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Original Research Article

A study of short PFN in management of fracture of intertrochanteric femur in elderly population

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Abstract: Intertrochanteric Femur fractures comprise approximately 50% of all hip fracture caused by low intensity injury. Intertrochanteric fractures are difficult to manage and associated with many complications.
Aims and Objectives: To evaluate effectiveness and strength of Short PFN with early mobilization and functional recovery of patient in management of fracture intertrochanteric femur
Materials and Methods: Forty patients with Fracture Intertrochanteric Femur visiting Orthopaedic Casualty and OPD were studied. Fractures are evaluated as stable and unstable fractures according to Modified Evan- Jensen classification. Elderly patients with unstable intertrochanteric fractures, Short PFN was applied and followed up for a period of 6 months at regular intervals. The clinical data collected and evaluated with pre injury activity and present functional levels with Harris Hip Score.
Results: Majority of the patients were males (65%) and had age between 61-80 years (52.5%) with mean age of 71.58 ± 12.37 years. Majority of the patients had operative time more than equal to 1 hour. Harris Hip Score at 1 month was 71.10 ± 5.52, while at 3 months it was 80.13 ± 7.97. There was a statistically significant increase in the mean Harris Hip Score at 3 months in comparison to 1 month. The mean Harris Hip Score at 1 month was 71.10 ± 5.52. There was a statistically significant increase in the mean Harris Hip Score at 6 months in comparison to 3 months.
Conclusion: For Intertrochanteric fractures the Short PFN is a good minimal invasive implant which gives significant functional result with good anatomical reduction.

Keywords: intertrochanteric fractures, proximal femoral nail, harris hip score, femur.

1. Introduction

Fracture intertrochanteric femur is a most common fracture of hip especially in elderly having male to female ratio of 3:1 with porotic bones usually due to low energy trauma[1].Intertrochanteric Femur fractures comprise approximately 50% of all hip fracture caused by low intensity injury[2].Most of the inter trochanteric fractures are unstable (>50%). Unstable intertrochanteric fractures are difficult to manage and associated with many complications. Recently new treatment modality isShort PFN devised by AO/ASIF group has

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proven to be a stable implant in peritro- chanteric, intertrochanteric femoral fractures. Biomechanically, superior to plate device, an intramedullary device associated with 25- 30% less implant stress. This has benefit in elderly patients, in whom demand of early weight bearing and mobilization is mandatory[3].Short PFN greatly reduces the lever arm distance and intramedullary location provides buttress against lateral displacement and reduces bending strain on the implant, so compared with Dynamic hip screw. Dynamic condylar screw, decreased incidence of above mentioned complications[4].Elderly patients with intertrochanteric fractures demand stable fixation with the least invasive technique and prompt postoperative activation and mobilization[5].Now Trochanteric fracture is common in young population due to high-speed trauma.Some studies on short PFN have shown that the complication rates are higher like screw cutout ,
proximal femoral fracture, higher revision rates[6].But in this study, which was conducted in the elderly age group, we reported that with good preoperative planning and with good surgical skill reduced the complications of the proximal femoral nail and is a very good implant for intertrochanteric fracture fixation.

2. Materials and methods

Present prospective study was performed on 40 patients with Fracture Intertrochanteric Femur visiting Orthopaedic Casualty and OPD of Index medical college and Research Center, Indore (M.P.).A record for follow up 1-6 months was also maintained for all the patients from January 2022 to December 2022. Details on history, follow up at interval of 1, 3 and 6 months and clinical examination was recorded by analyzing case papers and on admission, patient was first examined thoroughly in primary survey for vital data and other major associated injuries in head, thorax, abdomen, or spine along with local injuries.

