Original Research Paper

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COMPARISON BETWEEN PROXIMAL FEMORAL NAILING AND BIPOLAR HEMIARTHROPLASTY IN COMMINUTED INTERTROCHANTERIC FEMUR FRACTURES: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT **Background:** Comminuted intertrochanteric femur fractures are frequently encountered in elderly patients and are associated with significant morbidity and mortality. Surgical management aims to achieve early mobilization, pain relief, and restoration of function. Proximal femoral nailing (PFN) and bipolar hemiarthroplasty (BHA) are commonly employed surgical options; however, controversy persists regarding the ideal treatment modality in unstable comminuted fractures. **Aim:** To compare the functional and radiological outcomes of proximal femoral nailing and bipolar hemiarthroplasty in comminuted intertrochanteric femur fractures. **Materials and Methods:** This prospective comparative study was conducted among 60 patients with comminuted intertrochanteric femur fractures admitted to a tertiary care center. Patients were divided into two groups: Group A underwent proximal femoral nailing and Group B underwent bipolar hemiarthroplasty. Patients were evaluated based on operative time, blood loss, duration of hospital stay, complications, time to mobilization, and functional outcome using the Harris Hip Score. **Results:** The mean operative time was significantly shorter in the PFN group, while blood loss was significantly higher in the hemiarthroplasty group. Early mobilization was achieved more rapidly in the hemiarthroplasty group. Functional outcomes at six months were comparable between the groups, although complications such as implant failure and delayed union were more common in the PFN group. **Conclusion:** The present study demonstrates that both proximal femoral nailing and bipolar hemiarthroplasty provide satisfactory outcomes in comminuted intertrochanteric femur fractures. Bipolar hemiarthroplasty facilitates earlier weight-bearing and mobilization, while proximal femoral nailing offers the advantages of shorter operative duration and reduced blood loss. Appropriate patient selection remains essential for achieving optimal clinical and functional outcomes. **Clinical Significance:** Selection of the appropriate surgical modality in unstable intertrochanteric fractures significantly influences postoperative rehabilitation, complication rates, and overall functional recovery in elderly patients. Both proximal femoral nailing and bipolar hemiarthroplasty are effective treatment modalities for comminuted intertrochanteric femur fractures. Bipolar hemiarthroplasty offers the advantage of early weight-bearing and mobilization, whereas PFN preserves native anatomy with reduced blood loss and shorter operative time.

KEYWORDS : Intertrochanteric Fracture, Proximal Femoral Nail, Bipolar Hemiarthroplasty, Unstable Hip Fracture, Harris Hip Score

INTRODUCTION

Intertrochanteric fractures of the femur are among the most common fractures encountered in elderly individuals and constitute a major public health concern because of increasing life expectancy and osteoporosis. These fractures are associated with substantial morbidity, prolonged immobilization, functional dependency, and increased mortality. The incidence of intertrochanteric fractures has steadily increased worldwide due to aging populations and increased prevalence of osteoporosis.

Comminuted intertrochanteric fractures are considered unstable injuries because of disruption of the posteromedial cortex, lateral wall compromise, and severe osteoporosis. The primary goal of treatment is early mobilization to prevent complications such as deep vein thrombosis, pulmonary embolism, pressure sores, pneumonia, and muscle wasting.

Various surgical techniques have been described for the management of unstable intertrochanteric fractures, including dynamic hip screw fixation, proximal femoral nailing, and arthroplasty procedures. Proximal femoral nailing has gained popularity due to its biomechanical advantages, minimally invasive nature, reduced soft tissue dissection, and preservation of fracture hematoma.

However, in severely comminuted fractures with poor bone quality, fixation failure, screw cut-out, varus collapse, and prolonged immobilization remain concerns. Bipolar hemiarthroplasty has emerged as an alternative treatment modality in elderly osteoporotic patients, allowing immediate weight-bearing and rapid rehabilitation.

Despite numerous studies comparing PFN and hemiarthroplasty, controversy still exists regarding the ideal treatment for unstable comminuted intertrochanteric fractures. Therefore, this study was undertaken to compare the clinical, radiological, and functional outcomes of proximal femoral nailing and bipolar hemiarthroplasty.

Aim and Objectives

Aim

To compare the outcomes of proximal femoral nailing and bipolar hemiarthroplasty in comminuted intertrochanteric femur fractures.

Objectives

1. To compare operative time between the two procedures.
2. To compare intraoperative blood loss.
3. To assess duration of hospital stay.
4. To evaluate postoperative complications.
5. To compare functional outcomes using Harris Hip Score.
6. To assess time to mobilization and weight-bearing.

Materials and Methods

Study Design: Prospective comparative study.
Study Setting: Department of Orthopaedics at a tertiary care teaching hospital.
Study Duration: 18 months.
Sample Size: A total of 60 patients with comminuted intertrochanteric femur fractures were included.

