

Functional Outcome of Proximal Femur Fracture Managed Surgically using Proximal Femoral Nail (PFN)

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ABSTRACT

Introduction: Proximal fractures of femur are the most frequently occurring fracture especially the intertrochantric in elderly. The goal of treatment is early restoration of the patient to their pre-injury status. Multiple modalities of treatments are available, since the fracture patterns are not uniform and the morphology has significant variations. Using PFN for fracture fixation has less blood loss, improved early mobilization, reduced rate of infection and mal union was noted in among these patients. Objective of our study was to assess the functional outcome of these fractures managed surgically using PFN.

Material and Methods: This is a prospective study, on patients with proximal femoral fractures in the age group of 40 to 75 years. Period of study was from June 2011 to June 2016. 54 Patients were selected for the study from those presenting to our hospital. The outcome was assessed based on Kyle's Criteria.

Results: Based on the Kyle's criteria 68.5 % i.e 37 patients showed excellent results. 16.67 % of patients i.e 9 patients had minimal pain at 12th month of follow up, following surgery. 68.5 % of patients returned to their pre injury status in terms of daily routine activities. Only 3 patients had limb shortening of around 2 cm.

Conclusion: In unstable proximal femur fractures achieving anatomical reduction and stable fixation is vital in attaining good outcome. PFN is a good minimally invasive option with minimal soft tissue handling. Patients treated by proximal femoral nailing gained good outcome.

Keyword: Proximal femur, Intertrochanteric fractures, Subtrochantric fractures, Proximal femoral nail.

INTRODUCTION

Hip fractures are a growing concern for the orthopedic surgeons all over the world, because the incidence of hip fractures is increasing dramatically and these fractures impose a significant challenge in their efficient management.¹

Among the fractures in upper end of femur, trochanteric and sub trochanteric fractures account for more than half of the hip fractures in elderly. These fractures are seen usually in 6th -7th decade, frequently resulting from simple fall. Now-a-days due to rapid industrialization and automobiles these fractures are also common in young age group.²

As compared to conservative treatment, operative treatment is better tolerated by elderly because of greater comfort, early mobilization of patient, lowered morbidity and mortality of patient.³ In subtrochanteric fractures operative treatment is imperative as there is limited role for conservative management.⁴ Using proximal femoral nail for fracture fixation has been associated with less blood loss, improved early mobilization, reduced rate of infection and mal union. Objective of the present study was to assess the functional outcome of these fractures managed surgically using PFN.

MATERIAL AND METHODS

This was a prospective study, conducted after the institutional ethical committee clearance, on patients with proximal femoral fractures in the age group of 40 to 75 years. The period of study was 5 years from June 2011 to June 2016. 54 Patients (36 intertrochantric and 18 subtrochantric fractures) were selected into the study from those presenting to Karnataka Institute of Medical Sciences, Hubli. The data was collected with informed consent for the study from patient and their relatives by interview and analyzing records. Patients were followed up at intervals of 6th week, 12th week and 6 months post-operatively till they resumed their daily activities as pre injury state. The outcome was assessed based on KYLE'S CRITERIA - post operative pain, return to activities of daily living, range of movements, shortening of limb, neck shaft angle, implant position and radiological union.

Patients who fulfilled the inclusion criteria were included in the study. Inclusion criteria were 1. All proximal femoral fractures including intertrochantric and subtrochantric region. 2. Age of the patient > 20 years. Exclusion criteria were 1. Age of the patient < 20 yrs. 2. Compound fractures. 3. Pathological fractures. 4. Patients with associated injuries in the same limb or other limbs.

After hemodynamic stabilization of the patients, antero-posterior and lateral views of the involved extremity was obtained along with routine blood investigations. Age, sex, pre-fracture walking ability and mechanism of injury were recorded preoperatively. The operation was usually performed within two days of admission, in most cases.

In most cases fractures were reduced by closed means with a fracture table and open reduction in some where closed reduction failed. The standard short PFN for intertrochantric fracture and long PFN for subtrochantric fracture were used. Pre operatively the femur length was measured for the long PFN and diameter of 9 mm, 10 mm, 11 mm or 12mm was used by using approximately 4-5 cm skin incision which extended from the the tip of the greater trochanter. After splitting the fascia and muscles, an entry awl was inserted at the tip of the greater trochanter under fluoroscopic control in both planes. Guide wire was passed from proximal to distal fragment keeping the fracture in reduction. The proximal part of the femur was reamed with

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How to cite this article: S F Kammar, V K Bhasme, Akash Hosthota, Mayur Rabhadiya. Functional outcome of proximal femur fracture managed surgically using proximal femoral nail (PFN). International Journal of Contemporary Medical Research 2017;4(1):22-24.

