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Evaluation of functional outcome in Extracapsular proximal femur fractures treated with proximal femoral nail in a tertiary care centre, South India

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Abstract

Background: Fractures of the proximal femur of the hip are relatively common injuries in adults. Several epidemiological studies show that the incidence of fractures of the proximal femur is increasing. Dissatisfaction with use of a sliding hip screw in unstable fracture patterns led to the development of intramedullary hip screw devices. This design offers potential advantages like more efficient load transfer, decrease tensile strength on the implant, controlled fracture impaction, reduces amount of sliding and therefore limits limb shortening and deformity.

Objectives: assess the clinical and functional outcome post operatively and during follow ups in proximal femur fractures by using Proximal Femur Nail.

Methods: This is a prospective study of 30 cases of fresh intertrochanteric and subtrochanteric fractures admitted to a tertiary care center. Cases were taken according to inclusion and exclusion criteria. Results were evaluated by fracture union on X ray and Harris hip score and descriptive statistics were used to analyze the data.

Results: In our series of 30 cases there were 23 males and 7 females, most of the patients were between 41 to 60 years. Mean age of 57.7 years, of cases were admitted due to slip and fall and with predominance of right side. About 50% showed excellent and 50% showed good functional outcome in intertrochanteric and intertrochanteric fractures respectively as per Harris Hip scoring system (Modified).

Conclusion: From this study, we consider that Proximal Femoral Nail as a reliable implant for the treatment of intertrochanteric and subtrochanteric fractures. This implant also gives very good functional outcome in intertrochanteric and subtrochanteric fractures.

Keywords: Proximal femoral nail, intertrochanteric fracture, Subtrochanteric fracture, femoral fracture

Introduction

Proximal femoral fractures are commonly seen in patients over 70 years of age and incidence of these fractures has increased primarily due to increasing life span and more sedentary life style brought by urbanization. In younger population, proximal femoral fracture occurs due to high velocity trauma, whereas in elderly population, it is most often due to trivial trauma. Other risk factors include white race, neurological impairment, malnutrition, impaired vision, malignancy, and decreased physical activity^[1, 2].

The incidence of intertrochanteric fractures is gender and race-dependent and varies from country to country. In the United States, the annual rate of intertrochanteric fractures in elderly females is about 63 per 100,000, in males 34 per 100,000^[3].

Intertrochanteric (IT) fractures can be managed by conservative or operative methods. Conservative methods were the treatment of choice before the introduction of new fixation devices. As conservative methods resulted in higher mortality rates and complications like decubitus ulcer, urinary tract infections, pneumonia, thromboembolic complications. These methods have been abandoned^[2, 4].

Even the trochanteric fractures can be managed by conservative means and there is usually union of fracture.

If suitable precautions are not taken the fracture undergoes malunion leading to varus and external rotation deformity at the fracture site with shortening and limitation of hip movements [4]. Conservative methods are now indicated under 2 conditions, (i) Elderly person with high medical risk for anaesthesia and surgery (ii) Non ambulatory patient with minimal discomfort following injury [1, 3].

Petrochanteric and subtrochanteric fractures of femur possess clinical, structural anatomical and biomechanical characteristics that distinguish them from intracapsular fractures. Subtrochanteric fractures comprises about 10 to 34% of hip fractures.

Subtrochanteric fractures are complicated by malunion and delayed union and nonunion. The factors responsible for these complications in subtrochanteric fractures are high stress concentration, predominance of cortical bone and difficulties in getting biomechanically sound reduction because of comminution and intense concentration of deforming forces.² Rigid Internal fixation and early mobilization has been the standard method of treatment. Strength of fracture implant assembly depends on the Extramedullary devices (DHS, Intramedullary devices (PFN) [5].

The latest implant for management of intertrochanteric fracture is Proximal Femoral Nail (PFN). This implant is a cephalomedullary device and has many potential advantages efficient load transfer, less chance of implant failures, controlled impaction is maintained, therefore less chance of shortening and deformity [3, 6].

