



Outcomes Of Proximal Femoral Nail in Subtrochanteric femur fractures through Medial Entry

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ABSTRACT

Background: Subtrochanteric fractures of the femur remain some of the most challenging fractures facing Orthopaedic surgeons. Internal fixation of these fractures has gained widespread acceptance but the problems i.e. malunion, nonunion, implant failure, refracture and infection encountered after surgical treatment of these fractures have prompted continued development of new devices and treatment programs. We study the outcome of these fractures treated with long proximal femoral nail.

Methods: All patients above 16 years of age who presented to our emergency department with subtrochanteric fracture of the femur were included in the study. Radiographs were taken and all the fractures were classified according to the Seinsheimers classification. All patients underwent fixation with the proximal femoral nail. The functional outcomes of the patients were assessed using the Modified Harris hip score.

Results: There were 20 males and 6 females in our study. According to the Seinsheimers classification we had 10 patients with type II fracture, 11 patients with type III fracture, 3 patients with type IV fracture and 2 with type V fracture. The average Harris hip score at the end of 1 year follow up was 82. There were 16 patients with an excellent Harris hip score, 10 patients with a good score at the end of 1 year. We had 8 minor complications in our study, all fractures went on to unite and there was no implant failure.

Conclusions: In our study we had good results with the proximal femoral nail, it requires minimal exposure and achieves biological fixation. It allows early weight bearing which is beneficial and has fewer implant related complications. Proximal femoral nail is a good choice of implant for fixation of subtrochanteric fractures.

KEYWORDS :

INTRODUCTION

Subtrochanteric fractures of the femur remains some of the most challenging fractures facing orthopaedic surgeons. They account for 10 to 15 % of all hip fractures.¹ Osteoporosis, severe comminution and high stresses in this region of the skeleton can lead to failure of fixation, shortening, malrotation and non-union. Furthermore the involved bone is cortico-diaphyseal, rather than the more rapidly healing cancellous bone that predominates in the intertrochanteric region. There is a bimodal distribution with 1/3 of these fractures occurring in young patients with high energy injury and 2/3 in the elderly population with low energy injuries and osteoporotic bone.² Subtrochanteric fractures have been variously defined but most authors' limit the term to fractures occurring between the lesser trochanter and isthmus of the diaphysis of the femoral shaft. Fielding and Magliato have defined it as fractures occurring between a line extending from the superior border of the lesser trochanter to a line 7.5 cm distal to it.³ The mechanism of injury varies with age. In younger patients, the fracture is more commonly caused by high energy trauma. In older age groups, the fractures occur with low energy trauma as in a simple fall. Bergman and colleagues noted an average age of 40.6 years in high energy trauma group and an average age of 76.2 years in the low energy group.⁴ Closed management of these injuries poses difficulty in obtaining and maintaining a reduction making operative management the preferred treatment. Internal fixation of these fractures has gained widespread acceptance but the problems i.e. malunion, nonunion, implant failure, refracture and infection encountered after surgical treatment of these fractures have prompted continued development of new devices and treatment programs. The theoretical and biomechanical advantages of cephalomedullary implants over plate fixation are attributed to a reduced distance between the hip joint and the implant. These further results in a reduced bending movement across the implant

and fracture site and allow the load to be transferred directly to the femoral shaft, bypassing the calcar femorale. Despite these advantages cephalomedullary nails have been associated with a number of complications including periimplant fracture and thigh pain.⁵ The objective was to study the outcome of these fractures treated with proximal femoral nail.

Proximal femur nails are designed forentry from the tip of trochanter, as it is more subcutaneous than the pyriform fossa, reduces the risk of damage to medial circumflex femoral artery and superior gluteal nerve. But this resulted in varus malalignment of the proximal fragment with too lateral of the entry point. An ideal entry point suggested by the manufacturers also results in slight varus deformity.

In such situation as Suggested by Richard¹⁴ et. al. slight medial entry leads to valgus alignment which is desired along with the anatomical reduction while nailing subtrochanteric fractures. In the study conducted by Perez et al. Suggested that slight more medial entry also protected abductors and caused no damage

Materials and Methodology

All patients who presented to our emergency department from June 2015 to December 2016 with subtrochanteric fracture of the femur admitted in Sheth V.S. General hospital Ahmedabad were included in the study. All skeletally mature patients who were above 16 years of age with fracture of non-pathological origin and who were able to walk prior to the fracture were included in the study. Patients not giving consent and those who are not willing for followup were excluded from the study. Radiographs were taken and all the fractures were classified according to the Seinsheimer's classification. Patients were worked up and pre-anesthetic checkup was done. Preoperatively antibiotics were given according to the

hospital protocol. All patients underwent fixation with the proximal femoral nail.

The study was conducted after the approval given by the Institutional review board committee.

