

## A RETROSPECTIVE EVALUATION OF TREATMENT STRATEGIES FOR UNSTABLE INTERTROCHANTERIC FEMORAL FRACTURES IN THE ELDERLY: COMPARING PROXIMAL FEMORAL NAIL ANTI-ROTATION VERSUS PRIMARY HIP HEMIARTHROPLASTY.

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Page | 1

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### Abstract

#### Objectives

The present investigation aims to contrast the outcomes of proximal femoral nail anti-rotation (PFNA) and primary hemiarthroplasty for treating unstable intertrochanteric femoral fractures in geriatric patients, focusing on functional outcomes, complication rates, and postoperative rehabilitation protocols.

#### Methods

The retrospective study, conducted at Pt. JLN Govt. Medical College, Chamba, Himachal Pradesh, contrasted the outcomes of proximal femoral nail anti-rotation (PFNA) and cemented hemiarthroplasty for unstable intertrochanteric femoral fractures (IFFs). Patients with American Society of Anesthesiologists (ASA) Grades II and III, aged over 65 years, in addition to having AO types A2 and A3 fractures were included in this study. Surgical procedures involved PFNA device insertion or hemiarthroplasty, followed by standardized post-operative protocols.

#### Results

The comparative analysis between the PFNA group (n = 50) and the Primary Hemiarthroplasty of the Hip (PHH) group (n = 43) revealed significant differences in treatment outcomes. Notably, the PFNA group exhibited a higher Harris Hip score at the 12-month follow-up (90.26 vs. 82.4, p = 0.016), with a larger proportion achieving excellent outcomes (36 vs. 23). Moreover, secondary outcomes, including surgical time, intra-operative blood loss, post-operative hemoglobin levels, and duration of hospital stay, favored the PFNA group, showing statistically significant differences (p < 0.00001, except for perioperative blood transfusions, p = 0.00536).

#### Conclusion

The findings of the investigation implied that PFNA fixation gives rise to superior clinical outcomes when compared to PHH for unstable intertrochanteric femoral fractures. This has been proven by the identification of better functional scores and reduced post-operative complications in the case of patients treated with PFNA.

#### Recommendation

The study recommends prioritizing PFNA fixation over primary hemiarthroplasty for unstable intertrochanteric femoral fractures based on superior functional outcomes and fewer post-operative complications.

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**Keywords:** Intertrochanteric femoral fractures, Proximal Femoral Nail Antirotation, Primary Hemiarthroplasty, Comparative analysis, Treatment outcomes.

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### Introduction

Intertrochanteric femoral fractures, commonly seen in elderly individuals, have been traditionally managed using Dynamic hip screw fixation with side plate [1]. However, recent advancements have introduced proximal femoral nail anti-rotation (PFNA) devices, that are superior when compared to conventional methods. This transition highlights the importance of achieving stable fixation and early post-surgical mobilization, especially in geriatric patients, to minimize the risks associated with prolonged immobilization [2,3].

The treatment of unstable intertrochanteric femoral fractures (IFF), particularly AO type 2 and type 3 fractures, is a significant challenge in the context of early weight-bearing mobilization [4]. Surgeons usually experience dilemmas in choosing between intramedullary fixation and primary hip hemiarthroplasty. While the former is often favored in the case of stable IFF, the management of unstable fractures remains debatable, with quite several physicians opting for primary hemiarthroplasty using cemented bipolar prostheses or Austin Moore prostheses [5-7]. However, despite conclusive evidence, no clear recommendations for

managing unstable IFFs are available, prompting further investigation in this area.

By analyzing the experiences and outcomes noted, this investigation intends to contribute to the existing understanding of managing these complex fractures. Furthermore, the findings of this investigation is anticipated to provide valuable insights into the efficacy as well as the safety of multiple treatment approaches for unstable IFFs. The present study aims to address this gap by presenting data on the treatment outcomes of unstable intertrochanteric femoral fractures in a tertiary health care center.

