

Functional Outcome of Cemented Modular Bipolar Hemiarthroplasty for Displaced neck of Femur fractures in elderly

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ABSTRACT

Background: Displaced femoral neck fractures are common in the elderly and often result in significant morbidity and loss of independence. Cemented modular bipolar hemiarthroplasty has emerged as a preferred surgical option, offering improved pain relief, early mobilization, and functional recovery. Evaluating its functional outcomes is crucial to guide evidence-based orthopedic management in geriatric populations.

Objective: To evaluate the functional outcome of cemented bipolar hemiarthroplasty in elderly patients with displaced femoral neck fractures using the Harris Hip Score (HHS).

Methods: It was a descriptive case series study that was carried out at Orthopedics Unit-1, Services Hospital Lahore, within a 6-month span. A sample of 68 patients with femoral neck fractures of Garden type 3 or 4 and having ASA I or II were taken through non-probability consecutive sampling of patients aged 60 years and older. Patients having pathological or conservatively treated fractures, systemic or psychiatric illnesses were ruled out. Each of them was subjected to cemented bipolar hemiarthroplasty by one consultant. Procedural hip function was identified by the 3-month Harris Hip Score. SPSS 26 was used to analyze the data analyzed, and comparison of subgroups was done using independent t-tests; p value of ≤ 0.05 was taken as significant.

Results: The mean age was 68 ± 5.86 years and the percentage of males was 73.5%. 72.1% of the patients had Garden type 3 fractures and the majority, 76.5%, were obese. The 3 months mean HHS was 68.72 ± 5.80 and showed moderate hip functioning. When HHS was stratified by the age, gender, BMI,

fracture side, Garden type, or ASA status there were no statistically significant differences found ($p > 0.05$ in all). **Conclusion:** In older patients cemented bipolar hemiarthroplasty gives similar functional results regardless of demographic or clinical subgroup, as assessed after 3 months HHS

Keywords: ASA score, Elderly patients, Garden classification, Hemiarthroplasty, Hip fracture, Obesity, Outcomes, Postoperative recovery.

INTRODUCTION

Hip fracture is the most frequent injury that orthopedic surgeons have to treat especially among the elderly population. More than one-third of the adults aged 65 years and above experience a fall each year¹. Displaced neck of femur fractures is taken to be fatal in the elder patients. They increase the risk of death and are associated with morbidity besides reducing the quality of life². The three most popular surgical interventions of displaced and unstable femoral neck fractures (FNF) include total hip arthroplasty (THA), unipolar hemiarthroplasty (U-HHA) and bipolar hemiarthroplasty (B-HHA)³. Such patients will receive an operation that will help them with nursing, provide immediate pain relief, prompt mobility and faster rehabilitation⁴. The traditional indication of Bipolar hemiarthroplasty (BHA) is in elderly low-demand patients with the displaced femoral neck fracture (Garden types III and IV)⁵. The Harris Hip Score shows that the functional results of hip arthroplasty (HA) are not as much as it was in a total hip arthroplasty (THA). But, the measurements are that it has been established that the rates of dislocation are quite lower in the first year after surgery with BHA since the bipolar cups are larger and increase jump distance⁶. Cemented modular bipolar hemiarthroplasty is an effective and uncomplicated treatment alternative to the middle-aged and elderly patients that present femoral neck fracture. After cemented modular bipolar hemiarthroplasty, most of the patients had good or excellent functional result. The results of one of the research reveal that out of 30 cases 70 percent of cases had great results, 20 percent had fair results, 10 percent ordinary results after 6 months of follow-up⁷. In an Indian study on patients aged over 60 years, the three months follow up mean Harris Hip score was 75.8 ± 4.2 in a bipolar group⁸. This research is aimed to compare the functional results of cemented modular bipolar hemiarthroplasty and unipolar hemiarthroplasty.

According to my knowledge of information, research on effectiveness of cemented modular bipolar hemiarthroplasty in managing displaced neck of femur in the elderly is not conducted among local population in type (3 or 4) fractures. It is therefore a matter of serious research because of the rising cases of such fractures in the aged circles. The foremost aspect of the management is productive treatment choices capable of restoring mobility, decrease pain, and improve the quality of life of older adults

MATERIALS & METHODS:

Study Design: Descriptive case series

Setting: Department of Orthopedics Unit-1, Services Hospital Lahore.

