

## Treatment of Subtrochanteric Femoral Fractures Using an Intramedullary Proximal Femoral Nail Versus Treatment of Subtrochanteric Femoral Fractures Using a Proximal Femoral Nail with A Trochanteric Support Plate

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**Abstract: Background:** Sub trochanteric femur fracture is proximal femur fracture that occur within 5cm of lesser trochanter. In the last few years with increased of knowledge of biomechanical and fracture biology management of sub trochanteric femur fracture have evolved to the next level. Comparison of sub trochanteric femur fracture treatment with intramedullary proximal femur nail vs intramedullary proximal femur nail augmented with trochanteric support plate. **Methods:** We retrospectively reviewed the clinical operative study was conducted at the department of orthopaedics on June 2006 to July 2007 BSMMU. Operative study was approved by the institutional ethics committee. Two groups were divided from 50 patients to 25 in each and first were treated with PFN and the other with a combination of PFN plus trochanteric support plate. **Results:** Total 60 patient were included in study 30 patients were treated with PFN and rest were treated with PFN with long trochanteric support plate. Patient were distributed in all age groups, the overall age of PFN group was 35 year and the average age of PFN with plate group was 37years. The PFN group had 20 male and 10 female and while the second group has 25 male and 5 female. At the end of 6 months all except 2 patients from group 1 mobilized unassisted while all the patient from group 2 got mobilized unassisted. Based on harries hip score. **Conclusion:** Intramedullary fixation with intra medullary proximal femur nail plus trochanteric support plate.is feasible for the treatment of subtrochanteric femur fracture. Intraoperative reduction and surgical skill are important for the clinical outcome and the patients.

**Keywords:** Femoral neck fractures, Fracture fixation, internal, Bone plates, Bone screws.

### Research Paper

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## INTRODUCTION

Subtrochanteric fractures are fractures of the proximal femur occurring within 5 cm of the lesser trochanter [1]. In recent years, treatment of subtrochanteric fractures has evolved to a new level due to increased knowledge of biomechanics and fracture biology. Previous conservative treatment of subtrochanteric fractures was associated with morbidity and mortality due to severe deformity, shortening, malrotation, and prolonged immobilization. Subtrochanteric fractures account for approximately 10-30% of all peritrochanteric fractures and affect people of all ages [2,3]. As the total load on the medial cortex is up to 1100 N, subtrochanteric fractures are usually comminuted and require reconstruction of the medial

cortex. The transferred load acts mainly on the subtrochanteric area, and the cortical bone in particular has a poor blood supply, which leads to delayed or nonunion, resulting in loss of fixation and implant failure [4]. Commonly referred to as the subtrochanteric region of the femur, it is the area of the femur below the lower limit of the lesser trochanter and extends distally for 7.5 cm to the junction of the proximal and middle thirds of the femur [5]. These are the most frequent fractures. Fractures occur in two patient groups: older osteopenic patients after low-energy falls and younger patients who have sustained high-energy trauma [2,5]. In older patients, minor slips and falls often result in direct lateral hip trauma, the most common injury mechanism. This age group is prone to metastases, which can lead to pathologic fractures. In young patients, the mechanism

of injury is always high-energy trauma, either direct or axial loading (e.g., fall from height), often resulting in a comminuted fracture. In this fracture, both the proximal and distal segments are compressed by the surrounding lesser and greater trochanter muscle attachments, and the proximal end is flexed and externally rotated by traction of the iliopsoas and abducted by the hip abductors and the distal end is flexed by traction of the adductor magnus. The high compressive tension of the muscles causes the fracture fragments to separate and become unstable. The proximal femoral nail (PFN) was developed as an intramedullary device for the treatment of subtrochanteric fractures. In addition to all the advantages of an intramedullary nail, the PFN has several other beneficial properties: B. It can be dynamically locked, allows early mobilization, has good rotational stability, and minimizes soft tissue damage. Therefore, a study was performed to analyze the union of subtrochanteric fractures internally fixed with PFN. However, extension into the intertrochanteric area is common. These account for approximately 10-30% of peritrochanteric fractures [6].

## MATERIALS AND METHODS

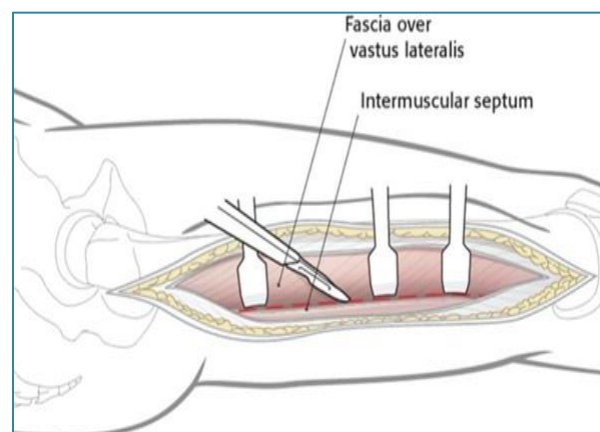
We retrospectively reviewed the clinical operative study was conducted at the department of orthopaedics on June 2006 to July 2007 BSMMU. Operative study was approved by the institutional ethics committee. Informed written consent was taken from the operative study participants. Individuals with subtrochanteric femur fracture >18 years of age were selected for the operative study and individual patients <18 years of age, pathological subtrochanteric fracture and open subtrochanteric femur fracture were not selected for the operative study. Operative study was conducted on 50 subtrochanteric fracture patients amongst them 25 individuals were treated with proximal femoral nail (PFN) and grouped in first group and other 25 treated with a combination of PFN with trochanteric support plate. For all the high-risk patients posted for surgery low molecular weight heparin was given and prior to surgery part preparation prophylactic antibiotics were administered. In the study hospital acquired complications, stay length at the hospital, required blood transfusions and immobilization period were recorded.

