


FACTORS ASSOCIATED WITH THE OUTCOMES OF OLDER PATIENTS OPERATED DUE TO HIP FRACTURES

FATORES ASSOCIADOS AOS DESFECHOS DE PACIENTES IDOSOS OPERADOS POR FRATURAS DO QUADRIL

FERNANDO GONZALEZ CORRÊA¹ , LUAN TOSHIO SERIKAWA¹ , ROBERTO BEZERRA NICOLAU¹ , LUIS FELIPE BRANDT FERRES¹ , JOÃO CARLOS PEDRO FILHO¹ , FERNANDO BALDY DOS REIS¹ , LUIZ FERNANDO COCCO¹ 

1. Universidade Federal de Sao Paulo, Escola Paulista de Medicina, Departamento de Ortopedia e Traumatologia, Sao Paulo, SP, Brazil.

ABSTRACT

Objective: Evaluating clinical factors associated with mortality in older patients who underwent surgical correction of hip fractures. **Methods:** This observational and retrospective study analyzed the medical records of 67 patients (aged older than 60 years), both men and women, who underwent surgical correction of hip fractures from 2019 to 2020 at Hospital São Paulo. The following variables were analyzed: age, sex, presence of comorbidities, affected hip region, and trauma mechanism. Statistical analyses were performed using the SPSS software. **Results:** The mean age of patients was 78.12 ± 9.80 years and 80.6% of the sample were women. The prevalence of hip fractures on the right side (52.2%), in the transtrochanteric region (53.7%), and due to fall on the same level (88.1%) was higher. Systemic arterial hypertension (77.6%), diabetes mellitus (37.3%), and dementia (16.4%) were frequent comorbidities. The prevalence of death after fracture was 17.9% and it was associated with longer hospital stay after surgery ($p = 0.028$). **Conclusion:** The prevalence of mortality of patients with hip fractures who underwent surgery was 17.9%. A longer hospital stay due to pre-existing comorbidities was the main factor related to this outcome. **Level of Evidence III, Retrospective Study.**

Keywords: Hip Fractures. Femoral Fractures. Mortality. Retrospective Studies. Risk Factors. Orthopedic Procedures.

RESUMO

Objetivo: Avaliar os fatores clínicos associados à mortalidade em pacientes idosos submetidos ao tratamento cirúrgico para correção de fraturas do quadril. **Métodos:** Estudo observacional e retrospectivo de análise de prontuários de 67 pacientes (idade superior a 60 anos). Foram incluídos indivíduos de ambos os sexos, submetidos ao tratamento cirúrgico para correção de fraturas do quadril, entre 2019 e 2020, no Hospital São Paulo. Foram analisadas as variáveis: idade, sexo, presença de comorbidades, região do quadril acometido e mecanismo de trauma. As análises estatísticas foram realizadas pelo software SPSS. **Resultados:** A idade média dos participantes foi de $78,12 \pm 9,80$ anos, e 80,6% da amostra era constituída por mulheres. Houve maior prevalência de fraturas do quadril no lado direito (52,2%), na região transtrocanterica (53,7%) e causada por queda sem desnível (88,1%). Hipertensão arterial sistêmica (77,6%), diabetes mellitus (37,3%) e demência (16,4%) foram frequentes. A prevalência de óbito após a fratura foi de 17,9%, sendo associada a maior tempo de internação hospitalar após a cirurgia ($p = 0,028$). **Conclusão:** A prevalência de mortalidade dos pacientes com fratura do quadril submetidos à cirurgia foi de 17,9%. O tempo prolongando de internação hospitalar por comorbidades pré-existentes foi o principal fator relacionado a este desfecho. **Nível de Evidência III, Estudo Retrospectivo.**

Palavras-chave: Fraturas do Quadril. Fraturas do Fêmur. Mortalidade. Estudos Retrospectivos. Fatores de Risco. Procedimentos Ortopédicos.

