



ISSN: 2395-1958  
IJOS 2018; 4(4): 909-915  
© 2018 IJOS  
www.orthopaper.com  
Received: 26-08-2018  
Accepted: 30-09-2018

**Memon Rohan R**  
Resident of orthopaedics,  
NHL Medical College  
Sheth VS General hospital  
Ahmedabad, Gujarat, India

**Bhavsar Neel M**  
Associate Professor of  
Orthopaedics, NHL Medical  
College, Sheth VS General  
hospital, Ahmedabad, Gujarat,  
India

**Patel Pankaj**  
Professor and Head, NHL  
Medical College, Sheth VS  
General hospital, Ahmedabad,  
Gujarat, India

**Correspondence**  
**Memon Rohan R**  
Resident of orthopaedics,  
NHL Medical College  
Sheth VS General hospital  
Ahmedabad, Gujarat, India

## Outcomes of proximal femoral nail in subtrochanteric femur fractures through medial entry

**Memon Rohan R, Bhavsar Neel M and Patel Pankaj**

DOI: <https://doi.org/10.22271/ortho.2018.v4.i4l.120>

### Abstract

**Introduction:** Subtrochanteric Fractures of Femur accounts for 10-34% of all hip fractures. Several Methods of treatment of this Fractures have been reported like DHS (Dynamic hip screw), Angled blade Plate, Proximal Femur Locking Plate and Intramedullary devices. Currently Intramedullary Devices like Proximal Femur Nail are used by many giving satisfactory results in subtrochanteric femur fractures. In such situation as Suggested by Richardu *et. el.* slight medial entry leads to valgus alignment which is desired along with the anatomical reduction while nailing subtrochanteric fractures. In the study conducted by perez *et al.* Suggested that slight more medial entry also protected abductors and caused no damage.

### Materials and Methodology

- All the patients of subtrochanteric femur fractures treated with long proximal femur nail through medial entry will be called for follow up and data is collected as per the performa
- Functional assessment will be done using Harris Hip Score.

**Discussion:** Utizizing the tip of the trochanter as a starting point led to both varus and valgus malalignments.

Using the Trochanteric Fixation Nail (TFN) with a lateral to the tip of the trochanter, starting point demonstrated 6.83° varus and a gap of 8.03 mm. A medial starting point resulted in 6.6° valgus with a mean gap of 3.88 mm and a tip starting point showed 0.3° varus and 3.56 mm of gapping.

In the above conducted study there was a valgus angulation at the proximal femur due to medial entry of the proximal femur nail.

**Conclusion:** From this sample study, we conclude that Proximal Femoral Nail through medial entry is a good method for the treatment of Subtrochanteric fractures of femur provided optimal reduction of the fracture and good positioning of the nail and screws are achieved.

**Keywords:** proximal femur nail, subtrochanteric femur fractures, varus alignment, medial entry

### 1. Introduction

Currently intramedullary devices like proximal femur nail are used by many giving satisfactory results in subtrochanteric femur fractures.

Proximal Femur Nail has several advantages like less soft tissue, less blood loss, restoration of mechanical axis, superior bending stiffness which is similar to the intact femur. It resist to the medialisation of the shaft due to the muscle pull of adductors causing more efficient load sharing across the fracture

Proximal Femur Nails are designed for entry from the tip of trochanter, as it is more subcutaneous than the pyriform fossa, reduces the risk of damage to medial circumflex femoral artery and superior gluteal nerve. But this resulted in varus malalignment of the proximal fragment with too lateral of the entry point. An ideal entry point suggested by the manufacturers also results in slight varus deformity.

In such situation as suggested by Richardu <sup>[7]</sup> *et al.* slight medial entry leads to valgus alignment which is desired along with the anatomical reduction while nailing subtrochanteric fractures. In the study conducted by perez *et al.* Suggested that slight more medial entry also protected abductors and caused no damage.

### 2. Purpose of the study

The purpose of this study is to evaluate the results of subtrochanteric femur fractures treated

with long proximal femur nail with entry medial to the tip of greater trochanter from 2014 -2016 treated at VSGH.

