



## RESEARCH ARTICLE

### A STUDY OF UNSTABLE INTERTROCHANTERIC FRACTURES TREATED WITH TROCHANTERIC FIXATION NAIL

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#### ABSTRACT

**Background:** Intertrochanteric (IT) fractures are common injuries that most commonly affect the elderly but are also seen in younger age patients. Understanding of Biomechanics of the fracture and also development of implants had led to improvement in the treatment modalities available for these patients. Trochanteric Fixation Nail were developed to improve the rotational stability of the proximal fracture fragment and the tip of the nail was re-designed with reduction of the distal diameter of the nail to decrease the risk of intra and postoperative fractures of the femoral shaft by a significant reduction in bone stress.

**Materials and methods:** The study was done on 40 patients with unstable intertrochanteric fracture treated with trochanteric fixation nail. The patients were followed up at 4th week, 6th week, 3rd and 6th months. All surgeries were done by the same surgeon. Average length of incision, intraoperative blood loss, duration of surgery, intraoperative complications, postoperative infection, duration of hospital stay, range of movements, shortening of limb, implant failure, union time, periprosthetic fracture and any additional surgical procedure done were studied. Functional outcome was assessed based on Kyle's criteria.

**Results:** There was decrease in size of incision, intraoperative blood loss, duration of surgery, hospital stay with Trochanteric Fixation Nail. Range of movement was good to excellent in almost all cases. No periprosthetic fracture was seen in any patients.

**Conclusion:** Our study conclude that Trochanteric Fixation Nail is a significant advancement in the treatment of unstable intertrochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and early return to work.

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## INTRODUCTION

Intertrochanteric (IT) fractures are common injuries that most commonly affect the elderly but are also seen in younger age patients. The frequency of these fractures has increased primarily due to the increasing life span (Kannus *et al.*, 1996). Intertrochanteric fractures occur in the younger population due to high velocity trauma, whereas in the elderly population it is most often due to trivial trauma. The incidence of intertrochanteric fractures is more in the female population compared to the male due to osteoporosis. Intertrochanteric fractures initially were managed by conservative treatment. If suitable precautions are not taken the fracture undergoes malunion, shortening and limitation of hip movements.

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It is also associated with complications of prolonged immobilization like bedsores, deep vein thrombosis and respiratory infection. Understanding of Biomechanics of the fracture and also development of implants lead to improvement in the treatment modalities available for these patients. The standard treatment of intertrochanteric fracture has now become stable fixation, which allows early weight bearing mobilization of the patients (Al-Yassari *et al.*, 2002; Boyd, 1949). Since this fracture is more common in the elderly patients, the aim of treatment should be prevention of malunion and early mobilization. Taking all these factors into consideration, surgery by internal fixation of the fracture is ideal choice. In unstable Intertrochanteric fractures where there is loss of posteromedial cortex continuity; when load is applied, there is increased bending force on the Dynamic Hip Screw leading to implant breakage, screw cutout or separation of plate from shaft. This lead to the introduction of intramedullary devices which theoretically due to its position

provides more efficient load transfer and shorter lever arm can decrease tensile strain thereby decreasing the risk of implant failure. The newer implant for management of unstable intertrochanteric fractures is Trochanteric Fixation Nail which were developed to improve the rotational stability of the proximal fracture fragment and the tip of the nail was re-designed with reduction of the distal diameter of the nail to decrease the risk of intra and postoperative fractures of the femoral shaft by a significant reduction in bone stress. This implant is a centromedullary device and biomechanically more stable<sup>5,6</sup>. It also has other advantages like small incision and undisturbed fracture hematoma.

### Aim and Objectives

To study the outcome of unstable intertrochanteric femur fractures operated with Trochanteric Fixation Nail (TFN).

- To assess average length of incision, intraoperative blood loss, duration of surgery and intraoperative complications.
- To study postoperative infection, duration of hospital stay, range of movements, shortening of limb, implant failure, union time, periprosthetic fracture and any additional surgical procedure done.
- To assess functional outcome based on Kyle's criteria.

### MATERIALS AND METHODS

A prospective clinical study was done on subject pool of 40 patients with unstable intertrochanteric fracture operated with Trochanteric Fixation Nail.

**Inclusion criteria:** Closed unstable intertrochanteric femur fractures in patients above 40 years of either sex were treated with Trochanteric fixation nail.