SURGICAL PROCEDURE

The patient was placed in supine position on fracture table with adduction of the affected limb by 10-15 degrees and closed reduction of the fracture was done by the traction and internal rotation. The unaffected leg was flexed and abducted as far as possible or kept in wide abduction. The image intensifier was positioned so that anterior-posterior and lateral views of hip and femur could be taken. Open reduction was performed if closed reduction failed. A skin incision measuring 3-5cm was made proximal to tip of greater trochanter on the proximal extension of anatomical femoral bow. Skin, subcutaneous tissue and fat separated and gluteal muscle split along its fibres. Tip of greater trochanter was exposed. In AP view under image intensifier, the entry point was selected medial to the tip of greater trochanter. In lateral view, guide wire position was confirmed in the center of the medullary cavity. The medullary canal was entered with a curved bone awl, the guide wire was inserted into the medullary canal. Using a cannulated conical reamer proximal femur was reamed for a distance of about 7cms. After confirming satisfactory fracture reduction, an appropriate size nail as determined preoperatively and intraoperatively was assembled to insertion handle and inserted manually. This step was done carefully without hammering by slight twisting movements of the hand until the hole for 8mm screw was at the level of inferior margin of the neck. Open reduction was performed in case satisfactory reduction was not possible by closed means. Guide wire for hip pin and neck screw were inserted with the help of aiming device lightly screwed to the insertion handle. A 2.8 mm guide wire was inserted through the drill sleeve after a stab incision. This guide wire was inserted 5mm deeper than the planned screw size. The final position of the guide wire should be in the lower half of the neck in AP view and in the center of the neck in lateral view. A second 2.8 mm guide wire was inserted through the drill sleeve above the first one for hip pin. The tip of this guide wire was positioned approximately 25-20mm less deep than planned neck screw. Drilling was done over 2.8mm guide wire until the drill was 8mm short of tip of the guide wire. Tapping was not done as neck screw is self tapping. Neck screw was inserted using cannulated screw driver. Similarly appropriate length hip pin was inserted. Length and position of the screw was confirmed under c-arm image intensifier. Distal locking was usually performed with two cortical screws. A drill sleeve system was inserted through a stab incision. A drill hole was made with 4mm drill bit through both cortices. Locking screw was inserted and position was confirmed with image intensifier. After fixation was over, lavage was given using normal saline and incision was closed in layers. Suction drain was used in case open reduction was performed

POSTOPERATIVE AND FOLLOWUP PROTOCOL

Postoperatively, patients were encouraged to sit in the bed after 24 hrs following surgery. Patients were taught Quadriceps static exercise and knee mobilization in immediate postoperative period. Patients were taught gait training before discharge from hospital. All the patients were followed up at 4 weeks, 12 weeks and then at every 6 weeks interval thereafter till fracture union was noted. Patients were serially followed up at 6 months, 9 months and 1 year. At each visit, patient was assessed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening. Hip function in each patient was assessed by using the Modified Harris Hip Scoring System.

Results

30 patients with subtrochanteric fractures were included in the study out of which 4 patients were lost to follow up. Therefore the final outcome analysis was done in 26 patients. The average age of the patients was 50 years. There were 20 males and 6 females in the

study. Road traffic accident (RTA) was the most common mode of injury in 15 (58%) patients, trivial fall was the next common cause in 8 (31%) cases and fall from height was seen in 3 patients (11%). According to the Seinsheimer's classification we had 10 patients with type II fracture, 11 patients with type III fracture, 3 patients with type IV fracture and 2 with type V fracture (Table 1).

Table 1: Number of patients according to Seinsheimer's classification.

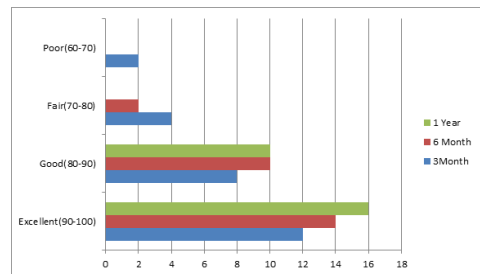
Seinsheimer type	Type II	Type III	Type IV	Type V
No of patients	10	11	3	2

Table no. 2:- Modified Harris Hip scoring for functional evaluation of Hip Point scale with maximum of 100 points distributed as follows:-

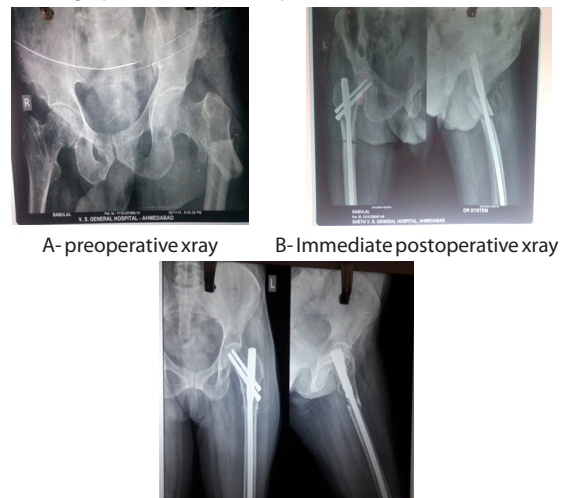
Pain	44
Function	47
Range of motion	05
Absence of deformity	04
Total	100

