

Original Article

Effects of Length of Proximal Femoral Nail on Intraoperative and Post-Operative Outcomes of Intertrochanteric Fractures

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ABSTRACT

Background: Trochanteric femoral fractures are often seen in patients aged they can be caused by high-energy or low energy trauma or may be pathological. Particularly in the elderly, hip fractures are a major cause of increased mortality and morbidity. Because of the decreased physical capacity, concomitant systemic diseases, and increased vulnerability to environmental dangers, even low-energy trauma can cause unstable femoral trochanteric fractures in this age group. Compare the functional outcome of the short proximal femoral nail with a long proximal femoral nail in intertrochanteric fractures.

Methods: This randomized control trial was conducted in the Department of Orthopedics, Surat Municipal Institute of Medical Science, Surat.

Results: The mean duration of surgery in the long PFN group was 79.84 ± 7.09 minutes and the short PFN group was 50.72 ± 7.96 minutes. The two-tailed P value < 0.001 this difference is considered to be extremely statistically significant. The mean intra operative blood loss in the long PFN group was 330.8 ± 31.74 ml and the short PFN group was 170 ± 23.10 ml. The two-tailed P value < 0.001 , this difference is considered to be statistically significant. The number of cases with limb shortening were more in the Short PFN group than the patients in whom long PFN was use.

Conclusion: Both the long and short intramedullary nails are the optional internal fixation choices for femoral intertrochanteric fracture. But the long nail could avoided the refracture of femur and reduced postoperative hip pain whereas the short nail has the advantage of reduced surgical time, blood loss and fluoroscopic time.

Key words: Proximal femoral nail, Short femoral nail, long femoral nail, Intertrochanteric fracture

INTRODUCTION

The advance research in medicine has enabled many to live long. However, the increased age precipitates certain comorbidities. Osteoporosis is one of the major comorbidities. The increased prevalence of hip fractures in osteoporotic individuals is well known.¹ Intertrochanteric fractures are commonly seen in old age subjects, as compared to young ones. These fractures can be treated with conservative line of treatment which reduces the chances of complications like, avascular necrosis of head and osteoarthritis. Without surgical interventions, malunion, non - union with coxa-vara deformity are seen which might result in shortening of limb.² Fall from standing height is the most common type of trivial trauma for intertrochanteric femur fractures.

Intramedullary devices are used widely for the management of proximal femoral fractures, as they provide a better biomechanical environment. Because of indirect load sharing, a short lever arm, allowing and healing less collapse at fracture site that provides stable medial configuration and prevents the varus collapse. Early rehabilitation and weight bearing are two benefits of Intramedullary devices.³

The primary goal to fix the fracture to be early mobilize and avoid secondary complications. Intertrochanteric fractures can be operated with two different manners. One is open reduction and internal fixation with Dynamic hip screw (DHS). It was considered as the devise of choice because of fracture union predictability can occur. A difficulty with

sliding hip screw can be collapse of femoral head leading to Hip offset loss and shortening of limb. Sliding in fewer amounts is always expected; too much shortening is harmful to hip. Another method which was found in 1996 is Proximal femur nail (PFN) which gives the greatest advantage of minimal invasive surgery.⁴

There are different type of intramedullary devises to treat the intertrochanteric fractures. Which are mainly Long Proximal femoral nail, Short proximal femoral nail, AO type proximal femur nail (PFNA & PFNA 2).

The debate between the most successful method to treat the Intertrochanteric femur fracture is an age old. Meta analytical studies have still not come to any Conesus that which on is better. Intertrochanteric femur fractures are treated with both; The Dynamic hip screw and Proximal Femur nail. In proximal femur nail, short and long proximal femur nail being used. The long proximal femur nail has varying length from 340 mm to 440 mm and diameter from 8 to 12 mm while in short proximal femur nail the length is 240 mm and diameter from 9 to 12 mm.⁵⁻⁶

Proximal femur nail in intertrochanteric femur fractures is mostly used nowadays but effect of nail length on fracture and effect of nail length on the complications like periprosthetic fractures is still a controversy.

The purpose of this study to evaluate the intraoperative and post operative measures after treating the intertrochanteric

femur fractures with either Short proximal femur nail or long proximal femur nail.

The aim of this study is to compare two Intramedullary devices; Long PFN and Short PFN used in the treatment of intertrochanteric fractures in terms of Clinical and radiological follow-up.

METHODS

All the materials were taken and study was done from the patients admitted in Surat municipal institute and Medical sciences Surat. The study was done at Surat municipal institute and Medical sciences Surat between the period of June 2019 to August 2021. It is a prospective study. The study has total 50 patients. In which 25 patients are taken in each category of short PFN as well as long PFN. Patients were informed about in all respect and prior written consent were taken before the studies. All permission were taken from Institutional Ethical committee (IEC) before starting the study. Patients with at least 1 year of follow up were included in this study.

