

To Assess the Functional Outcome of Intertrochanteric Fractures of Femur Treated with Proximal Femoral Nail

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Abstract

Background: Intertrochanteric fractures occurs in the old aged after accidental fall due to osteoporosis and poor bone quality but in young individuals, these fractures are the result of road traffic accidents. Interestingly these constitute around 34% of all hip fractures. The calcar decides the stability of these fractures. Fixation needed in these fractures for early mobilization and better functional outcome. The focus of surgical research in these fractures is to reduce implant failure and cut out of the femoral head and neck fixation components. The current practice of treatment of a stable variety of intertrochanteric fracture with dynamic hip screw is widely accepted, however, an unstable variety of intertrochanteric fractures are better treated with Cephalo-medullary nails.

Materials and Methods: It's a prospective study with a sample of 20 patients with Intertrochanteric fractures of the femur done in the Gandhi Medical College, Bhopal from July 2019 to June 2021. Operating time was calculated from the start of surgical incision to wound closure. Intra-operative blood loss was calculated from the number of mops and gauze piece soaked with blood. Patients were evaluated clinically and radiologically during follow up. Harris Hip Score (HHS) was calculated with the standard scoring sheet.

Results: Patients were evaluated clinically and radiologically at 3 weeks interval for first 3 months and there after monthly for the next 3 months and bimonthly for next 6 months. During follow up the Harris Hip Score was evaluated at 3 months and 6 months post operatively. Operating time varied from 58 to 84min. Blood loss varied from 150 to 350ml. The mean Harris hip score at the end of 3 months was 78.65 and at end of 6 months was 85.05. 1 patient had cutout of the cervical screws leading to collapse and severe varus deformity and another patient with a single load bearing cervical lag screw developed varus deformity. 3 patients developed abductor lurch which improved with time. Superficial wound infection occurred in 1 case and there were no cases of deep infection.

Conclusion: PFN has advantages of closed reduction, preservation of fracture hematoma, less tissue damage & minimal blood loss during surgery, Shorter operative time and early rehabilitation in the management of intertrochanteric fractures. The incidence of perioperative and postoperative femoral shaft fractures in PFN can be reduced by good preoperative planning.

Keywords: Intertrochanteric fracture, PFN

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Introduction

Fractures around the trochanteric region of femur are one of the commonest fractures encountered in orthopaedics and also the most devastating injuries of the elderly. The incidence of these fractures increases with advancing age [1].

In younger patients the fractures usually result from high energy trauma like RTA and fall from height and accounts for only 10% whereas in older patients suffering from a minor fall can sustain fracture in this region because of weakened bone due to osteoporosis or pathological fracture and this accounts for 90% which results in prolonged morbidity and extensive disability unless the treatment is appropriate [2].

Until 1960's non operative treatment was the option available for these type of fractures in the form of traction with prolonged bed rest with fracture healing occurring in 10 to 12 weeks (usually) followed by a lengthy rehabilitation. These are associated with complications of prolonged recumbence [3].

Now due to better understanding of the biomechanics of the fracture and the development of better implants have lead to radical changes in treatment modalities. Increasing emphasis on the preservation of blood supply to the fracture fragments has improved biological results.

While the development in biomedical research have yielded implants of greater strength and longer fatigue life. With the thorough understanding of fracture geometry

and biomechanics optimal treatment can be selected for individual cases [4].

The sliding hip screw device with its modification has been used widely and successfully for more than a decade for the treatment of these fractures. In unstable trochanteric fractures where there is loss of posteromedial cortex continuity, when load is applied increased bending force on the DHS lead to implant breakage, screw cutout or separation of plate from shaft. Since DHS performed less well in unstable trochanteric fractures with high rates of failure, intramedullary devices have become increasingly popular to overcome these difficulties [5].

The proximal femoral nail(PFN) is an effective load bearing device that incorporates the principles and theoretical advantages of all the intramedullary devices and considered to be the second generation nail [6]. Intramedullary devices provide more efficient load transfer and shorter lever arm can decrease tensile strain thereby decreasing the risk of implant failure. Several recent studies are going on for comparison with DHS and other IM devices and the results are encouraging but needs time and further evaluation to be accepted.

Material and Methods

This was a prospective study with a sample of 20 patients with Intertrochanteric fractures of the femur with the mean follow up of 10 months. The study was conducted from July 2019 to June 2021 at the Department of Orthopaedics, Gandhi

Medical College, Bhopal. Patients were recruited into the study based on the inclusion and exclusion criteria.

Inclusion Criteria

1. Age > 18 years
2. Both sex
3. Cases of Intertrochanteric fractures (Boyd and Griffin type-I,II, III, IV)
4. Closed fracture

Exclusion Criteria

1. Patients with compound fractures
2. Patients with Deformity over proximal femur
3. Patients with Active infections
4. Patient not giving consent
5. Medically unfit for surgery

All the fractures were classified according to the Boyd and Griffin classification. All patients were done Physical and radiological examination. All patients were operated using a standard prescribed surgical technique in supine position on traction table with fracture reduced by close reduction with traction and internal rotation. The alignment of the medial cortex in AP view and reduction of the proximal fragment and shaft fragment in lateral view is checked.