**3. Inclusion criteria**

All skeletally mature Patients with subtrochanteric fractures and treated with long proximal femur nail.

**4. Exclusion criteria**

Patient lost to follow up  
Patient not willing to give consent

**5. Study design**

This is a prospective, observational, longitudinal type of study

**6. Materials and Methodology**

permission from ethical committee was taken Patient data is collected from OOT register VSGH from 2014-2016.All the patients of subtrochanteric femur fractures treated with long proximal femur nail through medial entry will be called for follow up and data is collected as per the performa. Patients were followed up at 2, 4, 6 weeks and then monthly with clinical and radiographic assessment until fracture union. Fracture union was considered when bridging callus was visible on 3 of 4 cortices on anteroposterior and lateral radiograph. Functional assessment will be done using Harris Hip Score.

**7. Case study proforma**

**1. General Data**

Name	Age	Sex	Occupation	Address	IP NO
					*
					*

**2. Chronological data**

Date of injury	Date of admission	Date of surgery	Date of discharge

**3. Mode of injury**

RTA	Fall down	Others

**4. Pre Existing systemic illness**

**5. Examination**

- Side- unilateral
  - Right
  - Left
- Bilateral
- Type of injury:
  - Open
  - Closed
- Distal neurovascular status
- Associated injuries.

**6. Radiographs.**

- Seinsheimer type
- Associated osteoporosis
  - Present
  - Absent.

**7. Management**

**Primary management**

- Traction-

- Skin
- Skeletal
- TT/Antibiotics
- Iv fluids
- Blood
- Debridement if open.

**Definitive management**

- Procedure
  - Open
  - Closed
- Details of implant-  
Nail- length- Diameter-  
Hip screw- length- Position-  
Antirotation screw- length- Position-  
Distal screws- size- number-
- Reduction

**Postoperative management**

- Antibiotics
- Suture removal
- Physiotherapy-quadiceps strengthening exercises.
- Hip/Knee bending exercises.
- Mobilisation
  - Non weight bearing
  - Partial weight bearing
  - Full weight bearing

**Postoperative Complications**

**Early complications-**

- Infection
  - Superficial
  - Deep
- Wound gaping
- Epidermal necrosis
- Seroma
- Hematoma
- Decubitus ulcer

**Late complications-**

- Cutting out of the screws-
- Z effect of screws
- Reverse z effect of screws
- Varus collapse
- Nail breakage
- Diaphyseal fracture
- Limb length discrepancy
- Hip stiffness
- Delayed union
- Nonunion.

**8. Follow up proforma**

- Duration
- Knee bending
- Pain:
  - No pain
  - Slight
  - Moderate
  - Severe
- Limp
- Hip ROM:
  - Flexion
  - Extension
  - Adduction



**8. Observations**

**1. Mode of injury causing fracture**

60% of the patients suffered injury due to RTA, 33.3% suffered due to fall down

**Incidence based on Seinschemers classification**

**Distribution of the patients as per seinschemers classification.**

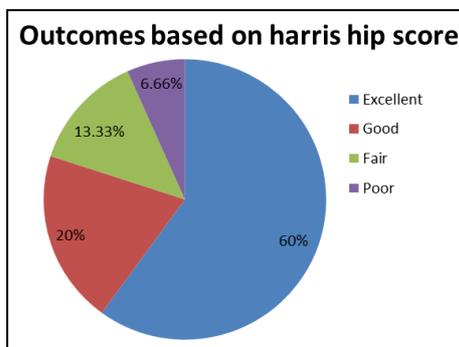
Most commonly seen fractures pattern in this study is Seinschmer's type III A.

**Assessment at final follow up**

**Overall result based on Harris hip score**

**Table 3:** Distribution of patients as per Harris hip score

	No of patients	Percentage
Excellent	18	60.00
Good	06	20.00
Fair	04	13.33
Poor	02	6.66



**Graph 1:** Distribution of patients based on Harris hip score

**9. Discussion**

The pull of the hip flexor and abductor muscles makes antegrade nailing of subtrochanteric femur fractures difficult, independent of starting point.

