



Severity of acute cholecystitis in times of COVID-19: myth or reality?

Severidad de la colecistitis aguda en tiempos de COVID-19: ¿mito o realidad?

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Abstract

Introduction. Acute cholecystitis is one of the most frequent causes of hospital admissions in the adult population and laparoscopic cholecystectomy is considered the gold standard for its management. Within the effects of the COVID-19 pandemic, an increase in the severity of presentation has been perceived in these patients. This study aims to compare the clinical and surgical presentation based on the different severity scales of acute cholecystitis before and during the COVID-19 pandemic.

Methods. A retrospective cohort study was performed with patients undergoing laparoscopic cholecystectomy for acute cholecystitis between 2019 and 2020. A bivariate and Kaplan Meier analysis was performed with the time elapsed between onset of symptoms and admission to hospital, and between admission to hospital and performance of surgery.

Results. A total of 302 patients underwent laparoscopic cholecystectomy for acute cholecystitis. The time of evolution of symptoms until admission was 83.3 hours (95% CI: 70.95 - 96.70) vs. of 104.75 hours (95% CI: 87.26 - 122.24) before and during the pandemic, respectively. The time between admission to the hospital and the surgical procedure was significantly shorter in the current pandemic period (70.93 vs. 42.29) ($p < 0.001$). The patients with greater severity (Parkland 5) was the same before and during pandemic (29%).

Conclusion. Similar clinical and surgical severity is reported before and during the COVID 19 pandemic, probably secondary to the results of a significantly shorter entry time to the operating room during the pandemic, due to a greater availability of operating rooms for urgent surgical pathologies.

Keywords: COVID-19; SARS virus; coronavirus; pandemics; cholelithiasis; acute cholecystitis.

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Resumen

Introducción. La colecistitis aguda es una de las causas más frecuentes de ingresos hospitalarios y la colecistectomía laparoscópica es el estándar de oro para su manejo. Dentro de los efectos de la pandemia por COVID-19 se ha percibido un aumento en la severidad de presentación en estos pacientes. Este estudio tuvo como objetivo comparar la presentación clínica y quirúrgica de la colecistitis aguda, antes y durante la pandemia por COVID-19.

Métodos. Estudio retrospectivo de una cohorte con pacientes llevados a colecistectomía laparoscópica por colecistitis aguda entre 2019 y 2020. Se realizó un análisis bivariado y de Kaplan Meier con el tiempo transcurrido entre inicio de síntomas y el ingreso al hospital, y entre el ingreso del hospital y la realización de la cirugía.

Resultados. Fueron llevados a colecistectomía laparoscópica por colecistitis aguda un total de 302 pacientes. El tiempo de evolución de los síntomas hasta el ingreso fue de 83,3 horas (IC_{95%}: 70,95 – 96,70) antes de la pandemia y 104,75 horas (IC_{95%}: 87,26 – 122,24) durante la pandemia. El tiempo entre el ingreso al hospital y el procedimiento quirúrgico fue significativamente menor en el período de pandemia (70,93 vs. 42,29) ($p < 0,001$). El porcentaje con mayor severidad (Parkland 5) fue igual antes y durante la pandemia (29 %).

Conclusión. Se reporta una severidad clínica y quirúrgica similar antes y durante la pandemia por COVID-19, probablemente secundario a los resultados de un tiempo de entrada al quirófano significativamente menor durante la pandemia, debido a una mayor disponibilidad de quirófanos para las patologías quirúrgicas urgentes.

Palabras clave: COVID-19; virus del SRAS; coronavirus; pandemias; coleditirosis; colecistitis aguda.

Introduction

Worldwide, acute biliary pathology has become one of the most common causes of hospital admissions for gastrointestinal causes in the adult population, being considered the most frequent surgical disease in this age group. Its prevalence has increased to more than 20% since the 1980s¹. Approximately 60,000 laparoscopic cholecystectomies are performed each year in Colombia, making it the most common laparoscopic procedure^{2,3}. Acute cholecystitis is the indication for 14 to 30% of cholecystectomies^{4,5} and is defined as an inflammatory process of the gallbladder, secondary in most cases to obstruction of the cystic duct by stones or biliary sludge; this inflammation leads to the occlusion of venous and arterial flow, with subsequent ischemia and necrosis of the wall³.

Ultrasound is the image of choice for the evaluation of acute gallbladder pathology due to its non-invasiveness, greater availability and lower cost, with a sensitivity of 73.3%⁶. Other studies that can be used in the diagnostic process are abdominal tomography, magnetic resonance imaging and, in cases of images with ambiguous findings and high clinical suspicion, a scintigraphy

with Tc-99m hepatobiliary iminodiacetic acid (HIDA) can be used, which has greater sensitivity (78-100%) and specificity (96%) compared to the rest of the diagnostic methods⁷.

