

Outcome of Subtrochanteric Femur Fractures Treated by Proximal Femoral Nail in a Tertiary Care Hospital

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Author's Contribution

^{1,2} Conception of study

^{1,2} Experimentation/Study conduction

³ Analysis/Interpretation/Discussion

^{1,3} Manuscript Writing

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Abstract

Objective: To determine the Outcome of Subtrochanteric Femur Fractures Treated by Proximal Femoral Nail in a Tertiary Care Hospital.

Materials and Methods: This prospective study was conducted from 1st July 2017 to 30th June 2019. The inclusion criteria were all the patients of both genders above 16 years of age who presented to the emergency department with subtrochanteric fractures of the femur. Exclusion criteria included pathological fractures, fractures in children, old neglected fractures, and multiple fractures. Radiographs were taken and all the patients were classified according to Seinsheimers classification. All the patients underwent internal fixation with Proximal Femoral Nail. The outcome of all patients was assessed by using the Modified Harris Hip Score.

Results: A total of One hundred and ten patients were enrolled in the study. The average age of patients was 30.05±8.59 years. 81 (73.63%) patients were males and 29 (26.36%) were females. According to Seinsheimers classification, we had 54 patients with Type II fractures, 35 patients with Type III fractures, 19 patients had Type IV fractures and 02 patients had Type V fractures. The average duration of stay in the hospital was 06 days while the average time required for full weight-bearing was 12 weeks. In our study, excellent results were found in 71 patients (64.5%), good results in 28 patients (25.4%), fair results in 06 patients (5.4%), and poor results in 03 patients (2.7%). 02 patients were lost in follow-up. The mean Harris Hip score was 93.5± 5.42. 14 patients (12.7%) had minor complications including 06 patients with Superficial wound infections, 03 patients with Deep infection, 01 patients with Deep vein thrombosis, and 04 patients had Fractures from the distal tip of the nail. All the fractures unite within 6 months period and no implant failure was observed.

Conclusion: Proximal Femoral Nail is a good choice implant for the fixation of subtrochanteric femur fractures leading to a high rate of union, fewer implant-related complications, and excellent functional outcomes.

Keywords: Subtrochanteric, Femur fracture, Proximal Femoral Nail, Modified Harris Hip Score, Seinsheimers classification, Complications.

Introduction

Strong deforming stresses at the fracture site, a shaky blood supply, and enormous load-bearing forces exerted through the peri-trochanteric region make subtrochanteric femur fractures challenging to treat. To improve patient outcomes, proper reduction and secure fixation are essential when treating these fractures.^{1,2} Subtrochanteric fractures account for around 7% to 34% of all femur fractures. They are equally maintained by males and females. According to studies, the bisphosphonate alendronate was administered to 7% of individuals with atypical subtrochanteric femur fractures. The one-year mortality rate for older patients with subtrochanteric femur fractures has been reported to be 25%.³ Non-union problems can occur in both intracapsular and extracapsular hip fractures due to inherent therapeutic limitations.¹

Non-union of the subtrochanteric fracture is difficult to treat. Even though revision with either an intramedullary or extramedullary device has been recommended with satisfactory results, problems that necessitate further procedures still occur.² The 95° plates, Femoral reconstruction nails, or Trochanteric femoral nails with interlocking options can all be used to effectively fix these fractures. Nails form very stable structures and can be inserted consistently with the patient in the lateral position on the radiolucent table or supine on the fracture table.⁴ Increased stiffness, rigidity, and a shorter moment arm of intramedullary nails provide a biomechanical benefit, resulting in a stronger build and less strain on the implant.⁵

Because the surgeon should be aware of the adjustable elements that can improve surgical results, such as nail entrance site and construct design, fracture reduction and stability can be affected.⁶ An unfavourable entrance location at the greater trochanter is typically the source of operational complications when applying Femoral locking nails. The nail is required to follow the cortical abutted medullary canal, especially in fractures that are further away. The tension between the nail and the femur is invariably caused by an incorrectly specified entry site, whether in the medio-lateral or dorso-ventral directions. In this case, a forceful insertion could result in iatrogenic comminution on the fracture side or further fractures on the proximal femur.⁷ For the treatment of subtrochanteric fractures, Antegrade femoral intramedullary nailing through a greater trochanteric insertion site has been recommended. The properties of the currently available trochanteric nails differ, and

the best insertion position for proper subtrochanteric fracture alignment has yet to be discovered.⁸

Complications after surgical management of subtrochanteric femur fracture are high and in a poor resource country including Pakistan, it is important to lessen the postoperative complications to reduce the cost of surgery for patients as well as from hospital administration. So, there is a vast need to conduct trials to improve the practice of surgical management of subtrochanteric femur fracture. Therefore, we aimed to conduct this study to get evidence for the management of subtrochanteric femur fracture by using Proximal Nailing. This would help us to get local evidence, and, in the future, we will implement the Proximal Femoral Nails for such fractures in order to improve our practice and achieve more success and patients satisfaction.

