Rev. Fac. Med. Hum. October 2019;19(4):84-94.
DOI 10.25176/RFMH.v19i4.2344
ORIGINAL ARTICLE
ISSN Version Online: 2308-0531
Faculty of Human Medicine URP

PRONOSTIC FACTORS ASSOCIATED WITH BAD EVOLUTION IN PATIENT OPERATED HIP FRACTURE OVER 65 YEARS OLD

FACTORES PRONÓSTICOS ASOCIADOS A MALA EVOLUCIÓN EN PACIENTES OPERADOS DE FRACTURA DE CADERA MAYORES DE 65 AÑOS

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ORIGINAL ARTICLE

ABSTRACT

Introduction: Hip fracture in the elderly is the most common cause of hospitalization in the trauma department, causing repercussion in several clinical areas, affecting its independence. **Objective:** To determine the prognostic factors of poor evolution in the study population. **Methods:** Ambispective, correlational and non-experimental study was designed. The population consisted of all patients over 65 years of age who underwent surgery for hip fracture between January 2014 and July 2015 at the Central Hospital of the Pruvian Air Force (F.A.P). The magnitude of the association was quantified using the odds ratio, and a multivariate analysis was performed on the significant variables and a 6-month follow-up was performed. **Results:** The variables identified with a strong association with poor evolution were: age greater than 75 years (OR = 3,750 CI: 1,275-11,026 p = 0,016), high comorbidity (OR = 4.00 CI: 1.58 -10.08 p = 0.003), hemoglobin <10 (OR 6,545 CI: 1.17-36.6 p = 0.0032), respiratory complication (OR 6.00 CI: 1.55-22.94 p = 0.000) patients in the 6-month follow-up. The previous fracture was strongly related to mortality (OR 3,665 CI: 1,366 - 9,821 p = 0,010). **Conclusions:** The poor evolution in hip fracture is associated with high comorbidity, age greater than 75 years, residence (institutionalized patient), postoperative respiratory complication with significant limitations in gait capacity and the functional status of the patients. Finally, the antecedent previous fracture showed high association with an increased mortality of patients at 6 months follow-up.

Key words: Hip fracture; Prognostic factors. (source: MeSH NLM)

RESUMEN

Introducción: La fractura de cadera en el adulto mayor es la causa más común de hospitalización en el servicio de traumatología, ocasionando repercusión en distintas áreas clínicas y afectando su independencia. **Objetivo:** Determinar los factores pronósticos de mala evolución, en la población de estudio. **Métodos:** Se diseñó un estudio ambispectivo, correlacional y no experimental. La población estuvo constituida por todos los pacientes mayores de 65 años intervenidos quirúrgicamente por fractura de cadera, entre enero de 2014 hasta julio 2015 del Hospital Central de la Fuerza Aérea del Perú (F.A.P). Se cuantificó la magnitud de la asociación utilizando el odds ratio, posteriormente se hizo un análisis multivariado para las variables significativas. **Resultados:** Las variables identificadas con un fuerte grado de asociación a mala evolución (grado funcional desfavorable) a los 6 meses de seguimiento fueron: edad mayor de 75 años (OR= 3,750 IC: 1,275-11.026 p= 0,016), alta comorbilidad (OR= 4,00 IC: 1,58-10.08 p= 0,003), hemoglobina < 10 (OR 6,545 IC: 1,17-36.6 p= 0,0032), complicación respiratoria (OR 6,00 IC: 1,55-22.94 p= 0,000). La fractura previa mostro ser factor pronostico asociado a mortalidad (OR 3,665 IC: 1,366- 9.821 p= 0,010). **Conclusión:** La mala evolución en fractura de cadera está asociada a una elevada comorbilidad, edad mayor de 75 años, residencia, complicación respiratoria postoperatoria con importantes limitaciones en la capacidad de la marcha y el estado funcional de los pacientes. Finalmente, el antecedente de fractura previa mostró alta asociación a mayor mortalidad de los pacientes a los 6 meses de seguimiento.