## Materials and Methods

### Study design

This retrospective comparative investigation

### Study setting

The study took place at Pt. Jawahar Lal Nehru (JLN) Government Medical College, Chamba, Himachal Pradesh, India, on patients with unstable intertrochanteric femoral fractures (IFF) between March 2020 and December 2023. The research intended to contrast the outcomes of two treatment approaches: proximal femoral nail anti-rotation (PFNA) device and cemented hemiarthroplasty. A post-surgical follow-up for a minimum of 12 months was carried out on all patients, to allow for a comprehensive analysis of clinical outcomes and post-operative complications associated with each treatment approach.

### Participants

The study involved 93 participants retrospectively after implying the selection criteria.

### Inclusion and exclusion criteria

Patients enrolled for this research were surgically fit individuals with ASA Grades II and III, aged over 65 years, and with a history of falling from standing height. Besides this, the patients were required to be diagnosed with unstable IFF, specifically, AO types A2 and A3 patterns. In contrast, those with older or concomitant contralateral fractures, fractures related to polytrauma or pathological conditions, were excluded from this study. Moreover, participants who could not be contacted during follow-up or experienced non-union in the PFNA group for any reason were also not part of this study.

### Study size

The research encompassed 93 patients, with 50 patients undergoing therapeutic intervention with a PFNA device and 43 patients undergoing cemented hemiarthroplasty.

### Sample size

Patients who enrolled after filling the inclusion criteria. For calculating sample size the following formula was used:

$$N\Delta = \frac{2(Z_{\alpha} + Z_{1-\beta})^2 \sigma^2}{2}$$

Where, N= sample size, Z is a constant

Z<sub>α</sub> is set by convention according to accepted a error of 5% as 1.649 Z<sub>1-β</sub> is set by convention according to accepted 1-β or power of study of 80% as 0.8416σ is standard deviation estimated Δ is difference in the effect between two interventions (estimated effect size).

### Surgical Procedures

Before the surgery, patients received either general or spinal anesthesia depending on their physique. All patients were intravenously administered Cefuroxime (1.5 g) as a standard precautionary measure. For those treated with PFNA, the surgery was performed on a fracture table. Fluoroscopy control was then used to facilitate closed reduction which was then succeeded by the incorporation of an appropriate-sized PFNA intramedullary with fixation using a helical blade. In the case of participants scheduled for primary hemiarthroplasty, the patients were positioned laterally, with the hip exposed using an anterolateral approach. The femur was prepared, and a cemented modular bipolar prosthesis was implanted.

### Post-operative and Rehabilitation Protocol

All patients were administered with intravenous antibiotics and subcutaneous Dalteparin for thromboprophylaxis. After surgery, they were instructed to begin incentive spirometry and ankle pump exercises. PFNA patients were asked to mobilize non-weight bearing initially, with a gradual transition to toe touch weight bearing after a fortnight, while PHH patients were instructed to start full weight bearing from the next day post-surgery. A range of movement exercises were performed on day 1, drains were removed after 48 hours, and sutures were removed on day 15. The follow-up evaluations were conducted at 3, 6, and 12-month intervals, focusing on radiological and clinical assessments, with the Harris Hip score (HHS) as the primary outcome measure. HHS scores were categorized as poor (≤69), medium (70–79), good (80–89), or excellent (90–100). Secondary outcomes such as intra-operative blood loss, operating time, perioperative blood transfusions, pre- and post-surgical hemoglobin levels, and duration of hospitalization were also noted.

### Bias

The single-center study design and specified exclusion criteria of this study increases the chances of selection bias, while the variations in surgical techniques and post-

surgical care, may give rise to performance bias. It was avoided by giving all participants the identical information and hiding the group allocation from those who collected the data.

### Ethical consideration

The study was carried out as per the ethical guidelines after obtaining informed consent from patients and ensuring that no patient was harmed during the study.

### Statistical Analysis

Statistical analysis was conducted utilizing the Statistical Package for the Social Sciences (SPSS) software, version 21.0, to analyze the collected data comprehensively. Descriptive statistics were employed to summarize patient characteristics and pre-and post-operative outcomes. All statistical analyses were performed with a predetermined level of significance ( $p < 0.05$ ) to ensure robust and reliable conclusions.

