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Original Article

FUNCTIONAL OUTCOME OF SUBTROCHANTERIC FRACTURE TREATED WITH LONG PROXIMAL FEMUR NAIL: A PROSPECTIVE STUDY

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ABSTRACT

Background: Orthopaedic surgeons encounter subtrochanteric femur fractures of the femur as one of the most difficult fractures to treat changes due to numerous muscle attachments, including the iliopsoas, medial hip adductors, lateral hip abductors, and short external rotators, are located in the subtrochanteric area, which increases the load on the proximal femur.
Objective: This study evaluates the functional outcome of subtrochanteric femur fracture treated with long proximal femoral nail**.**
Subjects and Methods: The study included 40 patients with subtrochanteric fractures who were admitted to the Orthopaedics Department of a Govt Medical College Hospital between the years 2024 and 2025. Under either spinal or general anaesthesia, depending on the patient's condition and fracture fixation was done with long proximal femoral nail.
Results: Among the 40 patient 31 is male and 9 were female. They were between 24 to 62 year of age grou; with mean age being 40 years. Based on the Seinsheimer's classification, we had 15 patients with type II fracture, 17 patients with type III fracture, 5 patients with type IV fracture and 3 with type V fracture. Based on the Harris Hip Score results showed that 9 patients had excellent score, 24 were good score, 7 had fair score. These results show significant improvement in functional status of participant with majority of patient scoring good to excellent. At the end of 6 month all patients were mobilised independently.
Conclusion: We had good results with the long proximal femoral nail, long PFN is safe, effective and patient friendly device useful for the treatment of all subtrochanteric fractures irrespective of their comminution.

Keywords*: Subtrochanteric fracture, Long proximal femur nail, Harris hip score, Intramedullary implants.*

INTRODUCTION

In all age categories, hip fractures are the most debilitating injuries. The primary components of extracapsular fractures (intertrochanteric and subtrochanteric fractures) are compact cancellous bone and cortical bone.(1)Femoral fractures known as subtrochanteric fractures happen in the femur shaft between 5 cm distally and below the lower trochanter.(2) Orthopaedic surgeons still encounter subtrochanteric fractures of the femur as one of the most difficult fractures to treat. They are responsible for 10–15% of all hip fractures(3) As people age, their injury mechanism changes. High intensity trauma is the most common cause of fractures in younger individuals. Low intensity trauma, such as a simple fall, is the cause of fractures in older age groups. Bergman and associates observed that the low energy group's average age was 76.2 years, while the high energy trauma group's average age was 40.6 years(.4) Numerous muscle attachments, including the iliopsoas, medial hip adductors, lateral hip abductors, and short external rotators, are located in the subtrochanteric area, which increases the load on the hip and proximal femur.(5)Sub-trochanteric fractures have been treated with extramedullary implants, such as condylar blade plates and proximal femoral locking plates, however these procedures have been linked to issues such as a high rate of reduction loss, fixation failure, and the requirement for

reoperation.(6) Intramedullary implants offer a number of biomechanical advantages to extramedullary implants, such as less soft tissue incision, dynamic locking, ease of insertion, possible reduction in blood loss, and mechanical axis restoration.(7) For different kinds of upper femoral fractures, AO-ASIF's 1997 development of the Proximal Femoral Nail is said to provide better outcomes than alternative methods.(8) Our study's objective was to assess the effectiveness, and functional results of extended PFN in the treatment of subtrochanteric femur fractures.

SUBJECTS AND METHODS

This prospective study included 40 patients with subtrochanteric fractures who were admitted to the Orthopaedics Department of Govt Medical College SriGanganagar, Rajasthan between the years 2024 and 2025. Subtrochanteric fracture femur, close fracture and age above 18 years were included in this study. Patients with pathological fracture, open fracture, fracture in patients below 18 years of age, old neglected fractures, peri-prosthetic fractures were excluded from the study.

