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# Functional Outcome of Cemented Bipolar Hemiarthroplasty in Patients with Fracture Neck of Femur

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## ABSTRACT

**Background:** Femoral neck fractures are common injuries in the elderly, often resulting from low-energy trauma. These fractures are associated with significant morbidity and mortality due to underlying comorbidities and prolonged immobilization. Cemented bipolar hemiarthroplasty is a preferred treatment for displaced intracapsular fractures in this population, aiming to restore mobility and reduce complications.

**Objective:** This study evaluates the functional outcomes and postoperative recovery in patients undergoing cemented bipolar hemiarthroplasty for fracture neck of femur (NOF), with particular attention to the influence of age, sex, surgical timing, and complication rates.

**Methods:** A prospective, hospital-based study was conducted over one year at the Department of Orthopaedics, Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem. Thirty patients aged above 55 years with displaced NOF fractures underwent cemented bipolar hemiarthroplasty. Functional outcomes were assessed using the Modified Harris Hip Score (HHS) at multiple postoperative intervals (2 weeks, 6 weeks, 3 months, and 6 months). Statistical analyses included Chi-square tests and ANOVA, with significance set at $p<0.05$.

**Results:** The majority of patients were aged 61–80 years, with a slight male predominance. Functional outcomes showed consistent improvement, with mean HHS increasing from 41.40 postoperatively to 88.25 at six months ($p<0.0001$). At final follow-up, 66.7% of patients had excellent outcomes, and 26.7% had good outcomes. Complication rates were low (16.7%), with minor issues such as radiolucency and prosthetic subsidence observed. No major complications like dislocation or infection were reported.

**Conclusion**: Cemented bipolar hemiarthroplasty offers excellent functional recovery and low complication rates in elderly patients with intracapsular femoral neck fractures. Early surgical intervention and structured rehabilitation significantly enhance postoperative outcomes, supporting this procedure as a reliable treatment option for active, elderly individuals

## 1. INTRODUCTION

Hip fractures are among most common injuries orthopaedic surgeons see, but it happens more in elderly patients with over one third of people 65 years old or older falling once a year [1]. Among them, femoral neck fractures are a common disease that involves the hip joint; their incidence has increased dramatically in recent years and thereby becomes most common injury with high morbidity and mortality in the old population [2]. The neck of femur(NOF) fractures are common in old age, while young adults (of age less than 50 years) in India constitute a significant percentage of these patients. It is however uncommon in children [3].The majority of patients report a history of trivial fall (low energy falls). In 2-3% instances, an absence of trauma history is reported , & the damage may be pathological or a stress fracture [4].

Femoral neck fractures, have consistently posed significant complications for orthopaedic surgeons. They are also linked to numerous comorbidities such as hypertension, cardiovascular issues, diabetes, and dementia. The combination of these factors plus extended immobilisation resulting from fractures contributes to heightened morbidity and mortality rates. Consequently, early mobilisation post-operatively is imperative for intracapsular neck fractures [5]. An un-displaced intracapsular hip fracture, often managed with internal fixation. Nonetheless, the majority are displaced fractures & primarily affect geriatric female patients. In elderly patients, bones exhibit osteoporosis. Notwithstanding the pervasive occurrence of these fractures, a notable variance in therapy persists [5,6]. Hemiarthroplasty is the predominant intervention procedure for displaced femoral neck fractures among the elderly, with superior functioning outcomes & reduced reoperation rates compared to internal fixation [6].

