

Evaluation of functional outcome in fracture neck of femur treated with uncemented bipolar hemiarthroplasty

¹Dr. Ganta Venkata Sai Krishna, DNB Orthopaedics, Assistant Professor, Department of Orthopaedics, Katuri Medical College and Hospital, Guntur, Andhra Pradesh.

²Dr. Anand Kumar Kamsetty, Junior Resident, Orthopaedics, Katuri Medical College and Hospital, Guntur, Andhra Pradesh.

Corresponding Author: Dr. Anand Kumar Kamsetty, Junior Resident, Orthopaedics, Katuri Medical College and Hospital, Guntur, Andhra Pradesh.

How to citation this article: Dr. Ganta Venkata Sai Krishna, Dr. Anand Kumar Kamsetty, “Retrospective study on clinical and laboratory profile of Cleistanthus collinus poisoning”, IJMACR– October– 2026, Volume – 9, Issue – 5, P. No. 630 – 645.

Open Access Article: © 2026 Dr. Ganta Venkata Sai Krishna, et al. This is an open access journal and article distributed under the terms of the creative common’s attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Fracture neck of femur is a major cause of morbidity among older adults and is frequently associated with pain, reduced mobility, and loss of independence. Displaced intracapsular fractures are often treated with hemiarthroplasty because internal fixation may be complicated by non-union, fixation failure, and avascular necrosis. Uncemented bipolar hemiarthroplasty offers immediate mechanical stability without the need for bone cement, although complications such as intraoperative femoral fractures, stem subsidence, and postoperative thigh pain remain important concerns.

Aim: To evaluate the functional outcome and complications of uncemented bipolar hemiarthroplasty in patients with fracture neck of femur.

Materials and Methods: A prospective observational study was conducted in the Department of Orthopaedics at Katuri Medical College and Hospital over 24 months. Thirty patients aged above 50 years with intracapsular fracture neck of femur were included. Three patients underwent hemiarthroplasty following failed internal fixation. Patients were assessed clinically and radiologically before surgery and during postoperative follow-up at 2 weeks, 6 weeks, 3 months, and 6 months. Functional outcomes were assessed using the Harris Hip Score. Intraoperative, early postoperative, late postoperative, and radiological complications were documented.

Results: Thirty patients underwent surgery, of whom 26 completed the 6-month follow-up. The mean age was 68.4 ± 8.7 years, and females constituted 60% of the study population. Domestic falls accounted for 90% of

injuries. The mean Harris Hip Score improved from 61.0 ± 8.7 at 6 weeks to 90.7 ± 6.8 at 6 months. At the final follow-up, 14 patients (53.8%) had excellent outcomes, 9 (34.6%) had good outcomes, 2 (7.7%) had fair outcomes, and 1 (3.8%) had a poor outcome. Independent ambulation was achieved by 18 of the 26 patients (69.2%). Intraoperative femoral cracks requiring cerclage wiring occurred in 3 patients (10%). Other complications included dislocation, surgical-site infection, symptomatic deep vein thrombosis, persistent thigh pain, and radiographic acetabular erosion.

Conclusion: Uncemented bipolar hemiarthroplasty was associated with substantial improvement in hip function over six months in this small observational cohort. However, intraoperative femoral fractures and late implant-related complications emphasize the importance of careful patient selection, appropriate surgical technique, and structured postoperative rehabilitation.

Keywords: Femoral Neck Fracture, Uncemented Bipolar Hemiarthroplasty, Harris Hip Score, Functional Outcome, Complications, Hip Arthroplasty.

Introduction

Fracture neck of femur is a common orthopaedic injury, particularly among older adults with reduced bone mineral density and increased susceptibility to falls. These fractures frequently result in severe pain, impaired mobility, loss of independence, and an increased requirement for medical and rehabilitative care. With increasing life expectancy, the burden of hip fractures is expected to remain a significant challenge for healthcare systems. Early diagnosis, appropriate surgical management, and effective rehabilitation are therefore essential components of treatment^{1,2}. The femoral neck has a unique anatomical and vascular arrangement that influences fracture healing. Intracapsular fractures may

disrupt the retinacular blood supply to the femoral head, increasing the risk of avascular necrosis and non-union. Fracture displacement, poor bone quality, and the mechanical stresses acting across the hip joint further complicate management. Consequently, treatment decisions must consider fracture displacement, physiological age, pre-fracture mobility, comorbidities, cognitive status, and anticipated functional requirements^{1,3}.

The treatment of femoral neck fractures includes internal fixation, hemiarthroplasty, and total hip arthroplasty. Internal fixation is generally considered in selected patients, particularly when preservation of the native femoral head is appropriate. However, displaced intracapsular fractures in older adults may have a substantial risk of fixation failure, non-union, and subsequent reoperation. Arthroplasty is therefore frequently preferred for displaced fractures in appropriately selected older patients because it permits earlier mobilization and avoids dependence on fracture union for functional recovery^{2,3}.