Duration: The study was done in 6 months after approval of synopsis from 01-03-2025 to 31-08-2025

Sample Size: A total of 68 cases are estimated using Mean Harris Hip score at 3 months follow-up as 75.8 ± 4.2 %, using $d = 1$ and confidence level as 95%.

Sampling Technique: Non-probability, consecutive sampling

Sample Selection:

Inclusion Criteria:

- Patients aged 60 and above
- Both male and female.
- Garden type 3 and 4 fractures (as operational definition)
- ASA 1 and 2.

Exclusion Criteria:

- Patients with pathological fractures.
- Managed conservatively for other medical reasons.
- Any psychiatric, neurological, or musculoskeletal disease which could hamper the results.
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DATA COLLECTION PROCEDURE:

After permission from institutional ethical review committee, a total of 68 patients presenting in the Department of Orthopedics, Services Hospital, Lahore meeting the inclusion criteria were enrolled into this study. Written informed consent and a detailed history was taken from every patient. Hemiarthroplasty was performed in all patients. Displaced femoral neck fractures were defined as either Garden type 3, characterized by a complete but partially displaced fracture of the femoral neck, or Garden type 4, representing a complete and fully displaced fracture. These were assessed on anteroposterior (AP) and lateral radiographs, identified by the discontinuity of the bony cortex. Bipolar hemiarthroplasty refers to a prosthetic implant with two articulating components: an inner low-friction bearing composed of a metal head and a polyethylene liner, and an outer bearing composed of a metal shell that articulates with the native acetabulum⁸. After exposure of the hip joint the hip joint was exposed. This is followed by an appropriate femoral neck cut and preparation of the femoral canal using sequential femoral canal rasps. Then, trial prosthesis was used to determine the appropriate femoral neck length and stem size for the individual patient. After final trial the cement restrictor was inserted into the femoral canal and an appropriately sized femoral prosthesis was inserted followed by reduction of the hip joint and wound closure was done. A single shot of injection cefoperazone and sulbactam was given to all patients one hour prior to surgical incision. Prophylactic antibiotics was administered in all cases pre and postoperatively for 7 days as per hospital protocol. All the procedure was done by a single consultant to minimize the bias. The telephonic contact and address of the patient was recorded in order to ensure follow-up. Functional outcome was assessed using the Harris Hip Score (HHS), which has a maximum of 100 points. The score is divided into four major domains: pain (44 points), function (47 points), range of motion (5 points), and absence of deformity (4 points). The function domain is further subdivided into activities of daily living (ADL), contributing 14 points, and gait, contributing 33 points. A higher Harris Hip Score indicates better hip function and less dysfunction, making it a reliable tool for evaluating postoperative recovery in patients with hip pathology.⁶ It was assessed at 3rd month after procedure as mean score. All collected data was entered and analyzed using SPSS version 26. Mean $\pm$ S.D was used for quantitative data like age, BMI and Harris Hip score (HHS) score at 3rd months. The categorical data were presented in form of frequency and %, like gender, fracture side, fracture

type and obesity. Data was stratified for age, gender, Obesity, fracture side, Garden type 3 or 4 fractures and ASA status (A or II) to address effect modifiers. Independent sample t-test was applied to compare HSS in these strata and $p\text{-value} \leq 0.05$ was considered as significant.

RESULTS

The study population comprised predominantly elderly individuals, with a mean age of 68.00 ± 5.86 years, ranging from 60 to 80 years. The participants also exhibited a high mean body mass index (BMI) of 32.47 ± 2.64 kg/m², indicating a largely obese cohort. Functional outcome was assessed using the Hip Harris Scale, with an overall mean score of 68.72 ± 5.80 , suggesting moderate hip function in the postoperative phase. A majority of participants (58.8%) were within the 60–70 age group, while 41.2% were aged 71–80 years. The sample included 50 males (73.5%) and 18 females (26.5%). Notably, 76.5% of participants were classified as obese, while only 23.5% were non-obese. The left side was more frequently involved (58.8%) compared to the right (41.2%). Regarding fracture classification, 72.1% had Garden type 3 fractures and 27.9% had type 4. In terms of preoperative anesthetic assessment, 38.2% were categorized as ASA I and 61.8% as ASA II, indicating that most had mild systemic disease. When comparing Hip Harris scores across demographic and clinical subgroups, no statistically significant differences were observed. Participants aged 60–70 years had a mean score of 69.40 ± 5.95 , while those aged 71–80 years had a slightly lower mean of 67.75 ± 5.54 ($p = 0.251$). Males demonstrated a marginally higher mean score (69.24 ± 5.92) than females (67.28 ± 5.36), though this difference was also not statistically significant ($p = 0.221$). Among BMI groups, obese participants had a mean score of 68.56 ± 6.02 compared to 69.25 ± 5.14 in non-obese individuals ($p = 0.680$). Functional outcomes were similar between left (68.18 ± 5.50) and right side involvement (69.50 ± 6.23), with a $p\text{-value}$ of 0.358. Likewise, Garden type 3 and type 4 fractures had nearly identical mean scores (68.84 ± 5.98 vs. 68.42 ± 5.45 ; $p = 0.793$). Finally, ASA I patients had a mean score of 68.96 ± 5.52 , while ASA II patients scored 68.57 ± 6.02 ($p = 0.790$). These findings indicate that hip function recovery, as measured by the Hip Harris Scale, was consistent across all major demographic and clinical subgroups without statistically significant differences.

