

Outcome of management of Intertrochanteric Fracture of femur with proximal femoral nailing.

Orthopaedic

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ABSTRACT

BACKGROUND: Retro spective Study of 20 cases of Intertrochanteric fracture of femur with Proximal femoral nailing

Inclusion criteria:

1. Fractures about Trochanteric area classified according to the Orthopedic Trauma Association system AO/OTA 31A1/A2/A3.
2. Patients with age 20 years & above.
3. All fresh fractures.

Exclusion criteria:

1. Patients younger than 20 years.
2. Non ambulatory patients.
3. Malunited fractures.

KEYWORDS:

Intertrochanteric fracture, Proximal femoral nailing, Reaming, Guide wire insertion.

Introduction

Intertrochanteric femoral fractures, they are the most frequently operated fractures; they have the highest post-operative fatality rate of surgically treated fractures¹. The incidence of fractures in Proximal femoral area has risen with increasing numbers of elderly persons with osteoporosis & road traffic accidents in young adults². In elderly patients the incidence has increased markedly in recent years. Due to their poor bone quality, it is very difficult to achieve & maintain a stable fixation. The aim of surgery is to achieve early mobilization & prompt return to pre-fracture activity level.

The most widely used extra-medullary implant- Dynamic Hip Screw {DHS}- seems to have a biomechanical disadvantage when compared with Intramedullary devices because the load bearing in Proximal femur is predominantly shared by the calcar. Intramedullary devices such as the Proximal femoral nail {PFN}, are more stable under loading with shorter lever arm, so the distance between hip joint & the nail is reduced compared with that of a plate, thus diminishing the deforming forces across the implant³.

The PFN system, developed by AO/ASIF, has some major biomechanical innovations to overcome the limitations of the DHS & Gamma nail:-

The addition of the 6.4mm anti-rotation hip pin to reduce the incidence of implant cut-out & the rotation of the cervico-cephalic fragments

The smaller diameter & fluting of the tip of the nail, specially designed to reduce stress forces below the implant & therefore the incidence of low-energy fracture at the tip.

The greater implant length, smaller valgus angle & setting of this angle at a higher level (11 cm from the proximal end)

The more proximal positioning of the distal locking, to avoid abrupt changes in stiffness of the construct. In this respect, it should be borne in mind that the neck screw must be adjacent to the calcar, taking into account the need to place the anti-rotational hip pin⁵.

AIMS AND OBJECTIVES

- 1) To assess clinical & functional results in Intertrochanteric fractures that was treated by closed reduction & internal fixation

using a Proximal Femoral Nail.

- 2) To assess intra-operative and post-operative complications of closed reduction and internal fixation of intertrochanteric fractures using a Proximal Femoral Nail.

MATERIALS AND METHODS

The study was conducted on 20 cases of intertrochanteric fractures admitted in Department of Orthopedics during June 2015 to October 2016. All cases reported to hospital were subjected to the following criteria.

Patients admitted with Intertrochanteric fracture were examined and investigated with X-ray pelvis with both hips AP and Lateral view (whenever possible). Skin traction was applied to all cases, up to 10% body weight till the date of surgery. Blood and urine examinations were ordered as follows:

INVESTIGATIONS

1. Blood – Hb%, Total count, Differential count, E.S.R, sugar levels, urea;
2. Urine routine;
3. Blood grouping and Rh type;
4. Bleeding time and Clotting time;
5. HIV, HbsAg, HCV;
6. Serum Creatinine;
7. ECG;
8. Chest X-ray And Cardiac evaluation if needed.