Palabras clave: Fractura de cadera; Factores pronósticos. (fuente: DeCS BIREME)

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Cite as: Renee Flor Vento-Benel, Cecilia Salinas Salas, Jhony A. De la Cruz-Vargas. Pronostic factors associated with bad evolution in patient operated hip fracture over 65 years old. Rev. Fac. Med. Hum. Octubre 2019;19(4):84-94. DOI 10.25176/RFMH.v19i4.2344

Journal home page: http://revistas.urp.edu.pe/index.php/RFMH

INTRODUCTION

Hip fracture is a prevalent entity in the elderly age group, and is one of the most frequent causes of hospital admission in people over 65 years of age; because the population of older adults has been growing in recent decades, this pathology has acquired great importance. About 1.5 million hip fractures occur each year[1]. The World Health Organization has estimated that by 2050, a total of 6 million hip fractures will occur worldwide per year, and in the European Community, it will be more than 1 million fractures[2]. In the United States, the total number of hip fractures in people aged 50 and older will increase from 238,000 to 512,000 by 2040, with a concomitant increase in avoidable deaths, disability, and medical costs[3].

In Peru and Latin America, there are no exact figures related to this pathology. However, it is estimated that by 2050, this type of injury will increase worldwide and 70% will correspond to Latin America[4], and in Peru, EsSalud (the national health insurance provider for public workers) estimates that 12-16% of Peruvian women over 50 will suffer a hip fracture per year. Population statistics project that there will be 7.5 million Peruvian women aged 50 or over in 2050[5]. Therefore, more than 500,000 hip fractures could be expected in 2050, so some authors have called it the silent epidemic in Peru[6].

In-hospital mortality oscillates between 4 and 8%, and it is considered that around 40-50% of patients regain functionality before the fracture, although only 30% will become independent again for the activities of daily living[7]. In studies carried out in the USA, it was found that close to 30% of patients operated for a hip fracture will die[8]. Hip fracture alone is capable of decreasing life expectancy by almost two years, and one in five patients who suffer from it will require permanent socio-sanitary assistance[9].

It has been described multiple factors that influence perioperative morbidity and mortality: some of the patient's own factors (age, sex, lack of autonomy, comorbidity, dementia, polypharmacy, anaemia, type of fracture, place of residence or geriatric asylum, etc.)[10], other intrahospital factors (surgical delay, type of surgery, anaesthetic treatment, start of wandering and rehabilitation, etc.)[11] and others related to the patient's discharge (rehabilitation, support, fall prevention, osteoporosis treatment, etc.)[12].

It is necessary to optimize the state of health before surgery, prevent complications, and offer the most appropriate hospital treatment throughout the process to reduce hospital stay and postoperative morbidity and mortality[11].

For all these reasons, hip fracture is a problem of great importance both for the area of care and for proper hospital management.

The main objective of this study was to determine the prognostic factors associated with weak evolution (unfavorable functional grade) in patients over 65 years of age with hip fracture and to identify the prognostic factors associated with postoperative mortality six months after surgery.

METHODS

A study was carried out of an ambispective, correlational, non-experimental type, with a census sampling, where 99 patients over 65 years of age underwent surgery for hip fracture, between January 2014 and July 2015, at the Central Hospital of the Peruvian Air Force.

Patients diagnosed with pathological fracture and those who were not subject to surgical treatment were excluded.

Hospital records of the Trauma and Orthopaedic Service were consulted for population identification. The sociodemographic, biological, clinical, and therapeutic information was obtained from the files in the clinical history.

Patients were monitored six months after discharge from the hospital, through outpatient care and home visits by geriatrics. The study variables were grouped into sociodemographic, biological, clinical, fracture and treatment data, postoperative complications, and presence of blood transfusions. Besides, functional and mortality parameters were evaluated six months after surgery.

Comorbidity was evaluated using the Charlson index (CI) (categorized for our study as low comorbidity = 2 points and high comorbidity > = 3 points)[1]. For preoperative anemia, transfusion was indicated in patients with hemoglobin values of less than 8 g/dL; and in patients with cardiorespiratory disease and/or hemodynamic instability if hemoglobin values were 10 g/dL, according to the restrictive transfusion criteria set by the institution's Committee on Haemotherapy. In order to assess the functional status, the functional degree of the Red Cross was recorded[2], according to the revised literature is broken down to functional grade 0.1 and 2 as favorable; and 3.4.5 as unfavorable[13].

