

# Evaluation of unstable intertrochanteric and subtrochanteric femur fractures treated with proximal femoral nail with trochanteric stabilization plate: An observational study

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## Abstract

**Objective:** To evaluate clinical and functional outcome of unstable intertrochanteric and subtrochanteric fractures of femur treated with proximal femoral nailing with trochanteric stabilization plate.

**Methods:** In our study we included twenty patients of unstable intertrochanteric and subtrochanteric fracture of femur fixed with proximal femoral nailing with trochanteric stabilizing plate. Our study design is prospective and observational. Our study has maximum follow up of eighteen months and minimum of three months. Patients from third decade of life and onwards, presenting to orthopedic outpatient department in casualty or regular OPD with history of household fall or minor or moderate trauma or sometime with road traffic accident.

**Results:** Twenty patients with unstable intertrochanteric and subtrochanteric fracture of femur fixed with proximal femoral nailing with trochanteric stabilizing plate, it was observed that six (30%) patients with Harris hip score between 90-100, nine (45%) patients with Harris hip score between 80-89, three (15%) patients with Harris hip score between 70-79 and two (10%) patients with Harris hip score between < 70. Also twenty patients we observed six (30%) patients with excellent result, nine (45%) with good result, three (15%) with fair result and two (10%) with poor result. There were three patients with infection, in one patient infection got resolved but in two patients early removal of implant was done. And in one patient both hip screws were broken after one month of surgery.

**Conclusion:** Observations of twenty cases of unstable intertrochanteric and subtrochanteric fracture of femur treated with proximal femoral nailing with trochanteric stabilizing plate having advantages of creating biomechanically stable construct by incorporating the comminuted trochanter and restores proximal femoral anatomy. The superior functional and

radiological outcomes in patients with unstable trochanteric and subtrochanteric fractures are observed in our study.

**Keywords:** Intertrochanteric femur fracture, proximal femoral nail, trochanteric stabilizing plate, subtrochanteric femur fracture

## Introduction

Hip fracture mainly confined to the area of bone between the hip joint capsular attachments to level of 5 cm distal to the lower border of lesser trochanter. Extracapsular fractures can be further divided into trochanteric and subtrochanteric fractures <sup>[1]</sup>.

An estimated 1.3 million hip fractures occurred worldwide in 1990. Assuming there is no age specific increase, this number is predicted to rise 2.6 million by 2025 and 4.5 million by 2050 <sup>[1]</sup>.

### There are three main factors involved in aetiology of trochanteric hip fracture

1. Influence of fall/trauma.
2. Loss of Protective mechanisms: such as putting out the arms to reduce the impact of fall is largely related to aging.
3. Strength of bone.

Trochanteric hip fractures generally an isolated injury. For about 4% of patients, an additional fracture present. The most common associated fractures are an ipsilateral distal radius fracture (2%) or an ipsilateral proximal humerus fracture (1%).

Trauma to the head of sufficient severity to justify a CT scan has been reported for 21% of low energy fracture patients <sup>[1]</sup>. Non operative treatment for trochanteric hip fracture is treatment of choice in few situations like simple 2-part undisplaced crack fracture in physically active person and elderly patient who is non-ambulatory or bed bound with displaced trochanteric fracture <sup>[1]</sup>.

Trochanteric hip fracture can be fixed with the broad groups of extramedullary (using a slide plate and lag screw), intramedullary nailing, external fixation and replacement arthroplasty <sup>[1]</sup>. Main discussion in choice of implant is between intra and extramedullary fixation. Some of studies have reported improved functional outcomes with cephalomedullary nail due to reduced collapse and femoral medialization as fracture heals in more anatomical position.

Contemporary studies also suggest tendency for some of nails to have less fracture healing complications compared to sliding hip screw.

Sliding hip screw has advantage of being cheaper implant than intramedullary nail.

Sliding hip screw with trochanteric stabilizing plate can be used for reconstruction of greater trochanter and provides support for those case in which lateral femoral plate is disrupted. Recent study comparing sliding hip screw with intramedullary nail, addition of trochanteric stabilizing plate was used effectively in unstable injuries <sup>[1]</sup>.

## Materials and Methods

In our study we included twenty patients of unstable intertrochanteric and subtrochanteric fracture of femur fixed with proximal femoral nailing with trochanteric stabilizing plate. Our study design is observational. Our study has maximum follow up of eighteen months and minimum of three months.

### Inclusion criteria

All adults including age > 35 years.