Physician fitness was taken for all cases. All the cases had Pre-Anesthetic evaluation before taken up for surgery. The cases posted for surgery were put on traction table after spinal or epidural anesthesia & closed reduction was performed. The fracture was reduced by traction, internal rotation, abduction & satisfactory reduction with opposition of major fragments & restoration of neck shaft angle (130° to 135°) & anatomy on the medial side was achieved. Reduction was confirmed with the aid of C-arm in both the views. The operative area was prepared, painted & draped. Through a skin incision made on the lateral aspect of thigh, fractures were fixed with a standard Proximal femoral nail (240 mm) under C-arm guidance. 6.4 mm hip screw & 8 mm neck screw were fixed 15 mm and 5 mm below the sub-chondral bone respectively.

Intra-operative period was uneventful.

In the post-operative period, antibiotics & analgesics were administered. Broad spectrum antibiotics (cephalosporins) were administered parentally an hour before surgery & was continued

post-operatively for 48 hrs & then was continued with oral antibiotics until suture removal.

Physiotherapy was started from 1st week and was continued for 8 weeks, and Non-weight bearing mobilization with the aid of an adjustable walking frame as tolerated in the 1st week of surgery depending on stability during intra-operative & immediate post-operative period & other factors like general condition & density of bone.

All patients were assessed clinically & functionally by Harris hip score at 6 weeks, 3 months & 6 months follow up. Proforma specially made for the study was used. Data collected at the end of the study was statistically compared and analyzed with the similar studies done before.

Operative procedure:

Patients were given spinal or epidural anesthesia and shifted to aradiolucent fracture table in a supine position. Operative leg was put on traction. Opposite limb was put in a full abduction as to give space for the C-arm between the legs. Reduction was achieved by traction and internal rotation primarily and adduction or abduction as required. Reduction was checked in a C-arm with anterior-posterior and lateral view. Limb was scrubbed, then painted and draped under sterile condition. A 5cm incision was taken above the tip of the greater trochanter and deepened to the gluteus medius muscle. Tip of the greater trochanter palpated and minimal muscle attachment was cleared off. After this PFN was fixed in a following manner:

1. Entry point

Insertion of the guide pin: It is on the tip of the greater trochanter at the virtual meeting point of the line drawn in the center of the neck and a line drawn in the femoral shaft 6° lateral.

2. Guide wire insertion

Guide wire: 2.8mm guide wire is inserted into the femoral shaft and across the fracture site in 6° of valgus. Its position is checked in the C-arm. And the entry is widened with the awl.

3. REAMING OF THE PROXIMAL FEMORAL NAIL: Reaming:

Reaming of the proximal femur is done.

4. Nail insertion: Nail is fixed on the jig and the alignment is checked. Then the nail is inserted into the femur. The position of the holes for the hip screws is checked in the C-arm for the depth of the nail.

5. Placing the guide wire pins: Guide wire for the screws: Guide wires for the screws are inserted via the jig and the drill sleeve. The ideal position of the guide wires is parallel and in the lower half of the neck in AP views, in a single line in the center of the neck in the lateral views. The proximal wire is 15mm from the sub-chondral bone and the distal wire 5mm from the sub-chondral bone.

6. Inserting the screws after the final setting: **Insertion of the screw:** First the 8mm hip screw is inserted after reaming over the distal wire and then the 6.5mm cervical screw. The hip screw is placed 5mm away from the sub-chondral bone. And the cervical screw 15mm away from the sub-chondral bone. Or both the screw tips make one horizontal line when joined. **Distal screws:** One or two static or dynamic 4.9mm interlocking bolts are inserted via the jig into the distal part of the nail. Out of which one is a static and another is a dynamic hole. It is done after removing the traction along with the tightening of the proximal screws.

The final position of the nail was checked in the C-arm in both views and the wound was closed in layers. Patient was given an IV broad spectrum cefalosporin one dose pre-operatively and followed BID dose till 48 hrs depending on the condition of the wound and patient followed by oral antibiotics until suture removal.

Following parameters were noted intra-operatively:

1. Total time of the surgery.
2. blood loss: it was counted approximately by counting 50ml per mop used.
3. Intra-operative complications.

