



PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF INTRAMEDULLARY FIXATION (PROXIMAL FEMORAL NAIL) IN UNSTABLE PERITROCHANTERIC FRACTURES

Orthopaedics

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ABSTRACT

Introduction: Fractures around the trochanteric region of femur are one of the commonest fractures encountered in orthopaedics. The incidence of this fracture increases with advancing age. The 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 fall from height and accounts for only ten percent. Older patients suffering from a minor fall can sustain a fracture in this area due to osteoporosis or pathological fracture and this accounts for 90%. **Objective:** To Assess the Functional and Radiological Outcome of Proximal Femoral Nail in Unstable Peritrochanteric Fractures of Femur and To Assess the complications associated with the Procedure. **Methods:** A total of 74 cases of unstable peritrochanteric fractures presenting in the Department of Orthopaedics, GRMC, GWALIOR who fall under selection criteria was treated with proximal femoral nail. All the fractures were classified according to the Modified Muller AO Classification 2018. Preoperatively, X-ray of the pelvis with bilateral hips-AP view and whole length X-ray of the femur-AP/Lateral view was taken. Follow up was done at 6th week, 3rd month and 6th month where Functional assessment was done using Harris Hip Score at each visit and Radiographic healing of fractures treated with was assessed by Radiographic Union Score for Hip (RUSH) score. A RUSH score cutoff of >18 was utilized as evidence of fracture union. **Result:** The mean Harris Hip Score at 6th week was 57.84 ± 8.92 and at 3 months it was 72.22 ± 4.72 . The difference was found to be statistically significant ($p=0.001$), showing a significantly improved Harris Hip Score at 3 months in comparison to the 6th week score. The mean Harris Hip Score at 3 months was 72.22 ± 4.72 and at 6 months it was 85.70 ± 6.25 . In our study, the fracture union rate was 98.6 % by 6 months. Complete fracture union was seen in 3rd month for 40 (54.05%) patients and Complete Union was seen in the 6th week for 5 (6.75%) patients. Most common complication encountered in our study was Surgical site infection which was seen in 3(4.05%) cases then one case each of Reverse Z effect, Screw Back-out and non-union was seen respectively. **Conclusion:** Finally, we conclude that the PFN is a significant advancement in the treatment of unstable trochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and early return to work. Osteosynthesis using a PFN, used in unstable trochanteric fractures, resulted in low rates of clinical complications, excellent stabilization, few mechanical complications and adequate functional results. Thus the treatment of unstable intertrochanteric fracture with PFN had a more favorable outcome and it is the ideal implant of choice for unstable intertrochanteric fractures at present

KEYWORDS

Proximal Femoral nail, Peritrochanteric fracture, Harris hip score, RUSH score

INTRODUCTION

Fractures around the trochanteric region of the femur are among the most frequently seen in Orthopaedics. The 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 fall from height and account for only ten percent. Older patients suffering from a minor fall can sustain a fracture in this area due to osteoporosis or pathological fracture and this accounts for 90%.^[1]

In elderly individuals, intertrochanteric fractures often result from minor trauma due to osteoporosis and the higher frequency of minor injuries associated with aging, which is linked to reduced muscle strength, slower reflexes, impaired vision, and unstable blood pressure. In contrast, younger patients typically require high-energy trauma to sustain such fractures.^[2]

Until 1960's conservative treatment was the option available for these type of fractures in the form of traction with prolonged bed rest with fracture healing occurring in ten to twelve weeks (usually) followed by an ambulation training program of long duration. 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.^[1,2]

During this century a better understanding of the biomechanics of the fracture and the development of better implants have led to radical changes in treatment modalities.^[3]

Femur is the important weight-bearing bone of the lower limb. Proximal femur has two ridges the greater trochanter and the lesser trochanter. Intertrochanteric fractures occur in the extracapsular basilar neck region and extend to the area around the lesser trochanter. Stable fractures includes those fractures that are undisplaced or have an intact posteromedial cortex. Conversely, fractures with a broken posteromedial cortex are considered unstable. Unstable attributes to about 50%-60% of all intertrochanteric fractures. Unstable intertrochanteric fractures encompass various types, including three-fragment fractures with posteromedial comminution, fractures with more than two intermediate fragments where the lateral wall is compromised, reverse oblique fractures, transverse oblique fractures, and intertrochanteric fractures extending into the subtrochanteric region.^[3,4]

