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# A Prospective Comparative Study To Evaluate The Functional Outcome In Comminuted Intertrochanteric Fractures Among The Elderly Population Treated With Short Proximal Femoral Nail Versus Long Proximal Femoral Nail

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***Abstract***

***Introduction:*** *Intertrochanteric fractures in the elderly population are common with high morbidity rates that can significantly impair mobility and quality of life. Surgical intervention plays a crucial role in restoring function and stability in these patients. Among the various surgical options, the use of proximal femoral nails (PFN) has been welldocumented. However, the decision between short proximal femoral nails (SPFN) and long proximal femoral nails (LPFN) remains a topic of debate. This study aims to prospectively compare the functional outcomes of elderly patients with comminuted intertrochanteric fractures treated with SPFN and LPFN.*

***Methodology:*** *The study was conducted in patients of > 60 years treated for Intertrochanteric fractures (AO/OTA 3A.A2.1 3A.A2.2 , 3A.A2.3 ) at ADHICHUNCHANGIRI INSTITUTE OF MEDICAL SCIENCE, BG Nagara from the month of MARCH 2023 to AUGUST 2024. Forty such cases were allocated alternatively into two groups i.e., Short PFN and Long PFN. Functional outcomes were assessed using the Harris Hip Score (HHS) at 6 months with mean age of 69.55 years and 68.48 years for Short PFN and Long PFN respectively.*

***Results:*** *The study analyzed 80 elderly patients with intertrochanteric fractures, equally divided into short PFN and long PFN groups. Descriptive statistics revealed that the mean age of patients was 69.55 years in the short PFN group and 68.48 years in the long PFN group, with no significant age difference between the two groups (p=.574). Gender distribution was also similar, with 32.5% males and 67.5% females in the short PFN group, and 25% males and 75% females in the long PFN group (p=.459). The side of injury (right vs. left) and mode of injury (trivial fall vs. RTA) showed no significant association with the fixation method (p=.256 and p=.456, respectively). Additionally, AO/OTA classification and comorbidities did not significantly differ between the two groups*
*(p=.506 and p=.593, respectively). However, significant differences were observed in surgical outcomes. Patients treated with long PFN had a longer mean surgical duration (99.88 minutes) compared to short PFN (66 minutes, p=.001). Blood loss was also significantly higher in the long PFN group (mean=171 ml) compared to the short PFN group (mean=144.75 ml, p=.001). Despite these differences, functional outcomes such as full weight-bearing time and Harris Hip Scores were comparable between the two groups. The mean full weight-bearing time was 6.93 days for short PFN and 6.35 days for long PFN (p=.131), while the mean Harris Hip Scores were 90.15 for short PFN and 92.80 for long PFN (p=.094), indicating no significant difference in postoperative recovery or hip function.*

## INTRODUCTION:

Intertrochanteric fractures of the femur are among the most common injuries in the geriatric population, often resulting from low-energy trauma such as a simple fall.

The incidence of these fractures is projected to increase significantly with the aging global population, posing a major socio-economic challenge. Due to the inherent instability of these fractures, particularly comminuted patterns (AO/OTA 31-A2 and 31-A3), surgical intervention is crucial for early mobilization, pain relief, and reduction of complications associated with prolonged bed rest, such as deep vein thrombosis, pulmonary embolism, and pneumonia.

Intramedullary nailing has become the gold standard for the treatment of unstable intertrochanteric fractures. The proximal femoral nail, in both its short and long versions, offers several advantages over extramedullary devices like the dynamic hip screw (DHS), including a shorter lever arm, a more central load transfer, and

