

Treatment and presentation of intertrochanteric hip fractures during the COVID-19 pandemic in a third-level care hospital

Manejo y presentación de las fracturas transtrocantericas de cadera durante la pandemia de COVID-19 en un hospital de tercer nivel de atención

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Abstract

Background. The prevalence of intertrochanteric hip fractures is approximately 30%. The usual management of hip fractures is performed by dynamic hip screw (DHS) or central medullary nailing (CMN). The COVID-19 pandemic has changed medical treatment guidelines in all specialties around the world. **Objective.** To recognize the prevalence and management of unstable trochanteric hip fractures during the COVID-19 pandemic. **Method.** An observational study was conducted in a third-level care hospital in patients with fractures of type AOTA 31A2.1 and A2.2 managed with CMN or DHS. The management trends by orthopedic surgeons were analyzed. **Results.** The prevalence during 2019 was 38%, in 2020 it was 21.3% and in 2021 it was 32.6%. The male-to-female ratio found was 1:1.7. The age was 66.48 ± 21.6 years (range, 17-92). Of orthopedic surgeons surveyed, 80.4% preferred CMN. **Conclusions.** The prevalence decreased during 2020. The treatment trend during the pandemic was higher for the DHS system; the use of CMN decreased by 86%. The treatment of intertrochanteric hip fractures was influenced due to the COVID-19 pandemic towards a cheaper method.

Keywords: COVID-19. Hip fractures. Prevalence. Surgical procedures. Therapeutics.

Resumen

Antecedentes. La prevalencia de las fracturas transtrocantericas se sitúa alrededor del 30%. El tratamiento se realiza mediante sistema de tornillo deslizante (STD) o clavo centromedular (CCM). La pandemia de COVID-19 ha modificado las pautas de tratamiento médico en todas las especialidades en todo el mundo. **Objetivo.** Reconocer la prevalencia y el manejo de las fracturas transtrocantericas inestables durante la pandemia de COVID-19. **Método.** Se realizó un estudio observacional en un hospital de tercer nivel de atención en pacientes con fracturas de tipo AOTA 31A2.1 y A2.2 manejados con CCM o STD, y se analizaron las tendencias de manejo por parte de los cirujanos ortopedistas. **Resultados.** La prevalencia durante el año 2019 fue del 38%, en 2020 fue del 21.3% y en 2021 fue del 32.6%. La proporción encontrada hombre-mujer fue de 1:1.7. La edad fue de 66.48 ± 21.6 años (rango: 17-92). De los cirujanos ortopedistas encuestados, el 80.4% prefieren el CCM. **Conclusiones.** La prevalencia disminuyó durante el año 2020. La tendencia de tratamiento durante la pandemia fue superior para el sistema STD y el uso de CCM disminuyó un 86%. El tratamiento de estas fracturas fue influenciado por la pandemia de COVID-19 hacia un método más económico.

Palabras clave: COVID-19. Fracturas de cadera. Prevalencia. Procedimientos quirúrgicos. Tratamiento.

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Introduction

Hip fractures are a significant problem of public health, being the most common cause of hospitalization and admission to the ER. The prevalence of this condition is nearly 30%, and is more common in women, with a 2:1 ratio compared to men^{1,2}. In general, patients older than 60 years are more affected compared to younger individuals. Same-level and height falls are the main causes of hip fractures, and various associated risk factors have been recognized, including age, smoking, alcoholism, along with osteoporotic processes, hypertension, diabetes mellitus, and depression^{3,4}.

The hip joint involves the head and neck of the femur. Proximal femoral fractures can be divided into intracapsular (head and neck of the femur) and extracapsular (intertrochanteric) fractures. Hip fractures are considered unstable when there is a loss of integrity of the femoral calcar, or the proximal femur posterior-medial cortex⁵. The surgical management of unstable hip fractures is based on the placement of a sliding hip screw (SHS), or the use of a cephalomedullary nail (CMN) as a surgical alternative^{6,7}, with the latter surpassing SHS due to surgeon preference rather than representing a true biomechanical, clinical, or prognostic advantage for the patient⁸.

There are numerous factors that determine the postoperative clinical course in this group of highly vulnerable patients, such as age, pre-existing functional levels, life expectancy, risk of non-union, fracture type, quality of remaining bone, and hip joint functionality⁹. Comparatively, there is no clear advantage in terms of mortality or ambulatory capacity between the use of an angulated plate with SHS and CMN fixation to the femoral neck¹⁰. However, both techniques are considered standard for the management of transtrochanteric fractures and remain useful for fractures of the proximal femoral metaphysis¹¹.

