Section: Orthopaedics

Original Research Article

FUNCTIONAL OUTCOME OF BIPOLAR HEMIARTHROPLASTY IN ELDERLY PATIENTS WITH NECK OF FEMUR FRACTURES WITH COMORBIDITIES: A PROSPECTIVE OBSERVATIONAL STUDY

Srinivasan Palaniappan[1], Jeffrey Samson[2], Abhishek Ventakataramani[3], R Jaiganesh[4]

[1]Associate Professor, Department of Orthopaedics, Government Omandurar Medical College, Chennai, Tamil Nadu., India.
[2]Assistant Professor, Department of Orthopaedics, Government Omandurar Medical College, Chennai, Tamil Nadu., India.
[3]Assistant Professor, Department of Orthopaedics, Government Omandurar Medical College, Chennai, Tamil Nadu., India.
[4]Post Graduate, Department of Orthopaedics, Government Omandurar Medical College, Chennai, Tamil Nadu., India.

Received : *14/05/2026*
Received in revised form : *01/07/2026*
Accepted : *15/07/2026*

Keywords:
Neck of femur fracture, Bipolar hemiarthroplasty, Elderly patients, Femoral neck fracture, Modified Harris Hip Score, Functional outcome, Comorbidities, Hip arthroplasty, Geriatric orthopaedics, Osteoporotic fractures.

Corresponding Author:
Dr. Jeffrey Samson,
Email: drjeffsamson@gmail.com

DOI: 10.47009/jamp.2026.8.4.82

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

Int J Acad Med Pharm
2026; 8 (4); 463-475

ABSTRACT

Background: Femoral neck fractures are among the most frequently encountered fragility fractures in elderly individuals and represent a major cause of disability, morbidity, mortality, and socioeconomic burden worldwide. The incidence of these fractures has increased steadily due to rising life expectancy, urbanization, sedentary lifestyles, and the growing prevalence of osteoporosis among the aging population. Elderly patients sustaining neck of femur fractures often present with multiple associated comorbidities such as hypertension, diabetes mellitus, ischemic heart disease, chronic respiratory disorders, renal dysfunction, and endocrine abnormalities, which significantly complicate perioperative management and postoperative rehabilitation. These fractures are associated with prolonged immobilization, increased dependency, reduced quality of life, and higher mortality if not managed effectively and promptly.

The primary goals of treatment in elderly patients with femoral neck fractures include early pain relief, restoration of mobility, rapid rehabilitation, prevention of complications associated with prolonged bed rest, and improvement in overall functional status. Various treatment modalities have been described for femoral neck fractures, including internal fixation, hemiarthroplasty, and total hip arthroplasty. However, in elderly patients with osteoporotic bone and limited physiological reserve, bipolar hemiarthroplasty has emerged as a preferred surgical option because it allows immediate stability, facilitates early mobilization, reduces implant-related complications, and minimizes the risks of nonunion and avascular necrosis associated with internal fixation.

Bipolar hemiarthroplasty offers several advantages in geriatric patients, including shorter operative duration, relatively lower blood loss, reduced dislocation rates compared to total hip arthroplasty, and satisfactory restoration of hip function. Furthermore, the bipolar prosthesis design provides dual articulation, potentially decreasing acetabular wear and improving long-term functional outcomes. Nevertheless, postoperative recovery in elderly patients may be significantly influenced by pre-existing comorbid conditions, delayed rehabilitation, nutritional status, and perioperative complications. Therefore, evaluating the functional outcomes of bipolar hemiarthroplasty in elderly patients with associated comorbidities is essential to guide clinical decision-making, optimize perioperative care, and improve postoperative quality of life.

Aim: To assess the functional outcome of bipolar hemiarthroplasty in elderly patients with neck of femur fractures associated with comorbidities.

Objectives

1. To evaluate postoperative functional recovery following bipolar hemiarthroplasty using the Modified Harris Hip Score.
2. To study the demographic and clinical profile of elderly patients with neck of femur fractures.

3. To analyze the effect of associated comorbidities on postoperative functional outcomes and rehabilitation.
4. To evaluate perioperative complications, mortality, and radiological outcomes following bipolar hemiarthroplasty. **Materials and Methods:** This prospective observational study was conducted in the Department of Orthopaedics at Government Medical College, Omandurar Government Estate, Chennai, over a period of 24 months from 2023 to 2024. The study included elderly patients aged 60 years and above diagnosed with Garden type I–IV neck of femur fractures associated with at least one comorbidity. A minimum sample size of 35 patients was included after fulfilling predefined inclusion and exclusion criteria and obtaining informed written consent.
Patients with open fractures, polytrauma, pathological fractures, pre-existing lower limb deformities, or inability to comply with follow-up were excluded from the study. Detailed preoperative evaluation included demographic profiling, assessment of comorbid conditions, fracture classification, radiological assessment, anesthetic fitness, and ambulatory status before injury.
All patients underwent bipolar hemiarthroplasty using cemented or uncemented prostheses depending on bone quality and intraoperative findings. Surgical procedures were performed under spinal or epidural anesthesia using standard posterior or lateral surgical approaches. Perioperative variables including operative duration, blood loss, prosthesis type, and intraoperative findings were documented systematically.
Postoperative management included antibiotic prophylaxis, pain management, early mobilization, physiotherapy, and regular follow-up evaluations. Functional outcomes were assessed using the Modified Harris Hip Score at immediate postoperative period, 2 weeks, 1 month, 3 months, 6 months, and 12 months follow-up intervals. Postoperative complications, mortality, radiological findings, and rehabilitation progress were also recorded and analyzed. **Results:** The study population had a mean age of 72.7 years, with female predominance observed among the participants. Most patients belonged to the 61–80 years age group. Transcervical fractures constituted the most common fracture pattern, while Garden type IV fractures represented the majority of displaced injuries encountered in the study population.
Comorbidities were present in a substantial proportion of patients, with hypertension and diabetes mellitus being the most frequently observed medical conditions. Cemented bipolar hemiarthroplasty was performed more commonly than uncemented procedures owing to poor bone quality in elderly individuals. The mean operative duration and average intraoperative blood loss were within acceptable surgical limits.
Functional assessment using the Modified Harris Hip Score demonstrated progressive and significant improvement during serial follow-up evaluations over the one-year postoperative period. Although patients with multiple comorbidities exhibited relatively slower early postoperative recovery and rehabilitation, long-term functional outcomes remained satisfactory with appropriate perioperative optimization and rehabilitation support.
Postoperative complications were minimal and included surgical site infection, trochanteric bursitis, and contralateral hip fracture in a small number of patients. Mortality during the one-year follow-up period was observed in three patients, corresponding to an overall mortality rate of 8.5%. **Conclusion:** Bipolar hemiarthroplasty is a safe, effective, and reliable surgical treatment modality for elderly patients with neck of femur fractures, even in the presence of significant comorbid conditions. The procedure provides satisfactory pain relief, facilitates early mobilization, and results in favorable functional outcomes with acceptable complication and mortality rates. Careful patient selection, meticulous perioperative optimization, standardized surgical technique, and structured rehabilitation protocols are essential for achieving successful postoperative recovery in this vulnerable geriatric population.

