

Functional Outcome of Unipolar (Austin Moore's) Versus Uncemented Bipolar Hemiarthroplasty of Hip at 1-Year Follow-up

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Abstract

Background: Fracture neck of the femur leads to significant morbidity and mortality in elderly population. Various surgical options are available for the treatment in the elderly, but the gold standard between Austin Moore's prosthesis and bipolar prosthesis is always debated. Hence, we designed a short-term prospective study to compare the monopolar and bipolar hemiarthroplasty in the elderly having fracture neck of the femur.

Materials and Methods: We conducted a prospective study at a tertiary hospital between 2017 and 2019. In our study, we enrolled 30 patients in each group. Patients in Group A (monopolar) underwent Austin Moore's hemiarthroplasty and in Group B (Bipolar) underwent uncemented bipolar hemiarthroplasty by standard posterolateral approach. Patients were treated by standard protocols and analyzed at regular intervals with final assessment done at the end of 1 year. Functional outcome was evaluated using Harris Hip Score.

Results: Out of total 60 patients, 51 were evaluated at the end of 1 year. Mean age of population was 66.58 ± 5.96 in monopolar and 64.68 ± 7.48 in bipolar group. Harris Hip Score was 86.58 ± 5.42 in monopolar and 88.52 ± 3.08 in bipolar group. Pain was 38.69 ± 3.58 in monopolar and 40.20 ± 1.50 in bipolar group. Functional status was 39.72 ± 3.00 in monopolar group and 39.58 ± 3.45 in bipolar group. Excellent outcome was noted in 13 of monopolar and 15 of bipolar patients seven 7 complications in monopolar and six in bipolar group, respectively.

Conclusion: In our study, we had comparable functional (Harris Hip Score) results in the monopolar and bipolar prosthesis groups, though more excellent outcomes and less complications were encountered in the bipolar group than monopolar which is statistically insignificant at the end of 1 year.

Keywords: Austin Moore; Bipolar; Hemiarthroplasty; Monopolar; Neck of femur fracture; Hemireplacement.

Introduction

Fracture neck of the femur leads to significant morbidity and mortality in elderly population. Its management has been debated and had been named as unsolved fracture by "Speed k" in the early part of the 19th century [1]. The goal of the management of neck of femur fracture is to make elderly patient ambulatory at the earliest and return to

their earlier functional level to reduce the morbidity and mortality [1, 2, 3]. Although various surgical options are available, there is no consensus on the gold standard surgical method which has been accepted universally [2, 4, 5]. Accepted general guidelines suggest internal fixation in the younger population, total hip arthroplasty for the elderly who are physically active, and hemiarthroplasty for the elderly who have less physical demand or who have significant comorbidities [1, 6, 7, 8]. Other than patient age: Fitness, activity level, and financial aspect also need to be considered while deciding about the surgical method [1, 7].

Austin Moore's and Thompson introduced monopolar prosthesis in the early 1950 which has been widely adopted [9]. Prosthetic loosening, acetabular erosion, groin pain, subsidence, and dislocation were some of the complications which were observed in these cases [9, 10, 11]. Technological advances and material improvement have led to the introduction of the bipolar prosthesis. Although costlier than monopolar prosthesis, bipolar prosthesis has been claimed to provide better outcome [7, 12, 13]. Many studies have attempted to verify these claims [2, 5, 14, 15]. We designed a prospective study to compare the monopolar and bipolar

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hemiarthroplasty in the elderly having fracture neck of the femur. We hypothesized that there is no difference in the outcome of monopolar and bipolar hemiarthroplasty in the elderly.

Materials and Methods

Our prospective study was conducted in the period 2017–2019 in a tertiary center. Institutional Ethical Committee clearance was obtained following all the guidelines. Valid consent was taken from all the study participants. Elderly patients above the age of 60 years having fracture neck of the femur treated with hemiarthroplasty were included in the study. Patients who were <60 years, medically not fit for surgery, patients who had any surgery in the past in the affected limb, concomitant ipsilateral fractures, and who have osteoarthritis of hip were excluded from the study.