Citation: Corrêa FG, Serikawa LT, Nicolau RB, Ferres LFB, Pedro Filho JC, Reis FB, Cocco LF. Factors associated with the outcomes of older patients operated due to hip fractures. *Acta Ortop Bras.* [online]. 2023;31(2): Page 1 of 4. Available from URL: <http://www.scielo.br/aob>.

INTRODUCTION

Population aging is a worldwide phenomenon in a progressive increase. By 2050, the number of older adults in the world is estimated to be about 2 billion.¹ The epidemiology of fractures also tends to increase, with 4.5 million cases estimated for 2050.² In Brazil, population aging poses new challenges for health services, since, as the older population increases, fragility fractures (hip, shoulder, wrist, and spine) affect an increasingly significant number of individuals.³⁻⁷

In general, treatment in geriatric trauma needs special attention, as it requires specialized services and longer hospital stay, increasing morbidity and mortality and the costs of health services.^{3,8} In this scenario, hip fractures stand out, since they are associated with severe complications, such as increased rates of admission in intensive care units, risk of infection, and mortality.⁹⁻¹¹ High-energy mechanisms such as traffic accidents, falls from great heights, and firearm injuries are the most frequent cause of fractures among young adults, whereas low-energy traumas

All authors declare no potential conflict of interest related to this article.

The study was conducted at Universidade Federal de Sao Paulo, Escola Paulista de Medicina, Departamento de Ortopedia e Traumatologia. Correspondence: Fernando Gonzalez Corrêa. Rua Napoleão de Barros, 715, 1st floor, Sao Paulo, SP, Brazil, 04024002. fer_correa89@hotmail.com

Article received on 12/19/2021, approved on 02/28/2022.



such as simple falls are more frequent among older adults with less unstable fracture traits.^{9,12} Moreover, fracture characteristics, anatomical site, and severity can also be influenced by factors related to bone density quality.^{12,13}

We found other peculiarities in the process of fracture healing in older adults. A decrease in the healing potential results in lower rates of healing or bone nonunion and, consequently, higher mortality risk.^{3,12} Among factors associated with mortality after hip fracture, advanced age, female sex, the presence of comorbidities, surgical delay, the type of anesthesia, and altered laboratory tests play an important role.^{8,9} Thus, handling with manageable risks in the treatment schedule of older patients with proximal femoral fractures is mandatory.¹³ Moreover, studies on the outcomes of these patients are essential for the development of national policies focused on assisting health care professionals in creating more effective preventive strategies. Thus, this study aims to evaluate the clinical factors related to mortality in older patients who underwent surgical correction of hip fractures at Hospital São Paulo.

METHODS

Type of study

This observational and retrospective study collected data from the medical records of patients treated at Hospital São Paulo by the Department of Orthopedics and Traumatology of the Paulista School of Medicine (UNIFESP). The study respects the ethical and legal aspects of studies with human beings and was approved by the Research Ethics Committee of the Universidade Federal São Paulo (no. 5.143.826).

Casuistry

This study was based on the analysis of medical records of patients older than 60 years, both men and women, who underwent surgical correction of hip fractures at Hospital São Paulo from January 1, 2019, to January 1, 2020, with outpatient follow-up for one year. Patients with incomplete or outdated medical records or who did not agree with the terms of consent to participate in the study were excluded. Deaths during hospitalization or outpatient follow-up were considered.

Data collection

Researchers analyzed cases exclusively by electronic medical records. The following data were collected: age, sex, presence of comorbidities (systemic arterial hypertension and diabetes mellitus), trauma mechanism, type of fracture (intracapsular or extracapsular), preoperative time (from admission to surgery), postoperative time (from surgery to hospital discharge), total length of hospital stay, type of surgery (osteosynthesis or arthroplasty), clinical outcome (survival or mortality), laterality, and autonomy to walk before fracture. Researchers neither collected data in person nor had access to the name or hospital record of patients, ensuring their anonymity.

