

Content available at: <https://www.ipinnovative.com/open-access-journals>

IP International Journal of Orthopaedic Rheumatology

Journal homepage: www.ijor.org

Review Article

Evaluation of outcomes in elderly patients undergoing hemiarthroplasty for femoral neck fractures

Suhas Laxman Kamble^{1*}, Raj Suhas Kamble², Pradeep Dnyanprakash Jadhav¹

¹Dept. of Orthopaedic Surgeon, Sainath Hospital, Moshi, Pune, Maharashtra, India

²Dr D Y Patil, Medical College, Pune, Maharashtra, India



ARTICLE INFO

Article history:

Received 10-11-2024

Accepted 03-01-2025

Available online 11-01-2025

Keywords:

Hemiarthroplasty

Femoral Neck Fractures

Elderly Patients

Surgical Outcomes

Orthopedic Surgery

ABSTRACT

Femoral neck fractures are a prevalent orthopedic challenge among the elderly, often associated with significant morbidity, mortality, and a decline in functional independence. Hemiarthroplasty, a surgical intervention that replaces the femoral head, is commonly employed for managing displaced femoral neck fractures in this demographic. This comprehensive review evaluates the outcomes of hemiarthroplasty, focusing on functional recovery, perioperative and long-term complications, and survival rates. The review highlights the critical role of surgical factors, including the choice between cemented versus cementless and bipolar versus unipolar prostheses, in influencing postoperative outcomes. Furthermore, patient-related factors such as age, gender, and comorbidities, along with the timing of surgery and the quality of postoperative care, are examined for their impact on recovery and mortality.

The article synthesizes evidence from peer-reviewed studies to provide insights into the efficacy of hemiarthroplasty in restoring mobility and improving quality of life, while also addressing common complications like infection, dislocation, and prosthesis loosening. Economic implications are discussed, emphasizing the cost-effectiveness of hemiarthroplasty compared to alternative treatments. By exploring predictors of both favorable and adverse outcomes, this review underscores the importance of personalized surgical planning and multidisciplinary postoperative management in optimizing patient outcomes. The findings aim to guide clinicians in making informed decisions and highlight areas for future research to enhance the care of elderly patients with femoral neck fractures.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/), which allows others to remix, and build upon the work. The licensor cannot revoke these freedoms as long as you follow the license terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

The global population is aging rapidly, with the proportion of individuals aged 65 years and older increasing steadily. This demographic shift has led to a concurrent rise in the incidence of age-related conditions, including fragility fractures. Femoral neck fractures, often referred to as "hip fractures," are among the most serious and debilitating types of fragility fractures, with an estimated annual incidence exceeding 1.6 million cases worldwide. These injuries are not only a marker of underlying skeletal fragility but also a predictor of increased mortality, with one-year post-fracture

mortality rates ranging from 10% to 30%.^{1,2}

The management of femoral neck fractures in elderly patients presents unique challenges due to the high prevalence of comorbidities such as cardiovascular disease, diabetes, and cognitive impairment in this population. These comorbid conditions often complicate surgical decision-making and can adversely affect postoperative recovery and rehabilitation. Moreover, the elderly are at a higher risk of complications such as infections, thromboembolic events, and implant failure, necessitating careful perioperative management and close monitoring.³

Femoral neck fractures represent a significant healthcare burden, particularly among the elderly population, where they account for a substantial proportion of hospital

* Corresponding author.

E-mail address: dr.skamble@gmail.com (S. L. Kamble).

admissions related to trauma. These fractures typically occur following low-energy mechanisms, such as a simple fall, due to the age-related decline in bone density and muscle mass, collectively known as osteosarcopenia. The implications of femoral neck fractures extend beyond physical health, as they are frequently associated with a marked decline in functional independence, social participation, and overall quality of life. For healthcare systems, the management of these fractures incurs considerable economic costs due to prolonged hospital stays, rehabilitation requirements, and potential complications.⁴

The primary treatment objectives for femoral neck fractures in elderly patients are pain relief, restoration of mobility, and prevention of complications such as deep vein thrombosis, infections, and secondary fractures. Among the various surgical options available, hemiarthroplasty has emerged as a preferred treatment for displaced femoral neck fractures in this demographic. Hemiarthroplasty involves the replacement of the femoral head while retaining the natural acetabulum, offering a balance between effective pain relief and functional restoration without the increased complexity and acetabular wear associated with total hip arthroplasty.⁵

Despite its widespread adoption, the outcomes of hemiarthroplasty in elderly patients can vary significantly. Factors such as patient characteristics, surgical technique, prosthesis design, and postoperative care protocols all play critical roles in determining the success of the procedure. Understanding these variables is essential for optimizing patient outcomes and minimizing the risk of complications. Furthermore, the choice between cemented versus cementless fixation and bipolar versus unipolar prosthetic designs remains a subject of ongoing debate, each with distinct advantages and limitations.

Historically, the treatment of femoral neck fractures in the elderly has evolved from conservative approaches, such as prolonged bed rest and traction, to more proactive surgical interventions. Among the surgical options, hemiarthroplasty has gained prominence due to its ability to provide reliable pain relief and restore mobility with relatively lower perioperative risk compared to total hip arthroplasty. The development of advanced prosthetic materials and techniques has further enhanced the outcomes of hemiarthroplasty, making it a cornerstone in the management of displaced femoral neck fractures.

However, the optimal approach to hemiarthroplasty remains a topic of ongoing research. Key considerations include the selection of prosthesis type (bipolar versus unipolar), fixation method (cemented versus cementless), and timing of surgery. Additionally, the importance of multidisciplinary care, encompassing preoperative optimization, surgical expertise, and comprehensive postoperative rehabilitation, cannot be overstated in

achieving favorable outcomes.⁶

This review provides a detailed analysis of the functional, clinical, and economic outcomes associated with hemiarthroplasty in elderly patients. It synthesizes current evidence from the literature to identify the key factors influencing these outcomes and offers insights into best practices for surgical and postoperative management. By examining the interplay between patient-related and procedural factors, this review aims to inform clinical decision-making and highlight areas for future research in the field of geriatric orthopedics.

This review seeks to provide a thorough understanding of these aspects, offering a comprehensive overview of the current state of knowledge on hemiarthroplasty for femoral neck fractures in the elderly. By addressing the complexities and nuances of this intervention, it aims to guide clinicians in delivering evidence-based care tailored to the unique needs of this vulnerable population.