Understanding important factors in management of Intertrochanteric fracture like stability, reduction, role of posteromedial wall, lateral wall, will help in choosing implant for better outcome. Stability of the fracture type plays a very important role in guiding the operative plan and in determining the prognosis.^[4]

Intertrochanteric fractures of the proximal femur are best managed with anatomic reduction and internal fixation in young adults. Non-operative is very rarely considered in the young patient. There are meta-analyses and prospective randomized trials comparing different implants and techniques, but despite this controversy persists.^[5]

Stable fractures with intact posteromedial cortex usually resist all compressive loads once reduction is achieved. Unstable intertrochanteric fractures consist of comminution of the posteromedial cortex, a thin lateral wall, displaced lesser trochanter fracture, subtrochanteric extension, and reverse obliquity fractures.^[5]

In unstable intertrochanteric fractures there is loss of posteromedial cortex, when load is applied increased bending force on the DHS implant leads to complications like implant breakage, screw cut out or separation of plate from shaft. This lead to the introduction of Intramedullary devices which theoretically due to its position provides more efficient load transfer and shorter lever arm can decrease tensile strain thereby decreasing the risk of implant failure.^[1,5]

Although many devices can achieve rigid fixation, the proximal femoral nailing is the most commonly used one for intertrochanteric fractures due to its advantage as a high union rate with interfragmental compression effect, cephalomedullary nail is preferred and in cases of the reverse oblique fracture types, where the orientation is inherently unstable. Nowadays, the rate of intramedullary nailing is increasing, especially in the management of unstable intertrochanteric fractures. Different types of implants have been introduced and are used according to type of intertrochanteric fracture. Proximal Femoral Nailing has evolved as a first-line choice of procedure for intertrochanteric and subtrochanteric fractures.^[5,6]

This study has been conducted to assess the functional outcome of proximal femoral nail in unstable peritrochanteric fractures of femur, to assess the radiological outcome and to assess the complication associated with the procedure.

MATERIALS AND METHODS

A total of 74 cases of unstable peritrochanteric fractures presenting in the Department of Orthopaedics, GRMC, GWALIOR who fall under selection criteria was treated with proximal femoral nail. All the fractures were classified according to the Modified Muller AO Classification 2018. Preoperatively, X-ray of the pelvis with bilateral hips-AP view and whole length X-ray of the femur-AP/Lateral view was taken. Follow up was done at 6th week, 3rd month and 6th month where functional assessment was done using Harris Hip Score at each visit and Radiographic healing of fractures treated with was assessed by Radiographic Union Score for Hip (RUSH) score. A RUSH score cutoff of >18 was utilized as evidence of fracture union.

RESULTS

The mean age of the patients was 54.3 years with the youngest patient being 27 years and the oldest being 80 years (range 20-80). Most cases 21 (28.2%) were in the age group of 51-60 years. In our study, it was observed that the majority of patients were males 50(67.5%) while the remaining 24 (32.5%) cases were females. In our study Trivial fall was the most common mode of injury (39.19%) followed by Road traffic accidents (25.68%), and more than half of the patients were having right sided intertrochanteric fracture 40(54.05%) while 34 (45.95%) had left sided with most common AO Fracture type being AO 31 A2.2. The average duration of surgery was 67.45 ± 11.10 mins with the maximum and minimum duration being 120 mins and 48 mins respectively. The mean Harris Hip Score at 6th week was 57.84 ± 8.92 and at 3 months it was 72.22 ± 4.72 . The difference was found to be statistically significant ($p=0.001$), showing a significantly improved Harris Hip Score at 3 months in comparison to the 6th week score. The mean Harris Hip Score at 3 months was 72.22 ± 4.72 and at 6 months it was 85.70 ± 6.25 . The difference was found to be statistically significant ($p=0.001$), showing a significantly improved Harris Hip Score at 6 months in comparison to a 3-month score. In our study, the fracture union rate was 98.6 % by 6 months. Complete fracture union was seen in 3rd month for 40 (54.05%) patients and Complete Union was seen in the 6th week for 5 (6.75%) patients. Most common complication encountered in our study was Surgical site infection which was seen in 3(4.05%) cases then one case each of Reverse Z effect, Screw Back-out and non-union was seen respectively.

