

One-year mortality rates and factors affecting mortality after surgery for fracture neck of femur in the elderly

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ABSTRACT

Context: Fractures around hip in elderly are associated with significant morbidity and mortality. **Aim:** This study aims to investigate 1-year mortality rates and risk factors associated with this mortality. Effect of delay in surgery on mortality rates will also be studied. Our null-hypothesis was that there is no association between common comorbid conditions or delay in surgery on 1-year mortality rates. **Study Settings and Design:** Patients 60-years and above who underwent operative treatment for fracture of neck of femur between January 2018 and February 2019 were included in this retrospective study. **Materials and Methods:** Demographic and clinical data were collected from hospital information system and inpatient case records. Patients were followed up with quality of life (QoL) assessment with short form-12 (SF-12) at 1 year. Mortality during this period was also evaluated. **Statistical Analysis:** Continuous factors were expressed as means, standard deviations. Different risk factors between the patients alive and dead were studied using Fisher's exact test. **Results:** Nineteen out of 95 patients died at the end of 1 year. Smoking, hypertension, diabetes, low hemoglobin, raised total leukocyte count, low serum albumin, delay in surgery (>1 week), higher American Society of Anesthesiologist grade, and postoperative blood transfusion were significantly associated with higher mortality rates. Mean SF-12 QoL scores at 1 year was 35.6 ± 6.3 . **Conclusion:** Hip fractures in elderly are associated with higher mortality rates. Results of this study indicate that patients at a higher risk of mortality may be identified and help in preoperative optimization with the aim to reduce mortality. However, these findings need to be verified by further studies with a relatively larger sample size and longer follow-up period.

KEYWORDS: Fracture neck of femur, fragility fractures, hip fracture, mortality, osteoporosis, short form-12

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INTRODUCTION

Fractures around the hip are one of the most common fractures in elderly population. The number of hip fractures is on a rising trend worldwide. In India, as the life expectancy of population is increasing, the prevalence of fractures around hip is also rising.^[1,2] In osteoporotic elderly people, it generally occurs due to low energy trauma, such as simple fall from standing height, and is associated with considerable morbidity and mortality.

Fracture neck of femur includes both intracapsular fractures and extracapsular fractures. Surgical treatment

is indicated unless the patient is not fit for surgery due to associated comorbid conditions. The presence of a hip fracture in elderly has been considered as a harbinger of mortality.^[3] Surgery improves survival, mobility and prevents complication of prolonged immobilization such as deep vein thrombosis, pulmonary embolism, decubitus ulcers, and pneumonitis.^[4-6] Despite surgical

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treatment, a number of studies have shown that the mortality rate is high in hip fractures in comparison to the general population matched for age and sex.^[7-9] The presence of comorbid conditions, delay in surgery, and female sex has been shown in literature to adversely affect mortality.^[10-13]

Mortality from hip fractures is an indicator of compromise in overall health and wellbeing of these patients. The data on mortality and its risks factors needs to be understood in the context of a particular population. There is very little data from India on mortality of patients after hip fractures,^[14,15] and there is a lack of dedicated geriatric hip fracture registries. Protocols to fast-track care of these patients are nonexistent in most health-care settings. The aim of this study was to investigate 1-year mortality rates and risk factors associated with this mortality. Effect of delay in surgery on mortality rates was also studied. Null-hypothesis was that there is no association between common comorbid conditions or delay in surgery and 1-year mortality rates.

MATERIALS AND METHODS

This is a retrospective study, including patients more than 60 years of age, admitted for hip fractures (intracapsular and extracapsular) between January 2018 and February 2019. Only the patients undergoing operative treatment were included. Informed consent was obtained from all participants assessed for quality of life (QoL), alive at the end of 1 year following their operative management. Institutional ethical exemption certificate was obtained for cases of subtrochanteric fractures, acetabular fractures, polytrauma, patients with other associated fractures needing surgery were not included in the study. Data were collected from the hospital information software system. History, clinical details, and postoperative complications were studied from the case records accessed from medical record department.

Those patients who were not able to come for follow-up visits were contacted telephonically to know about their wellbeing and living status. Those living were assessed using short form 12 (SF-12) score,^[16] 1 year after the surgery. Analysis of the cause of death was done for those patients who died during this period. Cause of death was recorded from medical records if available or from the immediate caregivers.

Data on the following comorbidities were collected: Hypertension, diabetes mellitus, coronary artery disease, previous cerebrovascular accident, cognitive impairment, pulmonary diseases, smoking, and alcohol intake. The duration between the injury and the surgery was also noted. From the investigation charts, the note was made of the presence of anemia (hemoglobin <10 g/dl), high

total leukocyte counts (>11,000 cells/cubic mm) and low albumin level (<3 gm/dl) preoperatively, and need for perioperative blood transfusions. The association between these factors and mortality was studied.