Table -1: Descriptive statistics of age, BMI and Hip Harris scale

	Age (years)	Body mass index (BMI)	Hip Harris scale
Mean	68.00	32.47	68.72
Std. Deviation	5.86	2.64	5.80
Range	20.00	9.70	20.00
Minimum	60.00	27.37	60.00
Maximum	80.00	37.07	80.00

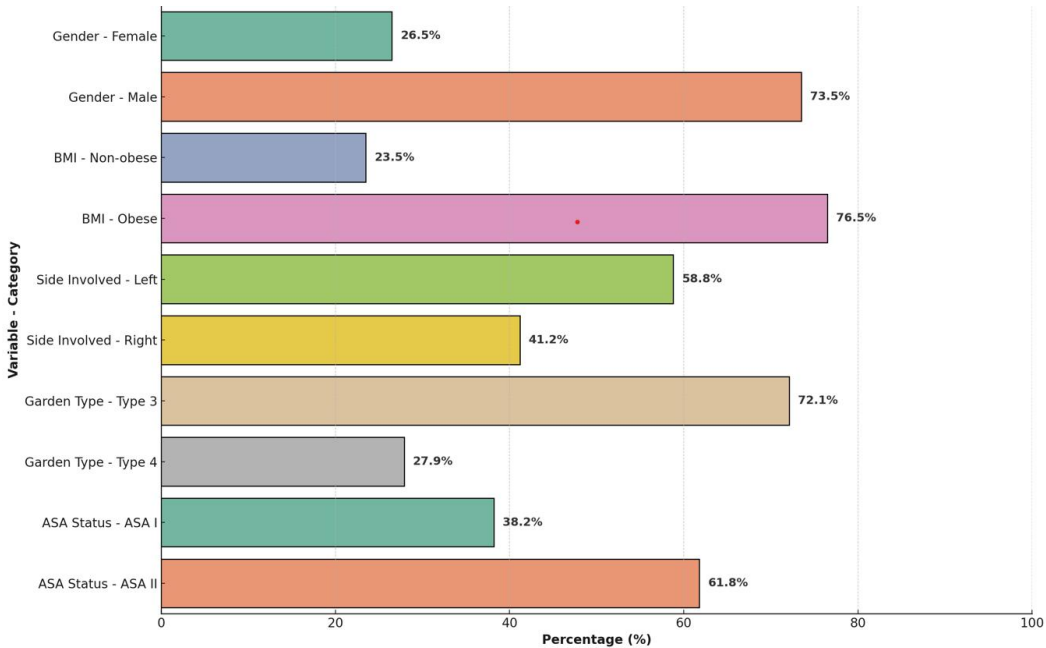


Fig-1: Distribution of Study Participants by Demographic and Clinical Characteristics (n = 68)

Table-2: Comparison of Hip Harris Scale by Demographic and Clinical Variables

Variable	Group	n	Mean $\pm$ SD	p-value
Age Group	60–70	40	69.40 $\pm$ 5.95	0.251
	71–80	28	67.75 $\pm$ 5.54	

Gender	Male	50	69.24 ± 5.92	0.221
	Female	18	67.28 ± 5.36	
BMI	Obese	52	68.56 ± 6.02	0.680
	Non-obese	16	69.25 ± 5.14	
Side	Left	40	68.18 ± 5.50	0.358
	Right	28	69.50 ± 6.23	
Fracture type (Garden Type)	Type 3	49	68.84 ± 5.98	0.793
	Type 4	19	68.42 ± 5.45	
ASA Status	ASA I	26	68.96 ± 5.52	0.790
	ASA II	42	68.57 ± 6.02	