All patients those with break in lateral wall of proximal femur.

All patients those with close fracture.

### Exclusion criteria

All patients those age < 35years.

Patients those who have stable fracture pattern.

Patients those who have pathological intertrochanteric fracture.

Patients those who have open fractures.

Patients those who have intertrochanteric femur fracture with shaft or distal femur fracture.

Patients from third decade of life and onwards presenting to orthopaedic outpatient department in casualty or regular OPD with history of household fall or minor or moderate trauma or sometime with road traffic accident.

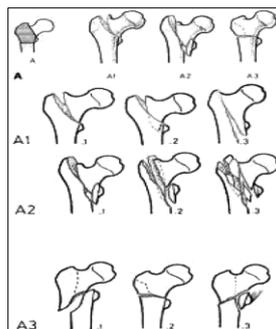
### Primary Manegment

Patient was first examined thoroughly in primary survey for vital parameters and other major associated injuries in head, chest, abdomen or spine along with local examination of lower limb. If patient has poly trauma than stabilizes the patient with ATLS protocol with multi-departmental involvement. Once patient is stabilized than shifted to orthopadic ward for orthopedic management.

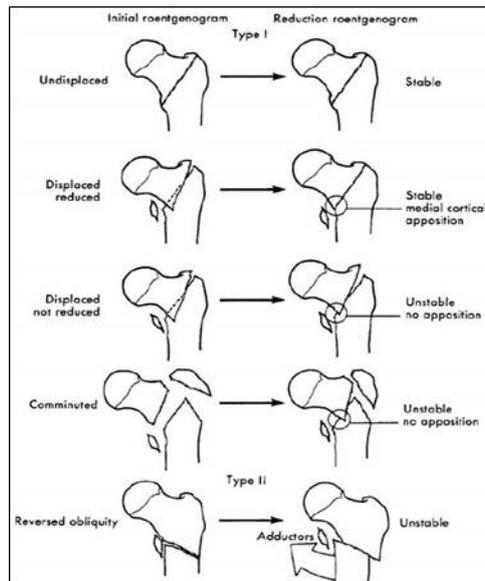
In ward, patient reassured about injury, fracture assessment done with planning of surgical procedure, stabilizes with intravenous fluids if patient hemodynamically unstable, intravenous antibiotic given if chest or other infection and pain is managed by intravenous analgesic and axial traction by lower limb skin traction with counter traction, counseled about surgical management and treatment protocol.

After primary assessment and vital stabilization of patient, routine hematological examination plus local part x-rays are done.

After preoperative fitness, patient planned for surgical procedure. Patient shaved from umbilicus to knee on involved side with private parts, after removing all accessories and fasting overnight. Foley Catheter done as per requirement. Adequate blood was arranged for surgery for intraoperative transfusion, if required. The patient is fully explained about nature of disease process, its possible aetiology, anaesthesia and its risk, the surgical procedure; its need, nature, benefits, possible pre/intra/post-operative blood transfusion and study involved in his/her own language. An informed, valid, explained, documented, signed and witnessed consent is taken for all patient undergoing surgical procedure. Patient's clothes are changed with sterile OT dress and were shifted to OT next morning.