Pre Operative photo



Fig 1: showing Intertrochanteric fracture of femur (Right)

Intra operative photos

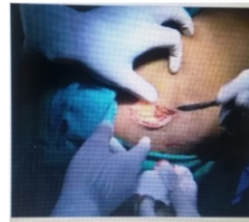


Fig.2: Incision

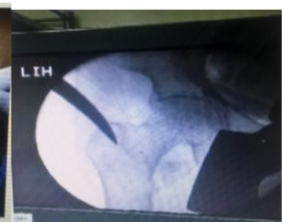


Fig.3: Entry point



Fig.4: Placement of hip screws

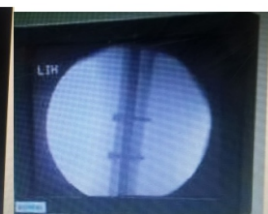


Fig.5: Distal locking

Post operative photos



Post op x-ray showing proximal femoral nail in situ

POST OPERATIVE CARE:

The limbs were elevated on pillow and patients kept under observation in recovery room until stable then shifted to ward. IV antibiotics were continued for first 48 hours and then it was followed by oral antibiotics until suture removal. Static quadriceps exercises were started on the 2nd-3rd postoperative day. Active quadriceps and hip flexion exercise were started on 6th and 7th post-operative day. Dressing was done on 2nd and 5th post-operative days. Sutures were removed on 10th post-operative day.

Patients were advised for non-weight bearing mobilization with the aid of an adjustable walking frame as soon as tolerable. Full weight bearing walking was allowed after assessing for radiological and clinical union.

DISCUSSION

The successful treatment of Intertrochanteric fractures depends on many factors like:

1. Age of the patient;
2. Time from fracture to treatment;
3. The

adequacy of treatment; 4. Concurrent medical illness; 5. Stability of the fixation; 6. Osteoporosis

At present it is generally believed that all Intertrochanteric fractures should be internally fixed to reduce the morbidity and mortality of the patient. But the appropriate method and the ideal implant by which to fix the Intertrochanteric fracture is still in a debate. Because each method having its own advantages and the disadvantages.

In the present study 20 patients with Intertrochanteric fractures were studied.

1) AGE:

In the present study the average age was 60.65 years with minimum age being 45 years and maximum age being 80 years.

In a study done by Ozkan K et al² the average age was 62 years with minimum age being 21 years and maximum age being 93 years. Where as In a comparative study done by Ujjal Bhakat et al⁸, the average age was 67.8 years with minimum age being 51 years and maximum age being 79 years. In a study done by W.M Gadegone et al⁶ the average age was 69 years with minimum age being 33 years and maximum age being 82 years. Where as In a study done by Zhi Li et al⁹ the average age was 75.61 years with minimum age being 65 years and maximum age being 91 years. And In a study done by Domingo et al¹⁰ the average age was 80.1 years.

2) SEX:

In the present study, out of the 20 patients studied 13 were male patients and 7 were females. There was an increase in male to female ratio of 1.8:1 with 13 being males and 7 being females which was similar to W.M. Gadegone et al⁶ who had a male to female ratio of 1.7:1 with 62 males and 36 females and Ozkan K et al² who had a male to female ratio of 1.5:1 with 9 males and 6 females.

Unlike the present study there was female predominance in other studies like Domingo et al¹⁰ with a ratio of 1:3 with 76% being female patients. K Akan et al¹¹ who studied 80 patients with 18 being males and 62 being females with a ratio of 1:3. Zhi Li et al⁹ who studied 66 males and 90 females with a ratio of 1:1.3

3) MODE OF INJURY:

The most common mode of injury in our study was domestic fall in 9 patients accounting to 45%. The other modes of injury were RTA in 7 patients accounting to 35% and fall at work place in 4 patients accounting to 20%. The mode of injury was also affected by the age, as older patients were more likely to sustain a fracture by domestic fall.