The varus deformity commonly seen is worse in subtrochanteric fractures because of the very high proximal medial fracture line and the malalignment produced by the contraction of the gluteus medius musculature.

The anatomy of the greater trochanter is variable and the rotation, abduction, and flexion positions of the proximal femur associated with a subtrochanteric fracture can make this starting point difficult to visualize and at best a very "inexact" procedure.

Often subtrochanteric fractures are well aligned on the fracture table, yet introduction of the nail with its proximal bend can produce a deformity.

Second-generation intramedullary nailing of subtrochanteric femur fractures through a piriformis fossa entry site has been shown to have a propensity toward a varus deformity [24, 25].

Utilizing the tip of the trochanter as a starting point led to both varus and valgus malalignments [26].

Using the Trochanteric Fixation Nail (TFN) with a lateral to the tip of the trochanter, starting point demonstrated 6.83° varus and a gap of 8.03 mm. A medial starting point resulted in 6.6° valgus with a mean gap of 3.88 mm and a tip starting point showed 0.3° varus and 3.56 mm of gapping [26].

Streubel PN [27]. In his study concluded that the ideal entry

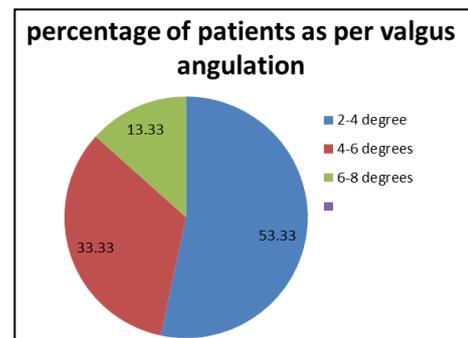
point ranged from 16 mm medial to 8 mm lateral to the trochanteric tip (mean, 3 mm medial; standard deviation, 5 mm). In 70% of patients, the ideal entry point was medial to and in 23% lateral to the tip of the greater trochanter and the trochanteric tip represents the ideal starting point in only the minority of cases.

Prasarn [28] in his study concluded that rigid femoral nails introduced through a lateral entry portal have been associated with a higher risk of iatrogenic fracture and malreduction.

In the above conducted study there was a valgus angulation at the proximal femur due to medial entry of the proximal femur nail

**Table 4:** Distribution of patients as per valgus angulation

Degrees of valgus angulation	No of Patients	Percentage
2-4 degrees	16	53.33
4-6 degrees	10	33.33
6-8 degrees	04	13.33



**Graph 2:** Distribution of patients as per valgus angulation

**10. Conclusion**

Various devices have evolved in an attempt to effectively neutralize these forces.

Closed insertion technique, shorter lever arm decreasing the tensile strain on the implant and increased purchase of the proximal fragment are the added advantages of Cephalomedullary nails over other fixation devices in subtrochanteric fractures.

Out of 30 cases of Subtrochanteric fractures treated with Proximal Femoral Nail, 24 patients had Excellent to good outcome at their final follow up. Poor outcome was seen in 02 patients. 2 of these patients had poor reduction intraoperatively.

The mean Harris Hip score at their final follow up was 80.76 which is comparable to international publications in the literature.

On follow up radiological examination at 6months 10 patients had 2-4 degrees of valgus angulation, 16 patients had 4-6 degrees of valgus angulation and 4 patients had 6-8 degrees of valgus angulation with no varus collapse.

From this sample study, we conclude that Proximal Femoral Nail through medial entry is a good method for the treatment of Subtrochanteric fractures of femur provided optimal reduction of the fracture and good positioning of the nail and screws are achieved.

50 year old male patient with history of RTA treated with proximal femur nail showing immediate and 6 months follow up X-ray.



