



## Treatment of Femoral Neck Fracture in Elderly a Comparative Study between Austin Moore Prosthesis and Bipolar Prosthesis

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### Abstract

**Introduction:** Neck of the femur fracture is one of the frequently seen fractures by an orthopaedic surgeon. The incidence of these fractures and the problems subsequent to them seems to be increasing; the cause of this is mainly the increase in elderly population. This percentage is due to increasing rate of osteoporosis and high velocity trauma. At present, there are many surgical options (Dynamic hip screw systems, Cannulated screws, Blade plates, Hemi and Total hip arthroplasty) available. There is a universal agreement that unipolar or bipolar hemiarthroplasty is the preferred method for treating displaced intracapsular femoral neck fractures in elderly patients.

**Aim:** To study and compare the functional and radiological outcome between Austin Moores prosthesis and Bipolar prosthesis done over 6 months.

**Materials and Methods:** 30 patients were divided into 2 groups depending on the prosthesis used on them. Type of prosthesis was chosen by taking patients health, age and demand under consideration. One group underwent hemiarthroplasty with Austin Moore's prosthesis and another group underwent hemiarthroplasty with bipolar prosthesis. All the patients were assessed using Harris hip score and Bakers acetabular score at 6 weeks, 3 months and 6 months respectively.

**Result:** At the end of the study, patients in both the groups were assessed using Harris hip sore and Bakers acetabular score and statistically significant values were obtained.

**Conclusion:** The current study shows that in short term follow-up both Austin-Moore arthroplasty and Bipolar arthroplasty showed more or less similar end results. However the incidence of complications like implant loosening was lower after bipolar hemiarthroplasty. And also patients showed better functional satisfaction in bipolar prosthesis compared to Austin-Moore prosthesis.

**Keywords:** neck of femur fracture, Austin Moore arthroplasty, bipolar arthroplasty.

### Introduction

Neck of the femur fracture is one of the frequently seen fractures by an orthopaedic surgeon. The incidence of these fractures and the problems subsequent to them seems to be increasing; the cause of this is mainly the increase in elderly population. Due to better healthcare and lifestyle, the lifespan of our population has increased.

Statistics shows that fracture of proximal femur will rise from 1.66 million in 1990 to 6.26 million by 2050<sup>1</sup>. This percentage is due to increasing rate of osteoporosis and high velocity trauma. Individuals coming under this age group have many co morbidities which will complicate the treatment of such fractures. The final result we

look for is to get the patient to his / her pre-morbid status of functioning. Management of fracture of femur neck in aged patients has been controversial. Neck of femur fractures has been considered 'unsolvable fracture' in Orthopaedics during the past era<sup>3</sup> because of high rate of associated complications, which include nonunion and avascular necrosis of the femoral head, among others. At present, there are many surgical options (Dynamic hip screw systems, Cannulated screws, Blade plates, Hemi and Total hip arthroplasty) available. Intracapsular extent of the fracture, decreased supply of blood to the femoral head going through the neck and difficulty in maintaining fracture reduction have been cited as reasons for failure of fixation. In spite of treatment methods being refined over time, a method on the ideal treatment remains less explanatory.

Factors to be considered in choosing any modality of treatment are intrinsic, viz. patient age, general condition of health, fracture classification; and extrinsic, viz. facilities at hand and lifestyle.

Even though conservative management of these fractures has been documented, presently there are very few indications for these fractures (for patients suffering from terminal illness or those who are confined to bed). Surgical treatment has been established as the gold standard; however, the surgical option remains a dilemma. Open reduction and internal fixation has been shown to have a high rate of revision surgery due to nonunion and avascular necrosis<sup>3-6</sup>.

Hip replacement arthroplasty (partial or total) is emerging as the most viable treatment option<sup>8-9</sup>. Replacement of the femoral head and neck with prosthesis offers a way to prevent complications of internal fixation and is therefore an attractive alternative in the elderly patient. There is however no consensus on how to treat patients with a displaced intracapsular fracture between sixty and eighty years of age. It is because of the poor clinical results that the displaced intracapsular fracture is referred to as "the unsolved fracture".

The development of bipolar hemiarthroplasty was based on the clinical experience with limited

success of unipolar prosthesis due to progressive acetabular erosion and protrusion. Hemiarthroplasty helps in early movement and good recovery of functional outcome. However, controversy remains as to choosing cemented or uncemented hemiarthroplasty in elderly patients. While neck of fracture treated via cemented hemiarthroplasty may be less prone to peri-prosthetic fracture and prosthetic loosening, they are also more expected to cause embolisms and reduced cardiac output during insertion of bone cement.

