

## Management of Avascular Necrosis of the Femoral Head by Bipolar Hemiarthroplasty: A Prospective Study

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### Abstract

Bipolar hemiarthroplasty (BHA) remains the effective surgical option for avascular necrosis (AVN) of femoral head, that claiming satisfactory and unsatisfactory surgical outcomes. The current study was designed to evaluate the functional outcome of bipolar hemiarthroplasty in cases with avascular necrosis in femoral head. This prospective study consists of 20 cases with avascular necrosis of femoral head attending outpatient department of Orthopedics,  $\geq 40$  years of age. Regular follow-ups were conducted postoperatively at 3 months and end of one year. During each follow-up, cases were radiologically assessed and clinically evaluated by using Harris hip score. At 3<sup>rd</sup> month follow up, 10% had excellent results, 60% had good results and 30% reported poor results. At one year of follow-up, 40% had excellent results and 60% reported good results. None of the cases reported poor outcome at one year of follow up. Bipolar hemiarthroplasty has a definite role in the management of patient with disabling disorders of AV of head of femur. It was effective in relieving pain and restoration of function.

**Keywords:** Bipolar hemiarthroplasty, avascular necrosis, head of femur, postoperative follow-up, Harris Hip Score.

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### Introduction

Avascular necrosis (AVN) of the femoral head is caused by diminished vascular supply that destructs bone cells[1]. It is predominantly affecting younger population between 33 to 38 years, leading to hip arthritis[2]. Alcohol consumption, corticosteroid intake, sickle cell disease and joint fractures are the common causes. Moreover, 30% of cases have idiopathic background[3]. India reporting constant

growth in joint replacement surgeries and reports has been suggested that country may claim highest hip arthroplasties from the period of 2020 to 2026 worldwide[4,5].

Early stage diagnosis is the key factor to achieve successful outcome in both conventional and arthroplasty treatment methods[6]. Management of Ficat Arlet

stage I and IIA condition with core decompression with or without secondary bone grafting procedure gained favourable results. Total hip arthroplasty (THA) and bipolar hemiarthroplasty (BHA) is preferable treatment modalities for several hip joint pathologies including Ficat Arlet stage III and IV AVN. However, THA has limitations in terms of subsequent requirement for a revision[7]. Bipolar implants for osteonecrosis of femoral head and fracture to neck of femur was pioneered by Bateman JE and Giliberty RP to mitigate adverse events of conventional metallic proximal femoral endoprosthesis[8,9]. Few studies have reported satisfactory results, but other reported unsatisfactory in terms of adverse events like Groin pain, loss of mobility in bipolar bearing, acetabular protrusion and erosion for BHA in the management of AVN femoral head[10-12].

The efficacy and success rate of BHA in AVN in femoral head is controversial. Thorough knowledge on effective treatment modalities of AVN femoral head is important for orthopedic surgeon. In this regard the present study was designed to evaluate the functional outcome of bipolar hemiarthroplasty in cases with avascular necrosis in femoral head.

### Material and Methods

This prospective study was conducted in Department of Orthopaedics, Government Medical College and Hospital, Nalgonda during August 2020 to January 2022. A total of 20 cases with avascular necrosis of femoral head attending outpatient department of Orthopedics at Government Medical College, Nalgonda,  $\geq 40$  years of age were recruited. Written informed consent was obtained from all the

participants and study protocol was approved by institutional ethics committee.

**Inclusion criteria:** Cases with avascular necrosis of head of femur above 40 years of age, with idiopathic AVN, symptoms of AVN for more than one year and Ficat and ARLT stage-III

**Exclusion criteria:** Case below 40 years of age, with AVN with symptoms less than one year, post traumatic AVN, Ficat and ARLT stage-I, II and IV.

All participants were underwent detailed clinical examination. Laboratory analysis was done for C-reactive protein, ESR, serum creatinine, and blood urea. Cases were radiologically evaluated in X-ray pelvis with both hips AP view, cross table lateral view of hip joint, X-ray affected hip with thigh anteroposterior and lateral view and MRI pelvis with both hips.

### Surgical technique:

Surgical procedure was performed under regional anaesthesia including spinal or epidural anaesthesia. The modified Gibson approach was preferred in lateral decubitus position. After exposing the short rotators incision was taken from insertion of Piriformis to the trochanter. Capsule incision was extended up to the lesser trochanter. The neck of femur was sectioned at the predetermined levels with the saw followed by extraction of the head in dislocating position of hip in flexion, adduction and internal rotation. A modular prosthesis was preferred in young and elderly cases. Once the bipolar cup is fitted on the morsetaper of modular stem the whole unit was relocated by traction abduction and external rotation of the Limb. Stability of the joint was evaluated before closure of the wound.

