

Proximal Femoral Nailing without Traction Table for Fixation of Intertrochanteric Fractures

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Abstract

Purpose: conventionally intertrochanteric fractures are being managed with proximal femoral nailing on supine position with the help of traction table for sustained traction and to reduce the number of assistants for surgery, however this position has its demerits like difficulty in placing entry point especially in obese patients, difficulty in reduction of fracture fragments as they are under constant muscle pull due to traction leading to open reduction, prolonged operative time and increased chances of infection. Some surgeons reported that these complications can be avoided by placing patient in lateral decubitus position. The purpose of this study was to demonstrate the technique of surgery as well as to report how these difficulties can be overcome by using Proximal Femoral Nail in fixation of intertrochanteric fractures in lateral decubitus position.

Materials and Methods: 30 cases of intertrochanteric fractures with or without comminution were operated with PFN in lateral position on radiolucent table from December 2019 to November 2021 were included in the study. Nail sizes are 9, 10, 11, and 12 mm with a fixed length of 250 mm were used.

Results: In the present study, age group of patients was 66yrs to 82yrs. Female patients (66%) were more than male patients (33%). An average of 147 ml of blood loss in both closed and open reduction cases. The average operative time for all cases was 82 minutes. average incision length of 8.3 cm in both open and closed cases, at least 1 assistant surgeon requiring for all cases. X-ray fluoroscopy average of 63 c-arm shoots per case.

Average union time of 15 weeks combining simple and comminuted fractures. Clinical function of hip and knee was excellent with full range of movements. Overall excellent to good results were achieved in 90% cases.

Conclusions: Lateral decubitus position has advantage of easy identification of greater trochanter and entry point, especially in obese patients, easy to achieve the reduction by open reduction technique and ease in placing distal locking screws. The lateral decubitus position has less operative time as it excludes the setup of traction table, minimal incision, minimal blood loss, less c-arm fluoroscopy time, less duration of hospital stay.

Keywords: Intertrochanteric fracture, Proximal Femoral Nail, traction table, lateral decubitus Position.

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Introduction

Intertrochanteric fracture is defined as the fracture extending from the extra-capsular basilar neck region along the lesser trochanter before the origin of the medullary canal. The annual global number of hip fractures is expected to exceed 7 million in the next 40 to 50 years[1-2]. They account for half of the hip fractures in the elderly[3]. The goal of treatment is to start early mobility to minimize the

risk of medical complications and bring back the patient to preoperative status. Among various treatment modalities for intertrochanteric fractures, cephalomedullary nailing is the most preferred method as it is more stable under loading with a shorter lever arm, so the horizontal lever arm between the hip joint and the nail is less compared with that for a plate, thus diminishing the

deforming forces across the implant. Being load sharing devices early ambulation of the patient and weight-bearing can be allowed [4-5].

Three primary positioning strategies have been described for fixation of peritrochanteric femoral fractures: supine on a fracture table, prone position with extended posterolateral exposure, and the lateral decubitus position on a flat radiolucent table [6-7]. Majority of the hip fractures are operated on fracture table in supine position. But fixing the patient on the fracture table is cumbersome and more time-consuming. Positioning of obese patient on a fracture table and securing to footplates of fracture table is still more difficult because of pendulous abdomen and gluteal folds falling by the side. In the case of failed closed reduction, exposure of the fracture site for open reduction is difficult in this position as the hip is in traction while extended. The surgeon finds some difficulty in the operative field such difficulty in getting lateral view, to tackle haemostasis, retraction of soft tissues requiring more assistance, blood loss and post operative infection, all these complications can be minimized with lateral decubitus position.

In 2013 Li Xue *et al* [9] published a meta analytical study stating the advantage of lateral position over supine position is easy identification of greater trochanter and entry point, useful in obese patients, easy to achieve reduction by open reduction technique and ease in placing distal locking screws. The lateral decubitus position also provides a shorter operation time, less of hospital stay, blood loss, number of intra-operative X-ray,

incision length and out-of-bed activity time. Reduction and fixation of proximal femoral fractures in the lateral position with fluoroscopy in the antero-posterior view for small set ups or in rural hospitals that lack a fracture table [8-9].

