



Mid-Term Survivorship And Functional Outcome Of Austin Moore And Bipolar Hemiarthroplasty In Patients With Femoral Neck Fractures

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ABSTRACT

Objective: To analyze outcomes and 5 year survivorship differences between Austin Moore (AMP) and bipolar hip hemiarthroplasty in our institution.

Material and Methods: A retrospective study was carried out including 371 patients with displaced intra-capsular neck of femur fractures who underwent Austin Moore Prosthesis (AMP) or bipolar hemiarthroplasty (BHA) after written and informed consent, in Liaquat National Hospital from 2012 to 2016. Patients were followed after 5 years. In both groups differences in gender, comorbidities, ASA scores, operating time, intraoperative blood loss, ambulatory ability or postoperative morbidity and mortality and revision surgery between the two groups were also assessed. Kaplan–Meier curves were used for survivorship analysis and data were analyzed using SPSS version 26.

Results: Between 2012-2016, a total of 371 patients underwent AMP and bipolar hemiarthroplasty in our setup, they were divided in 2 groups, after excluding the patients who were lost to follow-up or passed away, the total number of patients remaining were 76 (36 patients in AMP group and 40 patients in BHA group). The mean age in BHA group was 63.4 (\pm 9.3) and in AMP group 66.3 (\pm 10.9). Patients who achieved independent community ambulatory status in bipolar group was 70% and 33.3 % in AMP group, which was statically significant ($P < 0.05$). Survivorship analysis was done using two end points (with 95 % confidence interval), mean time from surgery to independent ambulatory status was 5 (\pm 0.6) weeks and 7 (\pm 0.7) weeks in bipolar and unipolar hemiarthroplasty respectively which shows significant difference.

Conclusions: Patients who underwent bipolar hemiarthroplasty had a more satisfactory outcome in terms of early independent ambulation in comparison with those who underwent Austin moore prosthesis. Although there was significantly less blood loss and operating time in unipolar hemiarthroplasty, the ambulatory ability was significantly better in bipolar hemiarthroplasty group.

Keywords: Bipolar hemiarthroplasty, Austin Moore prosthesis, Survivorship analysis

INTRODUCTION

In geriatric population, neck of femur fractures are one of the most common fractures encountered, and are associated with high mortality. (1,2) In the year 1990, there was an estimated 1.66 million cases of femoral neck fractures worldwide. The frequency is on the rising trend and it has been predicted, that by the year 2050, number of neck of femur fractures will reach to 6.26 million per year. (3) The choice of treatment modality of displaced neck of femur fractures is still debatable but hemiarthroplasty is most commonly performed to restore joint biomechanics. (4, 5, 6, 7, 8, 9) Hemiarthroplasty has two types of implants, unipolar and bipolar. Unipolar components, are the first ones to be introduced, in which the stem has femoral head fixed to them. On the other hand bipolar implants include a polyethylene bearing between the stem and the head of the endo-prosthesis, allowing component rotation. (10) Bipolar prosthesis has a theoretical benefit of translating the weight to the inner bearing of the prosthesis, which then reduces the prosthesis–acetabulum interface, thus decreasing acetabular erosion. (11, 12) For these fractures the treatment goals are swift recovery and return to a satisfactory functional status and minimizing the postoperative mortality and morbidity and the need of revision surgeries.

Due to the high cost of bipolar implant and procedure being technically more demanding, the question raised is, that how significant the functional outcome has to be so the above mentioned can be overseen. More recent studies with short-term results show that there are minor differences between unipolar and bipolar hemiarthroplasties. Better range of motion and less acetabular erosion are seen with bipolar hemiarthroplasty whereas there are negligible differences in the cumulative percentages of revision surgeries. (13-16)

A prospective, randomized controlled trial by Kari Kanto to compare survivorship and functional outcome at mid-term follow-up in series of patients with a displaced neck of femur fractures, receiving a unipolar or a bipolar implant, showed nearly similar survivorship rates in both groups, 42% of patients in unipolar hemiarthroplasty group and 48 % in bipolar hemiarthroplasty group returned to their preoperative ambulatory status at 1-year follow-up, whereas at 5-year follow-up in 66% in unipolar hemiarthroplasty group and 89% in bipolar hemiarthroplasty group retained their community ambulatory status. (17)

