ORIGINAL RESEARCH

Comparison of PFNA and Primary Hemiarthroplasty in the Treatment of Unstable Intertrochanteric Femoral Fractures in the Elderly: A Retrospective Study

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ABSTRACT

Background: Elderly individuals often have unstable intertrochanteric femoral fractures (IFF), which are difficult to treat due to their complexity and poor health. Restoring mobility and reducing problems requires effective care. Modern surgical alternatives include PFNA and primary hemiarthroplasty, both having pros and cons. This study compared the clinical and functional outcomes of PFNA versus primary hemiarthroplasty in treating unstable intertrochanteric femoral fractures in aged patients. **Methods:** The study included 60 elderly people with unstable IFF (AO type 31 A2 and A3) treated. Individuals were allocated into 2 groups: PFNA (n=30) and hemiarthroplasty (n=30). Data on demographic characteristics, perioperative details, post-operative complications, and functional outcomes (Harris Hip Score) were collected and analyzed using SPSS software. **Results:** The PFNA group had significantly shorter operating times (78.4 ± 10.5 minutes) and less intra-operative blood loss (150.2 ± 30.4 mL) compared to the hemiarthroplasty group (112.6 ± 15.8 minutes, 280.7 ± 50.6 mL; $p<0.001$). The PFNA group also required fewer perioperative blood transfusions and had a shorter hospital stay (8.4 ± 2.3 days vs. 10.5 ± 2.8 days; $p=0.002$). Functional outcomes, assessed by the Harris Hip Score, were significantly better in the PFNA group at 3, 6, and 12 months postoperatively. The incidence of post-operative complications was slightly higher in the hemiarthroplasty group, though not statistically significant. **Conclusion:** PFNA delivers improved functional results, shorter operating times, less intra-operative blood loss, fewer blood transfusions, and shorter hospital stays for elderly unstable intertrochanteric femoral fractures. Both treatment methods have benefits and should be chosen depending on patient conditions and surgeon ability. Recommendations: It is advisable to conduct additional research in the future with a greater number of participants in order to validate these findings and improve treatment guidelines. Additionally, individualized patient assessment should guide the choice of surgical intervention to optimize outcomes.

Keywords: Unstable intertrochanteric femoral fractures, PFNA, Hemiarthroplasty, Elderly patients, Harris Hip Score Mortality

INTRODUCTION

Unstable intertrochanteric femoral fractures (IFF) are a common and significant health concern among the elderly population. These fractures often result from low-energy falls due to the high prevalence of osteoporosis and decreased bone density in older adults. The management of unstable IFF poses a considerable challenge, given the complexity of the fractures and the often compromised physiological status of the elderly patients [1]. Effective treatment is crucial for restoring mobility, minimizing complications, and improving the quality of life in this vulnerable group.

Recent advancements in surgical techniques and implant design have expanded the treatment options for unstable IFF. Traditionally, open reduction and internal fixation (ORIF) with devices like the dynamic hip screw (DHS) was the standard approach. However, complications such as nonunion, implant failure, and prolonged recovery times have led to the exploration of alternative treatments. Proximal Femoral Nail Antirotation (PFNA) and primary

hemiarthroplasty have emerged as two viable options, each with distinct advantages and potential drawbacks [2].

PFNA, an intramedullary device designed for the fixation of proximal femoral fractures, has gained popularity due to its minimally invasive nature and biomechanical stability. Studies have shown that PFNA provides effective stabilization, reduces intra-operative blood loss, and shortens the duration of surgery compared to traditional fixation methods [3]. Moreover, PFNA allows for early mobilization, which is critical in reducing the risk of post-operative complications such as deep vein thrombosis, pulmonary embolism, and pneumonia [4].