Interpretation of Harris Hip Score Score

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

All elderly patients with Fracture Intertrochanteric femur with either sex having age more than 40 years, trivial fall, road traffic accident and those with comorbidities e.g. diabetes mellitus, hypertension and IHD were included. Patients with stable fractures and pediatric fractures were excluded. Written, informed consent of the patients was also obtained. Fractures are evaluated as stable and unstable fractures according to **Modified Evan-Jensen classification**. Elderly patients with unstable intertroch-anteric fractures which include posteromedial large separate fragmentation IIIB, displaced greater trochanteric (lateralwall fractures) IIIA Reverse obliquity patterns IV, with subtrochanteric extension IV,comminuted trochanteric fracture with extension to neck of the femur IV trochantericfracture associated with fracture of the shaft of femur IV.The patients were followed up for a period of 6 months at regular intervals.Surgical intervention was under taken after adequate pre- operative assessment was made and only after taking informed consent. Hemoglobin, total WBC count, differential count, ESR, bleeding time,clotting time, blood urea, serum creatinine, random blood glucose, ECG and 2D ECHO was done if required. Plain x-ray of relevant parts in anteroposterior and lateral views and traction and internal rotation x-rays was done if required.The clinical data collected and evaluated with preinjury activity and present functional levels with harris hip score.

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All the data was analyzed using IBM SPSS ver. 20 software. Cross tabulation and frequency distribution was used to prepare the tables. Quantitative data was expressed as mean and standard deviation whereas categorical data was expressed as number and percentage. The mean of the variables between the two groups was compared using Unpaired 't' test and within the groups means was compared using Paired 't' test. Pearson correlation was performed to obtain the correlation. A P value of < 0.05 was taken as statistically significant.

3. Results

There were 10 (25.0%) patients in the age group 42-60 years, 21 (52.5%) patients in the age group 61-80 years and 9 (22.5%) patients in the age group >80 years.Majority of the patients were in the age group 61-80 years. The mean age in our study was 71.58 ± 12.37 years.There were 14 (35.0%) females and 26 (65.0%) males in our study, showing a male preponderance in the study.In 7 (17.5%) patients the operative time was < 1 hour, while in 33 (82.5%) patients the operative time was more than equal to 1 hour.Majority of the patients had operative time more than equal to 1 hour.The mean operative time in our study was 67.38 ± 11.21 minutes.In majority of the patients 30 (75.0%) the hospitalization was 3 days, in 7 (17.5%) patients it was 4 days, in 2 (5.0%) patients it was 5 days and in only 1 (2.5%) patient it was 6 days.

Table 2:Distribution of patients according to complications in relation to age

Complication
Age group (years) Total 42-60 61-80 >80
Screw failure 1 (20) 2 (40) 2 (40) 5 (100)
Varus malalignment 1 (50) 1 (50) 0 (0) 2 (100)
Fracture lateral cortex 1 (100) 0 (0) 0 (0) 1 (100)
Z effect 1 (33.33) 1 (33.33) 1 (33.33) 3 (100)1
Joint stiffness 1 (20) 2 (40) 2 (40) 5 (100)
Shortening 0 (0) 0 (0) 1 (100) 1 (100)1
Postoperative Infection 1 (100) 0 (0) 0 (0) 1(100)
Postoperative DVT 0 (0) 0 (0) 0 (0) 0 (0) Only in 2 (5.0%)
patients' blood transfusion was required, while in the majority of thepatients no blood transfusion was required.

Table 3: Comparison of score between different time intervals

Pair	Time interval (months)	Mean ± SD	't' value	P value
Pair 1	1	71.10 ± 5.52	-6.27, df=39	<0.001
	3	80.13 ± 7.97		
Pair 2	1	71.10 ± 5.52	-9.00, df=39	<0.001
	6	86.70 ± 9.66		
Pair 3	3	80.13 ± 7.97	-8.74, df=39	<0.001
	6	86.70 ± 9.66		

Paired ttest applied. P value < 0.05 was taken as statistically significant

The mean Harris Hip score in the age group 42-60 years was 88.45 ± 5.79, in the age group 61-80 years it was 85.38 ± 11.29 and in the age group > 80 years it was 87.75 ±9.82. The comparison of mean Harris Hip score in relation to age groups was found to bestatistically not significant (p>0.05), showing a comparable mean Harris Hip score across all the age groups. The mean comparisons were done between the pairs: 42-60 years - >80 years; 61-80

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years - >80 years and 61-80 years – 42-60 years. The mean Harris Hip Score was comparable across all the pairs, which was statistically not significant (p>0.05).At 1 month there were 9 (22.5%) patients in poor grade and 31 (77.5%) patients were in fair grade.At 3 months there were 4 (10.0%) patients in poor grade, 7 (17.5%) patients were in fair grade and 29 (72.5%) patients were in good grade.At 6 months there were 4 (10.0%) patients in poor grade, 3 (7.5%) patients were in fair grade, 9 (22.5%) patients were in good grade and 24 (60.0%) patients were in excellent grade. There is an improvement in the Harris Hip Score Grading from 1 month to 6 months.

