



Original Article

Epidemiology of fractures of the proximal third of the femur in elderly patients[☆]



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ABSTRACT

Objective: This was an epidemiological study on fractures of the proximal third of the femur in elderly patients who were treated at a teaching hospital in the central region of São Paulo. **Methods:** The subjects were patients over the age of 60 years who were attended over a 1-year period. A questionnaire seeking basic sociodemographic data and information on comorbidities presented and medications used was drawn up. The circumstances of the fractures and their characteristics, the treatment instituted and the intra-hospital mortality rate were evaluated.

Results: The 113 patients included in the study presented a mean age of 79 years. The ratio between the sexes was three women to each man. Only 30.4% of the patients reported having osteoporosis and only 0.9% had had treatment for the disease. Low-energy trauma was the cause of 92.9% of the fractures. Femoral neck fractures accounted for 42.5% of the fractures and trochanteric fractures, 57.5%. Five patients did not undergo operations; 39 underwent joint replacement; and 69 underwent osteosynthesis. The mean length of hospital stay was 13.5 days and the mean length of waiting time until surgery was 7 days. The intra-hospital mortality rate was 7.1%.

Conclusion: The patients attended at this institution presented an epidemiological profile similar to what is found in the Brazilian literature. Chronic kidney failure is a significant factor with regard to intra-hospital mortality. Preventive measures such as early diagnosis and treatment of osteoporosis and regular physical activity practices were not implemented.

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Epidemiologia das fraturas do terço proximal do fêmur em pacientes idosos

R E S U M O

Palavras-chave:
Epidemiologia
Fraturas do quadril
Idoso

Objetivo: Estudo epidemiológico das fraturas do terço proximal do fêmur em pacientes idosos, tratados em hospital-escola na região central de São Paulo.

Métodos: Pacientes a partir 60 anos atendidos no período de um ano. Questionário foi elaborado com informações sociodemográficas básicas, comorbidades apresentadas e medicações em uso. Foram avaliadas circunstâncias da fratura e suas características, tratamento instituído e taxa de mortalidade intra-hospitalar.

Resultados: Os 113 pacientes incluídos no estudo apresentavam 79 anos em média. A proporção entre os sexos foi de três mulheres para cada homem. Somente 30.4% dos pacientes relataram osteoporose e somente 0.9% tratavam a doença. Trauma de baixa energia foi a causa de 92,9% das fraturas. Fraturas do colo do fêmur representaram 42,5% das fraturas e trocantéricas 57,5%. Cinco pacientes não foram operados, 39 foram submetidos a substituição articular e 69 foram submetidos a osteossíntese. O tempo médio de internação foi de 13,5 dias e de espera até a cirurgia sete dias. A taxa de mortalidade intra-hospitalar foi de 7,1%.

Conclusão: Pacientes atendidos na instituição apresentam perfil epidemiológico semelhante àqueles encontrados em literatura nacional. Insuficiência renal crônica é um fator significativo para mortalidade intra-hospitalar. Medidas preventivas como diagnóstico precoce e tratamento da osteoporose e prática regular de atividades físicas não são adotadas.

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Introduction

Aging of the population is a Brazilian reality. In 1991, the total number of elderly people, i.e. individuals aged 60 years and over, was 10.7 million or 7.2% of the population. In 2011, this group amounted to 23.5 million or 12.1% of the population.

This trend has led to greater concern regarding problems of diseases relating to this age group, which include fractures of the proximal third of the femur. These cause a high rate of morbidity and mortality.¹⁻³ A large number of these patients die within two years and many never recover their quality of life or functional independence.⁴⁻⁶

Among elderly people, these fractures occur in relation to low-energy trauma. The main cause is falls from a standing position.^{3,5,7,8} Several risk factors have been correlated with fractures of the proximal third of the femur and, among these, advanced age and osteoporosis stand out.^{2,9,10}

These fractures can be divided into femoral neck, transtrochanteric and subtrochanteric fractures.^{5,6} All of them should be treated surgically,^{1,5} but there is no consensus regarding the best surgical technique for each of them. Nonetheless, there are factors relating to the treatment that may modify the mortality rate among these patients. These include the length of time between hospital admission and surgery, use of prophylactic antibiotic therapy, and use of post-operative physiotherapy.^{3,4,11-13}

The objective of this study was to determine the epidemiological profile of fractures of the proximal third of the femur among elderly people who were treated in the orthopedics department of a hospital. Thus, the study aimed to analyze the causes of the fractures, their characteristics and the treatment

instituted. In addition it aimed to observe whether measures were being taken to avoid similar new occurrences.