The choice between cemented and cementless hemiarthroplasty is often guided by **Dorr's Classification, which categorizes femoral bone quality into three types (A, B, and C) based on cortical thickness and canal diameter. Dorr Type A represents thick cortical bone with a narrow canal, Type B indicates moderate cortical thickness with an intermediate canal, and Type C signifies thin cortical bone with a wide canal. Cemented hemiarthroplasty is typically preferred for patients with reduced bone mass(Dorr Type C), as it provides better initial fixation and stability, while cementless fixation may be considered for patients with better bone mass(Dorr Type A or B) [7].

| S.NO | Dorr’s Type | Description | Bone Quality | Recommended Fixation |
|---|---|---|---|---|
| 1 | Type A | Thick cortical bone, narrow canal diameter | Good bone quality | Cementless or Cemented |
| 2 | Type B | Moderate cortical thickness, intermediate canal diameter | Moderate bone quality | Cementless or Cemented |
| 3 | Type C | Thin cortical bone, wide canal diameter | Poor bone Quality | Cemented |

**Table1: Dorr’s classification**

Currently, the cemented bipolar prosthesis is the optimal choice, as it enables increased activity levels; particularly, the modular bipolar prosthesis, plus or minus cement, significantly enhances the quality of life for treated patients. Additionally, several surgeons choose to perform total hip replacement as a main treatment in elderly patients. Despite advancements in arthroplasty surgery, yet most surgeons favour hemiarthroplasty as the initial procedure, because total hip arthroplasty can be performed subsequently [2]. The primary objective of current research is to analyse the postoperative outcomes of cemented bipolar-hemiarthroplasty in patients with fracture neck of femur(NOF). Additionally, this study aims to assess and analyse the influence of various factors on these outcomes, including the age and sex of the patients, timing of the surgery, and the incidence of postoperative complications. By addressing these aspects, this research aims to offer an in-depth understanding of the factors influencing success and potential challenges related with this operative intervention.

## 2. METHODOLOGY

This prospective, hospital-based study was conducted over a one-year period in Department of Orthopaedics at Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem. The study aimed to evaluate the functional outcomes of cemented bipolar hemiarthroplasty in patients with intra-capsular fracture neck of femur. A total of 30 patients aged above 55 years, presenting to the Outpatient and Emergency Departments with fracture neck of femur and meeting the eligibility criteria, were included. The inclusion criteria required participants to be medically fit for surgery, ambulatory before the fracture,

and willing to undergo the procedure. Exclusion criteria included patients below 55 years of age, those with pathological fractures, and those unwilling to undergo surgery.

After a comprehensive clinical and preoperative evaluation, informed consent obtained from all participants. The surgical procedure was standardized, and all patients underwent cemented bipolar hemiarthroplasty performed by an experienced surgical team. Postoperative care involved early mobilization and rehabilitation under medical supervision. Patients were followed up at six weeks, three months, & 6 months, with a minimum follow-up period of 6 months. Functional outcomes were assessed using the modified Harris Hip Score, and radiographs of the affected hip were taken during follow-up visits to monitor progress and detect complications.

Data collected included demographic and clinical parameters such as age, sex, and time to surgery. Statistical analysis was performed using descriptive and inferential methods, including calculations of percentages, means, medians, and standard deviations. The Chi-square test was used to assess associations between variables, and differences in means were analyzed using ANOVA. A p-value of $<0.05$ was considered statistically significant. This methodology provides a structured approach to evaluating the efficacy of cemented bipolar hemiarthroplasty and identifying factors influencing postoperative outcomes in the study population.

