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Management Of Intracapsular Fracture Neck Of The Femur In Elderly With Bipolar Hemiarthroplasty.

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ABSTRACT

Intracapsular femoral neck fractures are common in the elderly population after a simple fall. To avoid the drawbacks of internal fixation and for early mobilization, hemiarthroplasty is performed in the elderly. This study aims to compare the outcome of AMP with the uncemented bipolar prosthesis in geriatric patients 51 patients above 60 years and an acute displaced fracture of the femoral neck was randomly allocated to treatment by either AMP (Austin Moore prosthesis) or bipolar hemiarthroplasty, in the Department of Orthopaedics, Department Of Orthopaedics, Sri Venkateshwara Medical College And Hospital, Ariyur, Pondicherry. The patients were summoned at 6 weeks, 12 weeks, 6 months, and 1 year. Functional outcome was assessed and compared with modified Harris hip score and radiological parameters. The mean Harris hip score in the bipolar and AMP groups was 86.31 ± 12.1 and 79.86 ± 15.42 , respectively ($p=0.182$). The range of motion was 204.52 ± 28.2 and 183.62 ± 36 ($p=0.014$) respectively. Functional activities like the use of public transport and the ability to wear shoes or socks were better with the bipolar group. Incidence of complications like painful hip, posterior dislocation, periprosthetic fracture, and acetabular erosion was encountered in the AMP group. The use of uncemented bipolar endoprosthesis in the management of displaced femoral neck fractures in the elderly was associated with better mean Harris hip score and the incidence of complications was limited. Hence, bipolar would be a better option for elderly patients with a fractured neck or femur.

Keywords: Unipolar, Bipolar, AMP, Hemiarthroplasty, Femur neck fracture

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INTRODUCTION

A fracture of the hip is a common injury. With increasing life expectancy throughout the world, the number of elderly individuals is increasing in every geographical area, and it is estimated that the incidence of hip fracture will rise from 1.56 million in 1990 to 6.38 million by 2045. Intracapsular femoral neck fractures can be divided into displaced and undisplaced fractures. According to the Swedish national hip fracture register, intracapsular fractures of the femoral neck constitute 53% of all hip fractures out of which 33% are undisplaced and 67% are displaced [1]. The rationale for operative treatment using internal fixation is to reduce the risk of secondary displacement of undisplaced fractures and to maintain fracture reduction in displaced fractures. The main reasons for the failure of internal fixation are avascular necrosis and non-union. Failure of internal fixation leads to a reintervention rate of 35% with decreased function and increased morbidity as demonstrated by a meta-analysis done by Yao [2]. Replacement of the femoral head and neck with prosthesis offers a way to prevent all possible complications of internal fixation and is, therefore, a better alternative in a biologically elderly patient. There is however no consensus on how to treat patients with a displaced intracapsular fracture between sixty and eighty years old. It is therefore because of poor clinical results that the displaced intracapsular fracture is referred to as the unsolved fracture [3, 4]. The first hemiarthroplasty was introduced in 1940 by Moore and Bohlman, after the removal of a giant cell tumor of the femoral head [5, 6].

METHODS

The present study of 51 cases of intracapsular fracture neck of the femur in elderly patients above the age of 60 years irrespective of sex treated by hemiarthroplasty using unipolar (Austin Moore's) or uncemented bipolar prosthesis, was done in the Sri Venkateshwara Medical College And Hospital, Ariyur, Pondicherry selected based on purposive sampling (judgment sampling) method. The study period was from April 2022 to May 2023. The clearance has been obtained by the ethical committee.

Inclusion criteria: Case of fractured neck femur of age group above 60 years; all patients medically fit for surgery even with hypertension and diabetes mellitus; All types of fractures under Gardens classification are considered; closed fractures; fracture within 20 days and pre-injury ambulatory patients.

Exclusion criteria: Terminally ill patients and patients unfit for surgery; pathological fracture; compound fracture; other limb fractures and neurovascular injuries. In this study primary hemi replacement arthroplasty of the hip is done in 51 cases of fracture neck of femur, using uncemented bipolar prosthesis for 25 cases and Austin Moore's prosthesis for 26 cases. The operative procedure is meticulously followed; the results are evaluated and compared. An anteroposterior radiograph of the pelvis with both hip joints is taken for all the patients on admission. Routine blood investigations RBS, serum urea, creatinine, chest x-ray, ECG, and 2D echocardiography were done and medical fitness was taken for surgery. Patients as well as attendees were explained about the surgery and its risk factors and written and informed consent for surgery was taken.