This study was done to determine the Outcome of Subtrochanteric Femur Fractures Treated by Proximal Femoral Nail in a Tertiary Care Hospital

Materials and Methods

Study design: Prospective Quasi-experimental study

Setting: Department of Orthopedic Surgery, Benazir Bhutto Hospital, Rawalpindi.

Study duration: Two years i.e. 1st July 2017 to 30th June 2019.

Sample size: The sample size of 110 cases was estimated by using a 95% confidence level, 7.5% margin of error, and percentage of subtrochanteric fractures i.e. 20% in all femur fractures.

Sampling technique: Non-probability, consecutive sampling.

Selection criteria: Patients of age 16-60 years, of both gender, with subtrochanteric femur fractures were enrolled. Patients with recurrent fractures of the same site, patients with implant failure, patients who already had deep vein thrombosis, Pathological fractures, Old neglected fractures, Fractures in children, Gunshot injuries, and Multiple fractures on the same site were not included in the study.

Data collection method: Patients fulfilling above stated selection criteria were enrolled from Emergency and OPD. Informed written consent was obtained. Demographics like Name, Age, Gender, BMI, Duration between fracture, Current presentation, and Cause of fracture were obtained. Radiographs were taken and all the patients were classified according to Seinsheimers classification. Then patients underwent internal fixation with Proximal Femoral Nail by Consultant Orthopedic Surgeon under Spinal

Anesthesia. Duration of surgery was noted. After surgery, patients were shifted to post-surgical wards and were followed up there till discharge. For at least two weeks after surgery, patients have been advised a standard antibiotic regimen along with standard medical treatment. All patients were discharged when they were able to move on their own and can move around the bed with a stick. Total hospital stay was noted. Then patients were followed-up in OPD for about 6-12 months, fortnightly for 6 months, and then monthly after 6 months. On each visit, radiographs were performed to determine the callus formation to see union. Duration of complete union was noted. Then patients were evaluated for full weight-bearing and time of full weight-bearing without stick or help was noted. After 6 months, patients were examined for Modified Harris Hip Score and outcome in terms of excellent, good, fair, and poor was noted. Patients were also examined for complications including Wound infection either deep or superficial, Deep vein thrombosis, Fracture from the distal tip of the nail, and Implant failure. All the data was collected in a proforma, specially designed for this research work.

Analysis plan: All the collected information was entered and analyzed by using SPSS v. 25. The outcome in terms of excellent, good, fair, and poor on Modified Harris Hip Score, and Complications was presented as frequency and percentage while outcome like Hospital stays duration, Duration required for full weight-bearing, Union duration was presented as mean and standard deviation.

Results

A total of one hundred and ten patients were enrolled in the study. The average age of patients was 30.05 ± 8.59 years. There were 81 (73.63%) male patients and 29 (26.36%) were females. The mean BMI of patients was 29.82 ± 13.21 kg/m². The mean duration of fracture was 3.21 ± 1.48 days. The major cause of fracture was Road Traffic accidents which were involved in 51 (46.4%) cases, followed by Falls from height [29 (26.4%)], Fight or being beaten up brutally by someone [21 (19.1%)] while 9 (8.2%) patients had a history of Trivial fall. According to Seinsheimers classification, we had 54 patients with Type II fractures, 35 patients with Type III fractures, 19 patients had Type IV fractures and 02 patients had Type V fractures. (Table 1)

The mean duration of hospital stay was 6.0 ± 1.2 days and the mean time of full weight-bearing was 12.1 ± 3.6 weeks. The mean duration of the union was $14.2 \pm$

2.9 weeks. In our study, excellent results were found in 71 patients (64.5%), good results in 28 patients (25.4%), fair results in 06 patients (5.4%), and poor results in 03 patients (2.7%). 02 patients were lost in follow-up. The mean Harris Hip Score was 93.5 ± 5.42 . 14 patients (12.7%) had minor complications including 06 patients with Superficial wound infections, 03 patients with Deep infections, 01 patients with Deep vein thrombosis, and 04 patients had Fracture from the distal tip of the nail. All the fractures united within 6 months period and no implant failure was observed. (Table 2)

The preoperative, postoperative and follow-up radiological images can be seen in Figure 1.