INTRODUCTION

Neck of femur fractures are among the most common and devastating orthopedic injuries encountered in the elderly population and continue to represent a major global public health challenge. These fractures are associated with substantial morbidity, mortality, prolonged hospitalization, functional impairment, and significant socioeconomic burden. With increasing life expectancy, rapid urbanization, sedentary lifestyles, and the rising prevalence of osteoporosis, the

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

incidence of femoral neck fractures has shown a marked increase worldwide. Hip fractures are projected to increase dramatically over the coming decades, with a major proportion expected to occur in Asian countries due to the rapidly aging population.[1,2] Elderly individuals are particularly vulnerable because of reduced bone mineral density, impaired balance, poor vision, muscle weakness, nutritional deficiencies, and multiple associated medical comorbidities.[3] Neck of femur fractures are intracapsular fractures occurring between the femoral head and intertrochanteric region.[4] These fractures are clinically important because the vascular supply to the femoral head is highly susceptible to disruption following fracture displacement, resulting in complications such as avascular necrosis and non-union.[5] The blood supply to the femoral head is mainly derived from the medial femoral circumflex artery through the retinacular vessels, and displaced fractures can significantly compromise this circulation.[6] Consequently, management of femoral neck fractures, particularly in elderly patients, remains challenging and requires careful consideration of fracture pattern, physiological age, functional demands, bone quality, and associated comorbidities.[7]

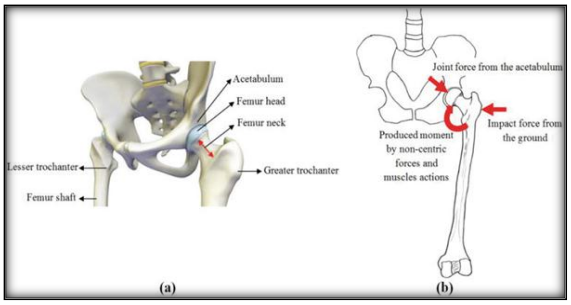

Figure 1: (A) Hip joint and (B) Forces acting to increase the risk of fracture:

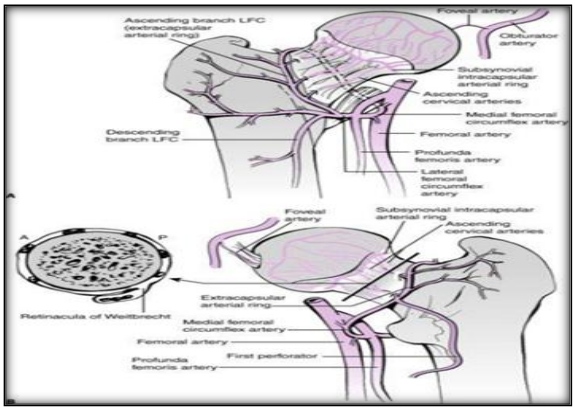

Figure 2: Blood Supply of Hip Joint:

Several classification systems have been proposed for femoral neck fractures, among which the Garden classification remains the most widely used in clinical practice.[8] Garden type I and II fractures are considered nondisplaced or minimally displaced fractures, whereas Garden type III and IV fractures are displaced fractures associated with a higher risk of vascular compromise and poor healing.[8,9]

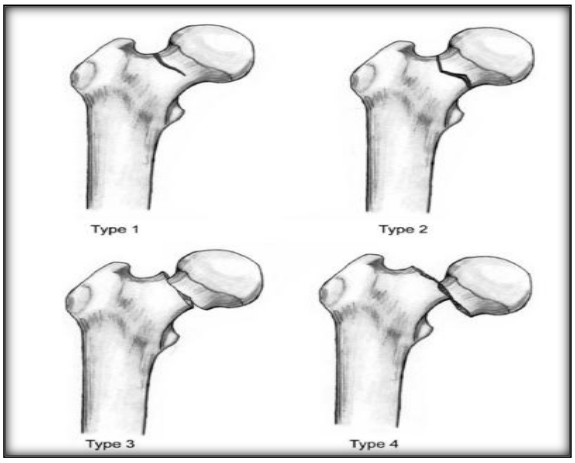

Figure 3: Image showing Garden classification of femoral neck fracture:

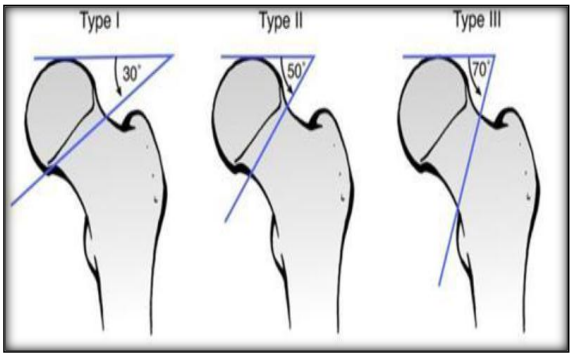

Figure 4: Image showing Pauwels classification of femoral neck fracture:

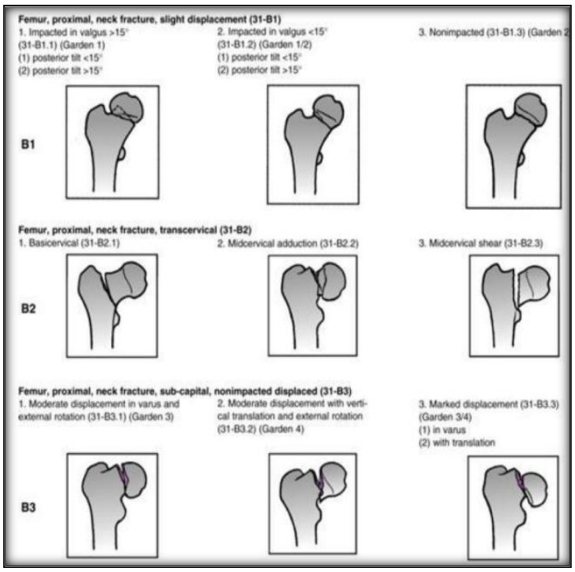

Figure 5: Image showing AO/OTA classification of femoral neck fracture:

Treatment strategies vary according to fracture displacement, patient age, activity level, and physiological reserve. In younger individuals, preservation of the native femoral head through internal fixation is generally preferred.[10] However, in elderly patients with osteoporotic bone and lower

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

functional demands, arthroplasty procedures have become the standard treatment because they permit early mobilization and reduce complications associated with prolonged immobilization and fixation failure.[11]

In addition to the Garden classification, Pauwels classification is commonly used to assess the biomechanical orientation and verticality of femoral neck fractures. It is based on the inclination angle of the fracture line relative to the horizontal plane. Pauwels type I fractures have an angle less than 30°, type II fractures range between 30° and 50°, and type III fractures exceed 50°. Increasing vertical orientation is associated with greater shear forces, instability, and higher risk of fixation failure.

