International Journal of Current Pharmaceutical Research

ISSN- 0975-7066 Vol 17, Issue 3, 2025

Original Article

FUNCTIONAL OUTCOME OF NECK OF FEMUR FRACTURE IN ELDERLY PATIENTS MANAGED WITH BIPOLAR HEMIARTHROPLASTY V/S TOTAL HIP REPLACEMENT

ANKUSH KUMAR, JAGDEEP SINGH REHNCY, HARRY MEHTA, JASKIRAT SINGH, AMANDEEP SINGH BAKSHI*, GIRISH SAHNI

Government Medical College, Patiala, Punjab, India
***Corresponding author: Amandeep Singh Bakshi; *Email: dramangomco@gmail.com**

Received: 20 Jan 2025, Revised and Accepted: 10 Mar 2025

ABSTRACT

Objective: Femoral neck fractures (FNFs) pose a significant public health challenge, particularly as the global population ages, with incidence rates doubling every decade after age 50. Mortality rates range from 3-10% within 30 days and nearly 30% within a year post-injury, with long-term consequences including the need for extended nursing care in 25% of patients and mobility challenges for nearly 50%. The majority of FNFs are displaced, especially in elderly females, necessitating diverse treatment strategies. Current management options include fracture reduction, bipolar hemiarthroplasty, and total hip replacement (THR), with emerging evidence indicating that THR may offer superior functional outcomes.

To evaluate and compare the functional outcomes of displaced FNFs in active elderly patients treated with either bipolar hemiarthroplasty or THR, providing insights into optimal orthopedic management.

Methods: This prospective study at Government Medical College, Patiala, assessed 30 elderly patients (aged over 60) with displaced femoral neck fractures (Garden types 3 and 4). Participants were randomly assigned to two treatment groups: Group 1 received bipolar hemiarthroplasty, and Group 2 underwent total hip replacement (THR). All patients provided informed consent, and ethical approval was obtained. The posterior-lateral approach was used for surgical access, followed by a standardized postoperative protocol involving intravenous antibiotics, early mobilization, and follow-up assessments at 2 w, 1 mo, 3 mo, and 6 mo, with functional outcomes evaluated using the Modified Harris Hip Score.

Results: In this study, the mean age was 68.67±7.36 y in Group I and 65.97±6.05 y in Group II, with no significant age or gender differences between groups. Operative time was significantly shorter in Group I (79.67±19.99 min) compared to Group II (108.16±24.65 min, p = 0.0410). Intraoperative blood loss was significantly higher in Group II (682.67±142.80 ml) than in Group I (428.33±114.98 ml, p<0.0001). Functional outcomes, measured by the Harris Hip Score, showed significant improvement in Group II at all follow-up intervals (2 w, 1 mo, 3 mo, and 6 mo) compared to Group I (p<0.00001). These findings suggest that THR may lead to better functional recovery than PHR in elderly patients with displaced femoral neck fractures.

Conclusion: This study underscores notable differences in clinical outcomes between bipolar hemiarthroplasty (PHR) and total hip replacement (THR) for femoral neck fractures. Patients who underwent THR experienced longer surgical durations, increased intraoperative blood loss, and better functional outcomes, as assessed by the Harris Hip Score, at multiple postoperative follow-up points.

Keywords: Femoral neck fractures, Displaced femoral neck fractures, Partial hemiarthroplasty, Total hip replacement Harris hip score

DOI: https://dx.doi.org/10.22159/ijcpr.2025v17i3.54434 Journal homepage: https://innovareacademics.in/journals/index.php/ijcpr

INTRODUCTION

Femoral neck fractures (FNFs) represent a critical public health issue, particularly as the global population continues to age [1]. The incidence of FNFs has surged in recent years, with fracture risk doubling for every decade after age 50 [2]. This alarming trend is underscored by significant mortality rates ranging from 3-10% within 30 days and escalating to nearly 30% within a year of injury [3, 4]. The long-term consequences of FNFs are profound; approximately 25% of patients necessitate extended nursing care and nearly 50% face challenges in regaining their pre-fracture mobility. By 2050, the global annual incidence of FNFs is projected to reach between 7 to 21 million cases, predominantly affecting elderly females [5, 6].

