Post-operative mortality and factors related to mortality after bipolar hemiarthroplasty in patients with femoral neck fractures

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**ABSTRACT**

Hip fractures are a common entity in the elderly. Hemiarthroplasty is a common treatment option for displaced neck of femur fractures and have been found to be successful in restoring mobility, reducing pain and improving quality of life following hip fractures in elderly. Many studies have reported that advanced age, male gender, long term stay in the intensive care unit, poor postoperative mobilization ability, a poor or dependent ADL score preoperatively, multiple comorbidities which result in a high ASA score have been associated with higher mortality. A retrospective study was done at the Department of Orthopaedics at Mahatma Gandhi Medical College and Research Institute, Pondicherry which included all patients who underwent hemiarthroplasty (both cemented and uncemented) from 2017-2020. The details of patients satisfying the inclusion criteria were obtained from the medical records department and were analysed by a single investigator. In case the subjects had not reviewed following surgeries, details were obtained by telephonic communication. In our study of 40 patients, mortality was observed in 4 patients which included 3 females and 1 male. It was also observed that mortality was high between the ages of 61-80 years, patients with multiple comorbidities and patients with high ASA scores. The hazard ratio was calculated for 3 parameters namely age, time to surgery and surgical duration and is 1.014, 0.842 and 0.984 respectively but this was not found to be statistically significant. This may due to the small sample size and retrospective nature of our study.

**INTRODUCTION**

Hip fractures are common serious injuries that occur in elderly individuals. They are considered as major public health problems worldwide with incidence increasing with age. The 1-year mortality rate associated with hip fractures ranges from 14% to 47%. (Lim et al., 2009)

Hemiarthroplasty is currently the most reliable treatment option for displaced neck of femur fractures in elderly with low functional demands (Liodakis et al., 2016). It is a simpler surgery when compared to total hip arthroplasty with lesser blood loss and low incidence of future dislocation. Perioperative complications following hemiarthroplasty are associated with significant morbidity and mortality but have seldom been studied. Previous studies have estimated a mortality rate of 2.4% to 8.2% at one month post surgery and over 25% at 1 year. (Nemes et al., 2018)
In several patients, failure to return to baseline activities after hemiarthroplasty due to perioperative complications or complications due to patient’s comorbidities may also be a risk factor for mortality. (Liodakis et al., 2016)

In this study, we aim to retrospectively analyze the factors related to morbidity and mortality following hemiarthroplasty and to calculate the baseline hazard ratio of hemiarthroplasty at 1 year and 3 years post surgery.

MATERIALS AND METHODS

A retrospective study was done at the Department of Orthopaedics at Mahatma Gandhi Medical College and Research Institute, Pondicherry which included all patients who underwent hemiarthroplasty (both cemented and uncemented) from 2017-2020.

Inclusion criteria

1. Patients who underwent hemiarthroplasty surgery before 3 yrs
2. Skeletally mature patients

Exclusion criteria

1. Previous history of Malignancies
2. Previous history of steroid use, chemotherapy or immunosuppressive agents
3. Previous history of infection

Methodology

The details of patients satisfying the inclusion criteria were obtained from the medical records department and were analysed by a single investigator. In case the subjects had not reviewed following surgeries, details were obtained by telephonic communication.

The data was collected and analysed by mean and standard deviation. Hazard ratio was calculated for 3 parameters namely age, time to surgery and surgical duration.

RESULTS

Forty patients were included in this study. The one year and 3 year mortality rates observed in this study were 5.0% and 10.0% respectively. The baseline patient data are summarized in Table 1.

The average age of patients enrolled in the study was 63.8 years. 1 year and 3 year mortality rate was found to be higher in patients between the age of 61-80 years. We observed that among the deceased, all 4 patients had a body mass index between 24.1 and 26 and more than two comorbidities which resulted in higher ASA score preoperatively.

DISCUSSION

In our study of 40 patients, mortality was observed in 4 patients which included 3 females and 1 male. In our study it was observed that mortality was high between the ages of 61 to 80 years. This was also observed by Lim et al who concluded that 1 year
Table 1: Baseline characteristics

