CORRELATION BETWEEN TIME UNTIL SURGICAL TREATMENT AND MORTALITY AMONG ELDERLY PATIENTS WITH FRACTURES AT THE PROXIMAL END OF THE FEMUR

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ABSTRACT

Objective: The primary aim of this study was to analyze the possible association between delay in receiving surgical treatment and mortality among elderly patients with fractures at the proximal end of the femur. Methods: 269 patients with fractures at the proximal end of the femur (femur neck and intertrochanteric fractures) who were treated surgically at Hospital São Paulo, UNIFESP, São Paulo, between January 2003 and December 2007, were studied. The following attributes were analyzed and compared with the literature relating to this subject: sex, age, type of fracture, classification of the fracture, affected side, synthesis used, trauma mechanism, length of hospitalization, waiting time for surgery, associated comorbidities, hemogram on admission, type of anesthesia, need for blood transfusion, day of the week and season of the year of the fracture. Results: The study showed that higher mortality correlated with higher numbers of clinical comorbidities, longer hospitalization and use of general anesthesia during the surgery. Conclusion: There was no association between the time spent waiting for surgery and mortality.

Keywords – Femoral Fractures; Mortality; Retrospective Studies

INTRODUCTION

The incidence of fractures at the proximal end of the femur has increased significantly in recent decades. It is believed that this increase is closely related to the increasing geriatric population in our society, since this disease occurs predominantly in elderly patients and its incidence progressively increases with advanced age[1-6].

In the United States, between 1999 and 2002, the cost of treating these patients reached three billion dollars a year. It is estimated that the number of hip fractures will increase by 310% in men and 240% in women by the year 2025[7].

The trauma is generally low-energy and is related to the factors responsible for the increase in its incidence, such as osteoporosis, malnutrition, impaired activities of daily living, decreased visual acuity and reflexes, and weakened muscles[1,8-12].

This type of fracture is responsible for mortality and

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functional loss, mainly due to the fact that it affects patients with significant comorbidities and at high risk of postoperative complications.

In general, 30% of elderly patients end up dying one year after the occurrence of the injury[1,13-15], making this disease the leading cause of death from trauma in people over 75 years of age[2].

As in several developed countries, like the USA and the UK, the social and economic costs of this type of femur fracture are increasing every year in Brazil too[14].

The causes of the high mortality in elderly patients with fracture at the proximal end of the femur have been thoroughly investigated in developed countries. However, little is known about this subject in developing countries[7].

There is a great controversy in the literature as to whether there is an association between waiting time for surgery after the occurrence of fracture at the proximal end of the femur among the elderly and mortality[16-18].

The primary objective of this study is to analyze the possible association between delayed surgical treatment and mortality in elderly patients with fracture at the proximal end of the femur. The secondary objective is to assess the correlation between the number of clinical comorbidities, hospitalization time, and the type of anesthesia used in surgeries where mortality was the outcome.

MATERIAL AND METHODS

The research project was approved by the Research Ethics Committee of the Universidade Federal de São Paulo (Unifesp/Hospital São Paulo).

This is a study with a retrospective cohort design which evaluated 314 patients with fractures at the proximal end of the femur who underwent surgery at the Hospital São Paulo (Department of Orthopedics and Traumatology, Universidade Federal de São Paulo - Escola Paulista de Medicina) from January 2003 to December 2007. The minimum and maximum follow-up periods were six months and five years, respectively. Of this total of patients, the present study included 269 patients. The criteria for exclusion was patients aged 60 years or under. Therefore, all the patients were considered elderly (aged above 60 years), according to the Brazilian Senior Citizen Statute, in order to make the study population more homogeneous.

Through descriptive analysis of medical records, data from the surgical department of Hospital São Paulo and previous protocol, we collected data on gender, age, type of fracture, fracture classification, affected side, type of surgical procedure, trauma mechanism, length of hospitalization, waiting time for surgery, hemogram on admission, type of anesthesia used in the surgery, need for blood transfusion during hospitalization, day of the week and season when the study participants suffered the fracture.

Seeking to reduce potential biases in this study due to the retrospective nature of the assessments, we sought to perform this analysis by comparing all the means of information available (medical records, data from the surgical department, protocol from the orthopedics department, and contact with patients or their family members).

Telephone contacts and outpatient care were used for follow-up and to verify patient deaths and comorbidities.

Regarding clinical comorbidity, we opted to divide the diseases into groups such as cardiovascular, pulmonary, metabolic, musculoskeletal, central nervous system, gastrointestinal, genitourinary and neoplasms. From this division, the total number of comorbidities for each patient was counted individually.

Femoral neck fractures and intertrochanteric fractures were counted as fractures at the proximal end of the femur.

The Garden classification was adopted for femoral neck fractures, and the Tronzo classification for intertrochanteric fractures.

The trauma mechanisms that led to the injury were divided into the following categories: falls, being run over, sports, car accidents, seizures and aggression. For statistical purposes, we considered two categories: falls and others (including all other mechanisms of injury except falls).