On the other hand, primary hemiarthroplasty involves replacing the fractured femoral head with a prosthetic implant, which can be particularly beneficial for patients with pre-existing hip arthritis or severely comminuted fractures where internal fixation might fail. Hemiarthroplasty offers the advantage of immediate weight-bearing, potentially leading to quicker functional recovery and shorter hospital stays [5]. However, the procedure is more invasive and associated with higher intra-operative blood loss and longer surgical times compared to PFNA.

Despite the benefits of both treatment options, the choice between PFNA and hemiarthroplasty remains contentious. The decision often depends on numerous factors, including the patient's overall health, the nature of the fracture, and the surgeon's expertise. Recent studies suggest that while PFNA is generally associated with shorter operative times and reduced intra-operative complications, hemiarthroplasty may provide better long-term functional outcomes in certain patient groups.

The study aimsto evaluate the outcomes of PFNA (Proximal Femoral Nail Antirotation) versus primary hemiarthroplasty in treating unstable intertrochanteric femoral fractures (IFF) in the elderly population.

METHODOLOGY

Study Design: A retrospective comparative study.

Study Setting: The study took place at Indira Gandhi Institute of Medical Sciences (I.G.I.M.S.), Patna, Bihar, India, from June 2021 to June 2023.

Participants: The study included 60 patients with unstable IFF (AO type 31 A2 and AO type 31 A3) treated either with PFNA (n = 30) or cemented hemiarthroplasty (n = 30).

Inclusion Criteria

- Surgically fit patients with ASA Grades II and III
- Age more than 65 years
- History of fall from standing height
- Diagnosed with unstable intertrochanteric femoral fractures (AO type 31 A2 and A3)
- Unstable fracture patterns including comminuted fractures, fractures with lateral wall comminution, split greater trochanters, single or multiple posteromedial fragments, basicervical patterns, and reverse obliquity patterns

Exclusion Criteria

- Patients with older or concomitant contralateral fractures
- Fractures associated with polytrauma
- Pathological fractures
- Surgically unfit patients
- Patients lost to follow-up
- Patients with nonunion in the PFNA group

Bias

Potential biases were minimized by using consistent inclusion and exclusion criteria, standardizing surgical techniques, and ensuring follow-up for all patients for at least 12 months.

Variables

Variables includedtype of treatment (PFNA vs. hemiarthroplasty), Harris Hip Score (HHS), operating time, peri-operative blood transfusions, intra-operative blood loss, pre- and post-operative hemoglobin levels, and duration of hospital stay

Data Collection

Baseline data, perioperative data, and post-operative complications were collected from patient records. Patients were counseled, and consent was obtained before surgery. AO classification was used for diagnosis.

Procedure

PFNA Group:

- Patients placed on a fracture table and given traction for closed reduction under fluoroscopy.
- Proximal incision made just above the greater trochanter.
- Guide wire inserted, proximal femur reamed, and appropriate sized PFNA inserted intramedullarily.
- Fracture fixed with a helical blade, reaching 5–10 mm from the subchondral bone.
- Distal locking with static and dynamic locking bolts.

Hemiarthroplasty Group:

- Patients placed in the lateral decubitus position, anterolateral approach used.
- Head and neck fragments excised, greater and lesser trochanter fragments preserved.
- Femur prepared with broaches, appropriate size femoral stem implanted and cemented.
- Greater trochanter fragment reduced and sutured with Ethibond™ sutures.

Post-operative and Rehabilitation Protocol

- Intravenous antibiotics and thromboprophylaxis with Dalteparin administered post-operatively.

- Incentive spirometry and ankle pump exercises started from the day of surgery.
- Mobilization protocols: PFNA patients mobilized non-weight bearing initially; hemiarthroplasty patients mobilized full weight bearing from the first post-operative day.
- Follow-up at 3, 6, and 12 months for clinical and radiological evaluation.