Since 2007, the Tokyo Guidelines have proposed new criteria for the diagnosis and evaluation of the severity of acute cholecystitis, based on a systematic review of the literature and a consensus of experts^{8,9}. For the diagnosis of acute stone cholecystitis, the World Society of Emergency Surgery in 2016 recommended the use of clinical, laboratory and imaging findings to confirm the diagnosis, with a sensitivity of 91% and a specificity of 97% if all three criteria are present¹⁰.

Management with early laparoscopic cholecystectomy (first 72 hours) is recommended in all degrees of severity^{11,12}; however, in patients with organ dysfunction and/or hemodynamic instability, other conservative management options are suggested^{13,14}. In the same way, there is an intraoperative severity classification system, called the Parkland Scale, which takes into account the degree of inflammation and the anatomical findings of the gallbladder, where higher degrees have been related to greater degree of complexity

of the surgical procedure, clinical and paraclinical severity and longer hospital stay^{15,16}.

After the start of the COVID-19 pandemic and the social management of quarantine in our country, subjectively, a clinical presentation of acute biliary pathology has been considered with a higher degree of severity according to the aforementioned scales. In the literature there are some studies that analyze the impact of the pandemic on the number of patients with surgical emergencies who attend the emergency services¹⁷, as well as the results of the treatment of emergency surgical pathologies such as acute appendicitis and acute cholecystitis^{18,19}. However, the behavior of acute cholecystitis in times of the COVID-19 pandemic is not known in our environment, therefore, this study aimed to compare the clinical-surgical presentation, based on the different severity scales of acute cholecystitis, before and during the COVID-19 pandemic.

Methods

An observational cross-sectional study was carried out between 2019 and 2020 in a third-level hospital in Northeastern Colombia. The participants inclusion criteria were: patients older than 16 years who underwent laparoscopic cholecystectomy for acute cholecystitis in the period between January 1, 2019 and December 31, 2020. The exclusion criteria were: patients with a concomitant diagnosis of acute pancreatitis, choledocholithiasis or other causes other than acute cholecystitis (cancer, gallbladder polyposis, etc.).

The search for patients was carried out in the operating room service database of the University Hospital of Santander, using the filter "laparoscopic cholecystectomy" in the procedure item in the bases of the years "2019" and "2020". The patients were classified into two groups using March 6, 2020 as the cut-off point, the date on which the first case of COVID-19 was registered in Colombia²⁰.

For this study, the following variables were taken into account: age, sex, time of evolution of symptoms until hospital admission, time from hospital admission to surgery, total time between

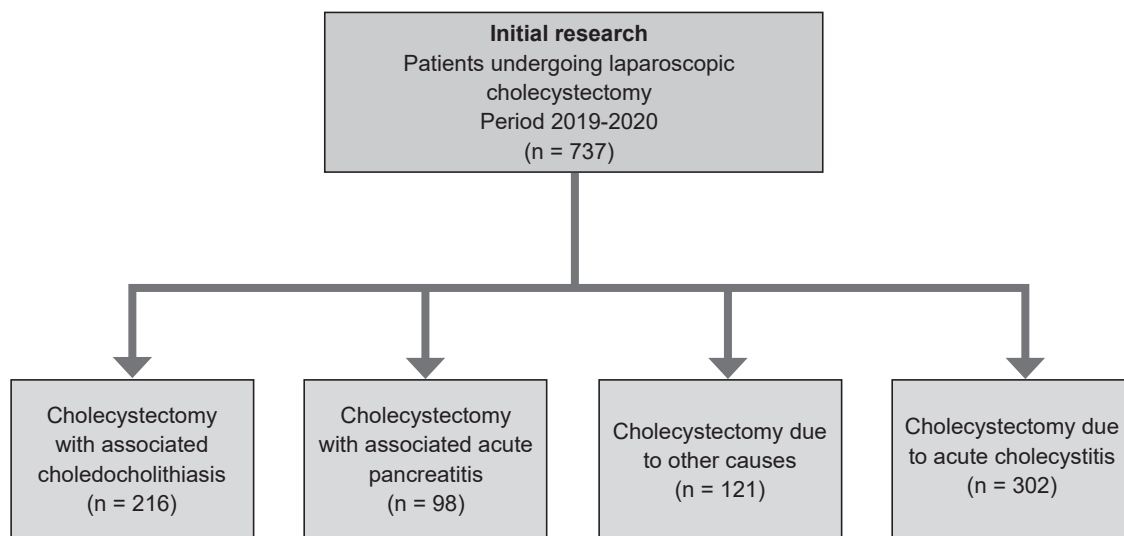
hospital admission and surgery, hospital stay, Tokyo clinical severity classification and Parkland surgical severity classification, conversion to open approach, reintervention, readmission, and mortality.

