

Outcomes of Proximal Femoral Nail in Subtrochanteric Femur Fractures Through Medial Entry

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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 Richardu⁷ 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.

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

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 than 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.

Discussion: Utilizing the tip of the trochanter as a starting point led to both varus and valgus malalignments²⁶ 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 gapping²⁶ Streubel PN²⁷ 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. Prasarn²⁸ 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

Conclusion: This study was conducted to analyze the results of Subtrochanteric fractures treated with this Proximal Femoral Nail through medial entry both radiologically and functionally. In our series 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 6 months 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.

Keywords: Proximal femur nail Subtrochanteric femur fractures Varus alignment Medial entry

Introduction

Subtrochanteric fractures of femur account for 10–34% of all hip fractures. Several methods of treatment of this fractures have been

reported such as dynamic hip screw), angled blade plate, proximal femur locking plate, and intramedullary devices. Currently, intramedullary devices like proximal femur nail are used by many

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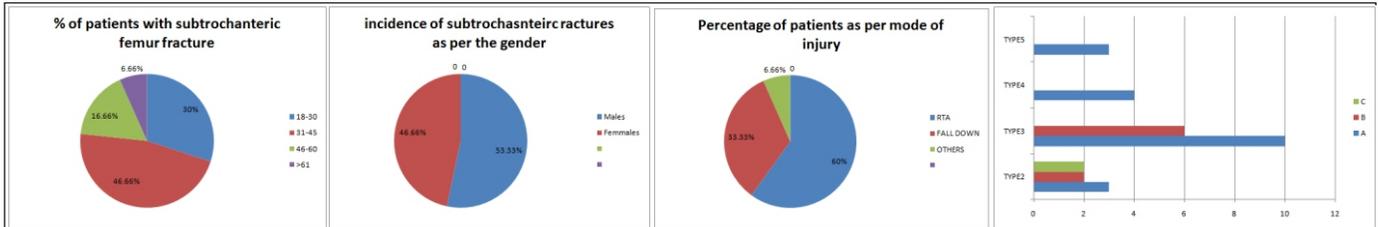


Figure 1: Percentage of patients with subtrochanteric femur fracture. **Figure 2:** Incidence of subtrochanteric fractures as per the gender. **Figure 3:** Percentage of patients as per mode of injury. **Figure 4:** Distribution of the patients as per Seinsheimer's classification.

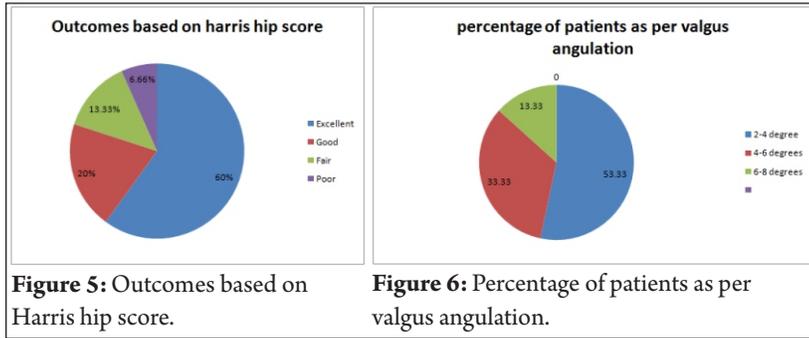


Figure 5: Outcomes based on Harris hip score. **Figure 6:** Percentage of patients as per valgus angulation.

Exclusion criteria

The following criteria were excluded from this study:

- Patient lost to follow-up
- Patient not willing to give consent

Study design

This is a prospective, observational, and longitudinal type of study.

Materials and Methods

- Permission from ethical committee was taken
- Patient data are collected from OOT register VSGH from 2014 to 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 are collected as per the pro forma
- Patients were followed up at 2, 4, and 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 the anteroposterior and lateral radiograph
- Functional assessment will be done using Harris hip score.

Case study pro forma

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

giving satisfactory results in subtrochanteric femur fractures. Proximal femur nail has several advantages such as less soft tissue, less blood loss, restoration of mechanical axis, and superior bending stiffness which is similar to the intact femur. It resists to the medialization 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 the medial circumflex femoral artery and superior gluteal nerve. However, 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 et al. [7] 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.

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 to 2016 treated at VSGH.

