



## Original Article

# One-year mortality of elderly patients with hip fracture surgically treated at a hospital in Southern Brazil<sup>☆</sup>



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## ABSTRACT

**Objective:** To analyze the mortality rate at one-year follow-up of patients with hip fracture who underwent surgery at the university hospital of this institution.

**Method:** The authors reviewed 213 medical records of hospitalized patients aged 65 years or older, following to the order they were admitted to the orthopedics and traumatology service from January 2012 to August 2013.

**Results:** One-year mortality rate was 23.6%. Mortality was higher among women, with a 3:1 ratio. Anemia ( $p = 0.000$ ) and dementia ( $p = 0.041$ ) were significantly associated with the death group. Patients who remained hospitalized for less than 15 days and who were discharged within seven days after surgery showed increased survival.

**Conclusion:** In the present sample of patients with hip fracture who underwent surgery, one-year mortality rate was 23.6%, and the main comorbidities associated with this outcome were anemia and dementia.

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## Mortalidade em um ano de pacientes idosos com fratura do quadril tratados cirurgicamente num hospital do Sul do Brasil

## RESUMO

**Objetivo:** Analisar a mortalidade, em um ano de seguimento, de pacientes com fratura da extremidade proximal do fêmur submetidos a procedimento cirúrgico no hospital universitário da nossa instituição.

<sup>☆</sup> Study conducted at the Universidade Luterana do Brasil (ULBRA), Hospital Universitário, Canoas, RS, Brazil.

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**Método:** Foram revisados 213 prontuários de pacientes internados com 65 anos ou mais, conforme a ordem de admissão no Serviço de Ortopedia e Traumatologia de janeiro de 2012 a agosto de 2013.

**Resultados:** A taxa de mortalidade em um ano foi de 23,6%. A mortalidade foi maior em mulheres, numa proporção 3:1. Anemia ( $p=0,000$ ) e demência ( $p=0,041$ ) estiveram significativamente associadas ao grupo óbito. Pacientes que permaneceram internados por até 15 dias e os que tiveram alta hospitalar em até sete dias após a cirurgia apresentaram um aumento na sobrevida.

**Conclusão:** Em nossa amostra de pacientes com fratura de fêmur submetidos a procedimento cirúrgico, a taxa de mortalidade foi de 23,6%; as principais comorbidades associadas a esse desfecho foram anemia e demência.

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## Introduction

Hip fractures are very common and serious events in elderly patients. A significant increase in the incidence of proximal femur fractures has been observed in recent decades, mainly due to the increase of the elderly population, since this incidence progresses with advancing age.<sup>1</sup> This type of fracture accounts for 84% of bone lesions in people aged over 60 years; it is a public health issue and a major cause of mortality, disability, excessive medical and hospital expenses, and social and family problems in this population.<sup>2-4</sup>

Fractures of the proximal end of the femur include subtrochanteric and transtrochanteric fractures, as well as those in the femoral neck. Most often, trauma is low-energy and is related to factors such as malnutrition, impaired activities of daily living, decreased visual acuity and reflexes, sarcopenia, and – particularly – bone fragility.<sup>1,5,6</sup>

In most cases, surgery is indicated. Conservative treatment is chosen in cases of incomplete fractures without displacement or when there are no clinical conditions for surgery. A period between 24 and 48 h after the fracture is considered ideal for the surgical procedure to take place, considering the general health of the patient.<sup>7-12</sup> Several studies indicate advanced age, physical status, male gender, and delayed treatment as determining factors in mortality.<sup>6,11,13</sup> Other factors related to an unfavorable outcome include non-ambulatory condition prior to fracture, cognitive deficiencies, occurrence of a second fracture, low functional level at time of discharge, and lack of bisphosphonates and vitamin D replacement.<sup>6,14</sup>

Because fractures of the proximal end of the femur occur in patients with significant comorbidities and high risk of pre-operative complications, this condition has a high mortality rate when compared with other fractures.<sup>10,11,13,15</sup> An important indicator in the evaluation of care provided in health institutions, mortality rate can also be used for two other purposes: determining the performance of a hospital over time and monitoring the performance of a number of hospitals.<sup>16</sup>

Given the importance of this issue, this study aimed to determine the mortality rate in the first year of follow-up of elderly patients with hip fracture who underwent surgery at

the university hospital of this institution and to identify the comorbidities associated with these patients.

## Material and methods

This was a retrospective study conducted at the university hospital of this institution. The study included elderly patients (65 years or older) admitted with a fracture of the proximal end of the femur and surgically treated from January 2012 to August 2013.