The purpose of this study was to demonstrate the technique of surgery as well as to report how these difficulties can be overcome by using Proximal Femoral Nail in fixation of intertrochanteric fractures in lateral decubitus position

Materials and Methods

General Data

This prospective study consists of 30 elderly patients with low-energy intertrochanteric fractures, who were treated with internal fixation using PFN at Department of Orthopaedics, GGH Kakinada from December 2019 to November 2021. Out of 30 cases, 10 patients were males and 20 patients were females. As soon as the patient with suspected trochanteric fracture was seen in the casualty, necessary clinical and radiological evaluation was done and the patient was immobilized using skeletal traction (upper tibial pin). All the patients were evaluated with routine investigation before

surgery and fitness for surgery and consent for the operation were taken. All the patients were operated in lateral position with PFN of sizes 9, 10, 11, and 12 mm and with a fixed length of 250 mm.

Inclusion Criteria

- Patients between age group of 45 and 80 years.
- Patients with all types of intertrochanteric fractures according to BOYD & GRIFFITH classification
- Fresh fractures occurred within 3 weeks

Exclusion Criteria

- Patients with severely comminuted fracture
- patients with age less than 45 years and more than 80 years
- Patients with comorbidities.

Surgical technique

Under spinal anaesthesia the patient is placed in the lateral decubitus position with a posterior tilt of approximately 10 degrees on a radiolucent table. The non-fractured limb is in contact with the operating table in a 90-degree hip and knee flexion position to prevent overlap of opposite hip in arm image in lateral view.

Anterior and posterior fixation of the patient is performed, either with special fixation devices in the sacrum and pubis anchored to the surgical table, or compact cloth lumps of approximately 30 cm in diameter can be improvised. We must always maintain the rear inclination of 10 degrees. The image intensifier is placed under the surgical table with the beam directed towards the hip joint anteroposterior and at a caudocephalic inclination of 15 degrees with respect to the longitudinal axis of the patient. The "C" -bow of the fluoroscope must be open to rotate the fluoroscope and view lateral views. At the time of performing this manoeuvre, the leg contralateral to the fracture must be in semi-flexion, to free the field of vision. The surgeon stands above the "C" arch posterior to the patient, at the level of the pelvis. The first assistant is positioned below the "C" arch at thigh level, where he could perform some pulling and counter traction manoeuvres as well as rotational movements. Thus began the conventional surgical technique of intramedullary nailing. The fracture was reduced by traction, internal rotation, abduction. satisfactory reduction, the opposition of major fragments & restoration of neck-shaft angle (130 to 135) & anatomy on the medial side was achieved. The reduction was confirmed with C-arm images in both views. The operative area was prepared, painted & draped. Through a skin incision made 5cm above the tip of GT on the lateral aspect of thigh, entry point created with awl medial to the tip of GT, guide wire passed into distal fragment, serial reaming and proximal flower reaming done, nail size is measured with the help

of radiolucent canal diameter measuring scale and corresponding nail passed into medullary cavity fractures were fixed with. 6.4 mm de-rotation screw & 8 mm lag screw was fixed 15 mm and 5 mm below the sub-chondral bone respectively and position checked under c-arm in both views and distal locking is done with 4.5mm interlocking screws and closure done with 2.0 vicryl. The intra-operative period was uneventful.

Postoperative protocol and follow-up

Static quadriceps exercises and knee mobilization was started in the immediate postoperative period. Non weight bearing mobilization was done in comminuted unstable fractures, but in stable fractures, partial toe touch weight bearing was

started early with a walker. Sutures removed between 10th to 12th postoperative day.

All patients were followed up at an interval of 4 to 6 weeks till fracture union and then once in 3 months till 1 year. At each visit, patients were assessed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening.

Fresh xrays were taken during each visit till fracture union progressive partial weight bearing was taught with help from physiotherapist up to full weight bearing. Functional outcome was assessed at 3rd month for all patients asking them to fill Harris hip score forms translated to their language.