The AO/OTA classification system is another comprehensive method used for categorizing femoral neck fractures based on fracture location, displacement, and biomechanical characteristics. This classification provides detailed subgrouping of femoral neck fractures into impacted, transcervical, and displaced patterns, thereby assisting in treatment planning, prognostic evaluation, and surgical decision-making.

The management of femoral neck fractures in elderly individuals is further complicated by the presence of multiple medical comorbidities such as hypertension, diabetes mellitus, ischemic heart disease, chronic kidney disease, chronic obstructive pulmonary disease, cerebrovascular disease, and endocrine disorders.[12] These associated conditions increase perioperative risks, delay rehabilitation, prolong hospital stay, and contribute to higher postoperative mortality.[13] Prolonged immobilization in elderly patients can lead to serious complications including pressure sores, deep vein thrombosis, pulmonary embolism, urinary tract infections, pneumonia, muscle wasting, and loss of independence.[14] Therefore, the primary objective of treatment in geriatric hip fractures is to achieve stable fixation or replacement that enables early mobilization, rapid rehabilitation, pain relief, and restoration of pre-injury functional status.[15]

Various treatment modalities are available for femoral neck fractures, including conservative treatment, internal fixation, hemiarthroplasty, and total hip arthroplasty.[16] Conservative treatment is now rarely advocated due to poor outcomes associated with prolonged recumbency and high rates of complications.[17] Internal fixation using cannulated cancellous screws or dynamic hip screws may be appropriate for younger patients and selected undisplaced fractures.[18] However, in elderly patients with displaced fractures and osteoporotic bone, internal fixation is associated with increased rates of fixation failure, nonunion, and avascular necrosis.[19]

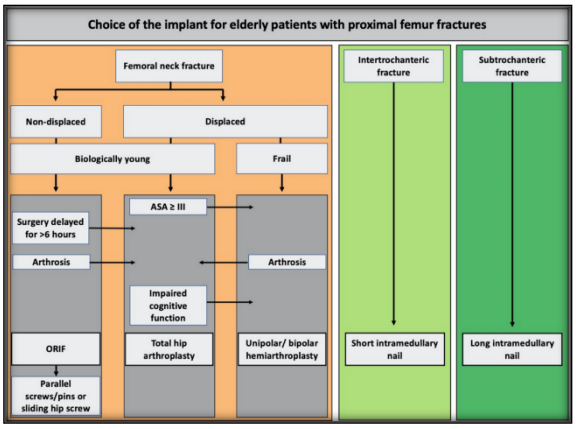

Figure 6: Choice of implant for femoral fracture in elderly:

Hemiarthroplasty has therefore emerged as a widely accepted treatment option for displaced femoral neck fractures in elderly patients.[20] It involves replacement of the femoral head while preserving the native acetabulum. Bipolar hemiarthroplasty, in particular, has gained popularity because of its modular design and dual articulation mechanism.[21] The bipolar prosthesis contains an additional inner bearing between the prosthetic head and polyethylene liner, theoretically reducing acetabular cartilage wear and improving range of motion compared to unipolar prostheses.[22] Bipolar hemiarthroplasty offers several advantages including shorter operative duration, lower blood loss, reduced dislocation rates, immediate postoperative stability, and early weight-bearing mobilization.[23] It also minimizes complications such as nonunion and avascular necrosis that are commonly associated with internal fixation procedures.[24]

The choice between cemented and uncemented bipolar prostheses remains an important consideration during surgery. Cemented prostheses provide better initial fixation and improved stability in osteoporotic bone but may be associated with bone cement implantation syndrome and cardiopulmonary complications in high-risk patients.[25] Uncemented prostheses avoid cement-related complications and permit biological fixation but may carry a higher risk of periprosthetic fractures and implant loosening in osteoporotic elderly individuals.[26] Therefore, selection of prosthesis type should be individualized based on bone quality, patient physiology, and surgeon preference.[27]

Functional outcome following bipolar hemiarthroplasty depends on several factors including patient age, pre-injury ambulatory status, nutritional status, associated comorbidities, surgical technique, rehabilitation compliance, and postoperative complications.[28] Functional recovery is commonly assessed using the Modified Harris Hip Score, which evaluates pain, gait, daily activities, deformity, and range of motion.[29] Early surgical intervention combined with comprehensive

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

perioperative management and rehabilitation has been shown to improve postoperative outcomes and reduce mortality in elderly hip fracture patients.[30]

Despite the widespread use of bipolar hemiarthroplasty for femoral neck fractures in elderly individuals, limited data are available regarding its functional outcomes specifically in patients with associated comorbid conditions in tertiary care settings. Understanding the influence of comorbidities on postoperative recovery and rehabilitation is essential for improving treatment strategies and optimizing patient care. Hence, this study was undertaken to evaluate the functional outcome of bipolar hemiarthroplasty in elderly patients with neck of femur fractures associated with comorbidities and to assess postoperative recovery, complications, and overall clinical outcomes following surgical management.

Aim and Objectives

Aim

To assess the functional outcome of bipolar hemiarthroplasty in elderly patients with neck of femur fractures associated with comorbidities.

Objectives

1. To evaluate postoperative functional outcomes following bipolar hemiarthroplasty using the Modified Harris Hip Score.
2. To study the demographic and clinical profile of elderly patients presenting with neck of femur fractures.
3. To assess the influence of associated comorbidities on postoperative recovery and rehabilitation.
4. To evaluate intraoperative parameters including duration of surgery, blood loss, and type of prosthesis used.
5. To analyze postoperative complications, mortality, and radiological outcomes following bipolar hemiarthroplasty.
6. To assess the overall effectiveness of bipolar hemiarthroplasty in restoring mobility and functional independence in elderly patients with femoral neck fractures.

MATERIALS AND METHODS

Study Design: This study was designed as a prospective observational study.

Study Setting: The study was conducted in the Department of Orthopaedics at Government Medical College, Omandurar Government Estate, Chennai, Tamil Nadu.

Study Period: The study was carried out over a period of 24 months from 2023 to 2024.

Study Population: The study population consisted of elderly patients aged 60 years and above presenting with neck of femur fractures associated with one or more comorbidities and admitted to the Department of Orthopaedics during the study period.

Sample Size: A minimum sample size of 35 patients was included in the study. The sample size was calculated using a 95% confidence level, 80% statistical power, 0.5 effect size, standard deviation of 1, and an anticipated 10% non-response rate.

Sampling Method: Consecutive sampling method was used for enrolling eligible patients who fulfilled the inclusion and exclusion criteria during the study period.

Inclusion Criteria

1. Patients aged 60 years and above.
2. Patients diagnosed with neck of femur fractures confirmed radiologically.
3. Garden type I, II, III, and IV femoral neck fractures.
4. Presence of at least one associated comorbidity such as diabetes mellitus, hypertension, ischemic heart disease, chronic kidney disease, thyroid disorders, respiratory illness, or other systemic diseases.
5. Patients medically fit for bipolar hemiarthroplasty surgery.
6. Patients ambulatory prior to injury, with or without assistive devices.
7. Patients willing to provide informed written consent and comply with follow-up protocol.