Measures of central tendency and dispersion were used for the description of its variables, a bivariate analysis was performed with the variables of interest and the corresponding group according to the date on which the surgical procedure was performed. A Kaplan Meier analysis was also performed with the time elapsed between symptom onset and hospital admission, and between hospital admission and surgery. The statistical program STATA (StataCorp LLC, USA) version 14 was used.

Results

A total of 737 patients who underwent laparoscopic cholecystectomy in the period described were identified, and from this group 216 patients were excluded due to a diagnosis of associated choledocholithiasis, 98 patients with associated acute pancreatitis, and 121 due to other preoperative diagnoses other than acute cholecystitis. Finally, 302 patients were selected for this study (Figure 1), 172 (56.9%) underwent the procedure before the first case of COVID-19 was registered in Colombia; 63.4% were women, and the mean age was 52 years (SD + 17 years) and 50 years (SD + 16 years), respectively, in each group.

The time elapsed between the onset of symptoms and the admission of patients to the hospital before COVID-19 was shorter with a mean of 83.3 hours (95% CI: 70.95 - 96.70) compared to a mean of 104.75 hours (95% CI: 87.26 - 122.24) during the pandemic (Table 1). In contrast, the time elapsed between admission to the hospital and the surgical procedure was longer in the participants admitted to the hospital prior to the current COVID-19 pandemic, this difference being statistically significant. However, the total time elapsed between the onset of symptoms and surgery was longer in patients treated during the pandemic, but with no statistically significant difference when compared to patients managed before the pandemic (Figure 2).



(Source: Authors)

Figure 1. Patient selection flowchart.

Table 1. Time elapsed from symptom onset to hospital admission, from hospital admission to surgery, and total time.

Variable	Before COVID-19		During COVID-19		p-value
	Median	95% CI	Median	95% CI	
Time elapsed between symptom onset and participants' admission to hospital (hours)	83.83	70.95 - 96.70	104.75	87.26 - 122.24	0.052
Time elapsed between hospital admission and surgery (hours)	70.93	61.77 - 80.10	42.29	35.60 - 48.98	<0.001
Total time elapsed between the onset of symptoms and surgery (hours)	90.38	77.45 - 103.32	109.55	92.04 - 127.05	0.076

(Source: Authors)

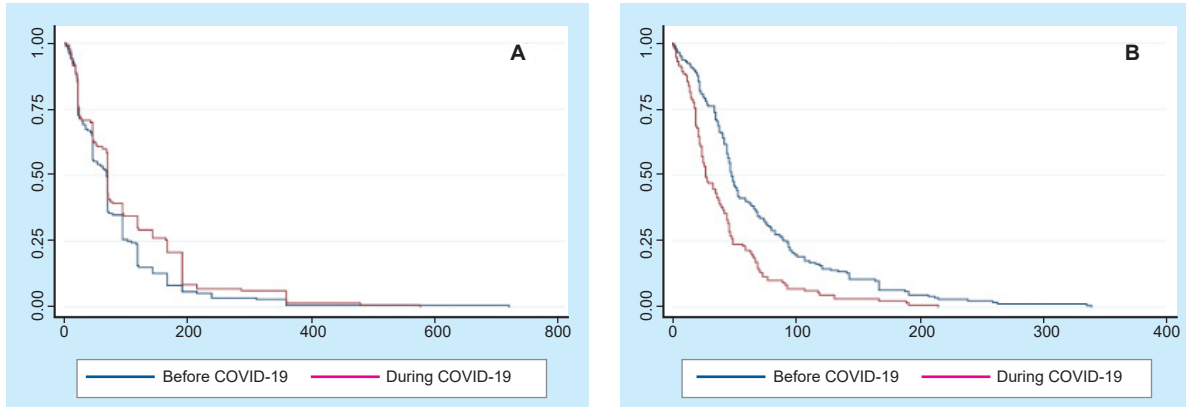
According to the Tokyo classification, patients presented more frequently in severity grade I and to a lesser extent in grades II and III prior to the start of the pandemic, with no statistically significant difference compared to the pandemic period. The intraoperative severity measured by the Parlant classification showed a similar distribution in the two groups (Table 2).

Regarding complications, 10.5% (n=18) of patients required conversion to open surgery before COVID-19 compared to 13.1% (n=17) during

the pandemic; however, there was no statistical difference significant (p=0.587). Likewise, 2.9% (n=5) required reintervention in the group before COVID-19 compared to 0.77% (n=1) during the COVID-19 pandemic. There were no cases of mortality in the analyzed period.

Discussion

The impact of the COVID-19 pandemic on health systems worldwide has been significant, with an increase in the number of patients admissions,



(Source: Authors)

Figure 2. Kaplan Meier analysis: A) Time elapsed in hours between the onset of symptoms and hospital admission. B) Time elapsed in hours between hospital admission and surgery.