Figure 1: Positioning of C-arm



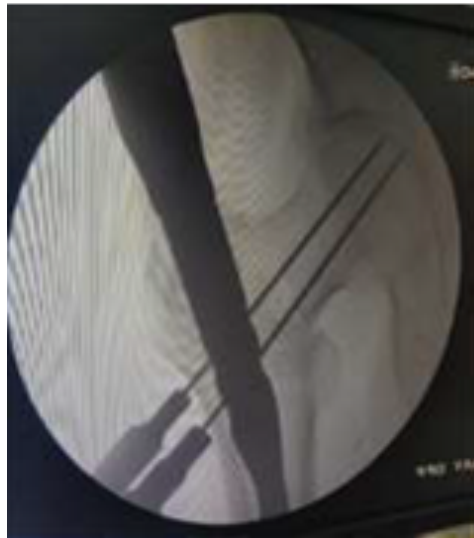
Figure 2: Positioning of C-arm



Figure 3: Positioning Of Patient



Figure 4: Entry with AWL



Fixation



Reaming

Figure 5

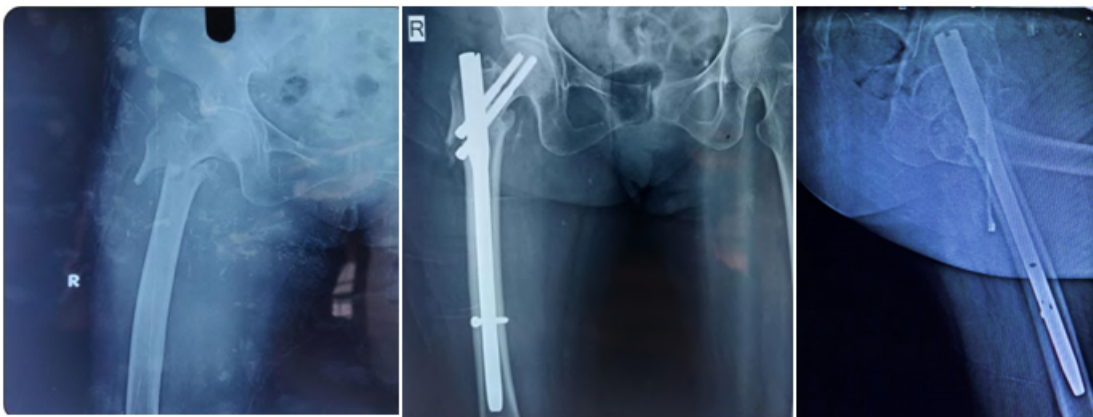


Figure 6: Preop Xray

Immediate Post Op



Figure 7: 6 month follwup



Figure 8: Post OP Range of Movements

Results

The most common age group in our series was 66-82 years, with the mean age of 67 years. In this series with 30 patients 20 were females and 10 were males. 24 Cases are due to low velocity trauma due to slip and fall injury. None of our patients had any associated bony injuries. 17 patients had fracture on the right side and 13 patients on left side. According to Boyd and Griffin classification 4 patients were diagnosed with type 1 fracture, 11 were diagnosed with type 2, 9 were

diagnosed with type 3, and 6 with type 4 fracture. All patients were operated at an average interval of 3 days from the date of trauma. An average of 147 ml of blood loss in both closed and open reduction cases ranging from 110-270ml respectively. Duration of surgery was considered from time of onset of spinal anaesthesia to skin closure. It was 62 minutes to 108 minutes mean operating time 82 minutes. length of incision was 8.3 cm ranging from 6-12 cm. average number of c-arm images required were 63. at least 1 assistant surgeon requiring for all cases.