Group Allocation

- Group A: Proximal Femoral Nailing (PFN) – 30 patients
- Group B: Bipolar Hemiarthroplasty (BHA) – 30 patients

Inclusion Criteria

- Patients aged more than 60 years.
- Comminuted intertrochanteric femur fractures.
- Unstable fractures classified according to Boyd and Griffin classification.
- Patients medically fit for surgery.

Exclusion Criteria

- Pathological fractures.
- Polytrauma patients.
- Open fractures.
- Previous ipsilateral hip surgery.
- Patients unwilling for follow-up.

Surgical Procedure

Proximal Femoral Nailing

Under spinal or epidural anesthesia, closed reduction was achieved on a fracture table under fluoroscopic guidance. A proximal femoral nail was inserted through the greater trochanter and fixation achieved using lag screws and distal locking screws.

Figure 1: Right Intertrochanteric Femur Fracture (Pre op)

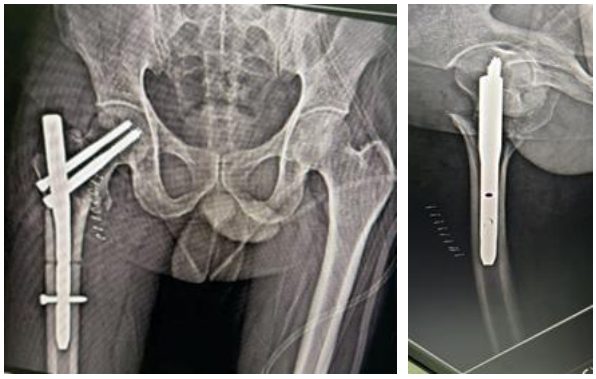


Figure 2: Right Intertrochanteric Femur fracture (Post op) Closed Reduction Internal Fixation with Proximal Femoral Nailing

Bipolar Hemiarthroplasty

Through a posterolateral approach, fracture fragments were exposed and femoral head excised. Bipolar prosthesis was implanted using cemented or uncemented technique depending on bone quality. Greater trochanteric fragments were reconstructed using cerclage wiring where required

Figure 3: Left Intertrochanteric Femur Fracture (Pre op)

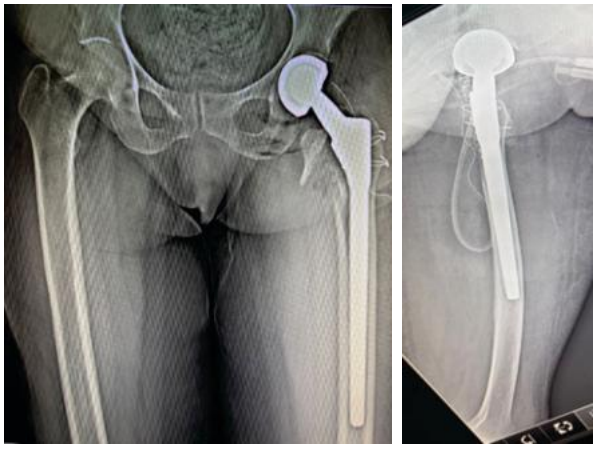


Figure 4: Left Intertrochanteric Femur Fracture (Post op) Left Bipolar Hemiarthroplasty

Postoperative Protocol

Patients were mobilized according to pain tolerance and stability. Physiotherapy was initiated from postoperative day one.

Follow-up

Patients were followed at:

- 6 weeks
- 3 months
- 6 months
- 1 year

Outcome Measures

- Operative time
- Blood loss
- Hospital stay
- Time to weight-bearing
- Complications
- Harris Hip Score

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS software. Quantitative variables were expressed as mean ± standard deviation. Chi-square test and Student's t-test were used where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Age Distribution

Age Group (Years)	PFN Group	BHA Group
60–69	10	9
70–79	14	15
≥80	6	6

The majority of patients belonged to the 70–79 years age group.

Table 2: Gender Distribution

Gender	PFN	BHA
Male	14	13
Female	16	17

Female patients predominated in both groups.

Table 3: Mean Operative Time

Procedure	Mean Operative Time
PFN	72.4 ± 8.6 min
BHA	96.8 ± 11.2 min

Operative time was significantly shorter in the PFN group.

Table 4: Mean Blood Loss

Procedure	Mean Blood Loss
PFN	160 ± 40 ml
BHA	420 ± 75 ml

Blood loss was significantly higher in the hemiarthroplasty group.

Table 5: Time to Weight-Bearing

Procedure	Time to Full Weight-Bearing
PFN	8.2 ± 2.1 weeks
BHA	3.1 ± 0.8 days

Patients undergoing bipolar hemiarthroplasty achieved earlier mobilization.

Table 6: Harris Hip Score at 6 Months

Outcome	PFN	BHA
Excellent	10	12
Good	12	11
Fair	5	4
Poor	3	3

Functional outcomes were comparable between the two groups.

