



## Original Article



## The Functional Outcome of Patients Treated with Proximal Femoral Nail (Pfn) for Sub Trochanteric Femur Fracture in Ayyub Teaching Hospital, Abbottabad

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## ABSTRACT

Sub-trochanteric femur fractures are challenging for orthopedic surgeons to fix owing to their location and associated consequences. Different intramedullary and extra-medullary implant stabilization techniques have been explored with varying degrees of effectiveness. **Objective:** To assess the functional outcomes of proximal femoral nail in patients treated for sub-trochanteric femur fracture. **Methods:** This cross-sectional study investigated 28 patients of sub trochanteric femur fracture treated with proximal femoral nail in Orthopedic Unit of Ayub Teaching Hospital, Abbottabad from January 2021 to March 2024. Patients aged  $\geq 20$  years who suffered from sub-trochanteric femur fracture and fit for surgery were included. All the patients were immobilized before surgery. Skin traction was applied and prepared for surgery. Postoperative outcome was assessed using the Harris hip score. **Results:** The overall mean age was  $56 \pm 10.8$  years. Out of 28 cases, there were 18 (64.3%) male and 12 (35.7%) female. The overall mean of hospital duration was  $14 \pm 4.6$  days. The majority of patients were 41-60 years old. Postoperative independence of ambulation was assessed in each patient after three, five, and six months. After 5 months, only two patients were unable to move around unassisted. Based on the Harris Hip Score, the incidence of exceptional, good, and fair outcomes was 6 (21.4%), 5 (17.9%), and 17 (60.7%) respectively. **Conclusions:** It was concluded that sub-trochanteric femur fractures can be treated with a proximal femoral implant, which offers advantages in terms of increased stability, quick disposition and minimal exposure.

## INTRODUCTION

Sub-trochanteric (ST) fractures manifest in a region extending 5 cm distally to the lesser trochanter region just at the junction of the diaphysis of the shaft. These fractures account for 10-30% of all hip fractures [1, 2]. The closed proximal femoral fractures need firm fixation because it is difficult to treat due to strong deforming forces at the fracture site, tenuous blood supply and immense load-bearing forces exerted through the per-trochanteric region. Hip fractures rank in the top ten injuries worldwide for individuals 50 years of age and older, resulting in significant disability [3]. The effects of hip fracture are profound, with mortality and negative effects on patient function and quality of life [4]. Sub-trochanteric

fractures represent approximately 10-30% of all hip fractures. They occur more frequently in older individuals experiencing low-speed impacts and in younger individuals exposed to high-speed impacts. Implant systems have been developed to reduce the incidence of complications during its function [7]. The lesser trochanter of the femur has particularly strong cortical bone, making it less susceptible to fracture compared with other areas and occurring more frequently at a younger age. Approximately 5-10% occur in the sub trochanteric (ST) [9]. Sub-trochanteric femur fractures are more common in females, with a reported prevalence of 33% compared with men [10, 11]. Older age and sex are recognized as important risk



factors, in addition to low total bone mineral density, diabetes mellitus, and the use of bisphosphonates for the management of osteoporosis [12]. Non-surgical methods of managing these fractures were previously associated with a higher risk of stroke, shortening, and even death due to delayed fixation. Unlike other proximal femoral fractures, sub-trochanteric fractures present additional clinical challenges. Recently, effective treatments for sub-trochanteric fractures have begun, with advances in fracture biology, reduction techniques, and biomechanically refined implants.

This study aims to assess the functional outcomes of proximal femoral nail (PFN) in patients treated for sub-trochanteric femur fracture.

## METHODS

This cross-sectional study investigated 28 patients of sub-trochanteric femur fracture treated with proximal femoral nail (PFN) in the Orthopedic Unit of Ayub Teaching Hospital, Abbottabad from Feb 2022 to March 2024 after getting ethical committee approval (RC-EA-2024/090). Non-probability consecutive technique was used. A total number of 28 patients (n=28) sample size was calculated using WHO software for sample determination in health studies having a confidence level of 95%, an anticipated population of 82.2%, and an absolute precision required was 8%. After getting informed written consent detailed demographics of enrolled cases were recorded [13]. Patients aged  $\geq 20$  years who suffered from sub-trochanteric femur fracture and fit for surgery and provided written consent were included. Open fractures along with pathological sub trochanteric (ST) femur fractures were excluded. All procedures were performed under spinal or epidural anesthesia. Every single patient who had a sub-trochanteric femur fracture was scheduled for an elective procedure. A typical lateral skin incision just above the tip of the greater trochanter was used throughout the surgical operation, which was performed and the patient was supine on a regular traction table. A guide wire was inserted using a drill sleeve through the tip of the greater trochanter until it reached the subtler-trochanteric area crossing the fracture site while the ante version of the femoral head and neck was maintained. Proximal reaming was done and then distally from the fracture site. The proximal femoral nail was passed. Drilling on the lateral trochanteric region was done for the lag screw crossing the lateral cortex to the neck and head and tapped and a spiral screw of the correct size was placed over the wire. The distal locking screw was passed. Assembly was removed, the wound was closed and the dressing was applied. Patients received intravenous antibiotics and analgesics and were monitored for two days after surgery in the postoperative ward. Patients were put on crutches and photographed thereafter. Patients were

