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Indian Journal of Orthopaedics Surgery

Journal homepage: <https://www.ijos.co.in/>

## Case Series

## Role of Bipolar hemiarthroplasty in geriatric patients with hip implant in failure

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## ARTICLE INFO

## Article history:

Received 01-03-2024

Accepted 09-03-2024

Available online 08-06-2024

## Keywords:

Implant failure  
Hemiarthroplasty  
Bipolar  
Modular  
Geriatric

## ABSTRACT

**Background:** The incidence of different hip implants failing in situ, irrespective of the cause, is on the rise. On the other side, its management remains widely understudied. Bipolar hemi-arthroplasty contributes to the salvage of failed trochanteric fracture fixation. Managing such cases necessitates skills related to complex trauma and advanced arthroplasty. It is crucial for the surgeon to comprehend and individualize surgical modalities based on the patient, fracture, and implant.

This case series presents three different cases involving three distinct implants undergoing failure and their management through Bipolar Hemi-arthroplasty.

**Cases:** Three previously operated hip fracture cases with three different implants in the elderly population presented with implant in situ failure. They were surgically managed with a cemented modular bipolar prosthesis. Following this, a postoperative protocol was maintained, and the postoperative outcome was graded using the Hip scoring system.

**Conclusion:** Bipolar arthroplasty enhances the long-term outcome of hemiarthroplasty due to reduced wear of the metal–cartilage interface. It stands as a viable, valid, and sound surgical modality compared to other surgical and non-surgical options.

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## 1. Introduction

Cemented modular bipolar hemiarthroplasty is a commonly utilized surgical procedure for hip fractures, particularly in elderly individuals. This intervention involves replacing the fractured femoral head with a modular implant, addressing both the proximal femoral fracture and potential underlying degenerative conditions.

The modular structure of the implant comprises two essential components: the femoral stem and the bipolar head. Typically crafted from robust materials such as titanium or stainless steel, the femoral stem is firmly cemented into the femur, ensuring stability and facilitating early weight-bearing, which is crucial for postoperative

recovery. The bipolar head, articulating within the acetabular cup, enables a dual-motion system. This design mimics the natural movement of the hip joint, minimizing friction and wear on the implant.

The bipolar construct proves especially advantageous in elderly patients with compromised soft tissues and diminished muscle strength, allowing a more forgiving range of motion. Immediate stability is a prominent advantage of cemented fixation, particularly vital in the elderly population where bone quality might be compromised.<sup>1,2</sup> Cement augmentation strengthens the implant's anchorage, reducing the risk of early postoperative complications.

The selection of cemented modular bipolar hemiarthroplasty over other hip arthroplasty techniques is influenced by factors such as patient age, bone quality,

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and surgeon preference. Evaluating the patient's overall health and functional status is crucial in determining the most suitable surgical approach. While the procedure has demonstrated success in enhancing pain relief and functional outcomes, the long-term durability of the implant can vary. Factors such as patient compliance, bone quality, and implant positioning contribute to the overall success of the surgery.

Postoperative care and rehabilitation play a crucial role in achieving optimal outcomes. Early mobilization, physiotherapy, and effective pain management significantly contribute to the patient's recovery and functional restoration.

## 2. Case Reports

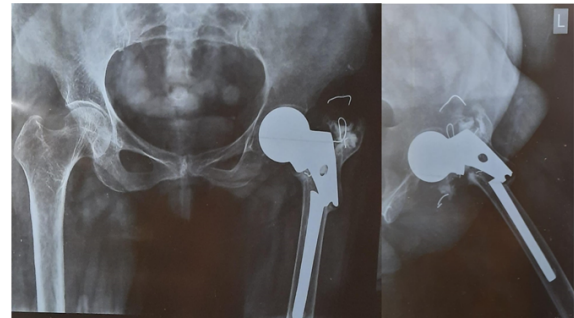
### 2.1. Case 1

A 68-year-old female presented with complaints of left groin pain and difficulty weight-bearing for the past two years, following a history of a fall on her left hip around two years ago. Subsequent to the fall, the patient experienced an inability to bear weight, accompanied by sharp shooting pain in the left groin, exacerbated by movement and weight-bearing, and relieved by rest and medication. The patient was unable to perform her activities of daily living and sought conservative treatment at a local general physician's clinic with medication. After a brief period of two months, as the pain intensity decreased, the patient could partially bear weight and walk with the assistance of a walker. However, she remained unable to walk without aid. There was no history of any other trauma to the left hip following this incident. The patient had undergone left hip hemiarthroplasty ten years ago.