Hemiarthroplasty replaces the femoral head and neck while preserving the native acetabulum. It is commonly used in older patients with displaced femoral neck fractures, particularly when the functional demands or medical circumstances do not favour total hip arthroplasty. Total hip arthroplasty may provide better functional outcomes in selected independently mobile patients, but it can involve a greater operative burden and a different complication profile.^{4,5}

The choice of arthroplasty should be individualized. Patient fitness, pre-injury mobility, cognitive function, life expectancy, bone quality, and the availability of appropriate postoperative rehabilitation are important considerations. No single procedure is optimal for every

patient^{4,5}. Bipolar hemiarthroplasty incorporates an inner articulation between the prosthetic head and an outer polyethylene-containing component. This design aims to permit movement at more than one articulation and potentially reduce the amount of movement occurring directly between the prosthetic head and the native acetabulum.

Compared with unipolar hemiarthroplasty, bipolar designs have been investigated for their potential effects on acetabular erosion, postoperative pain, hip function, and revision surgery. However, the extent of any clinical advantage varies across studies and follow-up periods. Consequently, bipolar hemiarthroplasty should be evaluated in relation to actual functional outcomes and complications rather than implant design alone.^{6,7}

Femoral stem fixation is another important consideration in hemiarthroplasty. Cemented stems achieve fixation using bone cement, whereas uncemented stems depend on initial mechanical stability and subsequent biological fixation between the implant and bone.

Cemented hemiarthroplasty has frequently been associated with reduced postoperative pain and fewer implant-related complications, particularly periprosthetic fractures and loosening. Nevertheless, cement implantation can cause acute physiological disturbances, including bone cement implantation syndrome, which requires appropriate perioperative precautions in susceptible patients.^{8,9}

Uncemented hemiarthroplasty avoids the use of bone cement and may reduce operative time in selected circumstances. However, adequate press-fit fixation can be difficult in osteoporotic bone, and femoral preparation or stem insertion may produce intraoperative fractures. Other potential complications include postoperative thigh pain, stem subsidence, loosening,

and periprosthetic fracture⁸⁻¹⁰. A systematic review and meta-analysis published in 2023 found that cemented hemiarthroplasty was associated with better hip function and pain relief and lower rates of several implant-related complications, although the operation generally took longer⁸. These findings highlight the importance of interpreting outcomes according to patient characteristics and the specific implant and fixation method used.

The success of hemiarthroplasty should be assessed not only by radiographic implant position but also by pain relief, mobility, independence, and the ability to perform activities of daily living. Functional assessment is particularly important in older patients because postoperative recovery is influenced by pre-existing comorbidities, muscle strength, balance, and the effectiveness of rehabilitation.

The Harris Hip Score is a widely used instrument for evaluating hip function. It incorporates pain, function, deformity, and range of motion. Repeated assessment allows clinicians to document postoperative improvement and identify patients who experience persistent disability despite apparently satisfactory radiographs¹¹. Early mobilization is another important component of treatment. Prolonged immobility following hip fracture is associated with complications such as venous thromboembolism, pressure injuries, respiratory problems, muscle wasting, and loss of independence. Orthogeriatric assessment, timely surgery, thromboprophylaxis, and structured rehabilitation are therefore integral to effective hip fracture care.^{12,13} Although hemiarthroplasty facilitates early mobilization, complications can occur during surgery or throughout postoperative recovery. Intraoperative complications include calcar splitting, proximal femoral fractures, excessive blood loss, and

difficulty achieving stable stem fixation. Early postoperative complications include dislocation, wound infection, deep vein thrombosis, pulmonary complications, and delirium.

Late complications include persistent thigh pain, limb-length discrepancy, stem subsidence, aseptic loosening, periprosthetic fracture, and acetabular erosion. Some patients may eventually require conversion to total hip arthroplasty because of persistent pain, symptomatic acetabular erosion, or other implant-related problems.^{9,10,14} These complications may influence recovery independently of the initial fracture. Therefore, comprehensive evaluation should include functional scoring, walking status, clinical examination, radiographic assessment, and documentation of adverse events.

Although published studies have examined different hemiarthroplasty designs and fixation methods, outcomes may vary according to patient characteristics, implant selection, surgical technique, and rehabilitation protocols. Local institutional data are useful for understanding the functional recovery and complications observed in a particular clinical setting. The present study was undertaken to evaluate functional outcomes following uncemented bipolar hemiarthroplasty in patients with fracture neck of femur treated at Katuri Medical College and Hospital. The study also documented intraoperative, early postoperative, and late complications, together with radiological findings during follow-up.

By assessing functional recovery using the Harris Hip Score and documenting implant-related complications, the study aimed to provide a clinically relevant assessment of the outcomes of this procedure in the study population^{15,16}

Materials and Methods

Study Design

A prospective observational study was conducted to evaluate functional outcomes and complications following uncemented bipolar hemiarthroplasty in patients with fracture neck of femur.

Study Setting

The study was conducted in the Department of Orthopaedics, Katuri Medical College and Hospital, Guntur, Andhra Pradesh.