In our study, we enrolled 30 patients in each group. Patients in Group A (monopolar) underwent Austin Moore’s hemiarthroplasty and in Group B (Bipolar) underwent an uncemented bipolar hemiarthroplasty by standard posterolateral approach. Following hemiarthroplasty, capsule was closed in all the patients and short external rotators were repaired using drill holes at the greater trochanter. Patients were mobilized on post-operative day 1 with full weight-bearing. Patients were taught

about the hip precautions before discharge. Patients received deep vein thrombosis prophylaxis for 6 weeks. Patients were followed up regularly and final assessment was done at the end of 1 year following the surgery. Functional outcome was evaluated using Harris Hip Score. Complications if any were also noted down.

Statistical Analysis

In our prospective non-randomized comparative study, we had enrolled 30 patients in each group. Sample size calculation revealed requirement of 22 cases in each limb to detect mean difference of 10 in Harris Hip Score (change of 1 grade) with the SD of 10. Calculated study sample had the power of 90% and two-sided confidence interval of 95%. Sample calculation was done using Open EPI v3.01.

Descriptive statistics were used to describe the demographic distribution. Student’s t-test was used to compare the means of continuous data such as age and Harris Hip Score. Gender, affected side, and pre and post-operative ambulatory status were dichotomized variables which were compared using Chi-square test. Fisher’s exact test was used to compare the categorical variables of garden type and functional outcome. SPSS v 22.0 IBM Corporation was used for the statistical analysis.

Results

Of the 60 patients who were eligible for the study, 51 patients completed 1-year follow-up. Nine patients were lost for follow-up. Hence, at the end of 1 year, there were 26 patients (two patients died and two had incomplete follow-up) available in the monopolar group and 25 (three patients died and two had incomplete follow-up) in the bipolar group for functional evaluation.

Our both study groups were comparable on baseline demographic data (Table 1). We did not find any significant difference in the age, sex distribution, ambulatory status before the fall, and fracture type. However, there was a significant difference between the affected sides. The right hip was involved more commonly in monopolar group and the left hip was involved more commonly in the bipolar group, which may not affect the final outcome in the study.

In our study, we did not find any post-operative residual deformity in any of patients in both groups. No significant limb length (<2 cm) discrepancy noted postoperatively in both groups.

At the end of 1 year of follow-up, both the groups were comparable with respect to Harris Hip Score and ambulatory status (Fig. 1). There was no significant difference in the complications encountered in either of the groups (Table 2). In both the groups, superficial

Table 1: Demographic comparison between monopolar and bipolar hemiarthroplasty groups.

	Monopolar group	Bipolar group	P value
No. of cases	26	25	
Mean age	66.58±5.96	64.68±7.48	0.32
Gender male/female	12/14	13/12	0.67
Affected side right/left	16/10	7/18	0.02*
Ambulatory status pre-fall community/household	14/12	18/7	0.18
Garden type III/IV	17/9	12/13	0.21
*P <0.05			

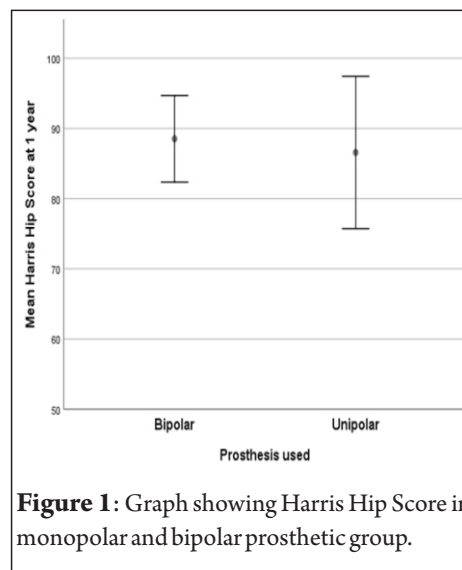


Figure 1: Graph showing Harris Hip Score in monopolar and bipolar prosthetic group.

Table 2: Comparison of functional outcome of monopolar versus bipolar groups at 1 year.