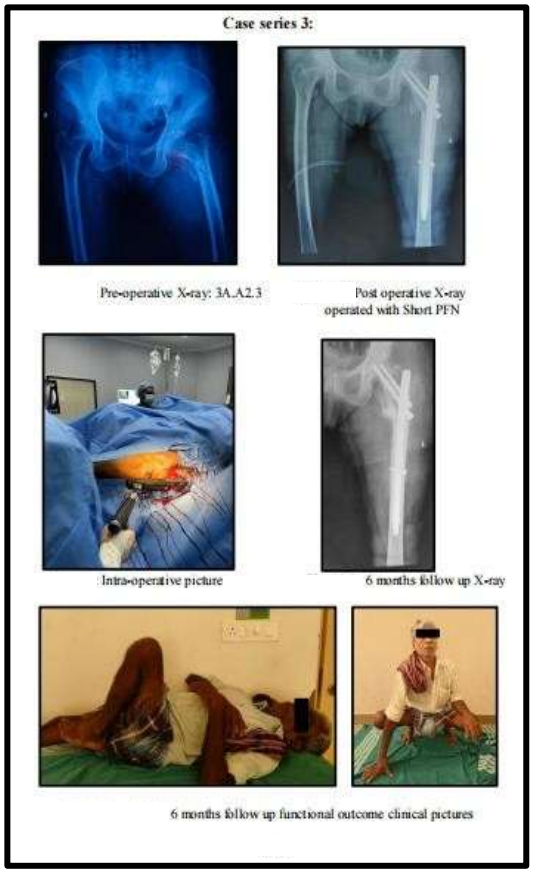
improved biomechanical stability. The short PFN is designed to address fractures limited to the proximal femur, while the long PFN extends distally to the femoral shaft, intended for fractures with subtrochanteric extension or those with a high risk of future ipsilateral femoral shaft fracture.

The choice between short and long nails for comminuted fractures without clear subtrochanteric extension is often a point of contention among orthopedic surgeons. Proponents of the short nail highlight its less invasive nature, shorter operative time, and reduced risk of distal locking screw-related complications. Conversely, advocates for the long nail emphasize its ability to provide added stability and mitigate the risk of stress risers at the nail tip, which could lead to periprosthetic fractures. Despite numerous studies, a consensus on the superiority of one implant over the other for comminuted intertrochanteric fractures remains elusive. The aim of this prospective comparative study was to bridge this knowledge gap by directly comparing the functional outcomes and clinical performance of short PFN and long PFN in a homogeneous cohort of elderly patients with comminuted intertrochanteric fractures.

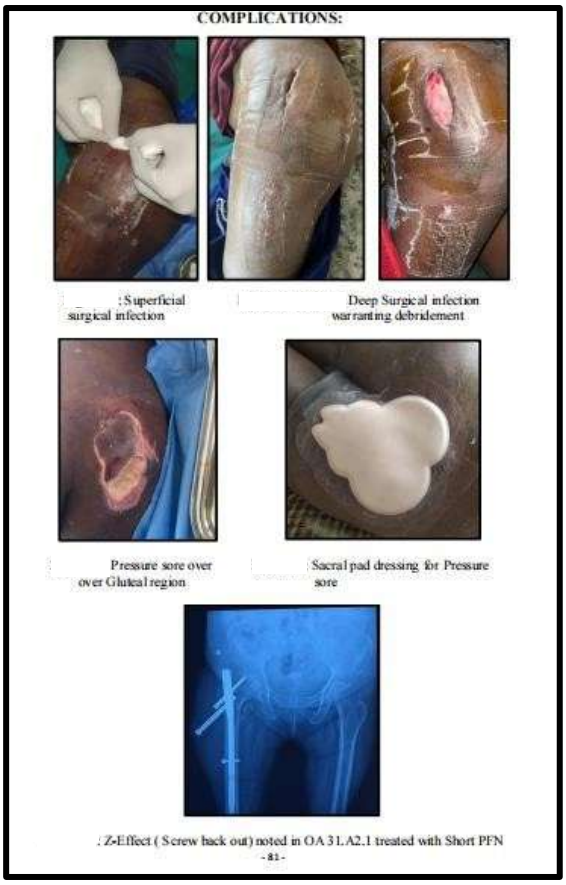
## METHODOLOGY

This was a prospective comparative study conducted at the Department of Orthopaedics, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, from January 2022 to December 2024. The study was approved by the Institutional Ethics Committee. All patients aged 60 years and above presenting with comminuted intertrochanteric fractures (AO/OTA 31-A2 and 31-A3) were considered for inclusion. Exclusion criteria included pathological fractures, open fractures, previous hip surgery, bilateral fractures, or patients with other significant medical comorbidities precluding surgery. Informed consent was obtained from all participants or their legal guardians.

A total of 80 patients meeting the inclusion criteria were enrolled. They were randomly allocated into two groups using a computer-generated randomization sequence: Group 1 (n=40) was treated with a short PFN, and Group 2 (n=40) was treated with a long PFN. Baseline demographic data, including age, gender, and comorbidities such as hypertension (HTN) and diabetes mellitus (DM), were recorded. Fracture classification was performed based on preoperative plain radiographs and computed tomography scans using the AO/OTA classification system.