From 2020 through 2021, the world was hit by the pandemic caused by SARS-CoV-2, and medical conditions were modified in their presentation and treatment¹². In this study, we recount the experience of a tertiary referral center high-specialty traumatology and orthopedics, which, due to health needs, had to turn into an exclusive COVID-19 hospital, subsequently transitioned to a mixed hospital, and then back to a high-specialty traumatology and orthopedics hospital. We describe the presentation of unstable hip fractures of AOTA 31A2.1 and A2.2 types during the pandemic years and the surgical preference of orthopedic surgeons during this time.

Method

This was a retrospective observational study conducted in the hip service of a tertiary referral high-specialty center from 2019 through 2021 of patients with AOTA 31A2.1 and A2.2 type hip fractures (unstable fractures) treated with CMN, or SHS. We considered the patients' demographic characteristics, etiology, and place where the accident took place. Stable fractures were excluded from the analysis as they required different treatments compared to the 2 treatments being studied (CMN and SHS). We also analyzed the treatment trends of orthopedic surgeons during this period. A survey was conducted to understand their preferences on the management of transtrochanteric femoral fractures, including their years of experience in the field, treatment preference regarding fractures, and the reason for preferring a particular technique. The results were analyzed using the SPSS 21.0 (Demo version) statistical program, with descriptive frequency analysis for qualitative variables and measures of central tendency and dispersion for quantitative variables. A comparative analysis of data from 2019, 2020, and 2021 was conducted to identify differences across these years. p values = 0.05 were considered statistically significant.

The present study followed approved guidelines for handling clinical information, and fully complied with the principles set forth in the Declaration of Helsinki, as well as with the national regulations in Mexico. It was, also, approved by the local hospital ethics review and research board (HTODYGRMV-2020-005).

Results

Data of patients with fractures

We included patients with unstable hip fractures of AOTA 31A2.1 and A2.2 types admitted during 2019, 2020, and 2021. A total of 176 patients were included across these years. The prevalence of hip fractures in 2019, 2020, and 2021 was 38%, 21.3%, and 32.6%, respectively. Women accounted for 63.1% of cases ($n = 111$), and men for 36.9% ($n = 65$); the male-to-female ratio was 1:1.7. The mean age of the sample was 66.48 ± 21.6 years (range, 17-92). The mean age was younger for patients treated with SHS compared to those treated with CMN (63.81 ± 22.51 vs 72.53 ± 18.3 years; $p < 0.001$). An analysis of the sample was conducted based on gender and the indicator of length of stay to verify differences between the 2 treatment groups, with the results shown in table 1. The underreporting

Table 1. Comparison between treatment groups based on age, length of stay, and gender of the sample obtained (n = 176)

Age, years (mean ± SD)		p*	Length of stay, day (mean ± SD)	p*	Women	%	Men	%	p**
SHS	63.81 ± 22.51	> 0.001	8.09 ± 5.4	0.677	72	40.9	50	28.4	0.094
CMN	72.53 ± 18.3		7.83 ± 4.9		39	22.2	15	8.5	

CMN: cephalomedullary nail; SD: standard deviation; SHS: sliding hip screw.

*Levene.

**Chi-square test.

of patients due to the pandemic was estimated at nearly 10% to 25%. The number of patients found per semester is shown in fig. 1. SHS was the most frequent treatment during the 3 years analyzed compared to blocked CMN, with a 86.6% drop in the use of the latter in 2020 compared to 2019. Afterwards, there was an increase in the use of CMN from 2020 through 2021, a 360% increase that, still, did not surpass the total number of surgeries performed with SHS (Fig. 2). A comparative analysis of treatment type, fracture etiology, trauma site, age, and length of stay was conducted, and statistical differences were found between each of the years studied (Table 2). Across 2019, 94.5% of the fractures sustained by individuals older than 60 were due to same-level falls, or from < 1 meter in height. In 2020, falls accounted for 87.1%. In 2021, fall-related fractures represented 70.3% of the cases, with an increase in fractures due to motorcycle accidents of 23.4%. Motorcycle accidents increased by 35% in 2021 compared to 2019 and 2020, being general delivery jobs the one most often associated with these accidents (groceries, processed foods, parcels, etc.), resulting in an odds ratio (OR) of 6.8 (95% confidence interval [CI]: 2.7-17.2) compared to other jobs.

