

FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL NAIL IN SUBTROCHANTERIC FEMUR FRACTURES

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Abstract

Background: The choice of the most suitable implant for internal fixation of Subtrochanteric femur fractures remains a topic of debate. Various intramedullary and extramedullary devices have been proposed for their fixation. Proximal Femoral Nail (PFN) is an intramedullary implant used to fix this fracture.

Objective: To determine the functional outcome of proximal femoral nailing (PFN) for Subtrochanteric femur fractures.

Material and Methods: This descriptive cross-sectional study was conducted at the Department of Orthopedic Surgery, Lady Reading Hospital, Peshawar, from 20th January 2019 to 31st March 2023. A sample size of 79 adult patients with sub trochanteric fractures fulfilling the inclusion criteria were treated with PFN. Post operative functional outcomes were assessed using the Harris Hip Score (HHS) and graded as excellent, good, fair and poor after 12 weeks. We analyzed our data with SPSS version 22.

Result: We treated 79 patients with PFN. The mean age of patients was 47 ± 2.87 years. Of the 79 patients, 58 (73.4%) were male, and 21 (26.6%) were female. The functional outcomes as per HHS was Excellent in 30 patients (38.0%), Good in 25 patients (31.6%), Fair in 20 patients (25.3%), and Poor in 4 patients (5.1%).

Conclusion: Proximal femoral nail (PFN) for Subtrochanteric fractures yielded excellent and good functional outcome in majority of our patients. On the basis of results of the study, it is recommend PFN as the implant of choice to fix sub trochanteric fractures in adults.

Keywords: Harris Hip Score, proximal femoral nail, Subtrochanteric femur fracture, functional outcome,

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Introduction:

Subtrochanteric femur fractures are defined as fractures occurring within 5 cm of the lesser trochanter.¹⁻³ These fractures exhibit a bimodal age distribution: younger patients are typically affected due to high-energy trauma such as vehicular accidents, while older individuals often sustain these fractures from low-energy falls related to osteoporosis.^{1,2,4,5}

The Subtrochanteric region is subjected to high mechanical stress—compressive forces medially and tensile forces laterally.^{3, 6,7} Historically, Subtrochanteric femur fractures have been managed surgically, but the choices of the most suitable implant for internal fixation remains a topic of debate. Various intramedullary and extramedullary devices have been proposed for their fixation. Hospitals have employed a range of proximal femoral devices, including

dynamic condylar screws, dynamic hip screws with barrel plates, gamma nails, and proximal femoral nails, with each reportedly achieving satisfactory outcomes.⁷⁻⁸

Traditionally, blade plates and proximal femoral locking plates were used, but these techniques required extensive soft tissue dissection and periosteal stripping, leading to compromised vascularity and delayed fracture union.⁸⁻⁹

The introduction of proximal femoral nails (PFN) has revolutionized treatment, offering minimally invasive fixation with reduced soft tissue disruption and superior biomechanical stability. PFN enables early mobilization and weight-bearing, providing excellent outcomes in fracture healing and patient rehabilitation. There are many advantages of using the proximal femoral nails, such as easy accessibility for surgeons and shorter operative times,

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resulting in reduced overall surgical duration.^{1,10,11}
This objective of our study was to determine the functional outcome of proximal femoral nailing (PFN) for Subtrochanteric femur fractures.

Material and Method:

Study Design:

Descriptive cross sectional.

Place and duration of study:

Department of Orthopedic Surgery, Lady Reading Hospital, Peshawar, from 20th January 2019 to 31st March 2023.

Sample size:

Total 79 patients were included in this study. The sample size was calculated with open epi software keeping the confidence interval 95%, margin of error 0.5% and prevalence 0.3%.

Sampling Technique:

Non-probability consecutive sampling.

Inclusion Criteria:

- Patients aged 20–60 years with Subtrochanteric femur fractures.
- Both male and female patients.

Exclusion Criteria:

- Pathological fractures.
- Previous surgeries on the femur.
- Medically unfit patients at high surgical risk.

Data Collection:

Patients meeting the inclusion criteria were enrolled after obtaining ethical approval from the hospital review board. Informed consent was obtained, and data were collected using a pre-structured proforma.

