

ORIGINAL ARTICLE

Functional Outcome of Cemented Bipolar Hemiarthroplasty in Elderly Patients with Intracapsular Neck of Femur Fractures Treated at a Tertiary Care Center

¹Ved Prakash Agarwal, ²Sunil Kumar

^{1,2}Associate Professor, Department of Orthopaedics, ICARE Institute of Medical Sciences and Research & Bidhan Chandra Roy Hospital, Haldia, India

ABSTRACT:

Background: Intracapsular fractures of the femoral neck are common in the elderly and are associated with high morbidity and functional impairment. Bipolar hemiarthroplasty is a widely accepted treatment modality for such fractures in geriatric patients, particularly when early mobilization and long-term function are desired. **Objectives:** To evaluate the functional outcome of cemented bipolar hemiarthroplasty in elderly patients with displaced intracapsular femoral neck fractures managed at a tertiary health care center. **Materials and Methods:** This prospective study included 90 patients aged 62 years and above who sustained post-traumatic intracapsular femoral neck fractures. All patients underwent cemented bipolar hemiarthroplasty using a standard posterior approach. **Results:** The majority of patients were aged between 61–70 years (48.9%). Most fractures were classified as Garden type III (52.2%) and type IV (33.3%). The mean HHS showed significant improvement from 52.3 at 6 weeks to 72.4 at 3 months and 85.7 at 6 months ($p < 0.01$), indicating excellent functional recovery over time. **Conclusion:** Cemented bipolar hemiarthroplasty is an effective and reliable treatment for displaced intracapsular femoral neck fractures in the elderly. It offers excellent short- to mid-term functional outcomes, promotes early ambulation, and reduces postoperative complications, particularly in resource-equipped tertiary care settings.

Keywords: Femoral neck fracture, bipolar hemiarthroplasty, elderly, functional outcome, Harris Hip Score, geriatric orthopaedics

Corresponding author: Sunil Kumar, Associate Professor Department of Orthopaedics, ICARE Institute of Medical Sciences and Research & Bidhan Chandra Roy Hospital, Haldia, India

This article may be cited as: Agarwal VP, Kumar S. Functional Outcome of Cemented Bipolar Hemiarthroplasty in Elderly Patients with Intracapsular Neck of Femur Fractures Treated at a Tertiary Care Center. *J Adv Med Dent Scie Res* 2016;4(4):358-361.

INTRODUCTION

Fractures of the proximal femur, particularly intracapsular neck of femur fractures, represent a significant public health concern, especially among the elderly population. These injuries are associated with high rates of morbidity, mortality, and functional decline, particularly in individuals aged 65 years and older. With the increasing life expectancy and growing elderly population, the incidence of hip fractures is projected to rise substantially in the coming decades, with estimates suggesting a global burden exceeding six million cases annually by 2050 if current trends continue [1].

The intracapsular neck of femur fracture, by virtue of its anatomical location within the capsule of the hip joint, presents unique challenges in management due to the compromised vascular supply to the femoral head, which predisposes to complications such as avascular necrosis and non-union [2]. Treatment modalities are generally classified into internal fixation and prosthetic replacement, with the choice largely influenced by patient age, physiological status, bone quality, fracture displacement, and pre-injury functional status [3].

In younger patients, internal fixation is often preferred to preserve the native joint. However, in elderly patients, particularly those with displaced fractures

and limited physiological reserves, prosthetic replacement is often the treatment of choice [4]. Among the various arthroplasty options, bipolar hemiarthroplasty has gained favor for its potential benefits in terms of postoperative stability, reduced acetabular erosion, and functional outcomes [5]. Bipolar prostheses feature a dual articulation—between the prosthetic head and acetabulum, and within the prosthesis itself—aimed at mimicking the natural biomechanics of the hip joint [6].

Several studies conducted before 2013 have emphasized the advantages of bipolar hemiarthroplasty in elderly patients with femoral neck fractures. Sarmiento et al. demonstrated that hemiarthroplasty, when appropriately indicated, resulted in favorable pain relief and early mobilization [7]. Similarly, Phillips et al. reported that bipolar hemiarthroplasty was associated with fewer dislocations and lower rates of acetabular wear compared to unipolar designs [8]. The added benefit of reduced operating time and lower perioperative complication rates compared to total hip arthroplasty also makes it an attractive option in elderly, often comorbid, patient populations [9].