In a study by Chen-Chiang Lin conducted in > 80 year old patients regarding the survivorship after the receiving either an AMP or BHA implant, 5 years survival rate according to Kaplan-Meier estimates were 40.0% and 62.9% in patients with AMP and BHA implants respectively. Whereas cox proportional hazard regression analysis of risks factors of death showed that the patients with AMP implant were 2.0-fold more likely to die in comparison to patients with BHA implant. (18)

Aim of our study is the comparison of mid-term survivorship and functional outcome of Austin Moore prosthesis and bipolar hemiarthroplasty in patients with neck of femur fractures.

MATERIALS AND METHODS

A retrospective study in 371 patients with displaced intra-capsular neck of femur fractures was carried out in patients who underwent Austin Moore or bipolar hemiarthroplasty after written and informed consent, in Liaquat National Hospital from 2012 to 2016. Out of 371 patients, 198 patients underwent BHA out of which 77 responded, 37 of them had expired and so 40 patients were included in our BHA sample size, out of which 70% (28) were females and 30% (12) were males. On the other hand, 173 patients underwent AMP out of which 116 responded, 80 of them had expired and so 36 patients were included in our AMP sample size out of which 61% (22) were females and 39% (14) were males. Mean age in BHA group is 63 (SD ± 9.3) years and in AMP group is 66 (SD ± 10.9) years. Maximum number of patients came under ASA II, 45% (18) patients in BHA group and 69% (25) patients in AMP group. Right limb was involved in most of the patients in both groups. This data is summarized in Table 1.

Both groups were treated with the similar protocol except for the differences in implants, there were multiple surgeons who performed these procedures, in all procedures lateral hardinge approach was used. Spinal anesthesia was used and single dose of prophylactic antibiotic was given 30 minutes prior to the procedure. Postoperatively, adequate analgesia was given, and from the next day, patients were started weight bearing as tolerated.

RESULTS:

Between 2012-2016, a total of 371 patients underwent AMP and BHA in our setup, they were divided in 2 groups, after excluding the patients who were lost to follow-up or passed away, the total number of patients remaining were 76 (36 patients in AMP group and 40 patients in BHA group). The mean age in BHA group was 63.4 (± 9.3) and in AMP group 66.3 (± 10.9). Most of the patients fell into ASA II in both AMP and BHA groups. There were more patients with multiple co-morbidities in both groups rather than single co-morbidity. This data is summarized in Table 1.

Of the 40 patients with BHA, 28 patients (70 %) retained their preoperative ambulatory status at 5-year follow-up, whereas of 36 patients with AMP, 12 patients (33 %) retained their community ambulatory status. Ambulatory status data is summarized in Table 2.

Operating time is significantly less in AMP procedure 76 (±10.8) minutes than in BHA procedure 106 (±9.7) minutes, with estimated blood loss being significantly less in AMP procedure 414 (±21.3) ml than in BHA procedure 464 (±23.6) ml. The difference in postoperative comorbidities and revision surgeries in both groups were statistically not significant (P < 0.05) with revision surgeries done in 3 patients in BHA group and in 4 patients in AMP group. This data is summarized in Table 3.

Kaplan Meier curves were used for survivorship analysis by using two end points (with 95% confidence interval), first end point being the mean time from surgery to independent ambulatory status was 5 (±0.6) weeks and 7 (±0.7) weeks in bipolar and unipolar hemiarthroplasty respectively which shows significant difference (Figure 1). Another endpoint used was survival time (time to death after surgery) which was not significant, 4 (±0.9) years and 3 (±0.4) years in bipolar and unipolar hemiarthroplasty respectively (Figure 2).