given intravenous antibiotics, analgesics, and calcium supplements on the second day following surgery. Over the first six weeks, they were permitted to touch down and mobilize with a walker on the operated leg, and then they were allowed to fully bear weight. At two weeks, four weeks, monthly, and then every three months for two years after surgery, all patients were evaluated. Patients were examined, x-rays were taken, and fracture assessments were performed at each subsequent appointment. High-risk individuals received subcutaneous low-molecular-weight heparin during their hospital stay. Length of stay, blood transfusion requirements, and any in-hospital complications were carefully recorded. At the end of the follow-up assessment of functional outcomes using the Harris Hip Score (HHS) was done. Post-operative complications were assessed. The HHS is to measure the functional deficit of the hip so the higher the score, the better the outcome for the patient. Results can be recorded and calculated online. The maximum possible score is 100. Open reduction and internal fixation were implemented. Harris Hip Score (HHS), Improvement Level Score, Excellent 90-100, Good 80-90, Fair 70-80, and Poor <70. The statistical analysis of data was carried out using SPSS version 26.0. The quantitative variables were assessed using the mean and standard deviation, while the qualitative variables were measured using frequencies and percentages. To compare the qualitative and quantitative variables, the chi-square test and the student t-test were employed, respectively. A statistical significance level of  $p < 0.05$  was maintained.

## RESULTS

The overall mean age was  $56 \pm 10.8$  years. Out of 28 cases, there were 18 (64.3%) male and 12 (35.7%) female. The overall mean of hospital duration was  $14 \pm 4.6$  days. The age group of patients were as follows; 8 (28.6%) in 20-40 years, 18 (64.3%) in 41-60 years, and 2 (7.1%) in >60 years (Table 1).

**Table 1:** Baseline Characteristics of Patients (n=28)

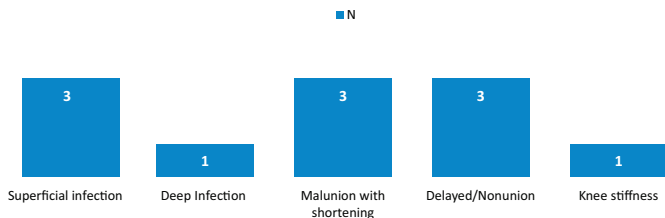
Parameters	Value
Age (Years)	$56 \pm 10.8$
<b>Gender n (%)</b>	
Male	18 (64.3%)
Female	12 (35.7%)
Length of Hospitalization (Days)	$14 \pm 4.6$
<b>Age Groups (Years)</b>	
20-40	8 (28.6%)
41-60	18 (64.3%)
>60	2 (7.1%)

Type of sub-trochanteric femur fracture, mechanism of injury, and average duration of surgery (Table 2).

**Table 2:** Preoperative Assessment of Patients(n=28)

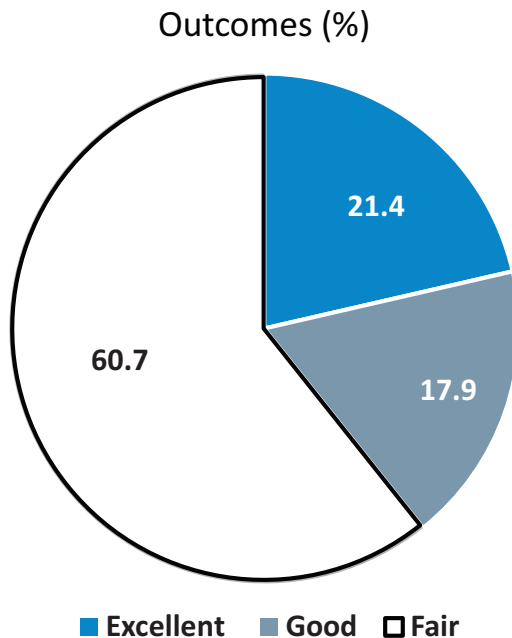
Parameters	n(%)
<b>Type of Sub-Trochanteric Femur Fracture</b>	
Type-I	56 ± 10.8
Type-II	
<b>Mechanism of Injury</b>	
Road Traffic Accident	18 (64.3%)
Fall from Height	12 (35.7%)
<b>Average Duration of Surgery (Hours)</b>	
<1	8 (28.6%)
1-1.3	15 (53.6%)
1.3-2	5 (17.9%)

Post-operative complications are illustrated(Figure 1).