This study was approved by the Research Ethics Committee of the institution. The research followed the recommendations of Resolution No. 196/96 of the National Health Council for Research in Human Beings, and was approved on 1/10/13 (CAAE: 21388913.1.0000.5349). Thus, no information that could identify individuals involved in the research will be published, ensuring the anonymity of the subjects and the privacy of information.

The survey was conducted through a review of medical records and telephone contact with patients and their relatives. The information on death and its date were obtained through telephone contact or through the Canoas Health Department, when direct contact was not possible. Patients whose medical records were incomplete or who died prior to surgical treatment were excluded. Patients who underwent conservative treatment were not included.

The following variables were studied: age, sex, comorbidities, type of fracture, surgical procedure, type of implant used, mean time between fracture and surgery, postoperative complications, and death. The cause of death was not assessed, as it had already been identified in a study conducted earlier in this service and because in most cases the cause of death was not directly related to the surgical procedure.

Data were analyzed with tables, descriptive statistics, and chi-squared and Fisher's exact tests, using SPSS software, version 13.0. A maximum significance level of 5% ( $p \leq 0.05$ ) was considered to be significant. The chi-squared test was used to assess the gender and age prevalence between groups, as

well as the number of comorbidities. The other variables were evaluated using Fisher's exact and chi-squared tests.

## Results

From January 2012 to August 2013, the medical records of 213 patients with fractures of the proximal end of the femur were selected for inclusion in the study. Of these, 12 were excluded due to incomplete medical records and two due to death prior to the surgery, which resulted in a final sample of 199 patients. Of the total sample, 153 were contacted directly and 46 through the Department of Health system;

47 (23.6%) patients died within a year and 152 (76.4%) remained alive. [Table 1](#) shows the comparison between the survival group and death group according to age and gender of patients. The survival group was significantly associated with age 65–75 years; conversely, the death group was associated with age range of over 86 years ( $p=0.021$ ). There was no difference between groups regarding sex ( $p=0.849$ ).

Regarding the number of comorbidities per patient, it is observed that the presence of no comorbidities was associated with the survival group and that the presence of three comorbidities was associated with the death group ( $p=0.004$ ; [Table 2](#)). Two comorbidities were significantly associated with the death group: dementia ( $p=0.041$ ) and anemia ( $p=0.000$ ; [Table 3](#)).

The most prevalent fracture in the study group was transtrochanteric (56.8%), followed by femoral neck (37.7%) and subtrochanteric fractures (5%). Among the osteosynthesis implants, the most widely used was the dynamic hip screw, in 42.7% of cases. [Table 4](#) indicates that three variables were associated with both groups: time between fracture and discharge ( $p=0.018$ ), time between surgery and discharge ( $p=0.003$ ), and osteosynthesis implant ( $p=0.011$ ). Regarding the variable of time between fracture and discharge, it was observed that the survival group was significantly associated with time <15 days and the death group, with time >30 days ( $p=0.018$ ). In the variable of time between surgery and discharge, the survival group was associated with time <7 days and the death group, with time 8–15 days and >15 days ( $p=0.003$ ). As for the implant used for osteosynthesis, dynamic hip screw was significantly associated with the survival group, and cemented partial hip prosthesis, with the death group ( $p=0.011$ ).

Regarding complications, sepsis in the postoperative period was significantly associated with the death group ( $p=0.001$ ). Among other comorbidities studied, there was no significant relationship with the death group ([Table 5](#)).

## Discussion

This study investigated the mortality of elderly patients who underwent surgery for fractures of the proximal end of the

**Table 1 – Comparison between the survival and death groups to sex and age of patients.**

Variable	Group						$p^a$
	Death (n=47)		Survival (n=152)		Total (n=199)		
	n	%	n	%	n	%	
Sex							
Female	34	72.3	114	75	148	74.4	0.849
Male	13	27.7	38	25	51	25.6	
Age							
65–75	9	19.1	54	35.5	63	31.7	0.21
76–86	20	42.6	67	44.1	87	43.7	
Over 86	18	38.3	31	20.4	49	24.6	

Source: Authors.

<sup>a</sup> Chi-squared test.

**Table 2 – Comparison between the survival and death groups according to the number of comorbidities presented.**

NO. of comorbidities	Group						$p^a$
	Death		Survival		Total		
	n	%	n	%	n	%	
None	1	2.1	32	21.1	33	16.6	0.4
One	13	27.7	45	29.6	58	29.1	
Two	14	29.8	47	30.9	61	30.7	
Three	16	34	22	14.5	38	19.1	
More than three	3	6.4	6	3.9	9	4.5	
Total	47	100	152	100	199	100	

Source: Authors.

<sup>a</sup> Chi-squared test.

