Original Article

Functional And Radiological Outcomes of Unstable Intertrochanteric Fractures Managed with Proximal Femoral Nail A-II In Elderly Patients in a Tertiary Care Hospital of Haryana

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Abstract

Background: Intertrochanteric fractures are one of the most common fractures of the hip more so in the elderly with osteoporotic bones. Morbidity and mortality associated with these fractures are very high if left untreated. Hence surgery is the treatment of choice for such fractures. Internal fixation and early mobilization are currently the standard method of treatment. The objective is to Assess the Functional and Radiological Outcomes of unstable intertrochanteric fractures managed with PFN A-II in elderly patients. **Material and Methods:** The study was conducted in the Department of Orthopaedics, Shaheed Hasan Khan Mewati Govt. Medical College, Nalhar, Nuh from 1st Sept 2022 to 29th Feb 2024, after due approval from the institutional ethics committee and review board and taking written informed consent from the patients. **Results:** Majority of cases had TAD value between 20-25mm (53.34%)followed by 10-20 mm (30%), <10mm (10%) and 25-30mm (6.6%). TAD of <25mm is considered satisfactory (93.34% in our study). The mean NSA on the operated side was 124.08±4.48º as compared to normal side 125.26±2.88º with p value of 0.9 which is statistically not significant. Harris Hip Score and it was found that initially HHS was 19.26±2.22, at 2 weeks follow up it was 52.7±6.22, at HHS at 6 weeks it was 65.26±7.21, at 3 months 83.26±7.21, 6 months 85.46±7.19 and 9 months 91.16±5.89. **Conclusion:** PFN A-II may be a better choice in IT fracture. PFN being a intramedullary load sharing device with a better biomechanical advantage offers biological indirect reduction, concomitantly allowing early mobilization, union rates and weight bearing.

Keywords: Functional, Radiological, Outcomes, Unstable Intertrochanteric Fractures, Proximal Femoral Nail A-II, Elderly Patients.

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Introduction

Fractures of proximal femur are associated with substantial morbidity and mortality in elderly patients, with 15.0-20.0% mortality within 1 year of fracture.[1] Sub-trochanteric fractures (account for 10.0% of proximal femur fractures) have a bimodal distribution, in 20 to 40 and >60 years of age.[2] Extra-capsular fractures (Inter-trochanteric and subtrochanteric fractures) primarily involve cortical and compact cancellous bone. The complex stress configuration of this region and its nonhomogeneous osseous structure results in fractures along the path of least resistance through the proximal femur.[3] Trochanteric (pertrochanteric/ intertrochanteric) as well as subtrochanteric fractures belong to the group of proximal femoral fractures, i.e., hip fractures, an entity to which also femoral neck fractures is subordinated. Femoral neck fractures constitute 51.0%, trochanteric fractures 38.0% and subtrochanteric fractures 8.0% of all hip fractures. The basicervical fracture is a rare fracture in the transition zone between the femoral neck and the trochanteric region constituting only 3.0% of all hip fractures. Gullberg B et al,[4] estimated that the future incidence of hip fracture worldwide would double to 2.6 million by 2025, and 4.5 million by 2050. The percentage increase will be greater in men (310.0%) than women (240.0%). In 1990 26.0% of all hip fractures occurred in Asia, whereas this figure could rise to 37.0% in 2025 and 45.0% in 2050. Hagino et al. Reported a lifetime risk of hip fracture for individuals at 50 years of age of 5.6% for men and 20.0% for women.[5]

Intertrochanteric fractures are one of the most common fractures of the hip more so in the elderly with osteoporotic bones. Morbidity and mortality associated with these fractures are very high if left untreated. Hence surgery is the treatment of choice for such fractures. It is estimated that by 2025, almost 20% of the Indian population will be older than 60 years and the annual incidence of hip fractures will reach 6,00,000. 90% of

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the intertrochanteric fractures arising from low-energy trauma, occur in patients older than 65 years.[6] Epidemiological survey data revealed a total of 1.66 million patients with hip fractures secondary to osteoporosis worldwide in 1990, which is expected to reach 6.26 million by 2050.[7]

Internal fixation and early mobilization are currently the standard method of treatment. These fractures can be managed by different types of implants like dynamic hip screw (DHS), blade plate, proximal femoral locking plate, gamma nail, proximal femoral nail (PFN) and Proximal femoral nail anti-rotation Asia (PFNA2). Broadly the implants can be divided into Intramedullary and extramedullary devices. Extramedullary devices comprise of DHS, blade plate and proximal femoral locking plate.[8]

PFN A-II (Antirotation Asia) has many advantages such as shorter operative time, minimal fluoroscopy time, minimal blood loss and early weight-bearing. Other advantages are fewer chances of implant failure, easier helical blade insertion (compared with a cumbersome lag screw and derotation screw insertion in PFN), lesser chances of postoperative hip pain, and better performance than any other implant.[9]

This study was undertaken to analyze the results of unstable intertrochanteric fracture of femur fixed with PFN A-II, its functional and radiological outcomes in the elderly Indian population. Very few previous studies have established the role of various factors affecting the outcome of unstable intertrochanteric fractures fixed with PFNA2 in the elderly Indian population with a prospective study.

