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**Original Research Article**

# Superiority of fixed stem bipolar prosthesis over Austin Moore prosthetic in fracture neck femur

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## ABSTRACT

**Background:** Hemi arthroplastyis a better option in treatment of fracture neck femur as it eliminates avascular necrosis of femoral head and non-union. It allows immediate weight bearing to return elderly patients to activity which helps in avoiding complications of recumbency and inactivity. The decision to perform hemi arthroplasty using a unipolar or bipolar prosthesis is a controversial issue. Both the prosthesis can be used even in remote areas both are cost effectives, good results can be achieved by general orthopaedic surgeons and post-operatively, it can be well adapted by Indian population. This study was done to compare the efficiency of Austin Moore's prosthesis (AMP) and bipolar prosthesis for the management of intra capsular fracture neck femur in elderly patients.
**Methods:** Patient's above 60 years with fracture neck of femur were included. In all total 140 patients were randomly allocated for treatment by either AMP or bipolar prosthesis, in the department of Orthopaedics, IIMSR Medical College, Badnapur, Jalna between March 2014 to March 2017. The patients were followed up at 6 weeks, 12 weeks, 6 months and 1year. Functional outcome was assessed and compared with modified Harris hip score.
**Results:** Modified Harris hip score was better with bipolar group as compared to AMP group. Functional activities like use of public transport were better with bipolar group. Complications like acetabular erosion were rare in bipolar group as comparison to AMP group.
**Conclusions:** Fixed stem bipolar prosthesis is a superior option as compared to Austin Moore's prosthesis.

**Keywords:** Austin Moore's prosthesis, Fixed stem bipolar prosthesis, Hemiarthroplasty, Femoral neck fracture

## INTRODUCTION

In elderly patients, the most common fracture that occurs around the hip is either fracture neck of femur or intertrochanteric fracture.[1] Osteoporosis is the most common cause for this fracture to occur in old age. Fracture neck femur occurring in elderly patients is a growing issue as it has a very important impact on the society there are many modalities of treatment for the fracture of neck femur but still no absolute treatment has been decided in general for every patient and so it has been called as unsolved fracture by Dickson & Nicoli.[2] Mainly there are two modalities of treatment for fracture neck of femur one is osteosynthesis and the other is hemi-arthroplasty.[3] Age of the patient, walking ability, comorbidities & life expectancy should be the criteria for treating fracture neck of femur either by osteosynthesis or hemiarthoplasty.[4] Advantages of hemiarthoplasty are that it prevents complications like non-union and avascular necrosis of femoral head. Patients with long life expectancy or young patient's total hip replacement are a better option to avoid acetabular complications. Similarly very little acetabular wear occurs with bipolar prosthesis due to dual bearing system but the complication of polythene wear is a possibility.[5,6] John Charnley was the first person to give the successful concept of arthroplasty

and he advocated two types of bipolar prosthesis of which one design was of Bateman & another design was of Gilberty.[7] In India maximum work on bipolar prosthesis was done by Dr. Talwalker his work was very much suitable according to Indian Squating habits. His prosthesis was single unit component of stainless steel head captive with high density polyethylene cup.

So in our study our aim was to compare the outcome of patients operated for hemiarthoplasty using Austin Moore's prosthesis and bipolar prosthesis by using modified Harris hip score.[8]

## METHODS

### *Study design*

A comparative study was conducted between Austin Moore's prosthesis and bipolar prosthesis in fracture neck Femur from the period of March 2014 to March 2017.

### *Study area*

Inpatient department, Department of Orthopaedics, IIMSR Medical College, Badnapur, Jalna, Maharashtra.

### *Study population*

All male and female patients aged 60 and above admitted in the hospital.

### *Sample size*

Total 140 elderly patients who were admitted and operated between March 2014 to March 2017 and had fulfilled the inclusion criteria, were enrolled for this study. Patients operated with Austin Moore's prosthesis were allocated to Group-A and operated with bipolar prosthesis were allocated to Group B 70 patients each were allocated into 2 groups. Approval from local ethical committee was taken prior to conducting of the study.

### *Inclusion criteria*

Cases of fracture neck femur of age group 60 years and above. All patients medically fit for surgery even with hypertension and diabetes mellitus.

### *Exclusion criteria*

Seriously ill patients and patients not fit for surgery. Fracture due to tumor or any other pathological cause. Compound fractures other limb fractures and Neuro vascular injuries.