Table 4:Correlation of age with Harris Hip Score

Pair	'r' value	P value	
Age – Harris Hip score at 1 month	-0.020	0.901, NS	Negative, very weak, statistically not significant correlation
Age – Harris Hip score at 3 months	-0.095	0.559, NS	Negative, very weak, statistically not significant correlation
Age – Harris Hip score at 6 months	-0.126	0.438, NS	Negative, very weak, statistically not significant correlation

Pearson Coefficient of Correlation applied. P value < 0.05 was taken as statistically Significant

4. Discussion

Intertrochantric fractures are low energy trauma fractures seen in elderly and osteoporotic bones. Because of the high incidence of malunion, non-union and delayed union, there is limited role of conservative treatment for intertrochantric fractures. Extramedullary fixation of these fractures with implants like the dynamic hip screw or the dynamic condylar screw has potential disadvantages of extensive exposure, more blood loss which then leads to problems in fracture union and also implant failure and infection. Intramedullary fixation is more biological as this implant is inserted after closed reduction using a minimal invasive technique. Short PFN reduces the lever arm due to intramedullary location , like an internal splint and acts like a load bearing device. This allows the patient to early weight bearing. As it is performed through a small surgical incision, so it is minimally invasive and reduces blood loss and infection. Some disadvantages of the Short PFN which have been reported include cutout of screws in head and neck and , and lateral migration of proximal screws (Z effect).There were 10 (25.0%) patients in the age group 42-60 years, 21 (52.5%) patients in the age group 61-80 years and 9 (22.5%) patients in the age group >80 years. Majority of the patients were in the age group 61-80 years. The mean age in our study was 71.58 ± 12.37 years. Studies done by Aithala et al[7] reported a mean age of 71.39 years, and Korkmaz et al[8]reported a mean age of 77.66 years. The results of these two studies corroborate with the results of our study. While the study done by Kumar et al reported a lower mean age (52.66 years) in the study[6]. There were 14 (35.0%) females and 26 (65.0%) males in our study, showing a male preponderance in the study. Endigeri et al[9] and Kumar et al reported a male preponderance in their study[6].In 7 (17.5%) patients the operative time was < 1 hour, while in 33 (82.5%) patients the operative time was more than equal to 1 hour. The mean operative time in our study was 67.38 ± 11.21 minutes. Study done by Tank et al[2]and Nithin et al[3] reported mean operative time to be 80 min and 75 min respectively. The results corroborate