In addition to the identification of prognostic factors associated with postoperative mortality and morbidity, baseline measure of functional status was performed, and also after surgery, at 6 months. Finally, survival and mortality rates were evaluated.

The Institutional Ethics Committee approved the study, and the Protocol was registered at the Faculty of Medicine of the University Ricardo Palma and approved by the Hospital Directorate of the Peruvian Air Forces.

Statistical analysis

There were elaborated frequency tables for qualitative variables, and, for continuous variables, there were obtained the mean and standard deviation.

Using Pearson's Chi-Square Test was performed the bivariate analysis for categorical variables. The multivariate analysis was performed using the logistic regression model. The outcome variables were baseline functional status and functional status six months after surgery, as well as mortality. The variables that were statistically significant in the bivariate analysis entered a multivariate analysis to obtain independent variables. There were calculated the odds ratios and their confidence intervals at 95%. It is considered, for all results, a significance of $p < 0.05$.

Survival analysis was performed using the Kaplan-Meier method. Comparison of survival curves was performed using the log-rank test.

It was used the statistical package SPSS for Windows v.23.0 for statistical analysis.

RESULTS

Of the 99 patients included, it was found the mean age of 83.51 +- 9.2 years (65 - 103). 64.6% were women. 100% of the patients were classified as ASA II-III. Table 1 describes the general characteristics of the study population, considering as "institutionalized" those patients residing in asylums and shelters, and as "non-institutionalized" those living in a private home.

Our study showed that 24.2% of patients take antihypertensive drugs, from which it can be inferred that arterial hypertension is a highly prevalent disease in this age group. Besides, 18.5% took antidepressants, 13.16% took some NSAID, and 20.57% were prescribed other medication. It should also be borne in mind that polypharmacy is common in patients. They take antidepressants 45 (18.5%), acetylsalicylic acid 22 (9.05%), clopidogrel 15 (6.17%), antihypertensive 59 (24.2%), hypoglycemic 18 (7.4%), NSAID 32 (13.6%) and 50 (20.5%) others.

At the time of admission, 53.5% of the patients presented a Charlson index greater than 3 — the surgical delay was greater than 48 hours in 78.8% of the patients.

In the postoperative period, the presence of some complications was high, with cognitive complications being the most frequent, followed by renal disorders, cardiovascular complications, respiratory complications, and infections, taking into account that a patient may have more than one difficulty (Table 3).

During hospitalization, 45.5% of patients received a blood transfusion. Overall mortality was 22.5%; in-hospital mortality was 4.05%; at three months, it was 11.12%, and, at six months follow-up, it was 7.08%. The basal functional grade: 27 (27.3%) fend for themselves, 26 (26.3%) wander with some difficulty, 19 (19.2%) are independent with a cane, 11 (11.1%) walk with a walker or require little help from one person, 10 (10.1%) need help from two people or have habitual incontinence, while 6 (6.1%) do not walk, have total incontinence or nursing care. On the other hand, at 6 months, 5 (6.49%) are on their own, 16 (20.8%) wander with some difficulty, 15 (19.5%) are independent with a cane, 19 (24.68%) walk with a walker or require little help from one person, 13 (16.9%) need help from two people or have habitual incontinence, and 9 (11.7%) do not walk, have total incontinence or require nursing care.

In the bivariate survival analysis, the variables associated with mortality at six months were: advanced age, previous fracture, presence of complications, Charlson comorbidity index of 3 or more, and presence of respiratory complications.

In the multivariate survival analysis, only the previous fracture variable maintained its association with mortality at six months. While age, hemoglobin less than 10, high comorbidity, and presence of respiratory complications were found associated with unfavorable functional grade.

Survival was analyzed using the Kaplan-Meier curve with and without previous fracture (Figure 3).

It could be observed that those patients who had a previous fracture had a higher mortality rate than those who did not have this antecedent.

It was then decided to analyze the previous fracture stratified by sex (Figure 3).

Table 1. Demographic, biological, clinical, and treatment characteristics of the factors associated with poor progression in hip fracture patients over 65 years old.