Antibiotics were administered prior to surgery. Under either spinal or general anaesthesia, depending on the patient's condition, they were placed supine on the fracture table. In order to make nail insertion through the piriform fossa easier, the leg was positioned in a small adduction and the fracture was reduced by longitudinal traction. A straight lateral incision was made 3-5 cm proximally, from 3 to 5 cm cranial to the greater trochanter tip. Directly medial to the greater trochanter's tip was the PFN entrance hole. Under C-arm control, a 2.8 mm threaded guide wire was introduced. The length and diameter of the long PFN were appropriate; the proximal diameter was 14 mm and the distal diameter was 9, 10, 11, and 12 mm. After mounting the nail of the proper size on the insertion device (zig), it was manually inserted into the femoral shaft. After inserting the hip pin, the neck screw of the proper size was added. Then, using free hand, distal interlocking was accomplished either statically or dynamically, depending on the type of fracture. When sufficient reduction was not achieved, open reduction was used. Closure was carried out in layers following fixation. Four patients were delayed for surgery because of a heart condition and elevated blood sugar levels, and the maximum number of patients had surgery within five days. After six months, all patients are able to move around on their own. For all patients, partial weight bearing began at six weeks, and complete weight bearing began at twelve weeks. At six weeks, three months, six months, and one year, patients were routinely checked, and radiographs were used to evaluate them. To evaluate the patients' functional outcome, the Harris hip score was used.

RESULTS

Among the 40 patient 31 is male and 9 were female (Table 1). They were between 24 to 62 years of age group with mean age 40 years (Table 2). Based on the Seinsheimer’s classification we had 15 patients with type II fracture, 17 patients with type III fracture, 5 patients with type IV fracture and 3 with type V fracture (Figure 1). According to the mode of injury, 26 patients were involved in traffic accidents, while the remaining patients had a history of fall (Table 3). We treated 35 patients with close reduction and 5 patients by open reduction (Table 4 and Figure 2). Based on the Harris Hip Score, results showed that 9 patients had excellent score, 24 were good score, and 7 had fair score (Table 5). These results show significant improvement in functional status of participant with majority of patient scoring good to excellent. At the end of 6 month all patient mobilise independently.

Table 1: Distribution of study patients by gender

Gender	No of patients	Percentage
Male	31	77.5
Female	9	22.5
Total	40	100

Table 2: Distribution of study patients by age

Age	No of patients	Percentage
18-40	28	70
40-60	10	25
Above 60 year	2	5
Total	40	100

Table-3 Mode of injury in study patients

Mode of injury	No of patients	Percentage
RTA	26	65
Fall	14	35
Total	40	100

Table-4 mode of reduction technique in patients

Mode of reduction technique	No of patients	Percentage
Close	35	87.5
Open	5	12.5
Total	40	100

Table-5 functional outcome of study patients based on Harris hip score

Result	No of patients	Percentage
Excellent	9	22.5
Good	24	60
Fair	7	17.5
Total	40	100

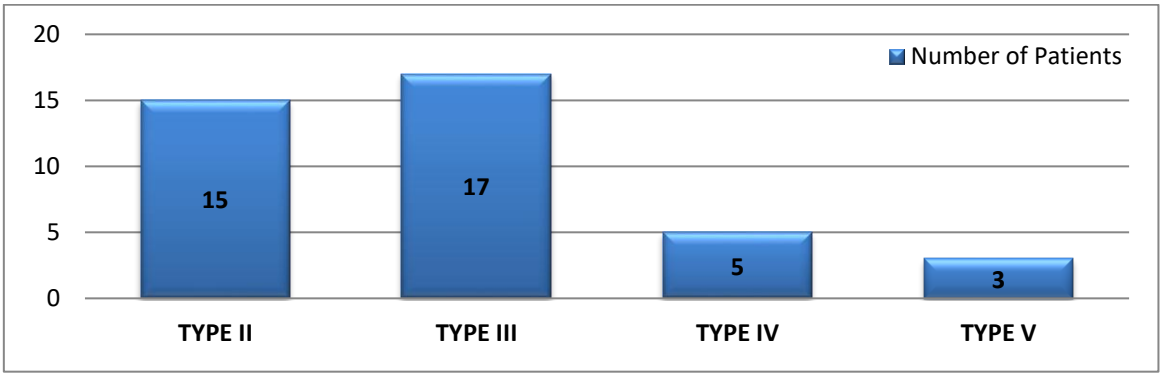

Figure 1: Distribution of patients across different types of subtrochanteric fracture based on Seinsheimer's classification we had 15 patients with type II fracture, 17 patients with type III fracture, 5 patients with type IV fracture and 3 with type V fracture.