Usually, the sliding hip screw has been considered the choice because fracture union predictably occurs. The main problem with sliding hip screws is collapse of the femoral neck, leading to loss of hip offset and shortening of leg. Hence, a new intramedullary device Proximal Femoral Nail (PFN) was designed which gives an advantage of minimally invasive surgery [5, 6]. So, with this background we conducted this study to assess the clinical and functional outcome post operatively and during follow ups in proximal femur fractures by using Proximal Femur Nail.

Material and Methods

This prospective study was conducted at Department of Orthopaedics, Vydehi Institute of Medical Sciences and Research Centre, Bangalore with diagnosis of intertrochanteric fractures and subtrochanteric fractures during January 2017 to June 2018.

All the cases of intertrochanteric fractures and subtrochanteric fractures of femur during the study period were taken as study population after looking for into the inclusion and exclusion criteria. We got, around 38 cases during the study period with fracture femur and but only 30 cases were fitting into our criteria. So, the final sample size we got was 30 cases.

Inclusion criteria

1. Patients who are medically fit for surgery and given written informed consent for the procedure.
2. Adult patients aged more than 18 years.
3. Patients with closed extracapsular proximal femur fractures.

Exclusion criteria

1. Intra capsular Fracture neck of femur.
2. Proximal femur fracture patients treated with other modalities
3. Compound Proximal femur fractures
4. Proximal femur fracture patients associated with severe cardiovascular diseases.
5. Patients with associated fractures of same or other limbs.

The study was started after taking Institutional Ethics Committee. The patients were informed about the study in all respects and informed consent was obtained from each patient and data was collected from the patients who gave informed consent.

The people who gave consent were included in the study and done the surgical intervention using Proximal Femur Nail after fracture reduction and followed all the necessary surgical steps.

Following parameters were collected intra-operatively: a. Total time of the surgery 2. Blood loss: it was counted approximately by counting 50ml /mop used. 3. Radiation exposure

After the surgery, standard postoperative protocol was followed. These are limb elevation over pillow and patient kept under observation in recovery room until stable then shifted to ward. Intravenous antibiotics were continued for first 48 hours and then shifted to oral. Blood transfusion was given depending on the requirement. Suction drainage was removed after 48 hours in case of open reduction. Static quadriceps exercises were started on third postoperative day. Active quadriceps and hip flexion exercises were started on 6th and 7th postoperative day. Dressing was done at 3rd, 6th and 10th postoperative day. Sutures were removed on 12th postoperative day. Patients were advised to walk non-weight bearing walking on axillary crutches as soon as tolerable. Partial weight bearing started at about 6 weeks postoperatively. Full weight bearing walking was allowed after assessing for radiological and clinical union.

Patients were discharged from the hospital when they were able to ambulate independently with or without walking aids. Clinical follow up at 6 weeks, 3 months, 6 months, 12 months regarding disability and functional outcome.

At every visit patient was assessed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening. X-ray of the involved hip with femur was done to assess fracture union and implant bone interaction.

The clinical and functional outcome was assessed using Modified Harris Hip Score (maximum score 100). The domains for the scoring are pain relief (44 points), function (47 points), hip range of motion (5 points) and absence of deformity (4 points) (Table 1).^{7,8} The interpretation of outcome using the modified Harris hip score was as follows: <70 (poor result), 70–79 (fair result), 80–89 (good result) and >90 (excellent result) [7].

Data were entered in Microsoft Excel and descriptive statistics were analysed using EpiData Analysis V2.2.2.182 in the form of frequencies and proportions.

Table 1: Shows the domains and items of the modified Harris hip score.