## 3. RESULTS

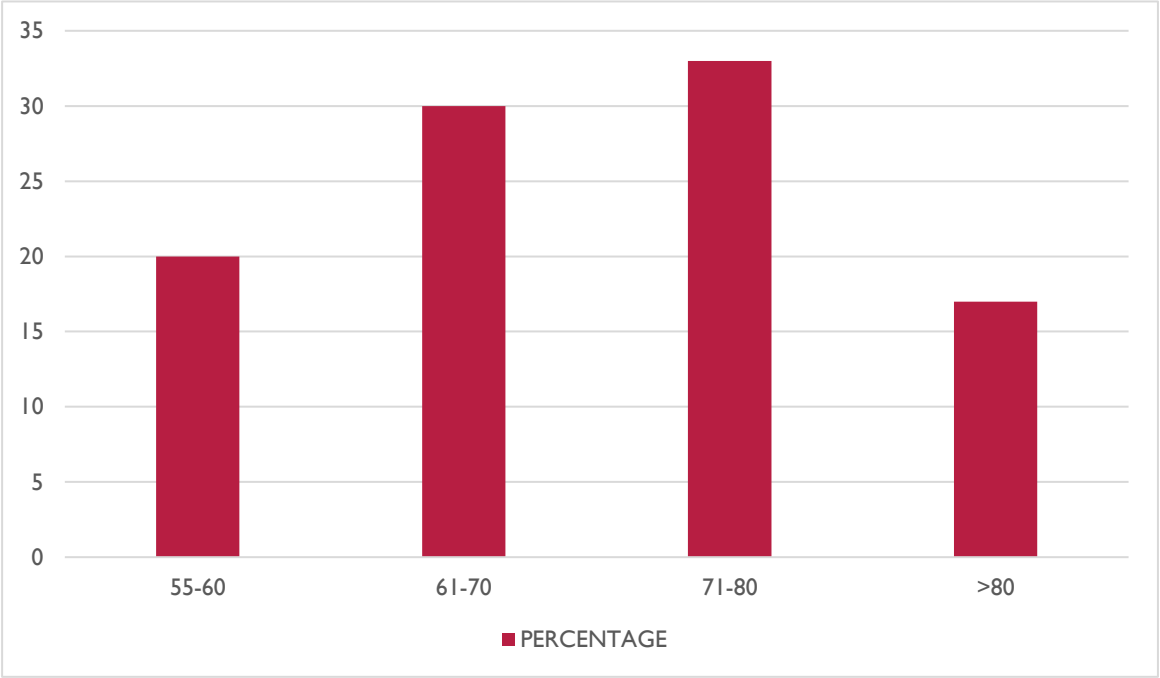


**FIGURE 1: AGE DISTRIBUTION**

| CATEGORY | COUNT | PERCENTAGE (%) |
|---|---|---|
| **AGE GROUP (YEARS)** | | |
| 55-60 | 6 | 20.0 |
| 61-70 | 9 | 30.0 |
| 71-80 | 10 | 33.3 |
| >80 | 5 | 16.7 |
| **GENDER** | | |
| MALE | 16 | 53.3 |
| FEMALE | 14 | 46.7 |
| **AGE GROUP V GENDER** | | |
| **TYPE OF FRACTURE** | | |
| FRACTURE NECK OF FEMUR | 30 | 100 |
| **IMPLANTS** | | |
| CEMENTED | 30 | 100 |
| **COMPLICATIONS** | | |
| PRESENT | 5 | 16.7 |
| ABSENT | 25 | 83.3 |
| **TIME TO SURGERY (DAYS)** | MEDIAN:3 | RANGE: 1-7 |
| **FUNCTIONAL OUTCOME AT 6 MONTHS** | | |
| EXCELLENT | 20 | 66.7 |
| GOOD | 8 | 26.7 |
| FAIR | 2 | 6.7 |

**TABLE 2: Demographic, Clinical, and Functional Outcome Distribution**

**TABLE 3: RANGE OF MOTION**

| ROM (DEGREES) | SCORE | FREQUENCY | PERCENTAGE |
|---|---|---|---|
| Flexion | 5 | 15 | 50.0 |
| Abduction | 4 | 12 | 40 |
| Adduction | 3 | 3 | 10 |
| External Rotation | 2 | 0 | 0 |
| Internal Rotation | 1 | 0 | 0 |

**TABLE 4 : FUNCTIONAL OUTCOMES**

| FUNCTIONAL OUTCOMES | FREQUENCY | PERCENTAGE |
|---|---|---|
| EXCELLENT (91-100) | 12 | 40 |
| GOOD (81-90) | 14 | 46.7 |
| SATISFACTORY (71-80) | 2 | 6.7 |
| POOR (<70) | 2 | 6.7 |