### *Statistical method*

Data was entered in Microsoft Excel 2013 and analyzed using OpenEpi version 3.01. Percentages and proportions were used whenever appropriate and chi-square test was also applied with $p \leq 0.05$ was considered as significant.

### *Pre-operative management*

Detailed history was taken with particular emphasize on mode of injury and associated medical illness. In all patients preoperatively.[9] Buck's traction with appropriate weight was applied, to the fractured lower limb, with the aim of relieving pain, preventing shortening and to reduce unnecessary movements of the injured limb. Oral or parental NSAIDs were given to relieve the pain. Anteroposterior radiographs of the affected hip joint of pelvis with both hips were taken for all the patients. Assessment of fitness was done by the anaesthetist and physician.

*Surgical procedure*: All surgeries were performed on an elective basis under spinal Anesthesia with fixed stem bipolar prosthesis or AMP. Position of the patient: Lateral position

### *Post-operative management*

Both the lower limbs kept in abducted position, with a pillow in between both the legs. Drain removal was done after 24 hours. Exercises like deep breathing exercises, quadriceps exercises and movements are taught. Patients were made to sit up, standup with support (walker) on the second day and were allowed to full weight bear and walk with the help of a walker on the third postoperative day depending on his/her pain tolerance and were encouraged to walk thereafter. Sitting cross-legged and squatting were notallowed.[10]

Suture removal was done on the 14$^{th}$ postoperative day. The patients were assessed for any shortening or deformities if any and discharged from the hospital. Patients were followed up at an interval of 6 weeks, 3 months, 6 months and one year. Functional outcome was analyzed by modified Harris hip scoring system. At each follow up radiograph of the hip was taken for radiological analysis.

*Follow up*: At the time of discharge the patients were asked to come for follow up after 6 weeks and for further follow up at 3 months, 6 months and one year. The patients who turned for follow up or whose details could be collected were finally taken up for the assessment of functional results. At follow up, detailed clinical examination was done systematically. Patients were evaluated according to Harris hip scoring system for pain, limp, the use of support, walking distance, ability to climb stairs, sitting on chair, ability to enter public transportation, deformities, leg length discrepancy and movements. All the details were recorded in the follow up chart. The radiograph of the operated hip was taken at regular intervals, at each follow up.

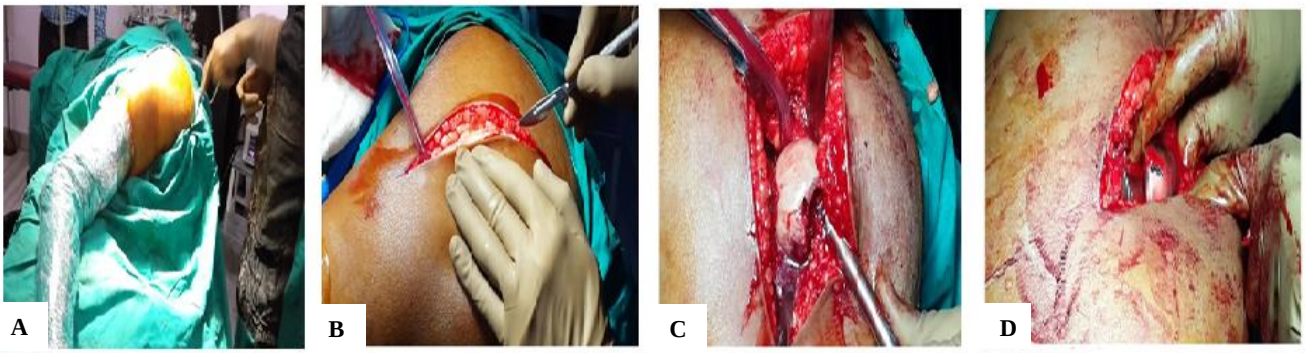


**Figure 1: Intra operative photographs, (A) Lateral position; (B) Moore's approach; (C) femoral head extracted; (D) bipolar prosthesis inserted.**