Surgical procedure

All the surgeries were performed on an elective basis using standard aseptic precautions with spinal, epidural, or general anesthesia. Lateral position with the patient lying on the unaffected side. The lower extremity from the groin to the toes was draped in sterile towels separately to enable easy manipulation of the limb during surgery. For all patients, the posterolateral approach (Moore's Approach) was used in our series. The fractured head and neck of the femur are levered out of the acetabulum and head size is measured using a femoral head gauge. The acetabulum was prepared by excising any soft tissues. The femoral canal was rasped using a broach (rasp) and prepared for insertion of the prosthesis. The prosthesis was then inserted into the femoral shaft in about 5-10 degrees of anteversion and impacted into the femur. No bone cement was used for the cases. The reduction of the prosthesis was then done with gentle traction of the thigh. The wound was closed in layers over a suction drain, which was removed at the first dressing change after 48 hours.

Postoperative management

IV fluids are given, and after 6 hours oral fluids are given. Intravenous antibiotics and analgesics were continued for 7 days postoperatively. Both the lower limbs are kept in abduction with a pillow in

between both legs. Check radiographs were taken after 48 hours. Patients were made to sit up on the second day, stand up with support (using a walker), on the third day, and were allowed to full weight bear and walk with the help of a walker on the fourth postoperative day depending on the pain tolerance. Sitting cross-legged and squatting were not allowed. Suture removal was done on the thirteenth (13th) postoperative day. The patients were assessed for any shortening or deformities if any and discharged from the hospital. Patients who had infections and bedsores were treated accordingly before discharging from the hospital.

Follow up

Patients were followed up at intervals of 6 weeks, 3 months, 6 months, and one year. Functional assessment was analyzed by a modified Harris hip scoring system for pain, limp, the use of support, walking distance, ability to climb stairs, ability to put on shoes and socks, sitting on a chair, ability to enter public transportation, deformities, leg length discrepancy, and movements were recorded in the follow-up chart. At each follow-up, a radiograph of the hip was taken for radiological analysis.

Harris hip scoring system

The HHS was developed for the assessment of the results of hip surgery and is intended to evaluate various hip disabilities and methods of treatment in an adult population. The original version was published in 1969 [7].

Total functional outcome was graded as follows depending on the total Harris:

- Failure: Harris's hip is less than 60
- Poor: Harris's hip score between 60-69
- Fair: Harris's hip score is between 70-79
- Good: Harris's hip score is between 80-89
- Excellent: Harris's hip score is between 90-100

The functional outcomes of the groups were then compared.

Statistical methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean \pm SD (min-max) and results on categorical measurements are presented in number (%). Significance is assessed at a 5% level of significance. The following assumptions are made: 1 Dependent variable should be normally distributed. 2. Samples drawn from the population should be random. The cases of the samples should be independent. Student t-test (two-tailed, independent) has been used to find the significance of study parameters on a continuous scale between the two groups (inter-group analysis) on metric parameters. The Chi-square/ Fisher Exact test has been used to find the significance of study parameters on a categorical scale between two or more groups [8]. The assumptions of the Chi-square test are as follows [9-11]. Association between two qualitative variables was seen by using Chi square/Fischer's exact test. A comparison of the mean and Standard Deviation between the two groups was done by using an unpaired t-test to assess whether the mean difference between the groups was significant or not. A p value of <0.05 was considered as statistically significant whereas a p<0.001 was considered as highly significant.

RESULTS

Of the 51 cases, 25 cases were managed with bipolar prosthesis and 26 cases with Austin Moore's prosthesis. The following observations were made from the data collected during the study. In our study among 51 cases, the maximum age recorded in both the male and female patients was 86 years. Most of the patients were in the age group of 60-70. The mean age in the bipolar group was 65.2 years and the AMP group was 73.55 (Table 1). Of the 51 cases, 22 cases were male and the rest 29 were females. In the bipolar group, 12 male cases and 13 female cases were recorded whereas in the AMP group, 10 male cases and 16 female cases were present. Females constituted 56.8% of the whole cases. There were 31 cases with fractures on the left side and 20 cases with fractures on the right side. The p-value was 0.73 between the two groups, suggesting statistical similarity between the two groups. The left side was most commonly

involved in both groups.