Variable	N = 99
Age	83.51 +- 9,2
Sex	
Female	64(64,6%)
Male	35(35,4%)
Home	
Institutionalized with Company	14 (14,1%)
Institutionalized without Company	32 (32,3%)
Not institutionalized with Company	32 (32,3%)
Not institutionalized without Company	21 (21,3%)
ASA	
I	0
II	65 (65.7%)
III	34 (34,3%)
IV	0
Charlson comorbidity index	
Absence of comorbidity (0-1)	3 (3%)
Low comorbidity (2)	43 (43,4%)
High comorbidity (3 or more)	53 (53,5%)
Hemoglobin on admission	10.1 +- 1,9
Hb < 10 gr/dl	57(57,6%)
Hb > 10 gr/dl	36(36,4%)
Surgery delay time	
>2 días	78 (78,8%)
<2 días	42 (42,4%)
Surgical technique	
Total prosthesis	20 (20,2%)
Partial prothesis	17 (17,2%)
DHS board	22 (22,2%)
Endomedular nail	29 (29,3%)
Others	11 (11,1%)
Blood transfusion	
Yes	45 (45,5%)
No	54 (54,4 %)
Operating Time	
< 45 minutes	28 (28,3%)
>45 minutes	71 (71,7 %)

Mean ± standard deviation; N (%); median
Source: SPSS database v.23

Table 2. Frequency and type of postoperative overall complications.

Variable	N = 99
Acute myocardial infarction	
Arrhythmias	3 (3,0%)
Acute Pulmonary Edema	12 (12,1%)
PULSE	4 (4,0%)
AVC	5 (5,1%)
AVC	1 (1,0 %)
Respiratory	
Hypoxia	4 (4,0%)
COPD decompensation	18 (18,2%)
Respiratory superinfection	4 (4,0%)
Other	1 (1,0%)
Major bleeding	15 (15,2%)
Renal	
Oligoanuria	14 (14,1%)
Acute renal failure	9 (9,1%)
Infections	
Wound	1 (1,0%)
Urinary tract	9 (9,1%)
Systemic	7 (7,1%)
Cognitive disorders	
Disorientation	16 (16,2%)
Agitation	1 (1,0%)
Surgical reintervention	7 (7,1%)
Other (minor complications)	16 (16,2%)

Source: SPSS database v.23 N (%). AVC: cerebral vascular accident.
COPD: Chronic obstructive pulmonary disease.

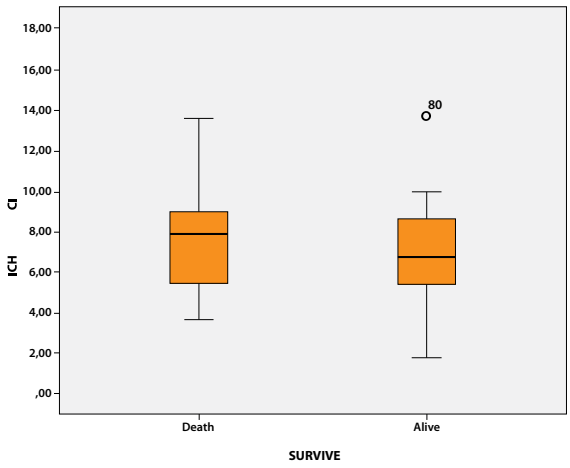
Table 3. Bivariate analysis of prognostic factors associated with poor progression in operated hip fracture patients older than 65 years.

Variables	Degree of Functionality Unfavorable			Mortality Dead		
	OR	IC 95%	Valor p	OR	IC 95%	Valor p
Sex						
Male	2.07	0.87 - 4.95	0.100	1.57	0.61 - 4.07	0.354
Female	1.00			1.00		
Age						
75+	7,746	1,494- 14,23	4,608	2.22	0.59 - 8.32	0.236
Under 75				1.00		
Hemoglobin						
Under 10	5,26	1,20 – 3,69	0.022	1.20	0.66 – 4.56	0.271
Greater than 10	1.00			1.00		
Previous Fracture						
Yes	1.52	0.62 - 3.70	0.360	4.19	1.57 - 11.16	0.004
No	1.00			1.00		
Comorbidity						
high	6.01	2.19 - 16.60	0.000	1.78	0.68 - 4.69	0.244
Low	1.00			1.00		
Institutionality						
Yes	4.89	1.95 - 12.28	0.001	2.14	0.83 - 5.55	0.118
No	1.00			1.00		
Respiratory Complication						
Yes	1.983	1.38 - 2.850	0.003	2.14	0.85 - 3.62	0.134
No	0.302			1.762		

Source: SPSS database v.23 N (%). AVC: cerebral vascular accident.
COPD: Chronic obstructive pulmonary disease.