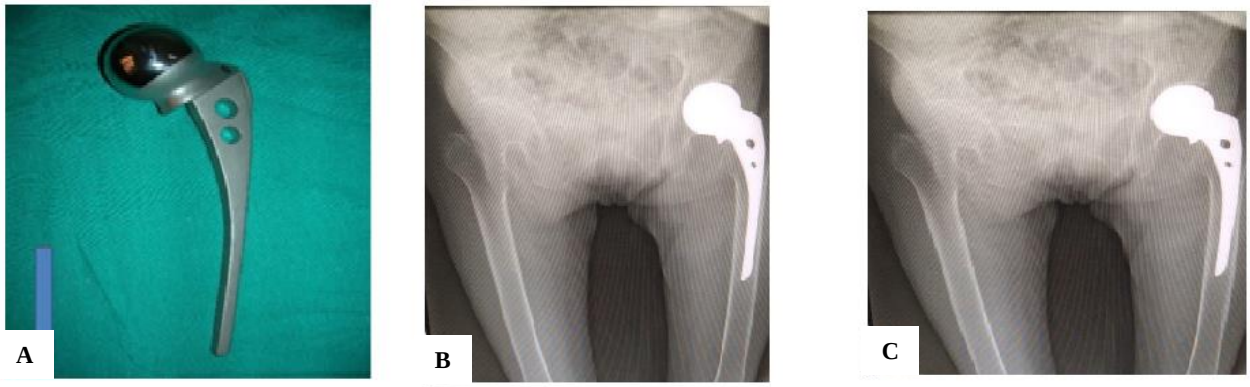


**Figure 2: Case of Austin Moore's prosthesis, (A) Austin Moore's prosthesis implant; (B) immediate postoperative radiograph; (C) postoperative radiograph at one year.**

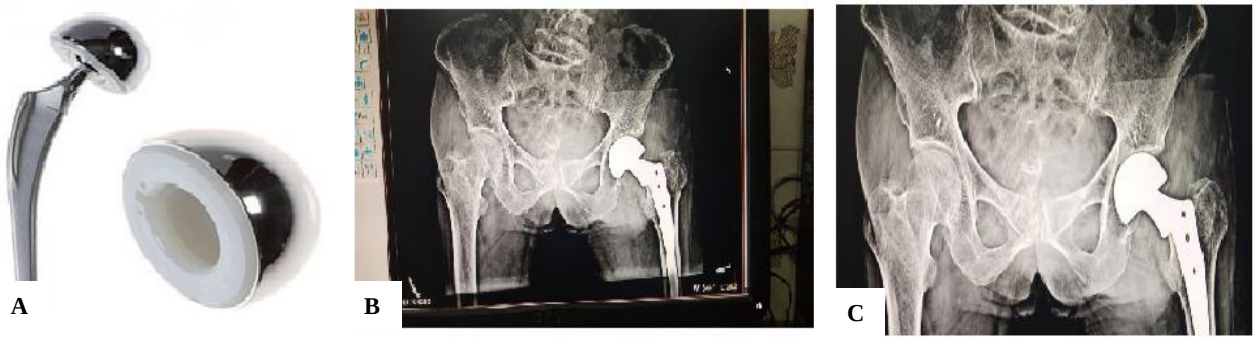


**Figure 3: Case of bipolar prosthesis, (A) implant of bipolar prosthesis; (B) immediate post-operative x-ray; (C) post-operative radiograph after one year.**

## RESULTS

In this study 68% were female patients affected with fracture neck femur as compared to 42% of male patients. Patients treated with bipolar prosthesis were relatively younger than patients treated with Austin Moore's prosthesis. The patients were followed up at 6 weeks, 6 months and 1 year.

Functional outcome was compared with modified Harris Hip score, relatively better outcome was obtained in bipolar prosthesis patients which has been shown in tabulated form, as excellent, good, fair and poor

In age group of 60 to 70 yrs excellent outcome was obtained in AMP (As shown in Table 1A).

**Table 1: Age incidence.**

| Age groups (in yrs) | AMP | Bipolar |
|---|---|---|
| **60-70** | 41 | 55 |
| **71-80** | 25 | 14 |
| **>81** | 04 | 01 |

**Table 1A: Association of age group with outcome – AMP.**

| Age Groups | Excellent | Good | Fair | Poor |
|---|---|---|---|---|
| **60-70** | 20 | 11 | 10 | 00 |
| **71-80** | 12 | 11 | 02 | 00 |
| **>81** | 01 | 02 | 00 | 01 |

**Table 1B: Association of age group with outcome – bipolar.**

| Age groups | Excellent | Good | Fair | Poor |
|---|---|---|---|---|
| **60-70** | 42 | 08 | 05 | 00 |
| **71-80** | 08 | 04 | 02 | 00 |
| **>81** | 00 | 01 | 00 | 00 |

**Table 1C: Outcome at 6 months.**

| Hip Score at 6 Months | AMP | Bipolar |
|---|---|---|
| **Poor (60-69)** | 00 | 00 |
| **Fair (70-79)** | 10 | 04 |
| **Good (80-89)** | 10 | 06 |
| **Excellent (90-100)** | 50 | 60 |

**Table 1D: Outcome at one year.**

| Hip score at 1 Year | AMP | Bipolar |
|---|---|---|
| **Poor (60-69)** | 00 | 00 |
| **Fair (70-79)** | 10 | 04 |
| **Good (80-89)** | 10 | 11 |
| **Excellent (90-100)** | 50 | 55 |

Relatively more excellent outcome was obtained in age group of 60-70 years as compared to AMP (As shown in Table 1B).