Sample and method

This was a prospective observational study conducted in a single teaching hospital in the central region of the city of São Paulo. The study included elderly patients with fractures of the proximal third of the femur who were attended consecutively between August 1, 2009, and July 31, 2010. Patients were excluded if they refused to participate or were not in a condition to answer questions. Patients were also excluded if they had a diagnosis of metastatic fracture or a fracture related to neoplastic processes in the femur.

A questionnaire was drawn up by the present authors, to be answered by the patients themselves or by a relative or caregiver who might be living with the patient. In this questionnaire, in addition to basic sociodemographic information such as sex, age, nationality, ethnicity and work activity, the trauma mechanism, the place where the event occurred and time when it occurred were evaluated. The patients were also asked about any comorbidities, including osteoporosis, that they were aware of having, along with the medications that they were using.

The other data gathered in the present study comprised the type of fracture, total duration of hospital stay, presence of osteoporosis seen on radiography, length of waiting time until surgery and treatment instituted.

To define the types, the fractures were divided into femoral, transtrochanteric and subtrochanteric types. For the femoral

neck fractures, we used Garden's classification and generically defined types I and II as stable fractures, while types III and IV corresponded to unstable fractures.

To define the presence or absence of osteoporosis as seen on radiography, Singh's method was applied.¹⁴

This study was previously approved by our institution's research ethics committee.

Results

The questionnaire was answered by 113 patients (28 males and 85 females) and these were included in the study. Their ages were between 60 and 99 years (mean of 79). Regarding occupation, 109 were only doing housework. Four patients were economically active. None of them were institutionalized and only 18 were living alone.

Falls were reported by 115 patients. The others had suffered high-energy trauma. Among the falls, 81 had occurred in the patient's own home, while 24 were in the streets. Most of these events occurred in the patient's bedroom, followed by the bathroom. Approximately two-thirds of the fractures occurred during the day. Sixty-five patients had a hip fracture during the colder seasons, while 48 were during the hotter seasons.

Only 16 patients said that they did not have any type of disease. The disease most frequently found on its own was systemic arterial hypertension, in 23 patients. Fifteen patients were diabetic, seven were diagnosed with Alzheimer and six had hypothyroidism. Twenty-two patients had three or more comorbidities.

Two patients were doing regular physical activities (walking in both cases).

When asked about preexisting diseases, only two patients reported that they had osteoporosis. We included a specific question about this disease in the questionnaire. When asked whether they had osteoporosis, 34 patients (30.1%) said that they did. We analyzed the radiographs of these patients in accordance with the criteria described by Singh¹⁴ and found that 107 patients (94.7%) had osteoporosis.

Twenty-two patients were not making use of any medication. Captopril was the medication most used. Only one patient reported using specific medication for treating osteoporosis (alendronate). None of the patients were using vitamin D.

The type of fracture most commonly encountered was transtrochanteric, in 57 cases. There were 48 cases of femoral neck fractures and eight cases of subtrochanteric fractures.

Five patients had not undergone any operation, while 108 had undergone some type of surgical intervention. Osteosynthesis was the treatment instituted in all the cases of subtrochanteric fractures and in 56 (98.2%) of the transtrochanteric fractures. One case of transtrochanteric fracture was treated with joint replacement because advanced arthrosis was presented in this joint. In relation to femoral neck fractures, 39 were considered to be unstable and were treated with joint replacement, while eight stable cases underwent fixation.

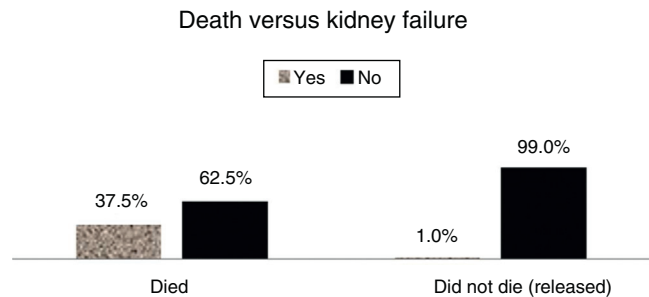


Fig. 1 – The only risk factor that was found to separately increase mortality in the hospital was chronic kidney failure. The percentage of patients with kidney failure was significantly greater among the patients who died than among those who did not die.