Materials and Methods

This Prospective observational study was conducted among elderly population with intertrochanteric fracture admitted in Department of Orthopaedics, Shaheed Hasan Khan Mewati Govt. Medical College, Nalhar, Nuh. Duration of study was 18 months. Prior to the study's initiation, ethical approval was acquired from the institutional ethical committee.

Sample Size: Cases satisfying the inclusion criteria were admitted in SHKM GMC, Nalhar. As per previous record of four years (2017 -2021) the prevalence of intertrochanteric fractures in elderly is 2% in our setup.

Allowable error in our study was 5%.

We used following formula for sample size calculation.

N= Z2PQ/L2

N =sample size

Z-=confidence level at 95% (standard value of 1.96) Q= 1-P

L= allowable error

On calculation we found a sample size of 30.118

So, this study will be undertaken with a sample size of 30 patients.

Sampling: All the patients presenting to emergency and OPD of SHKM GMC, NUH with fractures around the hip were assessed and the patients fulfilling the criteria were included in the study.

Inclusion criteria:

1. Patients > 60 years
2. Unilateral unstable inter-trochanteric fracture femur (AO Type 31A2 & A3)
3. Ambulatory prior to fracture,
4. Mentally sound and asymptomatic contra-lateral lower limb
5. Patients willing to give informed written consent to participate in the study.

Exclusion Criteria:

1. Pathological fracture
2. Open fracture
3. Polytrauma
4. Age<60yrs
5. Fracture with subtrochanteric extension
6. Fracture requiring open reduction.

Study Tools

- Predesigned Study Performa for data collection (Annexure I)

Screening of patients: A total 45 patients were screened during study period, 7 refused to participate in the study and 8 were not fit according to inclusion criteria and finally 30 patients were found fit according to inclusion criteria.

Data collection: Detailed history was taken and physical examination was done. The detailed procedure was explained to the patient via patient information sheet. The patients' details were recorded as per study proforma attached as Annexure I.

Outcome Measures: Radiological assessment with xrays Functional Assessment with Harris hip score.

Methodology: Written consent was taken from all potentially eligible subjects and excluded from the study if they did not match with inclusion criteria of the study. A detailed history and Clinical diagnosis of intertrochanteric fracture was done with the limb in external rotation, with shortening and a history of trauma. Emergency treatment in the form of analgesics was given. Haematological investigations were also done.

Anteroposterior X-ray of the pelvis with both the hips in 15-degree internal rotation and the lateral view of the injured hip were taken. Classification of fracture was done using AO/OTA classification of per trochanteric fracture. The preoperative neck-shaft angle and the medullary canal diameter were calculated with the help of the radiographs of the normal opposite hip.

All the surgeries (CRIF with nailing under image intensifier) were done under the regional anaesthesia after the patient was fit for the surgery. The diameter for PFN was measured from diameter of femur at level of isthmus. A standard length Short PFN A-II (180/240mm) was used in all cases. The average blood loss was measured using the method by Brecher et al.[10]

Postoperative restoration protocol was uniform. The isometric quadriceps exercise, knee- bending, sitting by-side of the bed and the exercise of abductor strengthening were advised directly after surgery. Non-weight bearing/Toe touch walking (NWB/TTW) was permitted with help of walker/ axillary crutches from second/third postoperative day depending upon general condition and pain tolerance of the patient. Patients were discharged after 5–7 days following the surgery with training to walk NWB/TTW with the help of walker or axillary crutches. Subjects were followed up at 2weeks, 6 weeks, 12 weeks, 6 months and 9months.

Patients were assessed radiologically with Xray hip – AP/Lateral of the operated side with respect to TAD, NSA and

signs of union. Union was decided based on the obliteration of the fracture line with the bridging callus to allow the unprotected function of limb. The patients were functionally assessed on Harris Hip Score. The postoperative pain and Gait were also assessed as per Harris Hip Score criteria at the end of all follow-ups.