Table 1C shows that better Harris Hip score was obtained in Bipolar prothesis at the end of 6 months.

**Table 2: Comparison between AMP and bipolar hemiarthroplasty.**

| Postoperative parameters | AMP hemiarthroplasty (%) | Bipolar hemiarthroplasty (%) | P value |
|---|---|---|---|
| **No pain** | 18 (25.7) | 28 (40) | 0.225 |
| **Limp** | | | |
| No limp | 29 (41.4) | 37 (52.8) | 0.558 |
| **Use of support** | | | |
| No support | 31 (44.2) | 18 (25.7) | 0.771 |
| **Sitting on chair** | | | |
| More than a hour | 38 (54.2) | 58 (82.8) | 0.278 |
| Use of public transport | 36 (51.4) | 58 (82.8) | 0.083 |
| **Stair climbing** | | | |
| Without support | 16 (22.8) | 30 (42.8) | 0.281 |
| **Ability to wear shoe or socks** | | | |
| With ease | 8 (11.4) | 32 (45.7) | 0.042 |
| **Range of movements** | 17 (24.2) | 31 (44.2) | 0.015 |

**Table 3: Complications.**

| Complications | AMP No. | Bipolar No. |
|---|---|---|
| **Superficial infection** | 2 | 3 |
| **Haematoma** | 0 | 0 |
| **Gaping** | 0 | 0 |
| **Post. dislocation** | 1 | 2 |
| **Prosthetic migration** | 0 | 0 |
| **Acetabular erosion** | 4 | 0 |
| **Restricted ROM** | 1 | 0 |
| **Late infection** | 0 | 0 |
| **Sciatic nerve paresis** | 0 | 0 |
| **Peri prosthetic fracture** | 0 | 0 |

Better Hip score was obtained in bipolar prothesis at the end of 1 year (as shown in Table 1D).

It was seen from Table 2 that use of public transport, ability to wear shoe or socks and range of movements

was significantly better in Bipolar prosthesis as compared to AMP.

Complications of acetabular erosion was more in AMP as compared to bipolar (as shown in Table 3).

## DISCUSSION

This study was the comparison of 70 patients operated with Bipolar Hemiarthoplasty & another 70 patients operated with Austin Moore's prosthesis in fracture neck of femur with age of the patients Sixty years & above and then follow up was done at the end of six weeks, six months and one year. At the end of the study we found that patients with Bipolar prosthesis had better functional outcomes in terms of post-operative pain, use of support postoperatively and postoperative improve range of motion.

This study shows that patients operated with bipolar prosthesis wear able to use public transport more effectively in comparison to those patients operated with Austin Moore's prosthesis. In this study patients operated with bipolar prosthesis had almost no chances of acetabular erosion as compared to those operated with Austin Moore's prosthesis.[10] In similar study of Cornell et al, they found patients with bipolar prosthesis had significantly better walk test as compared to those of AMP & they also stated that their patients range of motion at 6 months was better with bipolar prosthesis.[11] In another study of 496 patients done by Lestrange NR Shows that there was definite advantage of bipolar prosthesis over Austin Moore's prosthesis in relation to stability of implant, functional outcome and acetabular erosion.[12-14] Davison et al also did similar study in 2001 over 187 patients with minimum 2 year follow up but their conclusion was that there was no difference of outcome between the two prosthesis, But there problem was that more than 18% of patients had lost in follow up. Another similar study with very short number of patients that is 48 patients reported that the difference in functional outcome between the two groups was negligible.[15] In the study of Sabnis and Brenke, patients walking unaided was significantly large i.e. 54% with bipolar prosthesis, in comparison with Austin Moore's prosthesis which was only 14%.

## CONCLUSION

In our study, we found that fixed stem bipolar prosthesis is a superior option as compared to Austin Moore's prosthesis with better functional outcome, lower rate of complication and almost negligible cost difference.

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*Ethical approval: The study was approved by the institutional ethics committee*

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