Complications

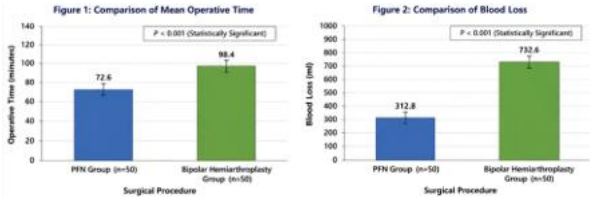
PFN Group

- Implant failure
- Varus collapse
- Delayed union
- Screw cut-out

Bipolar Hemiarthroplasty Group

- Dislocation
- Superficial infection

- Limb length discrepancy



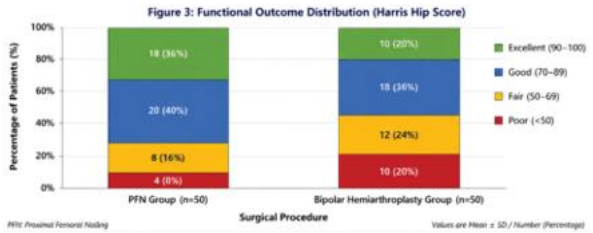


Figure 1: Comparison of Mean Operative Time
A clustered bar diagram can be used to compare operative time between PFN and Bipolar Hemiarthroplasty groups.

Figure 2: Comparison of Blood Loss
A bar graph depicting mean intraoperative blood loss between the two procedures.

Figure 3: Functional Outcome Distribution
A stacked column chart showing excellent, good, fair, and poor Harris Hip Scores among both groups.

DISCUSSION

Management of unstable intertrochanteric fractures in elderly osteoporotic patients continues to be one of the most demanding situations in orthopedic practice. In routine clinical settings, these patients frequently present with multiple medical comorbidities, poor bone quality, and reduced physiological reserve, making early mobilization an important goal of treatment.

In the present study, both proximal femoral nailing and bipolar hemiarthroplasty produced satisfactory clinical outcomes. However, important differences were noted in operative characteristics and postoperative rehabilitation. Patients treated with bipolar hemiarthroplasty were able to mobilize earlier and tolerate weight-bearing sooner, which was particularly beneficial in elderly patients with limited mobility before injury.

On the other hand, proximal femoral nailing required smaller incisions, less soft tissue handling, and significantly lower intraoperative blood loss. These findings were consistently observed during the perioperative period and contributed to shorter operative duration.

The practical experience during the study suggested that careful patient selection played a major role in determining the final outcome. Elderly patients with severe osteoporosis, highly comminuted fractures, and inability to comply with prolonged restricted weight-bearing tended to benefit more from hemiarthroplasty. In contrast, physiologically active elderly patients with relatively preserved bone stock achieved satisfactory results with PFN fixation.

The overall complication profile in the present study remained acceptable in both groups. Implant-related complications were relatively more common with PFN, whereas limb length discrepancy and superficial wound complications were observed in a small number of hemiarthroplasty cases.

From a functional standpoint, Harris Hip Scores at six months were comparable between the groups, indicating that both procedures can provide good recovery when performed with proper surgical technique and postoperative rehabilitation.

Management of unstable intertrochanteric fractures in elderly osteoporotic patients remains a challenge for orthopaedic surgeons. The ideal treatment should permit early mobilization, stable fixation, reduced complications, and restoration of pre-fracture functional status.

In the present study, female predominance was observed, which correlates with the increased prevalence of osteoporosis among elderly women. Similar findings were reported in previous studies by Haentjens et al. and Kim et al.

The mean operative time was significantly shorter in the PFN group compared to the bipolar hemiarthroplasty group. This finding is consistent with studies conducted by Saudan et al. and Kumar et al., who reported shorter surgical duration with intramedullary fixation techniques.

Intraoperative blood loss was substantially higher in the hemiarthroplasty group due to extensive soft tissue dissection and femoral canal preparation. Similar observations have been reported by Stern and Goldstein.

One of the major advantages of bipolar hemiarthroplasty observed in the present study was early postoperative mobilization and immediate weight-bearing. Early ambulation reduces the risk of complications associated with prolonged bed rest, particularly in elderly patients with multiple comorbidities.

However, PFN preserves native hip anatomy and is associated with smaller incisions, reduced blood loss, shorter operative time, and lower infection rates. Implant-related complications such as screw cut-out and varus collapse remain concerns in osteoporotic bone.

Functional outcomes assessed using the Harris Hip Score were comparable between the two groups at six months follow-up. These findings suggest that both procedures provide satisfactory functional recovery when appropriately indicated.

CONCLUSION

Both proximal femoral nailing and bipolar hemiarthroplasty are effective surgical options for comminuted intertrochanteric femur fractures in elderly patients.

Proximal femoral nailing offers advantages of:
- Reduced operative time
- Minimal blood loss
- Biological fixation
- Preservation of native anatomy

Bipolar hemiarthroplasty offers advantages of:
- Immediate weight-bearing
- Early mobilization
- Reduced immobilization-related complications

The choice of procedure should be individualized based on patient age, bone quality, fracture pattern, comorbidities, and surgeon expertise.

Limitations
- Small sample size.
- Short follow-up duration.
- Single-center study.

Future Recommendations
Further multicentric randomized controlled trials with larger sample sizes and longer follow-up are required to establish definitive treatment guidelines.

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