



## UNIPOLAR VERSUS BIPOLAR HEMIARTHROPLASTY IN ELDERLY PATIENTS WITH FRACTURE NECK OF FEMUR

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### ABSTRACT

**Background/Purpose:** Hemiarthroplasty is the treatment of choice in neck of femur fractures in elderly patients. Unipolar and bipolar prostheses have their own advantages and disadvantages, creating confusion in which prosthesis to use. **Methods:** 40 elderly patients (>65 years age) with intracapsular neck of femur fractures were included and randomly divided equally in this study, 20 patients were treated with unipolar hemiarthroplasty and 20 patients with bipolar hemiarthroplasty. All patients were evaluated for functional outcome by using Harris Hip score and radiological outcomes using various parameters. The outcomes of both groups were then compared using Chi-square test. **Results:** Overall mean Harris hip score pre-operatively for unipolar hemiarthroplasty was 36.2 and bipolar hemiarthroplasty was 39.1 which increased to 81.8 for unipolar and 85.05 for bipolar hemiarthroplasty respectively, with p-value of <0.561. Our results also show that we have 35% excellent result in Bipolar whereas we have 15% excellent result in unipolar Hemiarthroplasty group. **Conclusion:** The results of our study show that uncemented bipolar hemiarthroplasty gave better results when compared with uncemented unipolar hemiarthroplasty. Our results also show that, cemented bipolar hemiarthroplasty gave better results when compared with cemented unipolar hemiarthroplasty clinically and radiologically. Thus, Bipolar hemiarthroplasty did better when compared with unipolar hemiarthroplasty in general.

### KEYWORDS :

#### INTRODUCTION:

Neck of femur fractures are one of the most common fractures of the elderly. The principal goal of management is to help the patients to return to their pre-injury functional status, as soon as possible.<sup>1</sup> There are various operative modalities developed across several years which fall under the umbrella of either fixation or arthroplasty.<sup>2</sup>

Fixation techniques are marred by complications like non union leading to avascular necrosis, mal-reduction and poor fixation, chances of which are nil with use of arthroplasty.<sup>3</sup> Arthroplasty also allows immediate weight bearing which helps patients to return to activity sooner and helps avoid occasionally fatal complications of prolonged recumbency. Arthroplasty is thus the treatment of choice in the elderly patients, who commonly have poor bone quality, with fixation reserved for only those elderly patients who are actively involved in sports.<sup>4</sup>

There are 2 types of hemiarthroplasty prostheses – unipolar (Austin-Moore and Thompson) and bipolar prosthesis (Exeter). Unipolar arthroplasty was associated with complications like persistent groin pain and protrusio acetabuli, which led to advent of bipolar hemiarthroplasty.<sup>5</sup> Bipolar prostheses have a dual articulation between the inner head and the shell and the shell and the acetabulum, which reduces the risk of wear and acetabular protrusion. However, it is proposed that over time, such a dual articulation ceases to function as intended and for practical purposes bipolar hips functionally become unipolar implants.<sup>6</sup>

The decision to perform hemiarthroplasty using a unipolar or

bipolar prosthesis still remains controversial, as unipolar prosthesis also have their advantages over bipolar prostheses, like a lower cost and no risk of polyethylene wear debris.<sup>7</sup> So in view of these varied opinions we aim to compare the efficiency of these two prostheses for the management of intracapsular neck of femur fractures in the elderly.<sup>8</sup>

This study is aimed at comparing the outcomes of unipolar and Bipolar Hemiarthroplasty for treatment of Neck of femur fractures in the elderly patients using functional outcome (Harris Hip Score)<sup>9</sup> and radiological outcomes.

#### MATERIALS AND METHODS:

This prospective randomized study was conducted at a tertiary care hospital in Navi Mumbai between July 2020 and October 2022. Approval of Institutional ethics committee was obtained before the start of study. Following inclusion and exclusion criteria were used to select study population:

#### Inclusion Criteria:

Patients aged 60 years or more presenting with unilateral intracapsular neck of femur fractures with adequate calcar, of any duration.

#### Exclusion criteria:

1. Patient with neurological deficit
2. Patients with any other ipsilateral or contralateral fracture of upper or lower extremities (Eg: Fracture neck of femur with shaft of femur fracture, Bilateral neck of femur fracture)
3. Pathological fracture neck of femur.