**Exclusion criteria:** Open fractures, Pathological fractures other than osteoporosis, Previous surgery of proximal femur, Unwillingness to participate in the study, Patient unfit for surgery and/or anaesthesia.

#### Data collection

Data was collected from the patients attending the orthopedic department with unstable intertrochanteric fracture and satisfying the inclusion and exclusion criteria. Detailed history was taken about age, sex, occupation, mode of injury, past history and associated medical illness. Thorough clinical examination and general condition was assessed. Associated orthopedic and other systemic injuries were assessed and managed accordingly. To combat blood loss at the fracture site, IV fluids were started if needed. Limb was immobilized in Thomas splint initially and then skeletal traction was given if surgery was delayed. Analgesics, antibiotics and blood transfusion were given as needed. Standard radiographic examination included AP view of the pelvis with both hips (PBH) and cross table Lateral view of the injured proximal femur. The lateral radiograph helped to assess the posterior comminution of the proximal femur. An internal rotation view of the injured hip was helpful to identify non displaced

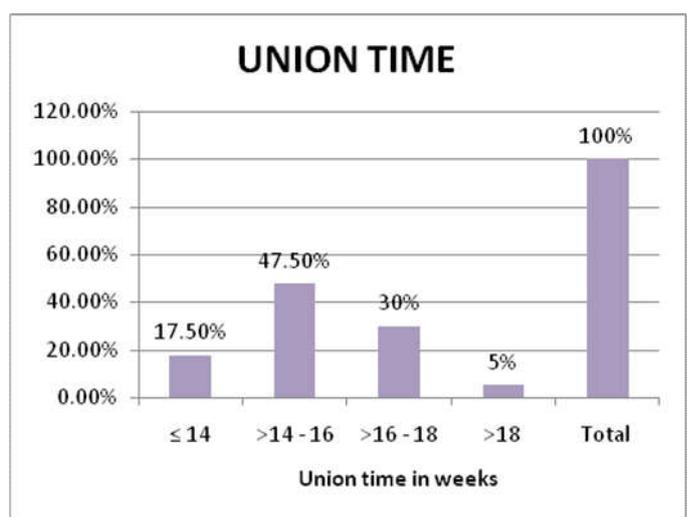
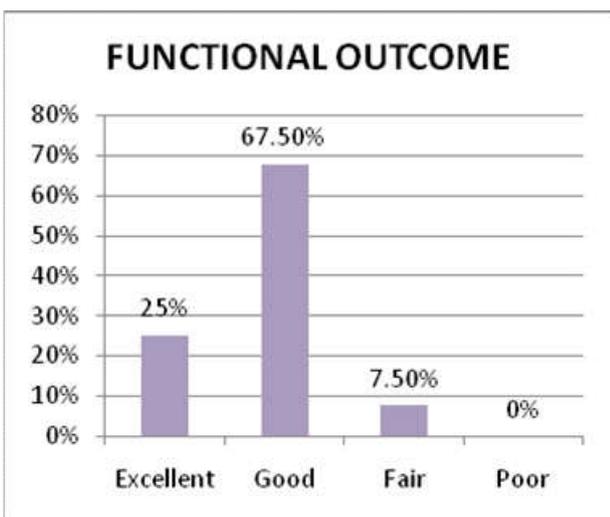
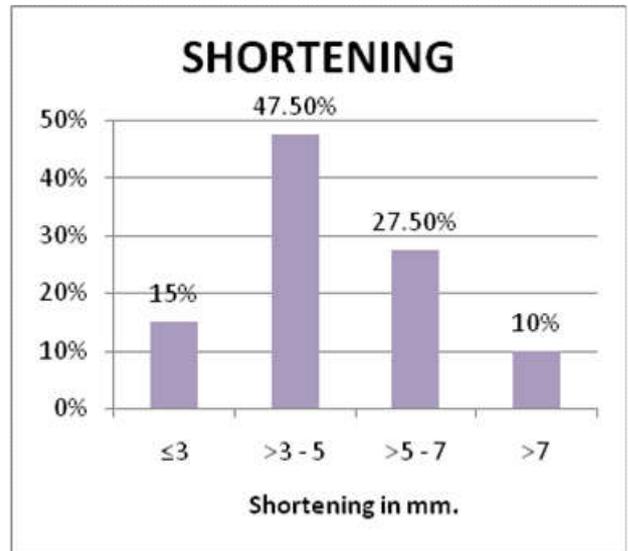
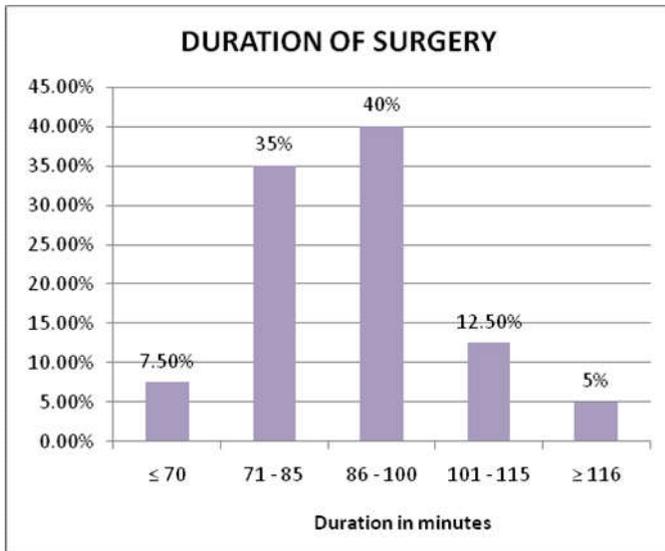
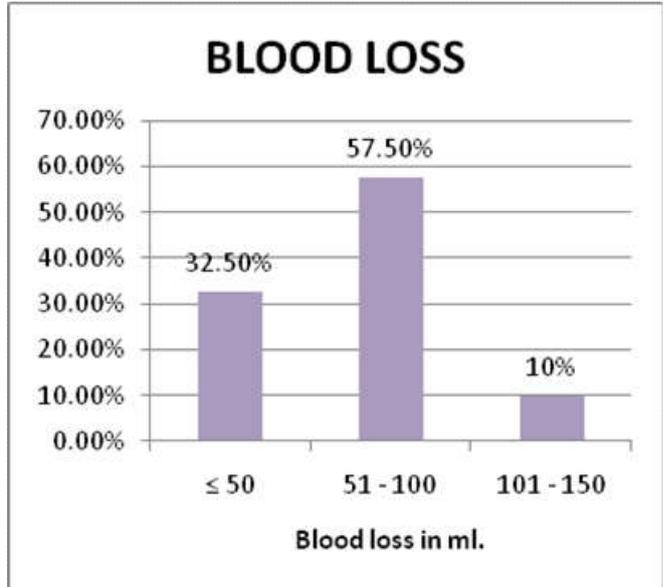
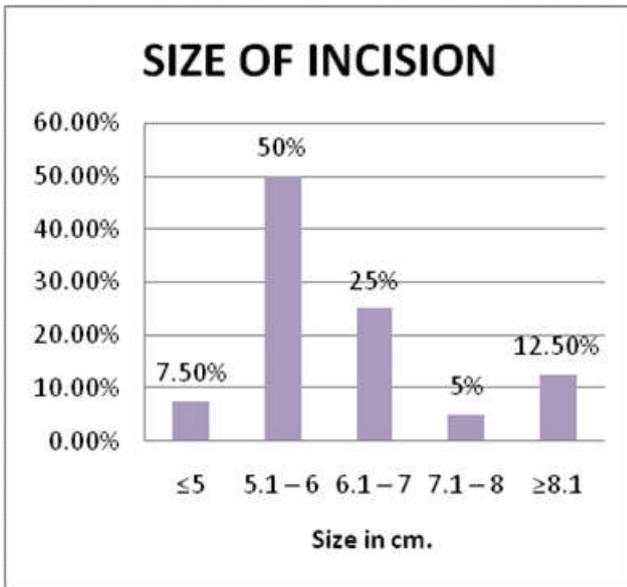