Preferences on the management of transtrochanteric fractures

A survey was conducted to recognize the management preferences among orthopedic surgeons regarding AOOT 31A2.1 and A2.2 transtrochanteric fractures. A total of 72 specialists were surveyed, and 46 surveys were returned on time and fully completed. A total of 12 resident physicians (3rd and 4th year) and 34 attending physicians participated. The mean years of experience among the colleagues were 6.54 $\pm$ 6.3 years (range, 1-28). Preferences on the management of CMN vs SHS among resident physicians and attending physicians did not reveal the presence of any statistically significant differences. Years of experience were not associated either with any differences between the use of SHS or

CMN. The preferences for using CMN or SHS, and the characteristics of the preferences are shown in table 3. A risk analysis was conducted by calculating the OR, being the comparison factor the use of CMN, and preferences were the exposure factors. Factors with the highest OR were implantation stability (OR, 66.0; 95%CI 6.46-673.9), implantation costs (OR, 8.75; 95%CI 1.2-63.8), and familiarity with the technique being used (OR, 10.31; 95%CI, 1.93-55.05) (Table 3).

Discussion

We conducted an epidemiological trial of transtrochanteric hip fractures to assess the use of CMN, or SHS. During the COVID-19 pandemic of 2020 and 2021, treatment trends had to change to adapt to the new reality the world was facing¹². For this reason, we conducted a descriptive study of the presentation of AOOT 31A2.1 and A2.2 hip fractures in a trauma center, which, due to health needs, had to be converted into an exclusive COVID-19 hospital in 2020 (from May 1 through November 30). We also conducted a survey to understand the preferences on how to manage these fractures with CMN or SHS.

The study found a decrease in the prevalence of fractures in 2020 compared to 2019 (38.8% vs 21.3%) and then a rebound in cases in 2021 (32.6%). Although the prevalence of hip fractures varies widely between countries, socioeconomic levels, and ethnic conditions, our results are similar to those reported in various epidemiological series in the scientific medical literature currently available^{13,14}. Patients treated with SHS had younger mean ages than those treated with CMN, being the latter option (considered more stable) spared for older patients (> 70 years of age), likely related to the quality of the patient's bone. The trend in the use of SHS was significantly higher over the 3 years compared to the use of CMN. The use of SHS dropped by 27% from 2019 through 2020, while the use of CMN dropped by 86% during the same period. This abrupt decline may have been due to the cost of implantation, which had to be fully covered by the patient during the global health

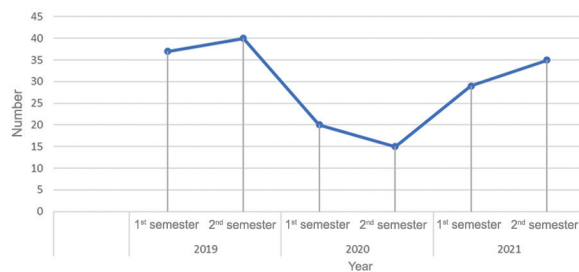
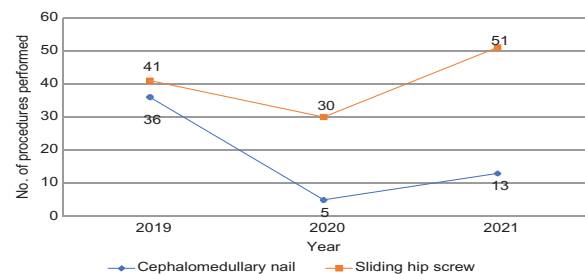
Table 2. Comparison of presentation per year associated with treatment, etiology, and accident site regarding fractures