Exclusion Criteria

1. Patients aged below 60 years.
2. Open femoral neck fractures.
3. Polytrauma patients involving multiple organ injuries or associated major fractures.
4. Pathological fractures other than osteoporosis-related fragility fractures.
5. Patients with pre-existing deformities of the lower limb affecting postoperative functional assessment.
6. Patients previously operated on the affected hip.
7. Bipolar hemiarthroplasty performed for conditions other than neck of femur fracture.
8. Patients unwilling to provide consent or unable to comply with follow-up.

Preoperative Evaluation: All patients underwent detailed clinical evaluation including history taking, assessment of mode of injury, comorbidity profile, ambulatory status before injury, and physical examination. Routine hematological and biochemical investigations were performed including complete blood count, renal function tests, liver function tests, blood sugar levels, coagulation profile, serum electrolytes, and blood grouping. Cardiovascular and anesthetic fitness were assessed preoperatively. Relevant specialty consultations were obtained whenever required for optimization of associated medical illnesses. Radiological evaluation included X-ray pelvis with both hips in anteroposterior view and affected hip lateral view. Fractures were classified according to the Garden classification system.

Preoperative Preparation: Patients were optimized medically prior to surgery. Appropriate management of diabetes mellitus, hypertension, cardiac disorders, respiratory illness, and other systemic diseases was

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

undertaken in consultation with physicians and anesthesiologists. All patients received prophylactic intravenous antibiotics approximately 30 minutes prior to skin incision. Informed written consent was obtained after explaining the nature of surgery, potential risks, benefits, complications, rehabilitation protocol, and follow-up schedule.

Surgical Procedure: All surgeries were performed under spinal or epidural anesthesia under strict aseptic precautions. Patients were positioned in lateral decubitus position with the affected side up.

Bipolar hemiarthroplasty was performed using either posterior or lateral surgical approach depending on surgeon preference and patient factors. Following exposure of the hip joint, femoral head removal and femoral canal preparation were carried out. Appropriate-sized bipolar prosthesis was selected intraoperatively based on templating and canal assessment. Both cemented and uncemented bipolar prostheses were used depending on bone quality and intraoperative findings.

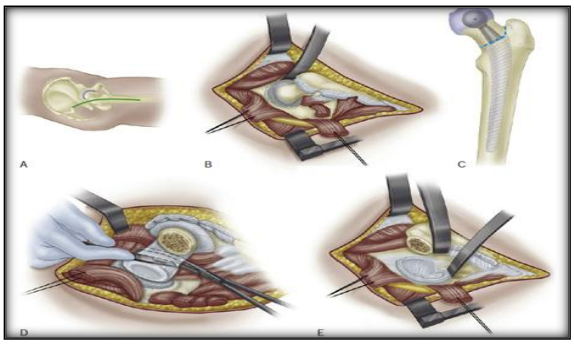

Figure 7: Image showing various steps of Hemiarthroplasty:

Both cemented and uncemented bipolar prostheses were used depending on bone quality and intraoperative findings. Cemented prostheses were preferred in patients with poor osteoporotic bone stock to achieve better fixation and early stability. Reduction was performed after prosthesis insertion and stability assessment was carried out intraoperatively. Thorough wound wash was given and layered wound closure was performed over suction drain wherever required.

Figure 8: Image showing Bipolar Hemiarthroplasty:

Postoperative Management: Postoperatively, patients received intravenous antibiotics, analgesics, thromboprophylaxis, and supportive care as per institutional protocol.

Early mobilization was encouraged. Static quadriceps exercises and ankle pump exercises were initiated on the first postoperative day. Patients were gradually mobilized with walker support under physiotherapy supervision depending on pain tolerance and general condition.

Patients were educated regarding hip precautions and rehabilitation protocols to minimize postoperative complications and improve functional recovery.

Follow-Up

Patients were followed up at:

- Immediate postoperative period
- 2 weeks
- 1 month
- 3 months
- 6 months
- 12 months

During each follow-up visit, detailed clinical evaluation, radiological assessment, gait analysis, and complication assessment were performed.

Patients unable to attend follow-up physically were contacted through telephone communication or home visits whenever feasible.

Outcome Measures

Primary Outcome

Functional outcome assessment using Modified Harris Hip Score.

Secondary Outcomes

1. Influence of comorbidities on postoperative recovery.
2. Postoperative complications.
3. Mortality during follow-up period.
4. Radiological assessment of implant position and stability.
5. Restoration of ambulatory status and functional independence.

Modified Harris Hip Score Assessment

Functional outcomes were assessed using the Modified Harris Hip Score, which evaluates:

- Pain
- Gait
- Functional activities
- Range of motion
- Deformity

Scores were graded as:

- Excellent: 90–100
- Good: 80–89
- Fair: 70–79
- Poor: <70

Data Collection and Data Management

All data were recorded using a standardized proforma. Patient confidentiality was maintained throughout the study. Collected data were entered into a secure electronic database and verified periodically for accuracy and completeness.

Statistical Analysis

Collected data were entered into Microsoft Excel and analyzed using appropriate statistical software.

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

Quantitative variables were expressed as mean and standard deviation, while qualitative variables were expressed as frequency and percentage.

Comparisons between categorical variables were analyzed using Chi-square test or Fisher's exact test wherever appropriate. Continuous variables were analyzed using Student's t-test. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Institutional Ethics Committee approval was obtained prior to commencement of the study. Written informed consent was obtained from all study participants. Confidentiality and privacy of patient information were strictly maintained throughout the study.

RESULTS

The present prospective observational study was conducted to evaluate the functional outcome of bipolar hemiarthroplasty in elderly patients with neck of femur fractures associated with comorbidities. A total of 35 patients fulfilling the inclusion criteria were included in the study and followed up for a period of one year. Various demographic parameters, fracture characteristics, comorbidity profiles, intraoperative variables, postoperative complications, mortality, and functional outcomes were analyzed systematically.

The majority of patients belonged to the elderly age group with female predominance. Most fractures were displaced femoral neck fractures, particularly Garden type IV injuries. Comorbid conditions such as hypertension and diabetes mellitus were frequently observed among study participants. Cemented bipolar hemiarthroplasty was more commonly performed because of osteoporotic bone quality in elderly individuals.

Functional outcomes assessed using the Modified Harris Hip Score demonstrated gradual and progressive improvement throughout the follow-up period. Most patients achieved satisfactory functional recovery with restoration of ambulatory capacity and pain relief. Although associated comorbidities delayed early postoperative rehabilitation in certain patients, long-term outcomes remained favorable with appropriate perioperative optimization and rehabilitation support.

Postoperative complications were minimal and manageable. Mortality observed during the one-year follow-up period reflected the frailty and associated systemic illnesses commonly encountered in elderly hip fracture patients

Table 1: Age-wise distribution of study participants

Age group (years)	Number of patients	Percentage (%)
60–70	12	34.3
71–80	15	42.9
>80	8	22.8

[Table 1] shows that the majority of patients belonged to the 61–80 years age group, indicating higher incidence of femoral neck fractures among elderly individuals in this age category.