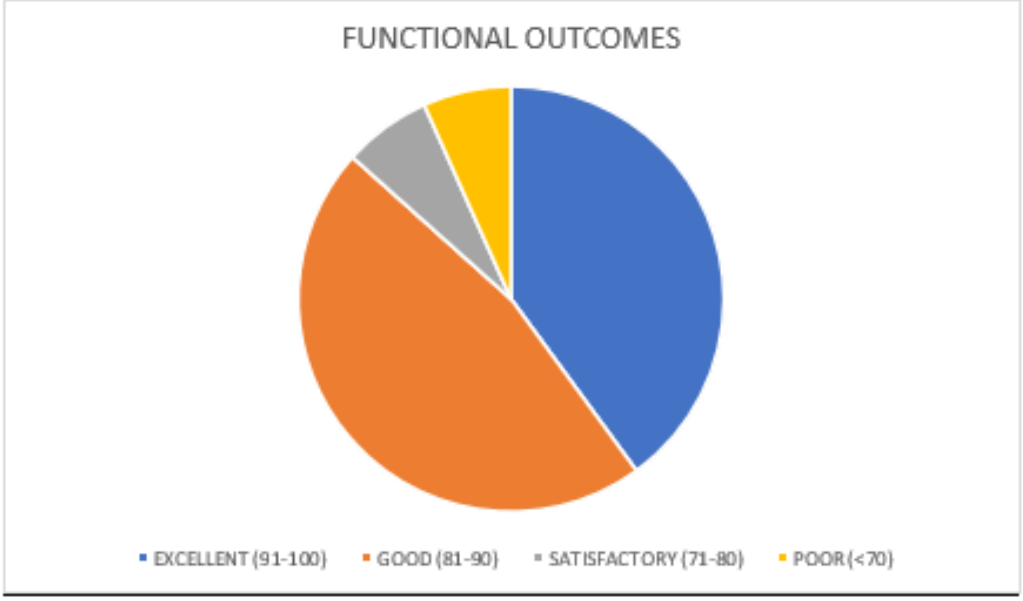


**FIGURE2: FUNCTIONAL OUTCOMES**

**TABLE 4: RADIOGRAPHIC FINDINGS**

| FINDINGS | FREQUENCY | PERCENTAGE |
|---|---|---|
| **FEMORAL STEM** | | |
| RADIOLUCENT ZONE > 2MM | 2 | 6.7 |
| SUBSIDENCE OF PROSTHESIS > 5MM | 1 | 3.3 |
| SCLEROSIS AT THE TIP OF THE PROSTHESIS | 0 | 0 |
| **ACETABULUM** | | |
| EROSION | 0 | 0 |
| PROTRUSION | 0 | 0 |
| **HETEROTOPIC OSSIFICATION** | 0 | 0 |
| **DISLOCATION/SUBLUXATION** | 0 | 0 |

**TABLE 5: MEAN VALUES OF HARRIS HIP SCORES OF THE PATIENTS POST**

| S.NO | TIME POINT | MEAN | SD | P value |
|---|---|---|---|---|
| 1 | POST-OP | 41.40 | 1.21 | |
| 2 | 2 WK | 55.00 | 2.60 | <0.0001 |
| 3 | 6 WK | 69.40 | 1.18 | <0.0001 |
| 4 | 3 MONTHS | 84.14 | 1.14 | <0.0001 |
| 5 | 6 MONTHS | 88.25 | 0.91 | <0.0001 |

## 4. RESULTS

The demographic analysis revealed that the majority of patients (33.3%) were aged 71–80 years, followed by 30.0% in the 61–70 age group, 20.0% in the 55–60 age group, and 16.7% aged above 80 years. Gender breakdown revealed a modest tilt toward males, who made up 53.3% and females 46.7% of the cohort.

All patients (100%) had fractures NOF & underwent cemented implant procedure. The median time to surgery was 3 days, with a range of 1–7 days. Complications were present in 16.7% of cases, while 83.3% were complication-free.