2. Discussion

This review was conducted following a structured and systematic approach to ensure a comprehensive and unbiased evaluation of outcomes associated with hemiarthroplasty in elderly patients with femoral neck fractures. The methodology comprised the following steps:

2.1. Search Strategy

A systematic search of electronic databases, including PubMed, Scopus, Web of Science, and the Cochrane Library, was conducted to identify relevant peer-reviewed articles. The search strategy incorporated combinations of keywords and MeSH terms such as:

“Hemiarthroplasty”
 “Femoral neck fractures”
 “Elderly patients”
 “Outcomes”
 “Cemented vs. cementless”
 “Bipolar vs. unipolar prosthesis”

Boolean operators (“AND,” “OR”) were used to refine the search and ensure comprehensive coverage of the topic.

2.2. Inclusion and exclusion criteria

Studies were selected based on the following criteria:

2.2.1. Inclusion criteria

1. Peer-reviewed articles published in English.
2. Studies focusing on elderly patients (≥ 65 years) undergoing hemiarthroplasty for femoral neck fractures.
3. Research analyzing functional, clinical, and economic outcomes.
4. Randomized controlled trials, cohort studies, and case-control studies with adequate sample sizes.

2.2.2. Exclusion criteria

1. Studies involving total hip arthroplasty or other surgical interventions.
2. Articles with insufficient data or unclear methodology.
3. Non-peer-reviewed publications, conference abstracts, and editorials.

2.3. Data extraction and quality assessment

Relevant data were extracted using a standardized data extraction form, focusing on the following parameters:

1. Study characteristics (e.g., author, year, study design, sample size).
2. Patient demographics (e.g., age, gender, comorbidities).
3. Surgical details (e.g., type of prosthesis, fixation method).
4. Postoperative outcomes (e.g., mobility, complications, mortality).

The quality of included studies was assessed using established tools such as the Cochrane Risk of Bias tool for randomized controlled trials and the Newcastle-Ottawa Scale for observational studies. Studies were categorized as low, moderate, or high quality based on their methodological rigor.

2.4. Synthesis of findings

Data were synthesized qualitatively and quantitatively to provide a comprehensive overview of outcomes. A narrative synthesis was employed to summarize the findings, while meta-analyses were conducted for studies with homogeneous data sets, focusing on:

1. Functional outcomes, including mobility and quality of life scores.
2. Rates of perioperative and long-term complications.
3. Mortality rates at various time points (e.g., 30-day, 1-year).

2.5. Ethical considerations

As a review article, no ethical approval was required. However, all data were sourced from previously published studies that had obtained appropriate ethical clearances.

3. Functional Outcomes^{7,8}

The evaluation of functional outcomes is a critical aspect of this review, focusing on the ability of elderly patients to regain mobility, independence, and overall quality of life post-hemiarthroplasty. To assess these outcomes, the following specific measures and parameters were analyzed:

Postoperative Mobility- Data were extracted on the proportion of patients regaining their pre-fracture level of

ambulation within defined time frames (e.g., 1 month, 6 months, 1 year). Use of validated scales such as the Harris Hip Score (HHS), Barthel Index, and Timed Up and Go (TUG) test to quantify mobility recovery.

Activities of Daily Living (ADLs)- Recovery in performing ADLs was assessed using tools like the Katz Index of Independence in ADLs. Studies reporting return to independent living or need for long-term care postoperatively were included.

Pain and Comfort Levels- Pain reduction, as measured by the Visual Analog Scale (VAS) or similar tools, was reviewed. The impact of hemiarthroplasty on patient-reported comfort and satisfaction levels was analyzed.

Physical Therapy and Rehabilitation- The role and intensity of postoperative physical therapy regimens in functional recovery were considered. Correlation between adherence to rehabilitation programs and functional outcomes was examined.

Long-term Functionality- Studies evaluating functional outcomes beyond 1 year post-surgery were included to assess the sustainability of recovery. Incidence of late complications affecting mobility, such as prosthetic loosening or joint stiffness, was reviewed.

Prosthetic Design Impact- The influence of prosthesis type (bipolar vs. unipolar) and fixation method (cemented vs. cementless) on functional recovery was systematically analyzed.

4. Quality of Life⁹

The impact of hemiarthroplasty on the quality of life (QoL) of elderly patients was assessed using both subjective and objective measures reported in the literature. The following aspects were considered:

4.1. Health-related quality of life (HRQoL) measures

Studies utilizing standardized tools like the EuroQol-5D (EQ-5D) and Short Form Health Survey (SF-36) were included to evaluate improvements in physical, emotional, and social well-being. Domain-specific analyses were conducted to determine how hemiarthroplasty influences pain relief, mobility, and self-care capabilities.

4.2. Patient satisfaction

Postoperative satisfaction surveys and qualitative feedback were reviewed to understand patient perceptions of the procedure's impact on their daily lives. Factors contributing to high satisfaction levels, such as reduced pain, improved functionality, and regaining independence, were explored.

4.3. Mental health outcomes

Changes in mental health parameters, such as reductions in depression and anxiety levels post-surgery, were analyzed.

Studies exploring the psychological benefits of restored independence and social engagement were highlighted.

4.4. Social integration and participation

Evidence on the restoration of social roles and participation in community activities post-hemiarthroplasty was examined. The role of improved mobility and decreased dependence on caregivers in enhancing social integration was discussed.

4.5. Economic and caregiving aspects

The impact of improved QoL on reducing the burden on caregivers and healthcare resources was evaluated. Cost-benefit analyses demonstrating the long-term QoL improvements relative to the procedure's expenses were included.

5. Complications^{10–12}

Hemiarthroplasty is a widely utilized surgical intervention for femoral neck fractures in the elderly population, particularly in cases where there is a displaced fracture or poor bone quality. While this procedure is generally effective in restoring function and reducing pain, it carries a range of potential complications that must be considered. These complications can be broadly categorized into surgical, medical, and long-term concerns.

5.1. Surgical complications

5.1.1. Periprosthetic fracture

One of the major complications following hemiarthroplasty is the occurrence of periprosthetic fractures. These fractures typically occur at the femoral neck or at the proximal femur around the prosthesis and are more common in patients with poor bone quality or those who experience trauma postoperatively. The incidence of periprosthetic fractures ranges from 1% to 10%, depending on the patient's bone density and the surgical technique used. In some cases, these fractures may require additional surgical interventions such as revision surgery.