The above table shows that the highest frequency of patients was observed in the 71–80 years age group with 15 patients (42.9%), followed by the 60–70 years age group with 12 patients (34.3%). Patients aged more than 80 years constituted 8 cases (22.8%), indicating that femoral neck fractures predominantly affected elderly individuals in the seventh and eighth decades of life.

Table 2: Gender distribution of study participants

Gender	Number of patients	Percentage (%)
Male	14	40.0
Female	21	60.0

[Table 2] shows female predominance among elderly patients sustaining neck of femur fractures.

The above table shows that females constituted the majority of study participants with 21 patients (60.0%), whereas males accounted for 14 patients (40.0%). The findings indicate a higher prevalence of femoral neck fractures among elderly females, likely related to osteoporosis and postmenopausal bone loss.

Table 3: Distribution according to mode of injury

Mode of injury	Number of patients	Percentage (%)
Trivial fall	28	80.0
Road traffic accident	5	14.3
Fall from height	2	5.7

[Table 3] shows that trivial fall was the most common mode of injury among study participants.

The above table shows that trivial fall accounted for the majority of injuries with 28 patients (80.0%), followed by road traffic accidents in 5 patients (14.3%). Fall from height was observed in only 2 patients (5.7%). These findings emphasize that low-energy trauma is the predominant mechanism of femoral neck fractures in elderly individuals

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

Table 4: Distribution according to fracture type

Fracture type	Number of patients	Percentage (%)
Subcapital	11	31.4
Transcervical	17	48.6
Basicervical	7	20.0

[Table 4] shows transcervical fracture as the most common fracture pattern observed in the study. The above table shows that transcervical fractures were the most frequently encountered fracture pattern with 17 patients (48.6%), followed by subcapital fractures in 11 patients (31.4%). Basicervical fractures were observed in 7 patients (20.0%).

Table 5: Distribution according to Garden classification

Garden type	Number of patients	Percentage (%)
Type I	2	5.7
Type II	5	14.3
Type III	10	28.6
Type IV	18	51.4

[Table 5] shows predominance of displaced femoral neck fractures among study participants. The above table shows that Garden type IV fractures constituted the majority with 18 patients (51.4%), followed by Garden type III fractures in 10 patients (28.6%). Garden type II and type I fractures accounted for 5 patients (14.3%) and 2 patients (5.7%) respectively, indicating that displaced fractures were more commonly encountered in the elderly population.

Table 6: Distribution according to associated comorbidities

Comorbidity	Number of patients	Percentage (%)
Hypertension	13	37.1
Diabetes mellitus	11	31.4
Ischemic heart disease	4	11.4
Chronic kidney disease	2	5.7
Chronic respiratory illness	3	8.6
Thyroid disorders	2	5.7

[Table 6] shows the prevalence of associated comorbid conditions among study participants. The above table shows that hypertension was the most common associated comorbidity observed in 13 patients (37.1%), followed by diabetes mellitus in 11 patients (31.4%). Ischemic heart disease, chronic respiratory illness, chronic kidney disease, and thyroid disorders were observed less frequently.

Table 7: Distribution according to type of prosthesis used

Type of prosthesis	Number of patients	Percentage (%)
Cemented	21	60.0
Uncemented	14	40.0

[Table 7] shows that cemented bipolar prosthesis was more commonly used in elderly patients. The above table shows that cemented bipolar hemiarthroplasty was performed in 21 patients (60.0%), whereas uncemented prosthesis was used in 14 patients (40.0%). Cemented implants were preferred predominantly because of osteoporotic bone quality and requirement for better initial fixation.

Table 8: Intraoperative parameters

Parameter	Mean ± Standard deviation
Duration of surgery (minutes)	74.3 ± 11.6
Blood loss (ml)	270.6 ± 52.4

[Table 8] shows operative duration and blood loss among study participants. The above table shows that the mean duration of surgery was 74.3 ± 11.6 minutes, while the mean intraoperative blood loss was 270.6 ± 52.4 ml. Both parameters remained within acceptable operative limits for elderly patients undergoing bipolar hemiarthroplasty.

Table 9: Postoperative complications

Complication	Number of patients	Percentage (%)
Surgical site infection	2	5.7
Trochanteric bursitis	2	5.7
Contralateral hip fracture	1	2.9
Dislocation	0	0
Periprosthetic fracture	0	0

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

[Table 9] shows postoperative complications encountered during follow-up.

The above table shows that surgical site infection and trochanteric bursitis were each observed in 2 patients (5.7%). One patient (2.9%) sustained contralateral hip fracture during follow-up. No cases of prosthetic dislocation or periprosthetic fracture were encountered in the study.

Table 10: Mortality during follow-up

Outcome	Number of patients	Percentage (%)
Survived	32	91.5
Died	3	8.5

[Table 10] shows mortality observed during the one-year follow-up period. The above table shows that 32 patients (91.5%) survived during the one-year follow-up period, whereas mortality was observed in 3 patients (8.5%). Mortality was mainly associated with advanced age and multiple comorbid conditions.

Table 11: Functional outcome according to Modified Harris Hip Score at final follow-up

Modified Harris Hip Score outcome	Number of patients	Percentage (%)
Excellent	9	25.7
Good	16	45.7
Fair	7	20.0
Poor	3	8.6

[Table 11] shows satisfactory functional outcomes among the majority of patients at one-year follow-up. The above table shows that good functional outcome was achieved in the majority of patients with 16 patients (45.7%), followed by excellent outcome in 9 patients (25.7%). Fair and poor outcomes were observed in 7 patients (20.0%) and 3 patients (8.6%) respectively, indicating overall satisfactory postoperative recovery following bipolar hemiarthroplasty.

Table 1 demonstrated that femoral neck fractures predominantly affected elderly patients in the seventh and eighth decades of life, with the highest frequency observed in the 71–80 years age group accounting for 15 patients (42.9%). Patients aged 60–70 years constituted 12 cases (34.3%), while those above 80 years represented 8 patients (22.8%). These findings highlight the increasing incidence of hip fractures with advancing age due to osteoporosis, reduced bone mineral density, impaired balance, and increased susceptibility to falls.

Table 2 showed female predominance among study participants, with females accounting for 21 patients (60.0%) compared to 14 males (40.0%). The higher incidence among females may be attributed to postmenopausal osteoporosis, hormonal changes, and reduced skeletal strength in elderly women.

Table 3 revealed that trivial fall was the most common mechanism of injury, observed in 28 patients (80.0%). Road traffic accidents and fall from height accounted for smaller proportions. The predominance of low-energy trauma emphasizes the fragility nature of femoral neck fractures in elderly osteoporotic individuals.

Table 4 demonstrated that transcervical fractures were the most common fracture type, observed in 17 patients (48.6%), and followed by subcapital fractures in 11 patients (31.4%). Basicervical fractures accounted for 7 patients (20.0%). These findings indicate that intracapsular fractures involving the femoral neck remain common among geriatric patients.

