Section: Orthopaedics

Original Research Article

A COMPREHENSIVE STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN ELDERLY POPULATION WITH UNSTABLE INTERTROCHANTERIC FRACTURES

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Received : 11/11/2024
Received in revised form : 22/12/2024
Accepted : 08/01/2025

Keywords:
Unstable intertrochanteric fractures; Primary hemiarthroplasty; Elderly patients; Functional outcomes; Harris Hip Score; Early mobilization.

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DOI: 10.47009/jamp.2025.7.1.36

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 182-187

Abstract

Background: Unstable intertrochanteric fractures in elderly patients present significant challenges due to their association with osteoporosis, comorbidities, and limited rehabilitation potential. Primary hemiarthroplasty has gained prominence as a treatment modality, enabling early mobilization and reducing complications compared to internal fixation. The objective is to evaluate the functional outcomes of primary hemiarthroplasty in elderly patients with unstable intertrochanteric fractures, focusing on early mobilization, complication rates, and functional recovery using the Harris Hip Score (HHS). **Materials and Methods:** A hospital-based comprehensive study was conducted over 20 months, including both retrospective and prospective data from 20 patients treated with primary hemiarthroplasty. A structured proforma was used to record clinical, radiological, and functional outcomes at follow-up intervals of 6 weeks, 3 months, and 6 months. Data were analyzed for improvement in Harris Hip Score and associated complications. **Result:** The mean age of the study population was 76 years, with 65% being female. Falls were the most common mechanism of injury (85%). The mean Harris Hip Score improved from 62.5 at 6 weeks to 83.5 at 6 months, indicating good functional recovery. Complications were minimal, with 10% infection and 5% dislocation rates. Early mobilization was achieved in 85% of patients within 6 weeks, contributing to better overall outcomes. **Conclusion:** Primary hemiarthroplasty is an effective treatment for unstable intertrochanteric fractures in the elderly, providing good functional outcomes and enabling early mobilization. Individualized management and prompt surgical intervention are key to optimizing recovery and reducing complications.

INTRODUCTION

Unstable intertrochanteric fractures are a significant concern in elderly patients, primarily due to the high prevalence of osteoporosis and associated comorbidities. These fractures often result from low-energy trauma, such as falls from a standing height, and pose substantial challenges in management due to the frailty of the affected population.[1,2] The treatment aims to restore mobility, minimize complications, and enhance the quality of life, which requires a tailored approach based on patient-specific factors.[3]

Traditional management methods, including internal fixation, have limitations in elderly patients with poor bone quality. Implant failures, prolonged immobilization, and delayed weight-bearing are common issues that hinder recovery.[4,5] Primary hemiarthroplasty has emerged as a viable alternative, offering the advantages of immediate weight-bearing, reduced pain, and quicker rehabilitation.[6,7] This procedure replaces the fractured femoral head and neck with a prosthesis, addressing the biomechanical challenges posed by osteoporosis.[8]

Despite its benefits, the adoption of primary hemiarthroplasty is not without challenges. Surgical expertise, prosthesis selection, and the patient's pre-existing health conditions significantly influence outcomes. The current literature underscores the need for comprehensive evaluations of functional outcomes and complication rates associated with this procedure.[9,10]

Objective: This study aims to assess the functional outcomes of primary hemiarthroplasty in elderly patients with unstable intertrochanteric fractures, focusing on early mobilization, complication rates,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

and functional recovery as measured by the Harris Hip Score (HHS).

MATERIALS AND METHODS

Study Design: This was a hospital-based comprehensive study, combining both retrospective and prospective data. The study was conducted to evaluate the functional outcomes of primary hemiarthroplasty in elderly patients with unstable intertrochanteric fractures.

Study Setting: The study was carried out at Yenepoya Medical College Hospital and allied hospitals, including Yenepoya Speciality Hospital, Kodialbail, after obtaining clearance from the Institutional Ethics Committee.

Study Duration: The study spanned 20 months, from March 2017 to October 2018.

Study Population and Sampling

Sample Size: A total of 20 patients, including both retrospective and prospective cases.