Sampling method and sampling size:

40 patients who fulfilled the inclusion and exclusion criteria and gave consent for surgery and study, were selected for study. These patients were divided in 2 groups by random allocation, using chit method, with first group of 20 patients allocated the group for unipolar Hemiarthroplasty and the other group of 20 patients allocated bipolar Hemiarthroplasty.

Treatment protocol:

Informed consents were taken for both groups of patients.

Baseline Harris Hip scores of all patients were recorded.

All patients were operated after getting appropriate physician and anesthetic fitness. All patients in both groups were operated by any one of the 3 senior arthroplasty surgeons in our hospital randomly with no preference to any one prosthesis.

All prostheses were used from a single indigenous company, which all patients could afford.

Post operative evaluations were based on functional (Harris Hip score) and radiological outcomes.

Outcomes:

Functional outcome:

Clinical evaluation is done based on Harris Hip Score.

Radiological outcomes:

Observations and measurements were made on the anteroposterior radiograph of the pelvis and lateral radiograph of the hip on immediate post op, at 6 weeks and then at every 6 months follow up.

Radiographic evaluation included:

- 1. Loosening of femoral components: Engh's criteria for Uncemented femoral component; Gruenzone criteria for cemented femoral component.<sup>10</sup>
- 2. Femoral stem position: Central, Varus or valgus<sup>11</sup>
- 3. Vertical subsidence<sup>12</sup>
- 4. Heterotopic Ossification: using Brooker's classification<sup>13</sup>

RESULTS:

The 20 hips each for unipolar and bipolar were evaluated both clinically and radiologically. Clinical evaluation was done using Harris hip score which reveals the following results:

Table 1. Unipolar Hemiarthroplasty – Functional Results

Excellent	3	15%
Good	12	60%
Fair	3	15%
Poor	2	10%

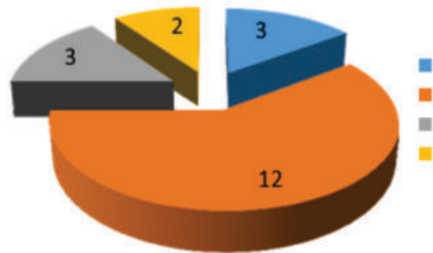


Fig 1. Unipolar Hemiarthroplasty – Functional Results

Table 2. Bipolar Hemiarthroplasty – Functional Results

Excellent	7	35%
Good	9	45%
Fair	3	15%
Poor	1	5%

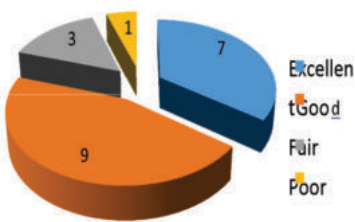


Fig 2. Bipolar Hemiarthroplasty – Functional Results

Comparison Of Uncemented Unipolar And Uncemented Bipolar Hemiarthroplasty- Functional Results

Table 3. Uncemented Unipolar Hemiarthroplasty - Functional Results

Excellent	3	30%
Good	3	30%
Fair	2	20%
Poor	2	20%

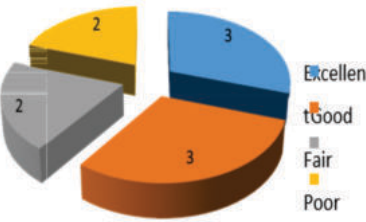


Fig 3. Bipolar Hemiarthroplasty – Functional Results

Table 4. Uncemented Bipolar Hemiarthroplasty - Functional Results

Excellent	5	50%
Good	3	30%
Fair	2	20%
Poor	0	0%

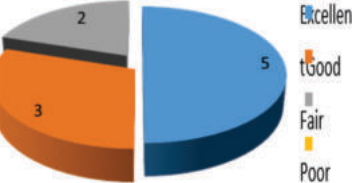


Fig 4. Bipolar Hemiarthroplasty – Functional Results

Comparison Of Cemented Unipolar And Cemented Bipolar Hemiarthroplasty- Functional Results

