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Original Research Article

Study on factors affecting mortality in nonagenarian patients in orthopaedic surgery

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ABSTRACT

Background: With medicine advancing, population is aging in the world. We encounter elderly patients in operating rooms more often. In this study, the aim was to investigate mortality and morbidity rates of patients 90 years of age or older within 1 year from the date of operation due to fractures.
Methods: The study was performed retrospectively in the 3rd stage health institution. All patients that had fracture operation in the operating rooms of the orthopaedics department between 2011 and 2017 and that were 90 years or older on the day of operation were included in the study. Patients who were operated twice were excluded from the study.
Results: Around 83 patients of which were included in the study. The mean age of the patients was 92.89±2.84. In-hospital mortality rate was 8.4%. The mortality rate within 3 months from the operation was 18.1%, 25.3% within 1 year, and 61.4% within 5 years or above. Author found that the mean survival period for the total of the surviving patients was 23.87±18.96 months. Author found that there was a meaningful causation between morbidity developing post-operation and in-hospital mortality, 3-month mortality, and 1-year mortality ($p<0.05$).
Conclusions: Author think that it was important to recognize the fact that despite being more vulnerable, patients 90 years of age or older have a significant life expectancy post-hospital discharge. Author think that post-operation acute morbidity affects mortality rates and it was important to avoid factors that may cause acute morbidity in patients 90 years of age and older.

Keywords: Fracture, Mortality, Nonagenarian

INTRODUCTION

With the advances in the medical field, the population is aging in developed countries and all over the world, and the number of nonagenarian patients increases. Thus, the number of patients 90 years of age or older admitted to hospitals with complaints of orthopaedic fractures also increases.[1,2] Hip fractures constitute one third of those complaints.[1,3] Elderly patients suffer from balance disorders and risk of falling due to age.[4] Furthermore, due to increased osteoporosis, even small falls can cause fractures.[4] In other words, the risk of fracture exponentially increases with age.[5,6] The hospitalization period of frail patients has increased considerably and become the second etiological cause following stroke.[5,7] This increase in fracture rates in elderly patient groups also gives rise to significant consequential expenses.[5] Nonagenarian patients, being the highest end of the

advanced age group, create particular concerns due to the increasing number of their co-morbid diseases, which is also the case in our country. Author encountered more nonagenarian patients in our operating rooms day by day; however, to this day, the prognosis of patients 90 years of age and older has been thought to be worse than other age groups.

The aim of this study was to evaluate the post-operative, in-hospital, 3-month, and 1-year mortality rates and morbidity rates of the patients 90 years of age or older admitted to the hospital with bone fractures and to determine the factors affecting the mortality and morbidity rates.

METHODS

Our study was a retrospective study performed at a university hospital. The ethics committee approval was obtained from The Institutional Review Board of the Department of Orthopaedics and Traumatology. Patients who applied to the Department of Orthopedics and Traumatology between 2011-2017 were evaluated. The inclusion criteria: all patients that had fracture operation in the operating rooms of the department between 2011 and 2017 and that were 90 years or older on the day of operation were included in the study.

Exclusion criteria

Patients who were operated twice or who had elective surgeries or polytraumas were excluded from the study. All data were obtained retrospectively from patient files. The primary aim of the study was to determine the factors affecting mortality in patients 90 years of age or older. In-hospital mortality, 3-month mortality, 1-year mortality, postoperative survival time, type of anaesthesia (general, peripheral, spinal) age (years), hospitalization time (day), postoperative mean time of death (month), long-term mortality, postoperative survival time were recorded. Long-term mortality was defined by including patients who were followed up for 5 years or more. Patients followed up for less than 5 years were not included in the long-term morbidity rates. Author defined morbidity as the occurrence of pulmonary, cardiac, gastrointestinal (GIS) and cerebrovascular pathologies in the postoperative period, independently from the preoperative co-morbidities. Only major pathologies were recorded. Minor pathologies were not evaluated as morbidity. The comorbidities were recorded as Alzheimer's, hypertension (HT), diabetes mellitus (DM), ischemic heart disease (ICH), chronic renal failure (CRF), cerebrovascular accident (CVA) and others.

Statistical analysis

SPSS 21.0 program was used to evaluate statistical outcomes of the study. In the evaluation of the data, author used descriptive statistical methods (mean, standard deviation, frequency, and rate) and the Mann-Whitney-U test for inter-group comparisons of quantitative data that were not normally distributed, and Chi-square tests for comparisons of the qualitative data. Significance was evaluated as $p<0.05$.

