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MORTALITY IN PATIENTS WITH INTERTROCHANTERIC FRACTURE OPERATED BETWEEN 2019-2021 IN A HIGH COMPLEXITY INSTITUTION

MORTALIDAD EN PACIENTES CON FRACTURA INTERTROCANTÉREA OPERADOS ENTRE 2019-2021 EN UNA INSTITUCIÓN DE ALTA COMPLEJIDAD

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Mortality in Patients with Intertrochanteric Fracture Operated Between 2019-2021 in a High Complexity Institution

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ABSTRACT

Objective: It was defined to determine mortality in adult patients with this type of fracture who underwent surgery between 2019 and 2021 in a first-level complexity institution. Method: An analytical, cross-sectional, retrospective study was carried out. Results: Finding a significant association between the origin, the classification of the fracture, and the associated injuries concerning mortality, but these variables did not behave as predictors of it. The Kaplan-Meier analysis showed that survival decreases concerning the time of the intervention from 20 hours post-surgery, with an average of 44.3 hours (95% CI: 736-909), but with no statistically significant difference (p=0.388). Conclusion: Mortality in adult patients with intertrochanteric fractures taken to surgical management may be associated with age, gender, delay in the time of care, delay in the time of surgical intervention, and ethnicity. However, a greater number of studies are required to assess with higher accuracy the behaviour of mortality in adult patients with intertrochanteric fractures taken to surgical management. Consequently, acquiring an enrich understanding in terms of evidence and favouring even deeper data of the outcome of surgical management in these cases.

***Keywords*:** femoral fractures, hip fractures, mortality, orthopedic procedures

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Mortalidad en Pacientes con Fractura Intertrocantérea Operados entre 2019-2021 en una Institución de Alta Complejidad

RESUMEN

Objetivo: Se definió determinar la mortalidad en pacientes adultos con este tipo de fractura intervenidos quirúrgicamente entre 2019 y 2021 en una institución de primer nivel de complejidad. Método: Se realizó un estudio analítico, transversal, retrospectivo. Resultados: Encontrando asociación significativa entre el origen, la clasificación de la fractura y las lesiones asociadas respecto a la mortalidad, pero estas variables no se comportaron como predictoras de la misma. El análisis de Kaplan-Meier mostró que la supervivencia disminuye con respecto al tiempo de la intervención a partir de las 20 horas postoperatorias, con un promedio de 44,3 horas (IC 95%: 736-909), pero sin diferencia estadísticamente significativa (p=0,388). Conclusión: La mortalidad en pacientes adultos con fracturas intertrocantéreas llevados a manejo quirúrgico puede estar asociada con la edad, el sexo, el retraso en el tiempo de atención, el retraso en el tiempo de la intervención quirúrgica y el origen étnico. Sin embargo, se requiere de un mayor número de estudios para evaluar con mayor precisión el comportamiento de la mortalidad en pacientes adultos con fracturas intertrocantéreas llevados a manejo quirúrgico. En consecuencia, adquiriendo una comprensión enriquecedora en términos de evidencia y favoreciendo datos aún más profundos del resultado del manejo quirúrgico en estos casos.

***Palavras-chave*:** fraturas do femur, fraturas do quadril, mortalidade, procedimentos ortopédicos

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INTRODUCTION

Intertrochanteric fractures are among the main causes of morbidity in the world, where the elderly people are the most affected with a high incidence, excessive healthcare, social and economic impact. [1] Osteoporosis is the main risk factor for hip fractures [2], to the point that hip fractures occupy more than 20% of the beds of Orthopaedic and Trauma Surgery Services with an approximate increase of 6.3 to 8.2 million hip fractures calculated by 2050 year. [3]

Approximately 250,000 hip fractures occur in the United States each year, 50% of them do not recover function and 30% die within a year of the fracture. [4, 5] In Mexico City, 1,725 cases of women and 1,297 men per 100,000 inhabitants suffered from Intertrochanteric fracture, with a projection of an increase of up to seven times by the year 2050. [6] In Colombia between 2015-2016 approximately 10,000 women suffered intertrochanteric fractures. [7] In addition, older adult patients are 65%. In a hospital in Cucuta-Norte de Santander (Colombia), the outcomes were that the average age was 75, with a higher prevalence in the female gender and 50% underwent surgery after 4 days [8], a higher incidence has been found in elderly female patients which pointed that women fell down from certain dangerous heights so, it was highlighted as the main risk factor in addition to comorbidities. [9] In 2015, at University Hospital data showed an annual mortality of 28%, 70% postoperative satisfaction, and recovery of functionality of 50%. [7]