DISCUSSION

Fractures of the femoral neck are common in the elderly and can significantly increase mortality, decrease mobility and increase the health cost. They account for nearly 50% of hip fractures. The elderly individuals are at a risk of sustaining a fracture at the femoral neck (FNFs), which can significantly increase death rates and hinder motion besides increasing healthcare burden and these account for almost half of all hip fractures ⁹. Arthroplasty is the common treatment modality in elderly patients affected by FNFs, and some of its probable outcomes are improved hip activity, reduction of hip pain, early ambulation and resumption of independent life. Hemiarthroplasty has the following advantages in comparison with the accomplishing of full hip replacement: it causes a less traumatic effect, recovery time is shorter, there is less bleeding, and the cost is lower ¹⁰. The cemented modular bipolar hemiarthroplasty method is easy to perform, well tolerated by older patients with early ambulation, and so the risk of the development of bed sore and lung issues is significantly lower, and finally, the re-surgery procedure is not needed as often hence increasing their quality of life ¹¹. The mean age of the participants involved in our research was 68.00 ± 5.86 years, which is consistent with the known epidemiological trend that hip fractures affect individuals who are above 60 years old ^{12, 13}. Most of the respondents (58.8 %) were aged 60-70. The average Harris Hip Score (HHS) of this group was 69.40 ± 5.95 higher by small margin, compared to the one between 71 and 80 years (67.75 ± 5.54). However, since this difference was statistically insignificant ($p = 0.251$), the age factor did not appear to be of significant influence on functional recovery rate of that surgery. Findings of the research are also supported by a study conducted in Chennai with the evaluation of 30 subjects of senior citizens and the conclusion was that cemented bipolar hemiarthroplasty provided early mobilization, favorable range of motion, and complete relief of pain. In this study the average Harris Hip Score was 85.76, 90 percent had collected relatively little discomfort, 66.6 percent could walk independently and there were few radiological complications. Our findings are consistent with these results as they demonstrated that 78.7 percent of the patients had good to excellent functional outcomes with a mean Harris Hip Score of 84.45 ¹⁴ and that the majority of patients were aged between 60 to 80 ¹⁴. Unlike the global trend where the female predominance is usually

reported, the male population reaches upto 73.5 percent of the sample. As an outcome, male participants were found to have slightly higher mean HHS (69.24 ± 5.92) as compared to female participants (67.28 ± 5.36), the difference though was not significant ($p=0.221$). On the same note, cemented modular bipolar hemiarthroplasty was accomplished in 56 male and 46 female participants in the Moaz et al study. The propensity toward men in this cohort is quite close to ours, whereby majority of the participants were men even though the epidemiological tendency of hip fractures to occur more frequently in women is identified¹⁵. In our study, the side of the fracture did not also indicate any difference in the outcome of our study. Patients with right-sided fracture had only a slightly higher (69.50 ± 6.23) score and the p-value of 0.358, and patients with left-sided fracture (58.8%) had a mean HHS of (68.18 ± 5.50). This minor dissimilarity is congruent to the other research findings which revealed no Hip mechanism alterations in relation to laterality following hemiarthroplasty^{14, 16}. Being highly obese with a mean BMI of 32.47 ± 2.64 kg/m² and with 76.5% of the sample size classified as obese, obesity was a given in our study group. There was not a significant difference in HHS between obese (68.56 ± 6.02) and non-obese subjects (69.25 ± 5.14) ($p = 0.680$), despite the concern that obesity might complicate the postoperative healing process due to reduced ability of movement or increased forces applied to the joint¹⁷. In line with our study, DE Genova et al, in their study involved enrollment of 157 patients going through total hip replacement or hemiarthroplasty of the femoral neck due to fractures found out that there was significantly elongated length of operations in cases of patients who were obese (BMI 30 or more). Notably, no major differences in the presence of postoperative outcomes were observed in comparison to non-obese patients, in spite of the trend of increased anesthesia time ($p = 0.14$) and total operation time ($p = 0.088$)¹⁸. Fracture classification based on the Garden system revealed that 72.1% of fractures were type 3 and 27.9% were type 4. A statistically significant difference was not found in the mean HHS of type 3 and 4 fractures, i.e. 68.84 ± 5.98 and 68.42 ± 5.45 , respectively ($p = 0.793$). The HHS of ASA I (healthy) and ASA II (mild disease) categories was 68.96 ± 5.52 and 68.57 ± 6.02 , respectively ($p = 0.790$) that is essentially equal functional outcomes. Among older patients who undergo hemiarthroplasty, a Postoperative Harris Hip Score of 68.72 ± 5.80 , in the study shows that the hip functions in a moderate level which can be considered a satisfactory outcome.