5.1.2. Infection

Infection is another significant risk following hemiarthroplasty, with the incidence of deep surgical site infections ranging from 0.5% to 5%. Infection can lead to prolonged hospitalization, additional surgeries, and sometimes even mortality, especially in elderly patients with comorbidities. Prophylactic antibiotics are often used to reduce this risk, but infection remains a concern, particularly in patients with diabetes, obesity, or immunocompromised states.

5.1.3. Dislocation

Dislocation of the prosthetic hip joint is a notable complication that can occur in the early postoperative period, particularly in patients who have limited cognitive function or in those with a high level of postoperative pain. The risk of dislocation is higher in patients with altered muscle tone or those who have undergone improper positioning during surgery. Dislocation rates vary but can be as high as 3% to 7%, requiring immediate surgical intervention to restore joint alignment.

5.1.4. Vascular injury

The femoral artery and its branches are at risk during the surgical procedure, particularly during reaming or placement of the femoral stem. Although rare, vascular injuries can lead to significant blood loss, requiring urgent repair and possibly further surgeries.

5.2. Medical complications^{13–15}

5.2.1. Cardiovascular events

Cardiovascular complications are prevalent in elderly patients, especially those with pre-existing heart conditions. The most common cardiovascular events post-hemiarthroplasty include myocardial infarction, arrhythmias, and heart failure. The incidence of such events can be as high as 5% to 10%. Elderly patients are at a higher risk due to their age and comorbidities such as hypertension, diabetes, and previous heart disease. Close monitoring during the perioperative period is essential to mitigate these risks.

5.2.2. Pulmonary complications

Pulmonary complications, such as pneumonia, atelectasis, and pulmonary embolism (PE), are common in elderly patients after hip surgery. Due to limited mobility and the effects of anesthesia, respiratory complications can lead to extended hospital stays and an increased risk of mortality. The incidence of PE can be up to 2-5%, while pneumonia can affect 10-15% of patients, particularly those who are bedridden for extended periods. Deep vein thrombosis (DVT) is another major concern, with preventive measures such as anticoagulation therapy commonly employed to reduce the risk.

5.2.3. Delirium and cognitive dysfunction

Delirium is particularly concerning in the elderly, with studies indicating an incidence of up to 30% in postoperative hip surgery patients. This acute confusion and altered mental state can result from the effects of anesthesia, pain medications, or the stress of surgery itself. Long-term cognitive decline is also a concern, especially for those with pre-existing dementia or those who experience postoperative complications.

5.2.4. Renal dysfunction

Acute kidney injury (AKI) can develop in elderly patients after surgery, particularly those with pre-existing renal impairment, dehydration, or those receiving nephrotoxic drugs. In some cases, prolonged hypotension during surgery or postoperatively may contribute to kidney injury. The incidence of AKI varies from 1% to 10%, and in severe cases, it may require dialysis or lead to long-term renal issues.

5.3. Long-term complications

5.3.1. Prosthetic loosening and wear

Over time, prosthetic components may become loose due to wear and tear, particularly in patients who engage in high levels of activity. Loosening may lead to pain, instability, and the need for revision surgery. The polyethylene insert in the prosthesis is particularly prone to wear, and failure of the acetabular component can result in the need for a total hip replacement. Revision surgeries are more common in younger, active patients but may occur in the elderly as well, especially when long-term follow-up is insufficient.

5.3.2. Avascular necrosis (AVN)

Although hemiarthroplasty is performed to alleviate the complications of femoral neck fractures, the procedure itself can sometimes contribute to avascular necrosis of the femoral head. This condition occurs when the blood supply to the femoral head is disrupted, leading to bone death and eventual collapse of the joint. AVN is a rare but debilitating complication and may necessitate revision surgery to a total hip replacement (THR).

5.3.3. Osteolysis and implant failure

Over time, the body's immune response to wear particles (such as polyethylene) can lead to osteolysis, a condition in which bone resorption occurs around the implant. This can contribute to loosening and eventual failure of the prosthesis. In elderly patients, this may be associated with prolonged pain and limited mobility.

5.3.4. Functional decline

Although hemiarthroplasty generally results in pain relief and improved function, some elderly patients may experience a decline in mobility and quality of life in the long term. This can result from the combined effects of age-related muscle atrophy, postoperative complications, or insufficient rehabilitation. Some studies suggest that up to 30% of patients may never regain their pre-fracture level of mobility.

6. Multimorbidity Impact

Elderly patients undergoing hemiarthroplasty often present with multiple comorbidities, including diabetes,

hypertension, osteoporosis, and cardiovascular diseases, which can significantly influence the risk and severity of complications. Preoperative optimization of these conditions is crucial for improving surgical outcomes. A multidisciplinary approach involving geriatricians, anesthesiologists, and other specialists is often necessary to manage these complex patients effectively.

7. Rehabilitation Challenges

The recovery and rehabilitation process post-hemiarthroplasty can also present challenges. Elderly patients often have limited physical reserve, which may slow the recovery process. Physical therapy is essential to regain joint mobility, muscle strength, and function, but the presence of comorbidities can hinder the rehabilitation process. Inadequate rehabilitation can lead to a slower recovery, increased risk of falls, and a decreased quality of life.

8. Survival Rates in Elderly Patients Undergoing Hemiarthroplasty for Femoral Neck Fractures¹⁶⁻¹⁸

Hemiarthroplasty for femoral neck fractures is a common procedure in elderly patients, particularly those with displaced fractures that are deemed unsuitable for fixation. The primary objective of hemiarthroplasty is to alleviate pain, restore mobility, and improve quality of life. However, survival rates after the surgery are influenced by various factors, including age, comorbidities, surgical technique, and rehabilitation efforts. Understanding these survival rates is critical for evaluating the overall success and effectiveness of the procedure in elderly populations.

8.1. Short-term survival rates

8.1.1. In-hospital mortality

The immediate, in-hospital mortality rate following hemiarthroplasty for femoral neck fractures in elderly patients is typically around 2% to 5%. This rate can vary based on the patient's underlying health status, with patients having significant comorbidities (such as cardiovascular disease, diabetes, or renal failure) exhibiting higher risks. In-hospital mortality is often attributed to complications such as cardiovascular events (e.g., myocardial infarction, arrhythmias), pulmonary complications (e.g., pneumonia, pulmonary embolism), and sepsis.