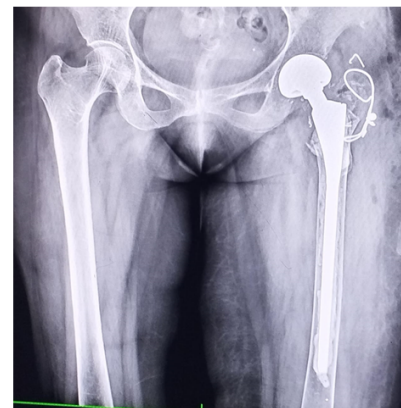
Upon examination, the patient exhibited restricted left hip range of movements with bipedal assisted gait using a walker and had a 5 mm shortening in the left lower limb. Routine investigations, along with ESR and CRP, yielded insignificant results. Radiographs of the pelvis with both hips revealed a Vancouver type A3 peri-prosthetic fracture of the left greater trochanter and lesser trochanter of the femur with a type IIC broken prosthesis, according to the classification by Elsayed Morsi et al.<sup>3</sup> The recommended course of action was a single-stage left-sided revision, hip hemiarthroplasty with a long stem, cemented, modular bipolar prosthesis.

After obtaining written informed consent and explaining the surgical procedure, the patient underwent induction under spinal with epidural anesthesia. The surgery was performed in the lateral position using the postal battle approach. Following exposure of the implant proximal head, it was extracted. Callus around the peri-prosthetic fracture was removed, and fracture edges were refreshed. Subsequently, the distal fragment of the prosthesis was removed from the femoral canal. Preparation was carried

out using reamers of appropriate size and standards, and a long stem prosthesis with a similar head size and standards was selected. The acetabular articular surface was examined intraoperatively for any loose bodies, disruption, erosion, and continuity. Limb length assessment was conducted intraoperatively, and a femoral long stem, modular bipolar prosthesis (head size 43mm, stem 10mm x 260mm) was then cemented. The fractured greater trochanteric fragment was reduced and fixed with a tension band wire. Layered closure was performed after washing. Antibiotic prophylaxis was administered with IV antibiotics, and low molecular weight heparin was given for five days. Appropriate analgesia was administered through an epidural catheter.



**Figure 1:** AP and Lat radiographs showing Vancouver type A3 peri-prosthetic fracture of left greater trochanter and lesser trochanter of the femur with type IIC broken prosthesis

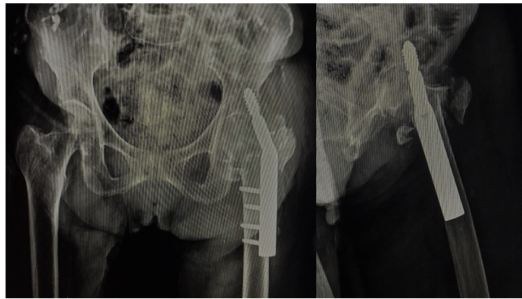


**Figure 2:** AP radiograph showing immediate post operative hip hemiarthroplasty with long stem, cemented, modular bipolar prosthesis

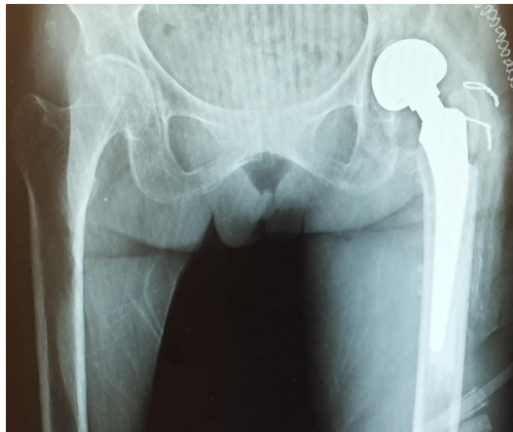
Non-weight-bearing mobilization commenced with a walker on day five, with partial weight-bearing initiated after one week. Post-operative x-rays demonstrated restoration of the rotational center of the hip with good implant stability and no implant loosening. After a three-month follow-up, the patient was pain-free and walking comfortably without any aid, with a Harris hip score of 92.

2.2. Case 2

A 80-year-old female was brought in with complaints of left-sided hip pain following a slip and fall during her physiotherapy. Approximately one month ago, she was apparently well when she experienced a fall on her left hip and underwent surgery for a hip intertrochanteric fracture with dynamic hip screw plate fixation. Two days prior to her current presentation, she had initiated partial weight-bearing with the assistance of a walker. Unfortunately, during this rehabilitation, her hand slipped, resulting in another fall and trauma to her left hip. Subsequently, she developed sharp shooting pain in the left hip and difficulty weight-bearing, leading to her presentation in the emergency department.