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with our study results.Screw failure was seen in 5 patients. Of these, 1 (20.0%) was in the age group 42-60 years, 2 (40.0%) were in the age group 61-80 years and 2 (40.0%) were in the age group >80 years. Varus malalignment was seen in 2 patients. Of these 1 (50.0%) each was in age group 42-60 years and 61-80 years. Fracture lateral cortex was seen in 1 (100.0%) patient of age group 42-60 years.Z effect was seen in 1 (33.33%) patient of age group 42- 60 years, 1 (33.33%) patient ofage group 61-80 years and 1 (33.33%) patient of age group more than 80 years. Joint stiffness was seen in 5 patients. Of these, 1 (20.0%) was in the age group 42-60 years, 2 (40.0%) were in the age group 61-80 years and 2 (40.0%) were in the age group>80 years. Shortening was seen in 1 (100.0%) patient of the age group > 80 years. Postoperative infection was seen in 1 (100.0%) patient of the age group 42-60 years. It was a superficial surgical site infection, which was managed with antibiotic suppression.Postoperative DVT was not seen in any of the patients.Overall screw failure was seen in 5 (12.5%) patients, joint stiffness in 5 (12.5%) patients,Z effect was seen in 3 (7.5%) patients, varus malalignment was seen in 2 (5.0%) patients,while fracture
lateral cortex, shortening, postoperative infection (superficial surgical site infection) was seen in 1 (2.5%) patient each.The correlation of age with Harris Hip Scores at 1 month, 3 month and 6 months was found to be statistically not significant ($p>0.05$), showing that age and Harris Hip score was negatively correlated with age, but this correlation is statistically not significant.In study Kumar et al reported proximal screw failure in 10%, distal screw failure in 3%, and fracture lateral cortex in 3%, joint stiffness hip joint in 10%, knee joint in 3%. Z effect was seen in 3%, shortening in 3% and varus malalignment 3%[6].Endigeri et al in their study reported superficial infection in 4%, proximal screw failure 2%, Distal screw Failure 2%, shortening in 1%, Z effect in 2%. They had lesser incidence of these complications as compared to our study.9Reska et al reported an incidence of deep vein thrombosis in 1.2%.10 Study done by Chidanand et al showed superficial infection in 4.5% cases and Z effect in 2.2%. Their results were comparable with that reported in the present study[11].Only in 2 (5.0%) patients' blood transfusion was required, while in the majority of the patients no blood transfusion was required. Kumar et al reported a higher incidence (10%) of blood transfusion in their study[6]. At 1 month there were 9 (22.5%) patients in poor grade and 31 (77.5%) patients were in fair grade .At 3 months there were 4 (10.0%) patients in poor grade, 7 (17.5%) patients were in fair grade and 29 (72.5%) patients were in good grade. At 6 months there were 4 (10.0%) patients in poor grade, 3 (7.5%) patients were in fair grade, 9 (22.5%) patients were in good grade and 24 (60.0%) patients were in excellent grade. There is an improvement in the Harris Hip Score Grading from 1 month to 6 months. Kumar et al reported an incidence of 53%, excellent grade at 6 months, which is comparable with our study results[6].While study done by Nithin et al reported excellent outcome at 6 months in only 20% patients with a mean Harris Hip Score of 83.5[3].Study done by Ghilzai et al found excellent outcome in 45.1% patients at 3months, while in our study there was no patient with excellent outcome at 3 months[12].In majority of the patients 30 (75.0%) the hospitalization was 3 days, in 7 (17.5%) patients it was 4 days, in 2 (5.0%) patients it was 5 days and in only 1 (2.5%) patient it was 6 days . Korkmaz et al[8]showed a higher mean hospital stay of 13.34 days, Kumar et al reported a mean hospital stay of 16.8 days. The hospital stay reported by these studies was higher as compared to that of our study[6].The possible reason could be that they had included patients with co morbidities, which would have increased the hospital stay of these patients.

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5. Conclusion

Short PFN is a good minimally invasive stable fixation option with minimal soft tissue handling for both Stable and unstable intertrochanteric fractures. Patients treated by Short PFN showed good functional outcome according to Harris Hip Score. Functional outcome was found to be independent of the age of the patients. It demands skill and experience of surgeon with this implant. In both stable and unstable intertrochanteric fractures is the better choice of implant because, it is not associated with intraoperative complications like blood loss, large incision and huge hematoma at operative site also prevent fracture site to expose outer environment and postoperative complications like infection, implant failure, nonunion, and limb, length discrepancy, deep vein thrombosis and postoperative pain etc. "As well as operative time not so long like other open procedures. The hospital stay is again short. Implant removal also not a complicated procedure it is done with a small incision and the patient can be discharged on the next day. Short PFN is a useful device in the treatment of proximal femur intertrochanteric fractures. This procedure is not so difficult with an experienced hand and also mechanically stable construct which allows early weight-bearing with union and mobilization which helps to achieve ambulatory status early.

The main causes of fixation failure are- very unstable fractures with severe comminuation and osteoporosis, unacceptable anatomical reduction, incorrect placement of the screw, and inexperienced hand. We conclude that in both stable and unstable intertrochanteric fractures the Short PFN is good minimal invasive implant gives wonderful functional result with good anatomical reduction

6. References

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