Table 5. Cemented Unipolar Hemiarthroplasty - Functional Results

Excellent	0	0%
Good	9	90%
Fair	1	10%
Poor	0	0%

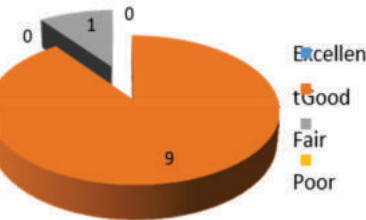


Fig 5. Cemented Unipolar Hemiarthroplasty - Functional Results

Table 6. Cemented Bipolar Hemiarthroplasty - Functional Results

Excellent	2	20%
Good	6	60%
Fair	1	10%
Poor	1	10%

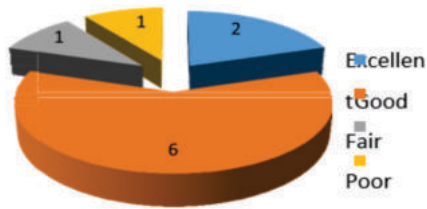


Fig 6. Cemented Bipolar Hemiarthroplasty - Functional Results

Table 7. Comparison of Pre-op and latest Harris hip score of Unipolar and Bipolar Hemiarthroplasty

	Mean pre-op HHS	Mean latest HHS	Mean Difference in HHS
Unipolar	36.2	81.8	45.6
Bipolar	39.1	85.05	45.95

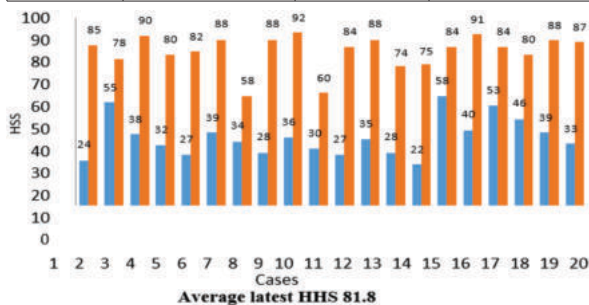


Fig 7. Comparison of Pre-op and latest Harris hip score of Unipolar Hemiarthroplasty

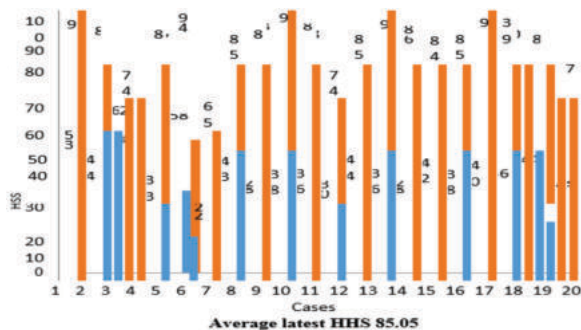


Fig 8. Comparison of Pre-op and latest Harris hip score of Unipolar Hemiarthroplasty

#### Complications Of Unipolar Hemiarthroplasty:

- Heterotopic Ossifications → 1 (5%)
- Limb Length discrepancy → 2 (10%)
- Sciatic nerve palsy → 1 (5%)
- Periprosthetic fracture → 1 (5%)
- Acetabular erosion → 2 (10%)

#### Complications

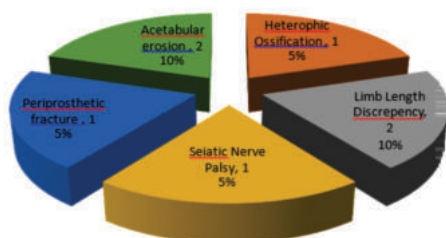


Fig 9. Complications of Unipolar Hemiarthroplasty

#### Complications Of Bipolar Hemiarthroplasty:

- Heterotopic Ossifications → 1 (5%)
- Limb Length discrepancy → 1 (5%)
- Sciatic nerve palsy → 1 (5%)
- Periprosthetic fracture → 1 (5%)
- Acetabular erosion → 1 (1%)