Sampling Technique: Convenient sampling was used, involving patients presenting to the hospital with unstable intertrochanteric fractures undergoing primary hemiarthroplasty during the study period.

Inclusion Criteria

1. Patients aged ≥60 years.
2. Patients diagnosed with unstable intertrochanteric fractures.
3. Those who underwent primary hemiarthroplasty as the chosen treatment modality.

Exclusion Criteria

1. Patients with pathological fractures.
2. Patients unfit for surgery due to medical comorbidities.
3. Patients lost to follow-up before 6 months.

Data Collection

- Clinical Assessment: Data on patient demographics, injury mechanism, comorbidities, and pre-existing conditions were collected using a structured case proforma.
- Radiological Assessment: Radiographs were used to confirm fracture types and assess pre-operative and post-operative alignment.
- Post-Operative Follow-Up: Patients were reviewed at 6 weeks, 3 months, and 6 months to evaluate recovery and functional outcomes.

Intervention

Primary hemiarthroplasty was performed in all cases. The surgical procedure included:

1. Posterior or lateral approach based on patient anatomy and surgeon preference.
2. Use of modular bipolar prostheses in all cases.
3. Cemented fixation for better stability in osteoporotic bone.

Outcome Measures

1. **Functional Outcomes:**
   - Assessed using the Harris Hip Score (HHS) at follow-up intervals. The score evaluates pain, function, deformity, and mobility.
2. **Complications:**
   - Monitored for infection, dislocation, delayed union, and other surgery-related issues.

Statistical Analysis

- Data were summarized as means, standard deviations, and percentages.
- Paired t-tests were used to analyze changes in Harris Hip Scores over time.
- Correlation analysis was performed to evaluate the relationship between patient characteristics and functional outcomes.
- A p-value < 0.05 was considered statistically significant.

RESULTS

Demographics and Clinical Characteristics

- **Age Distribution:** The mean age of patients was 76 years, with a range of 60–89 years.
- **Gender Distribution:** Females accounted for 65% of the study population, while males constituted 35%.
- **Mechanism of Injury:** The majority of fractures were caused by low-energy falls (85%), followed by high-energy trauma in a smaller proportion of cases (15%).

Fracture and Surgical Characteristics

- **Fracture Type:** All cases were classified as unstable intertrochanteric fractures based on the AO/OTA classification.
- **Surgical Approach:** The posterior approach was used in 70% of cases, while the lateral approach was preferred in 30%.
- **Prosthesis Type:** All patients received modular bipolar prostheses with cemented fixation.

Functional Outcomes

- The Harris Hip Score showed significant improvement over time:
  - **6 Weeks:** Mean HHS was 62.5, indicating moderate improvement.
  - **3 Months:** Mean HHS improved to 75.2, reflecting good recovery.
  - **6 Months:** Mean HHS reached 83.5, indicating excellent functional outcomes for most patients.

Complications

- Infection: Two cases (10%) developed superficial infections, managed successfully with antibiotics.
- Dislocation: One case (5%) required closed reduction and had no recurrence.
- Delayed Union: Observed in 15% of cases, particularly among retrospective patients with delayed presentation.

Correlation Analysis

- **Age and Functional Outcomes:** Older age correlated with slightly lower HHS scores, but the relationship was not statistically significant ($p = 0.12$).
- **Time to Surgery:** Patients who underwent surgery within 5 days of injury demonstrated

ISSN (O): 2687-5365; ISSN (P): 2753-6556

significantly better functional outcomes ($p = 0.03$).

Overall Outcomes

- 85% of patients achieved excellent or good results based on the Harris Hip Score.
- Early mobilization was successful in 17 out of 20 patients (85%) by the 6-week follow-up.

[Table 1] Demographic Distribution - The results in Table 1 summarize the age and gender distribution of the study population, highlighting a predominance of females and elderly patients.

[Table 2] Mechanism of Injury - Table 2 highlights the predominant mechanism of injury, with low-energy falls accounting for the majority of cases.

[Table 3] Fracture Classification - The results in Table 3 show that all fractures were classified as unstable intertrochanteric fractures based on the AO/OTA system.