Study Duration

The study was conducted over a period of 24 months.

Sample Size

A total of **30 patients** who underwent uncemented bipolar hemiarthroplasty were included in the study. Patients were recruited consecutively from hospital services after assessment against the eligibility criteria.

Inclusion Criteria

Patients were included if they fulfilled the following criteria.

1. Age above 50 years.
2. Intracapsular fracture neck of femur.
3. Selected cases requiring hemiarthroplasty following failed internal fixation, as determined by the treating orthopaedic team.
4. Willingness to participate and provide written informed consent.

Exclusion Criteria

Patients were excluded if they had any of the following:

1. Significant pre-existing acetabular arthritis or degeneration.
2. Active infection involving the hip or a systemic infection with relevant local involvement.

3. Medical or anaesthetic contraindications to surgery, as determined by the treating team.
4. A neuropathic hip joint.

These criteria follow the eligibility section of the uploaded dissertation.

Preoperative Evaluation

All patients underwent a detailed clinical assessment before surgery.

Clinical assessment

The assessment included:

- History of the injury and mechanism of trauma.
- Pre-injury mobility and functional status.
- Relevant medical and surgical history.
- Associated comorbidities and medication history.
- General and systemic examination.
- Local examination of the affected hip, including pain, limb position, shortening, and external rotation.

Laboratory investigations

The preoperative investigations included:

- Complete haemogram.
- Blood glucose.
- Blood grouping and Rh typing.
- Bleeding time and clotting time, as documented in the institutional protocol.
- Blood urea and serum creatinine.
- Viral markers, including HIV, HBsAg, and HCV.

Cardiopulmonary and radiological evaluation

Investigations included chest radiography and electrocardiography. Echocardiography was performed when indicated or required by the institutional pre-anaesthetic assessment. Radiographs of the pelvis and both hips were obtained to evaluate the fracture and plan the operation.

Surgical Procedure

Patients underwent uncemented modular bipolar hemiarthroplasty according to the departmental surgical protocol.

The operative technique involved appropriate hip exposure, removal of the fractured femoral head, preparation of the femoral canal, trial reduction, and insertion of the selected uncemented femoral stem and bipolar head.

The operative record documented the surgical approach, duration of surgery, estimated blood loss, transfusion requirements, implant-related complications, and any additional procedures required to achieve stability.



Figure 1: Femur Head Extraction



Figure 2: Head Measured with Moore's Ring.



Figure 3: Reaming with rasp



Figure 4: Preparation of Canal



Figure 5: Prosthesis Insertion

Important verification before submission: The uploaded dissertation contains inconsistent descriptions of the surgical approach in different sections. The final thesis should state the approach actually used in the operative records. The present methods section therefore avoids assigning a single approach without verification.

Postoperative Management

Postoperative care included pain management, wound assessment, monitoring for medical and surgical complications, and mobilization according to the patient's clinical condition and intraoperative stability. Patients were encouraged to begin early mobilization with assistance from the treating team and physiotherapy services.

Thromboprophylaxis and other postoperative measures were provided according to institutional policy and individual clinical requirements.

Follow-Up Schedule

Patients were assessed at the following intervals:

- 2 weeks after surgery.
- 6 weeks after surgery.
- 3 months after surgery.

- 6 months after surgery.

Follow-up assessment included pain, hip movements, walking ability, limb-length discrepancy, wound status when relevant, complications, and functional scoring.

Radiographs were reviewed to evaluate stem position, subsidence, loosening, acetabular erosion, and periprosthetic fractures.

Outcome Measures

Primary outcome

The primary outcome was the Harris Hip Score at six months after surgery.

Secondary outcomes

Secondary outcomes included:

1. Change in the Harris Hip Score during follow-up.
2. Walking ability and return to independent ambulation.
3. Operative duration and estimated blood loss.
4. Intraoperative complications.
5. Early postoperative complications.
6. Late postoperative complications.
7. Radiological outcomes, including stem subsidence, loosening, acetabular erosion, and periprosthetic fracture.
8. Requirement for revision surgery or conversion to total hip arthroplasty.

Statistical Analysis

Continuous variables were summarized using means and standard deviations where appropriate. Categorical variables were summarized using frequencies and percentages.

Functional outcomes were assessed at different postoperative intervals. Repeated-measures analysis was reported for complete-case follow-up data, as described in the original dissertation.

A p-value below 0.05 was considered statistically significant.

Ethical Considerations

The study documentation should include the approval number and date issued by the Institutional Ethics Committee, together with the informed-consent procedure. The exact approval details should be transcribed from the original ethics certificate rather than inferred.

Results

A total of 30 patients underwent uncemented bipolar hemiarthroplasty during the study period. At 6 months, complete follow-up data were available for 26 patients; attrition occurred due to 2 deaths and 2 losses to follow-up.