Statistical Analysis

The statistical analysis was conducted using SPSS software (Version 21.0). The main measure of the outcome was the HHS, which was classified into four categories: excellent (90–100), good (80–89), medium (70–79), and poor (≤69). Additional outcome variables encompassed the duration of the surgical procedure, the amount of blood lost during the operation, the need for blood transfusions during the perioperative period, the levels of haemoglobin before and after the surgery, and the length of hospitalisation.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

This study comprised a total of 60 patients, with 30 patients receiving treatment with PFNA and 30 patients receiving treatment with primary hemiarthroplasty. Table 1 provides a summary of the demographic and baseline characteristics of the patients.

Table 1: Demographic and Baseline Profile

Characteristics	PFNA Group	Hemiarthroplasty Group	p-value
Mean Age (years)	72.4 ± 4.8	74.1 ± 5.2	0.214
Gender			
- Male	16	15	0.799
- Female	14	15	
ASA Grade			
- Grade II	18	20	0.602
- Grade III	12	10	
Preoperative Hemoglobin (g/dL)	12.5 ± 1.3	12.3 ± 1.2	0.522
Fracture Type			
- AO 31 A2	17	18	0.793
- AO 31 A3	13	12	
Mean Time to Surgery (days)	2.1 ± 1.1	2.3 ± 1.2	0.486

The perioperative data are presented in Table 2. Patients in the PFNA group had a significantly shorter operating time and less intra-operative blood loss compared to the hemiarthroplasty group.

Table 2: Perioperative Data

Variables	PFNA Group	Hemiarthroplasty Group	p-value
Operating Time (minutes)	78.4 ± 10.5	112.6 ± 15.8	<0.001
Intra-operative Blood Loss (mL)	150.2 ± 30.4	280.7 ± 50.6	<0.001
Perioperative Blood Transfusions (units)	1.1 ± 0.3	1.8 ± 0.4	<0.001
Postoperative Hemoglobin (g/dL)	10.8 ± 1.1	10.2 ± 1.2	0.033
Duration of Hospital Stay (days)	8.4 ± 2.3	10.5 ± 2.8	0.002

Post-operative complications were recorded and are summarized in Table 3. The occurrence of complications was greater in the hemiarthroplasty group in comparison to the PFNA group, however the disparity did not reach statistical significance.

Table 3: Post-operative Complications

Complications	PFNA Group	Hemiarthroplasty Group	p-value
Deep Vein Thrombosis	2	3	0.645
Infection	1	2	0.558
Dislocation	0	1	0.313
Mortality	1	2	0.558

The functional outcomes were evaluated using the HHS at 3, 6, and 12 months after the surgery. The average HHS in the PFNA group was consistently higher than in the hemiarthroplasty group across all follow-up periods, and this difference was statistically significant.

Table 4: Functional Outcomes (Harris Hip Score)

Follow-up Interval	PFNA Group	Hemiarthroplasty Group	p-value
3 Months	75.4 ± 8.2	70.1 ± 7.9	0.028
6 Months	81.3 ± 7.4	76.5 ± 8.1	0.036
12 Months	88.6 ± 6.5	82.4 ± 7.3	0.009

DISCUSSION

The retrospective study aimed to compare the outcomes of PFNA versus primary hemiarthroplasty in treating unstable IFF in the elderly. The study included 60 patients, equally divided into two groups, treated between June 2021 and June 2023. The demographic characteristics, such as age, gender distribution, and ASA grades, were similar between the two groups, ensuring a balanced comparison.

The perioperative data indicated significant differences between the two treatment modalities. The PFNA group demonstrated a notably shorter operating time and less intra-operative blood loss compared to the hemiarthroplasty group. Additionally, the PFNA group required fewer perioperative blood transfusions and had higher postoperative hemoglobin levels, contributing to a shorter duration of hospital stay. These findings suggest that PFNA is a less invasive procedure with quicker recovery times, making it a suitable option for elderly patients.

Post-operative complications were slightly more frequent in the hemiarthroplasty group, though the differences were not statistically significant. Both groups had similar rates of deep vein thrombosis, infections, and mortality. However, nonunion was observed only in the PFNA group, albeit in a single case. The complication rates underscore the importance of careful patient monitoring and follow-up, regardless of the chosen surgical intervention.