The patients were allocated to two groups: those treated with long PFN and short PFN. Patient medical records, operative reports, and digital radiographs were reviewed thoroughly pre operatively. The following data was collected for each patient: age, sex, Orthopedic Trauma Association (OTA) classification of fractures, American Society of Anesthesiologists (ASA) score, blood loss, operative time, length of stay, time to fracture union, Harris Hip Score 6 months postoperatively, hip pain and failure rates. The failure rate was defined as periprosthetic fracture or significant collapse of the fracture needing reoperation requiring removal or revision of nail.

All surgeries had been performed by two senior orthopedic trauma surgeons with the patient in the supine position on a fracture table with fluoroscopic-guided imaging. After the patient had been anesthetized, closed reduction to an anatomical position was performed before making an incision. Femurs were reamed by hand or flexible power reamers and guide wires used in all procedures. Distal interlocking screws were placed through the nail guide or full moon technique for all nails. There were no intraoperative complications. Postoperatively, patients were allowed to bear weight as and when tolerated.

Patients with age above 20 years of age, Recent history of trauma, Patients willing to undergo surgery, No associated fracture in both lower limbs, Isolated, closed and type 31-A1,2,3 intertrochanteric fractures as classified with AO system, Consent for surgery and to participate in the study were included in the study. Pathologic fracture, Open fractures, Fractures in skeletally immature patients, Old neglected fractures & Revision surgeries, Refusal to provide informed consent, Fractures with neuromuscular disorders / neurovascular insufficiency, Multiple trauma patients were excluded from the study.

RESULTS

Fifty patients were eligible for this study. The most common age group in the study was in the range of 61 – 80 years, having Mean \pm SD 64.76 \pm 12.82 and 69.44 \pm 7.95 respectively in Long PFN and Short PFN Group. P value was 0.1067, which is not significant. 60% and 68% of total patients were female respectively in Long PFN and Short PFN group and male to female ratio was approximately 1:2 in the study.

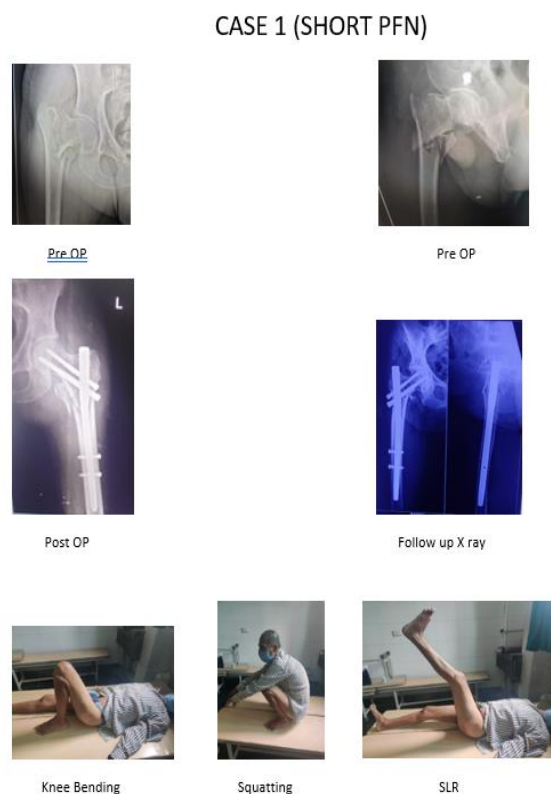


Figure 1: Short PFN

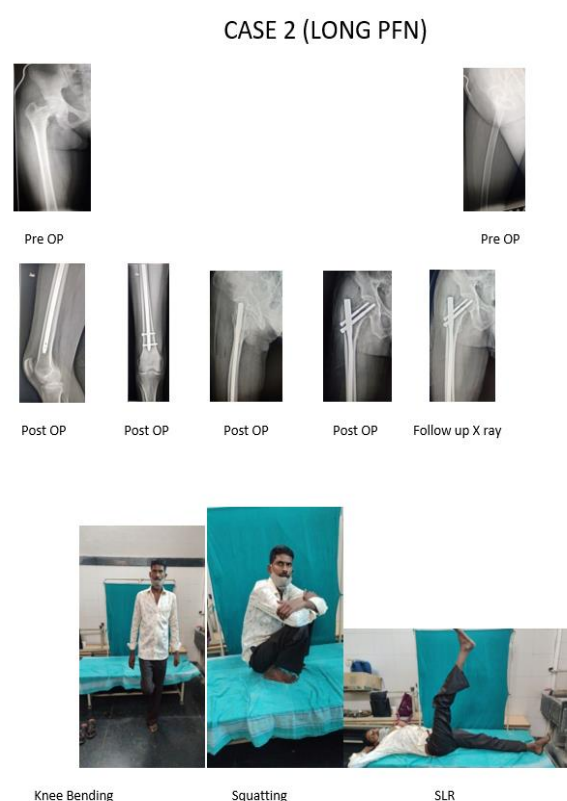


Figure 2: Long PFN

Table 1: Fluroscopy time (sec), Surgical time (minutes) and Intraoperative blood loss (ml)