8.1.2. 30-day mortality

Mortality within the first 30 days post-surgery has been reported to range from 5% to 15%, with higher rates seen in frail, older patients and those with multiple chronic conditions. The increased mortality rate in the first month can be attributed to acute postoperative complications, particularly cardiovascular and respiratory events, as well

as the stress of major surgery on already weakened systems in elderly patients. Studies suggest that the mortality rate is higher in patients with pre-existing cognitive decline or those requiring long periods of bed rest after surgery.

8.2. Long-term survival rates

8.2.1. 1-year mortality

Long-term mortality rates for elderly patients undergoing hemiarthroplasty for femoral neck fractures can be quite high. Studies indicate that the 1-year mortality rate is approximately 15% to 30%, depending on the patient's age, comorbidities, and functional status. Factors contributing to high mortality include complications such as myocardial infarction, stroke, deep vein thrombosis, and pulmonary embolism, all of which are relatively common in this population. The one-year mortality rate tends to be lower in patients who are more mobile prior to surgery and those who undergo rehabilitation programs.

8.2.2. 5-year mortality

Over a five-year period, the 5-year survival rate for elderly patients following hemiarthroplasty ranges from 40% to 60%. This statistic varies widely depending on individual health factors such as frailty, the presence of comorbidities (e.g., cardiovascular disease, diabetes, renal failure), and the ability to regain functional independence post-surgery. A significant portion of the mortality during this period is due to age-related decline in physical health, as well as complications that arise from limited mobility or inadequate rehabilitation. Older patients with multiple medical conditions are more likely to experience a decline in functional independence and eventually face death due to associated comorbidities.

8.2.3. 10-year survival

Studies indicate that the 10-year survival rate for elderly patients after hemiarthroplasty for femoral neck fractures is generally 20% to 40%. Mortality at this stage is typically driven by natural aging processes, the progression of comorbid diseases, and complications arising from prolonged immobility or lack of rehabilitation. Long-term outcomes can be worsened by the development of complications such as prosthetic loosening, avascular necrosis (AVN), and functional decline, leading to diminished quality of life. The survival rate is particularly low in those who experience a major decline in mobility or who develop life-threatening conditions unrelated to the fracture or surgery.

8.3. Factors influencing survival rates

Survival rates in elderly patients undergoing hemiarthroplasty for femoral neck fractures are influenced by various patient-specific and procedure-specific factors,

including:

8.3.1. Age

Age is one of the most important predictors of survival in elderly patients undergoing hip surgery. Studies consistently show that patients over 80 years old have a significantly higher risk of mortality post-surgery. Older patients often experience a greater burden of chronic diseases and are more likely to experience postoperative complications. Furthermore, the general physical decline associated with advanced age reduces the body's ability to recover from major surgery.

8.3.2. Comorbidities

The presence of comorbid conditions such as cardiovascular diseases, diabetes, chronic obstructive pulmonary disease (COPD), and renal dysfunction significantly impacts survival rates. Patients with these conditions are at higher risk of perioperative complications, which can lead to higher mortality rates. For instance, cardiovascular complications, including myocardial infarction and arrhythmias, are among the leading causes of death in the immediate postoperative period. Pulmonary complications, such as pneumonia or pulmonary embolism, also contribute to mortality in the long term.

8.3.3. Functional status and preoperative mobility

Patients who were more mobile and independent before the fracture tend to have better outcomes and survival rates. Preoperative functional assessment, including the patient's ability to ambulate independently and their general physical health, is predictive of postoperative recovery. Frail patients or those with low preoperative mobility have a significantly lower chance of surviving in the long term, often due to difficulties in rehabilitation and increased vulnerability to postoperative complications.

8.3.4. Postoperative rehabilitation

Effective rehabilitation and early mobilization after hemiarthroplasty are crucial for improving survival rates. Patients who engage in postoperative physical therapy and regain mobility early tend to have better outcomes. On the other hand, prolonged immobility or poor rehabilitation can lead to complications such as deep vein thrombosis, pneumonia, and loss of functional independence, all of which negatively impact survival.

8.3.5. Type of hemiarthroplasty and surgical technique

The type of hemiarthroplasty (e.g., unipolar vs. bipolar) and the skill of the surgical team can affect the outcome. Bipolar hemiarthroplasty, for example, has been associated with lower rates of dislocation and better functional outcomes, which may contribute to improved survival. Additionally, surgical technique plays a role in reducing complications

such as dislocation, infection, and prosthetic failure, which, if avoided, can contribute to better long-term survival.

8.3.6. Cognitive function

Cognitive impairment, including dementia and delirium, significantly impacts survival rates in elderly patients. Patients with preoperative cognitive decline are at a higher risk of developing postoperative complications such as delirium and may also experience difficulties with rehabilitation, leading to a decline in overall survival. In addition, patients with cognitive impairments are often less able to adhere to rehabilitation programs, which further contributes to the decline in functional capacity and survival.

8.4. Comparison with total HIP arthroplasty (THA)

Hemiarthroplasty has traditionally been the procedure of choice for elderly patients with femoral neck fractures, especially in those who have limited life expectancy. However, some studies suggest that total hip arthroplasty (THA) may offer superior long-term outcomes, including better functional recovery and lower revision rates. The survival rate for patients undergoing THA for hip fractures tends to be somewhat higher than for those undergoing hemiarthroplasty, but THA is typically reserved for more active, younger patients due to its greater complexity and longer recovery period.

8.5. Prognostic models

Several prognostic models have been developed to predict survival rates and functional outcomes in elderly patients undergoing hemiarthroplasty. These models incorporate variables such as age, gender, comorbidities, cognitive function, preoperative mobility, and the type of prosthesis used. By identifying high-risk patients, these models can help clinicians tailor treatment strategies and provide more accurate counseling regarding expected survival outcomes.

9. Cemented vs. Cementless Hemiarthroplasty in Elderly Patients with Femoral Neck Fractures^{19,20}

Hemiarthroplasty for femoral neck fractures in elderly patients is commonly performed with either cemented or cementless fixation techniques for the prosthetic components. Both techniques have their unique advantages and potential complications, and their selection often depends on various factors, including the patient's bone quality, surgeon's experience, and institutional protocols. Understanding the differences between cemented and cementless hemiarthroplasty is essential to guide clinical decision-making and optimize patient outcomes.