**Figure 1:** Post-Operative Complications(n=11)

Postoperative independence of ambulation was assessed in each patient after three and five months. After 5 months, only two patients were unable to move around unassisted. Based on the Harris Hip Score, the incidence of exceptional, good, and fair outcomes was 6 (21.4%), 5 (17.9%), and 17(60.7%) respectively(Figure 2).



**Figure 2:** Harris Hip Score-Based Outcomes(n=20)

## DISCUSSION

The present study mainly focused on the assessment of the functional outcome of patients treated for sub-trochanteric femur fracture with proximal femoral nail (PFN) and reported that Sub-trochanteric femur fractures

can be treated with a proximal femoral implant, which offers advantages in terms of increased stability, quick disposition and minimal exposure. Because of its ability to produce early and sustained movements, PFN may be ideal for the prevention of ST fractures in older individuals. Studies have found the effectiveness of PFN in preventing ST fractures. In addition, based on the Harris hip score, all treated participants fell into excellent, good, and fair groups, which is consistent with the results of the previous study [11, 12]. Closed procedures focus on anatomic realignment, correction of length and rotation abnormalities to achieve optimal results [13]. Sub-trochanteric fractures generally result from high-energy trauma and are difficult to manage with traction. Radical approaches have been neglected due to treatment delays, contradictions, and frequent treatment failures [14]. Consequently, conservative treatments, as proposed by Gokul et al., are considered obsolete in contemporary trauma care. Dynamic compression hip screws have emerged as the preferred method of fixation in sub-trochanteric femur fractures. Compressing the femoral neck improves stability in reduced fracture, allowing the bone and implant to distribute stress more effectively [15]. Sub-trochanteric fractures of the femur pose significant complications and are considered serious injuries by orthopedic surgeons. The primary goal in treating these fractures is to obtain a stable surgical fixation, for treatment has been facilitated, allowing earlier mobilization, and returning the patient to his or her pre-fracture functional status as quickly as possible. In the present study, the majority of patients were male, and road traffic accidents (RTAs) were the main cause of fractures. This observation can be attributed to factors such as increasing urbanization, increasing traffic, non-compliance with traffic rules, reckless driving, and preference for outdoor activities increases in men. Ibrahim et al., reported that RTA accounted for the majority (86%) of proximal femur fractures in their series [16]. Similarly, Kachewar et al., reported that 77% of the patients were between 20 and 60 years of age, which resemble our study findings [17]. Sub-trochanteric fractures of the femur usually result from high-energy trauma. This is due to the complex stress distribution in this area and the geometry of its irregular skeletal structure. Consequently, a fracture is evident in a relatively simple approach through the proximal femur. The majority of sub-trochanteric fractures occurred in younger individuals because of road accidents; whereas low-energy trauma such as falls from standing heights or stairs is the cause of bone loss, interstitial fractures occur mainly in the elderly [18]. PFN represents a superior implant technique for the management of femoral sub-trochanteric (ST) fractures because, unlike DHS, it is a weight-shearing implant. However, it will be important to conduct comparative studies with other implants to confirm our findings [19]. Several cases describe clear

recurrence of irreversible tumors supporting our findings. The findings in Pakistan are consistent with the results of our present study. In addition, this study showed that the Harris Hip Score favors a closed approach over an open approach to sub-trochanteric fracture repair. Notably, there was no statistically significant difference between the groups in fracture union rate and complication rate [20].

## CONCLUSIONS

It was concluded that sub-trochanteric femur fractures can be treated with a proximal femoral implant, which offers advantages in terms of increased stability, quick disposition and minimal exposure. It has the ability to produce early and sustained movements, so PFN may be ideal for the prevention of ST fractures in older individuals.

## Authors Contribution

Conceptualization: MY

Methodology: MY, SUS

Formal analysis: AR, AGSK, SA, RK

Writing review and editing: SUS, MSZ

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

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