Table 5 highlighted the predominance of displaced fractures, with Garden type IV fractures constituting 18 cases (51.4%) and Garden type III fractures accounting for 10 cases (28.6%). Nondisplaced fractures were comparatively less common. This distribution reflects delayed presentation and severe fracture displacement commonly seen in elderly individuals after falls.

Table 6 showed that hypertension and diabetes mellitus were the most prevalent comorbid conditions, affecting 13 patients (37.1%) and 11 patients (31.4%) respectively. Other systemic illnesses including ischemic heart disease, chronic respiratory illness, chronic kidney disease, and thyroid disorders were also observed. The high burden of comorbidities highlights the complexity of perioperative management in elderly hip fracture patients.

Table 7 demonstrated that cemented bipolar prostheses were used more frequently, accounting for 21 cases (60.0%), whereas uncemented prostheses were utilized in 14 patients (40.0%). Cemented fixation was preferred due to osteoporotic bone quality and the need for better immediate implant stability.

Table 8 showed that the mean duration of surgery was 74.3 ± 11.6 minutes and mean intraoperative blood loss was 270.6 ± 52.4 ml. These findings indicate that bipolar hemiarthroplasty can be performed within acceptable operative duration and blood loss limits even in elderly individuals with associated medical illnesses.

Table 9 demonstrated relatively low postoperative complication rates. Surgical site infection and trochanteric bursitis were each observed in 2 patients (5.7%), while contralateral hip fracture occurred in 1 patient (2.9%). Importantly, no cases of prosthetic dislocation or periprosthetic fracture

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

were encountered, indicating satisfactory surgical stability and implant performance.

Table 10 revealed an overall mortality rate of 8.5%, with 3 patient deaths during the one-year follow-up period. Mortality was likely influenced by advanced age, frailty, and associated systemic comorbidities commonly present in elderly hip fracture patients.

Table 11 demonstrated satisfactory functional outcomes following bipolar hemiarthroplasty. Good functional outcome was achieved in 16 patients (45.7%), while excellent outcome was observed in 9 patients (25.7%). Only a small proportion of patients demonstrated poor outcome. These findings suggest that bipolar hemiarthroplasty provides effective pain relief, restoration of mobility, and favorable postoperative functional recovery in elderly patients with neck of femur fractures associated with comorbidities.

Figures Summary

Figure 1 illustrates the anatomical structure of the hip joint and the biomechanical forces responsible for increasing fracture risk in elderly individuals. The figure demonstrates the relationship between the acetabulum, femoral head, femoral neck, greater trochanter, and femoral shaft. It also depicts the directional forces generated during weight-bearing and falls, including ground impact forces and muscular pull acting across the femoral neck. These biomechanical stresses contribute significantly to fracture occurrence, particularly in osteoporotic bone. The figure supports the discussion regarding fragility fractures in elderly patients and explains why intracapsular fractures commonly occur after low-energy trauma. Understanding hip biomechanics is essential for interpreting fracture patterns, instability, and surgical treatment principles in femoral neck fractures.

Figure 2 demonstrates the vascular anatomy and blood supply of the femoral head and neck. The figure highlights the medial femoral circumflex artery, lateral femoral circumflex artery, retinacular vessels, extracapsular arterial ring, and foveal artery contributing to femoral head perfusion. It emphasizes the critical role of retinacular vessels in maintaining vascularity of the femoral head. Disruption of these vessels following displaced femoral neck fractures can lead to avascular necrosis and nonunion. The figure provides anatomical justification for arthroplasty-based treatment strategies in elderly patients with displaced fractures. It also supports the clinical rationale behind avoiding internal fixation in fractures with compromised blood supply.

Figure 3 illustrates the Garden classification system of femoral neck fractures, categorizing fractures into Types I–IV based on displacement severity. Type I and II fractures represent incomplete or nondisplaced fractures, whereas Types III and IV indicate progressively displaced fractures with increasing vascular compromise. The figure provides visual understanding of fracture alignment, displacement, and stability. It supports clinical decision-making regarding internal fixation versus arthroplasty procedures. The predominance of displaced fractures in the present study further correlates with the preference for bipolar hemiarthroplasty among elderly patients.

Figure 4 demonstrates the Pauwels classification of femoral neck fractures according to the inclination angle of the fracture line. Pauwels Type I fractures show lower inclination angles with compressive forces predominating, whereas Types II and III exhibit progressively vertical fracture orientation associated with increased shear stress and instability. The figure explains the biomechanical basis of fracture instability and fixation failure. Increasing verticality of the fracture line significantly influences treatment selection and prognosis. This classification complements the Garden classification by emphasizing fracture biomechanics rather than displacement alone.

Figure 5 illustrates the AO/OTA classification system for femoral neck fractures. The figure categorizes fractures into impacted, transcervical, and displaced subtypes with further subclassification according to displacement and fracture morphology. This comprehensive classification system assists surgeons in identifying fracture severity, stability, and optimal treatment strategy. The figure highlights the complexity and variability of femoral neck fracture patterns encountered in orthopedic practice. It also supports standardized communication, radiological assessment, and operative planning in geriatric hip fractures.

Figure 6 demonstrates the treatment algorithm and implant selection strategy for proximal femoral fractures in elderly patients. The figure outlines management pathways according to fracture location, displacement, physiological age, frailty status, arthrosis, and cognitive function. It compares treatment options including internal fixation, total hip arthroplasty, hemiarthroplasty, and intramedullary nailing. The figure emphasizes that displaced femoral neck fractures in frail elderly individuals are commonly managed with hemiarthroplasty because of reduced operative stress and early mobilization benefits. It visually summarizes surgical decision-making principles in geriatric hip fracture management.

Figure 7 illustrates the sequential operative steps involved in bipolar hemiarthroplasty. The figure demonstrates surgical exposure of the hip joint, femoral head excision, canal preparation, prosthesis sizing, implantation technique, and reduction of the prosthetic joint. It provides detailed visualization of operative anatomy and surgical workflow. The figure supports the methodology section by clarifying the standardized surgical procedure performed in the study population. It also enhances reader understanding regarding implant positioning and procedural steps involved in hemiarthroplasty surgery.

Figure 8 demonstrates the postoperative radiographic appearance of bipolar hemiarthroplasty

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

following surgical fixation of femoral neck fracture. The radiograph shows appropriate positioning of the femoral stem and bipolar prosthetic head with satisfactory alignment and restoration of hip joint anatomy. The figure highlights the final surgical outcome following hemiarthroplasty and illustrates stable implant placement. It supports the study findings regarding favorable postoperative stability, early mobilization, and satisfactory functional recovery following bipolar hemiarthroplasty in elderly patients with associated comorbidities.

DISCUSSION

Femoral neck fractures in elderly individuals continue to represent a major orthopedic challenge because of their association with osteoporosis, frailty, reduced physiological reserve, and multiple systemic comorbidities. These fractures are associated with significant morbidity, prolonged hospitalization, functional decline, and increased mortality. The primary goals of management include restoration of mobility, pain relief, early rehabilitation, prevention of complications related to prolonged immobilization, and improvement in quality of life. Bipolar hemiarthroplasty has emerged as a reliable treatment modality for elderly patients with displaced femoral neck fractures because it permits immediate stability, early ambulation, and satisfactory functional recovery with relatively lower complication rates.

