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## Functional outcome of uncemented vs cemented prosthesis in management of fracture neck of femur by hemiarthroplasty: A prospective study

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### Abstract

Femoral neck fractures, one of the most common injuries constitute 50% of hip fractures. The incidence of these fractures has increased with improvement in life expectancy and is expected to double in the next 20 years and triple by 20501.

Fracture neck of femur occurs predominantly in the elderly; typically result from low energy falls and in young individuals due to high energy mechanisms. In elderly population these fractures are more common in females when compared to males especially in age group of 60 and above.

The goal of treatment of femoral neck fractures is restoration of pre-fracture function without associated morbidities.

Hemiarthroplasty is the most common treatment for displaced fractures of femoral neck in elderly and is associated with better functional outcome and fewer reoperations than internal fixation.

**Keywords:** fracture neck femur, hemiarthroplasty, austin moore prosthesis, bipolar prosthesis.

### Introduction

Hemiarthroplasty gives good pain relief and predictable results with lower reoperation rates, but morbidity is higher.

An arthroplasty using a cemented implant may be associated with increased mortality compared with an arthroplasty using an uncemented implant<sup>[2]</sup>.

Cementation of the prosthesis achieves good initial fix in an osteoporotic bone, however arthroplasty using a cemented implant may be associated with increased mortality compared with an arthroplasty using an uncemented implant, as it has the risk of bone marrow and fat embolization with resulting intraoperative hypotension and increased incidence of deep vein thrombosis. The mechanisms involved are not fully understood but involve cardiorespiratory disturbances caused by venous and pulmonary embolization of bone marrow contents and methyl methacrylate particles<sup>[5, 6]</sup>.

An uncemented implant may be associated with design-specific complications such as stress shielding, thigh pain, and a higher risk of periprosthetic fracture. This may be the result of the inferior method of fixation or the design of the prosthesis. Although hemiarthroplasties are an important treatment for femoral neck fractures, the literature does not provide a clear approach for selecting the implant fixation method<sup>[7]</sup>.

The main advantage of a bipolar over unipolar prosthesis is the reduction of residual thigh pain and acetabular erosion due to movement taking place within the prosthesis rather than between head of prosthesis and acetabulum. The aim to reduce immobilization and make patient walk early, with improved survival of implant is clearly met by the bipolar prosthesis. The results of hemiarthroplasty are initially better, but if the patient survives longer, then the function deteriorates.

The purpose of this prospective study is to compare hemiarthroplasty using a bipolar cemented implant with hemiarthroplasty using an Austin Moore uncemented implant.

### Objectives

- To compare the effectiveness and safety of the hemiarthroplasty with cemented bipolar prosthesis and that with uncemented Austin Moore prosthesis used in femoral neck fractures.
- To compare the end results of hemiarthroplasty using either of the prosthesis with respect to postoperative hip function, residual pain, mobility and stability.

### Material and Methods

The present study was conducted in Department of Orthopaedics, Mamata General Hospital, Khammam. Approval was obtained from the institutional ethical committee, and all patients provided informed consent and no patient refused to participate

**Study site:** The present study was conducted in The Department of Orthopaedics, Mamata General Hospital, Khammam between October 2016 and September 2018.

**Study population:** Patients admitted in Mamata general hospital in the department of orthopaedics with fracture neck of femur after taking their consent.

### Inclusion criteria

1. Displaced fractures of the intracapsular part of the femoral neck.
2. Failed internal fixation.
3. Ununited fracture neck of femur.
4. Patient willing to go for study.

### Exclusion criteria

1. Patients not willing to go for study
2. Patients with arthritic changes and rheumatological conditions
3. Pathological fractures
4. Fracture involving Acetabulum

### Surgical procedure

**Position:** lateral, with support braces at pelvis and thorax and bony prominences protected with cotton.

**Preparation:** The entire limb with gluteal region first with betadine scrub, later povidone iodine and spirit and later covered with sterile drapes.

Incision site was covered with clear, disposable incise drapes. The posterolateral approach was used for hemiarthroplasty as it gives adequate exposure with minimal bleeding.