A descriptive analysis of the variables involved in the study was initially performed, to characterize the sample. In order to assess the association of the variable mortality with other variables, we used the Chi-square test and Fisher's exact test. A level of significance of 5% was adopted throughout the analysis.

Data were analyzed using the application SPSS for Windows version 16.0.

To establish the cut-off number of comorbidities and length of hospitalization in days that would best indicate the relationship with the patient's death, we used the ROC curve.

RESULTS

The patients' ages ranged from 61 to 100 years. The average age was 79.9 (± 8.7) years. There was a slight prevalence of femoral neck fractures (50.1%) over intertrochanteric fractures (49.9%) (Table 1).

The patients diagnosed with femoral neck fracture were predominantly aged 70 to 89 years, while those diagnosed with intertrochanteric fracture were 80 years or older.

A prevalence of these fractures was observed in female patients (74.7%). The ratio between the genders for this type of fracture was 2.95 women to one man (Table 1).

Table 1 - Sample description (quantitative variables).

Variable	Frequency (%)
Mortality	
Non-fatal	38.7
Fatal	32.7
Not found	28.6
Gender	
Male	25.3
Female	74.7
Day of the week when the fracture occurred	
Sunday	14.9
Monday	10
Tuesday	11.5
Wednesday	16
Thursday	14.1
Friday	14.5
Saturday	19
Fracture	
Femoral neck	50.2
Intertrochanter	49.9

The distribution of femoral neck fractures according to the Garden classification was: type I (12.5%), type II (8.82%), type III (29.41%) and type IV (49.26%). Intertrochanteric fractures, according to Tronzo classification, were: type I (9.77%), type II (24.06%), type III (45.11%), type IV (12.03%) and type V (9.02%).

In our study, we observed a prevalence of unstable fractures, considering these as the ones classified as III and IV (78.67%) under the Garden classification and III, IV and V (66.16%) under the Tronzo classification.

The involvement of the left and right sides was similar (51.7% and 48.3%, respectively).

The predominant cause of fractures was falls (94.4%).

All patients underwent surgery, with 16.4% being submitted to total hip arthroplasty, 22.7% to partial hip arthroplasty, 6.7% to percutaneous pinning, 19.7% to intramedullary nail with cephalomedullary interlocked nail and 34.2% with plate and dynamic screw.

The length of hospitalization ranged from one to 101 days, with an average of 10.7 days. 53.2% of patients in this study stayed in hospital for a period of more than seven days (Table 2).

Table 2 - Sample description (quantitative variables).

Variable	Frequency (%)
Affected side	
Right	48.4
Left	51.7
Osteosynthesis	
PHA	22.7
THA	16.4
DHS	34.2
PFN	19.7
Pinning	6.7
Season	
Spring	23.4
Summer	22.7
Fall	24.9
Winter	29
Received blood during hospitalization	
Yes	42.8
No	57.2
Type of anesthesia	
General	23.8
Epidural	76.2
Length of hospitalization	
1 to 7 days	46.8
More than 7 days	53.2
Comorbidity	
None	7.8
From 1 to 4	81.4
More than 4	10.8

In terms of the relationship between the length of hospitalization and mortality, a significant difference was observed. The patients who were hospitalized for more than seven days had a higher mortality rate, compared to patients hospitalized for less than seven days ($p < 0.001$) (Table 3).

Table 3 - Correlations between variables and mortality.

	Non-fatal	Fatal	p
	N(%)	N(%)	
Gender			
Female	75 (72.1)	67 (76.1)	0.62
Male	29 (27.9)	21 (23.9)	
Waiting time for surgery			
Less than 1 day	8 (7.7)	13 (14.8)	0.11
From 1 to 2 days	22 (21.2)	11 (12.5)	
More than 2 days	74 (71.2)	64 (72.7)	
Type of anesthesia			
General	20 (19.2)	33 (37.5)	0.006*
Epidural	84 (80.8)	55 (62.5)	
Length of hospitalization			
1 to 7 days	64 (61.5)	25 (28.4)	< 0.001*
More than 7 days	40 (38.5)	63 (71.6)	
Comorbidity			
From 0 to 4	101 (97.1)	72 (81.8)	< 0.001*
More than 4	3 (2.9)	16 (18.1)	

Regarding the number of comorbidities, most patients (81.4%) presented between one and four clinical comorbidities. A significant difference was observed between the number of comorbidities and mortality. The patients who died had a higher number of comorbidities ($p = 0.002$) (Table 3).

The patients' hemoglobin and hematocrit levels on admission were, on average, 11.6 (± 1.8) mg/dl and 35.3 (± 8.4)%, respectively. The presence of anemia (Hb < 11) on admission was associated in some studies with increased mortality[20,21].

Regarding the need for blood transfusion, 57.2% of the patients did not receive any blood during hospitalization. However, 61.3% of the patients that received red blood cell concentrates during hospitalization died during the follow-up period.