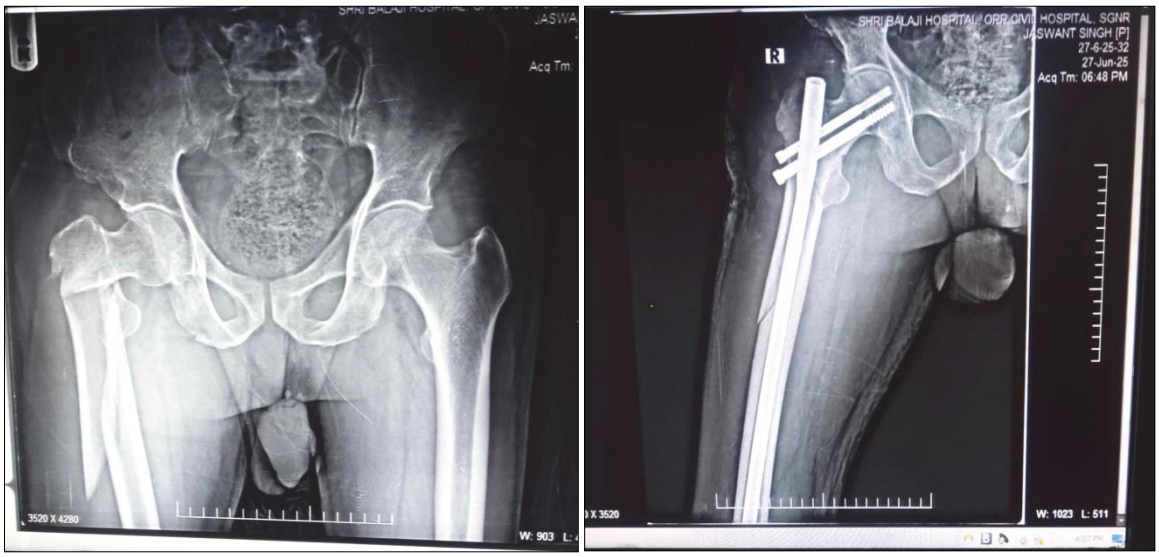

Figure 2: (Left) Pre-operative x-ray Figure; (Right) Immediate post-operative x-ray

DISCUSSION

In the treatment of proximal femoral fractures, Intramedullary (IM) nails are now more frequently used than extramedullary devices due to their greater biological and mechanical benefits, which include improved blood supply preservation at fracture sites surrounding soft tissue and improved weight and stress endurance.(8) IM nails are now more commonly used than extramedullary devices in the treatment of proximal femoral fractures because of their greater biological and mechanical benefits, which include improved weight and stress endurance and better preservation of the blood supply at fracture sites surrounding soft tissue.(9) The operating surgeon is further challenged by the unstable fractures that occur in this area since they are technically challenging to fix and a poor approach could result in primary fixation failure. Dynamic hip screws (DHS) are the best treatment for these fractures, according to earlier research, however failure rates of up to 20% were still reported.(10,11) The subtrochanteric fractures treated with the proximal femoral nail and the 95 degree blade plate were compared by Harris et al. 41 patients in all were examined. Patients treated with the 95 degree blade plate had a failure rate of 6 (29%) while those treated with the PFN did not experience

any failure. They came to the conclusion that, in contrast to closed intra-medullary nailing with a proximal femoral nail, internal fixation of subtrochanteric femur fractures with a 95-degree angled blade plate is linked to greater implant failure and revision. They reported no research failures.(12) At the end of six months, the mean Harris Hip Score was 87.6%, with 22.5 percent [9/40] reporting outstanding results, 60 percent [24/40] reporting good results, and 17.5% [7/40] reporting fair results.(13) According to Salphale et al., the average Harris hip score was 76.66, with a range of 70 to 93.(14) The majority of the cases in the James et al. study fell into the excellent group, which included 45% of the cases with an average HHS of 80–90.(15) Borens et al. found a mean union time of 17.2 weeks with long gamma nails for bone union.(16) According to Kim et al. (2006), who had an IM nail for 18.5 weeks, a comparatively extended union period is primarily caused by a misplaced fracture site or comminution of the medial cortical bone.(17) We could attribute relatively extended union periods to severe comminution and misplaced pieces, as the mean union period in our study was 17.5 weeks (range: 15 to 24 weeks). In our study, we did not experience complications like non-union or implant failure, which are common in other procedures.