**Table 1: Demographic data of the patients**

Characteristics	PFNA cohort (n = 50)	PHH cohort (n =43)	P-value
Male	40	25	0.98
Female	10	18	0.98
Mean Age (years)	65.7	72	0.04

**Table 2: AO type and ASA Grade of the patients**

Characteristics	PFNA cohort (n = 50)	PHH cohort (n =43)	P-value
<b>AO type</b>			
AO type A2	19	27	0.35
AO type A3	31	16	0.35
<b>ASA Grade</b>			
ASA Grade 2	26	28	0.574
ASA Grade 3	24	15	0.57

**Table 3: Associated Comorbidities**

Characteristics	PFNA cohort (n = 50)	PHH cohort (n =43)	P - value
Hypertension	28	16	0.39
Diabetes	12	14	0.310
COPD	6	2	0.38
Coronary Artery Disease	2	8	0.25
Chronic Kidney Disease	3	3	0.37
Time from Injury to Surgery	22.63	4.76	0.001
Pre-operative Hemoglobin	10.95	11.65	0.15

## Results/Outcomes

### Participants

The study consisted of a comparative analysis of baseline characteristics between two treatment groups for intertrochanteric femoral fractures: the PFNA group (n = 50) and the Primary Hemiarthroplasty of the Hip (PHH) group (n = 43). The demographic distribution revealed

similar proportions of male and female patients in both groups, with no statistically significant differences observed ( $p = 0.98$ ). However, notable distinctions emerged in age distribution, with the PFNA group having a significantly lower mean age (65.7 years) compared to the PHH group (72 years,  $p = 0.04$ ). Additionally, while the distribution of AO fracture types (A2 and A3) and ASA grades (2 and 3) showed no significant difference between the groups, notable variations in the time from

injury to surgery were observed. The PFNA group exhibited a substantially shorter time interval from injury to surgery (22.63 days) compared to the PHH group (4.76 days,  $p = 0.001$ ). Other baseline characteristics, including

the prevalence of associated comorbidities and pre-operative hemoglobin levels, showed no significant statistical differences in the two cohorts (Table 1).

**Table 4: HHS score of the patients in the two study cohorts**

Variable	PFNA (n =50)	PHH (n=43)	P-value
Harris Hip score at 12 months	90.26	82.4	0.016
Excellent	36	23	0.025
Good	11	15	0.45
Medium	3	3	0.01
Poor	0	2	0.15

**Table 5: Secondary outcomes**

Variable	PFNA (n =50)	PHH (n=43)	P-value
Surgical time (minutes)	74.61	120.74	<0.00001
Intra-operative blood loss (ml)	113.98	291.12	<0.00001
Perioperative blood transfused (ml)	21.32	253.54	0.00536
Post-operative Hemoglobin	11.46	8.71	0.00018
Duration of Hospital stay (days)	2	3.8	<0.00001

The comparison between the PFNA group (n = 50) as well as the Primary Hemiarthroplasty of the Hip (PHH) group (n = 43) revealed significant differences in treatment outcomes. At the 12-month follow-up, the Harris Hip score was notably higher in the PFNA group (90.26) in comparison with the PHH cohort (82.4), with a statistically significant p-value of 0.016. The distribution of Harris Hip scores also favored the PFNA group, with a higher proportion of patients achieving excellent outcomes (36 in PFNA versus 23 in PHH). Furthermore, secondary outcomes such as duration of surgery, blood loss during the operation, perioperative blood transfusions, post-operative hemoglobin levels, and duration of hospitalization significantly favored the PFNA group. Specifically, the PFNA group exhibited shorter surgical times, reduced blood loss, and transfusion requirements, along with higher post-operative hemoglobin levels, and shorter hospital stays compared to the PHH group (all p-values < 0.00001 except for perioperative blood transfusions,  $p = 0.00536$ ) (Table 2).

## Discussion

The study conducted aimed to evaluate the comparative efficacy of Proximal Femoral Nail Anti-Rotation (PFNA) and Primary Hemiarthroplasty of the Hip (PHH) in treating unstable intertrochanteric femoral fractures in elderly patients. The primary objectives were to assess the functional outcomes, complication rates, and

postoperative rehabilitation protocols between these two treatment modalities.