### Assessment of Functional outcome:

The function outcome was assessed by using Harris hip score:

Harris Hip Score	Outcome
<70	Poor
71-79	Fair
80-89	Good

≥90	Excellent
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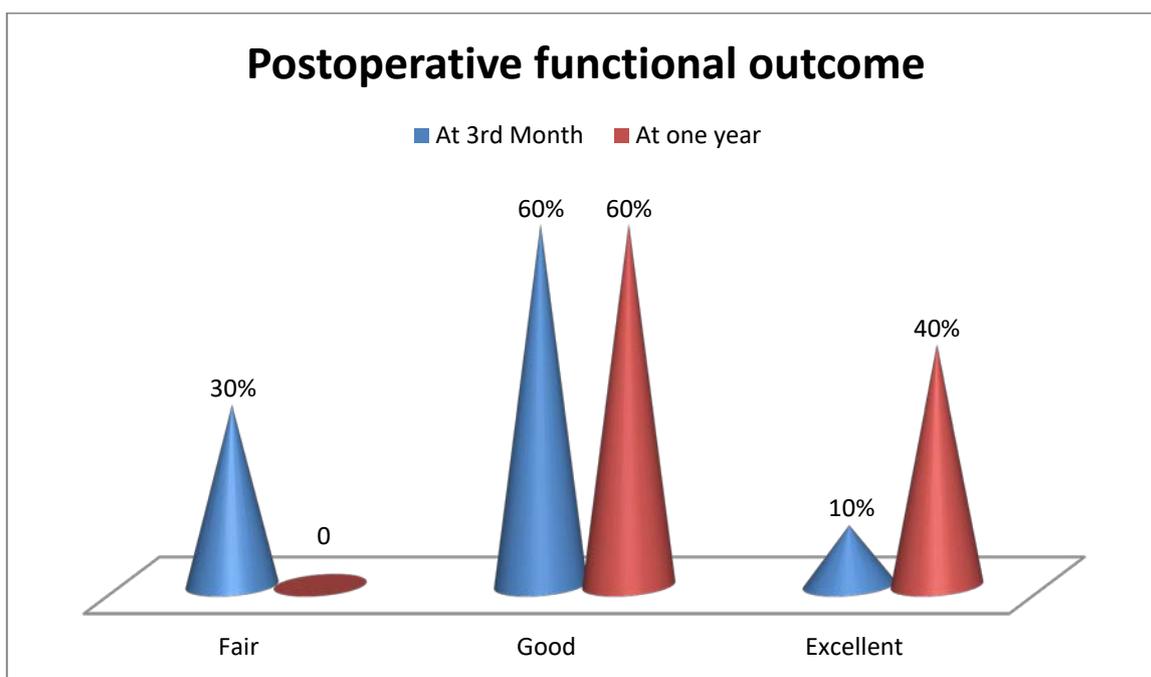
Post-operative follow up was done at 2<sup>nd</sup> post-operative day to check walking status and primary dressing. Regular follow-up was conducted at 3months and end of one

year. During each follow-up, cases were radiologically assessed and clinically evaluated by using Harris hip score.

**Results**

**Table 1: Demographic data of study participants**

Demographic variables	Total number of cases (n=20)	
	Frequency	Percentage
<b>Age</b>		
41-50	18	90%
51-60	02	10%
<b>Gender</b>		
Male	18	90%
Female	02	10%
<b>Laterality</b>		
Right	8	40%
Left	10	50%
Bilateral	2	10%



**Figure 1: Postoperative functional outcome at 3<sup>rd</sup> month and 1 year of follow-up**

**Discussion**

Osteonecrosis or avascular necrosis is characterized by death of osteocytes due to diminished vascular flow to the bony part[13]. The surgical options for Ficat and ARLET stage –III and early stage-IV osteonecrosis of the femoral head reflect both the importance of the problem and the lack of an efficient management method.

However, bipolar hip arthroplasty and surface replacement hemiarthroplasty are better operative choices for successful outcome[14]. Even though, surface replacements in avascular necrosis is a challenging procedure involved with high economic burden[15].

In current study, at 3<sup>rd</sup> month follow up, 10% had excellent results, 60% had good

results and 30% reported poor results. At one year of follow-up, 40% had excellent results and 60% reported good results. None of the cases reported poor outcome at one year of follow up (Figure 1). Similarly, Lee SB et al., reported no cases with poor postoperative results under bipolar hemiarthroplasty, but the incidence of groin pain was observed in 20% of subjects[16].

Several studies reported that bipolar hemiarthroplasty for osteonecrosis of head of femur had satisfactory outcome ranged between 48%-85% and had reported incidence of groin pain between 12-42%[17-19]. Chan and Shih did not found significant difference between bipolar hip arthroplasty and total hip arthroplasty in terms of groin pain, incidence of osteolysis, dislocation and revision rates. However, bipolar hip arthroplasty was an efficient alternate for total hip arthroplasty to manage Ficat stage-III avascular necrosis in young cases[20]. Scheerlinck T et al., reported that bipolar hip arthroplasty preserves bone stock for further revisions and provide excellent outcome in young patients[21]. Cabanela ME opined that bipolar prosthesis for osteonecrosis of femoral head was favourable, but could not reduce the femoral loosening rates[22]. Abe T et al., evaluated stage 3 osteonecrosis of the femoral head managed with bipolar hemiarthroplasty have found satisfactory outcome[23]. Dudani B et al., stated that bipolar hip arthroplasty along with tight fitting cup and acetabular reaming in AVN hip had claimed effective postoperative outcome, less chances for groin pain, acetabular erosion and revision in midterm follow-up for all types of Ficat stage osteonecrosis[24]. India may claim highest number of joint replacement surgeries globally from 2020 to 2026, due to expected raise in older population; which alarming the need for surgical assessment and implants[5].

In current study, idiopathic avascular necrosis was major indication, which

needs multidisciplinary approach to mitigate postoperative infection. This study was imitated to small sample size and limited period of postoperative follow up. Further long-term studies are required to evaluate complications with radiological and clinical follow up.

### Conclusion

The present one-year follow-up concluded that bipolar hemiarthroplasty has a definite role in the management of patient with disabling disorders of AVN of femoral head. It was effective in relieving pain and restoration of function.

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