### Materials and Method

Prospective comparative study performed at the orthopedics department in K.S. Hegde Hospital, Mangalore from August 2015 to November 2017. A total of 31 consecutive patients undergoing hemiarthroplasty after satisfying the eligibility criteria were included in the study and divided into two treatment groups:

**Group A**– Unipolar Arthroplasty by Austin Moore prosthesis

**Group CR**- Bipolar Arthroplasty by Bipolar prosthesis

### Inclusion Criteria

All the patients above the age of 50 years diagnosed to have fracture neck of femur and having acceptable cognitive function along with anaesthetic clearance as per ASA (American society of Anaesthesiologists).

### Exclusion Criteria

1. Patients seen as unfit for surgery as per ASA guidelines.
2. Cases of Rheumatoid arthritis/ Secondary osteoarthritis.
3. Cases with pre-existing acetabular involvement.
4. Paralytic disorder.
5. Amputation and non ambulatory patients.
6. Cases of avascular necrosis of the femoral head
7. Patients were initially screened in the casualty or out-patient department. Anteroposterior X-rays of pelvis with both

hips with opposite hip in 15° internal rotation and lateral view of the injured joint were taken. All patients with displaced intracapsular neck of femur fractures were initially immobilized with Thomas splint and skin traction. Routine haematological investigations were done. Assessment of fitness was done by the anesthetist and physician.

All patients were treated surgically with hemiarthroplasty using the Austin Moore's and Cemented Modular Bipolar prostheses with the posterior approach as per standard hospital protocol by trained surgeons.

Intravenous Antibiotics (Cefazolin 1gm) was given on previous night and same dose repeated just before starting surgery. Post-operatively antibiotics were continued for 5 days. Oral Cefuroxime (200 mg tab.) was given till suture removal on 10 days.

#### Post-op Protocol

- Post-operative and mobilization protocol was same for all patients.
- Patient is kept in well equipped, pre-fumigated room.
- Leg in 30o abduction with a pillow in between the thighs.
- Foot end elevation for one day.
- Deep vein thrombosis prophylaxis if high risk.
- Post-operative Antero-Posterior X-ray of operated hip.
- Post-operative Haemogram and Serum Electrolytes done immediate postoperatively and 24 hrs post operatively.
- Static exercises in bed for glutei, hamstrings and quadriceps and breathing exercises.
- Drain removal after 48 hrs.
- Sitting on 1st day with active and passive exercises in bed.
- Partial weight bearing i.e. walking on operated side with the help of a walker from 2nd day onwards and full weight bearing i.e. walking without support from 4th day.
- Postoperative dressings on 5th and 8th day.
- Suture removal on or after 10 days.

- Patient discharged after full rehabilitation.
- Prior to discharge check done for late clinical sepsis and deep vein thrombosis.

#### Routine Clinical Follow up

Post-operative visits were scheduled at 6 weeks, 3 months and 6 months. Clinico-radiological and functional assessments were carried out. All patients were functionally assessed using the Modified Harris Hip Score and complications, if any, were documented. Radiographs were analysed for acetabular erosion using the grading system proposed by Bakers acetabular erosion classification.



Pre-operative x-ray (bipolar prosthesis)



Post-operative x-ray (bipolar prosthesis)



Pre-operative x-ray (AMP)



Post-operative x-ray (AMP)

### Statistical Analysis

The quantitative data was represented as their mean  $\pm$  SD. Categorical and nominal data was expressed in percentage. The t-test was used for analyzing quantitative data, non parametric data was analyzed by Mann Whitney test and categorical data was analyzed by using chi-square test. The significance threshold of p value was set at  $<0.05$ . All analysis was carried out using SPSS software version 21.

### Demography

Mean age of the cases in the study was 67.93 years with about three fourth of the cases being over 60 years of age. Female predominance was observed in the present study with 56.3% female to 43.8% males.

Krishnan J et al. in their study observed the commonest age group was 61-70 years in the case undergoing hemiarthroplasty with mean age of 60.8 years. The female to male ratio observed in their study was 2.08:1. The mean age in a similar study on 40 cases by Mishra et al. was 67 years with 17 males to 23 females. Mean age in another similar study by Somashekar et al.<sup>5</sup> was 70 years with 66% females to 34% males. Most of the reports agree that neck of femur fracture is more common in females owing to higher prevalence of osteoporosis in elderly females.