	2019			2020			2021		
	n	%	p*	n	%	p*	n	%	p*
Treatment									
CMN	36	46.7	< 0.001	5	14.3	< 0.001	13	20.3	< 0.001
SHS	41	53.2		30	85.7		51	79.7	
Etiology									
Fall	73	94.8	< 0.001	31	88.5	< 0.001	45	70.3	< 0.001
Fall from motorcycle	3	3.9		4	11.4		15	23.4	
Car crash	1	1.3		0	-		4	6.25	
Accident site									
Home	51	29.0	< 0.04	29	16.5	< 0.04	37	21.0	< 0.04
Outside	26	14.8		6	3.4		27	15.3	
	Mean $\pm$ SD			Mean $\pm$ SD			p** (2019-2020)		
Age	74.7 $\pm$ 15.2			72.8 $\pm$ 15.6			< 0.001		
Length of stay	7.4 $\pm$ 3.7			7.8 $\pm$ 5.1			0.405		
	Mean $\pm$ SD			Mean $\pm$ SD			p** (2020-2021)		
Age	74.7 $\pm$ 15.2			72.8 $\pm$ 15.6			< 0.001		
Length of stay	7.4 $\pm$ 3.7			7.8 $\pm$ 5.1			0.305		

CMN: cephalomedullary nail; SD: standard deviation; SHS: sliding hip screw.

*Chi-square test.

**1-way ANOVA (Post hoc: Bonferroni).

**Figure 1.** Distribution of transtrochanteric fractures of AOTA 31 A2.1 and A2.2 types per semester.**Figure 2.** Treatments of the sample for hip fractures of AOTA 31 A2.1 and A2.2 types from 2019 through 2021. The absolute quantities of the procedures performed each year are shown.

contingency, likely playing a significant role in implant selection, although it is recognized that CMN has advantages over SHS in terms of intraoperative blood loss, surgery duration, early mobilization, and a shorter length of stay¹⁵. From 2020 through 2021, the use of SHS increased by 170% due to the increasing frequency of fractures, even though the use of CMN only increased by 38% during the same period. The trend toward the use of SHS over the 3-year span was greater compared to the use of CMN. Same-level falls and from a height dropped from 94.5% in 2019 down to 87.1% in 2020 and 70.3% in 2021. Most fall-related fractures occurred inside the patients' homes. Falls sustained outside the home setting dropped by 23% from 2019 through 2020, a trend observed worldwide and attributed to confinement¹⁶.

The COVID-19 pandemic caused a shift in the etiology of all fractures. Same-level fractures decreased significantly

during the critical period of 2020, and the management of these fractures had to change¹². In 2021, fractures due to motorcycle accidents increased by 23.4% compared to 2019 and 2020. This represents a nearly 4-fold increase in motorcycle accidents compared to figures from 2021 compared to the previous year. In the second half of 2020, home deliveries of groceries, prepared food, and parcels using various forms of transportation increased significantly¹⁷. This may have contributed to the rise in motor vehicle accidents, especially involving motorcycles.

Due to changes in the frequency of unstable hip fracture etiologies and the need to treat younger patients compared to previous years, we analyzed the preferences for managing these fractures among orthopedic surgeons. Over 80% of the surgeons expressed a preference for CMN, especially due to the expectation of greater stability, biomechanical superiority of the implant

Table 3. Preferences for the use of the sliding hip screw system or cephalomedullary nail in transtrochanteric fractures of AOOTa 31A2.1 and A2.2 types

	SHS, n (%)	CMN, n (%)	p*	OR	95%CI
Category					
Attending physician	7 (15.2)	27 (58.7)	0.768	0.77	0.14-4.35
Resident	2 (4.3)	10 (21.7)			
Total	9 (19.6)	37 (80.4)			
	Mean $\pm$ SD	Mean $\pm$ SD	p**	OR	95%CI
Years of experience	7.56 $\pm$ 7.6	6.3 $\pm$ 6.01	0.737		
	Affirmative responses, n (%)		p*	OR	95%CI
Preference					
Stability	1 (2.2)	33 (71.7)	< 0.001	66.0	6.46-673.9
Simplicity	2 (4.3)	3 (6.5)	0.222	3.23	0.45-23.11
Implantation cost	3 (6.5)	2 (4.3)	0.044	8.75	1.2-63.8
Best functional results	2 (4.3)	21 (45.7)	0.067	0.22	0.039-1.19
Familiarity with the technique	5 (10.9)	4 (8.7)	0.008	10.31	1.93-55.05
Biomechanical superiority of implantation	2 (4.3)	27 (58.7)	0.008	0.10	0.018-0.59
Based on the patient's comorbidity	-	4 (8.7)	0.302	-	-
Possibility of early support	1 (6.2)	15 (32.6)	0.20	0.18	0.02-1.62

95%CI: 95% confidence interval; CMN: cephalomedullary nail; SD: standard deviation; SHS: sliding hip screw; OR: odds ratio.