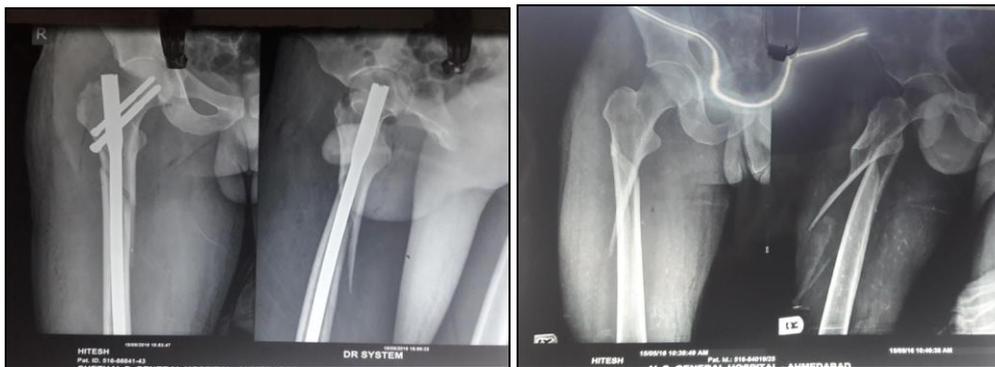
**X-ray 1:** Preoperative

**X-ray 2** Postoperative

**X-ray 3:** 6 months follow up Figure no 1(hip and knee flexion)



**Fig 2:** 28 year old male patient with history of RTA treated with proximal femur nail showing immediate and 6 months follow up X-ray