Tabla 4. Mutivariate analysis for the variables that were significant with respect to the objective e variable Functional Grade at 6 months.

Variables	Degree of Functionality Unfavorable				Mortality Dead			
	OR	Power	IC 95%	P value	OR	Power	IC 95%	P value
Sex								
Male	2, 175	0,365	0,875- 5,87	0,106	1,733	0,198	0,66-4,51	0,264
Female								
Age								
75+	3,750	0,915	1,275-11,026	0.016	2,075	0,222	0,552- 7,92	0,280
Under 75								
Hemoglobin								
Under 10	6,545	0,684	1,170- 36,6	0,032	2,593	0,183	0,636- 10,56	0,184
Greater than 10								
Previous Fracture								
Yes	1,183	0,504	0,429-3,260	0,746	3,663	0.773	1,366- 9,821	0.010
No								
Comorbidity								
high	4,00	0.843	1,58-10,08	0.003	1,949	0,212	0,709-0,357	0,196
Low								
Institutionality								
Yes	2,200	0,862	0,894-5,411	0.086	-	0,348	0,671-4,713	0,247
No								
Respiratory Complication								
Yes	6,00	0,635	1,55-22,94	0.009	-	0,317		0,450
No								



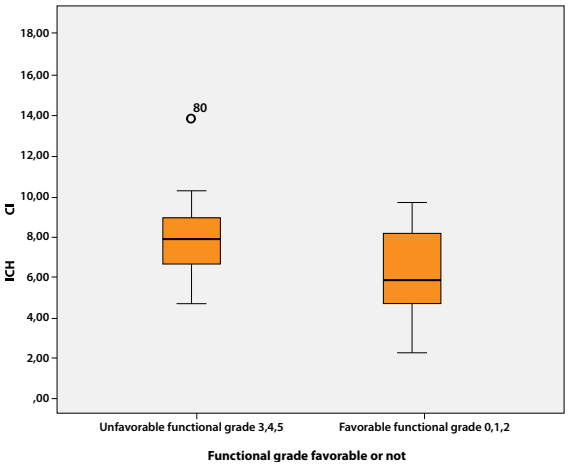


Figure 1. Comparison of survival and functional grade.

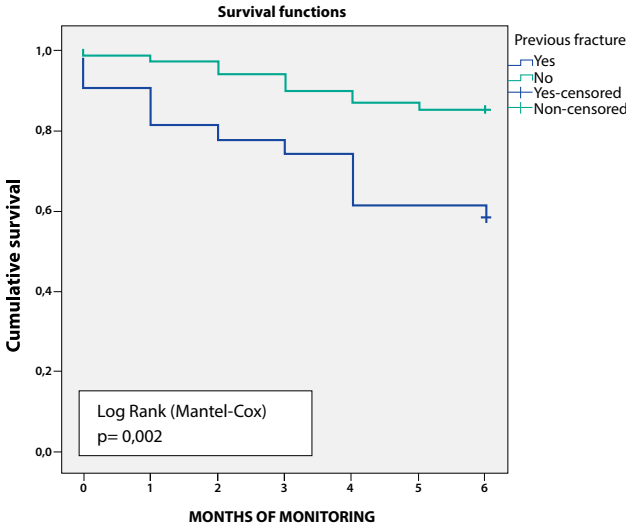


Figure 2. Survival according to previous fracture history.