The indigenous proximal femoral nail is an Indian version of the original European PFN (Synthes). It was modified to 15mm for proximal diameter and 8mm for load bearing femoral neck screw to suit the proximal femur of Indian patients.

The operating time was calculated from the start of surgical incision to wound closure. The blood loss was calculated from the number of surgical mops that were used, each corresponding to 50 ml blood. 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.

Patients were evaluated clinically and radiologically at 3 weeks for the first 3 months and thereafter monthly for the next 3 months and bi-monthly for the next 6 months. Clinical union was observed as the absence of tenderness or pain with full weight bearing. During follow up the Harris hip score was evaluated at 3 months and 6 months post operatively.

Observation and Results

In the present study the age group varied from a minimum of 32 years to a maximum of 72 years and average age was 52.7 years.

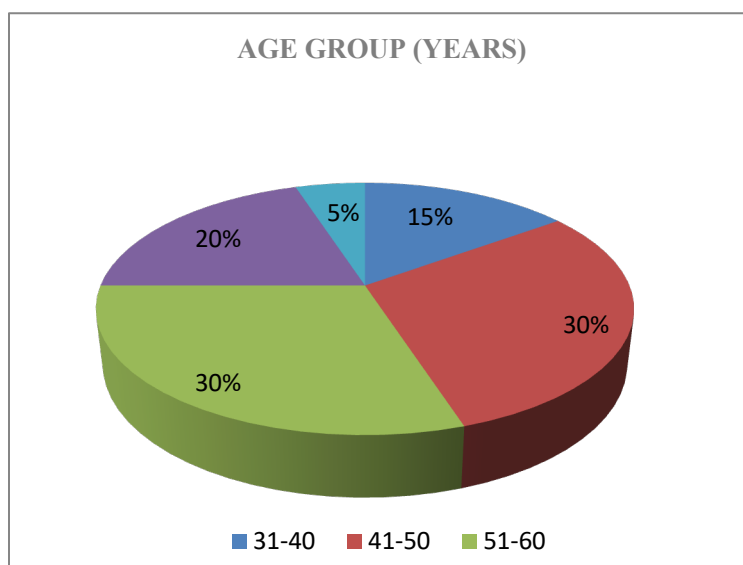


Figure 1: Pie diagram showing the distribution age groups

Out of the 20 patients 14 were males and 6 were females. Accidental fall was the most common followed by RTA. Right side was involved in 7 patients and in 13 patients the left side was involved.

Table 1: Shows the demographic data of patients involved in the study

Age Group (Years)					Gender		Type of Fracture				Mode of Injury		Side of Injury	
31-40	41-50	51-60	61-70	>70	Male	Female	I	II	III	IV	Self Fall	RTA	Right	Left
3	6	6	4	1	14	6	0	11	4	5	13	7	7	13

11 patients were classified as type II, 4 patients were classified as type III, 5 patients were classified as type IV with All of them are unstable trochanteric fractures

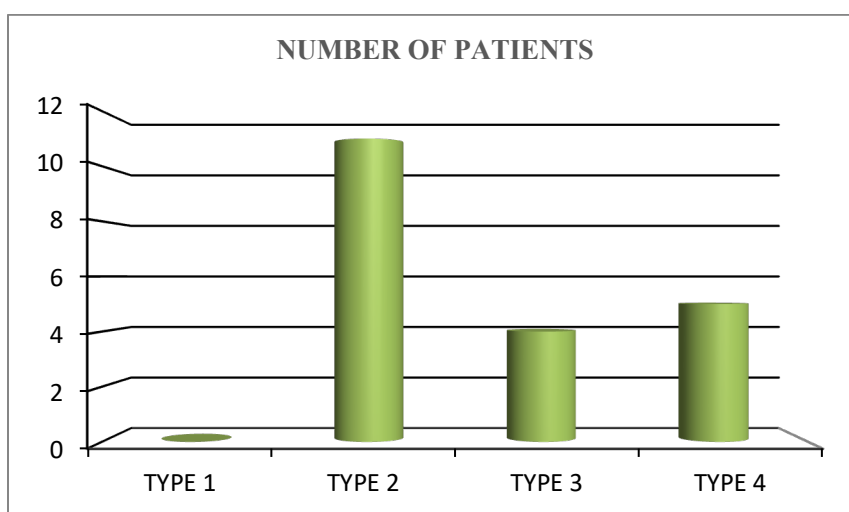


Figure 2: Bar diagram showing number of patients with type of fracture

Operating time varied from 58 to 84min with average duration of surgery was 71.5min. Blood loss varied from 150 to 350ml with the average blood loss was 230ml.