The mean duration of the patients' hospital stay was 13.5 days and the mean length of time that the patients waited between hospital admission and the surgery was 7 days.

The number of patients released from hospital was 115. Eight patients (7.1%) died while in hospital, among whom six were over 80 years of age and three had been diagnosed with chronic kidney failure. Five of these patients had femoral neck fractures (four of them underwent joint replacement) and three had transtrochanteric fractures (which underwent fixation).

We analyzed the cases of death in the hospital in relation to several variables, especially the following: type of fracture, type of surgery, number of associated diseases, season of the year, radiographic osteoporosis and age. At the 5% significance level, there was no relationship between death and the variables, as can be seen in [Table 1](#).

The only risk factor for higher mortality in the hospital that was found separately was chronic kidney failure. The percentage of the patients with kidney failure was significantly greater among the patients who died, in comparison with the patients who did not die ([Fig. 1](#)).

The same variables were also evaluated in relation to the total duration of the hospital stay and the time that elapsed between hospital admission and the surgical treatment. None of these were shown to be statistically significant in relation to the length of time spent waiting for the operation. The type of surgery was statistically significant in relation to the total duration of the hospital stay. The patients who underwent osteosynthesis stayed in hospital for less time than did those who underwent joint replacement ([Tables 2 and 3](#)).

There was a difference between the percentages of patients who reported having osteoporosis and who presented osteoporosis seen on radiography, such that the percentage of the patients with osteoporosis seen on radiography was significantly greater than the percentage reporting osteoporosis ([Fig. 2](#)).

Discussion

The epidemiological profile of the individuals in our sample did not differ much from what was found in previous studies in Brazil and worldwide. Women predominated over men in

Table 1 – Death in the hospital compared in relation to the following variables: type of fracture, type of surgery, number of associated diseases, season of the year, radiographic osteoporosis and age.

Death (yes or no) compared with the variables	Died (%)	Did not die (%)	Total (%)	p value
<i>Type of fracture</i>				
Stable femoral neck	0 (0)	9 (8.6)	9 (8)	0.387 ^b
Unstable femoral neck	4 (50)	35 (33.3)	39 (34.5)	
Unstable subtrochanteric	0 (0)	8 (7.6)	8 (7.1)	
Transtrochanteric	4 (50)	53 (50.5)	57 (50.4)	
Total	8 (100)	105 (100)	113 (100)	
<i>Type of surgery</i>				
Fixation	3 (42.9)	65 (64.4)	68 (63)	0.420 ^a
Replacement	4 (57.1)	36 (35.6)	40 (37)	
Total	7 (100)	101 (100)	108 (100)	
<i>Number of associated diseases</i>				
0	0 (0)	16 (15.2)	16 (14.2)	0.273 ^b
1 or 2	6 (75)	70 (66.7)	76 (67.3)	
3 or 4	2 (25)	19 (18.1)	21 (18.6)	
Total	8 (100)	105 (100)	113 (100)	
<i>Season of the year</i>				
Winter	3 (37.5)	33 (31.4)	36 (31.9)	0.150 ^b
Autumn	4 (50)	25 (23.8)	29 (25.7)	
Spring	1 (12.5)	26 (24.8)	27 (23.9)	
Summer	0 (0)	21 (20)	21 (18.6)	
Total	8 (100)	105 (100)	113 (100)	
<i>Osteoporosis seen on radiography</i>				
Yes	8 (100)	99 (94.3)	107 (94.7)	1.000 ^a
No	0 (0)	6 (5.7)	6 (5.3)	
Total	8 (100)	105 (100)	113 (100)	
<i>Age group</i>				
60–70 years	0 (0)	22 (21)	22 (19.5)	0.115 ^b
71–80 years	2 (25)	33 (31.4)	35 (31)	
>80 years	6 (75)	50 (47.6)	56 (49.6)	
Total	8 (100)	105 (100)	113 (100)	

Source: Files of the hospital service.

^a Fisher's exact test.

^b Likelihood ratio test.

the proportions of 3:1. The patients' mean age was 79 years. In a previous sample in the same hospital (2004–2005), Hungria et al.⁸ found predominance of women in the proportions of 2:1 and a mean age of 78.2 years. Ramalho et al.⁹ found proportions of 3.3:1 and a mean age of 78.5 years.