Table 1. Follow-up availability

Follow-up point	Patients available (n)	Cumulative attrition (n)	Reason
2 weeks	30	0	
6 weeks	29	1	Lost to follow-up (n=1)
3 months	27	3	Lost to follow-up (additional n=1), Death (n=1)
6 months	26	4	Death (additional n=1)

Figure 1: Follow-up Patient availability (n)

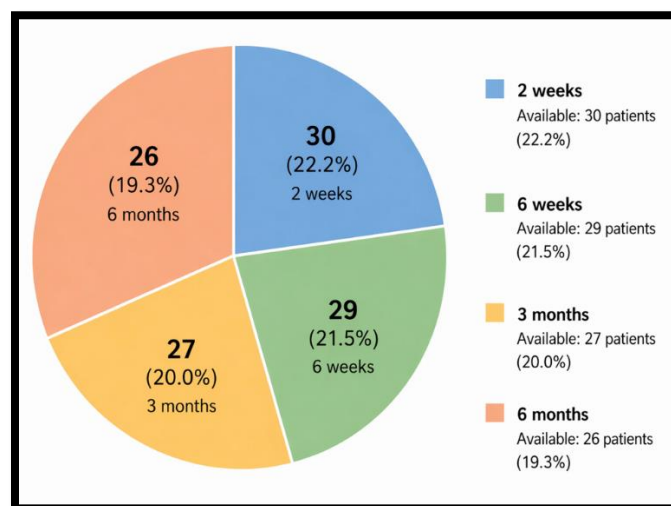
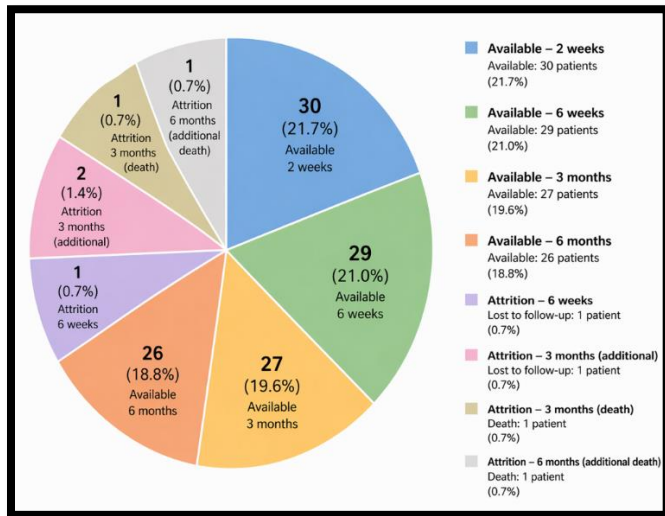


Figure 2: Follow-up patient availability and cumulative attrition up to 6 months.



Baseline demographic and clinical profile Baseline demographic and clinical characteristics are summarized in table 2. The mean age of the cohort was 68.4 ± 8.7 years (range 52-85), with females comprising 60% (18/30). Low-energy domestic falls accounted for 90% (27/30) of injuries. Most cases were displaced intracapsular fractures (Garden III-IV), and 3 patients (10%) underwent hemiarthroplasty as a salvage procedure after failed internal fixation.

Table 2: Baseline characteristics (n=30)

Variable	Value
Age (years), mean $\pm$ SD (range)	68.4 ± 8.7 (52-85)
Sex, n (%)	Male 12 (40%); Female 18 (60%)
Side involved, n (%)	Right 16 (53.3%); Left 14 (46.7%)
Mechanism of injury, n (%)	Domestic fall 27 (90%); RTA 3 (10%)
Fracture type (Garden), n (%)	II: 3 (10%); III: 17 (56.7%); IV: 10 (33.3%)
Hemiarthroplasty after failed internal fixation, n (%)	3 (10%)
Time from presentation/admission to surgery (days), median (IQR)	3 (2-5)

Pre-injury walking status, n (%)	Independent 19 (63.3%); Cane 7 (23.3%); Walker 4 (13.3%)
Comorbidities, n (%)	HTN 14 (46.7%); DM 12 (40%); IHD 4 (13.3%); COPD/Asthma 3 (10%); CKD 2 (6.7%)
ASA grade, n (%)	II: 16 (53.3%); III: 12 (40%); IV: 2 (6.7%)

Note: Garden classification reflects the documented intracapsular fracture pattern; salvage cases (failed fixation) were included in the cohort as per protocol.

Operative details and early postoperative recovery

Most procedures were performed under spinal anaesthesia (80%) using the standard Posterolateral (Southern Moore's) approach as per protocol. Mean duration of surgery was 72 ± 14 minutes, with mean estimated blood loss 250 ± 80 mL. Five patients (16.7%) required blood transfusion. Intraoperative femoral crack/calcar split occurred in 3 patients (10%), managed with cerclage wiring. Early mobilisation was achieved in most cases, with mean time to first stand using a walker of 1.6 ± 0.8 days. Weight bearing as tolerated (WBAT) was initiated in 83.3%, based on intraoperative stability.