Table 2: Shows different variables observed perioperative and complications during follow up

S. No.	Variables	Mean	
1	Duration of surgery (min)	71.5	
2	Blood loss (ml)	230	
3	Fracture union time (weeks)	12.6	
4	Harris Hip Score	At 3 months	At 6 months
		78.65	85.05
5	Superior cut out of lag screw with re-operation	1	
6	Varus Deformity	2	
7	Abductor Lurch	3	
8	Superficial infection	1	

The mean Harris hip score at the end of 3 months was 78.65 and at end of 6 months was 85.05. 1 patient had cutout of the cervical screw leading to collapse and severe varus deformity. Another patient with a single load bearing cervical lag screw developed varus deformity of 8 degree. 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.

Table 3: Shows HARRIS HIP SCORE during post of follow up

S No.	HHS	Grade	At 3 Month	At 6 Month
1	90-100	Excellent	0	3
2	80-89	Good	10	15
3	70-79	Fair	10	2
4	60-69	Poor	0	0

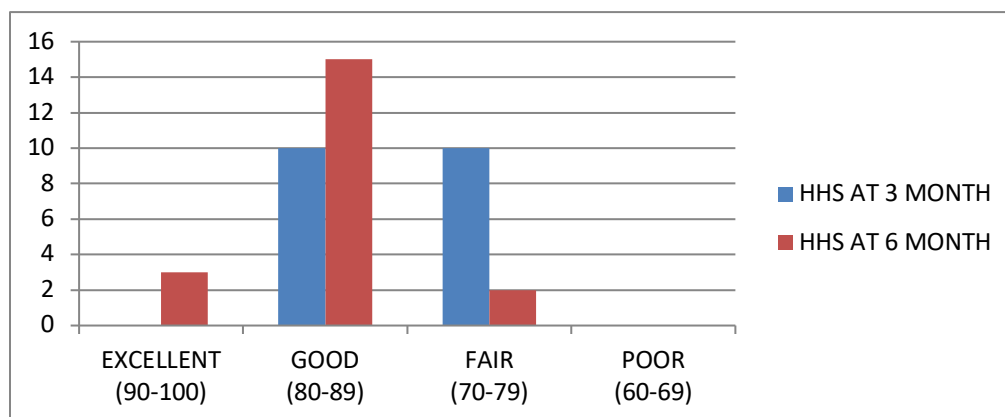


Figure 3: Bar diagram showing HHS during follow up

Discussion

Biomechanically the PFN is more stiff, it has a shorter movement arm whereas the DHS has a longer movement arm. The DHS with a longer movement arm undergoes significant stress on weight bearing and hence higher incidence of lag screw cutout and varus malunion (Rosenblum *i*) [7].

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 (Leung *et al*) [8].

In the current study the union rate was 95.0% with one case of varus malunion

(5.0%). 1 case of re-surgery with calcar replacing cemented bipolar hemiarthroplasty (5.0%). There was no case of perioperative and post operative femoral shaft fractures. This was comparable to Mandal, Dr & Kumar *et al* [9] in which the average union rate was 100% with PFN.

The average blood loss in patients treated with PFN was 232.5 ml. The results were comparable with Schipper I.B. *et al* [6], Pajarinen J. *et al* [10].

Average operating time in our study was 71.5min. In our initial cases operating time was in a higher range(90min). With experience the operating time reduced (5min). Results were comparable to the

series of Dousa *et al* [10], Pavelka t. *et al* [11], Pajarinen j. *et al* [12].

Full weight bearing was delayed in patients treated with DHS (Leung *et al*) [8]. Restoration of walking ability is gained more significantly faster in patients treated with PFN than DHS (Pajarinen J. *et al*) [12]. Despite the short lever arm screw cutout and shaft fractures have been more commonly reported in patients treated with Gamma nail (Herrera. A *et al*) [13] than PFN.

The mean Harris hip score at the end of 3 months was 78.65 and at end of 6months was 85.05. Which was comparable to the study conducted by Domingo, L *et al* [14]

Patients with narrow femoral canal and abnormal curvature of the proximal femur are the relative contra indications to fixation with PFN. We have followed these recommendations in this study. We have not encountered any perioperative or post operative femoral shaft fractures. A larger cohort of patients is necessary to document the incidence of shaft fractures which is a limitation to our study (Halder *et al* [15])

In our study 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 (Mandal, Dr & Kumar *et al*) [9]. Total varus deformity 2 cases (10.0%). We had 3 cases of abductor lurch in the post operative period (15.0%) which improved with progression of time. Pilot studies has shown good outcome with few complications after treatment with PFN when compared to Gamma nail (Schipper I.B. *et al*) [6].

Conclusion

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.

PFN is a suitable alternative for DHS in Indian patients. Early mobilization and weight bearing is obtained in patients with PFN thereby decreasing the incidence of 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 cervical lag screw can be reduced by optimal reduction of the fracture and accurate positioning of cervical lag screws and nail.

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