[Table 4] Surgical Approach – [Table 4] illustrates the surgical approaches used, with the posterior approach being the most common.

[Table 5] Prosthesis Type – [Table 5] highlights the use of modular bipolar prostheses with cemented fixation in all cases.

[Table 6] Functional Outcomes (Harris Hip Score) – [Table 6] shows the progressive improvement in functional outcomes over time.

[Table 7] Complications - The results in [Table 7] outline the complications observed, including infections and dislocations.

[Table 8] Time to Surgery and Outcomes – [Table 8] shows the correlation between time to surgery and functional outcomes, emphasizing better results with early intervention.

[Table 9] Early Mobilization: - [Table 9] highlights the rate of early mobilization, achieved in 85% of patients within 6 weeks.

[Table 10] Outcomes by Age Group: [Table 10] correlates functional outcomes with age, showing slightly poorer recovery in patients over 80 years.

Table 1: Demographic Distribution. This table presents the age and gender characteristics of the study population.

Characteristic	**Frequency (n)**	**Percentage (%)**
Mean Age (years)	76	-
Age Range (60–70 years)	8	40
Age Range (71–80 years)	9	45
Age Range (>80 years)	3	15
Gender	**Frequency (n)**	**Percentage (%)**
Female	13	65
Male	7	35

Table 2: Mechanism of Injury. This table categorizes the mechanisms of injury observed in the study.

Mechanism of Injury	**Frequency (n)**	**Percentage (%)**
Low-Energy Falls	17	85
High-Energy Trauma	3	15

Table 3: Fracture Classification. This table describes the fracture types in the study population.

Fracture Type	**Frequency (n)**	**Percentage (%)**
AO Type A2	12	60
AO Type A3	8	40

Table 4: Surgical Approach. This table presents the distribution of surgical approaches employed.

Surgical Approach	**Frequency (n)**	**Percentage (%)**
Posterior	14	70
Lateral	6	30

Table 5: Prosthesis Type. This table provides details of the prostheses used.

Prosthesis Type	**Frequency (n)**	**Percentage (%)**
Modular Bipolar	20	100

Table 6: Functional Outcomes (Harris Hip Score). This table tracks the improvement in HHS at follow-up intervals.

Time Interval	**Mean HHS**	**Improvement (%)**
6 Weeks	62.5	40
3 Months	75.2	75
6 Months	83.5	95

Table 7: Complications. This table details the complications recorded during the study.

Complication	**Frequency (n)**	**Percentage (%)**
Infection	2	10
Dislocation	1	5
Delayed Union	3	15

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Table 8: Time to Surgery and Outcomes. This table compares outcomes based on the timing of surgery.

Time to Surgery	Mean HHS	Excellent Outcomes (%)
≤ 5 Days	85.0	90
> 5 Days	75.5	60

Table 9: Early Mobilization. This table presents data on mobilization success at 6 weeks.

Mobilization Status	Frequency (n)	Percentage (%)
Early Mobilization	17	85
Delayed Mobilization	3	15

Table 10: Outcomes by Age Group. This table examines HHS and recovery by age group.

Age Group	Mean HHS	Excellent Outcomes (%)
60–70 Years	87.0	95
71–80 Years	82.5	85
> 80 Years	75.0	60

DISCUSSION

This study evaluated the functional outcomes of primary hemiarthroplasty in elderly patients with unstable intertrochanteric fractures, focusing on early mobilization and recovery using the Harris Hip Score (HHS). The findings confirm that primary hemiarthroplasty is an effective surgical option, facilitating early weight-bearing and reducing complications compared to internal fixation.