Table 1

Criteria	Mean
Duration of hospital stay (days)	14
Surgery time(min)	82
Amount of blood loss (ml)	147
Length of incision (cm)	8.3
Number of c-arm Fluoroscopy	63
Number of assistants for Surgery	1
Harris hip score	82
Union time (weeks)	15

In our study, we encountered certain complications intra operatively. In 9 patients, due to comminution and posteromedial cortical void, open reduction was required. Breakage of guide wire in femoral head occurred in 1 case due to jig mismatch. Shattering of greater trochanter happened in a case due to lateralization of entry point. 1 case had superficial wound infection. 3 patients developed delayed union. 2 patients with comminuted fractures and closed nailing done had shortening of 1 cm. 1 patient had shortening of more than 1.5cm due to gross comminution. 1 patient had backing out of the hip screw which required removal. 3 patients had restriction of

terminal hip flexion. None of our patients had knee stiffness due to the fracture and surgical procedure. Since many patients were from the elderly age group, knee osteoarthritis was present pre injury. None of our patients required bone grafting. 2 patients had varus malunion no reported cases of non-union.1 patient had delayed postoperative infected nail which had to be removed.

Table 2: Intraoperative Complications

Complication	Number Of Cases	Percentage
Failure To Get Closed Reduction	9	30%
Breakage of guide wire	1	3.33%
Shattering of GT	1	3.33%
Failure of distal locking	0	0

Table 3: Postoperative Complications

Complication	Number Of Cases	Percentage
Superficial wound infection	1	3.33%
Shortening >1 Cm	1	3.33%
Delayed Union	3	10%
Non Union	0	0
Varus malunion	2	6.66%
Implant Failure/Screw Cut Out	0	0
Hip Pain/ Back Out of screw	1	3.33%
Hip Stiffness	3	10%
Deep infection	1	3.33%



Figure 9: Screw back Out (Z Effect)

In our study anatomical results were assessed by presence/absence of deformities, shortening, and hip and knee range of movements. And functional result was assessed by Harris hip score, overall excellent to good results were achieved in 90% cases.

Table 4: Functional Result

Functional Results	No Of Cases	Percentage
Excellent	24	80%
Good	3	10%
Fair	2	6.66%
Poor	1	3.33%

Discussion

Supine position on traction table is age-old and standard position followed by many surgeons for

fixation of intertrochanteric fractures, however, some surgeons practice lateral position and studies are proving lateral position is better, as this position relaxes all muscle forces around the hip joint and

reduces the burden of c-arm rotation during surgery. Davis et al. in 1969 used the lateral position as a facilitated position for reduction and exposure for the first time in intertrochanteric and subtrochanteric fractures of the femur with Jewett nail plate. In 1969, Ozkan et al. used this position in

proximal femoral nailing in 2010 and Connelly et al. in complex proximal femur locked plating in 2012[10-12]. In our study minimal surgical incision, good reduction and alignment of fracture in lateral position, hemostasis, and decreased surgery time and less radiation of C-arm was observed.

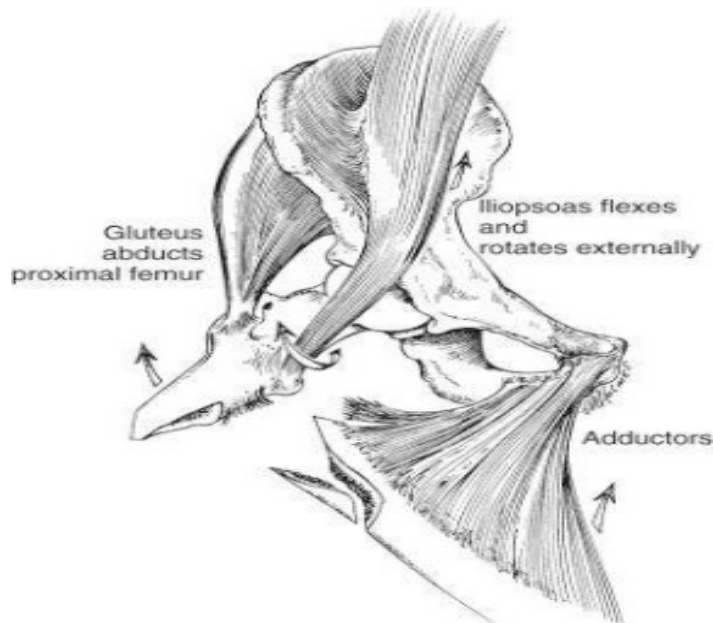


Figure 10: Lateral position as a facilitated position for reduction and exposure for the first time in intertrochanteric and subtrochanteric fractures of the femur

Merits of traction table

Reduction of fracture and sustained traction can be maintained throughout the surgery with the help of a traction table, thus eliminating the need for an extra assistant to hold the limb for reduction and traction during fixation of nail, the limb is held in adduction, internal rotation and traction during surgery leading to an alignment of fracture fragments, neck-shaft angle and rotates greater trochanter anteriorly thus revealing the fossa for entry point.