In our study, we found that 92.9% of the fractures were associated with low-energy trauma. This was a lower proportion than in the United States, where Stevens and Sogolow⁷ correlated more than 95% of the fractures with falls. Previously published Brazilian studies have reported slightly lower percentages: Hungria et al.,⁸ 87.3%; Astur et al.,³ 91.4%; and Rocha et al.,⁵ 73.5%. The great majority of these falls occurred inside the patients' homes: in our series, 76.9%; Hungria et al.,⁸ 73.4%; and Pereira et al.,¹³ 62.6%. The majority of the falls occurred during the day, predominantly in the bedroom, followed by the bathroom, i.e. in places where these elderly individuals were alone. These findings corroborated the theory defended by Hungria et al.,⁸ Siqueira et al.¹⁰ and Pinheiro et al.,¹⁵ among others, that improvements to elderly people's housing, such as removal of unnecessary furniture, avoidance of slippery floors, support bars next to the toilet bowl and shower, and avoidance of rugs and mats, could avoid many fractures.

Also in relation to falls, other known risk factors were identified in our sample. Patients who used more than one type of medication reported that these were often prescribed by different physicians and that they were almost never reviewed with the aim of preventing occurrences of falls. The latter measure was advocated by Siqueira et al.¹⁰ Only two patients (1.8%) were doing physical activity. Siqueira et al.¹⁰ showed that there was greater prevalence of falls among sedentary elderly people. Bandeira and Carvalho¹⁶ concluded that physical activity was a preventive measure against fractures of the proximal femur and diminished the osteoporosis rate.

Only 16 patients did not report any presence of diseases and only 22 were not making use of any medications; 76 reported having one or two comorbidities and 21, three or more. None of these data were found to be statistically significant with regard to death in the hospital or greater lengths of time waiting for the operation, but were important factors with regard to mortality within 1 year after the operation.^{1,2,11}

The data on osteoporosis deserve attention. When asked about preexisting diseases, only two patients (1.8%) said that they had osteoporosis. We included a specific question on this disease because of its strong association with fractures of the

Table 2 – Waiting time until surgery compared with the following variables: type of fracture, type of surgery, number of associated diseases, season of the year, radiographic osteoporosis and age.

Time elapsed between hospital admission and surgery in relation to the variables					p value
Type of fracture	Stable femoral neck	Unstable femoral neck	Unstable subtrochanteric	Transtrochanteric	
Mean ± standard deviation	4.5 ± 2.4	8.6 ± 9.3	8.9 ± 7	5.9 ± 3.6	0.364 ^a
Median (minimum–maximum)	6 (1–7)	6 (1–50)	8 (0–22)	5 (0–14)	
Type of surgery	Fixation	Replacement			
Mean ± standard deviation	6.1 ± 4.1	8.6 ± 9.2			0.279 ^b
Median (minimum–maximum)	6 (0–22)	6 (1–50)			
Number of associated diseases	0	1 or 2	3 or 4		
Mean ± standard deviation	5.7 ± 4.6	6.7 ± 5.5	9.2 ± 10.1		0.215 ^c
Median (minimum–maximum)	4.5 (1–17)	6 (0–36)	6.5 (2–50)		
Season of the year	Winter	Autumn	Spring	Summer	
Mean ± standard deviation	7.3 ± 4.8	4.9 ± 3.4	8.2 ± 10.9	7.9 ± 4.3	0.238 ^c
Median (minimum–maximum)	6 (0–22)	4 (1–12)	6 (0–50)	7 (1–17)	
Radiographic osteoporosis	Yes	No			
Mean ± standard deviation	6.9 ± 6.6	8.8 ± 4.4			0.482 ^d
Median (minimum–maximum)	6 (0–50)	9 (3–13)			
Age group	60–70 years	71–80 years	>80 years		
Mean ± standard deviation	7.8 ± 5.3	8.5 ± 9.5	5.7 ± 3.7		0.221 ^a
Median (minimum–maximum)	6 (0–22)	6 (2–50)	5 (0–17)		

^a Kruskal-Wallis nonparametric test.
^b Mann-Whitney nonparametric test.
^c Analysis of variance (ANOVA) model.
^d Student's t test.

proximal femur.^{10,16,17} From analyzing radiographs of the hip in anteroposterior view, we found that 94.7% of the patients were osteoporotic in accordance with the method described by Singh. Specific studies on the prevalence of osteoporosis

showed that it was 33.4% among patients aged 60–69 years and 72.7% among patients over the age of 80 years, in the series reported by Bandeira and Carvalho.¹⁶ This discrepancy was expected, given that our sample only dealt with patients

Table 3 – Length of hospital stay compared in relation to the following variables: type of fracture, type of surgery, number of associated diseases, season of the year, radiographic osteoporosis and age.

