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## A Prospective Study Of Intramedullary Fixation Of Unstable Peritrochanteric Fractures With Interlocking Proximal Femoral Nail.

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### ABSTRACT

Hip fractures are divided into two categories according to the anatomical location of fractures: intracapsular and extracapsular fractures. Femoral neck fractures are classified as intracapsular fractures and peritrochanteric fractures including intertrochanteric and subtrochanteric fractures as extracapsular fractures. The intertrochanteric zone is regarded as the region from the extracapsular femoral neck to the distal of the lesser trochanter, while the subtrochanteric area is defined as the area from the lesser trochanter extending 5 cm distally. Intertrochanteric fractures are most frequently caused by low-energy trauma like falls from standing height in elderly patients with osteoporosis, accounting for nearly half of all hip fractures; while subtrochanteric fractures account for approximately 25% of all hip fractures, caused by high-energy trauma in young patients and leading to relatively complex fracture pattern, or relating to pathological fractures and osteoporosis in elderly patients which frequently associated with spiral fracture configurations. This prospective study was conducted in the Department Of Orthopedics, Government Dharmapuri Medical College& Hospital, Dharmapuri, Tamil Nadu, India. we selected 21 cases of peritrochanteric fractures. All 21 cases were treated with proximal femoral nails (indigenous) of which 20 patients came for regular follow-up and they were included in the study. The preoperative and postoperative shortening of affected limbs were measured through the distance between the anterior superior iliac spine and medial malleolus. The fracture healing time was determined by clinical physical examination and X-rays showing blurred callus in the fracture area. Physical examination and X-rays in the follow-up were analyzed whether there were prosthesis loosening and displacement. The Harris hip score (HHS) was used to evaluate the hip function after surgery which was comprised of pain, function, absence of deformity, and range of movement. The maximum score is 100 points, of which the pain domain contributes 44, function 47, range of movement 5, and absence of deformity 4 points. A total score < 70 is considered a poor score, 70–80 is fair, 80–90 good and 90–100 excellent. Intraoperative complications like femoral shaft fracture and postoperative complications including incision infection, internal fixation failure again, prosthesis loosening and displacement, femoral head necrosis, and severe pain of the injured hip were recorded and analyzed. For internal fixation failure of intertrochanteric and subtrochanteric fractures, young patients can accept revision with PFLP or extension of intramedullary nails to restore normal anatomical structure, and correct varus deformity and autograft. Correction of varus deformity and restoration of femoral neck-shaftangle were essential for obtaining successful results. Elderly patients and patients with damaged femoral heads can be treated with arthroplasty to restore walking function, we should protect abductor function and avoid intraoperative shaft femoral fracture in the surgery procedure.

**Keywords:** Arthroplasty, Failure, Intertrochanteric fracture, Subtrochanteric fracture.

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## INTRODUCTION

Fractures around the trochanteric region of the femur are one of the most common fractures encountered in orthopedics and also the most devastating injuries for the elderly. The incidence of this fracture increases with advancing age. These patients are more limited to home ambulation and are dependent on basic and instrumental activities of daily living [1]. A growing number of population and road traffic accidents have resulted in an enormous increase in these types of fractures. In younger patients, the fractures usually result from high-energy trauma like RTA and falls from height and account for only ten percent [2]. Older patients suffering from a minor fall can sustain fractures in this area because of weakened bone due to osteoporosis or pathological fracture and this accounts for 90% [3]. Since the femur is the longest and the strongest bone in the body and one of the principal load-bearing bones in the lower extremity fracture of this bone may result in prolonged morbidity and extensive disability unless the treatment is appropriate. These fractures are associated with substantial morbidity and mortality [4]. Approximately 15 to 20% of patients die within one year of fracture. After one-year patients appear to resume their-adjusted mortality rate [5]. Until the 1960s non-operative treatment was the option available for these types of fractures in the form of traction with prolonged bed rest with fracture healing occurring in ten to twelve weeks (usually) followed by a lengthy program of ambulation training. These are associated with complications of prolonged recumbence like decubitus ulcer, UTI, joint contractures, pneumonia, and thrombo-embolic complications resulting in a high mortality rate [6].

