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**Dr. Eknath D Pawar**  
Professor and HOD, Department  
of Orthopedics, Grant Medical  
College and Sir J.J. Group of  
Hospitals, Maharashtra, India

**Dr. Shaswat Mishra**  
Shaswat Mishra, Resident,  
Department of Orthopedics,  
Grant Medical College and Sir  
J.J. Group of Hospitals,  
Maharashtra, India

**Dr. Hitesh Rohra**  
Resident, Department of  
Orthopedics, Grant Medical  
College and Sir J.J. Group of  
Hospitals, Maharashtra, India

**Nadir Z Shah**  
Associate Professor, Department  
of Orthopedics, Grant Medical  
College and Sir J.J. Group of  
Hospitals, Maharashtra, India

**Dr. Taikhoom Dahodwala**  
Resident Orthopaedic  
Department Grant Medical  
College, Sir JJ Group of  
Hospitals, Mumbai,  
Maharashtra, India

**Corresponding Author:**  
**Nadir Z Shah**  
Associate Professor, Department  
of Orthopedics, Grant Medical  
College and Sir J.J. Group of  
Hospitals, Maharashtra, India

## Cemented vs uncemented bipolar hemiarthroplasty in neck of femur fractures: A case series of 90 patients

**Eknath D Pawar, Shaswat Mishra, Hitesh Rohra, Nadir Z Shah and  
Dr. Taikhoom Dahodwala**

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### Abstract

**Introduction:** The purpose of our study was to compare results of cemented vs cementless bipolar hemiarthroplasty in fractures of neck of femur with regards to functional outcome, operative time, pain, blood loss and complications.

**Materials and Methods:** Ninety patients with displaced femoral neck fracture operated with bipolar hemiarthroplasty were enrolled in this study and their medical records were reviewed. 35 patients had undergone uncemented bipolar hemiarthroplasty and 55 had undergone cemented bipolar hemiarthroplasty. Post-operative status of the patients was assessed using Harris Hip Score (HHS) and Visual Analogue Score (VAS). Patients were reviewed after one year of surgery at 6 wks interval.

**Results:** Mean operation and bleeding times were longer in the cemented group compared to the uncemented group. The mean pain score was significantly less in the cemented group compared to the uncemented group. Hip functional outcome based on HHS was more in the cemented group. The intraoperative and postoperative complication rate was higher in the uncemented group.

**Conclusion:** Although higher rates of intraoperative bleeding and longer surgery time were seen with cemented bipolar hemiarthroplasty in patients with femoral neck fracture compared to uncemented bipolar hemiarthroplasty, cemented bipolar hemiarthroplasty is better because of better functional outcome and less residual pain.

**Keywords:** Hemiarthroplasty, femoral neck fractures, uncemented, cemented

### 1. Introduction

The femur neck (Femoral neck or neck of the femur) is a flattened pyramidal process of bone, connecting the femoral head with the femur shaft and forming with the latter a wide angle opening medialward.

Femoral neck fractures are more common in females. Mean age of the patients is 81 yrs. Risk of femoral neck fractures in females is 40-50% in females and 13-22% in males. Low energy falls from standing are responsible for the majority of fractures in the elderly, but fall direction is also a key factor<sup>[1, 2, 3]</sup>. Elderly tend to fall to the side as instead of forward, and the lateral hip and strikes the ground first<sup>[5]</sup>. During a sideways fall, the chances of hip fracture see a 15-fold and 12-fold increase in elderly males and females, respectively.

Risk factors for femoral neck fractures include BMI less than 18 Insufficient sunlight, low activity, smoking, history of osteoporosis related fracture, positive history of hip fracture in his or her mother and treatment with corticosteroid It is estimated that the incidence of femoral neck fracture with a change of lifestyle will grow from 1.66 million in 1990 to 6.25 million in 2050 in the world<sup>[4]</sup>. The usual cause of this fracture is a simple fall in which force is transmitted from greater trochanter to femoral neck. 2 other mechanism is leg external rotation with increased force on the capsule and iliofemoral ligament

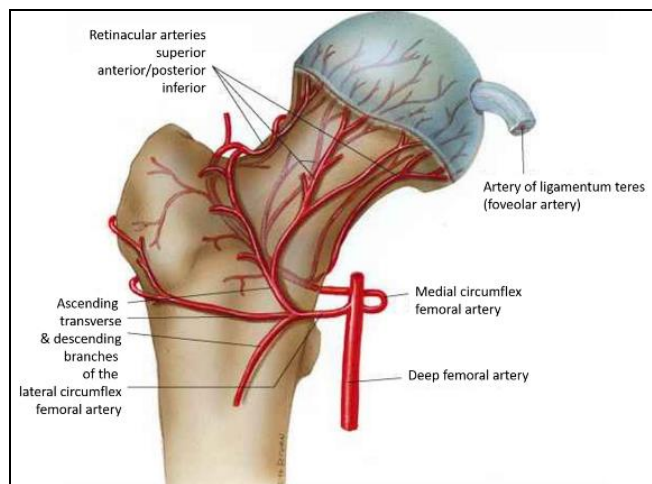
The union rate is low because of low blood supply and intracapsular situation; it is also sometimes associated with femoral head necrosis and delayed segmental necrosis.