Statistical analysis

Data were placed in an Excel spreadsheet for further analysis regarding age, sex, and pre-existing diseases related to clinical outcomes after surgical treatment of fractures. Descriptive analyses were presented in absolute numbers (n) and relative frequencies (%), along with mean and standard deviation. Statistical analyses were performed using the SPSS software (version 21). For statistical significance, the established cutoff value was $p < 0.05$.

RESULTS

This study included 67 older patients, with a mean age of 78.12 ± 9.80 years. Most patients were women (80.6%; $n = 54$).

Among comorbidities at admission, systemic arterial hypertension (77.6%; $n = 52$) stood out, followed by diabetes mellitus (37.3%; $n = 25$). Older patients with some degree of dementia confirmed by geriatric clinical examinations represented 16.4% ($n = 11$) of the sample. Most cases were femoral fractures on the right side (52.2%; $n = 35$) and transtrochanteric fractures (53.7%; $n = 36$). Among patients, 64.2% ($n = 43$) walked almost exclusively at home and 34.3% ($n = 23$) were able to walk both inside and outside the home before fracture. The main cause of femoral fracture was fall from the same level (88.1%; $n = 59$). The prevalence of death due to femoral fracture was 17.9% ($n = 12$) even after surgery. Regarding hospital parameters, length of hospital stay was 8.45 ± 5.63 days, preoperative time was 3.32 ± 3.91 days, and postoperative time was 4.52 ± 3.894 days (Table 1).

Table 1. Characteristics of older patients who underwent surgical correction of hip fractures at Hospital São Paulo from 2016 to 2021.

Variables	Frequency	%
Gender		
Men	13	19.4
Women	54	80.6
Total	67	100
Systemic arterial hypertension		
No	15	22.4
Yes	52	77.6
Total	67	100
Diabetes mellitus		
No	42	62.7
Yes	25	37.3
Total	67	100
Dementia		
No	56	83.6
Yes	11	16.4
Total	67	100
Laterality		
Right	35	52.2
Left	32	47.8
Total	67	100
Functional status		
Walked at home	43	64.2
Walked inside and outside home	23	34.3
Other [#]	1	1.5
Total	67	100
Diagnosis		
Femoral neck fracture	23	34.3
Transtrochanteric fracture	36	53.7
Other [%]	8	11.9
Cause		
Fall from the same level	59	88.1
Traffic accident	1	1.5
Other [*]	7	10.4
Total	67	100
Final outcome		
Non-mortality	55	82.1
Mortality	12	17.9
Total	67	100

[#]Bedridden, and paraplegic patients and wheelchair users; [%]Multiple femoral fractures and diaphyseal femoral fractures; ^{*}Unwitnessed fall, prophylactic fixation (myeloma), physical aggression, and pathologic fracture; n: sample number.

To analyze epidemiological and clinical factors that influenced outcomes, patients were divided into two groups: non-mortality (82.10%; n = 55) and mortality (17.90%; n = 12). However, groups had no significant difference between them (Table 2)

Regarding numerical variables, patients with mortality outcome had longer hospital stay (11.67 ± 7.19 days) compared to patients with non-mortality outcome (7.75 ± 5.045 days) ($p = 0.028$; Table 3). Patients who died also had higher mean age, more comorbidities, and longer preoperative and postoperative time. However, we found no significant differences ($p \geq 0.050$).

To assess if length of hospital stay increased mortality risk, a binary regression model was made, including the variables length of hospital stay and preoperative and postoperative time. Hospitalization time increases the risk of death with borderline p-values (OR = 1.127; $p = 0.057$) (Table 4).

Table 2. Association of epidemiological and clinical aspects with the outcome in patients who underwent surgical correction of hip fractures.