## MATERIALS AND METHODS

This prospective study was conducted in the Department Of Orthopedics, Government Dharmapuri Medical College & Hospital, Dharmapuri, Tamil Nadu, India. we selected 21 cases of peritrochanteric fractures. All 21 cases were treated with proximal femoral nails (indigenous) of which 20 patients came for regular follow-up and they were included in the study. The age group varied from a minimum of 32 years to a maximum of 72 years and the average age was 52.7 years. The duration of the study was from June 2021 to June 2022. The mean follow-up was 10.75 months. Of the 20 patients, 14 were males and 6 were females. The right side was involved in 7 patients and 13 patients the left side was involved. 13 patients were sedentary workers and 7 patients were manual laborers.

## RESULTS

Table 1: Age

Age Group (Years)	Proximal Femoral Nail	
	No.	%
31 - 40	3	15.0
41 - 50	6	30.0
51 - 60	6	30.0
61 - 70	4	20.0
> 70	1	5.0
Total	20	100
Mean	52.7	

Table: Mode Of Injury

Mode of Injury	Proximal Femoral Nail	
	No.	%
Accidental Fall	13	65.0
RTA	7	35.0

Accidental falls were the most common followed by RTA

**Table 3: Interval Between Injury & Surgery**

Intervals (Days)	Proximal Femoral Nail	
	No.	%
<2	-	-
2	1	5.0
3	2	10.0
4	3	15.0
5	4	20.0
6	5	25.0
7	2	10.0
8	2	10.0
9	1	5.0
>9	-	-
Total	20	100
Mean	5.0 days	

**Table 4: Classification**

Classification (Boyd & Griffin)	Proximal Femoral Nail	
	No.	%
I	-	-
II	11	55.0
III	4	20.0
IV	5	25.0
Total	20	100

The average interval from injury to the time of surgery was 5 days. All the patients were managed initially with skin traction before taking up for surgery. Patients with Colle’s fracture and fracture shaft of the humerus were treated with CMR with POP immobilization for Colle’s fracture on the day of admission and ORIF of the fracture shaft of the humerus after internal fixation of the trochanteric fracture.

**Table 5: OPERATING TIME**

Operating Time (Minutes)	Proximal Femoral Nail	
	No.	%
≤60	3	15.0
61-75	11	55.0
76-90	6	30.0
91-105	0	0
Total	20	100
Mean	71.5 mts	

**Table 6: Blood Loss**

Blood Loss (ml)	Proximal Femoral Nail	
	No.	%
<150	0	0
150	2	10.0
200	9	45.0
250	5	25.0
300	2	10.0
350	2	10.0
>350	0	0
Total	20	100
Mean	232.5 ml	

**Table 7: Image Intensifier Exposure**

Image Intensifier Exposure (sec)	Proximal Femoral Nail	
	No.	%
≤100	0	0
101-110	3	15.0
111-120	7	35.0
121-130	8	40.0
131-140	2	10.0
>140	0	0
Total	20	100
Mean	120.10 Sec	

**Table 8: Fracture Union**

Fracture Union (weeks)	Proximal Femoral Nail	
	No.	%
≤10	2	10.5
10-15	14	73.7
15-20	3	15.8
>20	0	0
Total	19	100
Mean	12.6 Weeks	

**Table 9: Proximal Femoral Nail**

Results	Proximal Femoral Nail	
	Mean	
Operating Time	71.5 min	
Blood Loss	230 ml	
Image intensifier Exposure	120 sec	
Fracture Union	12.6 weeks	
Harris Hip Score at 6 months	85.05	
Superior cut out of lag screw With re-operation	No.	%
	1	5.0
Varus Deformity	2	10.0
Abductor Lurch	3	15.0

All the patients were ambulated as early as 3 weeks with aids and at the end of 6 weeks, all patients were allowed full weight bearing. The mean Harris hip score at the end of 3 months was 78.65 and at the end of 6 months was 85.05. One patient had a cutout of the cervical screws leading to collapse and severe varus deformity. He was re-operated at 6 weeks with calcar replacing cemented bipolar hemiarthroplasty. Another patient with a single load-bearing cervical lag screw developed a varus deformity of 8°. The fracture united and the patient was comfortable with the deformity, so left alone. All the other patients went back to their pre-injury occupations. 3 patients developed abductor lurch which improved with time Superficial wound infection occurred in 1 case and it settled down with antibiotics. There was no case of deep infection.