Taking into consideration the relevance of this information that allows us to define strategies to avoid or minimize mortality in the affected population, it was decided to determine its prevalence, since there are no related studies in the region and fewer in the participating institution. As it can be seen, the most associated information is obtained from the North American or European population; even when it can be extrapolated, there are idiosyncratic aspects of the population of the region that are possibly related to the behaviour of mortality in this event, therefore, the present study is a sample of the current knowledge about intertrochanteric fractures and mortality related to them.

METHODS

An analytical, cross-sectional, retrospective study was carried out based on the information recorded in the medical records of adult patients with intertrochanteric fractures taken to orthopedic surgery from the emergency services and from the outpatient clinic population, who were recruited between 2019

and 2021 in the clinic's orthopedic service. They were chosen from the initial diagnoses that included the different types of intertrochanteric fractures, excluding those with an intertrochanteric fracture in polytrauma, minor patients with intertrochanteric fracture and cranioencephalic trauma, with follow-up for a period of one year.

Sociodemographic variables and those of a clinical nature related to the procedure applied to the fracture were compared concerning mortality, the last ones, defined as the outcome of the study. Partialities were controlled by verifying the correspondence of the registered information and checking the surgical information in the registers of the operating rooms, and there were no loses during follow-up. Informed consent was not required.

The facts of the chosen cases were entered into an Excel® database and processed in the SPSS IMB V26® software, presenting the qualitative data in absolute and relative frequencies and the quantitative variables in means and standard deviation according to their distribution. A bivariate analysis was carried out between the different variables and mortality using Chi-square and Anova of one factor, and later a logistic regression was carried out between the significant variables resulting in the crude analysis. Mortality analysis was performed using the Kaplan-Meier curve. A significant statistical difference was defined with a probability of $p<0.05$.

RESULTS

207 cases were included in the study period, 65.7% corresponding to women (n=136), with the sample having a mean age of 78.28±11.7 years and 64.7% coming from the rural area (Table 1). The occupation was very varied, the most prevalent being the group of patients who have not declared their occupation with 43.0% (n=89), followed by domestic employees with 25.1% (n=52), and in third place we had the pensioners with 11.6% (n=24) in order of presentation, among others (Table 1).

The most injured laterally was the right with 50.7% (n=105) and 100% having an open procedure. The classification of the fracture was diverse; the Basicervical type with 18.8% (n=39) was the more predominant, the second place was for the pertrochanteric type with 15.5% (n=32), followed by the intracapsular type with 9.2 % (n=19) in order of frequency among others. Associated injuries occurred in 2.9% (n=6); corresponding to humeral fracture (1.4%, n=3), ischial fracture, and a double fracture of the ulna and radius with 0.5% (n=1) respectively (Table 2).

On the intraoperative characteristics; 8.7% required transfusion of blood derivatives (n=18). The most used osteosynthesis was the cephalomedullary nail with 64.7% (n=134), followed by total hip replacement with 32.4% (n=67) and fixed-angle plate with 1.4% (n=3), among others. Surgical Reintervention was required in 2.9% (n=6), corresponding to four total hip replacements (1.9%) and two cephalomedullary nails (1.0%) (Table 3).

Regarding the outcomes, there was a case of infection during the first 30 days (0.5%), but there was no related information in 29.0% (n=60). Consolidation at ninety days was found in 14.0% (n=29), this percentage corresponds only to the cases with this information, of which it was documented that 2.4% had chronic pain (n=5) and other complications 1.9% (n=4). Mortality was detailed at 2.9% in the sample (n=6) (Table 4).