Operative Technique

Surgeries were performed under general anesthesia under image intensifier by same team of experienced consultant orthopedic surgeon, assisted by a senior postgraduate trainee. An identical standard surgical technique was adopted in all cases. The patient was positioned supine on traction table. Traction was applied to the affected limb. Fracture reduced closely. Under image intensifier an appropriate entry point at the tip of greater trochanter was made and checked in AP and lateral view. This was followed by passing a guide wire and proximal sequential reaming of appropriate size. An appropriate nail diameter was passed over the guide wire in antegrade mode. After retrieval of guide wire the proximal helical blade screw was passed into the femoral neck. Distal locking was performed via free hand under image (fig 1). Wound closed and dressing done.

Postoperative X-rays were taken on the first day. All patients were subjected to supervised physiotherapy. Patients were followed up at 2 weeks, 6 weeks, 8 weeks and 12 weeks. At last follow up at 12th week functional outcome was assessed using the Harris Hip Score (HHS). HHS scores were categorized as: Excellent: 90–100, Good: 80–89, Fair: 70–79 and Poor: <70 score.

Data Analysis:

Data were analyzed using SPSS version 22. Descriptive statistics were calculated for numerical variables, while frequencies and percentages were computed for categorical variables. Chi-square tests were applied for categorical variables while HHS was compared with independent sample t test for statistical significance. $p < 0.05$ was considered significant. Data presented in tables where necessary.

Results:

A total of 79 patients were included in the study. The mean age was 47 ± 2.87 years. The demographic and clinical characteristics of the patients are presented in Table 1.

Age Group	Frequency	Percentage
20–30 years	18	22.8%
31–40 years	19	24.1%
41–50 years	24	30.4%
51–60 years	18	22.8%

Demographics:

Of the 79 patients, 58 (73.4%) were male, and 21 (26.6%) were female. Most cases (58, 73.4%) were operated on within 1–2 weeks post-trauma, while 21 cases (26.6%) underwent surgery after 3–4 weeks.

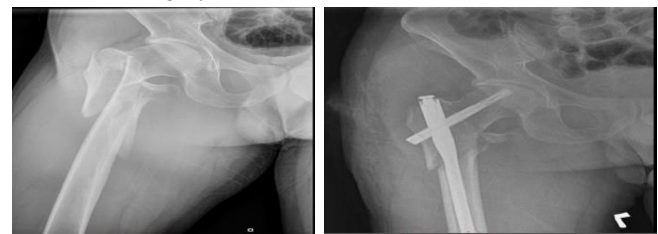


Fig 1: Pre and post op radiographs of 65-year-old lady treated with PFN.

Radiographic and Functional Outcomes:

All fractures united at the end of 12 weeks and no nonunion was noted. The mean HHS was 81 ± 4.5 the detailed Functional outcomes at 12 weeks, as assessed by HHS, are summarized in Table 2. Superficial surgical site was noted in 7 patients which resolved with antibiotics and dressing. No other major complication was observed.

Outcome	Frequency	Percentage
Excellent	30	38.0%
Good	25	31.6%
Fair	20	25.3%
Poor	4	5.1%

Overall, 69.6% of patients achieved Excellent to Good outcomes, while 5.1% had Poor outcomes. There was no statistical significance in terms of HHS when comparison was done in between male and female ($P=0.5$) and side of the fracture ($P=0.1$). However younger patients (41–50 years) have better HHS scores than others ($P=0.01$).

Variable	Frequency	%age	HHS(mean)	P value
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Male	58	73.4	82.3±4	0.5
Female	21	26.6	79.1±1.1	
Left side fracture	25	31.65	80±3.2	0.1
Right side fracture	54	68.35	81±2	
20-50 years of age	61	77.22	92.3±5.3	0.01
More then 50 years age	18	22.78	80±2.2	

Discussion:

Subtrochanteric femur fractures pose unique challenges due to their biomechanical and anatomical characteristics. There are numerous ways for surgical fixation of Subtrochanteric femur fractures. Different kinds of implants have been used for internal fixation of these fractures.^{11,12,13} Traditional methods, such as plating, are associated with complications like delayed union and implant failure due to extensive soft tissue dissection. Extramedullary implants act as load-bearing devices, which increases the risk of plate failure due to their load-bearing properties.^{14,15}