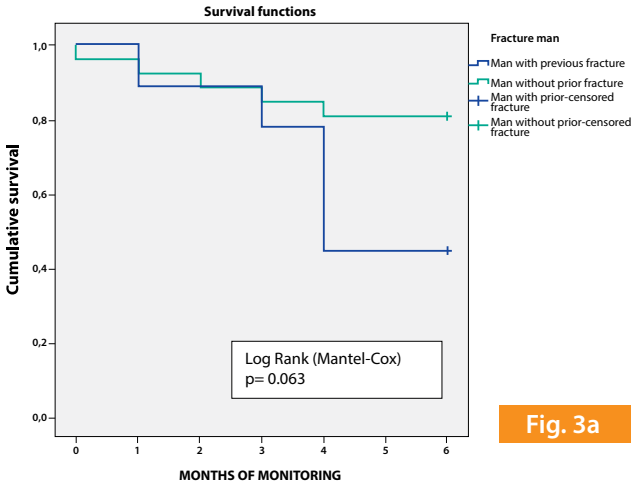


Fig. 3a

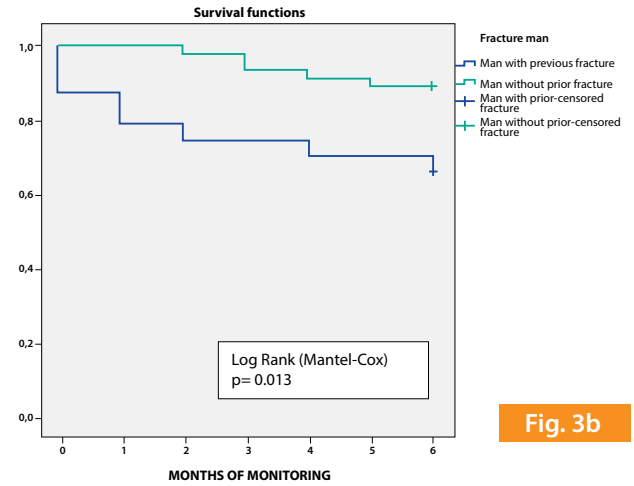


Fig. 3b

Figure 3. Survival was analyzed in relation to previous fracture by sex. (Figure 3 a and b).

3a Survival in men with and without prior fracture
3b Survival in women with and without fracture.

With previous fracture
No previous fracture

DISCUSSION

In our work, the population group studied is made up of patients over 65 years of age, who are divided into two groups with a cut-off point of 75 years, so it is to be expected that, as indicated in the literature consulted, the risk of suffering a hip fracture from the fifth decade of life doubles every five years. Our population would be eight times more at risk[14]. The average age presented by the patients in the study was 83.5 years. This figure corresponds to that of the published series that include patients considered to be elderly[15].

Concerning sex, we found that 64.6% were female, with a female/male ratio of 2:1. The incidence of hip fracture in our country is similar to that one of the other countries in the Mediterranean area and is below that those of Nordic countries. It is more frequent in the female sex than in the male sex, with a ratio that can be as high as 3 to 116.

When evaluating the favorable functional status (0.12), when comparing the basal (72.8%) with the one found at six months (46.73%), the reduction in the favorable functional grade was 40%, or, seen in another way, the recovery of the functional grade was 60%. When we included all patients and excluded the last two functional grades, we found that 83.9% had a baseline state in which they did not need help with all activities of daily living. However, at six months, those with this functional grade were 71.4%, which means that there was a recovery of 73.1%.

If each functional group is taken into account, it is observed that of 27 patients who were previously totally independent, after 6 months of the event, only 5 patients are able to recover total independence, in contrast to functional groups 3 and 4 (21 patients) that show an increase of 32 patients after 6 months of the fracture. Compared to Reguant 16's study, of 86 patients who walk normally before the fracture, only 33 (38.4%) had regained their previous walking ability one year after surgery, 47 patients (54.6%) needed some form of walking aid, and six patients (7%) did not walk.

In terms of patient residence, being in an institution or asylum was found to be a risk factor (OR= 4.89, CI= 1.95 - 12.28, p= 0.001) for unfavorable functional status (3, 4, or 5 on the Red Cross scale), coinciding with literature[17].

The previous state of health of the populations under study is a factor that will determine the evolution of a series of possible events after a hip fracture. In general, it is observed in other published studies that surgery could be delayed due to the poor clinical conditions of patients compared to those who underwent surgery before18. In our study population, we found that 3% of patients did not have any comorbidity. 43.7% had some comorbidity, and the remaining 53% had three or more comorbidities. We have found the existence of statistical association in the study population concerning the referred comorbidity (OR= 6.01, CI= 2.19 - 16.60, p= 0.000), coinciding with other published series[16,17].