**Fig 1:** Marking for skin incision

The incision starts about 8 cms anterior to posterosuperior iliac spine and extends to greater trochanter and along the course of the shaft of femur, 10 cms distal to greater

trochanter. The subcutaneous tissue is divided along the skin in a single plane down to the fascia lata and thin fascia covering the gluteus maximus. Fascia, gluteal and femoral bursae are divided in line with the skin incision.

The interval between the posterior border of gluteus medius and anterior border of gluteus maximus is entered.



**Fig 2:** Exposure after Skin, Subcutaneous tissue and Gluteus maximus were retracted. The short external rotator muscles- piriformis, gemelli and obturators tag sutures were applied and detached close to their insertion by maximum internal rotation of the limb, with electric cautery close to the bone. They were reattached to femur with drill holes during closure of wound.

Inverted T-shaped incision was made in the joint capsule. Fully exposed femoral neck was supported with retractors.

Head was removed with extractor, size of head measured with gauge, cotton plug put was inside acetabulum to prevent lodging of bone pieces in it.

Neck was cut above the lesser trochanter with extension to greater trochanter with preservation of calcar taken with oscillating saw as required.

Entry point was as lateral as possible in line with the inner wall of the lateral cortex. Femoral canal was prepared using straight reamers followed by broaching.



**Fig 3:** Final prosthesis before reduction

A head size was confirmed by measuring the extracted femoral head using the sizing jig. The head sizing rings through which the extracted head could not pass was considered as the required size of the prosthesis.

In case of Austin-Moore's hemiarthroplasty, the prosthesis as per the head size was inserted into the canal maintaining anteversion.



**Fig 4:** Austin Moore's prosthesis being inserted

Joint was relocated with gentle traction to limb, with thumb pressure and external rotation that indicated balanced soft tissue. Joint movements and stability were checked. Capsule was closed in all cases. Piriformis and short external rotators were reattached via drill holes in femur.



**Fig 5:** Final closure

**Post-operative protocol**

- Post-operative and mobilization protocol were same for all patients.
- Antibiotics, analgesics and other drugs used as required.
- Patient was kept in postoperative ward/intensive care ward.
- Operated limb in 30o abduction with a pillow kept between the thighs.
- Foot end elevation for one day.
- Prophylaxis for Deep vein thrombosis in high risk patients.
- Post-operative Antero-Posterior X-ray of operated hip.
- Post-operative investigations as required.
- Active exercises in bed for quadriceps and breathing exercises.
- Drain removal after 48 hrs.
- Sitting on 1st day with active and passive exercises in bed.
- Partial to full weight bearing walking on operated side with the help of a walker from 2nd day onwards according to pain tolerance.
- Postoperative dressings as required.
- Suture removal on or after 15 days.
- Patient discharged after full rehabilitation.
- Prior to discharge patients were checked for late clinical sepsis and deep vein thrombosis.

**Follow-up protocol**

Post-operative visits were scheduled at 4th week, 8th week, 6 months and 12 months. Clinico-radiological and functional assessments were carried out. All patients were functionally assessed using the Harris Hip Score and complications, if any, were documented.



**Pre-operative**



**Post-operative**



**Fig 6:** Post-operative clinical pictures of patient showing Range of movements



**Fig 7:** Pre and postoperative radiographs; postoperative clinical pictures showing range of movements

**Complications**

**1. Periprosthetic fracture**

In our study we had one case (1/30=3.3%) of periprosthetic fracture in the uncemented group while reduction of the prosthesis.

They were treated conservatively by skin traction and delaying weight bearing.

**2. Dislocation**

In our study we had one case of dislocation (1/30=3.3%) in cemented group which was found on the third post-operative day. The dislocation was successfully reduced under general anaesthesia. The number was not statistically significant but studies have reported higher rates of dislocations in cemented hemiarthroplasty.

**3. Infection**

In our study we had one (3.3%) superficial infection in the uncemented group and two (6.6%) superficial infections in the cemented group. No case of deep infection was noted in our study.

Superficial infection was seen in the patients who were diabetic and anemic. They developed signs of infection in the first week of operation. They were treated with proper antibiotics and dressings. All these infections were found

when the patients were still in the hospital and this resulted in prolongation of their hospital stay.