Length of hospital stay in relation to the variables					p value
Type of fracture	Stable femoral neck	Unstable femoral neck	Unstable subtrochanteric	Transtrochanteric	
Mean ± standard deviation	8.8 ± 3.9	16.3 ± 12.6	14.9 ± 12.9	12.1 ± 8.3	0.202 ^a
Median (minimum–maximum)	9 (3–14)	13 (1–56)	13 (2–43)	10 (3–54)	
Type of surgery	Fixation	Replacement			
Mean ± standard deviation	11 ± 6.9	16.1 ± 12.4			0.027 ^b
Median (minimum–maximum)	9 (2–43)	13 (1–56)			
Number of associated diseases	0	1 or 2	3 or 4		
Mean ± standard deviation	10.1 ± 6.9	13.3 ± 10.2	16.6 ± 11.7		0.156 ^c
Median (minimum–maximum)	7.5 (1–23)	11 (2–54)	13 (6–56)		
Season of the year	Winter	Autumn	Spring	Summer	
Mean ± standard deviation	13.1 ± 7.9	12.4 ± 12.3	15.3 ± 12.7	13 ± 6.9	0.738 ^c
Median (minimum–maximum)	12 (3–43)	8 (5–54)	12 (2–56)	11 (1–29)	
Radiographic osteoporosis	Yes	No			
Mean ± standard deviation	13.4 ± 10.4	13.7 ± 7			0.958 ^d
Median (minimum–maximum)	11 (1–56)	12 (6–22)			
Age group	60–70 years	71–80 years	>80 years		
Mean ± standard deviation	13.8 ± 9.5	14.3 ± 12.4	12.8 ± 9.1		0.779 ^c
Median (minimum–maximum)	11.5 (2–43)	11 (4–56)	10.5 (1–54)		

Bold indicate significance is 5%.
^a Kruskal-Wallis nonparametric test.
^b Mann-Whitney nonparametric test.
^c Analysis of variance (ANOVA) model.
^d Student's t test.

Reported osteoporosis versus radiographic osteoporosis

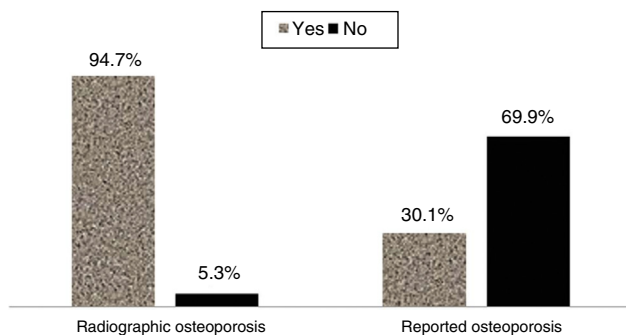


Fig. 2 – There was a difference between the percentage of patients who reported having osteoporosis and the percentage presenting osteoporosis on radiography, such that the percentage of patients with osteoporosis seen on radiography was greater than the percentage reporting osteoporosis. Furthermore, the kappa coefficient value was less than 0.5 (50%), which indicates that there was low concordance between reported and radiographic osteoporosis.

who had fractures, while the abovementioned series was a population-based study. In addition, there are studies in the literature, such as the one by Koot et al.,¹⁸ that show a lack of correlation between the Singh index and densitometry. Independent of the real prevalence of osteoporosis in our sample, attention is drawn to the fact that only one patient was using specific medication for treating this disease (alendronate). Jennings et al.¹⁷ conducted an important survey in several hospital services in the United States and concluded that only 2% received adequate treatment for osteoporosis during hospitalization and after their release. It is also not part of the routine at our hospital to introduce this type of treatment at this moment.

The proportions between the subtypes of fracture are not uniform among different series. Ramalho et al.⁹ reported that 50.7% were femoral neck fractures and 49.3% were trochanteric fractures. Bentler et al.⁴ found that 45% were trochanteric fractures. We found that 57.5% were trochanteric (7.1% subtrochanteric and 50.4% transtrochanteric) and 42.5% were in the femoral neck.