CONCLUSION

We observed good results with the long proximal femoral nail, long PFN is safe, effective and patient friendly device useful for the treatment of all subtrochanteric fractures irrespective of their comminution.

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REFERENCES

1. LaVelle GD. Fractures and Dislocations of the Hip. In: Canale ST, Beaty JH, editors. Campbell'soperativeorthopedics. 11th ed. Philadelphia: Mosby Elsevier publishers; 2008:3237-96
2. Bedi A, Toan Le T. Subtrochanteric femur fractures. OrthopClin North Am. 2004;35 (4):473–83.
3. Kyle RF, Cabanela ME, Russell TA. Fractures of the proximal part of the femur. Inst Course Lect. 1995;44:227-53.
4. Bergman GD, Winquist RA, Mayo KA. Sub trochanteric fracture of the femur: fixation using the zickel nail. J Bone Joint Surg. 1987;69(7):1032-9.
5. Feldman F. Atypical diaphyseal femoral fractures-new aspects Skeletal Radiol. 2012;41(1):75–81.
6. Kregor PJ, Obremskey WT, Kreder HJ, Swiontkowski MF; Evidance-Based Orthopaedic Trauma Working Group. Unstable pertrochanteric femoral fractures. J Orthop Trauma. 2005;19(1):63-6.
7. Yoon RS, Donegan DJ, Liporace FA. Reducing subtrochanteric femur fractures: Tips and tricks, do's and don'ts. J Orthop Trauma. 2015; 29(4): 28-33.
8. Simmermacher RK, Bosch AM, Van der Werken C. The AO/ASIF-proximal femoral nail (PFN): A new device for the treatment of unstable proximal femoral fractures. Injury. 1999;30:327-32.
9. Redford PJ, Needoff M, Webb JK. A prospective randomized comparison of the dynamic hip screw and the gamma locking nail. J Bone Joint Surg Br. 1993; 75(5): 789-93.
10. Baumgaertner MR, Curtin SL, Lindskog DM, Keggi JM. The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip. J Bone Joint Surg. 1995;77):1058–64.
11. Sierra RJ, Cabanela ME. Conversion of Failed Hip HemiarthroplastiesAfter Femoral Neck Fractures. ClinOrthopRelat Res. 2002;399:129-39.
12. Harris I, Rahme D. A prospective randomized controlled trial of subtrochanteric fractures treated with the proximal femoral nail and the 95 degree blade plate. J Bone Joint Surg. 2005;87-B:310-1.
13. Lakhani KR. Prospective study of the functional and radiological outcome of subtrochanteric femur fractures treated by long proximal femoral nailing in lateral decubitus position. J Clin Orthop Trauma. 2024 Nov;59:102842
14. Salphale Y, Gadegone WM, Ramteke A, Karandikar N, Shinde R, Lalwani P. Proximal Femoral Nail in Reverse Trochanteric Femoral Fractures: An Analysis of 53 Cases at One Year Follow-Up. Surg Sci. 2016;7(7):300–8.
15. James B, Prasath R, Vijayakumaran M. Functional outcome of proximal femoral nailing in inter trochanteric fractures of femur: A prospective study. Int J Orthop Sci. 2017;3(2e):513–8.
16. Borens O, Wettstein M, Kombot C, Chevalley F, Mouhsine E, Garofalo R. Long gamma nail in the treatment of subtrochanteric fractures. Arch Orthop Trauma Surg. 2004;124:443-7.
17. Kim JW, Chang JS, Lee H, Bae JY, Kim JJ. Clinical results of femoral subtrochanteric fractures. J Korean Hip Soc. 2010;22:222-6.

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