Table 1: DEMOGRAPHIC DATA

BASELINE CHARACTERISTICS	BPH (N=40)	AMP (N=36)
Gender		
Male	12	14

Female	28	22
Mean Age	63 (± 9.3)	66 (± 10.9)
ASA classification		
I	15	5
II	18	25
III	5	3
IV	2	3
Limb Involved		
Right	21	21
Left	19	15
Co-morbidities		
Diabetes	7	6
Hypertension	6	5
Ischemic heart disease	3	2
Multiple	8	10
Others	0	9
None	16	4

Table 2: AMBULATORY STATUS

AMBULATORY STATUS		BPH (N=40)	AMP (N=36)
Independent community ambulatory		28(70%)	12(33%)
Independent household ambulatory		3(8%)	4(11%)
Household ambulatory with cane		8(20%)	12(33%)
Household ambulatory with walker			
Assisted ambulation only		1(3%)	4(11%)
		0(0%)	4(11%)

TABLE 3: PER AND POSTOPERATIVE DATA

PER AND POST-OPERATIVE DATA	BPH (N=40)	AMP (N=36)	P VALUE
Operating time (mins)	106 (±9.7)	76 (±10.8)	0.000
Estimated blood loss (ml)	464 (±23.6)	414 (±21.3)	0.000
Hemorrhage	2	3	
Infection	2	2	0.934
Dislocation	1	1	
Revision	3	4	0.702

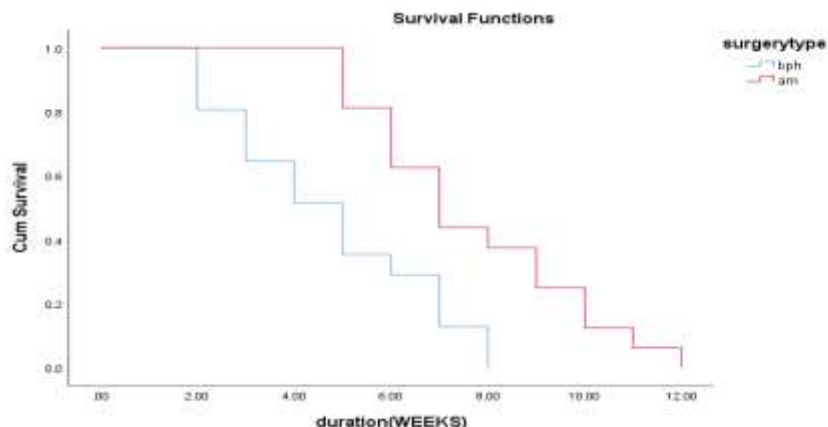


FIGURE 0.1: SURVIVORSHIP ANALYSIS OF MEAN TIME FROM SURGERY TO INDEPENDENT AMBULATORY STATUS

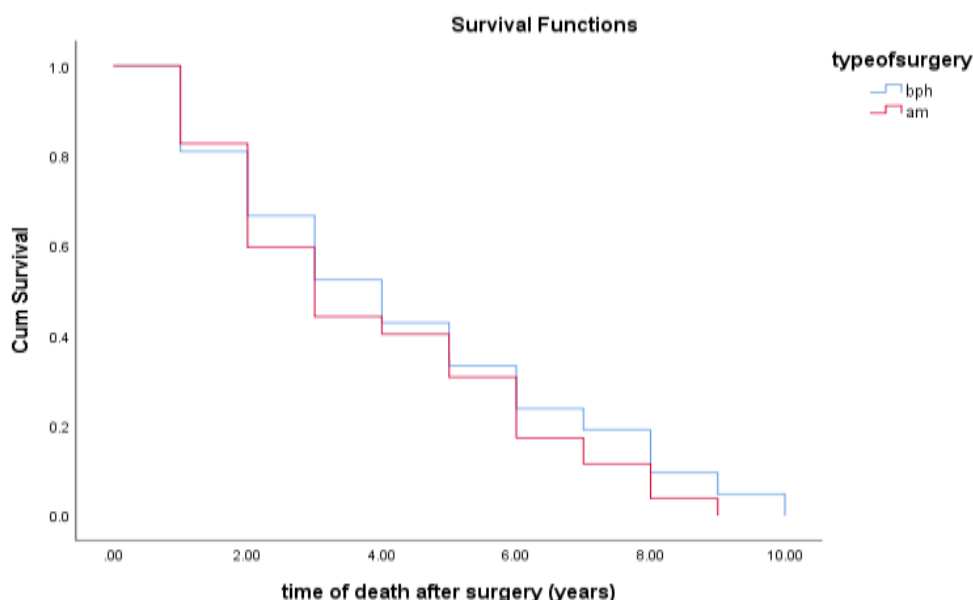


FIGURE 2: SURVIVAL TIME (TIME TO DEATH AFTER SURGERY)