**1.1** Blood supply of neck of femur is derived from vessels supplying part of the femur. Blood supply of head of the femur is also contributed by these vessels.

**1.1.1** Retinacular Vessels: Ascending cervical vessels arise from the extracapsular ring of an anastomosis formed by the medial and lateral circumflex femoral artery at the base of the neck

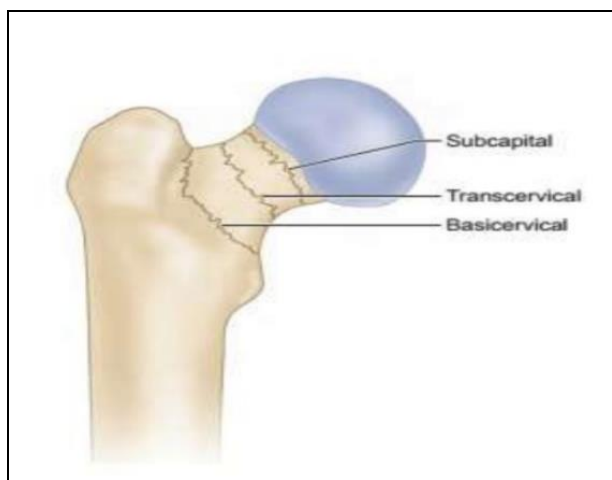
**1.1.2 Intraosseous Blood Supply of Neck of Femur:** The intramedullary branches of nutrient, metaphyseal and epiphyseal vessels.

**1.1.3 Artery of Ligamentum Teres:** It is a branch of the medial circumflex femoral artery and supplies the head of the femur through ligamentum teres.