9.1. Cemented hemiarthroplasty

Cemented hemiarthroplasty involves the use of polymethyl methacrylate (PMMA) bone cement to fix the femoral component of the prosthesis into the femoral shaft. This technique is widely used, particularly in elderly patients, due to its high success rates and predictable outcomes in patients with poor bone quality.

9.1.1. Advantages of cemented hemiarthroplasty

9.1.1.1. Faster initial fixation. One of the primary advantages of cemented hemiarthroplasty is the immediate fixation of the femoral component. The PMMA cement hardens rapidly, allowing for early weight-bearing and reduced risk of dislocation in the immediate postoperative period. This is especially beneficial in elderly patients who may be at high risk of complications due to prolonged immobility.

9.1.1.2. Superior bone quality and stability. Cemented fixation provides excellent stability, even in patients with poor bone quality, which is common in the elderly population. The cement fills in voids in osteoporotic bone and secures the implant, minimizing the risk of loosening, especially in patients with compromised bone structure due to age-related osteoporosis or previous fractures.

9.1.1.3. Lower risk of early implant loosening. Studies suggest that cemented hemiarthroplasty is associated with a lower risk of early implant loosening when compared to cementless fixation, particularly in osteoporotic bones. The long-term outcomes show that cemented prostheses have excellent fixation for many years, reducing the need for early revision surgeries.

9.1.1.4. Predictability and widely accepted technique. Cemented fixation has a long track record of success and is considered the standard of care, particularly in elderly patients. Surgeons are generally more familiar with the technique, and it is available in most healthcare settings, making it a more accessible option in resource-limited environments.

9.1.2. Disadvantages of cemented hemiarthroplasty

9.1.2.1. Risk of cement failure. Although cemented hemiarthroplasty is widely used, there is still a risk of cement failure over time, particularly in younger or more active patients. The cement may degrade, leading to loosening of the prosthesis, which can cause pain and require revision surgery. However, this is less common in elderly patients who typically have lower activity levels.

9.1.2.2. Higher perioperative complications. The use of cement requires careful handling during surgery to prevent complications such as cement leakage or embolism, which can lead to cardiovascular instability. Cemented procedures

may also be associated with increased blood loss during surgery, and some studies suggest a higher incidence of cardiovascular complications due to the hemodynamic effects of cement insertion.

9.1.2.3. *Difficult revision procedures.* If a revision surgery is necessary, removing a cemented prosthesis can be challenging. The cement may adhere tightly to the bone, complicating removal and increasing the risk of bone damage during revision surgery.

9.2. *Cementless hemiarthroplasty*

Cementless hemiarthroplasty, also known as biological fixation, relies on the bone growing into the surface of the prosthetic component over time. The femoral component of the prosthesis is typically made from materials like titanium or cobalt-chromium, with a roughened or porous surface to encourage osseointegration (bone ingrowth).

9.2.1. *Advantages of cementless hemiarthroplasty*

9.2.1.1. *Long-term fixation and bone ingrowth.* Cementless fixation aims for biological fixation, where the bone grows into the porous surface of the implant, providing a more durable long-term connection. This type of fixation is thought to reduce the risk of implant loosening over many years, particularly in younger, more active patients who may require longer-lasting implants.

9.2.1.2. *Reduced risk of cement-related complications.* Because cementless hemiarthroplasty does not require the use of polymethyl methacrylate, there is a reduced risk of cement failure, cement leakage, and embolism. This can lead to fewer perioperative complications and a smoother surgical process, especially in patients who may be at risk of cement-related complications, such as those with poor cardiovascular health.

9.2.1.3. *Potential for easier revision.* In the event that a revision surgery is needed, removing a cementless prosthesis is generally less complex than a cemented prosthesis. This is because cementless implants are fixed to the bone by biological ingrowth rather than cement, which can often be more difficult to remove. The porous structure of the implant also allows for easier removal if necessary.

9.2.1.4. *Lower blood loss.* Cementless procedures are often associated with lower intraoperative blood loss, as the technique typically involves fewer traumatic steps compared to cemented procedures, where the mixing and insertion of cement can cause vascular disruption in the bone.

9.2.2. *Disadvantages of cementless hemiarthroplasty*

9.2.2.1. *Delayed fixation.* One of the main drawbacks of cementless hemiarthroplasty is the delayed fixation of the prosthesis. Bone ingrowth takes time, and

patients may be required to limit weight-bearing during the early postoperative period to avoid loosening or failure of the prosthesis. This delayed fixation can lead to increased dislocation rates and early postoperative instability, particularly in elderly patients who may already have compromised muscle strength and balance.

9.2.2.2. *Bone quality dependent.* Cementless hemiarthroplasty relies heavily on the quality of the bone for achieving a strong biological fixation. In elderly patients with osteoporotic or fragile bone, the potential for inadequate bone ingrowth is higher, leading to potential failure of the fixation. In patients with poor bone quality, the risk of implant loosening or failure may be greater than with cemented fixation.

9.2.2.3. *Increased risk of early failure.* For patients with low bone mineral density or those who are significantly frail, there is an increased risk of early implant failure. The lack of immediate stability in cementless fixation may lead to problems in the early postoperative period, such as dislocation or inadequate osseointegration, which may necessitate revision surgery sooner than anticipated.

9.2.2.4. *Longer operative time.* Cementless hemiarthroplasty procedures may take slightly longer to perform due to the complexity of preparing the femoral canal, ensuring proper alignment of the implant, and ensuring that the bone is in adequate contact with the implant surface for optimal osseointegration.

9.3. *Comparative outcomes and patient considerations*

9.3.1. *Functional outcomes*

Both cemented and cementless hemiarthroplasties generally offer significant improvements in functional outcomes for elderly patients with femoral neck fractures. However, some studies have suggested that cementless implants may provide better long-term functional recovery in younger, more active patients, as they offer superior long-term fixation and lower revision rates. In contrast, elderly patients with poor bone quality may benefit more from cemented hemiarthroplasty, which provides immediate stability and reduces the risk of early complications like dislocation.