Cemented modular bipolar hemiarthroplasty consistently provides excellent functional results in a wide range of old patients, which is indicated by the fact that no significant differences were found in many of the subgroups (age, sex, BMI, laterality, fracture type, and ASA score). The findings of this study are in line with the findings of a study conducted by Moaz et al. (2024) at Services Hospital Lahore in which cemented modular bipolar hemiarthroplasty was applied to treat 102 elderly patients aged 65 years or more with displaced femoral neck fractures. The left side had the majority of fractures, and the patients were mainly above the age of forty and with relatively similar demographics. Moaz et al. attested a gradual increase of the improvement at the 6th week (78.15), the 3-month (83.49), and the 6-month period (88.76), meaning that the longer the follow-up is, the higher the scores would be. Just like in our study, no case of hip dislocation or acetabular erosion was reported and this shows that the treatment was stable. Superficial surgical site infection was the commonest complication and the complication rate was low. There were also no significant age, gender, and BMI differences in the functional outcomes nor ASA-class or type of fracture, the results of our research agree with those by Moaz et al. in regards to the consistency and reliability of this approach in the treatment of older patients with osteoporotic bones ¹⁵. In addition, a recent prospective study involving 108 cemented bipolar hemi arthroplasties, an average follow-up of 7.4 years, studies conducted between 1999- 2008. A 15-year survival rate of 93.1% was reported free from revision for any reason, and 97.1% was observed free from aseptic loosening. No indication of acetabular erosion-induced dislocation or revision was seen ¹⁹. Similarly, 81.8 percent of the patients in another prospective study conducted by Kerakkanavar et al. of 44 elderly patients were restored to pre-fracture activity levels having 86.75 percent Harris Hip Score at one-year. Variation in length of follow up may be attributed to our study (slightly lower mean of 68.72). They reported few complications and functional outcomes, in general, as in our study ¹². A prospective study carried out by Ramasamy et al. also evaluated the functional outcome of bipolar hemiarthroplasty in 43 elderly patients with proximal femoral neck fracture. Forty percent of the patients showed outstanding results and 45% had good outcomes at one-year follow-up by modified Harris Hip Score. Most of them were treated with cemented implants and the side effects were minimal and there were radiolucent zones (5%) or sinking of prosthesis (2.5%).

These findings fit our study, which revealed that superficial infection was the most common end outcome and that the Harris Hip Score kept on improving at 6 weeks, 3 months and 6 months ²⁰. Moreover, a clinical prospective trial showed that modified Harris Hip Score in a one-year follow-up period was equal to 85.4 and 49.5% of the participants got good outcomes and 29.7 percent of them achieved outstanding outcomes. 79 percent of patients brought back to their functional level prior to fracture ²¹. Another study done in India showed that bipolar implants suffered fewer complications such as anterior thigh pain and acetabular wear as compared to Austin Moore prosthesis ¹⁶. Likewise, outstanding results were demonstrated by a prospective study conducted in Egypt according to the Harris Hip Score and this is in support of our results. Only 5.5 percent of the patients in their group experienced pain symptomatically and 50 percent were ambulatory and did not show limping and not in need of help, what indeed cemented bipolar hemiarthroplasty does a disciplining effect of mobility, pain control and restoration of the pre injury functions ¹³. Our study might have some limitations because it comprised a single center and the sample size was small. With the follow up period being just three months, evaluation of the long-term results was not possible. Probability sampling subjects a person to selection bias. Moreover, the radiographic reviews that would have enlightened further on the placement of the implants and challenges were not incorporated.

CONCLUSION

The conclusion of our study was that cemented bipolar hemiarthroplasty provides predictable and reproducible functional results of fractured elderly patients with displaced femoral neck. No matter all the factors such as age, gender, obesity, type of fracture, or ASA grade, individuals could mostly expect the same progress in three months, which shows itself in the Harris Hip Scores of patients. These outcomes indicate that this surgery can be a reliable solution to enhance the mobility and the quality of life in elderly persons presented with such injuries.

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