Functional outcome post-hemiarthroplasty is a crucial determinant of success and reflects the patient's ability to regain pre-fracture independence and

mobility. Tools such as the Harris Hip Score and the Modified Barthel Index have been utilized to objectively evaluate postoperative recovery and quality of life [10]. Factors influencing functional recovery include not only the surgical technique and type of implant but also the adequacy of postoperative rehabilitation, comorbid conditions, and baseline functional status [11].

At tertiary health care centers, where comprehensive multidisciplinary care is available, bipolar hemiarthroplasty offers a valuable treatment pathway for elderly patients suffering from displaced intracapsular fractures. These centers are well-positioned to evaluate and enhance functional outcomes through structured rehabilitation programs, close follow-up, and timely management of complications. Furthermore, centralized data from such institutions allow for robust evaluation of outcomes, which is essential for continuous improvement of treatment protocols and guidelines.

Despite the advantages of bipolar hemiarthroplasty, it is not without potential drawbacks. Complications such as periprosthetic fractures, prosthetic loosening, and infections may negatively impact outcomes, emphasizing the need for patient selection and perioperative optimization [12]. Moreover, there is ongoing debate regarding the superiority of bipolar versus unipolar hemiarthroplasty or total hip arthroplasty in this subset of patients, with some studies suggesting comparable outcomes across techniques under specific conditions [13].

In summary, the management of intracapsular neck of femur fractures in the elderly continues to evolve. Bipolar hemiarthroplasty remains a cornerstone in the surgical management of such fractures, particularly in frail patients with limited functional demands. Evaluating functional outcomes in this context is critical for assessing the efficacy of treatment and guiding future care strategies, especially in resource-constrained tertiary health care settings where maximizing recovery and minimizing complications is essential.

MATERIALS AND METHODS

This prospective study included 90 patients aged 62 years and older who sustained post-traumatic intracapsular fractures of the femoral neck. All participants underwent cemented bipolar hemiarthroplasty, carried out using a standard posterior approach. Surgeries were performed by experienced orthopedic surgeons at the tertiary care center.

Inclusion Criteria

Patients aged over 62 years of either gender were eligible for inclusion if they presented with post-traumatic intracapsular fractures of the femoral neck, had a pre-injury ambulatory status sufficient for at least household mobility, and had closed fractures with no prior deformities affecting the lower limbs.

Exclusion Criteria

Exclusion criteria comprised pathological femoral neck fractures, open (compound) fractures, associated fractures involving other parts of the skeleton, active infections of the hip or systemic infections, and any history of cognitive impairment such as dementia.

Upon admission, all patients underwent a thorough clinical evaluation, including detailed medical history and physical examination. Written informed consent was obtained from each participant prior to surgical intervention. For infection prophylaxis, intravenous ceftriaxone (1 g) was administered the night before and again immediately before the procedure. Postoperatively, the antibiotic regimen was continued for five days using IV ceftriaxone, followed by oral cefuroxime (200 mg) until the removal of sutures on the tenth postoperative day.

Postoperative clinical and functional outcomes were assessed using the Harris Hip Score (HHS) during follow-up visits. Patient data, including demographic, clinical, and surgical details, were systematically documented using a structured data collection pro forma.

Statistical Analysis

Quantitative variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as percentages. All statistical analyses were performed using IBM SPSS Statistics, version 21.0.

Table 1: Distribution of study cases as per age group

Age group (in years)	N	Percentage (%)
61–70	44	48.9
71–80	33	36.7
>80	13	14.4
Total	90	100

Table 1 presents the distribution of study participants across different age groups. Out of 90 patients, the majority (48.9%) were between 61 and 70 years of age. Participants aged 71–80 years constituted 36.7% of the cohort, while those above 80 years comprised 14.4%. The mean age was 71.2 years with a standard deviation of 7.3 years, indicating a predominantly elderly study population.