There was a slight prevalence of fractures during winter, with 29.0% occurring in this season, 24.9% occurring in fall, 22.7% in summer and 23.4% in spring (Table 2). Regarding the day of the week in which the fracture occurred, we observed a slight prevalence of fractures occurring on Saturday (19.0%), followed by Wednesday (16.0%) and Sunday (14.9%) (Table 1).

The type of anesthesia most frequently used in the surgeries was epidural anesthesia (76.2%). A positive association was observed between the use of general anesthesia with an increase in mortality in these patients ($p = 0.006$) (Table 2).

In relation to mortality, 32.7% of the patients in the sample died during the follow-up period.

No statistical correlation was observed between gender and mortality ($p > 0.05$).

The waiting time for surgery was, on average, 5.8 days. Some patients underwent surgery on the day of admission, while the longest waiting time for surgery procedure was 60 days. In this sample, 13.01% of the patients underwent surgery within 24 hours of the occurrence of the fracture, 17.1% between 24 and 48 hours, and 69.89% more than 48 hours after the occurrence of the injury. No association was observed in this study between waiting time for surgery and mortality ($p > 0.05$) (Table 3).

DISCUSSION

The prevalence of patients aged 80 to 100 years, with fractures at the proximal end of the femur, was consistent with the literature[21,22]. These fractures are caused by low-energy traumas, particularly in osteoporotic bones. Global life expectancy, particularly in Brazil, is increasing, and an increase in incidence of these fractures is also expected[7].

In our study, there was a higher incidence of fractures in female patients, with a female to male ratio of 2.95:1. These data are consistent with several other studies that showed a prevalence of female patients ranging from between two and eight women to each man[7,10,21].

The involvement of the left and right sides was similar. An alternation of prevalence between right and left sides is seen in the literature, but it is always very close to 50% for each side[7,23].

Some authors have found a correlation between season and higher incidence of this type of fracture. However, in most cases, this relationship was observed in regions of cold weather, because, during summer, the

elderly population exercises more and consequently, is more exposed to the possibility of fractures[2,23,24]. In our study, a slight prevalence of fractures in the winter was observed.

As for the day of the week, a prevalence of fractures on weekends was observed. Another study reported no association between the day of the week and the higher incidence of these fractures[23].

The length of hospitalization ranged from one to 101 days, with an average of 10.7 days. This average was lower than the majority of services evaluated in different studies[7]. This shows the importance given in our department to prompt rehabilitation and discharge of this type of patient, who is so susceptible to complications caused by long periods spend in the hospital bed after surgery.

The analysis to correlate length of hospitalization with mortality showed that patients with a length of hospitalization of more than seven days had higher mortality. Therefore, we believe that the length of hospitalization should be reduced to improve the results. Undergoing surgery as soon as possible after the injury proved to reduce the length of hospitalization in these patients, with a possible reduction in mortality[25].

The number of comorbidities ranged from zero to seven, with most of the patients presenting between one and four clinical comorbidities, which was consistent with the literature[1,24]. We observed that the higher the number of comorbidities in the patient with fracture, the higher the chances of an outcome of death. Like the present study, previous studies have shown that patients with comorbidities are at increased risk of morbimortality after surgery[15,21,26]. Therefore, particular attention must be paid, in the preoperative, intraoperative and postoperative care of patients with clinical comorbidities. One study showed that delayed surgery was due, in 80% of cases, to the need for clinical optimization of the patient[27].

In this study, a positive association was observed between the use of general anesthesia and increased mortality. This correlation was not observed in another study, in which the type of anesthesia had no effect on increasing the mortality rate in patients undergoing surgery of fractures at the proximal end of the femur[28].

No association was observed in this study between waiting time for surgery and mortality. In the literature, there are few studies that defend delaying the intervention in these fractures, concluding that early surgery increases patient mortality[24,29]. However, the vast majority of articles found no association between waiting time for surgery and mortality[15,21,26,30,31]. Delayed surgery, according to some articles, increases the likelihood of these patients developing pressure ulcers, pneumonia and urinary tract infections[21,27]. A systematic review was performed in 2009, analyzing 52 articles involving 291,413 patients. No randomized clinical trials were found in these articles, since this type of trial often encounters ethical issues. Patient randomization would result in some patients being submitted to prolonged periods of pain and discomfort, and greater exposure to possible complications such as decubitus ulcers and pneumonia. This review concluded that there is no association between waiting time for surgery and mortality, but that a delay in performing surgery increases patient morbidity and length of hospitalization. The articles reviewed therefore recommend that surgery be performed as soon as possible if the patient has medical conditions[25].

CONCLUSIONS

Most patients in this study were aged between 80 and 100 years. The most common cause of fractures was falls (94.4%), predominantly in females (74.7%), and there was no significant difference in relation to the affected side.

A correlation was observed between a higher number of clinical comorbidities, longer length of hospitalization, the use of general anesthesia in surgery, and increased mortality.

However, no association was found in this study between waiting time for surgery and mortality.

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