**X-ray 4:** Preoperative

**X-ray 5:** Postoperative



**X-ray 6:** 6 months follow up

**X-ray 7:** 1 Year follow up



Fig 3: Squatting



Fig 4: Hip and knee flexion

### 11. References & citations

1. Tencer AF, Johnson KD, Johnston DW, Gill K. A biomechanical comparison of various methods of stabilization of subtrochanteric fractures of the femur. *J Orthop Res.* 1984; 2:297-305.
2. Beingsner DM, Scolaro JA, Orec RJ *et al.* Open reduction and intra- medullary stabilisation of subtrochanteric femur fractures: a retrospective study of 56 cases. *Injury.* 2013; 44:1910-1915.
3. Herscovici D Jr, Pistel WL, Sanders RW. Evaluation and treatment of high subtrochanteric femur fractures. *Am J Orthop (belle Mead Nj).* 2000; 29:27-33.
4. Borens O, Wettstein M, Kombot C *et al.* Long gamma nail in the treatment of subtrochanteric fractures. *Arch Orthop Trauma Surg.* 2004; 124:443-447.
5. Connelly CL, Archdeacon MT. The lateral decubitus approach for complex proximal femur fractures: anatomic reduction and locking plate neutralization: a technical trick. *J Orthop Trauma.* 2012; 26:252-257.
6. Saarenpaa I, Heikkinen T, Jalovaara P. Treatment of subtrochanteric fractures. A comparison of the Gamma nail and the dynamic hip screw: short-term outcome in 58 patients. *IntOrthop.* 2007; 31:65-70.
7. Richard SY, Derek JD, Frank AL. Reducing subtrochanteric femur fractures: Tips and Tricks, Do's and Don'ts. *J Orthop Trauma.* 2015; 29: 28-33.
8. Johnson KD, Tencer AF, Sherman MC. Biomechanical factors affecting fracture stability and femoral bursting in closed intramedullary nailing of femoral shaft fractures, with illustrative case presentations. *J Orthop Trauma.* 1987; 1:1-11.
9. Kraemer WJ, Hearn TC, Powell JN *et al.* Fixation of segmental sub- trochanteric fractures. A biomechanical study. *ClinOrthopRelat Res.* 1996; 332:71-79.
10. Wang J, Ma XL, Ma JX *et al.* Biomechanical analysis of four types of internal fixation in subtrochanteric fracture models. *Orthop Surg.* 2014; 6:128-136.
11. Brumback RJ, Toal TR Jr, Murphy-Zane MS *et al.* Immediate weight-bearing after treatment of a comminuted fracture of the femoral shaft with a statically locked intramedullary nail. *J Bone Joint Surg Am.* 1999; 81:1538-1544.
12. Benirschke SK, Melder I, Henley MB *et al.* Closed interlocking nailing of femoral shaft fractures: assessment of technical complications and functional outcome by comparison of a prospective database with retrospective review. *J Orthop Trauma.* 1993; 7:118-122.
13. Astion DJ, Wilber JH, Scoles PV. Avascular necrosis of the capital femoral epiphysis after intramedullary nailing for a fracture of the femoral shaft. A case report. *J Bone Joint Surg Am.* 1995; 77:1092-1094.
14. Orlor R, Hersche O, Helfet DL *et al.* Die avaskula're Hu'ftkopfnekrosealsschwerwiegendeKomplikationnachF emurmarknagelungbei Kindern and Jugendlichen. *Unfallchirurg.* 1998; 101:495-499.
15. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures; treatment by mold arthroplasty. An end-study using a new method of result evaluation. *J Bone Joint Surg Am.* 1969; 51:737-755.
16. Dodenhoff RM, Dainton JN, Hutchins PM. Proximal thigh pain after femoral nailing. Causes and treatment. *J Bone Joint Surg Br.* 1997; 79:738-741.
17. Bednar DA, Pervez A. Intramedullary nailing of femoral shaft fractures: re-operation and return to work. *J Can Surg.* 1993; 36:464-466.
18. Ostrum RF, Marcantonio A, Marburger R. A critical analysis of the eccentric starting point for trochanteric intramedullary femoral nailing. *J Orthop Trauma.* 2005; 19:681-686.
19. Neher C, Ostrum R. Treatment of subtrochanteric femur fractures using a submuscular fixed low-angle plate. *Am J Orthop.* 2003; 32:29-33.
20. Jie Wang, Xin-long Ma, Dan Xing *et al.* Biomechanical analysis of four types of internal fixation in subtrochanteric fracture models. *Orthopedic surgery.* 2014; 6:128-136.
21. Philipp NS, Ambrose HW, William MR, Michael JG. Is there a standard trochanteric entry site for nailing of subtrochanteric femur fractures? *J Orthop Trauma.* 2011; 25:202-207.
22. Chloe AM, Henk-Jan ten Duis *et al.* Functional outcome after antegrade femoral nailing: A comparison of trochanteric fossa versus tip of greater trochanter entry point. *J Orthop Trauma.* 2011; 25:196-201.
23. Adam JS, Michael TH, Charles MR *et al.* Cephalomedullary nails in the treatment of high-energy proximal femur fractures in young patients: A prospective, randomized comparison of trochanteric versus piriformis fossa entry portal. *J Orthop Trauma.* 2006; 20:240-246.
24. French BG, Tornetta P3rd. Use of an interlocked cephalomedullary nail for subtrochanteric fracture stabilization. *Clin Orthop.* 1998; 348:95-100.
25. Wiss DA, Brien WW. Subtrochanteric fractures of the femur. Results of treatment by interlocking nailing. *Clin Orthop.* 1992; 283:231-236.
26. Ostrum, Robert F, Marcantonio MD, Andrew DO, Marburger Robert RN. A Critical Analysis of the Eccentric Starting Point for Trochanteric Intramedullary Femoral Nailing. *Journal of Orthopaedic Trauma:*

10.1097/01.bot.0000184145.75201.

27. Streubel Philipp N, Wong MD, Ambrose HW, Ricci MD, William M, Gardner MD *et al.* Is There a Standard Trochanteric Entry Site for Nailing of Subtrochanteric Femur Fractures? Journal of Orthopaedic Trauma 10.1097/BOT.obo13e3181e932.
28. Prasarn Mark L, Cattaneo MD, Monica Daegl MS, Achor Timothy MD, Ahn Jaimo MD, Klinger PhD *et al.* The Effect of Entry Point on Malalignment and Iatrogenic Fracture With the Synthes Lateral Entry Femoral Nail.