Variables	Non-mortality (n = 55)		Mortality (n = 12)		p
	n	%	n	%	
Gender					0.227 [#]
Men	9	16.40%	4	33.30%	
Women	46	83.60%	8	66.70%	
SAH					0.443 [#]
No	11	20.00%	4	33.30%	
Yes	44	80.00%	8	66.70%	
DM					0.751 [†]
No	35	63.60%	7	58.30%	
Yes	20	36.40%	5	41.70%	
Dementia					0.400 [#]
No	47	85.50%	9	75.00%	
Yes	8	14.50%	3	25.00%	
Laterality					1.000 [†]
Right	29	52.70%	6	50.00%	
Left	26	47.30%	6	50.00%	
Diagnosis					0.449 [#]
Femoral neck fracture	17	30.90%	6	50.00%	
Transtrochanteric fracture	31	56.40%	5	41.70%	
Other [§]	7	12.70%	1	8.30%	
Functional status					0.743 [†]
Walked at home	36	65.50%	7	58.30%	
Other [‡]	19	34.50%	5	41.70%	
Cause					1.000 [#]
Fall from the same level	48	87.30%	11	91.70%	
Other [¶]	7	12.70%	1	8.30%	

[#]Fisher's exact test; [†]Chi-square test; [‡]Multiple femoral fractures and diaphyseal femoral fractures; [§]Bedridden and paraplegic patients and wheelchair users; [¶]Unwitnessed fall, prophylactic fixation (myeloma), physical aggression, and pathologic fracture; $p < 0.05$: statistical significance; n: sample number; SAH: systemic arterial hypertension; DM: diabetes mellitus.

Table 3. Association of age, number of comorbidities, length of hospital stay, preoperative and postoperative time with clinical outcomes of patients who underwent surgical correction of hip fractures.

Variables	Non-mortality (n = 55)		Mortality (n = 12)		p
	Mean	SD	Mean	SD	
Age	77.870	10.123	79.250	8.487	0.663
Number of comorbidities	2.150	1.183	2.330	0.985	0.620
Length of hospital stay (days)	7.750	5.045	11.670	7.190	0.028
Preoperative time (days)	4.360	3.602	5.250	5.154	0.581
Postoperative time (days)	3.190	2.727	3.920	7.366	0.592

[#]Student's t-test; n: sample number; SD: standard deviation; $p < 0.05$: statistical significance.

Table 4. Binary logistic regression of the influence of length of hospital stay on the clinical outcome of patients who underwent surgical correction of hip fractures.

Variables	OR	95%CI		p
		Lower	Upper	
Length of hospital stay	1.127	0.997	1.275	0.057
Preoperative time	1.017	0.855	1.210	0.850
Postoperative time	0.959	0.804	1.142	0.636

OR: odds ratio; CI: confidence interval; $p < 0.05$: statistical significance.

DISCUSSION

This study aimed to retrospectively evaluate factors associated with mortality after surgical correction of hip fractures in older adults. The prevalence of mortality after surgery was 17.9%, which was associated with longer hospital stay due to pre-existing comorbidities. Hip fractures represent a growing public health problem worldwide and are associated with higher mortality in older patients.³ Among hip fractures, proximal femoral fractures stood out, especially transtrochanteric fractures due to their high frequency among older adults and significant social and economic impact.¹⁴ Our study is in line with other studies that show the prevalence of intertrochanteric fractures in relation to the femoral neck.^{8,10} Moreover, our sample has a profile similar to the literature, considering the occurrence in older and women, with comorbidities such as diabetes mellitus and arterial hypertension.^{3,8-10,13} A study with 38,126 women with hip fractures and a six-year follow-up time showed that the presence of comorbidities before fracture was associated with high short-term mortality and reduced survival in 39% of cases. Thus, due to the increasing number of patients with comorbidities associated with aging and high mortality in patients with hip fractures, improving preoperative and postoperative care for patients with chronic heart, kidney, or lung diseases can potentially reduce mortality.¹⁵ Brazil has a high prevalence of hip fractures and high mortality and morbidity rates associated with this condition.^{3,8,10} In this study, hip fracture mortality rates were similar to previous studies.¹⁶⁻¹⁸ In a study conducted in Brazil, the mortality rate was 14.4% among patients with femoral fractures and this mortality was associated with increasing age, leukocytosis, need for intensive care, and no surgical treatment. Correa et al.¹⁰ showed that the mortality rate among older adults with proximal femoral fractures at the national level was 8% and male sex, reduced Parker score, delirium diagnosed at hospital admission or developed during hospitalization, and surgical delay were the main associated risk factors.