While performing a bivariate analysis between mortality, sociodemographic and clinical variables, a significant statistical difference was found concerning the origin, type of fracture, and associated injuries with a probability $p<0.05$. When an analysis of variance for a factor was being performed; we could infer that age, time to surgery, or time to surgical reintervention presented a significant association (Table 4).

After the previous crude analysis, a regression model was applied with significant variables, in which it was not observed that these variables behaved as a predictor of mortality, given a probability >0.05 (Table 4).

While applying a Kaplan-Meier analysis, we found that the survival related to the time of the intervention decreases without statistical difference from hour 44.3 (95% CI: 736-909; p=0.388) (Figure1)

DISCUSSION

We consider that mortality in patients with an intertrochanteric fracture is linked to sociodemographic and clinical characteristics, becoming predisposing factors for death. However, and even though an association between some variables and mortality in our study could be confirmed, it was not observed that these variables behaved as predictors of the final.

In this research it was common to find that the female gender was the most affected, as it is mentioned in the literature [9–15], even during the recent Covid-19 pandemic [16], since women have metabolic

and hormonal conditions that help the presence of fractures. However, concerning to mortality, women do not present the same prevalence, since men present higher rates of death [12], given their characteristics of both risk of fractures and death, as well as comorbidities and weakness. However, gender had no significance with respect to death.

The age in our study was close to 80 years, which is similar to the one reported by Kanters et al, who determined the disease burden of hip fractures in older Dutch adults and found an average of 80.2 years [10] already reported by Bekeris et al. [9] (81.5; IQR 72-88 years), according to Pollman et al. [11] (79.6 years) and the HIP ATTACK study [17], higher than mentioned by Chen et al. [13] in three care times (77.49±8.78; 76.72±8.45; 76.71±8.95 years respectively), but being inferior than what it was found by Prosso et al. [16] in three years of the pandemic (85±7.3; 82±8.1; 81±8.5 respectively). The above-mentioned allows us to appreciate that femur fractures are frequent around 80 years of age, as well as that age can be significantly related to mortality both at 30 days, 90 days, and a year after surgery. [11] Even so, in our study, age was not associated with mortality.

In the HIP ATTACK study, an overall 22% of major complications is mentioned [17], while in our study 3.4% of complications were found between reinterventions and postsurgical infection. Concerning the final, in the aforementioned study, 17.5%. [17] However, this percentage included subtrochanteric and femoral neck fractures.

A multinational and multicentre randomized study in which Colombia also participated, this study indicated that 2,970 cases with 52% intertrochanteric fractures recorded 9.5% overall mortality, but without behaving as a predictive factor, or being significant between this two groups that received conventional care and accelerated surgical care [17], contrary to what was found in our study, in which the type of fracture was significant relating to to mortality.

Another investigation that housed 206 adult patients with hip fractures during the Covid-19 pandemic between the years 2018-2020 (only two positive cases); found that the average mortality of 8.6% at 30 days and 12.3% at 90 days, both of which were really important; but with twice as much early mortality in both periods and risk of early mortality by age group as in previous years. [18]

A study of costs carried out In Germany indicated that the elderly population with hip fractures had a mortality rate of 0.5% at 30 days, a lower prevalence than the one found in our study, and in this same

referral a 16.7 % mortality per year, and 4.3% in older adults aged ≥80 years. [10] In Denmark, a mortality of 9.9% at 30 days was reported in 122,923 cases studied in thirteen years, but they included all types of hip fractures [12], a figure lower than that found in our series. In the United States, a national study found an average of 3.2% in overall mortality over 10 years in different types of fractures. [9]

Even though mortality in our series was low (2.9%), not finding predictive factors in our study may be due to different surgical conditions of the fracture; including age, which was around the ninth decade of life, and probable states of frailty (not addressed), which is strongly related to mortality, as mentioned in various studies. [14,19–23]