Table 1: Age-wise Distribution

No. of patients with age distribution		
Age in years	No of patients	Percentage
20-30	08	10.8%
31-40	07	9.4 %
41-50	13	17.5%
51-60	21	28.2 %
61-70	20	27%
71-80	5	6.7%
Total	74	100%

Table 2: Gender-wise Distribution

Distribution of patients according to gender		
Gender	No of patients	Percentage
Males	50	67.5%
Females	24	32.5%
Total	74	100%

Table 3: Distribution According To Mode Of Injury

Mode of injury	No. of Patients	Percentage
Fall from height	13	17.57%
RTA	19	25.68%
Trivial Fall	29	39.19%
Total	74	100.0%

Table 4: Distribution According To Side

Side of the surgery	No. of patients	Percentage
Right	40	54.05%
Left	34	45.95%
Total	74	100%

Table 5: Distribution Of Case According To Type Of Fracture (ao Classification)

Distribution of Case according to type of Fracture (AO Classification)		
AO fracture type	No of patients	Percentage
AO 31 A2.2	30	40.5%
AO 31 A2.3	13	17.5%

AO 31 A3.1	06	8.1%
AO31 A3.2	05	6.7%
AO 31 A3.3	20	27.03%
Total	74	100%

Table 6: Duration Of Surgery (mins)

	Mean (Minutes)	Standard Deviation
Duration of Surgery	67.45	11.10

Table 7: Functional Outcomes Of Patients As Per Harris Hip Score At 6th Week

Distribution according to the Harris Hip Score at 6th Week			
Clinical results	Total points	No of patients	Percentage
Excellent	100-90	0	0%
Good	89-80	0	0%
Fair	70-79	4	5.41%
Poor	<70	70	94.59%
Total		74	100%

Table 8: Functional Outcomes Of Patients As Per Harris Hip Score At 3rd Month Week

Distribution according to the Harris Hip Score after 3 months			
Clinical results	Total points	No of patients	Percentage
Excellent	100-90	0	0%
Good	89-80	12	15%
Fair	70-79	47	58.75%
Poor	<70	15	26.25%
Total		74	100%

Table 9: Functional Outcomes Of Patients As Per Harris Hip Score At 6th Month

Distribution according to the Harris Hip Score at 6th month			
Clinical results	Total points	No of patients	Percentage
Excellent	100-90	34	41.25%
Good	89-80	24	38.75 %
Fair	70-79	11	13.75 %
Poor	<70	05	6.25%
Total		74	100%

Table 10: Radiological Outcome Postoperatively

Radiological features	No. of Patients	Percentage
6th week		
Callus	69	93.24%
Union (RUSH >18)	5	6.75%
3rd month		
Callus	34	45.94%
Union (RUSH >18)	40	54.05%
6th month		
Union (RUSH >18)	73	98.6%
Callus	01	1.35%

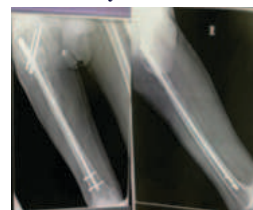
Table 11: Distribution Of Patients According To Complications

Complications		
Types	No of patients	Percentage
Surgical Site Infection	3	4.05%
Reverse Z effect	1	1.3%
Screw Back-out	1	1.3%
Non-Union	1	1.3%
No Complication	68	91.89 %

CASE 1: Babu Kushwah (50 yrs/M)



PRE OP- Xray Post OP Xray 6th Week Post OP



3rd Month Post OP

6th Month Post OP

Single Leg Standing Squatting Position Cross Leg Sitting

DISCUSSION

Intertrochanteric femur fractures constitute one of the most common fractures of the hip. The incidence of fractures in the trochanteric region with the increasing number of elderly population with osteoporosis has increased. These group of patients generally have poor bone quality, thus requiring a fixation device that provides maximum stability and minimizes surgical complications.^[48,49]

The intertrochanteric fractures treatment depends on many factors like the age of the patient, the patient's general health, the time from fracture to treatment, concurrent medical treatment, and the stability of fixation. The is still debate on appropriate method and the ideal implant to be used for these fractures with proponents of the various approaches each claiming advantages over others. Various internal fixation devices have been recommended for treating these fractures, including both extramedullary and intramedullary implants. The common causes of fixation failure are unstable trochanteric fractures, osteoporosis, lack of anatomical reduction, failure of the fixation device, and incorrect placement of the lag screw in the femoral head.^[50]

The proximal femoral nail has all the advantages of an intramedullary device such as a closed technique that retains the fracture hematoma, decreases the blood loss minimizes soft tissue dissection and wound complications. In an experimental study, GOTZE et al.^[51] (1998) Compared the loadability of osteosynthesis devices for unstable peritrochanteric fractures and found that the PFN could bear the highest load among all devices.