Functional evaluation was done according to HARRIS HIP SCORE based on following points:

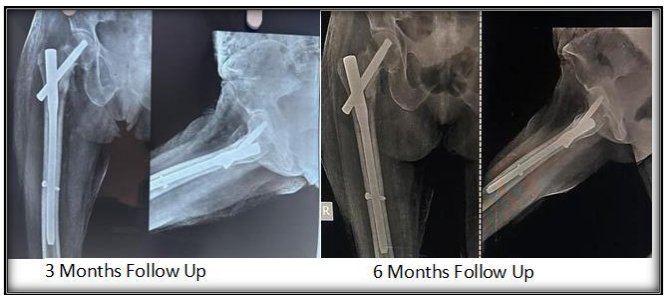
1. Pain
2. Limp
3. Support
4. Distance Walked
5. Sitting
6. Climbing Stairs
7. Enter Public Transportation
8. Absence of Deformity
9. Put on Shoes & Socks
10. Range of Motion

Grading of Harris Hip Score:

- <70 Points - Poor
- 70-79 Points - Fair
- 80-89 Points - Good
- 90-100 Points - Excellent

Statistical analysis: Data was analyzed using Statistical Package for Social Sciences, IBM manufacturer, Chicago, USA, ver 25.0 (SPSS Inc., Chicago). Results for continuous variables are shown as mean ± standard deviation (SD), whereas results for categorical variables are shown as number (percentage). P values were calculated with appropriate statistical tests. Values of $p < 0.05$ were considered as significant.

CASE 3/65Y/Female/AOType31A2/HHS96



Results

The majority of cases were in the age range between 60 to 69 years (53.3%) followed by 70 to 79 years (30.0%) and the least cases were of above 80 years of age (16.7%). The mean age of the total studied cases was 70±7 years. Majority of the cases were males (63.3%) followed by females (36.7%)

The [Table 1] shows the distribution of the cases based on the mode of injury and it was found that the majority of the cases were affected by slip and fall (40.0%), road traffic accidents (33.4%) followed by fall from height (23.3%) and 1 case was due to assault (3.3%).

Table 1: Distribution of the studied cases based on mode of injury

Mode of Injury	No. of cases (n=30)	Percentage
Slip and fall	12	40.0
Road traffic accident	10	33.4
Fall from height	7	23.3
Assault	1	3.3

Cases affected their right side (56.7%) whereas the left side was affected in 43.3% of cases.

[Table 2] shows the distribution of the studied cases based on AO classification and it was found that 53.3% of cases were of AO31-A2 fracture type and 46.7% were of AO31-A3 fracture type.

Table 2: Distribution of the studied cases based on AO classification

AO classification	No. of cases (n=30)	Percentage

AO31-A2	16	53.3
AO31-A3	14	46.7

Mean duration of surgery was 50.7±8.3051 minutes and the mean duration for the union was 11.57±1.19 weeks and the mean blood loss was 70.16±12.069 ml.

Table3: Duration of healing and union time

Variables	No. of cases (n=30)
Duration of surgery	50.7±8.3051minutes
Time for union weeks	11.57±1.19 weeks
Blood loss	70.16±12.069 ml

The mean neck shaft angle of the normal side was 125.26±2.88º and for operated side was 124.08±4.48 º
The majority of patients (53.34%) had a TAD between 20-25mm, while the smallest group (6.66%) had a TAD between 25-30mm. The total number of patients is 30, making up 100% of the sample. TAD <25mm was considered satisfactory.

Table 4: Tip Apex Distance (TAD) at 9 months

Tip Apex Distance	Number of patients	Percentage
<10mm	3	10.0
10-20mm	9	30.0
20-25mm	16	53.34
25-30mm	2	6.66
Total	30	100.0

The below table shows the functional outcome of the studied cases based on Harris Hip Score and it was found that post-operatively at 2 weeks follow up it was 52.7 ± 6.22, at 6 weeks follow up it was 65.26±7.21, at HHS at 12 weeks 83.26 ± 7.12 , at 6 months 85.46 ± 7.195 and at 9 months 91.16 ±5.89.

Table 5: Harris Hip Score

HHS	No. of cases (n=30)
HHS at 2 weeks	52.7 ± 6.22
HHS at 6 weeks	65.26 ± 7.21
HHS at 3 months	83.26 ± 7.125
HHS at 6 months	85.46 ± 7.195
HHS at 9 months	91.16 ± 5.89

Patients with a Harris hip score of 90-100 were considered to have an excellent result (36.6%), those with a score of 80-89 were considered good (56.7%) and those with a score of 70-79 were considered fair (6.7%) in terms of outcome.

Table 6: Functional assessment using Harris hip score (at 9 months).