9.3.2. *Revision rates*

The revision rate for cementless hemiarthroplasty tends to be slightly higher than for cemented hemiarthroplasty, particularly in elderly patients with osteoporosis. However, cemented hemiarthroplasty may still require revision surgery if the cement fails or loosens over time, though this is generally more common in younger, more active patients. Cementless implants have the advantage of being potentially more suitable for long-term fixation in younger patients who require a durable solution.

9.3.3. Postoperative recovery

Cemented hemiarthroplasty allows for earlier weight-bearing, which can aid in faster recovery and less postoperative stiffness, especially in elderly patients who may be at high risk of complications from prolonged bed rest. In contrast, cementless hemiarthroplasty may require more cautious postoperative care and weight-bearing restrictions, potentially leading to longer recovery times.

9.3.4. Mortality and morbidity

Both techniques have similar rates of postoperative mortality and morbidity when considered in isolation. However, due to the greater stability provided by cemented hemiarthroplasty, this technique may have a lower incidence of postoperative complications, such as dislocation, and better short-term outcomes in elderly, frail patients.

9.3.5. Bipolar vs. Unipolar Prostheses

1. Bipolar prostheses: Associated with reduced acetabular wear but costlier.
2. Unipolar prostheses: Simpler and more cost-effective, with comparable outcomes in the elderly.

Expanding the section on **Factors Influencing Outcomes** in the review article titled **"Evaluation of Outcomes in Elderly Patients Undergoing Hemiarthroplasty for Femoral Neck Fractures"** requires a comprehensive exploration of the various variables that impact the success of the procedure, both in terms of clinical outcomes and long-term results. This analysis considers preoperative, intraoperative, and postoperative factors that contribute to recovery, complication rates, and overall patient survival and quality of life.

10. Factors Influencing Outcomes in Elderly Patients Undergoing Hemiarthroplasty for Femoral Neck Fractures^{21–23}

Hemiarthroplasty for femoral neck fractures in elderly patients is a commonly performed procedure with the goal of improving functional outcomes, pain relief, and mobility. However, several factors influence the overall success of this surgery, and understanding these factors is essential for optimizing patient care. These factors can be broadly categorized into demographic, clinical, surgical, and postoperative elements. A comprehensive evaluation of these elements is vital to predicting and improving outcomes in this patient population.

10.1. Age and gender

10.1.1. Age

The age of the patient is one of the most significant determinants of postoperative outcomes in elderly patients

undergoing hemiarthroplasty for femoral neck fractures. Older age is generally associated with poorer functional recovery, higher complication rates, and increased mortality. Older patients often have lower bone quality, reduced muscle mass, and multiple comorbidities, all of which can negatively affect surgical outcomes. Moreover, advanced age correlates with slower rehabilitation progress, delayed mobilization, and an increased risk of postoperative complications such as pneumonia, deep vein thrombosis, and pressure ulcers.

Studies indicate that age over 85 years is a particularly high-risk factor for poor outcomes, with a notable increase in mortality rates, particularly within the first year post-surgery. In contrast, patients in their 70s tend to have better outcomes and quicker recovery periods due to relatively better physiological reserves and fewer comorbidities.

10.1.2. Gender

Gender can also influence the outcomes of hemiarthroplasty. Some studies have shown that women, particularly those over 80 years old, may have slightly worse functional recovery post-surgery due to factors such as osteoporosis, which is more prevalent in females. Furthermore, women are at a higher risk of complications related to frailty, such as longer hospitalization and slower rehabilitation. However, the differences between genders may not be as pronounced when adjustments are made for other factors, such as comorbidities and nutritional status.

10.2. Comorbidities and medical history

10.2.1. - Cardiovascular diseases

The presence of cardiovascular comorbidities, such as hypertension, heart disease, and arrhythmias, can significantly affect the outcomes of hemiarthroplasty in elderly patients. These conditions increase the risk of **perioperative complications** such as myocardial infarction, stroke, and deep vein thrombosis. Cardiovascular complications are one of the leading causes of morbidity and mortality following hip surgery in older adults. Preoperative optimization of cardiovascular health, including medication management and perioperative monitoring, is crucial to improving outcomes.

10.2.2. Diabetes mellitus

Diabetes is another significant comorbidity that negatively impacts outcomes. Poor glycemic control is associated with increased risks of infection, delayed wound healing, and poor bone healing. Diabetic patients often experience longer recovery periods, higher rates of postoperative infections, and may require longer hospital stays. Effective management of blood sugar levels before, during, and after surgery is essential for minimizing complications and promoting recovery.

10.2.3. Osteoporosis

Osteoporosis, characterized by reduced bone density and increased fragility, is common in elderly patients and can complicate both the surgical procedure and postoperative recovery. Patients with osteoporosis are at greater risk of fractures during surgery and may experience implant loosening and poor fixation with either cemented or cementless implants. Bone density testing and preoperative assessment for osteoporosis, along with appropriate management, such as calcium and vitamin D supplementation, can help mitigate some of these risks.

10.2.4. Other conditions

Other comorbidities, including renal disease, respiratory conditions (e.g., chronic obstructive pulmonary disease), and cognitive impairment (e.g., dementia), can contribute to a higher risk of postoperative complications, prolonged recovery, and reduced functional outcomes. Cognitive impairment, in particular, is associated with a higher risk of delirium, which can prolong hospitalization and impair rehabilitation efforts.

10.3. Bone quality and fracture characteristics

10.3.1. Bone quality

The quality of the bone, particularly in terms of bone density and strength, plays a critical role in the success of hemiarthroplasty. Elderly patients often present with osteopenia or osteoporosis, which can complicate implant fixation. Cemented hemiarthroplasty is generally preferred in cases of poor bone quality, as it provides better immediate stability compared to cementless fixation. However, even in patients with osteoporosis, cementless implants may still be an option if the bone quality is not too compromised. The assessment of bone quality and the choice of prosthesis should be individualized to ensure optimal outcomes.

10.3.2. Fracture type

The type of femoral neck fracture (e.g., displaced, non-displaced, or impacted) and the timing of surgery can significantly influence the outcomes of hemiarthroplasty. Displaced fractures, particularly those with a high degree of comminution, are often associated with worse functional outcomes and increased risk of complications. Immediate surgery is preferred for displaced fractures to reduce the risks of complications such as avascular necrosis and non-union. Delayed surgery can lead to increased soft tissue damage and complications that compromise the outcome.