Five patients could not be operated, since their clinical conditions made the surgical risk very high. Practically all the patients with transtrochanteric fractures who could be operated underwent internal fixation, as also did those with stable fractures of the femoral neck. Forty joint replacements were performed: 39 in cases of unstable femoral neck fractures and one in a case of transtrochanteric fracture with advanced arthrosis. The first thing to which attention is drawn is the fact that all the unstable fractures of the femoral neck were treated by means of joint replacement and none of them by means of reduction and osteosynthesis. However, it needs to be noted that our sample only included patients over the age of 60 years, and that the great majority of them presented osteoporosis on radiography and associated comorbidities. Parker et al.¹⁹ advocated hemiarthroplasty instead of internal fixation, for elderly patients with displaced fractures of the femoral neck.

The mean duration of the hospital stay was 13.5 days and the mean length of time spent waiting for surgery was 7 days. These results did not differ much from those of other Brazilian series. Mesquita et al.² found a mean waiting time of 6.8 days and a mean hospital stay of 14 days. Astur et al.,³ at Hospital São Paulo, found 6.89 and 10.65. In the United States, Bentler et al.⁴ conducted a large study and found a mean duration of hospital stay of 7.2 days.

Many authors have defended the idea that delay in performing the surgery increases the risk of mortality in the hospital and within the first year after the operation.^{2,11,12} These studies drew attention to the problem of excessive delays until surgical intervention at hospitals within the Brazilian National Health System. Studies in other countries have taken into account waiting periods of 12, 24 or 48 h, whereas our patients waited for 7 days on average.

We believe that the precarious state of health of our patients at the time of the fracture and difficulties faced by the hospital service in dealing with cases are the main causes of delay. Problems within the hospital service relating to lack of beds for admissions, lack of beds in the intensive care unit and suspension of operations lead to longer hospital stays during this phase.

Type of fracture, age and number of comorbidities did not significantly affect the time spent waiting for the surgery.

The total duration of hospital stay in Brazilian series is much longer than that in other countries. We attribute this prolonged time not only to delays in scheduling surgery but also to social factors and the lack of public policies for postoperative reception of these patients. All the patients who were released in our series went to their own home or a relative's home, while 14% of the patients in the series of Bentler et al. did so.⁴ The others were received into support services until a definitive cure had been achieved. Type of fracture, age and number of comorbidities did not significantly affect the length of hospital stay. The patients with unstable fractures and those who underwent joint replacement stayed in hospital for longer times than those who underwent fixation. Mesquita et al.² reported similar results, but attributed this longer duration to greater amounts of time spent on preoperative preparation for arthroplasty procedures. In our series, the type of surgery did not affect the length of the wait for surgery.

Eight patients died during the hospital stay (rate of 7.1%). Sakaki et al.¹ reported a rate of 5.5% in a review. Other Brazilian studies have reported similar rates; Pereira et al.¹³ reported 8.9% in Rio de Janeiro and Ricci et al.⁶ reported 5.45% in Rio Grande do Sul. In another review, Bentler et al.⁴ reported 2.7% in the United States. Other studies in the United States have also shown much lower rates. Type of fracture, age, number of comorbidities and type of treatment did not influence the rate of mortality in the hospital. Chronic kidney failure was shown to be a separate risk factor for mortality. It is unclear why there should be such differences between the Brazilian samples and those from elsewhere. However, we believe that the poor clinical condition of the majority of the patients at the time of hospital admission, which would be secondary to deficient attendance within primary healthcare, and delays in scheduling surgery at a stage in which the patients are still bedridden, favors complications such as respiratory infection, thromboembolism and delirium, as occurred in the case of the

patient who died of pneumonia after 54 days of hospital stay. This hypothesis is advocated by Panula et al.²⁰

We believe that many of the factors studied were not statistically significant because of limitations regarding the sample size. Nonetheless, the values found did not completely differ from those of the large series. We need to continue to follow-up these individuals in order to correlate the variables studied with mortality within the first year after surgery.

Conclusion

The patients attended at this institution present an epidemiological profile similar to those reported in the Brazilian literature.

Chronic kidney failure is a significant factor relating to death in the hospital.

Simple and effective preventive measures, such as early diagnosis and treatment of osteoporosis and regular practicing of physical activity, have not been adopted.

Conflicts of interest

The authors declare no conflicts of interest.

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