RESULTS

Around 103 patients were evaluated for compliance. Files of 87 patients meeting the inclusion criteria were examined. After the patients who were operated twice excluded, 83 patients were included in the study. Demographic data are given in Table 1. The mean age of the patients was 92.89±2.84. The most common reason of admission was hip fracture (n:71), constituting 85% of the patients (Figure 1).

Table 1: Demographic data.

Parameters	Numbers and percentages	
Age (years)	92.89±2.84 (min: 90 - maks:104)	
Length of hospital stay (days)	15.48±11.97	
Postoperative mean death time (months)	19.30±18.49	
Long-term mortality		
Yes	51	
No	32	
Intra-hospital mortality	8.4% (n:7)	
3-month mortality	18.1% (n:15)	
1-year mortality	25.3% (n:21)	
Postoperative survival time	23.87±18.96	
Type of Anesteshia	**n**	**Percentages**
general	14	16.9%
Peripheral	9	10.8%
spinal	60	72.3%

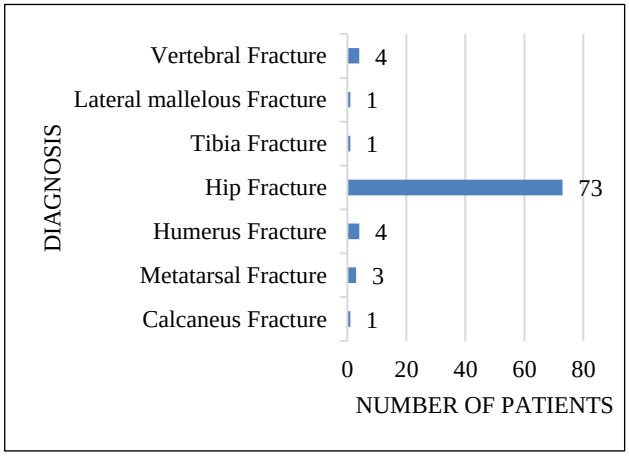

Figure 1: Diagnosis of patients.

The second most common reason was humeral fracture. The mortality rate within 3 months from the operation

was 18.1% (n:15), 25.3% (n: 21) within 1 year, and 61.4% (n:51) within 5 years or above. Author found that the mean survival period for the total of the surviving patients was 23.87±18.96 months (Table 1).

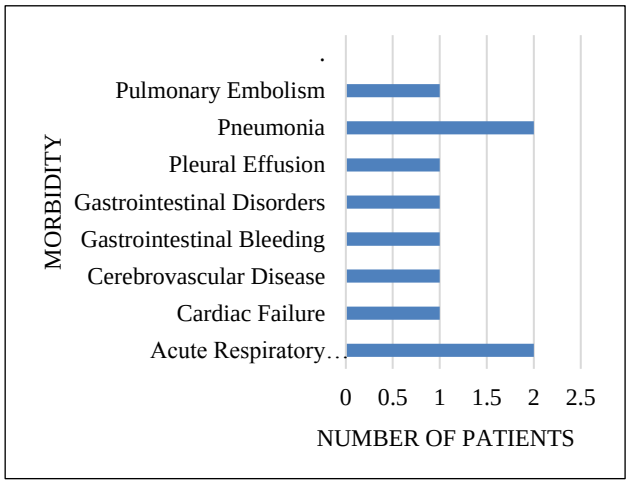

Figure 2: Postoperative morbidity.

We observed that pulmonary pathologies were the most commonly seen morbidities in the postoperative period (Figure 2). Author diagnosed CVA in 1 patient and gastro-intestinal problems in 2 patients. Author diagnosed heart failure in only 1 patient. Alzheimer's disease, hypertension (HT), diabetes mellitus (DM), ischemic heart disease (ICH), chronic renal failure (CRF) and cerebrovascular accident (CVA) were the most common co-morbidities. Most patients had multiple co-morbidities. It was remarkable that hypertension appeared to be the most common disease as 77 patients had hypertension (92.7%). This was followed by diabetes mellitus in 13 patients (15.66%), ischemic heart disease in 11 patients (13.23%), and Alzheimer's disease in 8 patients (9.6%). We found that anaesthetic methods had no meaningful effect on mortality ($p>0.05$). In the evaluation of sub-groups, no statistical significance was seen in terms of general anaesthesia, spinal anaesthesia, and peripheral block applications. The most common co-morbidities in the preop period were hypertension, diabetes, cerebrovascular accident (CVA), and Alzheimer. Author found that post-operative morbidity was significantly associated with in-hospital mortality, 3-month mortality, and 1-year mortality ($p<0.05$) (Table 2).

Table 2: Early period mortality rates.