**DISCUSSION**

Several fixation devices have been developed to overcome the difficulties encountered in the treatment of unstable trochanteric fractures. Until recently most of these fractures were treated by sliding hip screws. Since these devices performed less well in unstable trochanteric fractures with high rates of failure, intra-medullary devices have become increasingly popular [7]. The proximal femoral nail is an effective load-bearing device that incorporates the principles and theoretical advantages of all the intra-medullary devices and is considered to be the second-generation nail Biomechanically the PFN is more stiff, it has a shorter movement arm (i.e. from the tip of the lag screw to the center of the femoral canal) whereas the DHS has a longer movement arm (i.e. from the tip of the lag screw to the lateral cortex

) [8]. The DHS with a longer movement arm undergoes significant stress on weight-bearing and hence higher incidence of lag screw cutout and varus malunion. The larger proximal diameter of PFN imparts additional stiffness to the nail. It also combines the advantages of closed Intramedullary nailing, a dynamic femoral neck screw, minimal blood loss, shorter operative time, and early weight bearing than DHS [9]. The gamma nail and IMHS were the first intra-medullary devices available from 1988 specifically designed for the treatment of these fractures. Follow-up studies showed serious implant-related complications like fracture of the femoral shaft at up to 17 %, failure of fixation at up to 7 %, and complications of distal locking at 10 % because of these well-described and persistent problems the PFN was developed to improve the rotational stability of the proximal fracture fragment and the tip of the nail was re-designed with reduction of the distal diameter of the nail to decrease the risk of intra and post-operative fractures of the femoral shaft by a significant reduction in bone stress. Since its introduction in 1997, several clinical studies have shown good results with few intraoperative problems and a low rate of complications [10]. The average operating time in our series was 71.5 minutes. In our initial cases, operating time was in a higher range (90 mts.). With experience the operating time was reduced (58 mts) Multiple factors have been implicated like implant design, fracture stability, operative technique, surgeon skills & learning curve in the outcome of good results. Optimal reduction of the fracture, conformation of reduction in both AP and lateral views, and accurate positioning of the nail and screws remain of crucial importance and should be obtained at all times to prevent the important complication of screw cutout. Reduction in distal nail diameter, pre-reaming of the femoral canal one size bigger than the implant, and meticulous placement of the distal locking screws without creating additional stress risers decrease the complication rate of femoral shaft fractures [11]. Patients with a narrow femoral canal and abnormal curvature of the proximal femur are the relative contraindications to intra-medullary fixation with PFN. We have followed these recommendations in this series. We have not encountered any per-operative or post-operative femoral shaft fractures [12]. A larger cohort of patients is necessary to document the incidence of shaft fractures which is a limitation to our study. In our series, we had 1 case of superior cut out of lag screw with severe varus deformity that lead to re-operation (5.0%) and varus deformity in another 1 case (5.0 %) which is less than 10° and he was comfortable, so no intervention was done [13]. Total varus deformity 2 cases (10.0%). We had 3 cases of abductor lurch in the post-operative period (15.0%) which improved with the progression of time. Gluteus medius tendon injury has been reported in 27 % of patients treated with IM devices. The abductor lurch may improve in many of these patients and may also remain static in some patients [14]. In short, the PFN with distinct advantages over DHS can be proved as a better implant with adequate surgical technique. The requirement and follow-up-based changes in the design of PFN from the pioneer Gamma nail will certainly decrease the complication rates and increase all the postulated advantages of Intramedullary devices used in the treatment of trochanteric fractures [15].

### CONCLUSION

Intra medullary nailing with PFN as claimed has distinct advantages over DHS like reduced operating time, less blood loss, rigid fixation, and a positive effect on the speed of restoration of walking. It also has an advantage over Gamma nails in rotational stability of proximal fragments and reduction in the complication rate of femoral shaft fractures. By decreasing the proximal diameter of the original PFN (17.5 mm) to 15 mm and the diameter of load bearing cervical lag screw (11.0 mm) to 8.0 mm, it becomes a suitable alternative for DHS in Indian patients. Early mobilization and weight-bearing are obtained in patients with PFN thereby decreasing the incidence of decubitus ulcer, UTI, hypostatic pneumonia, and – embolic complications related to prolonged recumbency. The incidence of per-operative and post-operative femoral shaft fractures can be reduced by pre-reaming the shaft one size more than the diameter of the nail and by distal locking meticulously without creating additional stress risers. The incidence of cutout of the cervical lag screw can be reduced by optimal reduction of the fracture and accurate positioning of cervical lag screws and nails. Finally, we conclude that the PFN is a significant advancement in the treatment of unstable peritrochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation, and early return to work.

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