**Table 3 – Comparison between the survival and death groups according to the presence of comorbidities.**

Comorbidities	Group						p <sup>a</sup>
	Death (n=47)		Survival (n=152)		Total (n=199)		
	n	%	n	%	n	%	
DM	13	27.7	35	23	48	24.1	0.560
SAH	33	70.2	92	60.5	125	62.8	0.300
Stroke	8	17	11	7.2	19	9.5	0.53
NIHD	7	14.9	18	11.8	25	12.6	0.616
IHD	5	10.6	5	3.3	10	5	0.58
Dementia	8	17	10	6.6	18	9	0.41
Depression	4	8.5	4	2.6	8	4	0.91
COPD	1	2.1	4	2.6	5	2.5	1.000
CRF	2	4.3	4	2.6	6	3	0.628
Neoplasia	2	4.3	12	7.9	14	7	0.526
Anemia	8	17	1	0.7	9	4.5	0.000
Hypothyroidism	4	8.5	3	2	7	3.5	0.55
Dyslipidemia	1	2.1	5	3.3	6	3	1.000
Smoking/alcohol use	2	4.3	6	3.9	8	4	1.000
Others	3	6.4	21	13.8	24	12.1	0.208

Source: Authors.

IHD, ischemic heart disease; NIHD, non-ischemic heart disease; DM, diabetes mellitus; COPD, chronic obstructive pulmonary disease; SAH, hypertension; CRF, chronic renal failure.

<sup>a</sup> Chi-squared test and Fisher's exact test.

**Table 4 – Comparison of the study variables between the survival and death groups.**

Variable	Response	Group						p <sup>a</sup>
		Death (n=47)		Survival (n=152)		Total (n=199)		
		n	%	n	%	n	%	
Fracture	Femoral neck	22	46.8	53	34.9	75	37.7	0.450
	Trochanteric	22	46.8	91	59.9	113	56.8	
	Subtrochanteric	3	6.4	7	4.6	10	5	
	Femoral neck + trochanteric	–	–	1	7	1	0.5	
Time of fracture/surgery	Up to 7 days	5	10.6	29	19.1	34	17.1	0.352
	8–15 days	20	42.6	64	42.1	84	42.2	
	Over 15 days	22	46.8	59	38.8	81	40.7	
Time of fracture/admission	Up to 7 days	35	74.5	104	68.4	139	69.8	0.578
	8–15 days	9	19.1	41	27	50	25.1	
	Over 15 days	3	6.4	7	4.6	10	5	
Time of fracture/discharge	Up to 15 days	7	15.6	48	31.6	55	27.9	0.18
	16–30 days	23	51.1	79	52	102	51.8	
	Over 30 days	15	33.3	25	16.4	40	20.3	
Time of surgery/discharge	Up to 7 days	25	55.6	123	80.9	148	75.1	0.3
	8–15 days	11	24.4	15	9.9	26	13.2	
	Over 15 days	9	20	14	9.2	23	11.7	
Osteosynthesis	DCS	9	19.1	15	9.9	24	12.1	0.11
	DHS	14	29.8	71	46.7	85	42.7	
	Cannulated screw	–	–	5	3.3	5	2.5	
	PFN	1	2.1	9	5.9	10	5	
	Short PFN	2	4.3	5	3.3	7	3.5	
	Cemented PHR	8	17	9	5.9	17	8.5	
	Cementless PHR	6	12.8	4	2.6	10	5	
	Cemented THR	2	4.3	11	7.2	13	6.5	
Cementless THR	5	10.6	22	14.5	27	13.6		

Source: Authors.

DCS, dynamic condylar screw; DHS, dynamic hip screw; PFN, proximal femur nail; PHR, partial hip replacement; THR, total hip replacement.

<sup>a</sup> Chi-squared test and Fisher's exact test.

**Table 5 – Comparison between the survival and death groups according to the presence of complications in the postoperative period.**

Complications	Group						p <sup>a</sup>
	Death (n = 47)		Survival (n = 152)		Total (n = 199)		
	n	%	n	%	n	%	
UTI	3	6.4	17	11.2	20	10.1	0.418
BPN	6	12.8	11	7.2	17	8.5	0.370
SSI	4	8.5	7	4.6	11	5.5	0.464
Osteosynthesis infection	1	2.1	2	1.3	3	1.5	1.000
Osteosynthesis rupture/dislocation	1	2.1	5	3.3	6	3	1.000
Delirium	2	4.3	5	3.3	7	3.5	1.000
Sepsis without focus	8	17	3	2	11	5.5	0.001
ARF	1	2.1	3	2	4	2	1.000
Anemia	1	2.1	5	3.3	6	3	1.000
PTB	3	6.4	2	1.3	5	2	0.87
Others	3	6.4	3	2	6	3	0.145

Source: Authors.