Table 1: Baseline features of patients

Feature	Mean \pm SD, (F (%))
n	110
Age	30.05 ± 8.59
Gender	
Male	81 (73.63%)
Female	29 (26.36%)
BMI	29.82 ± 13.21
Duration of fracture (days)	3.21 ± 1.48
Cause of fracture	
Road traffic accident	51 (46.4%)
Fall from height	29 (26.4%)
Fight / beaten by someone	21 (19.1%)
Trivial Fall	9 (8.2%)
Seinsheimers Classification	
Type II fracture	54 (49.1%)
Type III fracture	35 (31.8%)
Type IV fracture	19 (17.3%)
Type V fracture	2 (1.8%)

Table 2: Outcome of patients after surgery

Outcome	F(%), Mean \pm SD
Duration of hospital stay (days)	6.0 ± 1.2
Duration of union (weeks)	14.2 ± 2.9
Duration of full weight-bearing (weeks)	12.1 ± 3.6
Modified Harris Hip Score	93.5 ± 5.42
Excellent	71 (64.5%)
Good	28 (25.4%)
Fair	6 (5.4%)
Poor	3 (2.7%)
Complications	
Wound infection	9 (8.2%)
Superficial wound infection	6 (5.5%)
Deep wound infection	3 (2.7%)
Deep vein thrombosis	1 (0.9%)
Fracture from distal tip of nail	4 (3.6%)
Implant failure	0 (0.0%)
Lost to follow-up	2 (1.8%)