On the other hand, PFN offers several advantages, including minimal disruption of soft tissue and vascularity, superior biomechanical stability, and facilitation of early mobilization. Studies comparing PFN with other fixation methods consistently demonstrate favorable outcomes. A study by Panteli M et al. indicates that open reduction of Subtrochanteric fractures is linked to a higher risk of superficial infections, extended surgical durations, and an increased need for blood transfusions.^{16,18}

A meta-analysis of 36 randomized controlled trials showed no difference in complication rates among eight types of surgical interventions but found lower blood loss and higher Harris Hip Scores with PFN-A (13). Liu Y et al. reported on 143 peri-trochanteric femur fractures fixed with PFN-A, with 142 cases achieving union and 74% regaining pre-injury mobility status.^{16,17}

A multicenter cohort study conducted in Denmark utilized data from the Danish Multidisciplinary Hip Fracture Registry (DMHFR). Among 909 patients with Subtrochanteric fractures, 308 were treated with a short intramedullary nail, while 601 received a long intramedullary nail. The rate of major reoperations was 8.4% in the short intramedullary nail group compared to 4.0% in the long intramedullary nail group. These findings suggest that long intramedullary nails are associated with a lower rate of major reoperations compared to short intramedullary nails in the treatment of Subtrochanteric fractures.^{19,21}

Jie Wang et al., in a comprehensive systematic review and meta-analysis, demonstrated that intramedullary fixation offers shorter union times and lower rates of nonunion and reoperation compared to extramedullary fixation methods.^{20,22}

In our study, 69.6% of patients achieved Excellent to Good functional outcomes, aligning with findings in the literature.

Our findings confirm the effectiveness of PFN in achieving satisfactory functional outcomes.

Our study had few limitations. Our design was descriptive. Our sample size was small and short follow up. We recommend further studies to address all these complications and further verify our results.

Conclusion:

Proximal femoral nail (PFN) for Subtrochanteric fractures yielded excellent and good functional outcome in majority of our patients. We recommend PFN as the implant of choice to fix sub trochanteric fractures in adults. It provides excellent functional outcomes with minimal complications, offering a significant advantage over traditional fixation methods.

References:

1. Prasad AK, Kumar A, Kumari K, Jee GM, Chaudhary L. Intramedullary Vs. Extramedullary Fixation in Subtrochanteric Femur Fractures: A Comparative Study. *Azerbaijan Pharmaceutical and Pharmacotherapy Journal*. 2024 Jul 17;23:1-6.
2. Linhart C, Kistler M, Kussmaul AC, Woiczinski M, Böcker W, Ehrnthaller C. Biomechanical stability of short versus long proximal femoral nails in osteoporotic subtrochanteric A3 reverse-oblique femoral fractures: a cadaveric study. *Archives of Orthopaedic and Trauma Surgery*. 2023 Jan;143(1):389-97.
3. Karahan G, Yamak K, Kocoglu T, Altay T, Kayali C. The effect of implant choice on varus angulation and clinical results in the management of subtrochanteric fractures. *Journal of Orthopaedics*. 2020 Jul 1;20:46-9.
4. An Y, Jiang D. Biomechanical effects of three internal fixation modes on femoral subtrochanteric spiral fractures in osteoporotic patients by finite element analysis. *Zhongguo xue fu Chong Jian wai ke za zhi= Zhongguo Xuefu Chongjian Waike Zazhi= Chinese Journal of Reparative and Reconstructive Surgery*. 2023 Jun 1;37(6):688-93.
5. Patel R, Menon H, Chaudhari N, Chaudhari V. Subtrochanteric femur fractures treated with extramedullary or intramedullary fixation at tertiary care centre. *International Journal*. 2017 Feb 1;6(2):226.
6. Jhamb JA. *Study of Management of Subtrochanteric Fractures of Femur with Reconstruction Nail* (Master's thesis, Rajiv Gandhi University of Health Sciences (India)).
7. Garrison I, Domingue G, Honeycutt MW. Subtrochanteric femur fractures: current review of management. *EFORT Open Reviews*. 2021 Feb 1;6(2):145-51.
8. Malik S, Malviya P, Vieira A, Jain D. A prospective study of management of subtrochanteric femur fracture using proximal femoral nail. *International Journal of Research in Orthopaedics*. 2020 Mar;6(2):292.
9. Wang J, Ma JX, Lu B, Bai HH, Wang Y, Ma XL. Comparative finite element analysis of three implants fixing stable and unstable subtrochanteric femoral fractures: Proximal Femoral Nail Antirotation (PFNA), Proximal Femoral Locking Plate (PFLP), and Reverse Less Invasive Stabilization System (LISS). *Orthopaedics & Traumatology: Surgery & Research*. 2020 Feb 1;106(1):95-101.
10. Abraham VT, Chandrasekaran M, Mahapatra S. Outcome of subtrochanteric fracture of the femur managed with proximal femoral nail. *Int Surg J*. 2016 Aug;3(3):1296-300.
11. Rapp K, Büchele G, Dreinhöfer K, Bücking B, Becker C, Benzinger P. Epidemiology of hip fractures: systematic literature review of German data and an overview of the international literature. *Zeitschrift für Gerontologie und Geriatrie*. 2019 Feb 7;52(1):10-6.
12. Chen J, Ma JX, Wang Y, Bai HH, Sun L, Wang Y, Lu B, Dong BC, Tian AX, Ma XL. Finite element analysis of two cephalomedullary nails in treatment of elderly reverse obliquity intertrochanteric fractures: zimmer natural nail and proximal femoral nail antirotation-II. *Journal of Orthopaedic Surgery and Research*. 2019 Dec 10;14(1):422.
13. Cheng YX, Sheng X. Optimal surgical methods to treat intertrochanteric fracture: a Bayesian network meta-analysis based on 36 randomized controlled trials. *Journal of Orthopaedic surgery and research*. 2020 Sep 10;15(1):402.