Regarding the above, the variables that were significant in the crude analysis were not predictors of mortality in our study, but age and sex have frequently been found to be predictors of death. For example; Pollman et al. [11] mentions that age is related to the latter with an OR of 1.05 (1.03-1.07; p<0.0001), as well as male gender OR 2.08 (1.45-2, 98, p<0.0001 and cognitive deficit OR 1.75 (1.03-2.96, p=0.037) thirty days after the intervention, which remained similar at ninety days and one year(eleven). It is necessary to mention that this behavior also includes hip fractures other than those of the intertrochanteric type. A similar study conducted in Southeast Asia in non-dialysis dependent chronic kidney disease older adults with hip fracture (all classes) found a Hazard Ratio of HR 2.40 (1.65-3.51; p<0 .0001) in mortality among older adults ≥80 years vs <80 years, as well as in the female vs male sex HR 2.71 (1.93-379; p<0.0001), peripheral vascular disease HR 3, 16 (1.17-8.55; p=0.0238), among others, and male gender and age ≥80 years behaved as predictors of mortality with an OR of 3.09 (2.18-4, 38; p<0.0001) and 2.52 (1.71-3.80; p<0.0001) respectively. [15]

Continuing with age, a study that included centenarians who underwent surgery, with 48% of intertrochanteric fractures (among others), presented a mortality prevalence of 27%, 40%, and 55%, respectively, at 30 days, three months, and one year of follow up. [24] In Norway in 73,557 older adults with hip fractures (all kinds), mortality was found to be unchanged when the delay between fracture and surgery was less than 48 hours, while a delay greater than 48 hours was associated with higher mortality at three days with a RR of 1.69 (1.23-2.34; p=0.001) and at one year with 1.06 (1.04-1.22; p=0.003), with a higher prevalence of complications compared to a delay in care larger than 24 hours. [25]

Finally, an investigation that analyzed the effects of ethnicity concerning mortality in 17,790 patients with a hip replacement for various fractures, when comparing black, Hispanic, and Asian patients with whites; found that black patients had a similar 1-year mortality rate with an OR of 0.93 (0.79-1.09; p=0.37), while Hispanics and Asians had lower rates with an OR of 0.85 (0.75-0.96; p=0.01) and an OR 0.65 (0.56-0.76; p<0.001), respectively. Even when the studies referred to above do not include ethnicity as a variable related to mortality, the results of this study are striking since it was a condition that was not considered in our research either and may be related to the mortality presented.

It is notorious that the various studies do not specifically address intertrochanteric fractures, but include them in the total number of operated fractures. It is not possible to compare mortality with a greater level of detail. In the same way, even when age and gender did not present a statistical association in our study, the type of fracture did, but this was not a predictive factor, an event that was not analyzed in the studies referred to in our investigation, which are considered limitations for it. Despite not having significant variables that coincide with the literature, the clinical behavior in terms of age and gender did, that it is accorded with the current evidence; even when the type of fracture, the type of osteosynthes is used.

CONCLUSIONS

Intertrochanteric fractures are common in octogenarians and with a higher prevalence in women. Complications in adult patients with intertrochanteric fractures undergoing surgical management may be related to the need for surgical reintervention and/or post-surgical infection.

Mortality in adult patients with intertrochanteric fractures undergoing surgical management may be associated with age, gender, delay in the time of care, delay in the time of surgical intervention, and ethnicity.

A greater number of studies are required to assess with greater accuracy the behavior of mortality in adult patients with intertrochanteric fractures undergoing surgical management. Thus acquiring an enrich understanding in terms of evidence and favoring even deeper knowledge of the outcome of surgical management in these cases.

Conflict of Interests

The authors state that there is no individual or group conflict of interest in conducting this study.

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ANNEXES

Socio -demographic characteristics of patients with intertrochanteric fracture regarding the pre-surgical clinical characteristics; the most frequent comorbidity was high blood pressure with 44.0% (n=99), followed by diabetes.

Table 1

Variable	**Frequency (Percentage)**
Sex	
Feminine	136 (65.7)
Male	71 (34.3)
Origin	
Rural	134 (64.7)
Urban	73 (35.3)
Occupation	
People who have not declared occupation	89 (43.0)
household employees	52 (25.1)
Pensioner	24 (11.6)
Farmer	10 (4.8)
Independent	8 (3.9)
Various trades	6 (2.9)
Housewife or household chores	6 (2.9)
social educators	3 (1.4)
Businessman	2 (1.0)
Bus drivers.	1 (0.5)
Diplomas in social education	1 (0.5)
elementary students	1 (0.5)
Masters of plastic arts and design workshop	1 (0.5)
Operators of radio and television equipment and telecommunications	1 (0.5)
Other vocational training technical faculty	1 (0.5)
Professors of universities and other centers of higher education	1 (0.5)