trochanteric reamer and femoral shaft was reamed with 8mm - 12mm reamers based on the size of the isthmus. The nail attached to the jig was then introduced into the femoral shaft. Using image intensifier control the first guide wire for the neck screw was placed in the lower half of the neck. Then the guide wire for the derotational hip screw was introduced. Depending on the type of fracture, distal static or dynamic interlocking was done using the free hand technique or the jig for the short PFN. All patients received a prophylactic dose of an injection ceftriaxone 1gm intravenous antibiotic pre op and for 5 days post op. Patients were allowed to perform quadriceps-strengthening exercises the next day. Partial weight-bearing was allowed. Sutures were removed on post op day 10-12. In case of stable fractures full weight bearing was allowed usually at 6 weeks and in unstable fractures weight bearing was delayed until patient is free of pain and bony union is seen on X-rays. Post operatively patients were followed up at 6 weeks, 3 months, 6 months, and 12 months. At each follow up patients were assessed with X-rays (figures 1-4) by antero-posterior and lateral views of the operated limb and functional assessment was done in terms of pain, range of motion, return to work was carried out. The functional outcome was assessed by Kyle's criteria. Along with the fracture, we addressed the osteoporosis also with calcium and bisphosphonates.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used for the data interpretation.

RESULTS

Based on the Kyle's criteria 68.5% i.e 37 patients showed excellent results. 16.67% of patients i.e 9 patients had minimal pain at 12th month of follow up, following surgery 68.5% of patients returned to their pre injury status in terms of daily routine activities. The complications which we saw in our series of patients include superficial infection in 2 patients, lateral migration or backout of the screws in 3 patients, in 2 comminuted fractures varus angulation was observed. Only 3 patient had limb shortening of around 2 cm. Bed sores of grade 1 and 2 were seen in 4 cases and healed once patient s were mobilized.

Trivial fall was the most common mode of injury and was seen in 35 patients, Road traffic accident (RTA) was the next common cause and was seen in 17 cases and fall from height was seen in 2 patients. According to the Boyd's and Griffin classification we had 7 type I fracture, 19 type II fracture, 5 type III and type IV each. According to the Seinsheimer's classification we had 5 patients with type II fracture, 9 patients with type III fracture, 3 patients with type IV fracture and 1 with type V fracture. 16 patients had osteoporosis with Singh's index of grade 1 or grade 2. 23 patients had borderline osteoporosis of grade 3 or 4.

DISCUSSION

Intertrochanteric fractures are low energy trauma fractures seen in elderly and osteoporotic bones, whereas subtrochanteric fractures of the femur are usually the result of high energy trauma. Because of complex stress configuration in this region and its nonhomogeneous osseous structure and geometry, fractures occur along the path



Figure-1: Pre Operative X – ray:



Figure-2: Post Operative X- ray:



Figure-3: Collapse of structure:



Figure-4: DHS in unstable fracture

of least resistance through the proximal femur.⁵ In the subtrochanteric fractures the fracture fragments are significantly displaced i.e abduction, external rotation and flexion of the proximal fragment because of abductors and

iliopsoas muscles and medialization of distal fragment by adductors, 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 limited role of conservative treatment for subtrochanteric fractures as previously advocated. 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.⁶

The implants for treatment of unstable trochanteric fractures have evolved from the biomechanical view point. The first type of implant consists of sliding neck screw or bolt connected to a plate placed on lateral cortex of femur. This implant is inserted after closed reduction using a minimal invasive technique. In the year 1996 Arbeitsegmenin Schafftur Osteo Synthes Fragen (AO/ASIF) designed a new medullary device, the —Proximal femoral nail.

The proximal femoral nail (PFN) has additional anti rotational screw and the nail tip is specially shaped to reduce the stress and to prevent low energy fracture at the tip of the implant. Compared with DHS, PFN greatly reduces the lever arm distance from the reactionary forces generated in hip joint as a result of movements at the hip joint and increases compressive forces implanted to the tension side application of DHS.⁷

The proximal femoral nail acts like an internal splint and can bear a large axial load. This allows the patient early weight bearing. As 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 screws in head and neck, lateral migration of proximal screws and femoral medialization.⁸

For stable fractures, sliding hip screw there is no significant difference in failure rate when compared to PFN and so the DHS is preferred implant. For unstable fractures, the failure rate for a DHS is as high as 21%.⁹

During implant removal DHS requires an extensive incision as before, periosteal stripping, post operative immobilization and chance for re fracture is high because of loss of bone stock in the proximal femur, these are not seen in PFN implant removal, which can be day care procedure also.

Kish et al did a study on 46 patients with unstable pertrochanteric and subtrochanteric fractures.¹⁰ 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 patients with 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 and have good results.

Menezes et al reviewed 155 consecutive patients who were treated with a proximal femoral nail.¹¹ Fixation failure occurred in three patients (2%) which includes one cutout, one delayed union, and one lateral displacement of the antirotation screw.

One case of femoral shaft fracture (0.7%). The low rates of femoral shaft fractures and failure of fixation suggest the proximal femoral nail is useful for treatment of unstable inter trochanteric and subtrochanteric fractures. We have encountered cases with Z effect. Werner et al¹² detected in 5 (7.1%) of 70 cases. The incidence of cut-out of the neck screw in this study was 5.5%.

CONCLUSION

In unstable proximal femur fractures achieving anatomical fracture reduction and stable fixation is vital in attaining good outcome. PFN is a good minimally invasive stable fixation option with minimal soft tissue handling for these types of fractures. Patients treated by proximal femoral nailing gained good outcome according to Kyle's criteria.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 9-12-2016; **Published online:** 22-01-2017