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Functional Outcome of Comminuted Intertrochanteric Fracture of Femur Internally Fixed Using Proximal Femoral Nail

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Abstract: **Intertrochanteric fractures of femur are the most frequently operated fracture types, have the highest postoperatively fatality rate of surgically treated fractures, and have become a serious health resource issue due to high cost of care required after injury. Multiple modalities of surgical treatment are available, since the fracture patterns are not uniform and the morphology of femur has significant variations. Using reconstruction nail [proximal femoral nail] for fracture fixation , improved mobility , less blood loss was noted in among these patients.**

Objective: To access the functional outcome of unstable comminuted intertrochanteric fractures of femur managed surgically using proximal femoral nailing.

Materials and Methods: This was a prospective study, conducted among 25 patients with comminuted proximal femoral fractures in the age group of 50 to 75 years. Period of study was from June 2013 to November 2014. Patients were drawn into the study from both elective and emergency groups presenting to the department of orthopedics, Father Muller Medical College Hospital, during the above mentioned period. The data was collected by interview, by analyzing case papers. Patient were followed up at intervals of 6th week, 12th week and 6 months post operatively. The outcome was assessed based on post operative pain, return to activities of daily living, shortening of limb, range of movements, neck shaft angle, radiological union and implant position.

Results: 80% of patients have minimal pain at 12th month of follow up, following surgery. 84% of patients returns to their pre injury status in terms of daily routine activities. Only one patient showed limb shorteing of around 2 cm. 10 % of non union noted following intramedullary fixation. Based on the kyle's criteria 70% of patients showed excellent results.

Conclusion: Achieving adequate fracture reduction and anatomical reconstruction is vital in attaining good outcome. However appropriate fixation device has to be selected based on the fracture pattern. Patients treated by proximal femoral nailing gained better range of movements. Majority of the fractures in which near normal anatomical reconstruction was done achieved union.

Keywords: **Intertrochanteric fractures, Proximal femoral nail, Non union.**

1. INTRODUCTION

Trochantric fractures of femur are one of the commonest injuries sustained predominantly in patients over 60 years of age. These usually occur through bone affected by osteoporosis, trivial fall being the most common mechanism of injury[1].

Earlier, little attention was paid to these fractures, as these, which occur through the cancellous bone with excellent blood supply healed regardless of the treatment. However conservative treatment usually resulted in malunion with varus and

external rotation resulting in short limb gait and a high rate of mortality due to complications of recumbency and immobilization.

The goal of treatment of an intertrochantric fracture must be restoration of the patient to his/her pre-injury status as early as possible. This led to recommendations for internal fixation of these fractures to increase patient comfort, facilitate nursing care, decrease hospitalization and reduce complications of prolonged recumbency[2].

The greatest problems for the surgeon providing this treatment are instability and the complications of fixation that result from instability. Intertrochantric fractures, stability refers to the capacity of the internally fixed fractures to resist muscle and gravitational forces around the hip that tend to force the fracture into a varus position. Intrinsic factors like osteoporosis and comminution of the fracture and extrinsic factors like choice of reduction, choice of implant and technique of insertion, contribute to failure of internal fixation.

The type of implant used has an important influence on complications of fixation. Sliding devices like DHS have been extensively used for fixation. However, if the patient bears weight early, especially in comminuted fractures, these devices can penetrate the head/neck, bend, break or separate from the shaft. Intramedullary devices like the proximal femoral nail have been reported to have an advantage in such fractures as their placement allowed the implant to lie closer to the mechanical axis of the extremity, thereby decrease the lever arm and bending movement on the implant. They can also be inserted faster with less operative blood loss and allow early weight bearing with less resultant shortening on long term follow up.

The purpose of the present study is to verify the theoretical advantages of the intramedullary device and also whether it actually alters the eventual functional outcome of the patient.

2. MATERIALS AND METHODS

Twenty five [25] patients with comminuted proximal femoral fractures in the age group of 50 to 75 years were selected. Period of study was from June 2013 to November 2014. Patients were drawn into the study from both elective and emergency groups presenting to the department of orthopedics, Father Muller Medical College Hospital, during the above mentioned period. The data was collected by interview, by analyzing case papers. Patient were followed up at intervals of 6^{th} week, 12^{th} week and 6 months post operatively. The patients included in this study were those who sustained isolated comminuted unstable intertrochantric fracture of femur. The exculsion criteria for the patients were: pathological fractures, age <50 and > 75yrs and open fractures of femur.