Table 1: Age distribution of the two groups

Age in years	Group bipolar		Group AMP	
	No	%	No	%
60-70	17	68	9	34.61
71-80	5	20	7	26.92
Above 80	3	12	10	38.46
Total	25	100	26	100.0
Mean ± SD	65.2±7.48		73.55±9.12	

Mode of injury

Trivial fall (self-fall/TT) was the most common mode of injury in both groups (94%). 2 cases of road traffic accident (RTA) in the bipolar group and 1 case of road traffic accident in the AMP group were present. The distribution of mode of injury is statistically similar in the two groups with p=0.49.

Type of fracture: Garden’s classification

All the fracture types were classified with Gardens classification. There were 9 cases each with gardens type 2 (35.3%). But in the Bipolar group, garden type 2 injury was encountered in 36% of the cases whereas in the AMP group garden type 3 was most commonly present. Distribution of Garden type of injury was statistically similar in the two groups with p=0.825.

Mortality

Among 51 patients, 8 patients (15.6%) expired during the follow-up period due to other co-morbidities, among them 4 patients from each of the group died. Bipolar (16%) and AMP (15.38%) mortality rates were statistically similar in both of the groups (with p=0.65).

Assessment of functional results

The patients were followed up at 6 weeks, 3 months, 6 months, and 1 year. Using a modified Harris hip-scoring system, the functional results of hemiarthroplasty were assessed. The results of the final follow-up, that is 1 year were considered for our analysis. The assessment was done with the following criteria 1. Pain, 2. Limp, 3 use of support, 4 walking distance, 5 climbing of the stairs, 6 putting ting on shoes and socks, 7 sitting on the the chair, 8 entering public transport, 9 deformities, 10 leg length discrepancy, 11 range of motion.

Pain

The patients were enquired about the kind of pain they experienced during their daily activity and recorded according to their grades and scores. No pain was present in 57.14% of the patients in the bipolar group and 36.36% in the AMP group. 2 cases of the AMP group experienced marked pain. The distribution of pain is statistically similar in both groups with p=0.225.

Limp

In our study, all the patients were observed for their gait and noted for their limp and recorded. 57.14% of bipolar and 50% in the AMP group had no limp. The distribution of limp is statistically similar in both groups with p=0.57.

Use of support

In our study, 40.9% of the AMP group used no support for walking whereas 38.09% of the patients in the bipolar group used a cane only for walking long distances. None of the cases used two canes or crutches. The distribution of support system is statistically similar in both the groups with p=0.72.

Distribution of public transport use of the patients studied

76.19% of the bipolar group were able to use public transport compared to only 54.54% of the patients of the AMP group, suggesting a significant statistical difference between the two groups ($p=0.072$) (Table 2).

Table 2: Use of public transport by the study groups.

Public transport	Group bipolar		Group AMP	
	No	%	No	%
No	5	23.80	10	45.45
Yes	16	76.19	12	54.54
Total	21	100.0	22	100.0

Ability to wear shoes or socks (cut toenail)

57.14% of the bipolar group were able to wear shoes and socks with difficulty whereas 72.72% of the AMP group had difficulty in wearing shoes and socks. Wear shoes and socks easily is significantly more associated with group Bipolar with $p=0.041^*$ (Table 3).

Table 3: Ability to wear shoes and socks by the study groups

Wear shoes and socks	Group bipolar		Group AMP	
	No	%	No	%
With easy	9	42.85	4	18.18
With difficulty	12	57.14	16	72.72
Unable	0	0.0	2	9.09
Total	21	100.0	22	100.0

Range of movements

In all the patients, the sum of the existing range of movements was recorded and graded. The mean range of movements was 208.5 in the bipolar and 179.3 in the AMP group. ROM is significantly higher in patients with bipolar with $p=0.014^*$.

Harris hip score

All the functional scorings were summed and graded as below. Mean HHS is statistically more with patients of Bipolar which is 86.31 compared to 79.86 in the AMP group. The distribution of results signifies, there is no statistical difference between the two groups, $p=0.256$ (Table 4).

Table 4: Harris hip scores of the two study groups.