DISCUSSION:

Due to the high one year postoperative mortality (19-41%) rates, neck of femur fractures have been termed as the “beginning of the end for an elderly person”. (19, 20) The choice of treatment in elderly patients is considered a very important choice because of their limited life expectancy as this makes early satisfaction as essential as long term outcomes. (21) With an annual mortality of 30% along with impairment of carrying out independent regular activities and decreased quality of life, return to preinjury mobility status as early as possible should be the aim of treatment for neck of femur fractures. (22, 23)

In a recent study, a meta-analysis and systematic review regarding the assessment of acetabular erosion, functional outcome, quality of life in patients with neck of femur fractures (24), the postoperative hip function, as evaluated by the Harris Hip score (12, 21, 25-27), revealed a statistically significant difference ($P < 0.05$) in favor of the bipolar group at 6, 12 and 24 month follow-up. One study (28) evaluating the Harris Hip score in 50 patients at an average follow-up of 4.4 years, reported a similar result in favor of bipolar group ($P = 0.004$). In an individual study by Jefcote et al. (29) about determining the rate of acetabular erosion, the bipolar group attained higher scores in Harris Hip Score, Western Ontario and McMaster University Index of Osteoarthritis (WOMAC) questionnaire and 6-min walk test. There was a statistically significant difference in results of both unipolar and bipolar groups at 3 months follow up, which was then similar at 12 and 24 months follow up. In a study by Cornell et al. (16) comparing hip ROM, walking speed and postoperative complication rates, reporting statistically significant difference favoring the bipolar group at both 3 and 6 months follow up.

Davison et al (30), in a similar study including 187 patients with mean age of 75 years, compared cemented Thompson prosthesis and Monk bipolar prosthesis, reported non-significant differences in survival rates which were 93% (unipolar) and 90% (bipolar), 89% (unipolar) and 88% (bipolar), and 72% (unipolar) and 78% (bipolar) at 6 months, 12 months and

36 months respectively. In a study by Baker et al (31), in patients receiving unipolar hemiarthroplasty, at an average follow-up of 39 months, acetabular erosion was observed in 21 out of 32 patients (66%).

Our results shows that in elderly patients with displaced neck of femur fracture, bipolar hemiarthroplasty offers a better range of motion, more stability with less postoperative pain, along with early return to pre-operative mobilization status than Austin Moore prosthesis, in spite being an expensive implant, causing significantly more blood loss and having a longer operating time.

There are few limitations in this study, foremost being that this was a retrospective study and no algorithm was used in choosing an implant (unipolar or bipolar) for the patients. A large sample size along with better patient selection and a long term follow up is necessary for the comparison of complication rates such as aseptic loosening and acetabular protrusion in both groups as they are likely to rise with long term follow-up.

CONFLICT OF INTEREST:

The authors declare that they have no relevant financial or non-financial conflicts of interests to report.

FUNDING:

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ETHICAL APPROVAL:

This study received approval from the Ethical review committee of Liaquat National Hospital under the protocol number 0865-2023 LNH-ERC.

INFORMED CONSENT:

Written and informed consent was attained from all the patients and/or guardians.

AUTHORS CONTRIBUTIONS:

S. Aziz designed the analysis, contributed to data collection and wrote the paper; A. Ghazi conceived the title and contributed to the analysis; M.B. Abbasi contributed in the data collection and performed the analysis; M. Kazim supervised the project; S. Khan collected the data; S. Noor supervised the project.

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