Overall, for all the high energy trauma associated fractures the management primarily consist of polytrauma management for initial fracture treatment. All high-risk life-threatening conditions for the patients are treated with utmost priority before shifting to definite management of subtrochanteric fracture. The patients who are severely injured the treatment should be directed towards damage control. As majority of fracture treating guidelines suggest non-operative treatment would only be applied to paediatric age group and the unfit patients for surgery under anaesthesia. In today's world with advancement of anaesthesia technology and monitoring

during the operation majority patients undergoing surgery have good predictable outcome.

For PFN insertion positioning of the patient was supine on the fracture table and spinal anaesthesia was given and patient was induced, reduction of the fracture was achieved by longitudinal traction on the fracture table and the position of limb was placed in slight adduction for nail insertion through pyriformis fossa. This procedure done is closed reduction and internal fixation [7].

For management of subtrochanteric femoral fracture which were treated with a combination of PFN with trochanteric support plate positioning of the patient was given supine on the fracture table and incision was given over lateral aspect from greater trochanter to the mid shaft. Fascia and subcutaneous fat were incised after which the tensor fascia lata and the vastus lateralis muscle were incised and retracted. Entry was made and the reduction was achieved by traction and manipulation of the bone fragments followed by insertion of nail through pyriformis fossa done after which a trochanteric support plate was fixed on the lateral aspect of the femur superimposed with the nail underneath the bone.



**Fig. 1: Showing approach used to access the subtrochanteric region**



**Fig. 2: Trochanteric support plate**

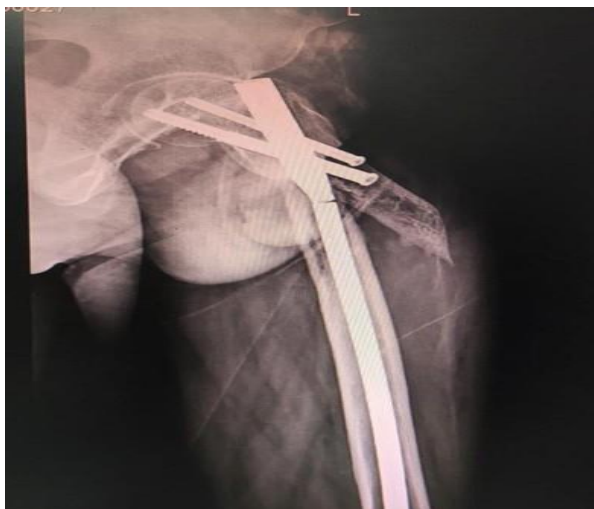
Postoperative results were assessed. This procedure done is called open reduction internal fixation.

## RESULTS

Total 60 patient were included in study, 30 patient were treated with PFN and rest were treated with PFN with long trochanteric support plate. Patient were distributed in all age groups, the overall age of PFN group was 35 year and the average age of PFN with plate group was 37years. The PFN group had 20 male and 10 female and while the second group has 25 male and 5 female. The average duration of hospital stay in group 1 was 5:50 days and group 2 was 7:00 days. At the end of 6 months all except 3 patients from group 1 mobilized unassisted while all the patient from group 2 got mobilized unassisted. Based on harries hip score 4 patient outcome was excellent, 20 were good and 6 was fair in group 1. While 15 were excellent, 9 were good and 6 fair in group 2. 1 patient from group 2 got complicated with in group 2. 1 patient from group 2 got complicated with infection which got manage subsequently.



**Fig. 3: Malreduced subtrochanteric femur fracture with broken implant insitu**



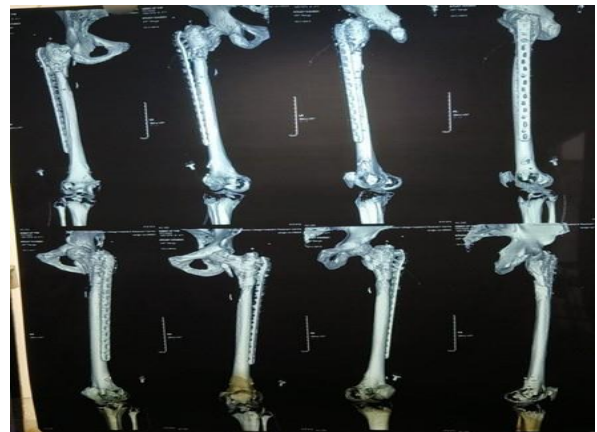
**Fig. 4: Malreduced subtrochanteric femur fracture with broken implant insitu**