Harris Hip Score	No. of cases (n=30)	Percentage
Excellent	11	36.6
Good	17	56.7
Fair	2	6.7
Poor	0	0.0

Discussion

Fractures of the intertrochanteric femur have always been taken as a major challenge by the community of orthopedic surgeons, not for achieving fracture union, but for restoration of normal functions in the shortest possible time with minimal side-effects. The goal of management is to provide desired mobilization, rapid rehabilitation, and fast reversion of individuals to premorbid home and work environments as a functionally and psychologically independent unit.[11] The management of Intertrochanteric (IT) fractures is still related with many failures. The reason is attributed to the biomechanics of fracture and surgical technique variables and due to high-stress concentration, which is subjected to multiple deforming forces. The PFN A- II compensates for the function of the medial column. It is recognized that initiating the sliding of the helical blade requires increased force in the PFN. The intramedullary location of PFN prevents significant shortening at the fracture site and its buttressing effect prevents medialization of the femoral shaft.[12] The present observational study was conducted over 30 intertrochanteric fracture patients. All patients in the present study belonged to ages more than and equal to 60 years the majority of cases were in the age range between 60 to 69 years (53.3%) followed by 70 to 79 years (30.0%) and the least cases were of above 80 years of age (16.7%). The mean age of the total studied cases was 70 ± 7years. These observations were comparable to the findings of Kaushal A et al,[13] the mean age of PFNA-2 group was 47.80 ± 17.25 years. A similar observation is also reported by Sujana

Theja J S et al,[14] findings in the study, the mean age of 60 intertrochanteric femur fracture patients was 68.52 ± 6.83 years.

In the present study, the majority of the cases were males (63.3%) followed by females (36.7%). Males are affected more than females. Similar findings were also reported by Reddy et al,[15] and Jonnes et al.[16] In Sujana Theja J S et al,[14] study of 60 patients, 32 were male and 28 were female patients.

In this study commonest mode of injury for IT fracture was slip and fall (40.0%), road traffic accidents (33.4%) followed by fall from height (23.3%) and 1 case was due to assault (3.3%). Similar findings were reported also made by Mundla MKR et al.[17] In his study, the commonest mode of injury for IT was slip and fall (70%), followed by road traffic accidents (23.3%). The results in the present study were also in agreement with an earlier study by Jonnes et al,[16] who reported that trivial trauma (77%) was the commonest mode of injury, followed by road traffic accidents (23%) for intertrochanteric fractures. In SujanaTheja J S et al,[14] study fracture because of domestic fall occurred in 60%, 8.3% met with road traffic accident, 31.7% had fall at workplace.

Among all 30 cases, the right side IT fracture was reported in 56.7% and the left side was affected in 43.3% of cases. Similarly, in a study by SujanaTheja J S et al,[14] the right side was affected in 31 cases while the left was in 29 cases. In the study conducted by R C Gupta,[18] right-sided fractures were common, whereas in researches made by Kenzora et al,[19] and Cleveland et al20 left fractures were common.

Duration: In the present study, the mean duration of surgery was 50.7±8.30 minutes and the mean duration for the union was 11.57±1.19 weeks the mean blood loss was 70.16±12.06ml. Similarly, in Kaushal A et al,[13] study the average time of surgery was 90.25 min and mean intraoperative blood loss, in the PFNA-2 group was 68.25 ± 5.20 mL and another study by Pulin Bihari Das et al,[21] reported, the average blood-loss in PFN group was 74 ml. Another study by Sameer Ajit Mansukhani et al,[22] reported PFN had lower mean blood loss than other studied groups ($p<0.05$).

Harris Hip Score (HHS) and final outcome: In our study initially, HHS was 19.2±2.22, at 2 weeks follow-up it was 52.7±6.22, at 6 weeks it was 65.26±7.21, at 3 months, 6 months and 9 months it was 83.26±7.21, 85.46±7.19 and 91.16±5.89, and Harris hip score of 90-100 was considered to have an excellent result (36.6%), those with a score of 80-89 were considered good (56.7%) and those with a score of 70-79 were considered fair (6.7%) in terms of outcome. Similarly, Jamshad OP et al,[23] study the average HHS was 81.6. and HHS was found to be excellent in 6 (17.1%) patients, good in 14 (40%) patients, fair in 12 (34.3%) patients and poor in 3 (8.6%) patients. Similarly, a previous study by Saurabh Agrawal et al,[24] in his study, he found that in unstable fracture patients, the score for PFN was 79.36. In Garabadi M and Grover A,[25] study reported excellent outcomes with high union rates. In Yadav RL et al,[26] study excellent to good results achieved in 80% of patients.

Limitations of the study: Sample size(n=30) and single-center design limit generalizability. Longer follow-up would better assess implant longevity and late comlications.

Conclusion

PFN A-II may be a better choice in IT fracture. PFN being a intramedullary load sharing device with a better biomechanical advantage offers biological indirect reduction, concomitantly allowing early mobilization, union rates and weight bearing.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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