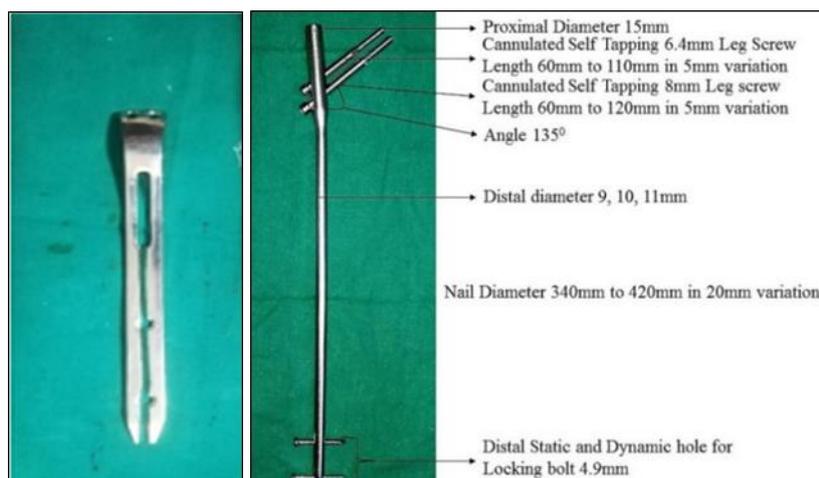


**Fig 1:** AO/OTA Classification



**Fig 2:** Jansen 'S Modified Evans Classification <sup>[2]</sup>

## Implants



**Fig 3:** Trochanteric stabilizing plate and PFN

## Surgical technique

Patient was given spinal anaesthesia and shifted to radiolucent fracture table in supine position with perineal post. Operative leg is slightly adducted and put on traction as according to fracture reduction required, and opposite limb was put in abduction. Fracture reduction was done by traction and internal rotation of fractured lower limb primarily, and adduction or abduction as required. Reduction was checked under image intensifier in anterior-posterior and lateral view. Operative side (area) was washed, painted, and draped with standard sterile aseptic precaution.

A 4-5 cm long incision made from tip of greater trochanter of femur in line of femur shaft, skin and subcutaneous tissue was cut, dissection plane was between gluteus medius muscle. Tip of greater trochanter was palpated, and minimal muscle stripped off from greater trochanter.

Entry is made with entry awl at pyriform fossa of proximal femur and checked under image intensifier in AP and lateral views.



**Fig 4:** Entry point with entry awl

4.2 mm guide wire is inserted into femoral shaft and across fracture site up to distal femur and position of guide wire is checked under image intensifier. Proximal reaming is done up to lesser trochanter of femur. Proper size of nail is fixed with jig and alignment was checked and is inserted into femur. The position of hole for hip screw is checked under image intensifier. Skin incision is made at level of sleeves passing from jig system and around 5-6 cm incision is made for placement of trochanteric stabilising plate. Guide pins for screws are inserted through the jig and sleeve guide. The ideal position of guide pins is parallel and in the lower half of neck of femur in AP view and in single line in centre of neck of femur in lateral view. Guide pins are inserted up to 5 mm of articular margin of head of femur and size of screws has determined. And drilling is done for lag screw.



**Fig 5:** IITV AP view of PFN with Guide wire and clinical image of PFN jig with skin incision

Proper size trochanteric stabilizing plate is inserted through guide pins from first skin incision and manipulation for position of trochanteric stabilizing plate done from second incision. First 8 mm hip screw is inserted on distal guide pin through TSP and then 6.4mm screw is inserted. The hip screw should be 5 mm away from the subchondral bone. One or two 4.9 mm cortical screw is inserted in to the distal part of nail, out of which one is static and another is dynamic hole. It is done free hand under image intensifier. After distal locking screw insertion jig is removed and final position of nail is checked under image intensifier in both AP and lateral views. Final normal saline was given, and wound closer is done in layers.

### Postoperative care

Patient is advised to rest in supine position. Patient is kept fasting for 4 hours, intravenous fluids are given till patient is fasting, and parental antibiotic for 3 days and intravenous analgesics for 48-72 hours as per patient's pain threshold are started postoperatively.

As patient is out from anaesthetic effect, patient is instructed about physiotherapy like quadriceps strengthening and ankle pumping exercises. And next day patient is motivated for non-weight bearing walking with walker and for high sitting knee flexion and extension exercises. Bowel-bladder-back care is given. The primary operated site is checked 48-72 hours after surgery and drain is removed if kept, dressing the wound in strict aseptic precautions. Anti-osteoporotic regimen is started for elderly patients.

### Advice on discharge

Patient is advised to continue physiotherapy and non-weight bearing walking with walker. Sutures removal at 14 days of surgery and oral antibiotic and analgesic is given for 14 days till sutures removal. Patient is asked for follow up on 1, 3, 6, 12, 18 months of surgery, and anytime if in case of problem. On each follow up patient is assessed for functional outcome and for modified Harris hip score.

### Clinical photographs



**6 Month Follow Up**



6 Month Follow Up

## Results

In our study of twenty patients, thirteen patients (65%) were males and seven patients (35%) were females. The commonest age group affected was age group of 60-69 years were 9 patients (45) %. In our study of twenty patients, we observed twelve (60%) patients with right sided fracture and eight (40%) patients had left sided fracture. Most common mode of injury observed was domestic fall with seventeen (85%) patients and road traffic accident with three (15%) patients being second most common. In our study AO type 31A1 were around 20%, mostly subtype 31A1.3 were common, AO type 31A2 were around 25%, subtype 31A2.2 were common and AO type 31A3 were around 55%, subtype 31A3.3 were common. Overall, most common pattern was AO 31A3 fracture. Least common pattern seen was AO 31A3.1.