W.M Gadegone et al⁶ in his study observed the most common mode of injury to be domestic fall in 75% of patients, while RTA accounted for 25% of patients. And Minos Tyllianakis et al⁵ in his study observed that domestic fall was the most common mode of injury accounting to 67% of patients while RTA accounted for 12 patients (27%).

4) SIDE OF INJURY:

In the present study 40% patients (8 patients) had right sided fracture and 60% patients (12 patients) had left sided fracture.

Ozkan K et al² in their study observed that 66.66% patients (10 patients) had right sided fracture and 33.33% (5 patients) had left sided fracture. And Pu JS et al³ in their study observed that 35.6% patients (31 patients) had right sided fracture and 64.3% patients (56 patients) had left sided fracture.

5) FRACTURE PATTERN:

In the present study 14 patients (70%) had 3.1 A2 fracture pattern and the remaining 6 patients (30%) had 3.1 A3 fracture pattern.

In a study done by Domingo et al¹⁰, 26% patients had 3.1 A1 fracture pattern, 59% had 3.1 A2 fracture pattern and 15% had 3.1 A3 fracture pattern. Where as In a study done by W.M Gadegone et al⁶ 36 patients

(37.5%) had 3.1 A1 fracture pattern, 40 patients (41.6%) had 3.1 A2 fracture pattern, 20 patients (21.5%) had 3.1 A3 fracture pattern and 4 patients had combination of injuries. And In a study done by K. Akan et al¹¹ 34 patients (42.6%) had 3.1 A1 fracture pattern, 34 patients (42.6%) had 3.1 A2 fracture pattern and 12 patients (15.1%) patients had 3.1 A3 fracture pattern. In a study done by Ujjal Bhakat et al⁸ 17 patients (56.6%) had 3.1 A2 fracture pattern and 13 patients (43.4%) had 3.1 A3 fracture pattern.

6) SINGH'S INDEX:

Osteoporosis was measured by the Singh's index. More osteoporosis was present in older patients and post menopausal females. In our study 45% had a grade -3 osteoporosis which was in comparison to the Indian study of Singh & Maini⁷. K. Akan et al¹⁶ in their study observed that 18.8% patients had Grade 1 Singh's index, 38.8% patients had Grade 2, 31.3% patients had Grade 3, 10% patients had Grade 4 and 1.3% patients had Grade 5 Singh's index. Ujjal Bhakat et al⁸ in their study observed that 13.33% patients had Grade 1 Singh's index, 23.33% patient had Grade 2 Singh's index, 20% patients had Grade 3 Singh's index, 20% patients had Grade 4 Singh's index, 13.33% patients had Grade 5 Singh's index and 10% patients had Grade 6 Singh's index. Domingo et al¹⁰ in their study observed that 70% of patients studied had a Singh's index of grade 3 & 4.

In the present study 5% patients had Grade 2 Singh's index, 45% patients had Grade 3 Singh's index, 10% patients had Grade 4 Singh's index, 20% patients had Grade 5 Singh's index and 20% patients had Grade 6 Singh's index.

7) BLOOD LOSS:

In the present study the average intra operative blood loss was very minimal. The average was 80 ml. Only 2 (10%) of the patients required post operative transfusion as they had very low pre-operative hemoglobin (9-10 gm%).

Ujjal Bhakat et al⁸ in their study observed that the average blood loss in the PFN group was 116 ml and in the DHS group was 213 ml, blood loss is less in PFN which is statistically significant, p value < 0.0001. And Pu JS et al³ in their study observed that the mean blood loss was 80 ml in A.2 fractures and 200 ml in A.3 fractures. 38% of patients required blood transfusion

8) SURGERY TIME:

In the present study, the average operating time was 53.25 minutes from the incision to skin closure with minimum operating time being 35 minutes and maximum being 80 minutes. We had a greater operating time in the beginning which reduced greatly in the later part of the study. This signifies the learning curve of the Proximal femoral nailing.