### Functional outcome

At the end of 6 weeks, fair outcome was seen in 40% and 56.3% cases of AM prosthesis and Bipolar prosthesis respectively ( $p=0.47$ ). Fair to good outcome at the end of 3 months was seen in 46.7%, 20% and 50%, 37.5% cases of AM prosthesis and Bipolar prosthesis respectively ( $p=0.37$ ). Good/ Excellent outcome at the end of 6 months was seen in 46.7% and 75.1% cases of AM prosthesis and Bipolar prosthesis respectively ( $p=0.19$ ). Poor outcome was associated with 3 cases of AM prosthesis. However no poor outcome was associated with bipolar group.

Cornell et al. performed a prospective six month follow up of 33 bipolar and 15 unipolar

hemiarthroplasties and found no significant differences between the 2 groups in terms of functional recovery. Ali A et al. average hip score results were higher in all grade among Bipolar patients. However, the difference from scores of AM Prosthesis group patients was statistically insignificant ( $p>0.05$ ). Krishnan J et al. in their study also observed that Austin- Moore hemiarthroplasty showed 72.73% good result and 27.27% poor results, where as in Bipolar arthroplasty 41.67% showed excellent results and 58.33% showed good results ( $p>0.05$ ). Somashekar et al.<sup>5</sup> In their study observed excellent to good results in 47.1% and 41.1% cases of bipolar group as compared to 33.1% and 27.8% patients of AM prosthesis group. The mean Harris hip score at the end of follow up period was 86.2 and 79.8 in Bipolar and AM group respectively ( $p>0.05$ ). Long and Knight as well as Drinker and Murray also showed that there was little difference between the unipolar and bipolar prosthesis in terms of postoperative mobility of the patient, operative morbidity and mortality.

However few other authors reported better results with Bipolar hemiarthroplasty. Kenzora et al. in a prospective outcome study at 24 months of follow-up of 195 bipolar and 75 unipolar hemiarthroplasties showed that patients who underwent bipolar hemiarthroplasty had better pain relief and function. Lestrangle et al. found that the bipolar prosthesis showed better results in terms of improved functional outcome. Merlo et al. Attested to the superiority of bipolar components when compared with conventional hemiarthroplasties. They reported better clinical results with bipolar components.

Thus observations made in present study and that by other authors showed that in short term follow-up both Austin-Moore arthroplasty and Bipolar arthroplasty showed similar functional outcome.

### Radiological observations

Normal radiological findings were observed in most cases apart from a single case of dislocation of operated hip. The prosthesis was dislocated

twice in this patient during the course of 6 months and ultimately hip replacement was required. No case of acetabular erosion was seen in Bipolar group.

Efthekar stated "pressure brought by the femoral prosthesis upon the acetabular cartilage makes subsequent migration of the prosthesis inevitable. The bipolar prosthesis has two bearing surfaces; load and frictional torque can theoretically be absorbed in part by the metal on polyethylene inner bearing reducing the magnitude of forces between the implant and acetabulum thus decreasing acetabular erosion.

Abdelkhalek M et al. in a similar study of 50 cases (25 in each group) observed acetabular erosion in 2 cases of AM prosthesis group as compared to none in bipolar group. Lestrang found that the bipolar prosthesis offered advantages over one piece designs in terms of fit and decreased acetabular erosion. La belle et al. in a long term follow up of bipolar vs unipolar prostheses concluded that there was less pain and decreased acetabular protrusion in the bipolar group.

### Complications

Superficial Infection were observed in 2 and 1 cases of Austin moore and Bipolar group respectively ( $p < 0.05$ ).

The infection rate has been reported high when posterior approach is used for arthroplasty due to proximity of the incision to the perineum. Patient who developed infections had to stay longer in the hospital. Management of superficial infections was done with appropriate frequent dressings and antibiotics according to culture and sensitivity reports. In our study we did not encounter any deep infection.

In present study, limb length discrepancy was observed in 2 (13.3%) cases with Austin Moore prosthesis as compared to none in Bipolar group. Limb length discrepancy was more pronounced in AM group, possibly due to factors related to alignment of the prosthetic stem, length of head offset and calcar seating. Individual differences

exist and may be responsible for some discrepancy.