Domain	Score
Pain (44)	
▪ None or ignores it	44
▪ Slight, occasional, no compromise in activities	40
▪ Mild, no effect on ordinary activity, pain after activity, uses aspirin	30

▪ Moderate, tolerable, makes concessions, occasional codeine	20
▪ Marked, serious limitations	10
▪ Totally disabled	0
Function (47): Gait Limp	
▪ None	11
▪ Slight	8
▪ Moderate	5
▪ Severe or Unable to walk	0
Support	
▪ None	11
▪ Cane, long walks	7
▪ Cane, full time	5
▪ 2 canes	4
▪ 2 crutches	2
▪ Unable to walk	1
Distance Walked	
▪ Unlimited	11
▪ Six blocks	8
▪ Two or three blocks	5
▪ Indoors only	2
▪ Bed and chair	0
Functional Activities Stairs	
▪ Normally without using a rail	4
▪ Normally using a rail	2
▪ In any manner	1
▪ Unable	0
Squatting	
▪ With ease	4
▪ With difficulty	2
▪ Unable	0
Sitting cross legged	
▪ With ease	5
▪ With difficulty	3
▪ Unable	0
Public transportation	
▪ Able to use	1
▪ Unable to use	0
Hip range of motion (Clinician assessed)	
Flexion (maximum = 140°)	
Abduction (maximum = 40°)	
Adduction (maximum = 40°)	
External rotation (maximum = 40°)	
Internal rotation (maximum = 40°)	
Range of motion scale (sum of the range of motion)	
▪ 211–300	5
▪ 161–210	4
▪ 101–160	3
▪ 61–100	2
▪ 31–60	1
▪ 0–30	0
Absence of deformity (Clinician assessed)	
Less than 30 ° fixed flexion contracture – Yes/No	
Less than 10 ° fixed abduction – Yes/No	
Less than 10 ° fixed internal rotation in extension – Yes/No	
Less than 3.2 cm limb length discrepancy – Yes/No	
▪ If all 4 yes	4
▪ If less than 4 yes	0
Interpretation of Scores	
▪ Excellent Result	90-100
▪ Good Result	80-89
▪ Fair Result	70-79
▪ Poor Result	Less than 70

Results

A total of 30 cases with Intertrochanteric and Subtrochanteric fractures of proximal femur were assessed, among them 23 (76.7%) and 7 (23.3%) were males and females respectively.

The mean age of the participants was 57.7±12.6 years and 12 (40%) were in the age group of 41- 60 years, followed by 9 cases in the age group 61-80 years.

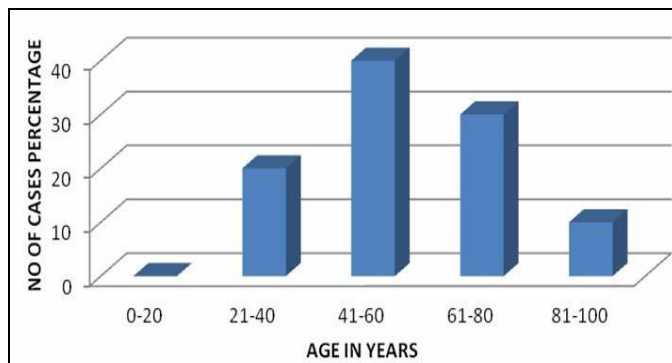


Fig 1: Age distribution of the study population

The commonest mode of injury was slip and fall (46.7%) followed by road traffic accidents, around 18 (60%) of them had injury to the right leg. About 19 (63.3%) of the people had intertrochanteric fracture and rest had subtrochanteric fracture (Table 2).