	Monopolar group	Bipolar group	P value
Harris Hip Score	86.58±5.42	88.52±3.08	0.124
Pain	38.69±3.58	40.20±1.50	0.057
Functional status	39.72±3.00	39.58±3.45	0.087
ROM	4.31±0.67	4.60±0.50	0.087
Deformity	4	4	
Outcome			0.91
Excellent	13	15	
Good	9	7	
Fair	4	3	
Ambulatory status community/household	9/17	12/13	0.33
Complications			
Sup infection	3	1	
Pneumonia	1	4	
Dislocation	2	1	
Sensorineural deficit	1	0	
Total	7	6	0.811

infection and pneumonia were the minor complications which were managed conservatively without any consequences. Two dislocations in monopolar group and one dislocation in bipolar group were noted within 3 weeks and reduced closely. They were treated with bed rest and limb in abduction and traction for 3 weeks before mobilization following relocation. One patient from monopolar group had paresthesia in the common peroneal nerve distribution, might be due to excessive traction during surgery or post-operative excessive external rotation of the limb, and later improved with conservative management (Table 2). In our series, we did not have any deep-seated infection or prosthetic failures.

Discussion

Fracture neck of the femur in the elderly has significant morbidity and mortality.

It adds up to functional, psychological, emotional, and financial burden already endured by elderly patients because of comorbid conditions [16]. The aim of any intervention should be at achieving pre-injury mobility status and restoration of the functional level so that patient become independent in his/her activities of daily living [2, 16]. It has been observed that internal fixation of the fracture neck of the femur in the elderly leads to increase in the mortality rate and the morbidity as well [6].

Replacement of the femoral head has been one viable solution offered since the beginning of the century. Introduction of the Thompson and Austin Moore's monopolar prosthesis has improved the outcome in elderly patients [2]. Mortality and morbidity have been reduced due to early mobilization and weight-bearing which helps in functional restoration. It is well accepted that

monopolar hemiarthroplasties are marred by the complications of acetabular erosion, loosening, subsidence, periprosthetic fractures, protrusion, and groin/hip pain many of which have been attributed to the design of the prosthesis [17].

Batemen in 1954 introduced bipolar prosthesis which had two articulations: One between metal head and polypropylene and another between outer head and the acetabulum. Less acetabular erosion, improved range of motion, reduced dislocation rate, and availability of modularity with ability to convert to THA at a later date were the advantages cited for the use of the bipolar prosthesis [10, 17, 18].

However, many authors have questioned the advantages of bipolar hemiarthroplasty [15]. It has been found that many bipolar prostheses behave as monopolar overtime [19] which essentially nullifies the claim of dual mobility. Even though dislocation rate is relatively low, if dislocation occurs, failure in relocating the head closely has been noted and often needs open reduction [20]. Disengagement of the bipolar head invariably needs open reduction and has higher redislocation as observed by Barnes et al. [18]. We had one dislocation in the bipolar group we could reduce it closely without any complications. In view of the similar outcome observed in elderly population on comparing with the monopolar hemiarthroplasty, many authors raised question of using costlier bipolar prosthesis [2, 16, 21, 22, 23]. Poly wear and bony erosion were the complications with bipolar prosthesis found during 5–12 years follow-up, as noted by Calton et al in their case series [24]. We did not encounter any of these problems radiologically in our series on regular follow-up till 1 year. Long-term follow-up might have revealed these complications. Prospective nature, adequate sample size with acceptable dropout rate, and adequate power of the study are some of

the strengths of this study. Relatively short-term follow-up is the drawback in our study.

In our prospective comparative study, we compared monopolar and bipolar hemiarthroplasties at the end of 1 year of completed follow-up. At the end of the 1 year, we found no significant difference in the Harris Hip Score. Our findings are similar to other studies in the literature [22, 25, 26, 27].

The patients included in our study have limited resources to afford for a total hip arthroplasty. Hence, hemiarthroplasty of hip was taken as the procedure of choice in spite of their activity and ambulatory status.

Postoperatively, all patients returned to their pre-injury ambulatory level. Although patients were able to walk independently with the support of a walking aid (cane/walker), they chose to be home bound as matter of precaution to prevent further fall and injury.

Conclusion

In our study, we had comparable functional (Harris Hip Score) results in the monopolar and bipolar prosthesis group, though more excellent outcomes and less complications were encountered in the bipolar group than monopolar which is statistically incomparable (due to small sample size) at the end of 1 year.

Hence, a more randomized and radiological study with a larger sample size and longer follow-up is warranted in our study to further analyze and compare with the results already published in the literature. We conclude that the polarity of prosthesis had no significant functional outcome with the procedure, when correct technique, precaution, and standard protocol of rehabilitation after procedure are maintained in short course of time.

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