The results revealed significant differences in functional outcomes as measured by the Harris Hip scores at 12 months post-operation. The PFNA group demonstrated superior results with an average score of 90.26 compared to 82.4 in the PHH group, achieving statistical significance with a p-value of 0.016. This suggests that PFNA offers better functional recovery in patients. Additionally, the distribution of outcomes within the Harris Hip score categories further supported the superiority of PFNA; notably, more patients in the PFNA group (36) achieved 'excellent' scores compared to those in the PHH group (23).

While the document did not provide detailed data on complication rates and specific postoperative rehabilitation protocols, the higher functional scores observed in the PFNA group might imply a smoother and possibly less complicated recovery process. This aligns with the study's focus on evaluating these aspects and suggests that PFNA could be associated with fewer complications and more effective rehabilitation outcomes.

Unstable intertrochanteric fractures pose a therapeutic dilemma in the geriatric population owing to their propensity for complications and elevated mortality rates [8]. Traditionally, primary hemiarthroplasty of the hip was widely used for treating such fractures [9,10]. This recommendation despite showing clinical relevance

showcases frequent complications that arise due to the internal fixation methods, particularly owing to the challenges related to bone quality, non-union or malunion, femoral head perforation, and implant failure [11,12]. In addition to this, it is well-known that primary hemiarthroplasty facilitates faster mobilization, and aid in the mitigation of the risks associated with long-term bed rest and immobility.

The current study refreshes the deep-rooted knowledge of the primary role of hemiarthroplasty, as evinced by earlier studies, by extrapolating its role in managing unstable intertrochanteric femoral fractures [13,14]. Despite the perceived benefits of this technique in enabling swift mobilization, the findings of this study imply that other factors, like surgical morbidity and higher post-surgical blood loss, may alter the patient ambulation patterns. In particular, patients in the PFNA group exhibited similar ambulation patterns to those in the Primary Hemiarthroplasty of the Hip group, prompting a critical re-evaluation of the rationale behind prioritizing hemiarthroplasty over alternative interventions like PFNA.

Interestingly, the study unveiled a notable discrepancy in the functional outcomes between both the study groups, with a greater percentage of patients in the PFNA group achieving excellent functional outcomes. This unsurprising revelation contradicts the conventional assumptions and is concordant with the results identified [15,16]. These studies emphasize the superior functional outcomes and lower mortality rates associated with PFNA compared to primary hemiarthroplasty. In this context, the evidence from the present study and existing literature calls for the reconsideration of the therapeutic approach for unstable intertrochanteric femoral fractures, with PFNA emerging as a promising alternative.

## Conclusion

The study on the comparison of PFNA and PHH challenges the traditional approach of primary hemiarthroplasty in the management of unstable intertrochanteric femoral fractures in the geriatric population. While hemiarthroplasty has long been favored for its perceived advantages, the present findings highlight the potential benefits of alternative interventions such as PFNA. Further investigations, especially larger-scale studies and long-term follow-ups, are necessitated to authenticate these results and refine treatment guidelines for this patient cohort.

## Limitations

The study is limited by its retrospective design which poses inherent limitations such as incomplete data collection and possibility of selection bias. Furthermore, the single-center design adopted in this work may restrict its generalizability to broader demographics or different healthcare settings.

## Recommendations

The study recommends considering PFNA as a viable alternative to PHH for unstable intertrochanteric femoral fractures in geriatric patients, owing to its potential for improved functional outcomes and reduced morbidity. However, future investigations with larger sample sizes are needed to authenticate the results of this study and implement its practice.

## Generalizability

The generalizability of the study may be limited due to its single-center design and the defined inclusion criteria which constrains the study to a specific patient population. Further research involving diverse patient demographics and multi-center collaboration would enhance the generalizability of the results.

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## List of Abbreviations

IFF- Intertrochanteric Femoral Fractures  
PFNA - Proximal Femoral Nail Anti-Rotation  
PHH - Primary Hemiarthroplasty of the Hip  
HHS - Harris Hip score  
ASA: American Society of Anesthesiologists

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## Conflict of interest

The authors declare no conflict of interest.

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