**Fig. 5: Post operative subtrochanteric femur fracture- exchange nailing, with support plate insitu**



**Fig. 6: Post-operative subtrochanteric femur fracture- exchange nailing, with support plate insitu**



**Fig. 7: Post operative Ct scan- Subtrochanteric femur fracture Exchange nailing with support plate Insitu**

## DISCUSSION

The subtrochanteric region of the femur consists primarily of cortical bone. The femoral head and neck are anteverted approximately 10°~15° in relation to

the plane of the femoral shaft. The piriformis fossa lies at the base of the neck and is oriented in line with the femoral shaft. The lesser trochanter is posteromedial, and it is the point of insertion for the psoas and iliacus tendons. The femoral shaft has both an anterior and a lateral bow. The major muscles that surround the hip create significant forces that contribute to fracture deformity. To solve this problem, some scholars suggested that limited open reduction can decrease the interference on fracture ends, meanwhile maintain the stabilization and precision of reduction [8]. Muller *et al.*, made a biomechanical Analysis in 10 cadavers with subtrochanteric fractures and compared the cerclage group with uncerclage group [9]. Delee *et al.*, said that in modern trauma there is no role of conservative treatment [10]. Treatment of subtrochanteric fracture can be done by cephalomedullary nails along with TSP. Scholars choose it because it is easy and fast to apply and also gives stability to unstable fractures [11]. Hospital average length stay was 7.5 days. After 5 month all patients were mobilized independently, no aid required except two patient. They used crunch to mobilize up to 6 months post operatively. In one patient surgical site wound infection occur which was subsided by subsequent treatment. Cephalomedullary nailing is the mainstay in treatment of subtrochanteric femur fractures due to decreased blood loss, reduced operative time, superior biomechanical strength, fewer complications, and expedited time to weight bearing. In above cases no reoperation needed in any of the above cases. The assessment criteria by using Harris hip score, our patient had excellent outcome. 12 patient had excellent outcome 8 patient has good outcome and 5 patient has fair outcome. In group 2 as compared to the group 1: - 4 patient has excellent outcome 15 patient has good outcome and 6 patient has fair outcome in group 2. At the end of 6 months follow up, it was observed that PFN with TPS is better than PFN alone in treating subtrochanteric fracture. Fractures, reduction was possible in 80% of our cases were reduced by Open Reduction Internal Fixation for satisfactory angulation and satisfactory lengthening according to kenthimathi conducted a study reports 78% reduced by the closed method and 22% by open method this disparity is mainly due to character of sample in two different studies [12,13]. For early mobilization the reduced fracture are fixed with stable internal fixation to allow early mobilization for early healing of fracture. Internal fixation technique must follow guidelines of minimising the soft tissue trauma and osseous fragment. Plating of subtrochanteric region through lateral approach of proximal femur. The vastus lateralis muscle should be elevated and split at inter muscular septum near to large branches perforating to profundus femoris artery [14]. If medialization of more than one-third of the femoral diameter at the fracture site Occurs there is sevenfold increase of failure rate [15]. Radiological union average time in our study is 17 weeks in other studies radiological union was 19 weeks and 18 weeks respectively by Ashish *et al.*, and B. Kantimanthi *et al.*, [16] Achieving

union in our studies is in 17 weeks which is par from other studies. Patients are encourage to sit and do quadriceps exercise on a day after surgery. On second day of surgery patient with transverse, short oblique, facture and with no comminution fracture are allowed to start partial weight bearings with support of Walker and gradually shift to weight bearing as tolerated by patient. Allowing a minimally Open approach, intramedullary nailing is closely linked to “biological internal fixation, in addition to its mechanical benefits over plate fixation [17,18]. In this 2 group comparison we found that PFN Augmented with TSP is better than PFN alone. Most of these fractures are treated operatively with either a sliding hip screw or intramedullary hip screw, although arthroplasty is a rare option. Indications for the sliding hip screw include stable fracture patterns with an intact lateral wall. The best treatment for these injuries is surgery to fix the broken hip. A metal implant is put in the bone to hold it in place until it heals. The implant is put through a cut in the skin on the outside of the patient's hip.

## CONCLUSION

PFN is a very good implant for the treatment of subtrochanteric fractures of the femur. During the last decade, extramedullary fixation with various angle plates and compression hip screws with plates has been increasingly replaced by new intramedullary techniques due to the advantages that the surgery is faster, there is less blood loss and bone healing occurs mainly. The reduced position provides a biomechanically strong fixation, allows early weight bearing on the bone with fewer local and general complications. The use of PFN with trochanteric support plate also improves the postoperative functional outcome, makes it easier to tolerate weight bearing and ensures better fracture stability. PFN with PFN augmentation of the plate is a better treatment for subtrochanteric fractures of the femur.

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