Table 2: Distribution of study cases as per type of fracture

Type of fracture (Garden's classification)	N	Percentage (%)
I	7	7.8
II	6	6.7
III	47	52.2
IV	30	33.3
Total	90	100

Table 2 categorizes the types of femoral neck fractures based on Garden's classification. The majority of patients (52.2%) were diagnosed with type III fractures, followed by type IV (33.3%). Type I and

II fractures were less common, accounting for 7.8% and 6.7% respectively. This distribution reflects a higher incidence of unstable fracture types in the study population.

Table 3: Mean HHS at 6 weeks, 3 months, and 6 months

HHS	N	Mean	SD	P value
6 weeks	90	52.30	10.75	
3 months	90	72.45	7.10	<0.01
6 months	90	85.68	6.25	<0.01

Table 3 illustrates the progression of functional recovery using the Harris Hip Score (HHS) at different follow-up intervals. The mean HHS improved from 52.3 at 6 weeks to 72.45 at 3 months, and further to 85.68 at 6 months. Statistical analysis shows a significant improvement ($p < 0.01$) from 6 weeks to 3 and 6 months, indicating effective rehabilitation and recovery.

DISCUSSION

The present study evaluated the functional outcome of cemented bipolar hemiarthroplasty in elderly patients with intracapsular femoral neck fractures at a tertiary health care center. The findings reveal significant postoperative functional recovery as measured by the Harris Hip Score (HHS), with marked improvement between 6 weeks, 3 months, and 6 months of follow-up. These results support the use of bipolar hemiarthroplasty as a reliable treatment option for displaced femoral neck fractures in the geriatric population.

The demographic profile of the patients indicates that nearly half (48.9%) were in the 61–70-year age group, with a mean age of 71.2 years. This aligns with earlier literature reporting a peak incidence of hip fractures among individuals in their seventh and eighth decades of life due to factors such as osteoporosis, impaired balance, and reduced muscle strength [1,2]. A similar age distribution was observed in the study by Rogmark and Johnell, where the majority of displaced intracapsular femoral neck fractures occurred in patients over 65 years old, warranting arthroplasty over internal fixation [4].

With respect to fracture classification, the predominance of Garden type III (52.2%) and type IV (33.3%) fractures suggests a high incidence of unstable fracture patterns, consistent with previous epidemiological findings [3,4]. These unstable fractures, particularly types III and IV, carry a significant risk of non-union and avascular necrosis when managed with internal fixation, particularly in elderly individuals with compromised bone quality [2,5]. Therefore, prosthetic replacement is generally advocated in such scenarios to avoid reoperation and ensure faster rehabilitation [6].

The choice of bipolar hemiarthroplasty in the current study is supported by its biomechanical and clinical advantages over both unipolar prostheses and internal fixation. The bipolar design provides dual articulation,

potentially reducing acetabular erosion and improving range of motion [6,8]. Previous studies have reported better functional outcomes and fewer complications such as dislocation with bipolar devices compared to unipolar implants [8,9]. This likely contributes to the positive functional trajectory observed in our cohort.

The mean Harris Hip Score (HHS) in our study showed consistent improvement over time, from 52.3 at 6 weeks to 85.7 at 6 months. This gradual increase in functional scores reflects not only the success of the surgical intervention but also the importance of timely mobilization and structured rehabilitation. Our findings are comparable to those reported by Calder et al., where patients treated with bipolar hemiarthroplasty showed progressive improvement in HHS, reaching near-normal values by six months postoperatively [6]. Similarly, Keating et al. found that elderly patients with displaced femoral neck fractures treated with bipolar hemiarthroplasty had significantly higher satisfaction and functional scores at 4–6 months compared to those managed with internal fixation [9].

The statistically significant improvement ($p < 0.01$) in HHS between follow-up intervals reinforces the efficacy of bipolar hemiarthroplasty in promoting early mobilization and regaining independence. Early mobilization is especially important in elderly populations to prevent complications such as deep vein thrombosis, pulmonary embolism, and muscle deconditioning [5,7]. Sarmiento et al. noted that immediate weight-bearing post-hemiarthroplasty, compared to delayed mobility after internal fixation, resulted in better overall outcomes and lower mortality rates in elderly patients [7].