In our study, the mean age of the patients was 54 years. Majority 21 (28.2%) of cases were in the age group of 51-60 years. This study showed similar results to other studies conducted by Bindulal VA et al.^[52] in which the mean age was 54 years, whereas the mean age in the study by Yamauchi K, et al.^[53] was 79.7 years and the average age of the patient was 67.8 years in a study by Bhakat, et al.^[54] in 2013.

In this study Male patients slightly predominated with a ratio of Male: Female 2:1. In a comparative study conducted by Christian Boldin et al.^[55] also shows male patients predominated with a ratio of Male: Female 2.3:1.

Trivial fall was the most common mode of injury (39.19%) in our study. In another study conducted in 2016 by Dr. Punit J. Tank et al.^[56] it was seen majority of the intertrochanteric fractures occurred following low-velocity trivial trauma mostly associated with a domestic accident like a fall in the bathroom or a fall on the floor.

More than half of the patients had right-sided intertrochanteric fractures 40 (54.05%) while 34 (45.95%) had left-sided fracture. In 2011 Fakoor m et al.^[57] did a study in which 57.7% cases had right involvement and 42.3% of cases had left side involvement.

In our study 30 (40.5%) patients had AO 31 A2.2 fracture, 13 (17.5%) had AO 31 A2.3 fracture, 06 (8.1 %) had AO 31 A3.1 fracture and 06 (6.7%) had AO31 A3.2 fracture and 20 (27.03%) had AO 31 A3.3. AO 31 A2.2 was the most common fracture type in our study. Our study showed similar results to Study done by B. Schipper et al.^[58] in which most common fracture type is A2.2 followed by A2.3, A3.3, and A3.1.

The average duration of surgery was 67.45 ± 11.10 mins with the maximum and minimum duration being 120 mins and 48 mins respectively. In our initial cases operating time was in a higher range. With experience the operating time reduced. Results were comparable to the series of Dousa et al.^[59], Pavelka et al.^[60], Pajarinen J et al.^[61]

Majority of the patients had good to excellent outcomes according to Harris Hip Score. The mean Harris Hip Score at 6th week was 57.84 ± 8.92 and at 3 months it was 72.22 ± 4.72 . The difference was found to be statistically significant ($p=0.001$), showing a significantly improved Harris Hip Score at 3 months in comparison to the 6th week score. The mean Harris Hip Score at 3 months was 72.22 ± 4.72 and at 6 months it was 85.70 ± 6.25 . The difference was found to be statistically significant ($p=0.001$), showing a significantly improved Harris Hip Score at 6 months in comparison to a 3-month score. In our study, the fracture union rate was 98.6 % by 6 months whereas in study conducted by Mandice CJ et al.^[62] fracture union was 100% and by Rajesh Kapila et al.^[63] the fracture union rate was 92% by 6 months.

Most common complication encountered in our study was Surgical site infection which was seen in 3(4.05%) cases then one case each of Reverse Z effect, Screw Back-out and non-union were seen respectively. Kish et al.^[64] did a study on 46 patients with unstable peritrochanteric and subtrochanteric fractures. The patients in this study were allowed immediate full weight bearing. There was 1 case of shortening more than 1 cm, 1 case of screw cut out was observed. Menezes et al.^[65] conducted study on 155 patients who were treated with a proximal femoral nail. Fixation failure occurred in three patients (2%) which included one screw backout, one delayed union, and reverse z effect which is comparable to the complications seen in our study

CONCLUSION

Finally, we conclude that the PFN is a major advancement in treating unstable trochanteric fractures, providing benefits such as closed reduction, preservation of fracture hematoma, minimal tissue damage, early rehabilitation, and a faster return to work. Osteosynthesis with a PFN for unstable trochanteric fractures has resulted in low rates of clinical complications, excellent stabilization, minimal mechanical complications, and satisfactory functional outcomes. Therefore, the treatment of unstable intertrochanteric fractures with PFN had a more favorable outcome and it appears as an ideal implant choice for unstable peritrochanteric fractures with our study. But as this is short term study, more detailed long-term study with multicentric trials is required to give in definitive verdict.