## Table 1-Harris Hip Score

In our study of twenty patients with unstable intertrochanteric and subtrochanteric fracture of femur fixed with proximal femoral nailing with trochanteric stabilising plate, we observed six (30%) patients with Harris hip score between 90-100, nine (45%) patients with Harris hip score between 80-89, three (15%) patients with Harris hip score between 70-79 and two (10%) patients with Harris hip score between < 70. (Table 1)

**Table 1**

Harris Hip Score	No of Patient	Percentage
90-100	06	30 %
80-89	09	45 %
70-79	03	15 %
<70	02	10 %

**Table 2**

Complication	No of patient
Infection	03
Early removal of implant	02
Broken implant	01
Lateral screw migration	01
Peri-implant fracture	00

In our study, there was three patients with infection, in one patient infection got resolved but in two patient's early removal of implant was done. And in one patient both hip screws were broken after one month of surgery. And in one patient both hip screws were back out after weight bearing. In our study out of twenty patients, five patients had an intact lateral wall was checked after reduction intraoperatively so only proximal femoral nailing was done in those patients and same treatment protocol was followed.

In our study of twenty patients with unstable intertrochanteric and subtrochanteric fracture of femur fixed with proximal femoral nailing with trochanteric stabilising plate, we observed six (30%) patients with excellent result, nine (45%) with good result, three (15%) with fair result and two (10%) with poor result.

**Table 3: Results**

Grade	No of patients	Percentage (%)
Excellent	6	30
Good	9	45
Fair	3	15
Poor	2	10

## Discussion

In our study we included twenty patients of unstable intertrochanteric and subtrochanteric fracture of femur treated with proximal femoral nailing with trochanteric stabilizing plate, R. K. Gupta <sup>[3]</sup>, in their study mentioned the role of lateral wall reconstruction which we have also emphasised with the stabilisation with trochantric supporting plate. In our study majority of patients were male compare to female. Similar observation was found in study of Dr. W.M. Gadegone and Dr. Y.S. Salphale <sup>[2]</sup>.

In our study, mean age of affected patients are 64.5 years as similar observation was found in study of Dr. Monesh kumar <sup>[6]</sup> and DR. W. M. Gadegone <sup>[2]</sup>.

In our study, there are more number of right side hip involvement as compare to left side as similar observation was found in study of DR. S.B. Ganjale <sup>[4]</sup>.

The cause of fracture was mostly due to domestic fall like fall at home, fall down from bed, from bike, from cycle and slipping in bathroom, fall down due to dizziness which were low energy injuries. It clearly supports the fact that trivial trauma like fall is the most common mode of injury of unstable intertrochanteric and subtrochanteric fracture.

In our study most common mode of injury was domestic fall observed in 85% patients, Followed by road traffic accident 15% Similar observation has been observed by Dr. R.K.

Gupta *et al.* [3]. 85% patients were due to fall on a level surface, 15% of them were due to road traffic accidents. We observed AO/OTA classification type 31A3.3 is most common in our study as in study done by Monesh kumar *et al.* [5]. and S.B. Ganjale *et al.* [4]. In our study of twenty patients, we observed six patients with excellent modified harris hip score and nine with good score in our study but in study of Dr. Monesh kumar [5] there was a higher excellent score on modified harris hip score as compare to good score.

In our study, there were three patients with infection and one patient with lateral screw migration as mostly similar results was found in study of DR. S.B. Ganjale [4] found that two patients with lateral screw migration and infection.

In our study, three patients lost follow up due to death by covid-19 and patient had a broken screws but patient had lost follow up.

In our study there are three patients having infection in two patient early removal of implant done in one there was union but in second patient different type of fixation method was choose. One patient had a broken screw due to early weight bearing by patient his own. And one patient has lateral screw migration.

### Limitations

Our study with limitations of small number of patients, short duration of follow up with requirement of experience in surgical procedure, with very limited use of trochanteric stabilization plate in intramedullary proximal femoral nailing.

### Conclusions

Our study involves observations of twenty cases of unstable intertrochanteric and subtrochanteric fracture of femur treated with proximal femoral nailing with trochanteric stabilising plate having advantages of creating biomechanically stable construct by incorporating the comminuted trochanter and restores proximal femoral anatomy. The superior functional and radiological outcomes in patients with unstable trochanteric and subtrochanteric fractures are observed in our study.

**Conflict of interest:** There is no conflict of interest among all authors.

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