Functional outcomes, assessed using the HHS, favored the PFNA group. At 3, 6, and 12 months postoperatively, patients in the PFNA group consistently achieved higher HHS scores, indicating better hip function and overall mobility. The significant difference in functional outcomes highlights the potential benefits of PFNA in enhancing the quality of life for elderly patients post-surgery.

Overall, the study indicates that PFNA presents many benefits compared to primary hemiarthroplasty in the treatment of unstable intertrochanteric femoral fractures in older individuals. PFNA is correlated with decreased surgical durations, diminished intra-operative blood loss, decreased need for blood transfusions, and shorter hospital stays, all of which contribute to improved early recovery. Furthermore, the higher functional outcomes reported in the PFNA group provide further evidence of its efficiency in restoring hip function. Nevertheless, the selection of treatment should be tailored to the specific needs of the patient, taking into account their overall health, the features of the fracture, and the surgeon's level of experience.

Unstable intertrochanteric femoral fractures in older patients are typically treated with either PFNA or hemiarthroplasty. A comprehensive analysis and synthesis of multiple studies determined that PFN is more effective than bipolar hemiarthroplasty (BPH) in treating unstable intertrochanteric femoral fractures in older individuals. The study revealed notable enhancements in health-related quality of life and reduced mortality rates when comparing PFN to BPH. In addition, the use of PFN was linked to reduced surgical duration, less blood loss, and shorter hospitalisation periods [6].

A comparative study was conducted to evaluate the efficacy of PFNA in comparison to cemented bipolar hemiarthroplasty for the treatment of intertrochanteric fractures. The study revealed no statistically significant disparity in HHS at the six-month follow-up. Nevertheless, PFNA shown benefits in terms of decreased intraoperative blood loss, shorter surgical duration, and reduced hospitalisation period [7]. A study investigated the results in senior patients aged 80 and above, and found that there were no notable disparities in terms of mortality, postoperative complications, or HHS between the PFNA and hemiarthroplasty groups. Nevertheless, the duration of the surgery was considerably reduced for PFNA, indicating a clear advantage in this particular age group [8].

A retrospective study compared PFNA and cementless bipolar hemiarthroplasty. The results showed that both methods were effective and safe, but PFNA had a shorter operation time and less intraoperative bleeding. Hemiarthroplasty allowed for faster mobilization but had similar overall long-term outcomes [9]. A study compared PFNA and cementless bipolar hemiarthroplasty, finding that both treatments were effective. However, PFNA had shorter operation times, less blood loss, and better HHS at one year, indicating better functional outcomes [10].

CONCLUSION

This study demonstrates that PFNA is a superior treatment option for unstable intertrochanteric femoral fractures in the elderly compared to primary hemiarthroplasty. PFNA is associated with shorter operating times, less intra-operative blood loss, fewer perioperative blood transfusions, and shorter hospital stays, leading to quicker recovery. Additionally, PFNA patients exhibited significantly better functional outcomes as measured by the HHS at various follow-up intervals. Despite these advantages, both treatment options should be considered based on individual patient conditions and surgical expertise to ensure the best outcomes.

Limitations: The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: It is advisable to conduct additional research in the future with a greater number of participants in order to validate these findings and improve treatment guidelines. Additionally, individualized patient assessment should guide the choice of surgical intervention to optimize outcomes.

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List of abbreviations
IFF: Intertrochanteric Femoral Fractures
PFNA: Proximal Femoral Nail Antirotation
HHS: Harris Hip Score
ORIF: Open Reduction and Internal Fixation
DHS: Dynamic Hip Screw
ASA: American Society of Anesthesiologists
AO: Arbeitsgemeinschaft für Osteosynthesefragen (Association for the Study of Internal Fixation)
BPH: Bipolar Hemiarthroplasty

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