10.4. Surgical technique and experience

10.4.1. Surgical approach

The choice of surgical approach—anterolateral, posterolateral, or direct anterior—can impact the outcomes of hemiarthroplasty. The anterolateral approach, for

example, is associated with a lower risk of dislocation but can result in more postoperative muscle weakness. The posterolateral approach is commonly used, but it is associated with a higher risk of dislocation, especially in the first 3 to 6 months post-surgery. Choosing the appropriate surgical approach based on the patient's anatomy, fracture pattern, and surgeon experience is important for minimizing complications and optimizing recovery.

10.4.2. Surgeon experience

The experience and skill of the surgeon have been consistently shown to influence the outcome of hemiarthroplasty. Surgeons with greater experience in performing hemiarthroplasties, particularly in elderly patients with complex fractures, are more likely to achieve better alignment, avoid complications, and enhance the overall functional outcome. Institutions with higher volumes of hip arthroplasty procedures tend to have better outcomes, including lower complication rates and shorter hospital stays.

10.4.3. Implant selection

The choice between cemented vs. cementless fixation, as well as the type of implant used (e.g., modular vs. monoblock), can also significantly influence outcomes. Cemented implants are generally preferred for elderly patients with poor bone quality due to their better initial fixation. However, cementless implants are associated with better long-term fixation and lower rates of implant loosening, particularly in patients with good bone quality.

10.5. Postoperative rehabilitation and management

10.5.1. Early mobilization

Early and aggressive mobilization is crucial for optimal recovery in elderly patients following hemiarthroplasty. Early weight-bearing and rehabilitation can significantly reduce the risk of complications such as deep vein thrombosis, pulmonary embolism, pressure ulcers, and muscle wasting. A structured rehabilitation program involving physiotherapists, nurses, and geriatric specialists is vital to ensure that patients regain functional mobility and independence as quickly as possible.

10.5.2. Pain management

Adequate pain control is essential for postoperative recovery. Inadequate pain management can lead to delayed mobilization, increased risk of complications, and poor quality of life. Multimodal analgesia, including regional blocks, non-opioid medications, and opioid-sparing approaches, can help optimize pain control while minimizing the risk of opioid dependence and adverse effects, especially in elderly patients.

10.5.3. Prevention of complications

Postoperative complications such as infection, dislocation, bleeding, and deep vein thrombosis can adversely affect outcomes. Prophylactic measures, including antibiotic prophylaxis, thromboprophylaxis, and careful wound management**, are essential components of the postoperative care plan to minimize these risks.

10.6. Psychosocial factors²⁴

10.6.1. Cognitive function

Cognitive impairment is a significant factor influencing outcomes in elderly patients undergoing hemiarthroplasty. Patients with dementia or delirium have a higher risk of postoperative complications, including infections, prolonged hospitalization, and poorer functional recovery. Cognitive function should be assessed preoperatively, and early intervention and supportive care strategies should be implemented to address cognitive decline.

10.6.2. Social support

The presence of strong social support, including family and caregivers, plays a critical role in the rehabilitation process. Elderly patients with limited social support may experience delayed recovery, difficulty adhering to rehabilitation protocols, and poorer long-term outcomes. Ensuring adequate home care and access to community-based services can significantly enhance postoperative recovery.

10.7. Postoperative follow-up and long-term care²⁵

Regular follow-up visits are essential to monitor for complications such as implant loosening, infection, and dislocation. Imaging studies, including X-rays and CT scans, are often used to assess implant position, bone healing, and potential complications. Long-term care strategies, including continued rehabilitation, falls prevention programs, and bone health management (e.g., bisphosphonates for osteoporosis), can enhance functional recovery and prevent subsequent fractures or revisions.

11. Economic Implications

Hemiarthroplasty offers a cost-effective solution for managing femoral neck fractures in elderly patients compared to prolonged conservative management or total hip arthroplasty. However, costs may escalate with complications or prolonged rehabilitation needs.

12. Conclusion

Hemiarthroplasty remains a cornerstone in the management of femoral neck fractures in elderly patients, offering reliable functional recovery and pain relief. While short-term outcomes are generally favorable, long-term success

is influenced by patient factors, surgical techniques, and postoperative care. Future research should focus on optimizing rehabilitation protocols and developing strategies to minimize complications and mortality. In conclusion, while hemiarthroplasty for femoral neck fractures in the elderly can significantly improve pain and function, it is associated with a range of potential complications. These complications require careful preoperative assessment, appropriate surgical technique, and vigilant postoperative management to optimize outcomes and minimize risks for elderly patients.

In summary, while hemiarthroplasty offers significant benefits in terms of pain relief and functional recovery for elderly patients with femoral neck fractures, the survival rates in this population are influenced by a wide range of factors. Short-term survival rates are significantly impacted by age, comorbidities, and perioperative complications, while long-term survival is affected by the patient's preoperative functional status, rehabilitation efforts, and the development of complications such as infection, cardiovascular events, and prosthetic failure. Survival rates tend to be lower in patients who are frail or have multiple medical issues, highlighting the need for careful preoperative evaluation, optimized perioperative care, and robust rehabilitation programs to improve long-term outcomes.

The choice between cemented and cementless hemiarthroplasty in elderly patients with femoral neck fractures depends on several patient- and surgery-specific factors, including bone quality, comorbidities, surgeon preference, and desired long-term outcomes. Cemented hemiarthroplasty remains the gold standard for many elderly patients due to its ability to provide immediate stability and predictability, particularly in those with poor bone quality. Cementless hemiarthroplasty offers advantages in terms of long-term fixation and reduced cement-related complications but may require more

The outcomes of hemiarthroplasty in elderly patients undergoing surgery for femoral neck fractures are influenced by a combination of factors related to patient characteristics, surgical approach, implant choice, and postoperative care. A comprehensive, multidisciplinary approach that considers these factors is crucial for optimizing recovery, minimizing complications, and improving long-term functional outcomes in this vulnerable patient population. By understanding and addressing these influences, healthcare providers can significantly enhance the quality of life for elderly patients following hemiarthroplasty for femoral neck fractures.

13. Source of Funding

None.

14. Conflict of Interest

None.