It was also found that, since the patient is institutionalized, he or she has a higher risk of bad evolution, which coincides with the study carried out by Homero et al.[19], since this type of patient presents a higher risk of falls. Falls, in turn, are the leading cause of accidents in this age group. Although falls do not often have fatal consequences, they do affect people's health and quality of life[20].

On the other hand, the results of this study show that the intervened population of hip fracture, in our hospital, during the year 2014, had similar characteristics to other published series[8,16,21]. Our results show an intrahospital mortality of 4.05% and accumulated mortality at 3 and 6 months of 18.20%, figures lower than those published by other groups[17, 21, 22].

We found no significant difference in mortality between patients operated on before or after 48 hours of admission. There is much controversy in the literature regarding the relationship between surgical delay time and postoperative mortality. Several authors support that early treatment is associated with a reduction in mortality in the short and medium-term. In the study conducted at the Hospital Cayetano Heredia, it was found that a surgical delay greater than 48 hours was associated with urinary complications and pneumonia6. However, in our study, we observed a higher number of complications with greater surgical delay, reaching significance only for respiratory complications. In the meta-analysis of Shiga et al.[23], a surgical delay of more than 48 hours was associated with increased mortality in the short and medium-term in elderly patients with femoral fractures and early surgery with increased benefit in low-risk and younger patients. We associated surgical delay with mortality at six months, but, unlike Shiga et al.[23], we found no association with surgical waiting time.

With respect to hemoglobin as a prognostic factor, our study shows a high association with respect to an unfavorable functional grade (OR: 5.26; p= 0.022 ; CI = 1.20 - 3.69) which coincides with other published series in which severe anemia is a factor associated with a decrease in independence and an increase in mortality; however, with respect to this last variable, our results disagree with studies carried out most probably due to the sample number[24].

The prognostic factors related to postoperative mortality described in the literature are the following: advanced age, male sex, an ASA III and IV, having three or more comorbidities associated with admission, dementia, cardiocirculatory, and postoperative respiratory complications, and living in a residence or asylum[25]. Our data after bivariate analysis coincide with the literature regarding advanced age and having three or more associated comorbidities, but not concerning sex; however, when comparing patients with the previous fracture according to sex, there is higher survival in female patients (p = 0.013).

In the multivariate analysis model, only the previous fracture (p= 0.007) remained an independent prognostic factor of mortality. Unlike the study by Roche et al.[25], we found no association between postoperative respiratory infections and mortality. Sex did not influence, perhaps because it was a limited sample.

The results obtained corroborate the high morbidity and mortality of the patients intervened for hip fracture, the important limitations in walking capacity, and the functional state of the patients six months after surgery.

Regarding unfavorable functional grade, in the multivariate model, it was obtained that advanced age, low hemoglobin, high comorbidity, and respiratory complications are associated factors, which would constitute the profile of an elderly patient with a poor prognosis.

RECOMMENDATIONS

Prospective and more statistically powered studies are recommended to confirm the association of prognostic factors related to postoperative complications, causes of surgical delay, the impact of anemia and surgical delay, and transfusion rate; and to consider the time elapsed for initiation of rehabilitation and patient mobilization. Also, it is necessary to pay special attention to those elderly patients who have high comorbidities to avoid postoperative complications that lead to a decrease in the patient's functional grade, applying a risk stratification strategy according to our study. Finally, we recommend prior comprehensive geriatric evaluation of all older adult patients in order to implement a prior multidisciplinary plan of action, with particular attention to patients with hip fractures before, during, and after surgery, focusing on reducing complications and morbidity and mortality.

That is why knowing the forecasts on the evolution of hip fracture is an issue of great importance and goes beyond the health field.

CONCLUSION

The prognostic factors of poor evolution in hip fracture (unfavorable functional grade) at six months were: age, residence (institutionalized patient), high comorbidity (Charlson Comorbidity Index more than three comorbidities), and respiratory complication. Finally, the history of the previous fracture showed a high association with higher mortality of patients at six months of follow-up.

Authorship Contributions: The authors participated in the genesis of the idea, project design, data collection and interpretation, analysis of results and preparation of the manuscript of this research paper.

Financing: Self-financed

Conflicto de interés: Interest conflict.

Received: January 23, 2019

Approved: July 30, 2019

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