Krishnan et al. in their study observed limb length discrepancy in 1 case out of 20 in AM group while none was seen in Bipolar group. Abdelkhalek M et al. in their study observed length discrepancy in one case (2%) of bipolar group and six cases (12%) with AMP group. Ali A et al. in their study observed Limb length discrepancy scores to be higher in AMP group patients throughout the follow up time. However, limb length discrepancy did not exceed 1-2 cm in either of the group patients resulting in no or very slight limping. Therefore, score points for this category were not significantly different between the two groups.<sup>2</sup>

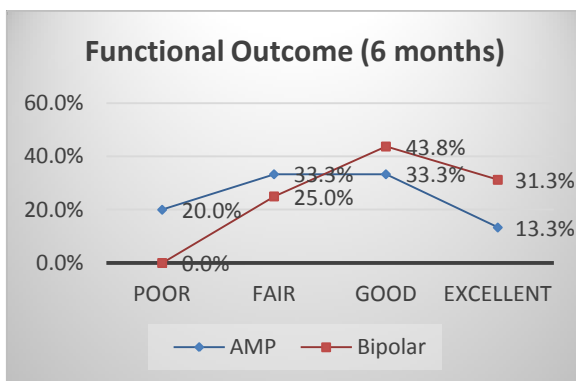
In present study, Implant loosening was observed in 1 case (20%) with Austin Moore prosthesis. No case required re-operation in Bipolar group. Abdelkhalek M et al.<sup>81</sup> in their study observed reoperation in 2 cases of Austin Moore prosthesis group (out of 25 cases) while none was observed in Bipolar group. Yamagata, Chao et al. observed rate of reoperation as 12.5% with fixed head endoprosthesis and 7% with bipolar prosthesis. Krishnan et al. also observed re-operation in 3 cases (out of 20) in AM group while no re-operation was seen in Bipolar group. Similarly Somashekar SV et al. observed re-operation in 2 cases (out of 20) in AM group while none was reported in Bipolar group.

### Results

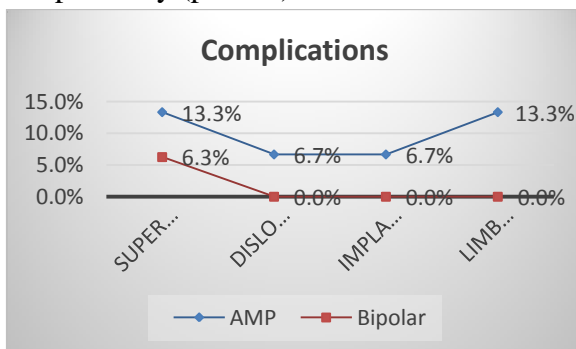
1. Mean age of the cases in the study was 67.93 years with about three fourth of the cases being over 60 years of age. No difference was observed between the study groups as per age ( $p = 0.284$ ).
2. Female predominance was observed in the present study with 56.3% female to 43.8% males. No difference was observed between study groups ( $p = 0.073$ ).
3. Most of the cases were from category III or IV (87.5%) as per Garden's classification. No

difference was observed between study groups (p=0.522).

4. Both the side were equally affected in present study with no difference between study groups (p=0.076).
5. Associated medical co-morbidity was seen in 17 (53.1%) cases with no difference between study groups (p=1.0). Most common associated co-morbidity was diabetes (13 cases) followed by hypertension (9 cases).
6. Good/ Excellent outcome at the end of 6 months was seen in 46.7% and 75.1% cases of Austin Moore prosthesis and Bipolar prosthesis respectively (p=0.19).



7. Poor outcome was associated with 3 cases managed with Austin Moore prosthesis.
8. Mean Harris score between the study groups was comparable at 6 weeks and 3 months. However at the end of 6 month, mean score was slightly better in bipolar group as compared to Austin more group, but the difference was non significant (p>0.05).
9. Superficial Infection were observed in 2 and 1 cases of Austin moore and Bipolar group respectively (p<0.05).



10. Dislocation was observed in 1 case of Austin Moore prosthesis.

11. Implant loosening was observed in 1 cases with Austin Moore prosthesis.
12. Limb length discrepancy was observed in 2 cases with Austin Moore prosthesis as compared to none in Bipolar group.

**Conclusion**

Hemiarthroplasty is considered the optimal treatment for elderly patients with intracapsular femoral neck fractures and produce satisfactory results. While bipolar prosthesis enables reduction of acetabular wear and increase in prosthesis life and function, unipolar hemiarthroplasty using the Austin Moore’s still remains a popular choice. The current study shows that in short term follow-up both Austin-Moore arthroplasty and Bipolar arthroplasty showed more or less similar end results. However the incidence of complications especially acetabular erosions and implant failures were lower after bipolar hemiarthroplasty. So, in younger patients with more ambulatory activities and greater life expectancy, bipolar hemiarthroplasty offers a better solution.

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