**4. Bed sore**

In our study we had one (3.3%) case of bed sore in the uncemented group and two (6.6%) cases of bed sore in the cemented group. In both the groups the bed sore were seen in patients with prolonged immobilisation secondary to conditions like delay in surgery due to comorbidities like diabetes, anaemia and postoperative immobilisation due to periprosthetic fracture in uncemented group and dislocation in cemented group. The bed sores responded to regular dressing and pressure reducing measures like regular change of position, air cushion and water bed etc.

A hip fracture in elderly patients is a known high-risk factor for development of pressure sores.

**Total functional result at 24 months**

In the cemented group 6 patients (20%) had excellent results; 21 patients (70%) had good results and 2 patients (6.7%) had fair results; whereas in the uncemented group 5 patients (16.7%) had excellent results; 20 patients (66.6%) had good results; 4 patients (13.3%) had fair results and one patient (3.3%) had poor functional result.

**Table 1:** Distribution of sample by criteria of total functional results by Harris Hip Score at 24 Months.

Criteria		Harris hip score At 24 months results			
		Uncemented		Cemented	
Frequency		Percentage	Frequency	Percentage	
Excellent	5	16.7%	6	20%	
Good	20	66.6%	21	70%	
Fair	4	13.3%	2	6.7%	
Poor	1	3.3%	1	3.3%	
Total	30	100%	30	100%	
P Value		>0.05-statistically not significant			

**Discussion**

Femoral neck fractures are common injuries among elderly people. The most common treatment for a displaced femoral neck fracture in the elderly is hemiarthroplasty. The hemiarthroplasty is either cemented into the femoral canal or uncemented with press-fit technique. The question of whether a hemiarthroplasty should be cemented has been a topic of controversy and ongoing debate until present.

The most common fixation method of the femoral stem has been cementing with special bone cement. However, this method has some disadvantages. The duration of surgery is longer than in uncemented technique. Also blood loss is greater and there is a risk of sudden death at the time of cementing. There is a long-standing debate on the superiority of the two methods.

In this context we undertook the present study to evaluate the immediate results of comparative study of the Austin Moore Prosthesis uncemented hemiarthroplasty with the cemented bipolar hemiarthroplasty in geriatric

**Table 2:** Comparison of Pre-operative scores in two groups studied

Pre-operative	Cemented	Un-Cemented	P value
<b>Scores</b>			
Pain	22.33 +/- 7.24	17.00 +/- 6.76	0.046
Function	23.60 +/- 7.51	23.00 +/- 6.32	0.828
ROM	1.13 +/- 0.92	1.33 +/- 0.72	0.512
AOD	3.47 +/- 1.41	3.20 +/- 1.66	0.638
Harris Hip Score	46.87 +/- 15.57	47.33 +/- 8.71	0.920
Student t test			

**Table 3:** Comparison of Postoperative Scores in two groups studied

Post-operative	Cemented	Uncemented total	P value
<b>Scores</b>			
Pain	41.27 +/- 2.77	42.20 +/-1.66	0.387
Function	38.13 +/- 3.94	38.80 +/- 4.32	0.725
ROM	3.60 +/- 0.62	3.67 +/- 0.49	0.749
AOD	3.00 +/- 0.00	3.00 +/- 0.00	
Harris hip score	89.07 +/- 7.04	90.67 +/- 5.26	0.525
Student t test			

In our study the functional modalities were compared between pre and post-operative follow up in both the cemented and uncemented arthroplasty and Harris hip score in pre-operative cemented is 46.87 +/-15.57 and uncemented is 47.33 +/-8.71 (P value = <0.001 strongly significant). Postoperative uncemented is 90.67 +/-5.26 and cemented is 89.07 +/-7.04 (P value = <0.001 strongly significant).

### Conclusion

Fracture neck of femur is common in geriatric population more in females.

There is no statistically significant difference in the functional outcome between cemented and uncemented hemiarthroplasty. ( $P>0.05$ ) KO

Both cemented Bipolar and uncemented Austin Moore prosthesis hemi-arthroplasties are good treatment options for displaced femoral neck fractures in elderly.

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