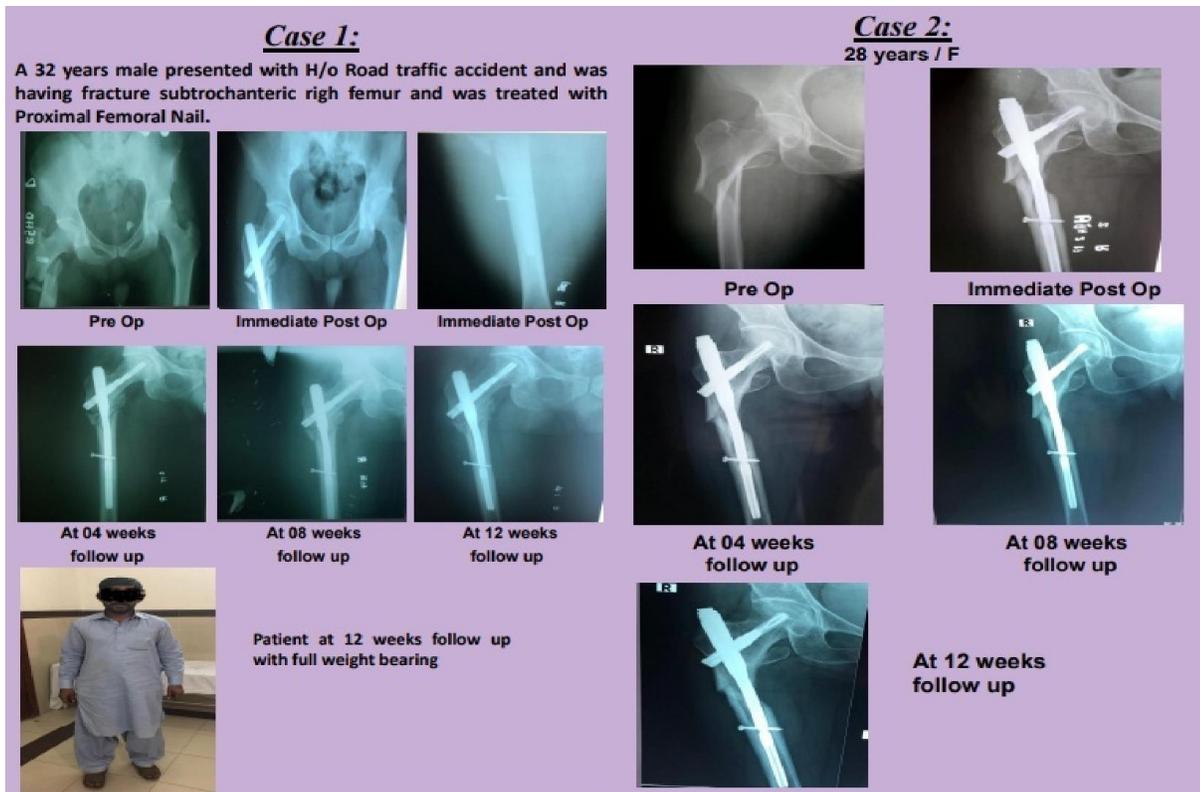


Figure 1: Pre Operative, Post operative and follow-up of patients

Discussion

Within 5 centimeters of the Lesser Trochanter, the subtrochanteric area is delineated. Intertrochanteric fractures are frequently seen in conjunction with subtrochanteric fractures. A characteristic deformity is created by the strong gluteal and thigh muscles. Abduction, flexion, and external rotation are all held by the proximal component.³ The incidence of these fractures has been estimated to be between 15 and 20 per 100,000 people.⁹ The age distribution for these fractures is bimodal: those younger than 40 years old account for around 20% of subtrochanteric fractures, while those older than 50 years account for more than two-thirds of subtrochanteric fractures.¹⁰ The frequency of these fractures appears to be roughly equal between males and females at younger ages; but, as people get older, the incidence of these fractures increases disproportionately in females.^{10,11} Subtrochanteric femur fractures are a rare complication in Orthopaedics, but when they do occur, they can be difficult to treat.¹² Intramedullary fixation has essentially established the gold standard for the treatment of subtrochanteric femur fractures.¹² The exact and professional technical performance of insertion is the basic surgical prerequisite in stabilizing

the subtrochanteric fractures by using the Proximal Femoral Nail. To minimize treatment failure, anatomical reduction along with little soft tissue handling and the use of adequate implants are required.¹³

In our trial, we observed that the average duration of stay in the hospital was 06 days and the average time required for full weight-bearing was 12 weeks. In our study, excellent results were found in 64.5% of patients, good results in 25.4% cases, fair results in 5.4% cases, and poor results in 2.7% cases. The mean Harris Hip Score was 93.5 ± 5.42 at end of the follow-up. About 14 patients (12.7%) had minor complications including 06 patients with Superficial wound infections and 03 patients with Deep infections. Because of the small site and minimal surgical dissection, the risk of postoperative infection with Cephalomedullary Nailing is quite low. Another study found one case of surface infection (5%), and one case of deep infection (5%), both of which occurred 3 months after surgery.¹⁴ Three out of 42 patients treated with a Russell-Taylor Reconstructive Nail developed an infection, according to Rethnam and colleagues: one had a superficial wound infection that was managed with antibiotics, and the other two required surgical debridement.¹⁵ Two of the 42 cases developed an

infection, as reported by Alvarez et al.¹⁶ Shah et al., looked at 51 subtrochanteric fractures treated with intramedullary nailing and reported good results, with one case of delayed union due to malignancy and one case of fixation failure.¹⁷

A further study found that after a year, total Harris Hip Scores were 90.1.¹² The surgeon can choose between a Piriformis entry site and a bigger Trochanteric entry site while doing an Anterograde intramedullary nailing. Reduced incidence of varus malreduction and medial cortical damage with reaming are two advantages of the piriformis entry site.¹⁸ The Holland nail had a radius of 300 cm and a proximal bend of 10 degrees, according to another study. 5 degrees and 350 cm for the Trochanteric Antegrade Nail, 6 degrees and 150 cm for the Trochanteric Fixation Nail, 4 degrees and 300 cm for Gamma 2, and 4 degrees and 200 cm for Gamma 3. Regardless of the nail, the tip beginning point resulted in the most neutral alignment. With all of the nails, the lateral starting point resulted in varus. With the Holland and Trochanteric Fixation Nails, the medial starting point resulted in valgus of >6 degrees; the Gamma and Trochanteric Antegrade Nail had better alignment with valgus of 4 degrees.⁸

Kumar et al. showed that the mean duration required for a complete union was 17.08 weeks (range 13 to 32 weeks), and the complete union was obtained in 92 percent of cases. In 68 percent of the cases, closed reduction was achieved, but 32 percent of the cases were done with open reduction. In 12% of instances, there were several per-operative complications, and in 26% of cases, there were delayed issues. In 86 percent of cases, good anatomical results were obtained, while 14 percent had fair results. According to the "Harris Hip Score", exceptional findings were seen in 28%, good in 56%, and fair in 16%. For subtrochanteric femur fractures, the long Proximal Femoral Nail is a durable implant with a high incidence of bony union and negligible soft tissues injury. Intramedullary fixation has some biological as well as bio-mechanical benefits, but it is a surgically challenging procedure.¹⁹

Conclusion

Proximal Femoral Nail is a good choice implant for the fixation of subtrochanteric femur fractures leading to a High rate of union, fewer implant-related complications, and Excellent functional outcomes. So

in the future, we recommend this implant for such types of fractures.

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