Demerits of traction table

As the ipsilateral body comes along the same line in the supine position, creating an entry would be difficult for the surgeon which is tougher in obese patients, while passing a guide wire often hitches the medial cortex leading to an increased number of c-arm shoots, prolonged operative time and intraoperative blood loss. While reaming the medullary canal it is difficult to align the reamer along the medullary canal leading to lateralization of entry and sometimes shattering of the greater trochanter, lateralized entry further leads to varus collapse, the operated limb is kept in adduction throughout the operative time compromising the space between the two limbs for negotiation of c-arm and for assessing the reduction and entry point

in lateral view. As all the muscles holding different comminuted fragments are under sustained traction pulling the fragments apart, assessing the fracture pattern and reduction is difficult on a traction table. In the case of Boyd Griffin type 3 & 4 fractures addressing posterior medial fragment either by open reduction or clamping or by percutaneous temporary fixation are burdensome on traction table causing more intra op and postop complications. As many of the patients sustaining these fractures are of geriatric age group having fixed flexion at the knee due to OA, fixing fractures in such patients on traction table is difficult as fixed flexion at the knee leads to posterior sagging of femur shaft which makes the negotiation of the guidewire into distal fragment laborious. Moreover, there are reported cases of the pudendal, sciatic nerve injury, and well leg compartment syndrome in patients positioned on traction table as per Fleril et al[13-15]. The risk of injury to both the superior gluteal nerve and the gluteus medius muscle is higher with limited degrees of hip flexion and adduction, such as are possible in the supine position on a fracture table, than it is with greater degrees of hip flexion and adduction, which are possible in the lateral position on a fracture table or in the so-called sloppy lateral position on an ordinary table. Therefore, insertion of a femoral nail with the hip in increased flexion and adduction

might help to lower the risk of injuries to the superior gluteal nerve and the gluteus medius muscle as stated by Ozsoy, Mehmet Hakan, Basarir, Keremet al[16].

Merits of lateral position

This position obviates the time required for setting up of fracture table. The proximal segment can be addressed easily from the top and can be adducted for revealing the fossa for entry and reaming and in obese patients, all the abdominal fat falls towards the operating table without obstructing the surgical field. All muscles around the hip pulling the fracture fragments apart are relaxed in this position and also the limb is free to move and align the distal segment with proximal making it easy for passage of guide wire. muscles causing hip flexion and extension in the sagittal plane are counterbalanced in lateral decubitus position itself and muscle forces causing abduction and adduction in the coronal plane are nullified by placing a pillow between two legs c-arm remains static and by flexing abducting and mild external rotation of limb assessment of reduction, guide wire position, and anteversion in lateral view is serene leading to less fluoroscopy time.

Demerits of lateral position

This position requires an assistant surgeon to hold the limb in traction abduction and internal rotation while passing guidewires into the neck and fixation of lag and de rotation screws. requires more surgical experience and practice for fixation in lateral decubitus position. Cannot be done in patients having chest and spine injuries and fractures of the contralateral limb.