14. Yu Y, Pan K, Wang G. Femoral trochanteric fracture: PFNA spiral blade placement with the aid of an angler. *Journal of International Medical Research*. 2020 Oct;48(3):0300060519890782.
15. Singh S. Proximal femoral nail versus proximal femoral nail antirotation: functional and radiological outcome in intertrochanteric fractures of femur. *Cureus*. 2021 Oct 28;13(10).
16. Köse A, Topal M, İpteç M, Engin MÇ, Dinçer R, Aydın A, Aykut S, Ayas MS, Özyıldırım E. Cerclage Cable and Long Proximal Femoral Nail Antirotation Fixation in Treatment of Subtrochanteric Fractures: Functional and Radiological Outcomes and Complications. *European Archives of Medical Research*. 2021 Sep 1;37(3).
17. Wu Z, Du B, Wang Q, Jiang T, Si Y, Zhang P, Wang Y. Minimally invasive clamp-assisted reduction and long InterTAN nail fixation for Seinsheimer type V subtrochanteric fractures: a case series describing the technique and results. *BMC Musculoskeletal Disorders*. 2023 Apr 3;24(1):256.
18. Panteli M, Vun JS, West RM, Howard AJ, Pountos I, Giannoudis PV. Management of subtrochanteric femur fractures: is open reduction associated with poor outcomes?. *European Journal of Trauma and Emergency Surgery*. 2022 Jun;48(3):1759-68.
19. Våberg B, Eriksen L, Højsager KD, Højsager FD, Lauritsen J, Palm H, Overgaard S. Should pertrochanteric and subtrochanteric fractures be treated with a short or long intramedullary nail?: a multicenter cohort study. *JBJS*. 2021 Dec 15;103(24):2291-8.
20. Wang J, Li H, Jia H, Ma X. Intramedullary versus extramedullary fixation in the treatment of subtrochanteric femur fractures: a comprehensive systematic review and meta-analysis. *Acta Orthopaedica et Traumatologica Turcica*. 2020 Nov;54(6):639.
21. Kasha S, Yalamanchili RK. Management of subtrochanteric fractures by nail osteosynthesis: A review of tips and tricks. *Int Orthop*. 2020;44(4):645-53.
22. Şensöz E, Cecen G. Comparison of Intramedullary and Extramedullary Fixation Results in Subtrochanteric Femur Fractures. *Cureus*. 2023 Nov 22;15(11).