Table 3: Intraoperative and early postoperative parameters (n=30)

Parameter	Value
Anaesthesia, n (%)	Spinal 24 (80%); General 6 (20%)
Duration of surgery (min), mean $\pm$ SD	72 ± 14
Estimated blood loss (mL), mean $\pm$ SD	250 ± 80
Blood transfusion, n (%)	5 (16.7%)
Intraoperative complications, n (%)	Calcar split/crack 2 (6.7%); Proximal femur crack 1 (3.3%)----- (10%)
Cerclage wiring used, n (%)	3 (10%)
Time to first stand with walker (days), mean $\pm$ SD	1.6 ± 0.8
Weight bearing protocol, n (%)	WBAT 25 (83.3%); PWB 5 (16.7%)
Hospital stay (days), mean $\pm$ SD	8.1 ± 3.0

Harris Hip Score (HHS) improved progressively across follow-up points, with the largest gains observed between 6 weeks and 6 months, followed by slower improvement thereafter. Mean HHS values over time are shown in Table 5 (Figure 23). At the final follow-up (6 months, n=26), mean HHS was 90.7 ± 6.8 . For inferential assessment of change over time, repeated-measures analysis was applied to the complete-case cohort (n=26) with serial follow-up through 6 months, demonstrating a statistically significant improvement in HHS over time ($p < 0.001$). Pairwise comparisons showed significant improvement from 2 weeks to each subsequent time point (all $p < 0.001$), while the change from 3 to 6 months was small and not statistically significant ($p = 0.18$). At 6 months (n=26), functional grading was: Excellent 14 (53.8%), Good 9 (34.6%), Fair 2 (7.7%), and Poor 1 (3.8%). Independence in ambulation increased over follow-up; at 6 months, 18/26 (69.2%) were independently ambulant, 6/26 (23.1%) used a cane, and 2/26 (7.7%) used a walker.

Table 4. Harris Hip Score (HHS) trend

Time point	n*	Mean HHS $\pm$ SD
2 weeks	30	61.0 ± 8.7
6weeks	29	72.3 ± 9.5
3 months	28	82.5 ± 8.3
6 months	27	87.6 ± 7.6

Complications were recorded as intraoperative, early postoperative (≤ 30 days), and late (>30 days). Early events are reported out of n=30 surgeries, while late events and radiographic late findings are reported out of n=26 patients available at 6 months. Most complications were managed without stem revision.

Table 5: Complications profile

Category	Complication	n (%)
Intraoperative (n=30)	Calcar split/femoral crack requiring cerclage	3 (10.0%)
Early ≤ 30 days (n=30)	Dislocation (closed reduction)	1 (3.3%)
	Superficial surgical site infection	2 (6.7%)
	Deep infection (debridement + antibiotics)	1 (3.3%)
	Symptomatic DVT	1 (3.3%)
	Delirium	2 (6.7%)
	Pneumonia	1 (3.3%)
Late >30 days (n=26)	Periprosthetic fracture after fall (ORIF)	1 (3.8%)
	Persistent thigh pain (>3 months)	3 (11.5%)
	Clinically relevant LLD (>1 cm)	2 (7.7%)
	Radiographic acetabular erosion	2 (7.7%)
	Conversion to THA (symptomatic erosion)	1 (3.8%)
Mortality (n=30)	Deaths by 6months	2 (6.7%)

Radiological outcomes

Two cases showed stem subsidence >5 mm that remained non-progressive, and no cases demonstrated radiological loosening.

Table 6: Radiological outcomes (n=26 at 6 months)

Radiological parameter	n/N (%)
Stem subsidence >5 mm (non-progressive)	2/26 (7.7%)
Radiological loosening (progressive radiolucent lines/varus migration)	0/26 (0%)
Periprosthetic fracture (postoperative)	1/26 (3.8%)
Acetabular erosion features	2/26 (7.7%)
Stem subsidence >5 mm (non-progressive)	2/26(7.7%)

Exploratory subgroup snapshots On exploratory comparison, patients aged ≤ 70 years demonstrated a higher mean 6-months HHS than those aged >70 years (92.4 ± 5.9 vs 88.2 ± 7.6), though this did not reach statistical significance ($p = 0.08$). Patients undergoing hemiarthroplasty after failed fixation (n=3) showed a lower mean 6-months HHS compared with primary fracture cases (86.7 ± 7.1 vs 91.3 ± 6.6 ; $p = 0.12$). These findings were treated as descriptive due to small subgroup numbers.