The score is reported as follows:-
 HHS between 90 to 100- Excellent results
 HHS between 80 to 89- Good
 HHS between 70 to 79- Fair
 HHS between 60 to 69- Poor, and
 HHS below 60:- as a failed result.
 * HHS: - Harris Hip Score

The average modified Harris hip score at the end of 1 year follow up was 82. There were 16 patients with an excellent Harris hip score, 10 patients with a good score at the end of 1 year of followup. (Figure).



Case1: A 45 year old male patient sustained road traffic accident presented with Seinsheimers typeIIa subtrochanteric fracture fixed with proximal femoral nail showing immediate postoperative xray and radiograph 6 months followup.



A- preoperative xray

B- Immediate postoperative xray

C-6Months follow up xray

CASE2: A 35 Year old female patient sustained road traffic accident presented with Seinsheimers type IIIa subtrochanteric femur fracture fixed with proximal femur nail showing preoperative

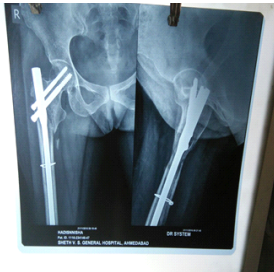
, immediate postoperative and 6 months follow up xray.



A-Preoperative xray



B- Immediate postoperative xray



C-6months followup xray

Discussion

Subtrochanteric fractures of the femur are usually the result of high energy trauma, the fracture fragments are significantly displaced, because of which there is difficulty in closed reduction and maintenance of reduction. Because of the high incidence of malunion, non-union and delayed union, there is no role of conservative treatment as previously advocated by Lee et al.⁷ 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 on to problems in fracture union and also implant failure. Intramedullary fixation is a more biological fixation and has mechanical benefits over extramedullary fixation.⁸

The proximal femoral nail acts like an internal splint and can bear a large axial load, this allows the patient early weight bearing. It is performed through a small surgical incision, so it is minimally invasive and reduces blood loss. Some disadvantages of the proximal femoral nail which have been reported include cutout of implant, lateral migration of proximal screws and femoral medialization.^{9,10}

Our study shows a good outcome of subtrochanteric fractures treated with the proximal femoral nail (PFN). We had good to excellent results in 19 (73%) of our patients. Below 60 years patients had a better average Harris hip score (93) compared to the above 60 years patients (average 75). Majority of our patients were either type 2 or 3 Seinsheimer's subtrochanteric fractures.

Kish et al did a study on 46 patients with unstable pertrochanteric and subtrochanteric fractures.¹¹ The average age of the patients was 78 years. All the patients in their series were allowed immediate full weight bearing. There was 1 case of shortening more than 1 cm, 1 case of cutting out was observed. They concluded that the use of a PFN appears to be advantageous and a beneficial alternative to DHS in elderly patient's unstable pertrochanteric fractures and subtrochanteric fractures as it allows the patient immediate full weight bearing thus decreasing the post-operative morbidity. We also allowed our patients immediate weight bearing as tolerated in our patients and had good results.

Harris et al did a comparative study of the subtrochanteric fractures treated with the 95 degree blade plate and the proximal femoral nail.¹² A total of 41 patients were studied. There was a failure rate of 6 (29%) patients in the patients treated with the 95 degree blade plate whereas there was no failure in the patients treated with the PFN.

They concluded that internal fixation of subtrochanteric femur fractures with a 95-degree angled blade plate is associated with increased implant failure and revision compared to closed intramedullary nailing using a proximal femoral nail. We also had no failures in our study.

Jiang LS et al did a study on 49 patients with subtrochanteric fractures treated with the long proximal femoral nail.⁵ They achieved union in all their cases but one case had delayed union. They had no complications like cut out or breakage of the implant. They concluded that long proximal femoral nail or long gamma nail is a reliable implant in treatment of subtrochanteric fractures and leads to a high rate of bone union with minimal soft tissue damage. We also had similar results in our study.

Sahin EK et al did a comparison of proximal femoral nail antirotation with dynamic condylar screw in the elderly in the treatment of pertrochanteric fracture of the femur.¹³ They found that the mean salvati-wilson hip score was 31 in the PFNA group and 26 in the DCS group. They had good results in 73.9% of the patients in the PFNA group and 70% in the DCS group. They concluded that PFNA is a better choice as it has minimal exposure, reduce blood loss and achieves biological fixation

CONCLUSION

In our study we had good results with the proximal femoral nail, it requires minimal exposure and achieves biological fixation. It allows early weight bearing which is beneficial and has fewer implant related complications. Proximal femoral nail is a good choice of implant for fixation of subtrochanteric fractures.

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