| Baseline characteristics          | Frequency | Percentage |
|----------------------------------|-----------|------------|
| **Gender**                       |           |            |
| Males                            | 21        | 52.5%      |
| Female                           | 19        | 47.5%      |
| **Age**                          |           |            |
| <50                              | 3         | 7.5%       |
| 51-60                            | 10        | 25.0%      |
| 61-70                            | 12        | 30.0%      |
| 71-80                            | 11        | 27.5%      |
| 81-90                            | 4         | 10.0%      |
| **BMI**                          |           |            |
| <21                              | 4         | 10.0%      |
| 21.1-22                          | 3         | 7.5%       |
| 22.1-23                          | 3         | 7.5%       |
| 23.1-24                          | 5         | 12.5%      |
| 24.1-25                          | 8         | 20.0%      |
| 25.1-26                          | 15        | 37.5%      |
| 26.1-27                          | 2         | 5.0%       |
| **Comorbidities**                |           |            |
| No comorbidities                 | 14        | 35.0%      |
| Diabetes mellitus                | 12        | 30.0%      |
| Systemic hypertension            | 11        | 27.5%      |
| Pulmonary diseases               | 1         | 2.5%       |
| Cerebrovascular diseases         | 2         | 5.0%       |
| **Number of comorbidities**      |           |            |
| No comorbidities                 | 14        | 35.0%      |
| 1 comorbidity                    | 9         | 22.5%      |
| 2 comorbidities                  | 7         | 17.5%      |
| >2 comorbidities                 | 10        | 25.0%      |
| **Ambulatory status**            |           |            |
| Ambulant                         | 34        | 85.0%      |
| Ambulant with aids               | 4         | 10.0%      |
| Non ambulant                     | 2         | 5.0%       |
| **ASA score**                    |           |            |
| 1                                | 20        | 50.0%      |
| 2                                | 9         | 22.5%      |
| 3                                | 7         | 17.5%      |
| 4                                | 4         | 10.0%      |
| **Time to surgery**              |           |            |
| 1-3 days                         | 9         | 22.5%      |
| 4-10 days                        | 22        | 55.0%      |
| >10 days                         | 9         | 22.5%      |
| **Surgical duration**            |           |            |
| 60-100 minutes                   | 17        | 42.5%      |
| 100-140 minutes                  | 20        | 50.0%      |
| >140 minutes                     | 3         | 7.5%       |
| **1 year mortality**             |           |            |
| Alive                            | 38        | 95.0%      |
| Dead                             | 2         | 5.0%       |
| **3 year mortality**             |           |            |
| Alive                            | 36        | 90.0%      |
| Dead                             | 4         | 10.0%      |
| **Type of hemiarthroplasty**     |           |            |
| Cemented                         | 20        | 50.0%      |
| Uncemented                       | 20        | 50.0%      |
Table 2: Factors related to mortality

| Characteristics       | Frequency | Percentage |
|-----------------------|-----------|------------|
| **Sex**               |           |            |
| Males                 | 1         | 25.0%      |
| Females               | 3         | 75.0%      |
| **Age**               |           |            |
| 51-60                 | 2         | 50.0%      |
| 61-70                 | 2         | 50.0%      |
| **BMI**               |           |            |
| 24.1-25               | 2         | 50.0%      |
| 25.1-26               | 2         | 50.0%      |
| **Comorbidities**     |           |            |
| Diabetes mellitus     | 3         | 75.0%      |
| Systemic hypertension | 3         | 75.0%      |
| Pulmonary diseases    | 2         | 50.0%      |
| Cerebrovascular diseases | 2     | 50.0%      |
| **Comorbidities**     |           |            |
| 2 comorbidities       | 2         | 50.0%      |
| >2 comorbidities      | 2         | 50.0%      |
| **Ambulatory status** |           |            |
| Ambulant              | 2         | 50.0%      |
| Non ambulant          | 2         | 50.0%      |
| **Time to surgery**   |           |            |
| 1-3 days              | 1         | 25.0%      |
| 4-10 days             | 3         | 75.0%      |
| **Surgical duration** |           |            |
| 60-100 minutes        | 2         | 50.0%      |
| 100-140 minutes       | 2         | 50.0%      |

Table 3: Correlation between Age, Time to surgery and surgical duration with hazard risk

|                  | B     | SE    | Wald  | df  | P-value | Hazard ratio | 95% CI for exp (B) |
|------------------|-------|-------|-------|-----|---------|--------------|-------------------|
| Age              | 0.014 | 0.042 | 0.108 | 1   | 0.741   | 1.014        | 0.934 1.100       |
| Time to surgery  | -0.172| 0.153 | 1.255 | 1   | 0.263   | 0.842        | 0.624 1.137       |
| Surgical duration| -0.016| 0.018 | 0.799 | 1   | 0.371   | 0.984        | 0.950 1.019       |

mortality of 11.3% was observed between the age of 61-80 years. (Lim et al., 2009) However Costain et al concluded that patients between ages if 61-70 years had a favourable survival rate. (Costain et al., 2011) Among the patients who expired in our study, majority were found to be females (75%). We observed that patients with a high BMI and multiple comorbidities had a higher risk of mortality as shown in Figures 1 and 2 respectively and the same was concluded by previous studies. Peterson et al in his study concluded that longer time to surgery and long surgical duration increased mortality risk but this was not found to be statistically significant in our study. (Petersen et al., 2006) However, high ASA scores contributed to mortality risk in our study and is in concordance with previous studies.

There was no statistically significant difference between patients who were ambulant or non ambulant prior to the injury in our studies but previous studies have shown increase in mortality risk among non ambulant patients when compared to ambulatory patients. (Richmond et al., 2003) The hazard ratio was calculated for 3 parameters namely age, time to surgery and surgical duration and is 1.014,0.842 and 0.984 respectively in our study but Nemes et al in his study of 43,891 patients
found a higher hazard ratio following hemiarthroplasty. (Nemes et al., 2018)

The limitations of our study were small sample size and the retrospective nature of our study. Further prospective studies with a larger sample size should be conducted to establish the factors associated with mortality following hemiarthroplasty in order to manage elderly patients with femoral neck fractures planned for bipolar hemiarthroplasty in a more efficient manner in order to reduce mortality among them.

**CONCLUSIONS**

Mortality rate and post-operative complications following hemiarthroplasty can be reduced by multidisciplinary team approach in case of multiple comorbidities and high BMI, early surgical intervention and mobilization. In our study however, no statistical correlation was found between factors causing mortality and post operative mortality. Further prospective studies are required to establish risk factors for mortality following hemiarthroplasty.

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**Conflict of Interest**

The authors declare that they have no conflict of interests for this study.

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