Discussion

The present study evaluated functional recovery and complications following uncemented bipolar hemiarthroplasty in 30 patients with fracture neck of femur. At six months, 26 patients had completed follow-up, while two deaths and two losses to follow-up were documented. The principal finding was an improvement in hip function during the postoperative period. The mean Harris Hip Score increased from 61.0 ± 8.7 at six weeks to 90.7 ± 6.8 at six months. Excellent or good outcomes were recorded in 23 of the 26 patients completing six-month follow-up. These findings suggest that substantial functional recovery can occur following uncemented bipolar hemiarthroplasty. Nevertheless, because the study did not include a comparison group, the results cannot establish that uncemented fixation is superior to cemented hemiarthroplasty or another treatment method.¹⁻³

Clinical Images



Figure 6: Pre-op x-rays

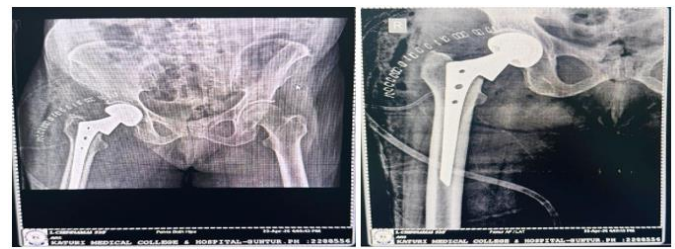


Figure 7: Post-op x-rays



Figure 8: post-op wound dressing

Clinical Images



Figure 9: Pre-op x-rays



Figure 10: Post-op x-rays



Figure 11: Post-op scar

Functional Recovery After Hemiarthroplasty

Functional recovery is a major determinant of successful treatment following a femoral neck fracture. Pain relief, early standing, progressive walking, and restoration of activities of daily living are particularly important in older patients.

In the present study, the mean Harris Hip Score improved substantially over six months, and 69.2% of patients completing follow-up achieved independent ambulation. This improvement is consistent with the general role of arthroplasty in facilitating early functional recovery after displaced intracapsular fractures.

However, recovery after hip fracture depends on more than implant fixation. Pre-fracture mobility, comorbidities, cognition, muscle strength, and access to rehabilitation may influence the final functional result.

These factors should be considered when interpreting the outcomes of the present cohort^{1,2,11,12}

Relevance of Bipolar Hemiarthroplasty

Bipolar hemiarthroplasty is designed to permit movement between the inner prosthetic head and the outer component, potentially reducing movement at the prosthesis-acetabulum interface.

Evidence comparing bipolar and unipolar hemiarthroplasty has reported differences in some outcomes, including pain and acetabular erosion, although the magnitude and consistency of these differences vary with follow-up duration and study design.^{6,7}

The present study evaluated only uncemented bipolar hemiarthroplasty. Therefore, its findings describe the outcomes of this procedure but cannot demonstrate whether a bipolar prosthesis provides better function or fewer complications than a unipolar prosthesis.

Uncemented Fixation and Implant-Related Complications

Uncemented stems depend on appropriate initial mechanical stability and subsequent biological fixation. This approach avoids bone cement, but obtaining a stable press fit can be challenging in patients with osteoporosis or compromised proximal femoral bone.

Three patients in the present study experienced intraoperative calcar splitting or proximal femoral cracking that required cerclage wiring. This finding highlights the importance of careful femoral canal preparation, appropriate implant sizing, and recognition of intraoperative fracture risk.

A systematic review and meta-analysis by Li et al. reported that uncemented hemiarthroplasty was associated with a greater risk of periprosthetic fracture and stem-related complications than cemented fixation,

although uncemented procedures generally required less operative time.⁹

Similarly, other meta-analyses have found lower rates of certain implant-related complications with cemented stems, while emphasizing that the overall choice of fixation must account for patient characteristics and perioperative risk.^{8,10}

The intraoperative fractures observed in the present study are therefore clinically relevant. However, the small sample size does not allow a reliable estimate of the relative risk compared with cemented hemiarthroplasty.

Comparison of Cemented and Uncemented Hemiarthroplasty

The choice between cemented and uncemented fixation remains an important issue in the management of femoral neck fractures.

In a systematic review and meta-analysis published in 2023, Li and colleagues found that cemented hemiarthroplasty was associated with better hip function, improved pain outcomes, and lower rates of several complications, including periprosthetic fracture and stem subsidence or loosening. Cemented procedures generally required longer operative time.⁸

These findings are relevant when interpreting the present study. Although patients treated with uncemented bipolar hemiarthroplasty experienced substantial functional improvement, the observed intraoperative fractures and late implant-related events indicate that satisfactory functional recovery does not eliminate mechanical risks.

The present study cannot determine which fixation method offers the best balance of function and complications because it included no cemented control group. The findings should therefore be interpreted as a

description of outcomes in the treated cohort rather than evidence of comparative superiority.⁸⁻¹⁰

Early Mobilization and Rehabilitation

Early mobilization is an essential component of postoperative hip fracture care. Prolonged immobility may contribute to muscle wasting, venous thromboembolism, pressure injuries, respiratory complications, and functional decline.

In the present study, the mean time to first standing with a walker was 1.6 ± 0.8 days. Weight bearing as tolerated was initiated in 25 patients, depending on the clinical and intraoperative circumstances.

These findings indicate that early postoperative mobilization was feasible for most patients. However, mobilization outcomes reflect the combined effects of surgery, perioperative medical management, pain control, and rehabilitation. They cannot be attributed solely to the type of femoral stem used.¹¹⁻¹³

Postoperative Complications

The present study documented several early postoperative complications, including dislocation, superficial and deep infection, symptomatic deep vein thrombosis, delirium, and pneumonia.