Surgical site infections and complications needing re-hospitalization were noted. Mobility status before and after the surgery was noted as mobility without aids, mobility with single walking aid, mobility with two aids or frame, and no functional mobility.

Continuous factors were expressed as means and standard deviations. Analysis of different risk factors between the patients alive and dead was studied using Fisher's exact test. Results were considered statistically significant when the $P < 0.05$. Data were analyzed using software SPSS, version 23 (IBM, New Orchard Road, Armonk, New York, United States).

RESULTS

The study included 95 patients. Demographic details of patients and risk factors for mortality are summarized in Table 1. Thirty-eight (40%) patients were males and 57 (60%) were females. 68 (71.5%) patients sustained injury by fall from standing height, 12 (12.6%) from road-side accident and 15 (15.7%) from fall from height >6 feet. Forty-five (47.37%) patients had intracapsular neck of femur fracture and 50 (52.63%) patients had extracapsular neck of femur fracture. Cemented modular bipolar hemiarthroplasty was performed in 58 patients. Closed reduction and internal fixation with dynamic hip screw was performed in 25 patients and with intramedullary nails in 12 patients. Nineteen (20%) patients died by the end of 1 year, of which 13 were males and 6 were females. Eleven out of 68 patients sustaining injury by fall from standing height died by 1 year as compared to eight out of 27 patients sustaining injury from other mechanisms. This difference was not statistically significant ($P = 0.26$).

The distribution of risk factors between those live and dead is summarized in Table 1. Sex distribution between the dead and alive was not statistically significant ($P = 0.397$). Mean age of the patients was 69.8 ± 7.99 years. Mean age of the patients living was 67.4 ± 5.5 years and mean age of patients who died was 73.6 ± 7.4 years. This difference was statistically significant ($P < 0.0004$). Out of the 19 patients who died, eight patients died within 3 months, five patients between three to 6 months while, six patients died between 6 months to 1 year. Difference in mortality rates between each time frame was not statistically significant ($P = 0.78$). Out of eight patients dying within first 3 months, three patients died within 1 week of surgery, during the hospital stay.

Table 1: Details of patients and risk factors for mortality

Risk factors	Alive (n=76)	Dead (n=19)	Total (n=95)	P
Mean age years±SD	67.4±5.5	73.6±7.4	95	0.0004
Sex				
Male	32	6	38	0.39
Female	44	13	57	
Type of fracture				
Intracapsular	32	13	45	0.039
Extracapsular	44	6	50	
History of smoking				
Smoker	31	13	44	0.03
Nonsmoker	45	6	51	
Hypertension				
Hypertensive	26	12	38	0.022
Nonhypertensive	50	7	57	
Diabetes mellitus				
Diabetic	12	8	20	0.018
Nondiabetic	64	11	75	
History of alcohol intake				
Alcoholic	15	4	19	0.898
Nonalcoholic	61	15	76	
Coronary artery disease				
Yes	5	3	8	0.20
No	71	16	87	
Previous CVA				
Yes	2	2	4	0.18
No	74	17	91	
Cognitive impairment				
Yes	2	1	3	0.49
No	74	18	92	
Pulmonary diseases				
Yes	3	2	5	0.26
No	73	17	90	
Hemoglobin (g/dl)				
<10	32	14	46	0.012
>10	44	5	49	
TLC (cmm)				
>11,000	30	15	46	0.012
<11,000	46	4	49	
Albumin (g/dl)				
<3	19	10	29	0.023
>3	57	9	66	
Postoperative blood transfusion				
Yes	25	11	36	0.005
No	51	8	59	
Injury to surgery duration (week)				
<1	36	4	40	0.032
>1	40	15	55	
Duration between surgery and mobilization (week)				
<1	50	7	57	0.086
>1	19	12	31	
ASA grade				
I/II	20	0	18	0.01
III/IV	56	19	77	

Significant *P* values mentioned in bold. ASA: American society of anesthesiologist, SD: Standard deviation, CVA: Cerebrovascular accident, TLC: Total leucocyte count

Among intracapsular neck of femur fractures, 13 patients died, while six patients died among extracapsular neck of femur fractures. This difference was statistically significant ($P = 0.039$). The mean age of patients sustaining extra-articular fractures was higher (74.1 years) as compared to those sustaining intra-articular fractures (67.1 years). This may explain the higher mortality rates in patients with extra-articular fractures.