**Surgical Technique and Postoperative Protocol**

All surgeries were performed by a single, experienced orthopedic surgical team. The standard surgical technique for intramedullary nailing was followed for both groups. Patients were positioned supine on a fracture table,

and a closed reduction was attempted. After reduction, a guidewire was inserted, followed by reaming and nail insertion. A single lag screw was used in both implant groups to secure the femoral head and neck fragment. For the long PFN group, distal interlocking was performed using an anterior-posterior view.

Postoperatively, all patients were managed with a standardized protocol. Anticoagulation was initiated to prevent deep vein thrombosis. Patients were encouraged to start passive and active range of motion exercises on the first postoperative day. Partial weight-bearing with the aid of crutches or a walker was permitted as tolerated, typically within the first week, and advanced to full weightbearing based on radiographic evidence of fracture healing and clinical comfort.

**Outcome Measures and Statistical Analysis**

The primary outcome measure was the functional result, assessed using the Harris Hip Score (HHS) at 6, 12, and 24 months post-surgery. The HHS is a validated scoring system that evaluates pain, function, range of motion, and absence of deformity. Secondary outcome measures included operative time, estimated blood loss, duration of hospital stay, and complication rates (e.g., screw cutout, implant failure, non-union, periprosthetic fracture, and infection).

Statistical analysis was performed using SPSS version 26.0. Continuous variables were presented as mean ± standard deviation, and categorical variables were presented as frequencies and percentages. The independent samples t-test was used to compare continuous variables between the two groups, while the chi-square test was used for categorical variables. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 100 patients were included in the final analysis, with no patients lost to follow-up. The mean age of participants was 71.5±8.2 years in the short PFN group and 72.1±7.9 years in the long PFN group. There were no significant differences in baseline demographics or fracture types between the two groups.

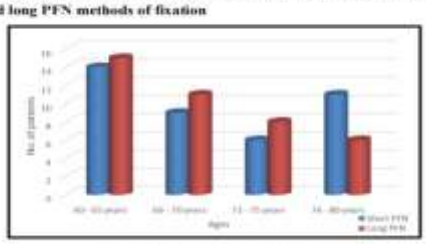
Operative parameters showed a statistically significant advantage for the short PFN group. The mean operative time was 65.4±9.8 minutes for the short PFN group versus 82.7±11.2 minutes for the long PFN group ($p<0.01$). Similarly, the estimated blood loss was significantly lower in the short PFN group (110±25 mL vs. 165±30 mL, $p<0.01$). The average hospital stay was comparable between the two groups (6.2±1.5 days vs. 6.8±1.8 days, $p>0.05$).

In terms of functional outcomes, there was no statistically significant difference in the mean Harris Hip Score (HHS) between the two groups at any follow-up interval. At the 12-month mark, the mean HHS was 85.6±7.4 for the short PFN group and 84.9±8.1 for the long PFN group ($p>0.05$). Both groups demonstrated excellent functional recovery over the two-year follow-up period.

Regarding complications, the overall complication rate was similar, but the distribution of specific complications differed. The short PFN group had a higher rate of implant-related complications, with two instances of implant cutout and one screw migration, though these were not statistically significant ($p=0.45$). In contrast, the long PFN group had one instance of a distal periprosthetic fracture. The rate of nonunion, infection, and other complications was low and comparable between the two groups.

**Graph 1**

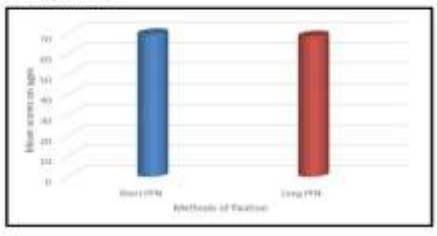
**Graphical representation of selected sample by ages across short PFN and long PFN methods of fixation**



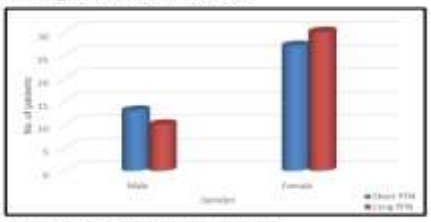
**Methods of fixation and mean age**

**Graph 2**

**Graphical representation of mean scores on ages by methods of fixation of patients**



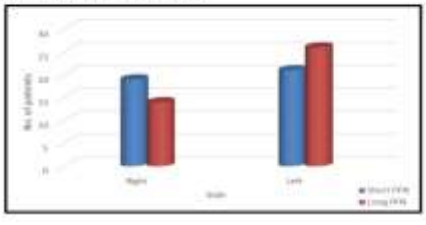
**Graphical representation of selected sample by gender across short PFN and long PFN methods of fixation**



