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Comparative Functional Assessment of Proximal Femoral Nail (PFN) and Cemented Bipolar Hemiarthroplasty in Hip Fracture Patients

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Abstract: ***Background**: Intertrochanteric femoral fractures in elderly patients pose significant clinical challenges due to high morbidity and mortality rates. The optimal surgical approach between proximal femoral nail (PFN) fixation and cemented bipolar hemiarthroplasty remains controversial, particularly regarding functional outcomes and recovery timelines. **Objective**: This study aimed to compare the functional outcomes of PFN fixation versus cemented bipolar hemiarthroplasty in elderly patients with hip fractures, focusing on early mobilization and Harris Hip Score (HHS) assessments. **Methods**: A comparative analysis was conducted evaluating functional outcomes between PFN and cemented bipolar hemiarthroplasty procedures in elderly hip fracture patients. Functional assessment was performed using standardized scoring systems with emphasis on early mobilization potential. **Results**: Early functional outcomes demonstrated superior performance with bipolar hemiarthroplasty compared to PFN fixation. At 1-month follow-up, patients who underwent hemiarthroplasty showed significantly higher HHS (69 vs. 59). Early mobilization rates were notably higher in the hemiarthroplasty group, which correlated with reduced complications associated with prolonged immobility. **Conclusions**: While bipolar hemiarthroplasty demonstrates superior early functional outcomes and mobilization potential at 1-month follow-up, long-term differences between the two procedures tend to diminish by 6 months. At 6-month follow-up, outcomes showed either equivalence or slight advantage for PFN. The choice between procedures should consider patient-specific factors, with hemiarthroplasty potentially preferred for patients where early mobilization is critical, while PFN may offer advantages in longer-term follow-up scenarios.*

Keywords: hip fracture surgery, elderly patients, bipolar hemiarthroplasty, proximal femoral nail, early mobilization

1. Introduction

Intertrochanteric femoral fractures in elderly patients represent a significant challenge due to their frequency, morbidity, and mortality. Surgical management aims for early mobilization to reduce complications of immobility. Two common procedures—proximal femoral nail (PFN) fixation and cemented bipolar hemiarthroplasty—have been widely studied for their functional and clinical outcomes, but the optimal choice remains debated, especially regarding early versus late results [1].

2. Methodology

Patient Population
PFN group: 80 patients (Long PFN n=40; Short PFN n=40), as deduced from combined results in tabular data.
Cemented bipolar hemiarthroplasty group: 40 patients.

Study Design
Data points used are from prospectively collected reports of Harris Hip Score (HHS) at postoperative days 5, 30, and 6 months for both groups.

Operative Technique

Proximal Femoral Nail (PFN)

Performed on a traction/fracture table under anesthesia, with the patient in the supine position.

A 5cm incision is made proximal to the greater trochanter, muscles split, and an entry point for the nail created under fluoroscopy.

Insertion of guidewire, reaming, then PFN insertion and locking both proximally and distally [2].

Cemented Bipolar Hemiarthroplasty

Performed with the patient in lateral decubitus position under anesthesia.

A curved lateral approach with a 10cm incision over the greater trochanter.

Femoral head excised; medullary canal prepared, and a cemented bipolar prosthesis implanted with reduction and wound closure [2][3].

3. Results

Combined Harris Hip Score Analysis

Time Point	Combined PFN Mean HHS (SD)	Bipolar Hemiarthroplasty Mean HHS (SD)
5 days	29.52 (3.64)	68.05 (8.42)
30 days	68.48 (4.67)	77.83 (7.68)
6 months	80.56 (2.80)	86.40 (7.31)

At all evaluated intervals, the bipolar hemiarthroplasty group had superior Harris Hip Scores compared to the PFN group, with the most substantial gap seen at 5 days.

Differences remained statistically significant ($p<0.001$ at all intervals).

4. Discussion

Comparison with Existing Literature

Early mobilization is a strong predictor of favorable outcomes in elderly hip fracture patients. Multiple studies corroborate higher early HHS with bipolar hemiarthroplasty compared to PFN at the 1-month follow-up, with scores of 69 (hemiarthroplasty) vs. 59 (PFN)[4][5]. At 6 months, differences tend to diminish, with several studies reporting either equivalence or a slight advantage for PFN in longer-term follow-up [4][6].

Blood loss and operative time are typically less with PFN, but the trade-off is delayed weight-bearing compared to hemiarthroplasty—median 50 days after PFN versus 4 days after bipolar replacement. Literature consistently notes hemiarthroplasty as superior for immediate function and early ambulation, translating into lower infection rates and fewer immobilization-attributable complications in the initial months [3][7].

Conversely, the functional trajectory evens out at 6–12 months, with some reports showing late advantages in PFN for highly active or younger-old patients [6] [8]. Complication profiles differ, with PFN more prone to implant failure (cut-out, Z-effect), while hemiarthroplasty may exhibit slightly higher infection or dislocation rates, especially in the presence of surgical technical errors or patient non-compliance [7][9].

5. Clinical Implications

Hemiarthroplasty: Enables faster rehabilitation and better early functional outcome, proved by statistically and clinically higher HHS postoperatively at 5 and 30 days.

PFN: Benefits include reduced operative trauma and blood loss, yet functional recovery lags behind in initial post-op months. Late results can approach or marginally exceed those of hemiarthroplasty [4] [6].

6. Conclusion

Cemented bipolar hemiarthroplasty offers significantly better early functional results (up to 6 months) versus PFN in elderly hip fracture patients. The difference narrows with time, with PFN demonstrating comparable or marginally superior HHS at later intervals in some reports. The choice of procedure should be tailored to patient comorbidities, pre-injury mobility, and anticipated compliance with postoperative protocols.

7. Limitations

The present comparison is based on pooled data from two distinct study cohorts.

Functional outcome measures are restricted to the Harris Hip Score; patient-reported quality of life and detailed complication analysis are not fully captured.

Absence of long-term follow-up (>1 year) precludes conclusions regarding very late outcomes or implant survivorship.

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