fractures. Internally rotating the involved femur 10 to 15° offsets the ante version of the femoral neck and provided a true AP of the proximal femur. AP of the contralateral side was used for preoperative planning. If any other injuries were suspected, corresponding radiographs were taken. Baseline investigations were carried out as follow: Complete Blood Count; Urine for sugar, albumin and microscopy; BT, CT, RBS, Blood urea, Serum creatinine; Blood grouping and cross matching; E.C.G and Chest PA view- as a baseline radiograph to assess any development of fat embolism later. Pre anesthetic check-up was carried out. Patient's consent was taken for the surgery. Patient was kept nil by mouth for 6-8 hours before surgery. After operation procedure was carried out, patient was kept nil by mouth for 4-6 hours. IV fluids were given to maintain hydration of the patient. Input and output charting were maintained. Hemoglobin was recorded 24 hours post operatively. Postoperative radiographs in AP and lateral view were taken. IV antibiotics were continued for 5/7 days and then oral antibiotics were given if needed. Analgesics were given according to the needs of the patient. Dressing was done on postoperative day 2, 5 and 7. Sutures were removed on the 12th postoperative day. The mobilization of patients out of bed and ambulation training was initiated on postoperative day 1. Furthermore, patient was allowed to bear weight as tolerated. Duration of Hospital stay was recorded. Follow-ups were done at every 4 weeks interval and any complication like infection, shortening, etc. were noted. Functional outcome was assessed according to Kyle's criteria. Radiographs were taken at postoperative 6 weeks, 3 months and 6 months to check for union, any periprosthetic fracture or implant failure.