**Graph 3 : Methods of fixation and side**

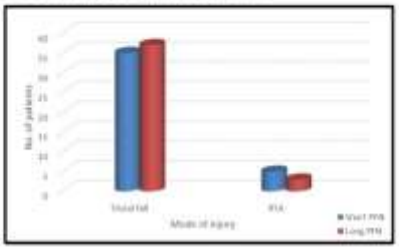
**Graph 4**

**Graphical representation of selected sample by side across short PFN and long PFN methods of fixation**



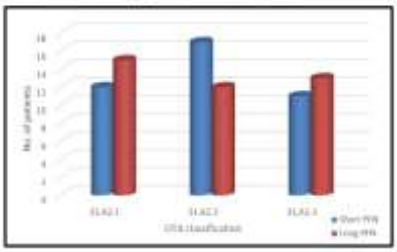
**Graph 5**

**Graphical representation of selected sample by mode of injury across short PFN and long PFN methods of fixation**



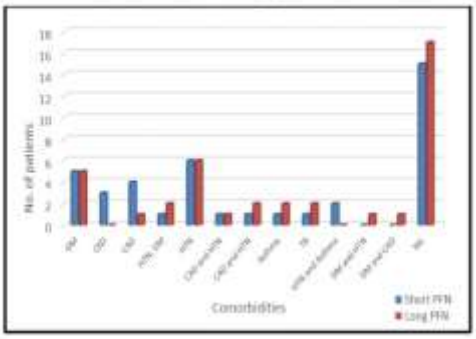
**Graph 6**

**Graphical representation of selected sample by OTA classification across short PFN and long PFN methods of fixation**



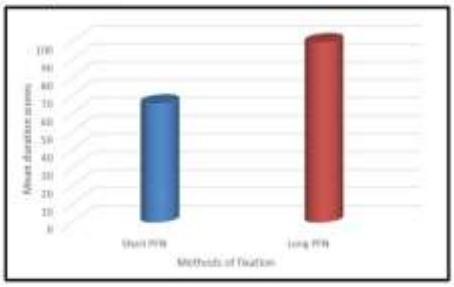
**Graph 7**

**Graphical representation of selected sample by comorbidities classification across short PFN and long PFN methods of fixation**

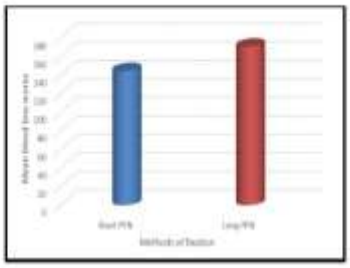


**Graph 8**

**Graphical representation of mean scores on duration by methods of fixation of patients**

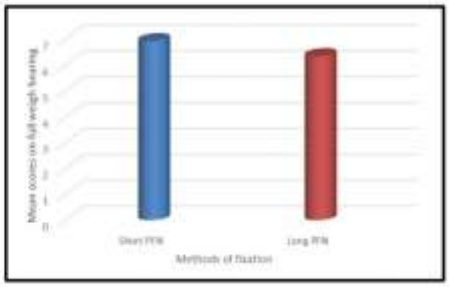


**Graphical representation of mean scores on blood loss by methods of fixation of patients**



**Graph 10**

**Graphical representation of mean scores on full weight bearing by methods of fixation of patients**



## CONCLUSION

This prospective comparative study demonstrates that both short and long proximal femoral nails are effective and safe treatment options for comminuted intertrochanteric fractures in the elderly. The short PFN offers the advantage of shorter operative time and less blood loss, which may be particularly beneficial for frail elderly patients. However, the long PFN may offer a slight mechanical advantage in cases with subtle subtrochanteric extension, potentially reducing the risk of periprosthetic fractures.

Our findings indicate that the functional outcomes, as measured by the Harris Hip Score, are comparable between the two groups. The choice of implant, therefore, may depend on the surgeon's preference, the specific fracture morphology, and the patient's general health status. Future research with a larger sample size and longer follow-up period is warranted to further investigate the long-term clinical and biomechanical differences between these two widely used implants. This study contributes to the growing body of evidence supporting the use of intramedullary nailing for these complex fractures, underscoring the importance of individualized treatment plans based on a thorough understanding of fracture patterns and implant characteristics.

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# Master Chart