All patients are evaluated primarily in the emergency or OPD by the resident on call. After stabilization of the patient and appropriate measures are taken in the form of splintage, analgesics, IV fluids / blood transfusion. Medical evaluation to stabilize the general condition of the patient. Standard radiographs of the pelvis with hips, involved femur AP and lateral view, baseline chest x ray PA view are taken. Pre operative hematological [viz., Hb, TC DC, ESR, platelet count, PCV] biochemical [viz., blood sugar, electrolytes, blood urea, serum creatinine] Serological [HIV, HCV, HbSAg] blood grouping and typing investigation are done in consultation with physician / anesthesiologist. Complete Medical evaluation is being carried out to rule out underlying medical illness which will have a major bearing on surgery. Pre Anesthetic Evaluation of these patients is being carried out by anesthesiologist. Patient is then subjected to surgery under appropriate anesthesia. Surgical setting includes closed reduction and proximal femoral nailing. Post operative regimen includes post operative ICU care, monitoring of vitals, adequate blood transfusion, antibiotic prophylaxis, DVT prophylaxis are being done. Appropriate physiotherapy measures under taken. Follow up of these patients are being done at the end of 6 weeks, 3 months and 6 months on out patient basis. At each visit patient is being assessed for wound healing, functional recovery and radiological union. Standard radiographs of involved hip [anteroposteior and lateral views] are taken in each visit. Final results are drawn at the end of 6 months which is the usual time taken for healing of such fractures.

The fracture was reduced by traction in neutral, slight internal rotation or external rotation depending on the nature of the fracture and checked by antero-posterior and lateral views on the image intensifier. Reduction was termed stable when posteromedial contact was achieved.

A lateral skin incision is made extending from the tip of the trochanter proximally depending on the size or obesity of the patient. An entry point is made just medial to the tip of the greater trochanter with a curved awl. Guide wire is placed into the femoral canal under image intensifier control. Depending on the femoral canal size appropriate size of reconstruction

nail was placed into the canal. Later proximal locking was done to fix the neck and the shaft of femur using the jig. Later distal locking was done using free hand technique under image intensifier control. Wound was closed in layers.

Figure 1: Position of patient

Figure 2:Intramedullary fixation

Antibiotics were administered perioperatively for 24 hours in all our patients. Pain management was done by injectable NSAIDs on operative day and oral pain management was started from the 1st Post operative day.

Active ankle mobilization and deep breathing exercises were instituted as early as possible following surgery in the intensive care unit. Static quadriceps exercises were started and patients were made to sit up on bed on first post operative day. Knee range of movements, non weight bearing with crutch assisted ambulation were started on second post operative day. Weight bearing was commenced depending upon the stability of the fracture, stability of the fixation, delaying it for patients with severely unstable fractures.

All the patients were discharged on the 3rd post operative day. Sutures were removed on 14th post operative day.

All the patients were followed up at 6th week, 12th week, and at 6th month. Check x rays were taken to assess fracture union. Functional recovery too was assessed at the same visit. Post operative pain was evaluated using the 4 point pain score as also used by saudan[3.]The fracture union was considered as malunion if varus angulation was less than 10 degrees. The outcome was assessed based on post operative pain, return to activities of daily living, shortening of limb, range of movements, neck shaft angle, radiological union and implant position as follows:

3. CRITERIA FOR EVALUATION AND RESULTS [Kyle's criteria 47]

1. Excellent:

- Fracture united.
- No pain.
- No infection.
- Full range of motion at hip.
- No shortening.
- Patient able to sit crossed legged and squat.
- Independent gait.

2. Good:

- Fracture united.
- Occasional pain.
- No infection.
- Terminal restriction of hip movements.
- Shortening up to half inch.
- Patient able to sit crossed legged and squat.
- Use of cane back to full normal activity.

3. Fair:

- Fracture united.
- Moderate pain in hip.
- No infection.
- Flexion restricted beyond eighty degrees.
- Noticeable limp shortening up to one inch.
- Patient not able to sit crossed legged.
- Patient walks with support of walker.
- Back to normal activities with minimal adjustments.