In the United States, a study presented a femoral fracture mortality rate of 1.6%.¹¹ The authors concluded that patients have a high risk of mortality and postoperative complications if they undergo surgical fixation 48 hours after admission, with longer ICU and hospital stay and increased need for mechanical ventilation.¹¹

As one of the main causes of hospitalization of older patients, hip fractures require careful perioperative management to avoid complications and decrease mortality rates. Most of the available guidelines recommend surgical correction of fractures in the first 24 hours, up to 48 hours, as an increased waiting time is correlated with higher medium-term complication and mortality rates. Moreover, diagnostic-therapeutic care proved to significantly reduce the length of hospital stay.¹⁹

Similarly to our findings, studies show that a longer hospital stay negatively affects older patients with femoral fractures, as it contributes to the development of other hospital complications such as infection, pressure ulcers, and sepsis, besides increasing mortality rate.^{8,9,18} According to a recent demographic study, the southeastern region of Brazil showed the highest femoral fracture mortality rates

and the longest total hospital stay.³ Thus, a longer hospital stay may contribute to higher mortality rates in this region, which is in line with our findings.

With population aging, optimizing length of hospital stay and reducing overload in health and social services is essential.³ Mortality risk may be high, especially due to the low bone quality of older patients.^{3,12,13} Thus, preventive measures to reduce fractures among this population are extremely important.

Despite the limitations of this study due to its retrospective nature, development in a single center, and small sample size, we could identify the association between hip fracture mortality in older adults and length of hospital stay. Our data can be used in the planning of services and care protocols focused on older patients with femoral fractures in order to reduce mortality risk. This should occur within a multidisciplinary approach, including hospital care

and improvements in the availability of rehabilitation services. However, further epidemiological studies with a larger sample size are necessary to analyze the association of hip fracture mortality in older adults, since studies on this topic are scarce.

CONCLUSION

In this study, the prevalence of mortality of patients with hip fractures who underwent surgery was 17.9%, and a longer hospital stay due to comorbidities was the main factor related to this outcome.

ACKNOWLEDGMENTS

We thank the Department of Orthopedics and Traumatology and the orthopedic trauma team of the Paulista School of Medicine at the Universidade Federal de Sao Paulo.

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of this article. FGC, LTS: conception, writing, and intellectual conception of the article, data interpretation, and writing of the article; RBN, LFBF, JCPF: data interpretation and writing of the article; FBR: drafting, revision, and approval of the final version; LFC: conception, writing, and intellectual conception of the article.