These complications are clinically important because they may delay mobilization and affect the recovery of independence. Their occurrence also illustrates the importance of comprehensive perioperative care in older patients undergoing hip fracture surgery.

The study included only 30 patients, so the percentages associated with individual complications are sensitive to small changes in event counts. In addition, the absence of a comparison group prevents assessment of whether the observed complication rates were higher or lower than those associated with alternative procedures.¹²⁻¹⁴

Late Complications and Radiological Outcomes

Late complications included persistent thigh pain, limb-length discrepancy, periprosthetic fracture, and acetabular erosion. Radiological assessment also identified stem subsidence greater than 5 mm in two patients, while loosening was not observed during the reported follow-up.

These findings emphasize that successful early mobilization does not necessarily indicate complete long-term implant success. Persistent pain, stem migration, acetabular changes, and periprosthetic fractures may affect mobility and quality of life after the initial recovery period.

The six-month follow-up provides useful information about early functional outcomes, but it is insufficient to establish the long-term durability of the implant or the eventual incidence of acetabular erosion and revision surgery^{6,7,14}

Clinical Implications

The findings of the present study suggest that uncemented bipolar hemiarthroplasty can provide substantial functional improvement in appropriately selected patients with fracture neck of femur.

Nevertheless, the documented intraoperative fractures and late complications highlight the importance of patient selection, surgical planning, appropriate implant sizing, careful femoral preparation, and structured rehabilitation.

The decision to use an uncemented stem should be individualized rather than based on the assumption that avoiding bone cement necessarily improves overall outcomes. Available evidence indicates that cemented and uncemented fixation have different advantages and risks, which must be balanced against the patient's physiological condition and bone quality^{8-10,15,16}.

The study used a prospective observational design and included a defined postoperative follow-up schedule. Functional outcomes were assessed using the Harris Hip Score, and both clinical complications and radiological findings were documented.

The reporting of deaths and losses to follow-up also makes the extent of attrition visible when interpreting six-month outcomes.

These features provide a useful description of postoperative recovery in the study population. Nevertheless, they do not remove the limitations associated with the small sample size and absence of a comparison group^{15,16}.

Functional Outcome and Recovery

The functional outcome after hemiarthroplasty should be interpreted in the context of the patient's overall recovery following hip fracture. Although implant stability is important, restoration of mobility also depends on pre-injury functional status, associated medical conditions, pain management, and rehabilitation.

The present study demonstrated improvement in Harris Hip Score during six months of follow-up. This finding is clinically encouraging, but it should not be interpreted as evidence that every patient will regain their pre-fracture level of independence. Functional recovery varies considerably among older adults, particularly those with substantial comorbidity or reduced baseline mobility^{17,18}.

Choice of Fixation Method

The choice between cemented and uncemented fixation requires consideration of both mechanical and physiological risks. Cemented stems may provide reliable fixation and reduce some implant-related complications, whereas uncemented stems avoid

cement-related physiological disturbances but may pose challenges in osteoporotic femora.

The intraoperative femoral fractures documented in the present study reinforce the importance of careful femoral preparation. However, the study's design does not permit a direct comparison of complication rates between fixation methods^{19,20}.

Long-Term Implant Performance

Late complications may develop after the period of early functional recovery. Acetabular erosion, progressive stem migration, persistent thigh pain, and periprosthetic fractures may compromise the benefits achieved during the initial postoperative months.

Because the present study followed patients for six months, its findings primarily describe early and intermediate recovery. Longer follow-up would be required to evaluate implant survival, delayed acetabular changes, and the cumulative requirement for revision surgery^{21,22}.

Implications for Future Research

Future studies should include larger patient populations and longer follow-up periods. Comparative studies involving cemented and uncemented bipolar hemiarthroplasty would be particularly useful for evaluating differences in function, pain, intraoperative fractures, subsidence, and revision surgery.

Studies should also account for pre-fracture mobility, bone quality, age, comorbidities, and rehabilitation exposure. Standardized outcome assessment and transparent reporting of deaths and missing follow-up data would improve the comparability of findings across institutions^{23,24}.

Conclusion

Uncemented bipolar hemiarthroplasty was associated with substantial improvement in hip function over six

months, with most patients completing follow-up achieving good or excellent functional outcomes. However, intraoperative femoral fractures and late complications highlight the need for careful patient selection, meticulous surgical technique, structured rehabilitation, and longer-term follow-up.

Limitations

1. The study included only 30 patients, limiting statistical power and the precision of complication estimates.
2. The single-centre observational design and absence of a comparison group prevent conclusions about the superiority of uncemented hemiarthroplasty over alternative procedures.
3. Follow-up was limited to six months, and two deaths and two losses to follow-up reduced the number of patients available for final functional assessment.

Declarations

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

Authors' contributions: Author equally contributed the work.