The present study evaluated the functional outcome of bipolar hemiarthroplasty in elderly patients with neck of femur fractures associated with comorbidities. Functional outcomes, perioperative parameters, postoperative complications, and mortality were assessed over a one-year follow-up period.

In the present study, the majority of patients belonged to the 71–80 years age group, with a mean age of 72.7 years. Similar age distribution has been reported in previous studies evaluating bipolar hemiarthroplasty in elderly patients. Ratanpal et al. observed that most patients were between 65–69 years of age, reflecting the increased incidence of femoral neck fractures with advancing age due to osteoporosis and fall-related injuries.[1] Chandrashekar et al. also reported a mean age of 69.2 years among patients undergoing bipolar hemiarthroplasty.[2] The increasing prevalence of femoral neck fractures among elderly individuals can be attributed to age-related decline in bone mineral density, impaired neuromuscular coordination, visual disturbances, and increased risk of falls.

Female predominance was observed in the present study, with females constituting 60% of study participants. Similar findings have been consistently reported in previous literature. Ratanpal et al. reported female predominance in approximately two-thirds of their study population.[1] The higher incidence among females is largely explained by postmenopausal osteoporosis, hormonal changes, reduced calcium reserves, and greater susceptibility to fragility fractures.

Trivial fall was identified as the most common mechanism of injury in the present study, accounting for 80% of cases. This finding is consistent with previous studies demonstrating that low-energy trauma is the predominant cause of femoral neck fractures in elderly individuals.[2,3] Osteoporotic bone combined with impaired balance and reduced reflexes predisposes elderly individuals to hip fractures even after minor falls.

In the present study, transcervical fractures represented the most common fracture pattern, while Garden type IV fractures constituted the majority of fracture classifications. Similar observations have been reported in studies evaluating displaced femoral neck fractures in elderly patients undergoing hemiarthroplasty.[4] Displaced fractures are associated with disruption of blood supply to the femoral head, thereby increasing the risk of avascular necrosis and nonunion if treated with internal fixation alone.

Comorbidities were highly prevalent among study participants. Hypertension and diabetes mellitus were the most common associated medical conditions observed. Elderly hip fracture patients frequently present with multiple systemic illnesses that increase perioperative risks and delay postoperative rehabilitation.[5] Appropriate preoperative optimization and multidisciplinary perioperative management are therefore essential for improving surgical outcomes and reducing mortality.

Cemented bipolar hemiarthroplasty was more commonly performed in the present study compared to uncemented prostheses. Cemented fixation provides superior initial stability in osteoporotic bone and facilitates early mobilization. Similar preference for cemented bipolar prostheses has been reported in previous studies.[1,6] Although cemented implants may carry a risk of bone cement implantation syndrome, careful anesthetic monitoring and surgical technique can minimize complications.

The mean duration of surgery and intraoperative blood loss observed in the present study were within acceptable operative limits for elderly patients. Sundar et al. reported shorter operative duration and lower blood loss with bipolar hemiarthroplasty compared to total hip replacement, emphasizing its suitability for elderly individuals with limited physiological reserve.[7] Reduced surgical duration and blood loss are important advantages in geriatric patients with associated cardiovascular and systemic illnesses.

Postoperative complications in the present study were relatively low. Surgical site infection and trochanteric bursitis were observed in a small number of patients, while no prosthetic dislocations or periprosthetic fractures occurred. Chandrashekar

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

et al. similarly reported low complication rates following bipolar hemiarthroplasty, with satisfactory postoperative recovery and minimal implant-related complications.[2] The absence of prosthetic dislocation in the present study may be attributed to meticulous surgical technique, appropriate implant positioning, and postoperative rehabilitation protocols.

Mortality observed during the one-year follow-up period was 8.5% in the present study. Hip fractures in elderly individuals are associated with substantial mortality because of advanced age, frailty, reduced mobility, and associated systemic illnesses. Ratanpal et al. also reported progressive mortality during postoperative follow-up among elderly patients undergoing bipolar hemiarthroplasty.[1] Mortality following hip fracture surgery is influenced not only by the surgical procedure itself but also by baseline functional status, nutritional condition, cardiopulmonary reserve, and associated comorbidities.

Functional outcome assessment using the Modified Harris Hip Score demonstrated progressive improvement during follow-up in the present study. The majority of patients achieved good or excellent outcomes at final follow-up, indicating satisfactory restoration of mobility and pain relief following bipolar hemiarthroplasty. Similar favorable functional outcomes have been reported in previous studies. Ratanpal et al. observed progressive improvement in Harris Hip Scores over time, with the majority of patients achieving good functional recovery at one year.[1] Chandrashekar et al. reported that 75% of patients achieved excellent or good outcomes following bipolar hemiarthroplasty.[2]

Comparative studies evaluating bipolar hemiarthroplasty and total hip arthroplasty have shown that although total hip arthroplasty may provide slightly superior long-term functional outcomes, bipolar hemiarthroplasty offers significant advantages in elderly patients with comorbidities because of shorter operative duration, lower blood loss, reduced dislocation rates, and lower perioperative morbidity.[7,8] Yoo et al. reported that total hip arthroplasty was associated with higher dislocation rates compared to bipolar hemiarthroplasty, particularly in elderly ambulatory patients.[8] Therefore, bipolar hemiarthroplasty remains an effective and practical treatment option for elderly patients with limited physiological reserve and associated medical illnesses.

The findings of the present study support the growing evidence that bipolar hemiarthroplasty provides reliable pain relief, early mobilization, satisfactory functional recovery, and acceptable complication rates in elderly patients with femoral neck fractures. Careful patient selection, perioperative optimization of comorbidities, meticulous surgical technique, and structured rehabilitation are essential to achieve favorable outcomes in this vulnerable population.

Limitations of the Study

1. The study was conducted at a single tertiary care center with a relatively small sample size.
2. Duration of follow-up was limited to one year, thereby limiting long-term assessment of implant survival and acetabular erosion.
3. Comparative analysis with total hip arthroplasty or internal fixation was not performed.
4. Functional outcomes may have been influenced by varying rehabilitation compliance and severity of associated comorbidities.
5. Quality-of-life assessment tools other than Modified Harris Hip Score were not utilized in the study.

CONCLUSION

The present study demonstrates that bipolar hemiarthroplasty is a safe, effective, and reliable surgical treatment modality for elderly patients with neck of femur fractures associated with comorbidities. The procedure provides satisfactory pain relief, stable fixation, early mobilization, and favorable functional recovery with acceptable complication and mortality rates.

The majority of patients in the present study achieved good to excellent functional outcomes according to the Modified Harris Hip Score during one-year follow-up. Female predominance and higher incidence among patients in the seventh and eighth decades of life emphasize the strong association between osteoporosis, aging, and fragility fractures. Trivial fall emerged as the most common mechanism of injury, highlighting the importance of fall prevention strategies in elderly individuals.