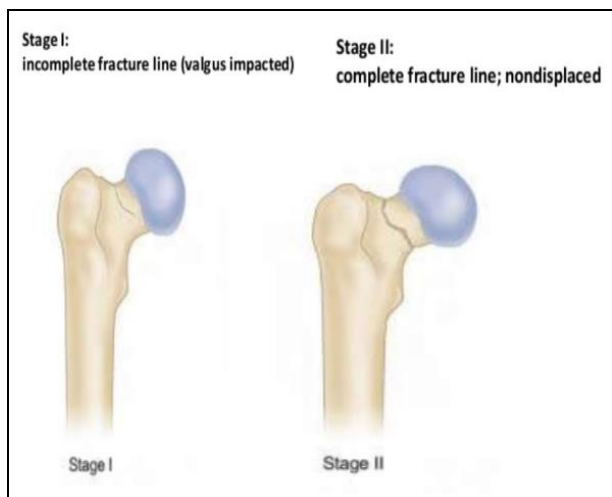
**Fig 1:** Classification

**1) Anatomical**

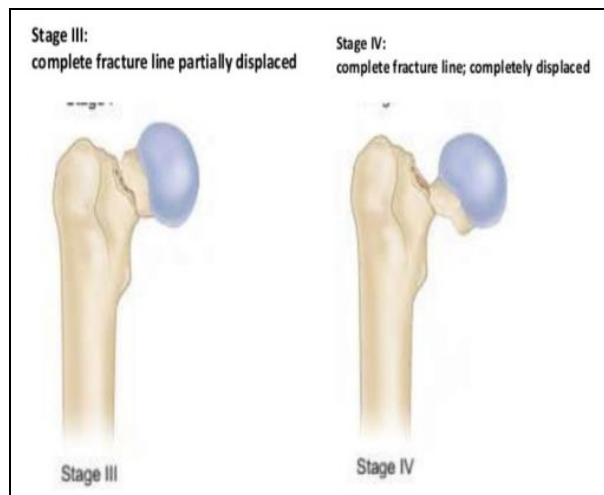


**Fig 2:** Anatomical Classification

**2) Garden**

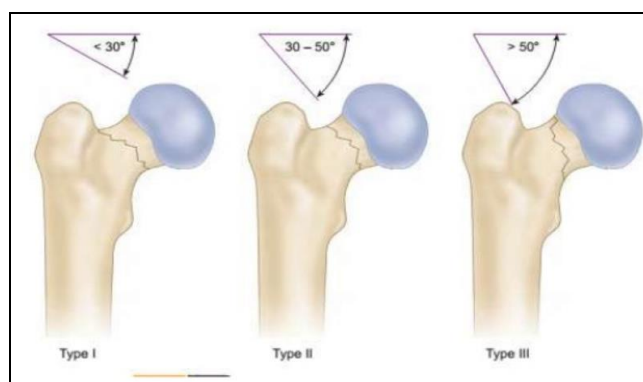


**Fig 3(A):** Garden classification



**Fig 3(B):** Garden Classification

**3) Pauwel's**



**Fig 4:** Pauwel's Classification

Treatment of neck of femur fracture is subjective to age of the patient. In general, young patients <60 yr of age are considered for DHS or CC screw fixation. In >60 age group, decision depends on the condition of the acetabulum. If the acetabulum is arthritic, a Total Hip Replacement is preferred. Otherwise Hemiarthroplasty is the treatment of choice. Hemiarthroplasty is the most common treatment for displaced fractures of the femoral neck in the elderly [5, 6, 7] and is associated with better functional outcome and fewer reoperations than internal fixation. There are different types of cement and uncemented bipolar prosthesis. This prosthesis has an articular surface between the head and shell. Cementless arthroplasties are associated with mid-thigh pain and a higher risk of periprosthetic fractures, whereas cemented arthroplasties are associated with a higher risk of cardiac and respiratory complications secondary to the toxic effect of cement or pulmonary embolization of bone marrow contents and methyl methacrylate particles [8, 9, 10, 11, 12, 13]. This study aims at comparing the results of cemented vs cementless bipolar hemiarthroplasty in terms of functional outcome, operative time, pain and blood loss.

**2. Material and Methods**

90 patients aged more than 65 years who underwent bipolar hemiarthroplasty for neck of femur fractures at Sir J.J. Group of Hospitals between Jan 2016 to June 2018 were included in the study. Medical records of these patients were reviewed. 55 patients were operated with cemented hemiarthroplasty and 35 were operated with uncemented. Patient age, gender, type

of treatment, number of associated comorbidities, prefracture ambulatory status, operative time, blood loss, intraop and post op complications were recorded. Exclusion criteria were pathological fracture, simultaneous intertrochanteric fracture, uncontrolled diabetes, severe cardiovascular disease, respiratory disease, uncontrolled neurologic disease and renal

disease.

Patients were chosen for cemented or uncemented bipolar hemiarthroplasty based on Dorr's classification. Dorr classification attempts to guide indications for cemented or uncemented femoral component fixation.

**Table 1: Dorr Classification**

Dorr Classification	Ratio (inner canal diameter at midportion of lesser trochanter divided by diameter 10 cm distal)	Characteristics	Suggested Femoral Component Fixation
Type A	<0.5	Cortices seen on both AP and lateral XR	Uncemented
Type B	0.5 to 0.75	Thinning of posterior cortex on lateral XR	Uncemented
Type C	>0.75	Thinning of cortices on both views	Cemented

**2.1 Operative procedure**

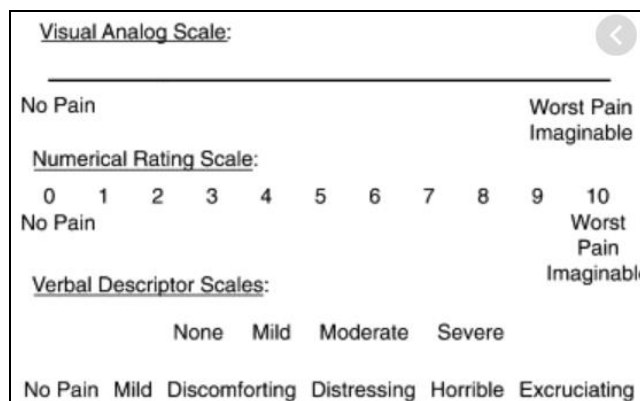
After careful scrubbing, painting, and draping of the fractured side a 10-15 cm long curved incision is made centered on the posterior aspect of greater trochanter. Fascia lata is incised and fibers of gluteus maximus and vastus lateralis are split. The hip is internally rotated to stretch and visualize short external rotators of hip. At this stage sciatic nerve is at risk for injury, care is taken to prevent it. After inserting stay sutures, external rotators are incised close to the bone and reflected backwards. Now the posterior capsule is incised and the hip is posteriorly dislocated. The femoral head is removed {fig2} and medullary cavity is prepared and reamed for cementing (not done in uncemented group) and stem insertion. After confirming appropriate size of head and stem, implant is inserted {fig 3} and the joint is. Capsule and short external rotators are sutured. Wound is closed in layers under vacuum drain [14, 15, 16, 17].