Clinically, these fractures can be categorized into high-impact and low-impact injuries, frequently resulting from falls, and present with symptoms including hip pain and mobility impairments [7, 8]. The complications associated with FNFs, such as avascular necrosis, non-union, late osteoarthritis, and diminished autonomy, further complicate the clinical management of these patients [9-12]. While X-ray imaging remains the primary diagnostic tool, the limitations of this modality in identifying non-displaced fractures necessitate the use of advanced imaging techniques like Magnetic Resonance Imaging for accurate assessment.

Consensus exists around the management of undisplaced intracapsular hip fractures; however, approximately 85% of FNFs are displaced, particularly among older females, leading to diverse treatment approaches. Current options include fracture reduction and stabilization, bipolar hemiarthroplasty, and total hip replacement (THR). Emerging evidence suggests that THR may result in superior functional outcomes compared to other surgical interventions [13]. This study aims to evaluate and compare the functional outcomes of displaced femoral neck fractures in active elderly patients treated with either bipolar hemiarthroplasty or total hip arthroplasty, contributing valuable insights to ongoing discourse in orthopedic management.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Orthopaedics at Government Medical College, Patiala, involving 30 elderly patients (aged over 60) with displaced femoral neck fractures (Garden types 3 and 4). Participants were randomly assigned to two treatment groups: Group 1 received bipolar hemiarthroplasty, while Group 2 underwent total hip replacement (THR).

Patient selection criteria

Inclusion criteria

- Age over 60 y
- Medically fit for surgery

- Displaced femoral neck fractures (Garden types 3 and 4)
- Closed injuries

Exclusion criteria

- Age below 60 y
- Unfit for surgery
- Open fractures
- Lack of consent for surgery
- Acetabular fractures

Methods

All patients provided written informed consent, and ethical approval was obtained. The surgical approach employed was the posterior-lateral (Gibson and Moore) technique. The incision was made over the greater trochanter, allowing access to the hip joint. Key steps included dissection of the gluteus maximus, division of the short external rotators, and exposure of the acetabulum for component placement.

Postoperative protocol

Post-surgery, patients received intravenous antibiotics for 24 to 48 h, with extended treatment if infections occurred. Mobilization began on the second postoperative day, and patients were placed in an abduction pillow for 5 to 7 d. Sutures were removed between the 12th and 14th d, and follow-up radiographs were performed to monitor healing and complications.

Follow-up and functional outcome assessment

Patients were followed up at 2 w, 1 mo, 3 mo, and 6 mo post-surgery, with radiographs taken at each visit. Functional outcomes were evaluated using the Modified Harris Hip Score, categorizing results as excellent (90-100), good (80-89), fair (70-79), or poor (<70).

Statistical analysis plan

The collected data were compiled and analyzed using the Statistical Program for Social Sciences (SPSS) software version 20.0 (Chicago, Illinois, USA). Statistical analyses were conducted on an intention-to-treat basis. Chi-square tests were employed to evaluate differences for categorical variables across the study groups.

RESULTS

A total of sixty elderly patients diagnosed with displaced femoral neck fractures were evaluated in this study, divided into two groups: Group I (n=30) received Bipolar Hemiarthroplasty (PHR), and Group II (n=30) underwent Total Hip Replacement (THR).

Patient demographics

The mean age in Group I was 68.67±7.36 y (range 60-85 y), while Group II had a mean age of 65.97±6.05 y (range 60-88 y). The majority of patients in both groups were aged between 61-70 y. Statistical analysis revealed no significant difference in mean age between the groups (p = 0.1261), indicating comparability.

In Group I, there were 14 females (46.67%) and 16 males (53.33%). In Group II, 10 females (33.33%) and 20 males (66.67%) were noted. The difference in gender distribution between the two groups was not statistically significant (p = 0.2918).

Operative time

The mean operative time for Group I was 79.67±19.99 min (range 45-125 min), while Group II had a mean operative time of 108.16±24.65 min (range 70-160 min). A statistically significant difference in mean operative time was observed between the two groups (p = 0.0410).

Fracture laterality

In Group I, 15 patients (50%) had fractures of the right femur, and 15 patients (50%) had fractures of the left femur. In Group II, 14 patients (46.67%) had right femur fractures, and 16 patients (53.33%) had left femur fractures. The difference in fracture laterality between the groups was non-significant (p = 0.7961).