Source: self-made

Table 2 Pre-surgical clinical features

Variable	Frequency (Percentage)
Laterality	
Right	105 (50.7)
Left	102 (49.3)
Comorbidities	
Arterial hypertension	99 (44.0)
Other comorbidities	39 (17.3)
High blood pressure and diabetes	26 (11.6)
Diabetes	17 (7.6)
No information	18 (8.0)
Type of surgery	
Open	207 (100.0)
Time to surgery	
Mean (Standard Deviation) in hours	198 (120.6)
Fracture classification	
Basicervical	39 (18.8)
Pertrochanteric	32 (15.5)
Intracapsular	19 (9.2)
Transcervical	14 (6.8)
Unstable	12 (5.8)
comminuted	9 (4.3)
Subtrochanteric	9 (4.3)
Sub capital	8 (3.9)
Garden IV	8 (3.9)
Trunk IIIB	7 (3.4)
Trunk IIIA	6 (2.9)
Displaced	5 (2.4)
Trunk III	4 (1.9)
Intertrochanteric	3 (1.4)
31A1	3 (1.4)
Pathological	3 (1.4)
Trunk II	3 (1.4)
Trunk IV	2 (1.0)
31A2	2 (1.0)
Evans II	2 (1.0)
Extracapsular	2 (1.0)
Intra-articular	2 (1.0)
31A3	1 (0.5)
32B3	1 (0.5)
Bicipital	1 (0.5)
Evans III	1 (0.5)
Fielding 3	1 (0.5)
Garden I	1 (0.5)
Garden III	1 (0.5)
Garner III	1 (0.5)
Garner IV	1 (0.5)
Inveterate	1 (0.5)
Type B Unstable	1 (0.5)
Trunk I	1 (0.5)

Source: self-made

Table 3 Intraoperative and outcome characteristics

Variable	Frequency (Percentage)
Type of osteosynthesis	
Cephalomedullary nail	134 (64.7)
Total hip replacement	67 (32.4)
Fixed angle plate	3 (1.4)
PFN Titanium Nail	1 (0.5)
PFNA	1 (0.5)
Cannulated screws	1 (0.5)
External tutor	1 (0.5)
Reintervention	
Total hip replacement	4 (1.9)
Cephalomedullary nail	2 (1.0)
Post-surgical infection	
Infection at 30 days	1 (0.5)
Consolidation	
Consolidation at 90 days	29 (14.0)
Non-consolidation at 90 days	1 (0.5)
No information	177 (85.5)
Chronic pain	
Chronic pain at 90 days	5 (2.4)
No chronic pain at 90 days	26 (12.6)
No information	176 (85.0)
Other complications	
Other complications	4 (1.9)
Without complications	198 (95.7)
No information	5 (2.4)
Mortality	
Mortality during the first 90 days	6 (2.9)

Source: self-made

Table 4 Bivariate analysis between mortality and sociodemographic and clinical variables

Variable	probability p
Sex	0.411*
Age	0.333**
Origin	0.035*
Occupation	1,000*
Comorbidities	0.767*
Laterality	0.387*
Associated injuries	0.041*
Transfusions	0.485*
Type of surgery	-
Time to surgery	0.388**
Fracture classification	0.020*
Osteosynthesis	0.986*
Reintervention	0.668*
Time to reintervention	-
Infection at 30 days	0.885*
Consolidation at 90 days	-
Chronic pain at 90 days	-
Other complications	0.724*

* Chi squared. **One-way Anova, Source: self-made

Table 5 Logistic regression between mortality and origin, fracture classification, and associated injuries

Variables	B.	Standard error	Wald	Exp(B)	Probability p
Origin	0.574	0.53	1,176	1,776	0.278
Fracture classification	0.052	0.052	1,013	1,053	0.314
Associated injuries	2,638	1,356	3,785	13,982	0.052

Figure1 Kaplan-Meier curve between surgery time and survival.