4. Poor:

- Fracture not united.
- Pain even with slightest movement at hip or rest pain.
- Infection
- Range of movements at hip restricted flexion restricted beyond sixty degrees.
- Shortening more than one inch.
- Patient not able to sit crossed legged or squat.
- Patient cannot walk without walking aid.
- Normal activities not resumed.

Statistical analysis was done by frequency, percentage and chi-square test using spss version 13 software to evaluate the results.

4. RESULTS

Age group of our patients was between 50 to 75years. The average age was 60yrs. 50% of our patients were in the age group of 50 – 60 years and the other half were above 60 years. This suggests that the fractures of the proximal femur are common among the elderly population. Our series also is not an exception. 55% of our series were male patients. Male: female ratio being 1.2: 1. 90 % of our patients sustained injury following trivial trauma. 10% got injured following road traffic accidents. These patients were between 50-60 years. 35% of patients had anaemia as depicted by haemoglobin percentage between 7 to 9gm%.

All proximal femoral fractures with unstable fracture pattern were taken into our study. 57.5% patients had combined posteromedial and lateral wall comminution and others had only posteromedial comminution. 82.5% of patients had Grade 4 osteoporosis. 7.5% patients had grade 3 osteoporosis. None of the patients had normal bone density.

Functional Outcome:

Table 1: Pain -Fishers exact test p= .408

Clinical result	Total number of patients
Pain -	20
Pain +	04
Pain ++	01
Total	25

Table 2: Range of Movement: Fishers exact test p = .386

Clinical result	Number of patients
Full ROM	19
Full ROM, abductor weakness	01
Restricted rotation	04
Restricted rotation , flexion	0
Total	25

10 % of non union noted following intramedullary fixation.

Table 3:Position of implant at 6th month of follow up

Implant postion	Number of patients
Normal	21
Back out of proximal screw	02
Back of distal screw	01
Implant failure	01
Total	25

Table 4: Clinico radiological outcome- Fishers exact test p=.642

Outcome	Number of patients
Excellent	17
Good	04
Fair	02
Poor	02
Total	25

CASE PROFILE [INTRAMEDULLARY FIXATION]:

Figure 3 :Pre operative view

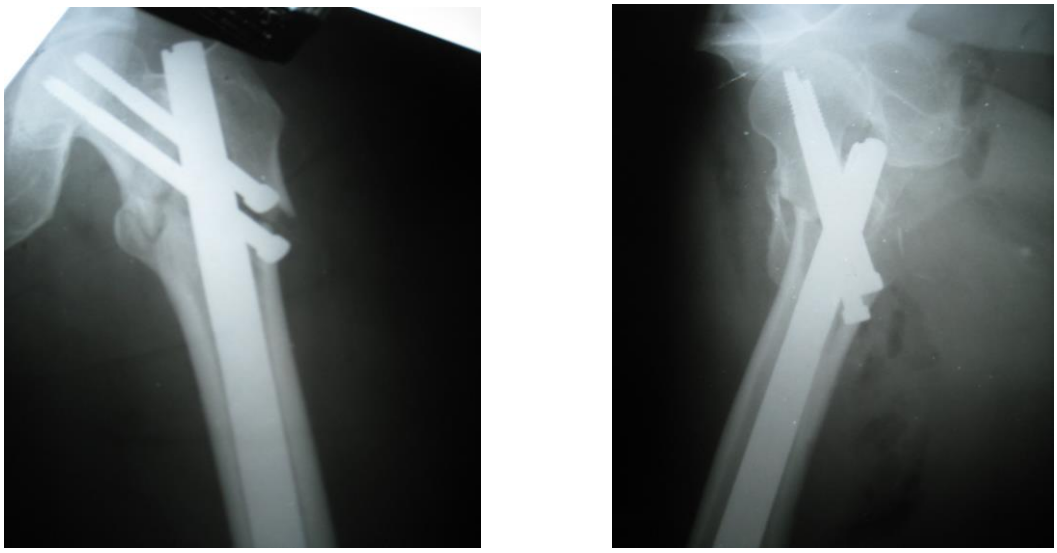

Figure 4 :Post operative view

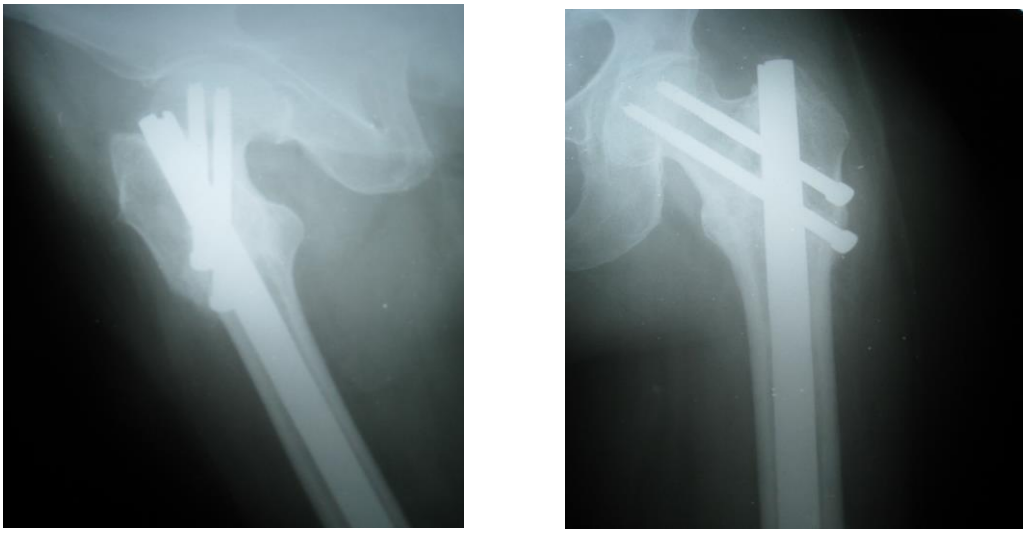

Figure 5: 6 months follow up view

Complications:

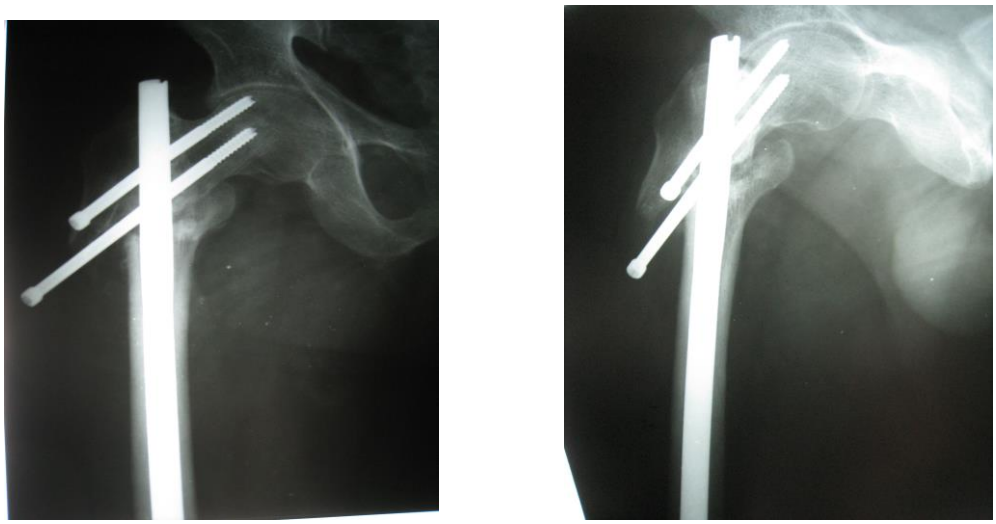

Figure 7: Inadequate anatomical reduction leading to failure

5. OBSERVATIONS AND DISCUSSION

Our series is no exception to the fact that the fractures of the proximal femur are more common in elderly population. The global epidemiology of these fractures also admit this fact. [Mary forte.et.al[4]]. The male preponderance in our series probably may be due to higher percentage of general male population. Tobacco abuse [in the form of chewing and smoking] and alcoholism are more common and widespread among male population in our country than females. These factors have an adverse affect on bone mineral metabolism thus affecting bone quality. These osteopenic / osteoporotic skeleton may be an associated factor coupled with increasing age for causing these fractures.