Intraoperative blood loss

In Group I (PHR), 22 patients (73.33%) experienced intraoperative blood loss of ≤500 ml, while 8 patients (26.67%) had blood loss between 501-700 ml. The mean blood loss in Group I was 428.33±114.98 ml (range 250-650 ml). In contrast, Group II (THR) had 3 patients (10%) with blood loss of ≤500 ml, 16 patients (53.33%) with blood loss between 501-700 ml, and 11 patients (36.67%) with blood loss exceeding 700 ml. The mean blood loss for Group II was significantly higher at 682.67±142.80 ml (range 400-1000 ml), with a highly significant difference between the groups (p<0.0001).

Harris hip score outcomes

At 2 w postoperatively

In Group I (PHR), all patients had poor Harris Hip scores (<70), with a mean score of 47.43±7.36. In Group II (THR), 27 patients (90%) had poor scores, and 3 patients (10%) had fair scores (70–79), resulting in a mean score of 59.56±7.78. The difference between the groups was statistically significant (p<0.00001).

At 1 mo postoperatively

At one month, 28 patients (93.33%) in Group I had poor scores, while 2 patients (6.67%) had fair scores. In Group II, 6 patients (20%) had poor scores, 19 patients (63.33%) had fair scores, and 5 patients (16.67%) had good scores (80–89). The mean Harris Hip score was 61.33±5.99 in Group I and 74.53±5.57 in Group II, with a significant difference (p<0.00001).

At 3 mo postoperatively

At three months, 11 patients (36.67%) in Group I had poor scores, 17 patients (56.67%) had fair scores, and 2 patients (6.67%) had good scores. In contrast, Group II had 6 patients (20%) with fair scores, 20 patients (66.67%) with good scores, and 4 patients (13.33%) with excellent scores (90–100). The mean Harris Hip score was 70.67±5.99 for Group I and 84.20±4.50 for Group II, showing a significant difference (p<0.00001).

At 6 mo postoperatively

At six months, 13 patients (43.33%) in Group I had fair scores, 15 patients (50%) had good scores, and 2 patients (6.67%) had excellent scores. In Group II, 12 patients (40%) had good scores, and 18 patients (60%) had excellent scores. The mean Harris Hip score was 80.33±4.75 for Group I and 90.03±2.90 for Group II, with a significant difference (p<0.00001).

Intra-group comparison of harris hip scores

In Group I (PHR), the mean Harris Hip scores across the follow-up periods were 47.43±7.36, 61.33±5.99, 70.67±5.99, and 80.33±4.75 at 2 w, 1 mo, 3 mo, and 6 mo, respectively (p<0.00001). In Group II (THR), the scores were 59.56±7.78, 74.53±5.57, 84.20±4.50, and 90.03±2.90 at the same intervals, also showing significant improvement (p<0.00001).

Table 1: Baseline characteristics of patients

Variables	Group I	Group II	Significance level
Age	68.67±7.36 y	65.97±6.05 y	0.1261 (NS)
Gender	Male (53.33%) Female (46.67%)	Male (66.67%) Female (33.33%)	0.2918 (NS)
Laterality of fracture	Right (50%) and Left (50%)	Right (46.67%) and Left (53.33%)	0.7961 (NS)

Table 2: Comparison of outcomes

Variables	Timelines	Group I	Group II	Significance level (Inter-group)
Operative time (Min)		79.67±19.99	108.16±24.65	0.0410 (S)
Intraoperative blood loss (ml)		428.33±114.98	682.67±142.80	<0.0001 (HS)
Harris Hip score	2 w	47.43±7.36	59.56±7.78	<0.00001 (HS)
	1 mo	61.33±5.99	74.53±5.57	<0.00001 (HS)
	3 mo	70.67±5.99	84.20±4.50	<0.00001 (HS)
	6 mo	80.33±4.75	90.03±2.90	<0.00001 (HS)
	p-Value (Intra-group)	<0.00001 (HS)	<0.00001 (HS)	

*ANOVA test applied

DISCUSSION

In our study, the mean age of patients in Group 1 (bipolar hemiarthroplasty, PHR) was 68.67±7.36 y (range 60-85 y), while Group 2 (total hip replacement, THR) had a mean age of 65.97±6.05 y (range 60-88 y), with no significant difference between the groups (p = 0.1261). These findings are consistent with previous studies, such as that by Saiyam *et al.* (2023) [14], which reported a mean age of 65.50 y among patients with femoral neck fractures, particularly in the 61-70 age group. Chatterji *et al.* (2022) also noted similar age distributions in their cohorts [15]. The increased incidence of fractures in older adults can be attributed to a significant decline in soft tissue bulk, which diminishes the protective shock-absorbing capacity of muscles and soft tissues [16].