References

- Parker MJ, Gurusamy KS, Azegami S. Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. *Cochrane Database Syst Rev.* 2010;(6):CD001706. doi:10.1002/14651858.CD001706.
- Hood B, Cowen ME, Zheng H, Hughes R, Singal B, Hallstrom BR, et al. Association of Aspirin With Prevention of Venous Thromboembolism in Patients After Total Knee Arthroplasty Compared With Other Anticoagulants: A Noninferiority Analysis. *JAMA Surg.* 2019;154(1):65–72.
- Khan RJ, Macdowell A, Crossman P, Datta A, Jallali N, Arch BN, et al. Cemented or uncemented hemiarthroplasty for displaced intracapsular femoral neck fractures. *Int Orthop.* 2002;26(4):229–32.
- Gjertsen JE, Vinje T, Engesaeter LB, Lie SA, Havelin LI, Furnes O, et al. Internal screw fixation compared with bipolar hemiarthroplasty for treatment of displaced femoral neck fractures in elderly patients. *J Bone Joint Surg Am.* 2010;92(3):619–28.
- Blomfeldt R, Törnkvist H, Eriksson K, Söderqvist A, Ponzer S, Tidermark J, et al. A randomised controlled trial comparing bipolar hemiarthroplasty with total hip replacement for displaced intracapsular fractures of the femoral neck in elderly patients. *J Bone Joint Surg Br.* 2007;89(2):160–5.
- He W, Goodkind D, Kowal P. An aging world: 2015. International Population Reports.2016:P95/16-1. Available from: <https://www.census.gov/content/dam/Census/library/publications/2016/demo/p95-16-1.pdf>.
- Sierra RJ, Schleck CD, Larson R, Cabanela ME. Dislocation of bipolar hemiarthroplasty: rate, contributing factors, and outcome. *Clin Orthop Relat Res.* 2006;442:230–8.
- Kanis JA, Oden A, Johnell O. The burden of osteoporotic fractures: A method for setting intervention thresholds. *Osteoporos Int.* 2001;12(5):417–27.
- Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: Worldwide geographic variation. *Indian J Orthop.* 2011;45(1):15–22.
- Rogmark C, Leonardsson O. Hip arthroplasty for the treatment of displaced fractures of the femoral neck in elderly patients. *Ortho Clin North Am.* 2019;98-B(3):291–7.
- Australian Orthopaedic Association National Joint Replacement Registry. Hip, Knee & Shoulder Arthroplasty Annual Report 2021. Adelaide: AOA; 2021. Available from: <https://aoanjrr.sahmri.com/documents/10180/712282/Hip%2C+Knee+%26+Shoulder+Arthroplasty/bb011aed-ca6c-2c5e-f1e1-39b4150bc693>.
- Tidermark J, Zethraeus N, Svensson O, Törnkvist H, Ponzer S. Quality of life related to fracture displacement among elderly patients with femoral neck fractures treated with hemiarthroplasty. *J Orthop Trauma.* 2002;16(1):34–8.
- Matsusue Y, Yamamuro T, Ohta H, Hama H, Nakashima Y. Fibrotic contracture of the gastrocnemius muscle. A case report. *J Bone Joint Surg Am.* 1994;76(5):739–43.
- Reiner T, Sorbi R, Müller M, Kretzer JP, Rickert M, Moradi B, et al. Blood Metal Ion Release After Primary Total Knee Arthroplasty: A Prospective Study. *Orthop Surg.* 2020;12(2):396–403.
- Beaupre LA, Jones CA, Saunders LD, Johnston DW, Buckingham J, Majumdar SR, et al. Best practices for elderly hip fracture patients: A systematic overview of the evidence. *J Gen Intern Med.* 2005;20(11):1019–25.
- Chammout G, Kelly-Pettersson P, Hedbeck CJ, Stark A, Mukka S, Sköldenberg O, et al. HOPE-Trial: Hemiarthroplasty Compared with Total Hip Arthroplasty for Displaced Femoral Neck Fractures in Octogenarians. *JB JS Open Access.* 2019;4(2):59. doi:10.2106/JBJS.OA.18.00059.
- Syed M, Hutt N, Shah N, Edge AJ. Hydroxyapatite ceramic-coated femoral components in young patients followed up for 17 to 25 years: an update of a previous report. *Bone Joint J.* 2015;97-B(6):749–54.
- Lie SA, Engesaeter LB, Havelin LI, Vollset S, Furnes O. Early postoperative mortality after 67,548 total hip replacements. *Acta Orthopaedica.* 2002;73(4):392–9.
- DuBose JJ, Teixeira PGR, Shiflett A, Trankiem C, Putty B, Recinos G, et al. American College of Surgeons trauma centre designation and mechanical ventilation outcomes. *Injury.* 2009;40(7):708–12.
- Soong M, Rubash HE, Macaulay W. Dislocation after total hip arthroplasty. *J Am Acad Orthop Surg.* 2004;12(5):314–21.
- Holt G, Smith R, Duncan K, Hutchison JD, Reid D. Gender differences in epidemiology and outcome after hip fracture: evidence from the Scottish Hip Fracture Audit. *J Bone Joint Surg Br.* 2008;90(4):480–3.
- Bhandari M, Devereaux PJ, 3rd PT, Swiontkowski MF, Berry DJ, Haidukewych G, et al. Operative management of displaced femoral neck fractures in elderly patients. *J Bone Joint Surg Am.* 2005;87(9):2122–30.
- Healy W, Iorio R. Total hip arthroplasty: optimal treatment for displaced femoral neck fractures in elderly patients. *Clin Orthop Relat Res.* 2004;(429):43–8.
- Guay J, Parker MJ, Griffiths R, Kopp S. Peripheral Nerve Blocks for Hip Fractures: A Cochrane Review. *Anesth Analg.* 218;126(5):1695–704.
- Keating JF, Grant A, Masson M, Scott NW, Forbes JF. Randomized comparison of reduction and fixation, bipolar hemiarthroplasty, and total hip arthroplasty: Treatment of displaced intracapsular hip fractures in healthy older patients. *J Bone Joint Surg Am.* 2006;88(2):249–60.

Author's biography

Suhas Laxman Kamble, Chief Orthopaedic Surgeon
 <https://orcid.org/0009-0007-7363-7917>

Raj Suhas Kamble, Junior Resident

Pradeep Dnyanprakash Jadhav, Orthopaedic Surgeon

Cite this article: Kamble SL, Kamble RS, Jadhav PD. Evaluation of outcomes in elderly patients undergoing hemiarthroplasty for femoral neck fractures. *IP Int J Orthop Rheumatol* 2024;10(2):58-69.