The number of patients with a history of smoking was 44, and the number of deaths among smokers was 13. Smoking was significantly associated with mortality ($P = 0.030$). Hypertension was present in 38 patients, and diabetes mellitus in 20 patients. Mortality at 1 year was significantly higher in patients with hypertension ($P = 0.022$) and diabetes mellitus ($P = 0.018$). Other factors associated with increased mortality were low hemoglobin ($P = 0.012$), transfusion requirement ($P = 0.005$), raised total leukocyte counts ($P = 0.012$), and low serum albumin levels ($P = 0.023$). Interval between injury and surgery of more than 1 week was significantly associated with mortality ($P = 0.032$). Higher American Society of Anesthesiologist (ASA) grade was significantly associated with increased mortality.

Preoperatively, 75% of patients were mobile without aids, 17% used one walking aid and 8% used a frame or two aids. Of the total patient alive 51.3% were independently mobile, 31.6% were walking with a single aid, 17% were mobile with two aids and 4% of patients were bedridden at the end of 1 year. 60.4% patient had similar mobility as prior to surgery while 39.6% has decreased mobility. Mean SF-12 QoL scores at 1 year was 35.6 ± 6.3 .

Five patients developed respiratory complications in the postoperative period which recovered without the need for mechanical ventilatory support, three patients developed deep venous thrombosis, two patients had postoperative delirium while eight patients had dyselectrolytemia (low serum sodium). Six patients developed surgical site infection which needed one or more surgical debridements.

Of the 19 deaths, eight were immediately preceded by respiratory failure or pneumonitis, six by myocardial infarction or cardiac dysfunction, one by renal failure and one had septicemia from an unknown source. Three patients died at home and no definite cause of death could be ascertained.

DISCUSSION

Maximum risk of mortality following hip fractures is during the 1st year after injury.^[17,18] In our study 19 out of

95 (20%) patients died during first 12 months. In a study by Wu *et al.*,^[19] the death rate at the end of 12 months was found to be 20.1%. In another study by Ozturk *et al.*^[20] the rate of mortality was 24% at 12 months.

Delay in surgery is a known risk factor for poor outcomes and mortality. Surgery within 24 h of injury has shown to improve outcomes and reduce mortality.^[21] Considerable delay was seen in this study. The mean duration between injury and surgery was 11.8 days. This reflects a lack of protocol-based fast track services for geriatric fractures. This could be one important reason for the high mortality rate is seen in this study, compared to the centers with fast-track services. Kulshrestha *et al.*^[22] studied 114 geriatric patients with hip fractures. Mean duration from injury to surgery was only 3.5 days. The 1-year mortality rate was 7.7%. Very few health care facilities in India are closer to this goal. Late presentation is frequently seen because of delay in seeking medical advice, inaccessibility to health services or delay in diagnosis of the fracture.^[15] Other factors causing delay are medical optimization of the patients, arrangement of operating time slot and arrangement of funds by the patients.^[15]

This study has attempted to evaluate if there is an association between known common risk factors for perioperative morbidity. Age was significantly associated with mortality. No significant association between gender and mortality rates was seen. Similar findings were reported in most other studies.^[19,20,23] Paksima *et al.*^[17] found higher mortality rate in males as compared to females. In our study, intracapsular fracture neck of femur was found to be significantly associated with mortality ($P = 0.039$). It is in consistent with the study of Wu *et al.*^[19] who showed that mortality rate was higher in extracapsular fractures neck of femur. In their study, 34 patients died out of 124 patients intracapsular fractures, while five patients died out of 71 of extracapsular fractures.

The effect of comorbidities such as hypertension, diabetes, and smoking is not clear in literature. We found increased mortality in the presence of these comorbidities. These findings are consistent with many other studies.^[12,24] However, Berry *et al.* failed to find any effect of comorbidities over mortality rate.^[25] Zhang *et al.*^[26] found anemia to be an independent risk factor for mortality in hip fractures. This is consistent with findings of our study. We also found high total leukocyte count and low serum albumin to be significantly associated with increased mortality.

Limitations of this study are its retrospective nature, small sample size and follow-up of only 1 year. The

patients were heterogeneous with respect to type of fractures, mechanism of injury, and type of surgery. There was no comparison group of a matched elderly cohort without a hip fracture during this period.

CONCLUSION

Thus, hip fractures in elderly are associated with higher mortality rates. Results of this study can help to identify patients at a higher risk of mortality. Delay in surgery, hypertension, diabetes, higher ASA grade, and smoking were significantly associated with mortality. Hematological markers such as low hemoglobin and raised total leukocyte count as well as biochemical marker such as low serum albumin were also associated with higher incidences of mortality. These findings can help in patient selection and preoperative optimization with the aim to reduced mortality. However, the findings need to be verified by further studies with a larger sample size.

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Conflicts of interest

There are no conflicts of interest.

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