Ujjal Bhakat et al⁸ in a comparative study between Proximal Femoral Nailing and Dynamic Hip Screw in Intertrochanteric Fracture of Femur done in 2013 noted that the average duration of surgery for the PFN (Avg. time 48.73 min) was shorter than DHS (Avg. time 69.03 min), which was statistically highly significant with a p value < 0.0001. And Pu JS et al³ in their study observed that the mean duration of surgery was 53 min for the A.2 fractures and 78 min for A.3 fractures.

In the present study the average hospital stay was 14.08 days. It was more in patients with co-morbid conditions and complications with highest being 22 days.

9) COMPLICATIONS:

Total complications in the present study were 15%. "Z - effect" was seen in 5% (1 patient) of patients which was mostly due to improper placement of the hip screw or cervical screw and early mobilization of the patients. This was comparable to W.M. Gadegone et al⁶ where 7% of the patients had superficial infection and 3% of the patients had Z-effect, which was slightly lower than the present study.

K.Akan et al¹¹ in their study of 80 patients observed total complications in 8 patients (10%) and Z-effect in 1 patient (1.25%).And Werner Tutschku et al¹² in their study of 70 patients observed total complications in 18 patients (25.7%) and Z-effect in 5 patients (7.1%).

In the present study infection was present in 10% (2 patients) of the patients which was superficial and was treated with antibiotics and regular dressing in the ward, none required debridement or implant removal or revision surgery and healed well.

In the series of 295 patients with trochanteric fractures treated with PFN by Domingo et al¹⁰, the average age of the patient was 80.1 years, which possibly accounted for 27% of the patients developed complications in the immediate postoperative period. There was no case of non-union or greater trochanter splintering which is usually encountered while inserting the nail. There was shortening of 0.5 to 1 cm seen in 8 patients.

Ujjal Bhakat et al⁸ in their study observed average shortening of 0.5 cm in the PFN group. Results were evaluated by Harris Hip Score². In our series we had 60% excellent, 25% very good, 10% good and 5% poor results which was similar to Ozkan et al² that concluded the use of PFN is a good option in the treatment of intertrochanteric fractures especially the reverse oblique type. The functional outcome of patients were evaluated at each follow up. The mean score was 55.9, 75.9 & 87.5 at 6 weeks, 3 months & 6 months respectively.

In the present study the mean Harris hip score at 6 months was 87.5 which was comparable to Ujjal Bhakat et al⁸ who reported mean Harris hip score of 82.8 at 6 months. We also cross tabulated the functional outcome with gender & fracture pattern which showed 8 male patients & 4 female patients showed excellent results and 12 patients with 3.1 A2 fracture pattern had excellent results. One of the important factor in our study was the cost of the implant as Proximal femoral nail is costly than the dynamic hip screw, but at the end it didn't cause much of a difference as:

1. Less operative time thus reducing the cost; 2. No or less need of transfusion of blood; 3. Post-operative antibiotics were used less reducing the cost of the drugs; 4. Less hospital stay; 5. Early return to daily activities.

SUMMARY

- 20 patients of either sex with Intertrochanteric fractures were studied with followup, up to 6 months.
- The mean age of the patient was 60.65 years with male: female ratio of 1.8:1.
- 45% fractures were due to domestic fall, 20% due to fall at work place and 35% were due to road traffic accidents.
- The most common side involvement in the study was left hip accounting for 60%
- 70% had 3.1 A2 type of fracture pattern and the remaining 30% had 3.1 A3 or reverse oblique pattern.
- 45% of patients had grade-3 Osteoporosis.
- Average blood loss was 80 ml and 2 patients required post-operative blood transfusion.
- The average Operating time was 53.25 minutes.
- In all cases, fractures were reduced by closed method on a fracture table with the aid of C-Arm.
- All cases underwent fracture fixation with standard Proximal femoral nail (240 mm)
- Total complications were 15%, with superficial infection being 10% and Z-effect being 5%
- The average hospital stay was 14.08 days.
- We had 60% excellent, 25% very good, 10% good & 5% poor results according to Harris hip score.
- Our results were comparable with most of the similar studies.