### RESULTS

In this study, patient's age ranged from 40 to 86 years with an average of 66.2 years. Out of them, 62.5% were males and 37.5% were females. Right side was more commonly involved (55%). Distal end radius fracture was present in 3 cases. Out of them, 2 patients were treated with closed reduction and internal fixation with K-wire and cast was applied, while in 1 patient only cast was applied. Periprosthetic fracture was not seen in any patients. In the study, 2 patients had superficial wound infection and they were treated with antibiotics and daily dressing was done till infection subsided. 1 patient with UTI was treated with systemic antibiotics.

### DISCUSSION

The age of patient's ranged from 40 to 86 years with an average of 66.2 years. The results were similar to study done by Murray and Frew *et al* and Gallagher *et al* (1980) reported an eight fold increase in trochanteric fractures in men over 80 years and women over 50 years of age<sup>7</sup> due to of senile osteoporosis as the age advances. The study population consisted of 62.5% males and 37.5% females. As ours is a rural setup, the majority of the patients in the series were male as they are more involved in outdoor activities like agriculture, driving of motor vehicles and are more likely to be involved or prone to accidents/fall. Females play a more dormant role and are involved more in household activities. In the study, average incision size was 6.65 cm with a SD of  $\pm 1.122$  cm. Incision was counted from.