Majority [75%] of the patients in our series belong to lower socioeconomic status hailing from most backward and underdeveloped districts of Karnataka. Basic amenities of life like safe drinking water, sanitation, nutritious diet, and housing are lacking in most of the regions that they hail from. These patients needed longer hospital stay and prolonged recovery period. Further their return to normal activity level was also limited.

Poor dietary knowledge, very low per capita income coupled with more number of persons in each family, together has resulted in poor nutrition status of our patients which is exemplified by noting severe degree of nutritional anaemia in our patients. All these patients needed pre operative build up of nutritional status so as to enable them to undergo a major orthopaedic surgery. We have also observed a wretched post operative and follow up recovery in these patients.

As mentioned in numerous studies on proximal femoral fractures, regarding mechanism of injury, trivial fall [like tripping on the road, walking on uneven grounds] has been the main causative factor. The same is true in our series also. Only very few [10%] of our patients sustained fractures due to injuries other than trivial fall. However in our observation more than the mechanism of injury it is the bone quality that has prime impact on fracture pattern, decision making and end result.

All our patients in the series had severe unstable comminuted intertrochanteric fractures. This herd has been chosen with particular attention to study the methodologies of surgical management including the implant stabilization. We have also observed certain factors with regard to fracture patterns. Of these the extent of the fracture into the subtrochanteric region, comminution of lateral femoral cortex, comminution at the posteromedial region of the fracture had an important bearing in deciding the surgical methodology and selecting the fixation device so as to obtain a near normal proximal femoral reconstruction. 62.5% of the unstable fractures attained a stable configuration following reduction maneuver. 37.5% of fractures still remained unstable even after reduction maneuver. Non union was noted in 20% of these unstable fractures and 8% non union in stable fractures. All the unstable fractures that were anatomically reconstructed united well. This suggests that unstable fractures are more likely to go for non union. Such fractures need adequate open reduction and fixation by either dynamic condylar screw plate or intramedullary fixation. [Haidukewych et al].

Significant osteoporosis was noted in all our patients and this proves the fact as mentioned in literature that such fractures are common in osteoporotic bones. We observed persistent thigh pain in 12% of our patients at 1 year follow up. In 71% of these cases pain was due to implant backout. Implant related complications occurred in those patients having osteoporotic bones.

12 % of the patients had restricted activities of daily living because of pain due to implant backout. In rest of the patients no significant difference was noted with respect to the return to pre injury activity level at the end of 1 yr follow up. Hardy et al[5] noted in their series that though intramedullary fixation gave better mobility to the patient in the first month the difference was no longer seen at third, sixth months.

Limb shortening was noted 5% of patients. Varus reduction was noted to be a significant cause for this shortening. This is in comparision with the study done by hardy et al[5]. 20% of patients had restricted rotations because of implant back out and abductor weakness. 10% patient had varus collapse. This varus collapse was because of the varus reduction / improper screw placement in these fractures. These patients had a poor / fair functional outcome. Rest of our patients attained near normal neck shaft angle. Proximal locking screw back out was noted in 10% and distal screw back out was noted in 5% of patients. Impingement of the nail on the anterior cortex because of bowing of femur was also encountered in our cases. Non union was noted in 10% of cases. This too is attributed to inadequate reduction / unstable configuration following fixation and poor bone quality.When the fracture remained unstable even after fixation, improper implant positioning led to failure of union. All these suggests that to achieve good outcomes care must be given to the details of accurate reduction and to the appropriate positioning and insertion of implant and not based on fixation device.

Based on the kyle's criteria we had 70% excellent results, 15% good, and 10% poor results. In conclusion, intertrochanteric fractures are more common in the elderly age group. Trivial fall is the commonest mode of injury. Osteoporosis makes an individual more vulnerable for such fractures. Unstable fractures are more likely to go for non union. Such fractures need adequate open reduction and fixation by either dynamic condylar screw plate or intramedullary fixation. Varus collapse, improper implant positioning, leads to bad functional outcome and also affects union of fracture.

6. CONCLUSION

Achieving adequate fracture reduction and anatomical reconstruction is vital in attaining good outcome. However appropriate fixation device has to be selected based on the fracture pattern. Patients treated by proximal femoral nailing gained better range of movements. Majority of the fractures in which near normal anatomical reconstruction was done achieved union.

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