18–20	1	1.67	0	0.00
21–30	4	6.67	1	1.67
31–40	11	18.33	1	1.67
41–50	6	10.00	2	3.33
51–60	5	8.33	3	5.00
61–70	9	15.00	13	21.67
>70	1	1.67	3	5.00
Total	37	61.67	23	38.33
Mean age	44.10±15.34		59.60±11.71	
P value	P=0.0001 (significant)			

Type	No of cases	Percentage
Mechanism of injury		
Road traffic accident	42	70
Fall from height	18	30
Total	60	100
Affected Side		
Right	38	63.33
Left	22	36.67
Total	60	100

Table 3: Type of reduction and duration of surgery in studied cases

Type	No of cases	Percentage
Open versus closed reduction		
Open reduction	14	23.33
Closed reduction	46	76.67
Total	60	100
Duration of surgery		
<90 min	44	73.33
90–120 min	16	26.67
Total	20	100

**Figure 3:** Intertrochanteric fracture femur with greater trochanter comminution (left), post-operative X-ray following fixation proximal femoral nail**Figure 4:** Functional outcome in studied cases

The analysis of cases on the basis of complications showed that there was no complication in majority of the cases (80%). Local surgical site infection was seen in 5 (8.33%) patients. The other complications such as various reduction (5%), shortening of affected limb (3.33%), malunion (1.67%), and Non-Union (1.67%) were less common complications.

DISCUSSION

One of the peculiar requirements of managing intertrochanteric fractures is that an early mobilization is necessary to avoid complication associated with prolonged immobilization particularly in elder individuals who are more prone to develop such complications.

Restoration of optimal functions within a short span of time is therefore the essence of managing these patients. Conventionally dynamic hip screws (DHS) were commonly used for the management of intertrochanteric fractures; however, DHS are associated with prolonged surgical time, increased blood loss and varus collapse. To minimize these factors associated with DHS PFN is increasingly being used. Being intramedullary PFNs are expected to withstand higher static as well as cyclical loading. Because of these advantages PFN is being preferred over DHS.¹¹

In our study, 60 patients were included in the study. Out of these 60 patients, there were 37 (61.67%) males and 23 (38.33%) females with a M: F ratio of 1:0.62. Jose et al., conducted a study of 23 patients operated for intertrochanteric fractures with PFN. Of the 23 patients, 15 were male and 8 were female patients.¹² The findings of this study were similar to our study as there was male preponderance in our study also. Although in elderly patients female preponderance is reported by the authors such as Douša et al.,¹³ and Lu et al.,¹⁴ male preponderance in our study may be due to the fact that most of the patients (70%) in our study had road traffic accidents as etiology which is more likely to occur in males as compared to females.

The mean age of male patients was 44.10 ± 15.34 years whereas mean age of female patients was 59.60 ± 11.71 years. The comparison of age groups of male and female patients showed that male patients were likely to have intertrochanteric fracture at a relatively younger age as compared to female patients. The difference in age distribution of male and female patients was found to be statistically significant ($P=0.0001$). Amini et al., conducted a study of 37 patients younger than 65 years (mean age, 45 years) with high-energy intertrochanteric fractures the authors reported the mean age of affected cases to be 45 years.¹⁵ Other authors such as Alpantaki et al.,¹⁶ and Gangadharan et al.,¹⁷ who had more cases secondary to fall as an etiology for intertrochanteric fractures had reported a relatively higher mean age of the affected cases. Since in young patients the most common cause of intertrochanteric fracture is high velocity trauma such as road traffic accidents young male patients are more likely to be affected. Whereas in patients having intertrochanteric fractures secondary to trivial trauma such as fall within home, the mean age is likely to be above 60 years of age.

In our study, functional outcome was excellent to good in 41 (68.33%) patients whereas fair and poor outcome was seen in 12 (20%) and 5 (8.33%) patients, respectively.

Very poor outcome was seen in 2 (3.33%) patients. The complication rate was minimal and most of the complications were conservatively managed. Rathore et al., conducted a similar study of 104 patients operated for intertrochanteric fractures with PFN.¹⁸ The analysis of functional outcome by the authors showed that excellent to good results were seen in 73% patients 18% patients had a fair outcome, 7.7% had poor, and 2% patients had very poor outcome. The functional outcome in our study was found to be similar to the study conducted by Rathore et al., as most of our patients also had excellent to good outcome in majority of the cases. Similar excellent outcome following PFN was also reported by the authors such as Jonnes et al.,¹⁹ and Mallya et al.²⁰

Limitation of study

A relatively small number of patients and only 1 method of managing intertrochanteric fracture was studied in this study. A study comprising larger number of patients and comparative study comparing PFN with other methods of managing intertrochanteric fractures such as DHS would further add value to the study.

CONCLUSION

PFN is an excellent surgical approach in cases of intertrochanteric femoral fractures and is associated with early mobilization in almost all cases. It is associated with excellent functional outcome in majority of the cases. PFN is associated with no complications in majority of the cases.

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SM- Concept and design of the study, interpreted the results, prepared first draft of manuscript, and critical revision of the manuscript; **RJ-** Statistically analyzed and interpreted, reviewed the literature, and manuscript preparation; **AMK-** Design of the study, statistically analyzed and interpreted, preparation of manuscript, and revision of the manuscript; and **BP-** Concept and coordination of the overall study.

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