Intra operative details	Method of fixation	
	Long PFN	Short PFN
Fluroscopy time (sec)	40.52 ± 5.26	30.92 ± 6.65
Surgical time (minutes)	79.84 ± 7.09	50.72 ± 7.96
Intraoperative blood loss (ml)	330.8 ± 31.74	170 ± 23.10

Table 2: Comparison of Complications of long PFN and short PFN

	Long PFN (n= 25) (%)	Short PFN (n= 25) (%)
Blood loss more than ABL	1 (4)	1 (4)
Dynamic bolt placed outside hole	2 (8)	0 (0)
GT Splintering	0 (0)	2 (8)
Medial wall fracture	1 (4)	1 (4)
None	21 (84)	21 (84)

The mean duration of surgery in the long PFN group was 79.84 ± 7.09 minutes and the short PFN group was 50.72 ± 7.96 minutes. The two-tailed P value < 0.001 this difference is considered to be extremely statistically significant.

The mean intra operative blood loss in the long PFN group was 330.8 ± 31.74 ml and the short PFN group was 170 ± 23.10 ml. The two-tailed P value < 0.001, this difference is considered to be statistically significant.

The mean HB of patients operated with Long PFN is 11.22 and those operated with Short PFN is 10.78. 2 patients 1 of Long PFN & 1 of Short PFN had skin infection at surgical site which healed eventually by wound care and 3 patients; 1 of Long PFN & 2 of Short PFN had varus deformity at the fracture site.

The mean length of anti rotation screw width in the long PFN group was 78.80 ± 7.34 mm and the short PFN group was 80.72 ± 9.01 mm. The two-tailed P-value = 0.341, which is not statistically significant.

The compression screw width in the long PFN group was 96.4 ± 6.3 mm and the short PFN group was 95.60 ± 8.94 mm. The two-tailed P value equals 0.7172, which is not statistically significant.

Fluoroscopia time (sec) of Short PFN fixation was significantly low as compared to Long PFN. **P-value < 0.001** was found, indicating the significant difference between the fluoroscopia time of both the groups.

The quality of reduction in the short PFN group was significantly better 17 of the 25 cases had very good reduction as compared to 15 of the 25 cases in the long PFN group.

The number of cases with limb shortening were more in the Short PFN group than the patients in whom long PFN was used. The mean ± SD time of union in the short PFN group was 19.32 ± 4.30 weeks and the long PFN group was 21.08 ± 4.67 weeks. The two-tailed P value equals 0.1725 by conventional criteria; this difference is considered to be not statistically significant.

The mean ± SD of harris hip score in the long PFN group was 84.60 ± 8.44 and in the short PFN group was 74.60 ± 8.47. The two-tailed P value < 0.001 by conventional criteria; this difference is considered to be statistically significant. Lower extremity functional scale is better in LONG PFN.

DISCUSSION

In our result it was evident that the use of Long PFN has advantages over short PFN in terms of the less postoperative complications and good functional outcome as per Harris Hip Score. The time of union and better lower extremity functional scores of Long PFN also has an advantage over Short PFN. There were nearly no cases noted of peri implant fracture in Long PFN. While there were cases noted of Peri Implant fracture in Short PFN due to its short length. The anterior thigh pain was noted in short PFN because of the distal end of nail touching the anterior cortex of shaft femur while it was not noted in Long PFN. In short PFN Cases limb shortening was noted while there was no limb shortening in Long PFN cases. It makes long PFN better in my study.

The disadvantage with Long PFN are Free hand distal locking system, more intra op time and a little higher radiation exposure. It has more amount of blood loss than the short pfn.

Long PFN also acts as a buttress to prevent medialisation of the shaft and provides more efficient load transfer than does a sliding hip screw. It is a superior implant for stable and unstable intertrochanteric fractures in terms of operating time, surgical exposure, blood loss, and complication rates.

In this study, parameters like duration of surgery, Blood loss during surgery, fluoroscopia time were higher in long PFN group as compared to Short PFN group but Long PFN is more preferable in comparison of Short PFN in the terms of Lesser post-operative complications, almost nil incidents of limb shortening and good to excellent Harris Hip Score at 6 months of follow up.

Kale Dr et al.⁷ suggested in their study that the long nail could avoid the refracture of femur and reduced postoperative hip pain. **Shyamkumar et.al**⁸ indicated that it was evident that the use of Long PFN has advantages over short PFN in terms of the less postoperative complications, less mean time of union & better lower extremity functional scores.

Li Zhiet al.⁹ stated that both the long and short intramedullary nails are the optional internal fixation choices for femoral intertrochanteric fracture in the aged patients older than 65 years. But the long nail could avoid the refracture of femur and reduced postoperative hip pain.

CONCLUSION

Both the long and short intramedullary nails are the optional internal fixation choices for femoral intertrochanteric fracture. But the long nail could avoided the refracture of femur and reduced postoperative hip pain whereas the short nail has the advantage of reduced surgical time, blood loss and fluoroscopic time.

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