#### Complications

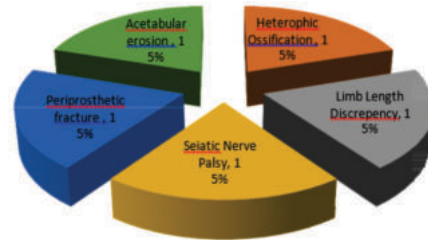


Fig 10. Complications of Bipolar Hemiarthroplasty

#### Radiological Evaluation: Unipolar Hemiarthroplasty:

Table 8. Radiological evaluation -Stem position in Unipolar cases

Stem Position	No.	Percentage
Neutral	13	65%
Valgus	2	10%
Varus	5	25%

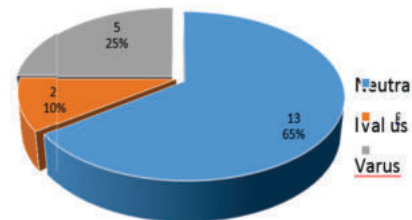


Fig 11. Radiological evaluation - Stem position in Bipolar cases

#### Bipolar Hemiarthroplasty:

Table 9. Radiological evaluation: Stem position in Bipolar cases

Stem Position	No.	Percentage
Neutral	16	80%
Valgus	1	5%
Varus	3	15%

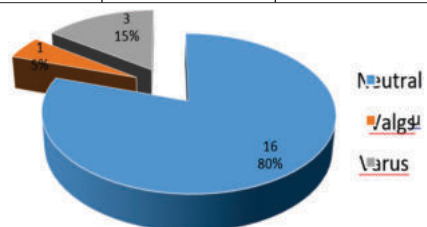


Fig 12. Radiological evaluation - Stem position in Bipolar cases

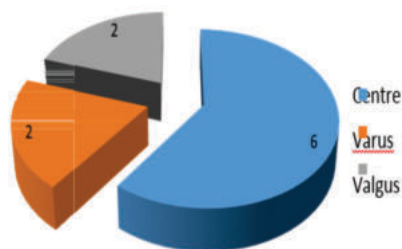
#### Comparison Of Uncemented Unipolar And Uncemented Bipolar Hemiarthroplasty- Radiological Results

Table 10. Uncemented Unipolar Hemiarthroplasty - Radiological Results

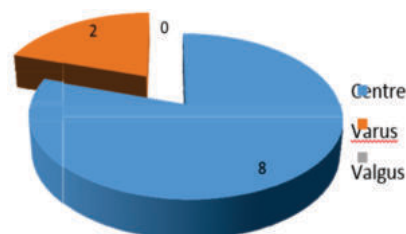
Centre	6	60%
Varus	2	20%
Valgus	2	20%

Table 11. Uncemented Bipolar Hemiarthroplasty - Radiological Results

Centre	8	80%
Varus	2	20%
Valgus	0	0%



**Fig 13. Uncemented Unipolar Hemiarthroplasty - Radiological Results**

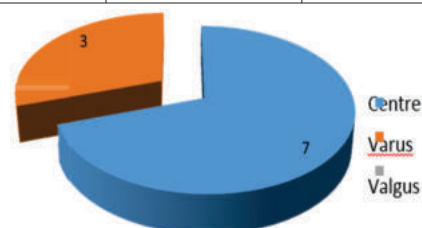


**Fig 14. Uncemented Bipolar Hemiarthroplasty - Radiological Results**

#### Comparison Of Cemented Unipolar And Cemented Bipolar Hemiarthroplasty- Radiological Results

**Table 12. Cemented Unipolar Hemiarthroplasty - Radiological Results**

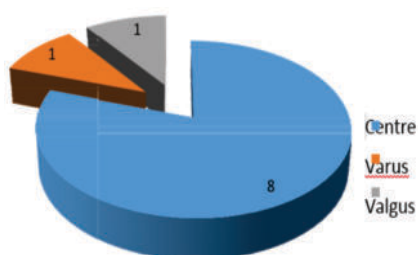
Centre	7	70%
Varus	3	30%
Valgus	0	0%



**Fig 15. Cemented Unipolar Hemiarthroplasty - Radiological Results**

**Table 13. Cemented Bipolar Hemiarthroplasty - Radiological Results**

Centre	8	80%
Varus	1	10%
Valgus	1	10%



**Fig 16. Cemented Bipolar Hemiarthroplasty - Radiological Results**

#### DISCUSSION:

Hemiarthroplasty, as an effective technique for femoral neck fractures, could help early ambulation and satisfactory functional recovery and is increasingly performed by the surgeons. However, controversy has persisted for a long time regarding the use of bipolar versus unipolar prosthesis. This study suggests that (1) Bipolar hemiarthroplasty is associated with similar or better improvement in hip functionality, hip