Conclusion

PFN has advanced over other extramedullary devices as it is minimally invasive due to closed technique, minimal soft tissue dissection, better biomechanical design to prevent implant failure, and ability to bear more load as it is a load-bearing implant and decreased abductor lever arm. The present results showed that PFN done in both supine positions on the traction table and in lateral decubitus position provide excellent to the good functional outcome for fixing intertrochanteric fractures. however, the merits of lateral position over supine position are easy identification of greater trochanter and entry point, useful in obese patients, easy to achieve the reduction by open reduction technique and ease in placing distal locking screws. The lateral decubitus position has less operative time as it excludes the setup of traction table, minimal incision, minimal blood loss, less C-arm fluoroscopy time, less duration of hospital stay. Hence, fixation of Intertrochanteric fractures by PFN in lateral decubitus position is an alternative as well as advantageous than traction

table. Although fixation of by PFN in the lateral decubitus position was found to be advantageous, further definitive research with large study groups longer follow-up period and meta-analytical studies are needed to support the use of PFN fixation in the lateral decubitus position.

References

1. Hutchings L, Fox R, Chesser T. Proximal femoral fractures in the elderly: how are we measuring outcome? *Injury*. 2011; 42(11):1205-1213.
2. Zeng C, Wang YR, Wei J et al. Treatment of trochanteric fractures with proximal femoral nail antirotation or dynamic hip screw systems: a meta-analysis. *Journal of International Medical Research*. 2012; 40(3):839-851.
3. Nork SE, Reilly MC. *Skeletal Trauma*. 4th ed. Philadelphia, PA: WB Saunders; Subtrochanteric fractures of the femur, 2008, 1977-2034.
4. Ajay Kumar, T. Somashekareappa, Ajit Singh, R KNarula. Proximal Femoral Nail Still of Implant of Choice in TrochantericFracture, *ijcmr*, 2016.
5. Asad K G, Syed K A S, Muhammad A K, Muhammad A G, MuhammadK R N. Role of Proximal Femoral Nail in the Treatmentof Unstable Intertrochanteric Fractures. *Biomed J Sci & Tech Res* 2(1)-2018. *BJSTR*.
6. Horwitz T. The posterolateral approach in the surgical management of basilar neck, intertrochanteric and subtrochanteric fractures of the femur; a report of its use in 36 acute fractures. *Surgery, gynecology & obstetrics*. 1952; 95(1):45-50.
7. Davis PH, Frymoyer JW. The lateral position in the surgical management of intertrochanteric and subtrochanteric fractures of the femur. *J Bone Joint Surg Am*. 1969; 51(6):1128-34.
8. Ravi kiran.k,ravi teja k.Ease of doing proximal femoral nailing in lateral position in the management of peri- trochanteric femoral fractures in adults: A prospective study. *International Journal of Orthopaedics Sciences* 2019; 5(2): 39-46
9. Fuqian Liu, Han Xie, WeiguoLiang. A Meta-analysis Comparing Lateral Decubitus with Supine Position for Surgery for Intertrochanteric Fractures. *The Scientific World Journal* Volume 2013, Article ID 276015, 7 pages.
10. Davis PH, Frymoyer JW. The lateral position in the surgical management of intertrochanteric and subtrochanteric fractures of the femur. *J Bone Joint Surg Am*. 1969; 51(6):1128-34.

11. Ozkan K, Cift H, Akan K, Sahin A, Eceviz E, Ugutmen E. Proximal femoral nailing without a fracture table. *European Journal of Orthopaedic Surgery & Traumatology*. 2010; 20(3):229-31.
12. Camille Connelly L. *J Orthop Trauma*. 2012; 26(4):252-257.
13. Flierl MA, Stahel PF, Hak DJ, Morgan SJ, Smith WR. Traction table related complications in orthopedic surgery. *J Am Acad Orthop Surg*. 2010 Nov;18(11):668-75.
14. Haddad FS, Cobiella CE, Wilson L. Inferior epigastric artery avulsion: a fracture table complication. *Journal of Orthopaedic Trauma*. 1998; 12(8):587-588.
15. Callanan I, Choudhry V, Smith H. Perineal sloughing as a result of pressure necrosis from the traction post during prolonged bilateral femoral nailing. *Injury*. 1994; 25(7):472.
16. Ozsoy MH, Basarir K, Bayramoglu A, Erdemli B, Tuccar E, Eksioglu MF. Risk of superior gluteal nerve and gluteus medius muscle injury during femoral nail insertion. *J Bone Joint Surg Am*. 2007 Apr;89(4):829-3.