**2.2 Post-Operative Care**

Wound was dressed on the 3rd postoperative day, and sutures were removed after 10–14 days. Active hip and knee range of motion exercises and protected weight bearing was started on the 3<sup>rd</sup> post-operative day and were mobilized from day 6. The patients were advised full weight bearing from 3 weeks onwards. The patients were followed every 6 weeks for more than 1 year clinically and radiologically. One patient who developed pulmonary embolism secondary to cementing intraop and died 2<sup>nd</sup> day postop. There was one patient in uncemented group who couldn't mobilize, remained bedridden and was marked as treatment failure. 3 patients (One cemented and two uncemented) developed superficial infections which was treated with I.V. antibiotics and patients recovered.

The intensity of pain (Based on visual analog scale), hip function (According to Harris hip score) [18], radiological signs of patient's x-ray (The presence or absence of acetabular erosion loosening of prosthesis) and postoperative complications were recorded at 1yr.

Binary variables were analyzed by Fisher's exact test, and continuous outcomes were analyzed with the use of the Student's t-test (two-tailed). Survival and the duration of hospitalization were further analyzed with use of the Kaplan-Meier method.  $P < 0.05$  was considered significant for all analyses.



Preop X-ray



Post-op X-ray of Cemented bipolar Hemiarthroplasty





Pre-op X-ray



Post-op X-ray of Uncemented bipolar Hemiarthroplasty

### 3. Results

90 patients operated with bipolar hemiarthroplasty at Sir J.J Hospital were followed up. Of these 56 were men and 34 were women. The mean age of the patients was 75(68-88) years with cemented group and 72.7(65-78) years old in uncemented group. The mean of operation time was 93 minutes in cemented group and 78 minutes in uncemented group. The mean of intraoperative bleeding volume was 320cc and 278cc in cement and uncemented groups, respectively ( $P>0.05$ ). Duration of admission was 11 days in cement group and 10 days in the uncemented.

The meaning of pain, according to VAS criteria was  $1.2 \pm 0.3$  after one month in cemented group that was  $1.8 \pm 0.4$  in uncemented group, respectively and there were significant differences.

The mean of HHS in cemented group was 88 at 1 yr.

The mean of HHS in uncemented group was 83 at 1 yr.

**Table 2: Harris Hip Score**

Harris hip score (at 6 months)	Uncemented (34)	Cemented (54)
100-91 (Excellent)	12	28
90-81 (Good)	7	8
80-71 (Fair)	13	14
<70 (Poor)	2	4

Intra operative and postoperative total complication rate was 21.5% in cemented group and 31.5% in uncemented group which was higher significantly. Post-operative thigh pain was

significantly higher in uncemented group.

### 4. Discussion

Neck of femur has a high incidence in old age people and is associated with high morbidity and mortality. Preferred treatment of femoral neck fracture is still being debated. Because of high complications and mortality rate with nonoperative treatment, recent studies are on the introduction of operative treatment that has the lowest cost and complications and results in better function in older people. Recently hemiarthroplasty has emerged as a favored treatment option. This method is performed with unipolar and bipolar prosthesis. The bipolar prosthesis causes less erosion and protrusion in acetabulum because of movement between metal head and polyethylene cover and movement between metal cup and the acetabulum (outer bearing). Moreover, femoral neck length and head size are variable and can be converted to THA. Therefore, some studies have shown better outcomes with this prosthesis for femoral neck fracture treatment in elderly. Recently, some studies have evaluated the indications for performing hemiarthroplasty with or without the use of cement which had different results.

In this study we compared patients who underwent hemiarthroplasty with cemented and uncemented bipolar prosthesis using HHS to assess the functional outcome. The study showed significant improvement in patients operated with cemented hemiarthroplasty with mean HHS 88% compared to uncemented group with HHS 83%

Among other parameters compared, cemented group had better mobility and less pain compared to cemented group. The mean of pain according to VAS criteria was significantly less in uncemented group. Several studies have showed that there is no significant difference between two groups as regards mortality, need for reoperation and postoperative complications although Carpintero *et al.* in a systematic review has showed that the meantime of surgery and bleeding volume was more in cemented group that is similar to our study.

In our study, the mean operation time was 93 minutes in cemented group and 78 minutes in uncemented group, respectively.

The mean bleeding volume was 320cc in cemented group and 278cc in uncemented group ( $p>0.05$ ).

### 5. Conclusion

Uncemented bipolar hemiarthroplasty is preferred choice in relatively young patients without comorbidities. But despite of increased intraoperative bleeding and prolonged time of surgery, cemented bipolar hemiarthroplasty for neck of femur fractures is preferred in old age people because of better patient functional levels and less residual pain, thus overall better outcome.ss

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