**Figure 3:** AP and Lat radiograph showing basi-cervical neck of femur fracture with implant cut out from the femur head and migrated superiorly



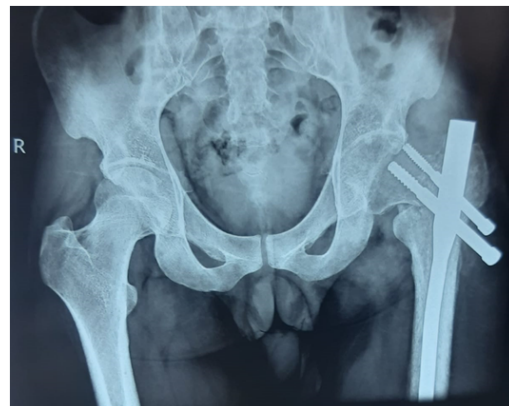
**Figure 4:** AP radiograph showing immediate post operative hip hemiarthroplasty with cemented modular bipolar prosthesis

Upon examination, the patient exhibited visible external rotation, deformity of the lower left limb with trochanteric tenderness, crepitus, and a 1 cm shortening of the left lower limb. However, she did not manifest any distal neurovascular complications. Radiographs indicated a basi-cervical neck of femur fracture with the implant cut out from the femur head and migrated superiorly. The patient underwent surgery for implant removal, followed by

a cemented modular bipolar hemiarthroplasty, employing similar post-operative protocols as mentioned in case 1. At the three-month follow-up, the patient was walking without any aid, experiencing a pain-free condition, without limb length discrepancy, and reported good subjective satisfaction. The Harris hip score was 86.

2.3. Case 3

A 68-year-old male presented with complaints of left groin pain and painful weight-bearing for the past three years. Three years ago, the patient was well until he experienced a slip and fall in the bathroom, resulting in trauma to the left hip. He underwent proximal femur nailing three years ago, followed by rehabilitation. Subsequently, the patient resumed his daily activities and occupation. However, two months ago, the patient had a history of repeated trauma to the left hip, leading to similar complaints of sharpshooting hip pain and an inability to bear weight.



**Figure 5:** AP and Lat radiograph showing basi-cervical neck of femur fracture with backing out of the femoral screws



**Figure 6:** AP radiograph showing immediate post operative hip hemiarthroplasty with cemented modular bipolar prosthesis

Upon examination, the patient exhibited trochanteric tenderness, crepitus, a painful restricted range of movement, and a 1 cm shortening of the left lower limb. There were no distal neurovascular complications. Radiographs suggested a basi-cervical fracture with the backing out of the femoral screws. The patient underwent implant removal, followed by cemented modular bipolar hemiarthroplasty, employing similar protocols as mentioned in case 1. At the three-month follow-up, the patient was walking with a stick, without any limb length discrepancy, and reported good subjective satisfaction. The Harris hip score was 74.

### 3. Discussion

In the aforementioned cases, it is imperative to underscore the mechanisms contributing to implant failure, including trauma, insufficient reduction of fractures, and metal fatigue secondary to delayed union or nonunion. Bipolar hemi-arthroplasty proves instrumental in salvaging failed trochanteric fracture fixation.

Several determining factors come into play when deciding on the appropriate course of hemi-arthroplasty, such as the anatomical site of the nonunion, the quality of the remaining bone and articular cartilage, and patient-related factors like age and activity level. In cases involving younger patients with a well-preserved hip joint, the preferred treatment typically involves revision internal fixation with or without bone grafting, rather than resorting to arthroplasty. Conversely, in older patients with poor bone stock or a severely damaged hip joint, arthroplasty becomes a viable option for restoring function and alleviating pain, allowing for early rehabilitation.

Additional considerations in surgical management encompass factors like broken hardware, deformity, and femoral bone defects. Leg length discrepancy, abductor dysfunction, and bone loss emerge as common technical challenges encountered during hip arthroplasties.

In the specific cases discussed, the choice of performing cemented bipolar hemiarthroplasty was driven by the necessity to address the removal of the broken implant and the insufficient bone stock of the femoral head. The common technical difficulties encountered during hip arthroplasties include leg length discrepancy, abductor dysfunction, and bone loss.<sup>4</sup> Similarly, while resection arthroplasty offers the advantage of bypassing complications associated with conventional arthroplasties related to prosthetics and cementing, this advantage is counterbalanced by the absence of long-term improvements in rehabilitation and early mobilization, subsequently leading to prolonged bed stays and an increased risk of complications associated with non-ambulatory status.<sup>5-7</sup> Alternative surgical modalities include total hip arthroplasty and resection arthroplasty. However, secondary total hip arthroplasty in instances of implant failure is associated with elevated complication and loosening rates when compared to primary total hip

arthroplasty. A study by Rogmark et al.<sup>8</sup> concluded that patients over the age of 80, requiring ambulatory assistance and experiencing mental confusion, are best treated with hemiarthroplasty as opposed to total hip arthroplasty.

### 4. Conclusion

Hemiarthroplasty facilitates earlier mobilization in older patients when compared to revision internal fixation. Bipolar arthroplasty enhances the long-term outcome of hemiarthroplasty by minimizing wear of the metal–cartilage interface. It stands as a viable, valid, and sound surgical modality in comparison to other surgical and non-surgical options.

### 5. Sources of Funding

No funding sources.


### 6. Conflict of Interest


None declared.


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**Cite this article:** Katkar MR, Kotresh SN, Kumarjuvekar SA, Mangwalkar VA, Kakad MA. Role of Bipolar hemiarthroplasty in geriatric patients with hip implant in failure. *Indian J Orthop Surg* 2024;10(2):169-173.