Harris hip score ($p=0.256$)	Group bipolar (n=25)		Group AMP (n=26)	
	No	%	No	%
Failure (less 60)	2	9.52	2	9.09
Poor (60-69)	0	0.0	3	13.63
Fair (70-79)	1	4.76	5	22.72
Good (80-89)	9	42.85	5	22.72
Excellent (90-100)	9	42.85	7	31.81
Total	21	100.0	22	100.0
Mean \pm SD	86.31 \pm 12.1		79.86 \pm 15.42	
Not recorded	4	16	4	15.38

Radiological assessment

At the end of 1 year, all the patients’ radiographs were taken for assessment, and changes were recorded. We noticed one case of stem loosening in the bipolar group, 2 cases of acetabular erosion, and 1 case of heterotrophic ossification in the AMP group.

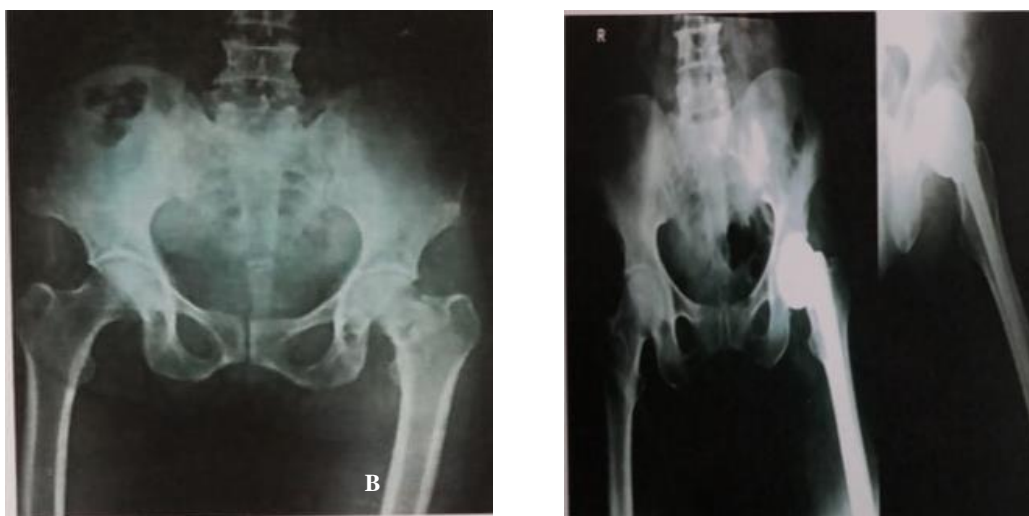


Figure 1: (A and B) Preoperative and follow-up X-ray (AMP case).

Complications

Out of all cases, 1 case (4.54%) in the AMP group presented with posterior dislocation on the 7th postoperative day, for which closed reduction was done under GA and immobilized for one and a half months and thereafter mobilized successfully. The dislocated hemiarthroplasties have a lower center edge angle of Wiberg and the patients with low offset hips were more inherently unstable and hence prone to dislocation [12].

One case (4.54%) of AMP presented with periprosthetic fracture after 3 months following trauma, which was managed by open reduction and internal fixation with plate and screw retaining the same prosthesis. Two cases (9.09%) from AMP presented with acetabular erosion and a painful hip.

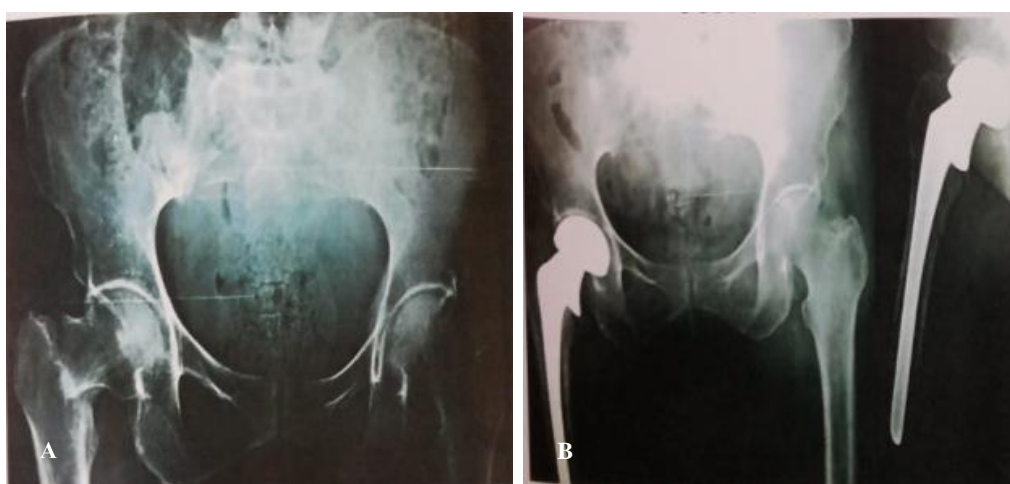


Figure 2: (A and B) Preoperative and follow-up X-ray (uncemented bipolar case).