CONCLUSION

We conclude from our study that Proximal femoral nail (PFN) can be

considered the most rational method of treating intertrochanteric fractures, especially the unstable & reverse oblique type due to the following reasons:

- Minimally invasive procedure with less operating time & less bloodloss.
- Closed technique preserving the fracture haematoma, leading to early union & early mobilization.
- It is used with equal good results in all grades of osteoporosis.
- Rate of complications being minimal.
- Early mobilization and weight bearing.

But Proximal femoral nailing requires a higher surgical skill, good fracture table, good instrumentation and good C-arm control. It has a steep learning curve.

Thus we can conclude that the PROXIMAL FEMORAL NAIL is after proper training and technique a safe and easy implant option for treatment of complex intertrochanteric fractures.

REFERENCES

1. Koval KJ, Cantu RV. Intertrochanteric fractures. In: Bucholz RW, Heckman JD, Courtbrown CM, Tornetta III P, McQueen MM, Ricci WM. Rockwood and Green's Fractures in adults 7th ed: Lippincott Williams & Wilkins; 2010:1597.
2. Ozkan K, Eceviz E, Unay K, Tasyikan L, Akman B, Eren A. Treatment of reverse oblique trochanteric femoral fractures with proximal femoral nail. *Int Orthop*. 2011; 35(4): 595-8.
3. Pu JS, Liu L, Wang GL, Fang Y, Yang T. Results of the proximal femoral nail anti-rotation (PFNA) in elderly Chinese patients. *Int Orthop*. 2009; 33(5): 1441-4.
4. Morihara T, Arai Y, Tokugawa S, Fujita S, Chatani K, Kubo T. Proximal femoral nail for treatment of trochanteric femoral fractures. *Journal of Orthopaedic Surgery* 2007; 15(3): 273-7.
5. Tyllianakis M, Panagopoulos A, Papadopoulos A, Papasimos S, Mousafir S. Treatment of extracapsular hip fractures with the proximal femoral nail (PFN): Long term results in 45 patients. *Acta Orthopaedica Belgium* 2004; 70: 444-54.
6. W.M. Gadegone, Y.S. Salphale. Proximal femoral nail- an analysis of 100 cases of proximal femoral fractures with an average follow up
7. Singh M, Nagrath AR, Maini PS. Changes in trabecular pattern of the upper end of femur as an index of osteoporosis. *J Bone Joint Surg* 1970; 52A: 457-67.
8. Bhakat U, Bandyopadhyay R. Comparative study between proximal femoral nailing and dynamic hip screw in intertrochanteric fractures of femur. *Open journal of orthopaedics* 2013; 3: 291-295.
9. Li Z, Liu Y, Liang Y, Zhao C, Zhang Y. Short vs long intramedullary nails for treatment of Intertrochanteric hip fractures in patients older than 65 years. *Int J Clin Exp Med*. 2015 Apr 15; 8(4): 6299-6302.
10. Domingo LJ, Cecilia D, Herrera A, Resines C. Trochanteric fractures treated with a proximal femoral nail. *Int Orthop* 2001; 25: 298-301.
11. Akan K, Cift H, Ozkan K, Eceviz E, Tasyikan L, Eren A. Effects of osteoporosis on clinical outcomes in Intertrochanteric hip fractures treated with a Proximal femoral nail. *The Journal of International Medical Research* 2011; 39: 857-865.
12. Werner-Tutschku W, Lajtai G, Schmeidhuber G, Lang T, Pirkel C, Orthner E. Intra and perioperative complications in the stabilisation of per- and subtrochanteric femoral fractures by means of PFN. *Unfallchirurg*. 2002; 105(10): 881-885.