pain, and quality of life compared with Unipolar hemiarthroplasty while with a higher cost and that (2) there are no significant differences between Bipolar hemiarthroplasty and Unipolar hemiarthroplasty with regard to operation time, blood loss, blood transfusion, hospital stay, mortality, reoperation, dislocation, and complications, and that (3) Bipolar hemiarthroplasty could not decrease acetabular erosion rate in the long term.<sup>14</sup>

Compared with Unipolar hemiarthroplasty, bipolar prosthesis with an additional inner articulation has the theoretical advantages of less acetabular erosion and less dislocation.<sup>15</sup>

This study demonstrates that the incidence of acetabular erosion in Bipolar hemiarthroplasty is less than that in the Unipolar hemiarthroplasty group at the follow-ups. However, statistical difference was only noted at 1 year follow-up and the acetabular erosion rate increased at the later follow-ups. This may be because the bipolar articulation loses mobility with time and functions as a Unipolar hemiarthroplasty. Regarding to dislocation, it is not proved to be less comparing Bipolar hemiarthroplasty with Unipolar hemiarthroplasty in this study.

Pain following hemiarthroplasty is usually due to one of the two pathological processes: articular cartilage degeneration in the acetabulum or loosening of the prosthesis.

In the unipolar study Jadhav AP et al<sup>16</sup>, reported mean age 65.7, Onche and Yinusa showed mean age in the study 67.4, in another study of Essoh J.B Sie M. Da et al reported range of the age 55-88 years with the standard deviation of 7.2. Similarly in this study mean age was showed as mean  $\pm$  SD 64.98  $\pm$  4.13. In the study of Ahmed I, reported male female ratio was 1:2. While in this study female were in the majority as compared to male with the 11:9.

According to the unipolar study of Barners CL et al.<sup>17</sup> dislocation rate was 1.5%. Other authors reported 4% dislocation rate. Noor SS<sup>18</sup>, reported 0% dislocation in their study with unipolar hemiarthroplasty. We have 0% dislocation rate because we fasten abduction pillow to the leg postoperatively, for 1 to 2 weeks, along the careful shifting of the patients from theatre table to the bed and also for X-ray. Postoperative wound infection 0% reported by Noor SS, and 7.5% reported by Dinesh Dhar<sup>19</sup>. In general, duration of operation has been proven conclusively to be a potent risk factor in the development of postoperative infection. We have only 4% superficial infection, because all the surgeries were performed by senior surgeons having less operating time with pre and post antibiotic cover and the special care was taken for patients hygiene and theatre condition. And those superficial infection settled well and now patients are not having any infections.

In the study of Anshu Shekhar et al<sup>20</sup> reported outcome of hemiarthroplasty treatment in patients with femoral neck fracture as excellent 43.5%, good 38.4%, fair 11.3% and poor 6.8%. Dinesh Dhar et al reported outcome of Austin-Moore in femur neck fracture outcome excellent 80.2% and fair 19.8%. Noor SS et al reported outcome as, excellent 38%, good 21%, fair 24% and poor 17.3%. Similarly in the present study outcome in 45 remaining patients was as; the excellent results were found in the 44.44% of the study participants, good and satisfied results were seen with the percentage of 26.66% and 20% respectively while poor results were seen in 8.88% of the patients.

#### CONCLUSION:

We have concluded that uncemented bipolar hemiarthroplasty gave better results when compared with uncemented unipolar hemiarthroplasty, and cemented



bipolar hemiarthroplasty gave better results when compared with cemented unipolar hemiarthroplasty clinically and radiologically. Hemiarthroplasty is an Excellent treatment strategy for intracapsular neck of femur fracture in terms of pain relief and restoration of function and mobility as near as possible to the pre injury level.

Acetabular erosion is the most commonly encountered complication in unipolar hemiarthroplasty than the bipolar hemiarthroplasty which had less complication comparatively.

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