Inclusion criteria

All skeletally mature patients with subtrochanteric fractures and treated with long proximal femur nail were included in this study.



Figure 7: A 50-year-old male patient with a history of road traffic accident treated with proximal femur nail showing immediate and 6 months follow-up X-ray.



Figure 8: A 28-year-old male patient with a history of road traffic accident treated with proximal femur nail showing immediate and 6 months follow-up X-ray.

3. Mode of injury

- Road traffic accident
- Fall
- 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
- Anti-rotation screw- length- Position
- Distal screws- size- Number

• Reduction

Post-operative management

- Antibiotics
- Suture removal
- Physiotherapy quadriceps strengthening exercises
- Hip/Knee bending exercises
- Mobilization
- Nonweight bearing
- Partial weight bearing
- Full weight bearing

Post-operative 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



Figure 9: A 28-year-old male patient with a history of road traffic accident treated with proximal femur nail showing immediate and 6 months follow-up X-ray

- Diaphyseal fracture
- Limb length discrepancy
- Hip stiffness
- Delayed union
- Nonunion.

8. Follow-up pro forma

- Duration
- Knee bending
- Pain:
 - No pain
 - Slight
 - Moderate
 - Severe
- Limp
- Hip ROM:
 - Flexion
 - Extension
 - Adduction
 - Abduction
- Limb length
- Walking
 - Nonweight bearing
 - Partial weight bearing
 - Full weight bearing
 - Sitting cross-legged
 - Squatting
- Ambulatory capacity:
 - Independent
 - With stick
 - With walker
- Radiological assessment
 - Union

- Implant
 - Back-out of screws
 - Cutting of screw
 - Breakage of nail or screw
- Bone structure
 - Normal
 - Osteoporotic
- Neck-shaft angle
 - Varus/valgus

Grading of Harris hip score

- <70 - poor
- 70–79 - fair
- 80–89 - Good
- 90–100 - Excellent
 - Radiological
 - Union: Fracture lines
 - Entry of nail
 - Neck-shaft angle
 - Varus/valgus

Observations

The youngest patient in our series is 18 years old, and the oldest is 75 years. A maximum number of patients in this study are of elderly age group, and the mean age is 50.8 years (Table 1 and Fig. 1). Most commonly seen fractures pattern in this study is Seinsheimer's type III A (Table 4 and Fig 4). Majority of the patients in this study had either no pain or slight pain which did not effect their activities. Only one patient had severe pain. 13.33% (4) patients had mild pain which was relieved with analgesics (Table 7a). In the current study, the majority of the patients had no or slight limp that did not effect their activities. 4 patients (13.33%) had a moderate limp (Table 7b). In our study, 66.66% (20) patients did not require any support for

walking, and 5 (16.66%) patients required canes for long walks, and only two patients were mobilizing with the help of crutch (Table 7c). In this series, 73.33% (22) patients could climb stairs without any support, and 26.66% (8) patients required the support of railing (Table 7d). Squatting was possible in 21 (70.00%) patients with ease and with difficulty in 6 (20.00%) patients. 3 patients were unable to squat (Table 7e). In this study sitting cross-legged with ease is possible in 23 (76.66%) patients. 5 (16.66%) patients were able to sit cross-legged but with difficulty. 2 (6.66%) patients were unable to sit cross-legged (Table 7f). In our study, one patient had shortening of more than 2 cm while one patient had shortening of <2 cm which did not require any intervention (Table 7g).

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 the 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 [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 the medial entry of the proximal femur nail (Table 9).

Conclusion

The incidence of subtrochanteric fractures of the femur is on the raise because of fast and high-speed automobiles and modern lifestyles and increased the life expectancy of the elderly age group patients. The deforming forces, high mechanical stresses, and morbidity of the fractures in this region have always challenged the ingenuity and skills of the orthopedic surgeon. 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. This study was conducted to analyze the results of subtrochanteric fractures treated with this proximal femoral nail through medial entry both radiologically and functionally. In our series of 30 cases of subtrochanteric fractures treated with a proximal femoral nail, 24 patients had excellent to good outcome at their final follow-up. Poor outcome was seen in 2 patients. Two 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 6 months 10 patients had 2–4° of valgus angulation, 16 patients had 4–6° of valgus angulation, and 4 patients had 6–8° 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.

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