	Intra-hospital mortality		p-value	3-month mortality		p-value	1-year mortality		p-value
	Yes (n:7)	**No (n:76)**		**Yes (n:15)**	**No (n:68)**		**Yes (n:21)**	**No (n:62)**	
Age	93.14±2.41	92.86±2.89	0.809	93.20±3.25	92.82±2.77	0.646	93.47±3.14	92.69±2.74	0.279
LOS	9.42±6.57	16.03±12.3	0.164	15.20±11.2	15.54±12.2	0.920	14.66±9.84	15.75±12.67	0.721
Anesthesia									
General	1	13	0.667	2	12	0.748	5	9	0.41
Spinal	6	54		12	48		15	45	
Peripheral block	0	9		1	8		1	8	
Postoperative morbidity	3	6	0.004*	5	10	0.002*	5	16	0.027*
p<0.05 as significant, LOS: Length of Hospital stay (days), Mann Whitney-U and Chi-square tests									

DISCUSSION

In this study, author examined the fracture patients 90 years of age (and older), and author found that the factors affecting the mortality were major post-operative morbid conditions. Author found that age, length of hospitalization, and type of anaesthesia did not have any effect on mortality.

In a recent study by Aschraf et al, they examined hip fractures in patients 90 years of age and older and gave similar mortality rates as the results (10.3% in hospital, 20.5% in 3 months and 35.9% in 1 year).[8] In this study, author found in-hospital mortality rate as 8.4% (n:7), 3-month mortality rate as 18.1% (n:15), and 1-year mortality as 25.3% (n:21). In a study conducted by Lin et al, they found a mortality rate of 9.9%, which is similar to the in-hospital mortality rate in this study.[9] The different studies conducted on nonagenarian patients in the literature provide mortality rates within the range of 5.0%-10.0%, although varying depending on the patient population and working method.[8,10,11] In general, author think that the small differences between studies are not only due to hip fracture, but also other fracture groups that author included in the study.

A recent study investigating factors affecting mortality in patients 90 years of age has found higher hazard ratios for mortality in patients with congestive heart failure and chronic obstructive pulmonary disease.[8] This result

differs from this conclusion in this study. In this study, author found that the co-morbidity in the preoperative period was not effective on mortality rates. In this study, all co-morbid conditions had similar mortality rates. Author believe this may be due to differences in patient groups.

Author see that some teams may be reluctant to operate patients 90 years of age or older because of their age. However, surgical procedures in these patient groups generally give positive results.[8,12,13] Author think that the post-operative acute complications are the most important factors affecting the mortality of the patient and hence, optimal conditions and treatment should be provided to this patient group pre and post operation which would decrease the mortality rates in nonagenarian patients. Not only does it prevent mortality, it also supports early recovery, physical therapy, and early leave from the hospital.[14]

In this study, author found that the morbid conditions in the postoperative period caused a significant increase in in-hospital, 3-month, and 1-year mortality rates. There are studies in the literature that support the results of this study and report that increased postoperative morbidity is associated with increased mortality.[14-16] Unlike this study, Tay et al, reported a very high rate of complications (47%), although there were studies (14.6-32%) reporting an early complication rate closer to the results.[14,17,18] In a study conducted by Öztürk et al, in the geriatric patient group, all patients with dementia were reported to have died within the first year.[19] These results differ from the findings. Author did not find any differences in mortality rates between patients with Alzheimer's disease or dementia and other morbidities.

In their study, Vochteloo et al, compared 65-89 years old patients with patients 90 years of age and older and reported significant differences between the groups in terms of 3-month mortality and sooner mortality but did not report mortality differences between nonagenarian and young patients in terms of excess mortality.[20] They also reported that more than half of the patients over 90 years of age returned to their homes and many of them gained preoperative mobility. Thus, they emphasized the importance of preventing the causes of hip fractures and preventing complications in the hospital.[20] The results also support these results. It is noteworthy that the postoperative survival time of the patients was 23.87±18.96 months. Author have found that the average life of patients who are over 90 years of age and have been operated for fracture is approximately 2 more years, which is a figure above the general opinion. When the patients were protected from the acute morbidity and taken home, there was a considerable life expectancy. Author think that the care and operation decisions of the patients should be evaluated by taking these data into consideration.

There are also limitations of this study. The low number of cases and the retrospective approach limits the extent of this study. The aim of this study was to cover all groups of fractures in patients over 90 in an equal manner, but most of the fractures were found to be hip fractures. This is likely to have affected this result.

CONCLUSION

We think that, it is important to recognise that, despite being more fragile due to age, patients 90 years of age and older have a significant post-operative life expectancy and that as post-operative acute morbidity affects mortality rates, any factor that may potentially cause acute morbidity in those patients should be avoided.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Review Board the Department of Orthopaedics and Traumatology, Istanbul, Turkey

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