Hypertension and diabetes mellitus were the most frequently encountered comorbid conditions among study participants, reflecting the complexity of perioperative management in geriatric hip fracture patients. Appropriate preoperative optimization and multidisciplinary management played an important role in minimizing perioperative complications and improving postoperative recovery.

Cemented bipolar hemiarthroplasty was more commonly utilized because of superior implant stability in osteoporotic bone. The procedure demonstrated acceptable operative duration and blood loss, making it suitable for elderly individuals with limited physiological reserve. Postoperative complications were minimal and manageable, with no cases of prosthetic dislocation or periprosthetic fracture encountered during follow-up.

Functional outcomes improved progressively during serial follow-up evaluations, indicating that bipolar hemiarthroplasty facilitates restoration of mobility and independence in elderly patients. Although associated comorbidities influenced early rehabilitation and recovery, long-term functional outcomes remained satisfactory with appropriate postoperative care and physiotherapy.

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

Based on the findings of the present study, bipolar hemiarthroplasty can be considered an effective treatment option for elderly patients with displaced neck of femur fractures, particularly in the presence of osteoporosis and associated systemic comorbidities. Early surgical intervention, meticulous operative technique, optimization of medical illnesses, and structured rehabilitation protocols are essential for achieving successful outcomes and improving quality of life in this vulnerable patient population.

REFERENCES

1. Sugand K, Ali R, Goodall R, Salciccioli J, Marshall D, Schuster-Bruce J, Abdul-Jabar HB, Shalhoub J. Trends in neck of femur fracture incidence in EU15+ countries from 1990–2017. *Injury*. 2023;54(2):64.
2. Ahuja K, Sen S, Dhanwal D. Risk factors and epidemiological profile of hip fractures in Indian population: A case-control study. Osteoporos Sarcopenia. 2017;3(3):138-148.
3. Chincholi S, Prasad KMV. Occurrence of fracture neck femur in the elderly Indian population. Int J Orthop Sci. 2017;3(2):706–709.
4. Kazley J, Bagchi K. Femoral Neck Fractures. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
5. Liang W, Qin G, Yu L, et al. Reducing complications of femoral neck fracture management: a retrospective study on the application of multidisciplinary team. BMC Musculoskelet Disord. 2023;24:338.
6. Joshi N, Dhukia RK. Bipolar hemiarthroplasty for fracture neck femur. In: Sharma M, editor. Hip Arthroplasty. Singapore: Springer; 2023.
7. Ramasamy V, Nallan R. Functional outcome of bipolar hemiarthroplasty for proximal femoral neck fractures in elderly: a prospective study. J Orthop Joint Surg. 2022;4(1).
8. Lehtonen EJI, Stibolt RD Jr, Smith W, Wills B, Pinto MC, McGwin G Jr, Shah A, Godoy-Santos AL, Naranje S. Trends in surgical treatment of femoral neck fractures in the elderly. Einstein (Sao Paulo). 2022.
9. Lu Y, Uppal HS. Hip fractures: Relevant anatomy, classification, and biomechanics of fracture and fixation. Geriatr Orthop Surg Rehabil. 2019;10:2151459319859139.
10. Sarvi MN. Hip Fracture: Anatomy, Causes, and Consequences. In: Total Hip Replacement - An Overview. InTech; 2018.
11. Keating JF. Femoral neck fractures. In: Rockwood and Green's Fractures in Adults. 8th ed. Wolters Kluwer; 2015. p. 1923-1956.
12. Sato T, Sato N. Clinical relevance of the hip joint: Part I – Review of the anatomy of the hip joint. Int Musculoskelet Med. 2015;37(4):141–145.
13. Gold M, Munjal A, Varacallo MA. Anatomy, Bony Pelvis and Lower Limb, Hip Joint. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
14. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: Worldwide geographic variation. Indian J Orthop. 2011;45(1):15-22.
15. Marks R. Hip fracture epidemiological trends, outcomes, and risk factors, 1970-2009. Int J Gen Med. 2010;3:1-17.
16. Kim DC, Honeycutt MW, Riehl JT. Hip fractures: current review of treatment and management. Curr Orthop Pract. 2019;30(4):385-394.
17. DeLaMora SN, Gilbert M. Introduction of intracapsular hip fractures: anatomy and pathologic features. Clin Orthop Relat Res. 2002;(399):9-16.
18. Collin PG, D'Antoni AV, Loukas M, Oskouian RJ, Tubbs RS. Hip fractures in the elderly - A clinical anatomy review. Clin Anat. 2017;30(1):89-97.
19. Pauyo T, Drager J, Albers A, Harvey EJ. Management of femoral neck fractures in the young patient: A critical analysis review. World J Orthop. 2014;5(3):204–217.
20. Sekeitto AR, Sikhauli N, van der Jagt DR, Mokete L, Pietrzak JRT. The management of displaced femoral neck fractures: a narrative review. EFORT Open Rev. 2021;6(2):139–144.
21. Lutnick E, Kang J, Freccero DM. Surgical Treatment of Femoral Neck Fractures: A Narrative Review. J Am Acad Orthop Surg Glob Res Rev. 2023;7(7):e23.00055.
22. Fischer H, Maleitzke T, Eder C, et al. Management of proximal femur fractures in the elderly: current concepts and treatment options. Eur J Med Res. 2021;26:86.
23. Cicio C, Testa G, Salvo G, Liguori B, Vescio A, Pavone V, Sapienza M. Femoral Neck Fractures in Elderly Patients: Dual Mobility Cup Arthroplasty or Hemiarthroplasty? A Narrative Review of the Literature.
24. Gezahegn B. Hemiarthroplasty. In: Arthroplasty - Advanced Techniques and Future Perspectives. IntechOpen; 2023.
25. Hsu A, Blomberg J. Femoral Neck Fracture Cemented Bipolar Hemiarthroplasty. Orthobullets. 2017.
26. AO Foundation. Hemiarthroplasty for femoral neck and head fractures with hip dislocation. AO Surgery Reference.
27. Kaushal A, Rao HTA. Functional outcome of osteosynthesis vs. bipolar hemiarthroplasty in elderly patients with fracture neck of femur. Int J Orthop Traumatol Surg Sci. 2019;5(1):28–31.
28. Luo S, Qin W, Yu L, et al. Total hip arthroplasty versus hemiarthroplasty in the treatment of active elderly patients over 75 years with displaced femoral neck fractures: a retrospective study. BMC Musculoskelet Disord.
29. Muslim SM, Lingayat MB, Bansode P, Kesharwani A. Comparative outcome assessment of total hip arthroplasty versus bipolar hemiarthroplasty in intracapsular neck of femur fracture in old age. Int J Res Orthop.
30. Yoo JI, Cha YH, Kim JT, Park CH. Clinical outcomes of bipolar hemiarthroplasty versus total hip arthroplasty: assessing the potential impact of cement use and pre-injury activity levels in elderly patients. Hip Pelvis..

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