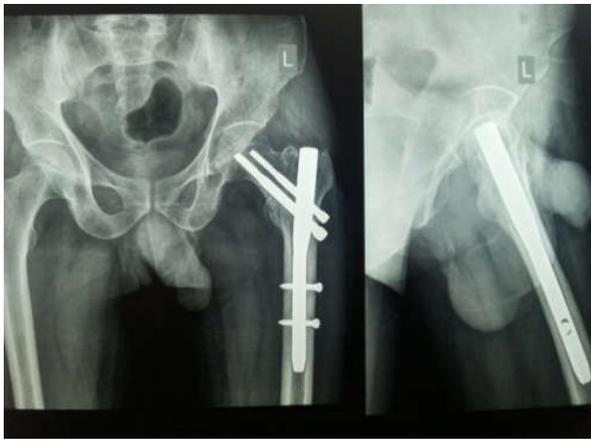




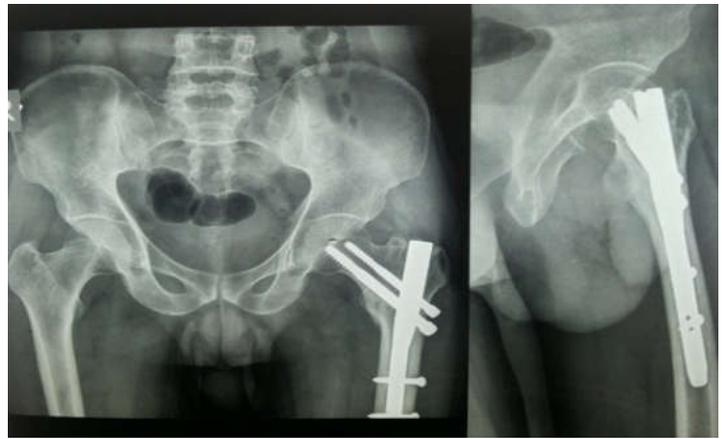
Pre Op X-ray



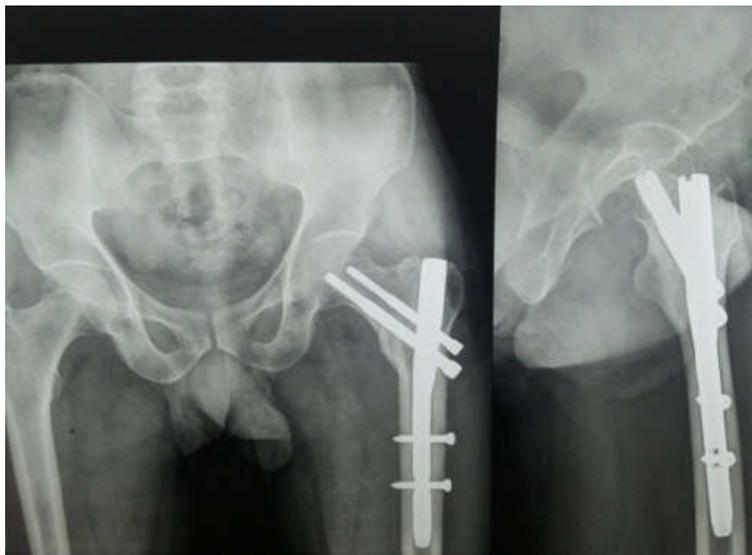
Post OP X-ray day 1



6 Weeks



3 Months



6 Months



Range of movements in tfn at six months

The results were comparable to study done by Nargesh *et al.*, 2012 which reported that mean incision size to be  $8.5 \pm 1.2$  cm. In our study, average blood loss was 88.75ml. These were comparable to studies done by Wasudeo *et al.*, 2007 and Morihara *et al.*, 2007. Average duration of surgery in our study was 91.5 minutes with SD of  $\pm 14.664$  minutes. The results were comparable to Morihara *et al.*, 2007 was 77 min and Yelne *et al.*, 2014 was 74 min. In our study, out of 40 patients 13 patients had intraoperative complications. Out of these, 6 patients had difficulty in reduction which was either due to delay in surgery due to uncontrolled diabetes mellitus and hypertension or reverse oblique fracture pattern. In one patient, open reduction was done. This study was comparable with Wasudeo *et al.*, 2007. In 7 patients, fracture site was distracted after inserting the nail which is comparable with study done by Kumar *et al.*, 2012. Also no patients had periprosthetic fracture which is comparable with Yelne *et al.*, 2014 and Bienkowski *et al.*, 2006. Average hospital stay was  $18.48 \pm 2.77$  days which is comparable to study done by Gill *et al.*, 2007 and Chow *et al.*, ?. Union time was 14 to 20 weeks in our patients with a mean of  $15.975 \pm 1.291$  weeks. In our study, 47.5% patients had 3 to 5 mm shortening with a mean of  $5.175 \pm 0.9842$  mm. Platzer *et al.*, 2008 in his study concluded that cephalomedullary nails were more successful in preventing limb length discrepancy in unstable IT fractures. Ujjawal *et al.*, 2013 and Nargesh *et al.*, 2012 in their comparative study with Dynamic Hip Screw found that there is less shortening of limb in Trochanteric Fixation Nail than Dynamic Hip Screw. In our study, functional outcome was evaluated with the help of Kyle's criteria. The range of motions in flexion, abduction, internal and external rotations were good to excellent in most of the cases operated. We had on an average 67.50 % good range of motion in all the patients. The fair range of motion was attributed to the poor compliance of the patients for regular physiotherapy and also due to poor reduction achieved at the time of surgery, thus not getting the best possible result which is comparable with Wasudeo *et al.*, 2007. There were 4 cases of implant failure in our study. The usual 'Z' pattern of implant failure was seen in 2 cases and reverse "Z" effect was seen in one case. Wasudeo *et al.*, 2007 also found in his study "Z" effect and reverse "Z" effect which is comparable with our study. One patient had proximal screw cut out. Union time was 14 to 20 weeks in our patients with a mean of  $15.975 \pm 1.291$  weeks.

## Conclusion

Intertrochanteric femur fractures are a major challenge, treatment modality has to be decided carefully not solely for achieving fractures union, but for restoration of optimal function in the shortest possible time that to with minimal complications. Trochanteric Fixation Nail has distinct advantages like reduced operating time, less blood loss, reduced incision size, rigid fixation and positive effect on the speed of restoration of mobilization along with rotational stability of proximal fragment and reduction in the complication rate of periprosthetic fractures. We conclude that the Trochanteric Fixation Nail is a significant advancement in the treatment of unstable intertrochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and

early return to work. Our study has limitations of small sample size & shorter follow up of 6 months. A prospective randomized controlled trial is required to investigate the long-term efficacy of Trochanteric Fixation Nail.

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