The CMN was taken into account as a comparison factor, and each asked feature of usage preference was considered as exposure factors.

*Chi-square test.

**Mann-Whitney U test.

over the SHS, and the expectation of early patient support. Surgeons who preferred SHS over CMN did so primarily because of the lower implantation cost expected and greater familiarity with the surgical technique. The simplicity of implantation, functional outcomes, and patient comorbidities were not determining factors in the preferences of the surveyed orthopedists. There was a range of 27 years of experience among the surveyed orthopedic surgeons, yet the mean years of experience did not have an impact on the choice of management. Neither did being a staff physician or a resident in the orthopedic and traumatology specialty show significant differences when choosing the type of implantation. Despite more than 80% of the surveyed surgeons showed a preference for CMN, the reality was different. Preferences for a specific implant by orthopedic surgeons were not reflected in practice: 53.2% of fractures were managed with SHS in 2019, 85.7% in 2020, and 79.7% in 2021. This trend in the management of unstable hip fractures was apparently influenced by the pandemic. Firstly, we believe it was due to the lower cost of SHS compared to CMN. In some health care systems, the osteosynthesis material for hip fractures in trauma centers like this one had to be covered by the patients due to the global health contingency since social support programs in Mexico were allocated to pandemic management and hospital conversions¹⁸. The first case ever reported of COVID-19 in Mexico was announced on

February 27, 2020, and by April 21, 2020, Mexico entered Phase 3 for COVID-19 with cases in full spread. All non-essential activities in the public sector were suspended, and the economy was rapidly damaged¹⁹. It appears that a greater expectation of stability and biomechanical superiority (CMN) was sacrificed for a more economical surgical technique (SHS). The presentation, etiology, and management process of AOOTa 31A2.1 and A2.2 transtrochanteric fractures changed during the SARS-CoV-2 pandemic. The frequency of fractures decreased to an unprecedented level during the second half of 2020, transtrochanteric fractures related to motorcycle accidents increased in 2021, and there was a greater use of SHS compared to CMN after both implantation types were almost equally used in 2019. The COVID-19 pandemic has shifted the paradigm of health care, modified the course of multiple conditions with changes in their prevalence and increased mortality, and will eventually require a new idea of health care procedures, ultimately leading to a "new normal."

The present study has obvious limitations. Due to the conversion into an exclusive COVID-19 hospital, it was necessary to transfer all orthopedic patients to a reference hospital. Even though the statistics department of the hospital continued to collect orthopedic data, underreporting was evident and very high in all cases and conditions. Similarly, many people who suffered hip fractures never received surgical treatment because they did not reach

the hospital due to fear of contagion and social distancing, or they arrived at COVID-19 hospitals with the disease, and eventually died. Currently (2022), patients who fractured in 2020 or 2021 are still being referred to trauma hospitals with malunions, or pseudoarthrosis, which were not promptly managed due to the pandemic. Another weakness in inferring the results obtained (external validity) is that the number of orthopedic surgeons who responded to the survey does not exceed 0.63% of orthopedic surgeons currently practicing in Mexico²⁰. This represents a sample with potential random bias. Nevertheless, it is an initial indicator of the trends in the management of hip fractures and treatment expectations, in a reality where both analyzed approaches (SHS and CMN) remain viable. In fact, it has been difficult to demonstrate a superiority in functional outcomes between them.

Conclusions

In the previous year and during the early stages of the COVID-19 pandemic, there was a drop in the prevalence of unstable transtrochanteric hip fractures of AOOTa 31A1.1 and A2.2 types. In 2020, the prevalence dropped from 38.8% in 2019 down to 21.3%. Afterwards, however, there was an increase in cases in 2021, reaching 32.6%. The treatment trend during the pandemic favored SHS, and the use of CMN dropped by 86%. Motorcycle accidents increased towards the end of 2020, while falls from standing height and falls from < 0.5 meters outside the home dropped by 23%.

More than 80% of orthopedic surgeons prefer CMN over SHS, primarily due to the expectation of greater stability, biomechanical advantages associated with implantation, and early patient support. The treatment of transtrochanteric hip fractures was impacted by the COVID-19 pandemic towards what appeared to be a more cost-effective surgical technique with SHS.

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Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

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