Functional outcomes assessed at six months revealed excellent results-66.7% of patients, good outcomes-26.7%, & fair outcomes-6.7%. Range of motion (ROM) evaluation showed that 50.0% of patients achieved a ROM of 211–300°, 40.0% achieved 161–210°, and 10.0% had a ROM of 101–160°, with no patients exhibiting a ROM below 100°.

Functional results were categorized as excellent(91–100 points) in 40% of patients, good (81–90 points)-46.7%, satisfactory(71–80 points) in 6.7%, & poor(<70 points)- 6.7%. Radiographic findings demonstrated a low prevalence of complications, with a radiolucent zone >2 mm noted in 6.7% of patients and subsidence of the prosthesis >5 mm in 3.3%. No instances of prosthetic tip sclerosis, erosion of acetabulum, protrusion, heterotopic ossification, or dislocation/subluxation were observed.

The mean Harris Hip Score showed significant improvement over time ($p < 0.0001$). Postoperatively, the mean score was $41.40 \pm 1.21$, which progressively improved to $55.00 \pm 2.60$ at 2 weeks, $69.40 \pm 1.18$ at 6 weeks, $84.14 \pm 1.14$ at 3 months, and $88.25 \pm 0.91$ at 6 months. This demonstrates the effectiveness of the surgical and rehabilitative interventions in improving functional outcomes.

## 5. DISCUSSION

This study looks at how well older adults recover functionally after undergoing bipolar hemiarthroplasty for displaced femoral neck fractures. As shown in the age distribution (Figure 1), most patients were in the older age brackets, which is consistent with the fact that such injuries are far more common in the elderly. This highlights the need for treatment options that are not only effective but also well-suited to the needs of this age group.

When we tracked recovery using the Harris Hip Score (HHS), we noticed a clear and steady improvement over time (Table 2). Right after surgery, the average score was $41.40 \pm 1.21$. But by two weeks, patients had improved significantly ($55.00 \pm 2.60$), and this trend continued through 6 weeks ($69.40 \pm 1.18$), 3 months ($84.14 \pm 1.14$), and 6 months ($88.25 \pm 0.91$). All of these changes were statistically significant ($P < 0.0001$), showing that most patients regained good function and mobility relatively quickly—something that's incredibly important in helping older adults return to daily life.

Our findings are in line with what other researchers have observed. For instance, Wathne and colleagues found better results with bipolar implants compared to unipolar ones, especially in reducing complications like acetabular wear and dislocations [8]. Saoudy and Salama also reported generally good outcomes in elderly patients who had bipolar hemiarthroplasty, although they did note a few complications such as superficial infections and some wear around the acetabulum [9]. Likewise, Patil et al. reported outcomes similar to ours, with 29% of patients doing excellently and just under 10% having poor results [10].

In our own group, complications were relatively rare. Two patients showed a radiolucent zone around the stem (over 2 mm), which may suggest some loosening. About 22.5% of patients had a small difference in limb length post-surgery, and one patient experienced some settling of the implant. However, these issues didn't have a major impact on the patients' overall recovery. Similar minor complications were reported by Saoudy and Salama as well [9].

Overall, the strong recovery trends and low complication rates we observed support the use of cemented bipolar

hemiarthroplasty as a dependable option for elderly patients who are still active and mobile. When done early and followed by proper rehabilitation, this procedure can restore mobility, reduce pain, and help patients return to a more independent lifestyle

## 6. CONCLUSION

Cemented bipolar hemiarthroplasty is a reliable and effective treatment for intra-capsular femoral neck fractures in elderly patients, providing significant improvements in functional outcomes, pain management, and mobility. The study demonstrates that timely surgical intervention, coupled with standardized postoperative care and rehabilitation, minimizes complications and enhances recovery. By addressing factors such as age, sex, and time to surgery, the findings underscore the procedure's ability to restore functionality and improve quality of life, making it a preferred option for managing these fractures in geriatric populations

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