References

1. Fernandez MA, Achten J, Parsons N, Griffin XL, Png ME, Gould J, et al.; WHiTE 5 Investigators. Cemented or uncemented hemiarthroplasty for intracapsular hip fracture. *N Engl J Med*. 2022;386(6):521-530. doi:10.1056/NEJMoa2108337
2. American Academy of Orthopaedic Surgeons. Management of hip fractures in older adults: evidence-based clinical practice guideline. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2021.

3. Parker MJ, Gurusamy K. Internal fixation versus arthroplasty for intracapsular proximal femoral fractures in adults. *Cochrane Database Syst Rev*. 2006;(4):CD001708.
4. HEALTH Investigators, Bhandari M, Einhorn TA, Guyatt G, Schemitsch EH, Zura RD, et al. Total hip arthroplasty or hemiarthroplasty for hip fracture. *N Engl J Med*. 2019;381(23):2199-208.
5. Lewis SR, Macey R, Eardley WG, Pattison G, Cook J, Griffin XL. Surgical interventions for treating intracapsular hip fractures in older adults: a network meta-analysis. *Cochrane Database Syst Rev*. 2022;2:CD013404.
6. Papavasiliou KA, et al. Comparative outcomes of unipolar and bipolar hemiarthroplasty for femoral neck fractures: a systematic review and meta-analysis of randomized controlled trials.
7. Jia Z, Ding F, Wu Y, Li W, Li H, Wang D. Unipolar versus bipolar hemiarthroplasty for displaced femoral neck fractures: a systematic review and meta-analysis of randomized controlled trials. *Int Orthop*. 2015;39(4):685-94.
8. Li H, et al. The comparison between cemented and uncemented hemiarthroplasty in patients with femoral neck fractures: a systematic review and meta-analysis of randomized controlled trials. *Orthop Surg*. 2023. doi:10.1111/os.13716.
9. Li L, et al. Cemented versus uncemented hemiarthroplasty for the management of femoral neck fractures in the elderly: a meta-analysis and systematic review. *Arch Orthop Trauma Surg*. 2021;141(6):1043-55. doi:10.1007/s00402-020-03737-4.
10. Liu B, Li A, Wang J, Wang H, Zhai G, Ma H, et al. Cemented versus uncemented hemiarthroplasty for elderly patients with displaced fracture of the femoral neck: a PRISMA-compliant meta-analysis of randomized controlled trial. *Medicine (Baltimore)*. 2020;99(33):e21731. doi:10.1097/MD.00000000000021731.
11. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am*. 1969;51(4):737-55.
12. National Institute for Health and Care Excellence. Venous thromboembolism in over 16s: reducing the risk of hospital-acquired deep vein thrombosis or pulmonary embolism. NICE guideline NG89. London: NICE; 2018. Updated 2019.
13. British Orthopaedic Association. The care of patients with fragility fracture: the best practice tariff and hip fracture standards. London: British Orthopaedic Association.
14. Li N, Zhong L, Wang C, Xu M, Li W, et al. Cemented versus uncemented hemi-arthroplasty for femoral neck fractures in elderly patients: a systematic review and meta-analysis of randomized controlled trials. *Medicine (Baltimore)*. 2020;99(8):e19039. doi:10.1097/MD.00000000000019039.
15. Kabelitz M, et al. Hemiarthroplasty in very elderly patients with femoral neck fractures: early radiographic outcomes and complications.
16. Imam MA, et al. Cemented versus uncemented hemiarthroplasty for femoral neck fractures: a systematic review and meta-analysis.
17. Bhandari M, Swiontkowski M. Management of acute hip fracture. *N Engl J Med*. 2017;377(21):2053-62.

18. Dyer SM, Crotty M, Fairhall N, Magaziner J, Beaupre LA, Cameron ID, et al. A critical review of the long-term disability outcomes following hip fracture. *BMC Geriatr*. 2016;16:158.
19. Fernandez MA, Griffin XL, Costa ML. Management of hip fracture. *Br Med Bull*. 2015;115(1):135-44.
20. Olsen F, Kotyra M, Houltz E, Ricksten SE. Bone cement implantation syndrome in cemented hemiarthroplasty for femoral neck fracture: incidence, risk factors, and effect on outcome. *Br J Anaesth*. 2014;113(5):800-6.
21. Gjertsen JE, Engesæter LB, Furnes O, Havelin LI, Steindal K, Vinje T, et al. The Norwegian Hip Fracture Register: experiences after the first 2 years and 15,576 reported operations. *Acta Orthop*. 2008;79(5):583-93.
22. Rogmark C, Leonardsson O. Hip arthroplasty for the treatment of displaced fractures of the femoral neck in elderly patients. *Bone Joint J*. 2016;98-B(3):291-7.
23. Samaheen A, et al. The health-related quality of life for cemented versus uncemented hemiarthroplasty in elderly patients with femoral neck fractures: a systematic review and meta-analysis of randomized controlled trials. *Orthop Surg*. 2025;17(2):361-72. doi:10.1111/os.14339.
24. National Institute for Health and Care Excellence. Hip fracture: management. NICE guideline CG124. London: NICE; 2011. Updated 2023.