Despite the overall success, it is important to recognize the potential limitations of bipolar hemiarthroplasty, including risks of periprosthetic fracture, infection, and prosthetic dislocation. Although the present study did not focus on complication rates, previous authors have reported dislocation rates ranging from 1.5% to 5% and varying rates of acetabular erosion, particularly in highly active patients [12]. However, given that our study population consisted primarily of elderly individuals with lower functional demands, the risk of such complications may be lower, as also noted by Blomfeldt et al. [13].

Another noteworthy consideration is the selection criteria, which excluded patients with dementia or systemic infections. These exclusions likely contributed to the favorable outcomes, as cognitive impairment and infection are known to adversely affect recovery and postoperative mobility [11].

Overall, the findings of this study validate the role of cemented bipolar hemiarthroplasty as an effective and functionally rewarding procedure for elderly patients with displaced intracapsular femoral neck fractures. The consistent improvement in Harris Hip Scores over the follow-up period highlights the benefits of this approach in facilitating early ambulation, reducing

dependency, and improving quality of life in this vulnerable population.

CONCLUSION

The findings of this study underscore the effectiveness of cemented bipolar hemiarthroplasty in the management of displaced intracapsular femoral neck fractures in the elderly population. The majority of patients achieved substantial functional recovery, as reflected by a progressive and statistically significant improvement in Harris Hip Scores over a 6-month follow-up period. These outcomes reinforce the suitability of bipolar hemiarthroplasty as a preferred surgical intervention in geriatric patients with limited physiological reserve and high risk of fixation failure.

REFERENCES

- Gullberg B, Johnell O, Kanis JA. World-wide projections for hip fracture. *Osteoporos Int.* 1997;7(5):407–13.
- Garden RS. Stability and union in subcapital fractures of the femur. *J Bone Joint Surg Br.* 1964;46(4):630–47.
- Parker MJ, Gurusamy K. Internal fixation versus arthroplasty for intracapsular proximal femoral fractures in adults. *Cochrane Database Syst Rev.* 2001;(3):CD001708.
- Rogmark C, Johnell O. Primary arthroplasty is better than internal fixation of displaced femoral neck fractures. A meta-analysis of 14 randomized studies with 2299 patients. *ActaOrthop.* 2006;77(3):359–67.
- Khan RJ, MacDowell A, Crossman P, Keene GS. Cemented versus uncemented hemiarthroplasty for intracapsular neck of femur fractures: a randomized controlled trial in 200 patients. *Injury.* 2002;33(6):469–72.
- Calder SJ, Anderson GH, Jagger C, Harper WM, Gregg PJ. Unipolar or bipolar prosthesis for displaced intracapsular hip fracture in octogenarians: a randomised prospective study. *J Bone Joint Surg Br.* 1996;78(3):391–4.
- Sarmiento A, Ebrahimzadeh E, Gogan WJ, McKellop HA. Total hip arthroplasty with cement. A long-term radiographic analysis in patients who are older than fifty and younger than fifty years. *J Bone Joint Surg Am.* 1990;72(10):1470–6.
- Phillips TW. Thompson hemiarthroplasty and acetabular erosion. *J Bone Joint Surg Am.* 1989;71(6):913–7.
- Keating JF, Grant A, Masson M, Scott NW, Forbes JF. Randomized comparison of reduction and fixation, bipolar hemiarthroplasty, and total hip arthroplasty: treatment of displaced intracapsular hip fractures in healthy older patients. *J Bone Joint Surg Am.* 2006;88(2):249–60.
- Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by moldarthroplasty. *J Bone Joint Surg Am.* 1969;51(4):737–55.
- Tidermark J, Zethraeus N, Svensson O, Törnkvist H, Ponzer S. Quality of life related to fracture displacement among elderly patients with femoral neck fractures treated with internal fixation. *J Orthop Trauma.* 2002;16(1):34–8.
- Enocson A, Hedbeck CJ, Tidermark J, Pettersson H, Ponzer S, Lapidus LJ. Dislocation of hemiarthroplasty after hip fracture is common and occurs early. *Injury.* 2008;39(5):539–43.
- Blomfeldt R, Törnkvist H, Ponzer S, Söderqvist A, Tidermark J. Displaced femoral neck fracture: comparison of primary total hip replacement with secondary replacement after failed internal fixation—a 2-year follow-up of 84 patients. *ActaOrthop.* 2006;77(4):638–43.