Table 2: Shows the Characteristics of Injury and Fracture among the study group

Characteristics of Injury and Fracture	Frequency (n=30)	Percentage
Nature of Violence		
▪ Motor Vehicle Accidents (RTA)	12	40.0
▪ Fall from height	4	13.3
▪ Slip and fall	14	46.7
Side Affected		
▪ Right	18	60.0
▪ Left	12	40.0
Type of Proximal Femoral Fracture		
▪ Intertrochanteric Fracture	19	63.3
▪ Subtrochanteric Fracture	11	36.7
Boyd and Griffin classification of Intertrochanteric Fracture (n=19)		
Type I	3	15.8
Type II	7	36.8
Type III	6	31.6
Type IV	3	15.8
Seinsheimer Classification of Fracture (n=11)		
Type I	1	9.0
Type IIa	2	18.2
Type IIb	2	18.2
Type IIc	1	9.0
Type IIIa	3	27.4
Type IIIb	2	18.2
Type IV	0	0
Type V	0	0

These 30 cases we did the surgery using proximal femoral nail and the mean duration of hospital stay was 15 days and mean time to full weight bearing was 14.97±1.9 weeks. All patients were followed at 6 weeks, 12 weeks, 6 months and same patients up to one year. At each follow up radiograph of the operated hip with upper half of femur was taken and assessed for fracture union and implant failure and screw cut out.

Functional Results: In our study, out of 30 operated cases two were lost follow up at 6th month. Functional and anatomical results were assessed taking the remaining 28 cases into considerations using Harris Hip scoring system (Modified) and in that 18 were having intertrochanteric

fractures and 10 were having subtrochanteric fractures. The most of the cases were showed excellent (50%) functional outcome in intertrochanteric fractures and 50% showed good functional results in subtrochanteric fractures as per Harris Hip scoring system (Modified).

Table 3: Functional results of intertrochanteric fractures and subtrochanteric fractures based on Harris Hip scoring system (Modified)

Functional Results of Post Operational	Frequency	Percentage
Functional results of intertrochanteric fractures (n=18)		
▪ Excellent	9	50.0
▪ Good	7	38.9
▪ Fair	2	11.1
▪ Poor	0	0
Functional results of subtrochanteric fractures (n=10)		
▪ Excellent	3	30.0
▪ Good	5	50.0
▪ Fair	2	20.0
▪ Poor	0	0

Discussion

The successful treatment of pertrochanteric fractures depends on many factors such as age of the patient, patient’s general health, time from fracture to treatment, the adequacy of treatment, concurrent medical illness and stability of fixation. The most common causes of failure are disregard of biomechanics, overestimation of potentials of new surgical techniques or implants and poor adherence to established procedures. At present it is generally believed that all pertrochanteric fractures should be internally fixed to reduce the morbidity and mortality of the patient. But the appropriate method and the ideal implant by which to fix the pertrochanteric fractures is still in debate. Because each method having its own advantages and disadvantages [1]. The most common mode of injury in our study was domestic fall 46.7% which is comparable to most Indian studies. This was also affected by the age as the older the patient more likely he/she getting the fracture by domestic falls. In our study trochanteric fractures contributed 63.3% of cases. 36.9% had type II Boyd & Griffin fracture followed by 31.6% were type 3. Subtrochanteric fractures accounted for 36.7% of cases out of which Seinsheimer type 3a consisted of 27.27% cases, followed by type 2a, 2b, 3b which were 18.18%. In our study, most of the cases showed excellent (50%) functional outcome in intertrochanteric fractures and 50% showed good functional results in subtrochanteric fracture as per Harris Hip score and it was slightly better compared to the study done by Kumar M *et al* which showed excellent results in 28% cases, good in 56% cases and fair in 16% cases [9]. The results were similar to the study done by Yadav S *et al* and less compared to the study done by Zhou ZB *et al*. [10, 11] The success of proximal femoral nail depends on good surgical technique, proper instrumentation and good C-arm visualization.

Conclusions

From this study, we consider that Proximal Femoral Nail as a reliable implant for the treatment of intertrochanteric and subtrochanteric fractures. This implant also gives very good functional outcome in intertrochanteric and subtrochanteric fractures. Even though the learning curve of this procedure is

steep with proper patient selection, good instruments, image intensifier and surgical technique, PFN remains the implant of choice in the management of extracapsular proximal femur fractures.

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Declarations

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Conflict of interest: None declared

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