BPN, bronchopneumonia; SSI, surgical site infection; ARF, acute renal failure; UTI, urinary tract infection; PTB, pulmonary thromboembolism.

<sup>a</sup> Chi-squared test.

femur after one year of follow-up. The results showed a mortality rate of 23.6%, associated with variables such as age, comorbidities, osteosynthesis, time between fracture and discharge, and time between surgery and discharge.

By presenting these data, the authors aim to encourage the improvement of the quality of the current services, initially by making health officials, hospital administrators, doctors, and other professionals aware of the real problem that these conditions represent.

A higher incidence was observed in female patients (74.4%); this finding is consistent with the literature, which indicates a ratio of two to five women for every man.<sup>1,3-5,9,13,15-21</sup> The mean age of patients included in the study was 79.84 years, similar to that found in the literature.<sup>1,3,17,21,22</sup>

One-year mortality rates show great variability in the literature.<sup>2,12,17-20</sup> The mortality rate in the present study was 23.6%. Ricci et al.<sup>20</sup> analyzed 202 patients and observed a mortality rate of 28.7% after one year of follow-up. In turn, Pereira et al.<sup>18</sup> observed a rate of 35% in a sample of 246 patients with hip fracture. In a study conducted in Italy, Meessen et al.,<sup>23</sup> with a sample of 828 patients, observed a mortality rate of only 20.7%.

In the present study, it was observed that mortality rate was higher in patients older than 86 years. Pugely et al.,<sup>24</sup> in a prospective study of 4331 patients, showed a similar increase in mortality in patients over 80 years with hip fracture, which was significant for their overall mortality rate.

The most prevalent comorbidities were hypertension, diabetes mellitus, heart disease, stroke, anemia, and dementia. This profile is consistent with that observed in several studies, in accordance to natural aging process.<sup>1,9,16,17,24</sup> Although hypertension and diabetes mellitus combined accounted for over 80% of prevalence, these comorbidities are not determinant of an unfavorable outcome. Anemia and dementia were significantly associated with the death group, and are mentioned in the literature as factors associated with increased morbidity and mortality.<sup>20,25-28</sup> In the present study,

an increase was observed in mortality among patients with three comorbidities prior to the fracture. Studies show that the number of previous diseases influences the mortality of patients with proximal end of femur fractures and that the presence of two or more comorbidities is associated with increased morbidity and mortality.<sup>29</sup>

The ideal time between fracture and surgical treatment has been widely discussed in the literature. The ideal time for surgery is considered to be between 24 and 48 h after fracture.<sup>9-12,15,17,22</sup> In the present study, the mean interval from fracture to surgery was 16.19 days, with a minimum of two and maximum of 100 days. Despite the disagreement with the literature, the death group was not associated with delay of surgery. As this is a tertiary hospital, there is a bias regarding time between fracture and surgery. As this hospital does not have an emergency care unit, patients are first treated at an emergency department and only after stabilization transferred to the definitive treatment. The authors believe that this generates a significant bias in the outcome of these patients, since the treatment is rarely performed in its ideal form due to the system itself.

Time between fracture and discharge was significant in this analysis. Patients who remained hospitalized for over 30 days presented a higher mortality rate. Astur et al.<sup>3</sup> reported an increase in mortality of more than five times in patients who were hospitalized for over ten days when compared with those who remained less than ten days. The time between surgery and discharge was statistically significant in the analysis, but this relationship was not observed in the literature.

Osteosynthesis was shown to be relevant to survival and mortality of patients. The use of dynamic hip screws was significantly associated with the survival group. The literature, however, does not indicate a difference between the type of implant used and the mortality of patients with proximal femoral fractures.<sup>18,21</sup>

Regarding complications, only 10% were linked to surgery and the osteosynthesis implant used. The most prevalent clinical complications were urinary tract infection (10.1%), nosocomial pneumonia (8.5%), sepsis (5.5%), and delirium (5.5%), all frequently cited in the literature.<sup>10,13,14,16,24</sup> Sepsis was significantly associated with the death group ( $p=0.001$ ). In a study published in 2014, Gibson et al.<sup>30</sup> demonstrated that one-third of patients with proximal femoral fracture admitted to the intensive care unit with sepsis died in the unit and another one-third died outside the unit before discharge.

## Conclusion

In this sample of patients with hip fracture who underwent surgery, the mortality rate at one year was 23.6%; the major comorbidities significantly associated with this outcome were anemia and dementia.

## Conflicts of interest

The authors declare no conflicts of interest.

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