DISCUSSION

The average age of our patients was 64.2 years in the case of the bipolar group and 63.6 years in

the case of the AMP group. The majority of our patients were between 60-70 years. Other authors in their study report similar age distribution. The elderly females are more prone to fracturing the neck of the femur as reported by Butler and others in their series [13]. Hinton and Smith in their study showed the association of age, race, and sex with the location of proximal femoral fractures in the elderly [14]. All the fractures in our series belonged to displaced fractures of Garden types 2 and 3. We could group 18 patients (35.29%) into type 2 and 17 patients (33.23%) into type 3. The types of displacement (gardens III & IV) are not taken as the criteria for choosing the procedure for the management of a fractured neck of the femur. The age of the patient was considered by Arwade in their study [15]. The time since fracture by Kulkarni is taken into consideration while selecting hemiarthroplasty for the management of fracture neck of the femur in their study [16]. We had no operative deaths in our series. Totally 8 patients (15.6%) expired during the follow-up period of our series, 4 each from bipolar and AMP group. All the deaths were due to other medical comorbidities like IHD, diabetes, hypertension, and stroke. Su et al reviewed the in-hospital mortality rates of patient's age greater than 65 years. They reported greater than 50,000 patients and found an overall mortality rate of 5.6% [17]. Our series, all the patients were discharged after the patients were trained for active mobilization and when fit for discharge. Most of our patients, 65% of bipolar and 82.3% of the AMP group stayed between 7-14 days. Cadler found that the length of hospital stay was not significantly different for the two groups ($p=0.40$) [18]. Sabnis et al in their study reported 52% of the patients in the bipolar group and 66% of AMP group patients experienced pain [19]. Whereas 55.1% of the bipolar group and 53% of patients of the unipolar group presented with pain in a study done by Cadler [18]. All the cases in our series were assessed according to this score and graded accordingly. We got 42.85% excellent results with the bipolar group and 31.81% with the AMP group. The distribution of results is statistically similar in both groups ($p=0.256$). The mean score is statistically more associated with a bipolar group ($p=0.182$). In 2003, Raia et al reported the results of a study including 115 patients randomized to a more modern cemented unipolar HA or bipolar HA with identical stems. At one year assessment there were no significant differences between the groups in terms of surgical complications and functional outcome [20]. Wachtl et al and others in their series of unipolar hemiarthroplasty reported 1.2% dislocation rate, 0.6% protrusion, and infection rate each in their study. Norrish and others in their series of unipolar hemiarthroplasty, reported 2% dislocation rate, 1.8% protrusion, and 0.8% infection rate. They concluded 81% excellent or good results in their study cases of AMP. A study of 140 elderly patients done by Naser et al 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. Functional activities like use of public transport were better with the bipolar group. Complications like acetabular erosion were rare in the bipolar group as compared to the AMP group. However, there has been a controversy regarding the use of cement for a long time. So, both the cemented and uncemented hemiarthroplasty are equally good options in the treatment of fracture neck of femur among elderly patients with minimal complications among the two methods. More data comparing uncemented and cemented hemiarthroplasty in patients with femoral neck fractures are still needed to substantiate their findings.

CONCLUSION

Based on the results of our study, we found there is a statistical difference between the two groups is bipolar being better in functional aspects. On the other hand, the incidence of complications was lower after the uncemented bipolar hemiarthroplasty, which in turn may indicate an advantage in the longer term. We conclude that uncemented bipolar hemiarthroplasty is a superior option as compared to Austin Moore's prosthesis with better functional outcome, Harris hip score, and almost negligible cost difference. This is a study showing only early comparative results with a follow-up of one year. A study with a greater number of patients and longer follow-up is required to educate us better.

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