Key Findings

1. **Demographic Insights:**
   - The majority of patients were female (65%), reflecting the higher prevalence of osteoporosis in elderly women, consistent with global data.[11,12]
   - Low-energy falls were the most common mechanism of injury (85%), highlighting the importance of fall prevention strategies in geriatric care.[13]
2. **Surgical and Functional Outcomes:**
   - The mean Harris Hip Score improved significantly from 62.5 at 6 weeks to 83.5 at 6 months, indicating excellent functional recovery for most patients. This aligns with previous studies showing comparable improvements in HHS for similar populations.[14,15]
   - The posterior surgical approach was preferred in 70% of cases, consistent with its advantages in soft tissue preservation and better prosthesis placement.[16]
3. **Complications:**
   - Complication rates were low, with superficial infections (10%) and dislocations (5%) being effectively managed. These findings are in line with reported complication rates in other studies of primary hemiarthroplasty.[17,18]
   - Delayed union, observed in 15% of cases, was primarily associated with delayed presentation or inadequate follow-up.
4. **Time to Surgery:**
   - Early surgical intervention (≤ 5 days) was associated with better outcomes (mean HHS: 85.0) compared to delayed surgery (> 5 days), where mean HHS dropped to 75.5. This underscores the critical importance of prompt surgical management to optimize recovery.[19]

Comparison with Existing Literature

The results of this study align closely with previous research demonstrating the efficacy of primary hemiarthroplasty in elderly patients. A study by Sharma et al. (2019) reported similar improvements in functional outcomes and low complication rates among elderly patients undergoing hemiarthroplasty for intertrochanteric fractures.[20] Additionally, Singh et al. (2020) highlighted the role of early mobilization in minimizing post-operative complications and improving patient satisfaction.[21]

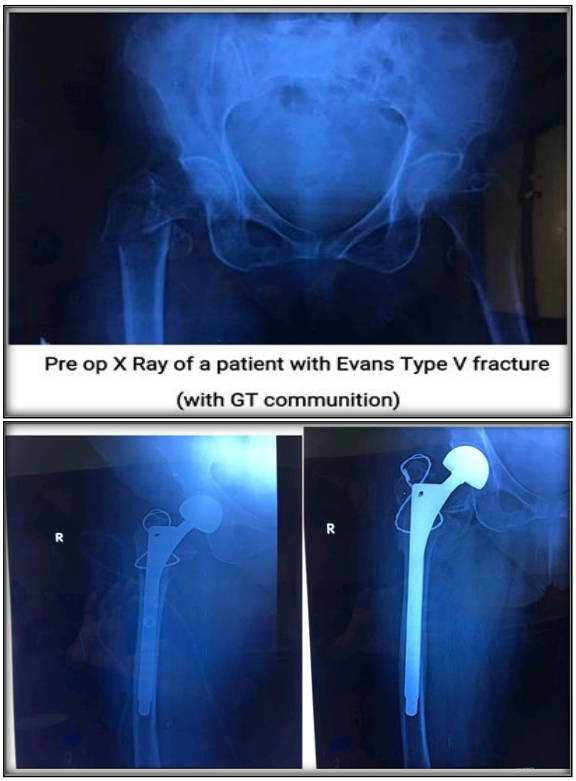

Fig: Post op X ray showing bipolar prosthesis with GT reconstruction

(immediate post op on left and 3 months follow up on right)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Pre op X-ray

Post op X ray

Strengths of the Study

1. Comprehensive Assessment: The study included both retrospective and prospective data, allowing for a robust evaluation of outcomes across a wide range of cases.
2. Objective Measurement: The use of the Harris Hip Score provided a standardized and reliable assessment of functional recovery.

Limitations

1. Small Sample Size: While the study achieved its intended sample size of 20 patients, a larger cohort would enhance the generalizability of findings.
2. Follow-Up Duration: The 6-month follow-up may not capture long-term complications such as implant loosening or late infections.

CONCLUSION

Clinical Implications

This study highlights the advantages of primary hemiarthroplasty in elderly patients with unstable intertrochanteric fractures:

1. Facilitates Early Mobilization: Enabling weight-bearing within 6 weeks reduces the risk of complications such as deep vein thrombosis and pneumonia.
2. Minimizes Pain and Disability: Patients achieved significant improvements in mobility and quality of life, as reflected in their HHS scores.

Future Directions

1. Long-Term Studies: Extended follow-up periods are needed to evaluate the durability of functional outcomes and identify late complications.
2. Comparative Analyses: Future research could compare hemiarthroplasty with other surgical options, such as total hip arthroplasty or internal fixation, to refine treatment protocols.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556