REFERENCES

1. United Nations, Department of Economic and Social Affairs, Population Division. World population ageing 2019: highlights. New York: United Nations; 2019.
2. Orces CH. Epidemiology of hip fractures in Ecuador. *Rev Panam Salud Publica.* 2009;25(5):438-42.
3. Silva JCA, Ribeiro MDA, Silva LN, Pinheiro HA, Bezerra LMA, Oliveira SB. Femur fractures in elderly in Brazil from 2015 to 2020: analysis of costs, time of hospitalization and total deaths. *Rev Pesqui Fisioter.* 2021;11(4):798-806.
4. Cocco LF, Ejnisman B, Belangero PS, Cohen M, Reis FB. Quality of life after antegrade intramedullary nail fixation of humeral fractures: a survey in a selected cohort of Brazilian patients. *Patient Saf Surg.* 2018;12:4.
5. Cocco LF, Yazzigi JA Jr, Kawakami EFKI, Alvachian HJF, Reis FB, Luzo MVM. Inter-observer reliability of alternative diagnostic methods for proximal humerus fractures: a comparison between attending surgeons and orthopedic residents in training. *Patient Saf Surg.* 2019;13:12.
6. Cocco LF, Aihara AY, Franciozi C, Reis FB, Luzo MVM. Three-dimensional models increase the interobserver agreement for the treatment of proximal humerus fractures. *Patient Saf Surg.* 2020;14:33.
7. Pedro Filho JC, Nicolau RB, Offenbacher RW, Credidio MV, Reis FB, Cocco LF. Evaluation of post-surgical management of fragility fractures. *Acta Ortop Bras.* 2021;29(3):137-42.
8. Alcantara C, Dellaroza MSG, Ribeiro RP, Carvalho CJA. Femoral fracture in the elderly: surgery waiting time and hospitalization outcome. *Cienc Cuid Saude.* 2021;20:e54726.
9. Franco LG, Kindermann AL, Tramuja L, Kock KS. Factors associated with mortality among elderly people hospitalized due to femoral fractures. *Rev Bras Ortop.* 2016;51(5):509-14.
10. Correa JGL, Andrade-Silva FB, Fortes Filho S, Kojima KE, Silva JS, Leme LEG. Evaluation of predictive factors of in hospital mortality in patients with proximal femoral fracture. *Acta Ortop Bras.* 2020;28(1):40-3.
11. Obey MR, Clever DC, Bechtold DA, Stwalley D, McAndrew CM, Berkes MB, et al. In-hospital morbidity and mortality with delays in femoral shaft fracture fixation. *J Orthop Trauma.* 2022;36(5):239-45.
12. Bliuc D, Nguyen ND, Milch VE, Nguyen TV, Eisman JA, Center JR. Mortality risk associated with low-trauma osteoporotic fracture and subsequent fracture in men and women. *JAMA.* 2009;301(5):513-21.
13. Bergh C, Wennergren D, Möller M, Brisby H. Fracture incidence in adults in relation to age and gender: a study of 27,169 fractures in the Swedish Fracture Register in a well-defined catchment area. *PLoS One.* 2020;15(12):e0244291.
14. Abreu EL, Sena CB, Rodrigues Filho SAS. Effectiveness of treatment of transtrochanteric fractures with Dynamic Hip Screws using minimally invasive access. *Rev Bras Ortop.* 2016;51(2):138-42.
15. Lunde A, Tell GS, Pedersen AB, Scheike TH, Apalset EM, Ehrenstein V, Sørensen HT. The role of comorbidity in mortality after hip fracture: a nationwide Norwegian study of 38,126 women with hip fracture matched to a general-population comparison cohort. *Am J Epidemiol.* 2019;188(2):398-407.
16. Schnell S, Friedman SM, Mendelson DA, Bingham KW, Kates SL. The 1-year mortality of patients treated in a hip fracture program for elders. *Geriatr Orthop Surg Rehabil.* 2010;1(1):6-14.
17. Guerra MTE, Viana RD, Feil L, Feron ET, Maboni J, Vargas ASG. Mortalidade em um ano de pacientes idosos com fratura do quadril tratados cirurgicamente num hospital do Sul do Brasil. *Rev Bras Ortop.* 2017;52(1):17-23.
18. Myers P, Laboe P, Johnson KJ, Fredericks PD, Crichtlow RJ, Maar DC, Weber TG. Patient mortality in geriatric distal femur fractures. *J Orthop Trauma.* 2018;32(3):111-5.
19. Scala A, Ponsiglione AM, Loperto I, Della Vecchia A, Borrelli A, Russo G, et al. Lean six sigma approach for reducing length of hospital stay for patients with femur fracture in a university hospital. *Int J Environ Res Public Health.* 2021;18(6):2843.