Regarding gender distribution, Group 1 comprised 14 females (46.67%) and 16 males (53.33%), while Group 2 included 10 females (33.33%) and 20 males (66.67%), with no significant difference observed (p = 0.2918). This aligns with findings from Saiyam *et al.* (2023) [14], which reported 53% female patients overall. Other studies, such as those by Edelstein *et al.* (2023) [17] and Chatterji *et al.* (2022) [15], reported higher female prevalence rates in both THR and hemiarthroplasty groups, with Aathithya *et al.* (2019) [16] emphasizing the increased fracture risk among postmenopausal women due to declining estrogen levels and resultant bone density loss.

In terms of fracture laterality, Group 1 had an equal distribution of right and left femoral neck fractures (15 patients each), while Group 2 had 14 right and 16 left fractures, with no significant difference (p = 0.7961). Aathithya *et al.* (2019) [16] reported a predominance of left-sided fractures in the THR group and right-sided fractures in the hemiarthroplasty group.

The mean operative time was significantly shorter in Group 1 (79.67±19.99 min) compared to Group 2 (108.16±24.65 min), with a p-value of 0.0410. This finding is corroborated by Subith *et al.* (2023) [18] and Chatterji *et al.* (2022) [15], who reported lower operative times for hemiarthroplasty compared to total hip replacement, attributed to the more complex nature of THR procedures, which often involve additional acetabular reconstruction.

Intraoperative blood loss was significantly greater in Group 2, with a mean of 682.67±142.80 ml compared to 428.33±114.98 ml in Group 1 (p<0.0001). This finding is consistent with various studies, including those by Subith *et al.* (2023) [18] and Aathithya *et al.* (2019) [16], which also noted higher blood loss in total hip arthroplasty due to the complexity of the procedure.

Functional outcomes, as measured by the Harris Hip Score, demonstrated significant differences between the groups at all postoperative time points. At 2 w, Group 1 had a mean score of 47.43±7.36, while Group 2 had a score of 59.56±7.78 (p<0.00001). This trend continued at 1 mo, 3 mo, and 6 mo postoperatively, with Group 2 consistently achieving higher scores, indicating better functional outcomes. These results align with findings from Subith *et al.* (2023) [18] and Chatterji *et al.* (2022) [15], which also reported superior Harris Hip Scores in the THR group.

Despite these findings, the study has limitations, including a relatively short duration, small sample size, and the region-specific nature of the data. Future research with larger, multicentric cohorts over extended periods is warranted to enhance the generalizability of the findings to broader populations.

CONCLUSION

In conclusion, this study highlights significant differences in clinical outcomes between bipolar hemiarthroplasty (PHR) and total hip replacement (THR) for femoral neck fractures. THR patients demonstrated longer operative times, greater intraoperative blood loss, and superior functional outcomes, as measured by the Harris Hip Score, at various postoperative intervals.

Ethical approval and Consent

Approval was taken from the relevant ethics committee and written informed consent was taken from each patient to publish his details while maintaining confidentiality.

FUNDING

There was no source of funding for our research.

AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICTS OF INTERESTS

Declared none

REFERENCES

1. Guyen O. Hemiarthroplasty or total hip arthroplasty in recent femoral neck fractures? Orthop Traumatol Surg Res. 2019 Feb 1;105(1S):S95-S101. doi: 10.1016/j.otsr.2018.04.034, PMID 30449680.
2. Kates SL, Kates OS, Mendelson DA. Advances in the medical management of osteoporosis. Injury. 2007;38 Suppl 3:S17-23. doi: 10.1016/j.injury.2007.08.007, PMID 17723788.
3. Roche JJ, Wenn RT, Sahota O, Moran CG. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. BMJ. 2005;331(7529):1374. doi: 10.1136/bmj.38643.663843.55, PMID 16299013.
4. Kristensen PK, Thillemann TM, Soballe K, Johnsen SP. Can improved quality of care explain the success of orthogeriatric units? A population-based cohort study. Age Ageing. 2016;45(1):66-71. doi: 10.1093/ageing/afv155, PMID 26582757.
5. Creditor MC. Hazards of hospitalization of the elderly. Ann Intern Med. 1993;118(3):219-23. doi: 10.7326/0003-4819-118-3-199302010-00011, PMID 8417639.
6. Gullberg B, Johnell O, Kanis JA. World-wide projections for hip fracture. Osteoporos Int. 1997;7(5):407-13. doi: 10.1007/pl00004148, PMID 9425497.
7. Foex BA, Russell A. BET 2: CT versus MRI for occult hip fractures. Emerg Med J. 2018;35(10):645-7. doi: 10.1136/emermed-2018-208093.3, PMID 30249714.
8. Taosuwan S, Yuenyongviwat V. Outcomes comparison in the management of displaced femoral neck fractures among elderly patients: total hip arthroplasty versus bipolar hemiarthroplasty: hip arthroplasty outcomes in displaced femoral neck fractures. Vajira Med J. 2024 Feb 13;68(1):e266094. doi: 10.62691/vmj.2024.266094.
9. Kenmegne GR, Zou C, Lin Y, Yin Y, Huang S, Fang Y. Postoperative clinical outcome and complications of combined cannulated cancellous screw with Kirschner wire in adolescent femoral neck fractures. Front Pediatr. 2023 May 16;11:1169581. doi: 10.3389/fped.2023.1169581, PMID 37260793.

10. Zlowodzki M, Brink O, Switzer J, Wingerter S, Woodall J JR, Petrisor BA. The effect of shortening and varus collapse of the femoral neck on function after fixation of intracapsular fracture of the hip: a multi-centre cohort study. J Bone Joint Surg Br. 2008;90(11):1487-94. doi: 10.1302/0301-620X.90B11.20582, PMID 18978271.
11. Chong KC, Chacha PB, Lee BT. Fractures of the neck of the femur in childhood and adolescence. Injury. 1975;7(2):111-9. doi: 10.1016/0020-1383(75)90008-x, PMID 1205604.
12. Bloomberg J. Femoral neck fractures. Available from: https://www.orthobullets.com/trauma/1037/femoral-neck-fractures. [Last accessed on 20 Aug 2024].
13. Wang F, Zhang H, Zhang Z, MA C, Feng X. Comparison of bipolar hemiarthroplasty and total hip arthroplasty for displaced femoral neck fractures in the healthy elderly: a meta-analysis. BMC Musculoskelet Disord. 2015 Dec;16:229. doi: 10.1186/s12891-015-0696-x, PMID 26316274.
14. Saiyam S, Uikey K, Bhalavi M, Jamre Y. Prospective study of the functional outcome of bipolar hemiarthroplasty versus total hip replacement in elderly patients with fracture of the neck of femur by using harris hip score. Asian J Pharm Clin Res. 2023;16(9):13-5.
15. Chatterji G, Shukla S, Singhania S, Singh MP, Mohanty SS, Jaiswal A. A prospective study comparing the functional outcome of bipolar hemiarthroplasty versus total hip replacement in elderly patients with fracture of the neck of femur. Cureus. 2022;14(9):e29529. doi: 10.7759/cureus.29529, PMID 36312669.
16. Aathithya S, B Chowdhary MB. A comparison of hemiarthroplasty with total hip replacement for displaced fracture of femoral neck in the elderly. Indian J Orthop Surg. 2019;5(1):46-51. doi: 10.18231/j.ijos.2019.009.
17. Edelstein AI, Dillingham TR, McGinley EL, Pezzin LE. Hemiarthroplasty versus total hip arthroplasty for femoral neck fracture in elderly patients: twelve-month risk of revision and dislocation in an instrumental variable analysis of medicare data. J Bone Joint Surg Am. 2023 Nov 1;105(21):1695-702. doi: 10.2106/JBJS.23.00247, PMID 37678258.
18. Subith S, Chartal A, Dakhode S, Naik K. Functional assessment of bipolar hemiarthroplasty versus total hip replacement in trans cervical neck fracture of femur in elderly patients a prospective observational study. Int J Res Orthop. 2023 May;9(3):513-8. doi: 10.18203/issn.2455-4510.IntJResOrthop20231175.