Table 2. Distribution in Tokyo and Parkland severity ratings.

Classification	Before COVID-19		During COVID-19		p-value	
	n	%	n	%		
Tokio	Grade I	53	30.81	28	21.54	0.126
	Grade II	116	67.44	97	74.62	
	Grade III	3	1.74	5	3.85	
Parkland	Grade 1	4	2.33	1	0.77	0.540
	Grade 2	24	13.95	21	16.15	
	Grade 3	62	36.05	39	30	
	Grade 4	32	18.6	31	23.85	
	Grade 5	50	29.07	38	29.23	

(Source: Authors)

severity of pathologies and deficits in institutional resources, becoming a daily challenge for health personnel. Surgical services were forced to suspend all scheduled surgeries for the management of benign and low-risk pathologies^{21,22}, concentrating hospital spaces, equipment, supplies and human resources for the care of patients affected by the virus and /or with non-deferrable medical or surgical emergencies.

We find acute lithiasic cholecystitis among the most frequent emergency surgical pathologies. Although the gold standard management is laparoscopic cholecystectomy^{11,12}, at the beginning of

the pandemic medical management was recommended due to the worse post-surgical outcomes presented by asymptomatic COVID-19 positive patients; however, later this conduct was not endorsed by multiple scientific societies, given the worst results in terms of morbidity and mortality²³. In our institution we adhere to these latest recommendations, managing our patients with early laparoscopic cholecystectomy.

The results obtained in this study show a similar demographic distribution in terms of sex and age of presentation in the two established periods, being similar to that described in other

studies²⁴. The time of evolution of the symptoms of the patients until their admission to the hospital was shorter in the period prior to the pandemic, results probably explained by the confinement, the limited access to means of transport and the fear of contagion, which was greater in the period prior to the pandemic. first semester of 2020. It was expected that these first data could be reflected in an increase in the severity of clinical and surgical presentation of patients with acute cholecystitis during the pandemic; however, when analyzing the time between admission to the hospital and the surgical procedure, this was much lower in the current pandemic period, with a statistically significant difference (70.93 vs. 42.29) ($p < 0.001$). Likewise, when performing an analysis between the time elapsed between the onset of symptoms and entry to the operating room, the delay in consultation in the time of pandemic is balanced by the shorter time of entry to the operating room, without statistically significant differences between the two periods, comparable results with similar studies in the literature, where it was possible to identify a decrease in hospital stay due to early surgical management with means of 4.21 ± 3.2 days in 2020 compared to 8.57 ± 7.4 in 2019¹⁹ and to the greater availability of operating rooms secondary to the cancellation of a large part of the surgical programming of non-priority surgeries.

One of the main objectives of this work was to document the subjective perception of a greater clinical and surgical severity of patients with acute biliary pathology during the current pandemic; however, in this report we found that in relation to the classification of clinical severity (Tokyo 2018) there was a similar distribution in both groups. In the classification of surgical severity (Parkland), grade 3 cholecystitis was the most frequent in both groups and patients with greater severity (grade 5) presented in both periods without differences, demystifying the perception of greater severity in cholecystectomies performed in emergency services in times of pandemic.

Additionally, this study reports a conversion rate to open surgery of 10.5% before vs. 13.1% during the pandemic, data similar to that reported in the literature (5-10%)¹¹. No differences were

found in both groups in terms of surgical reinterventions and no mortality was identified in the evaluated period.

These results support what is reported in the most recent literature in relation to COVID-19, therefore, health institutions and personnel have the responsibility and the need to continue providing timely management, without changes in the indications and management protocols for patients with emergency surgical pathologies²⁵, with the aim of reducing the collateral effects of the pandemic on medical and surgical pathologies, which continue to occur to the same or greater extent due to the increase in sedentary lifestyle, poor eating habits and decrease of promotion and prevention consultations.

Conclusions

Surgical emergencies continue to be one of the most frequent causes of hospital admissions during the COVID-19 pandemic. Due to the confinement measures and the longer evolution time to the emergency consultation, a presentation with a higher degree of severity has been confirmed for emergency surgical pathology, including acute cholecystitis. The results of our study demystify this perception, finding no significant differences between the clinical and surgical severity scales of patients undergoing laparoscopic cholecystectomy in our emergency department during the pandemic.

Compliance with ethical standards

Informed consent: This clinical research protocol adheres both in its design and execution following the principles established in the guidelines of Good Clinical Practices of the International Harmonization Committee and the ethical principles of the Declaration of Helsinki, in accordance with the CIOMS guidelines and the Resolution 008430 of 1993 of the Ministry of Health of the Republic of Colombia. In accordance with Article 11, it is considered that the present study classifies as a research with "minimal risk". This article was reviewed and approved by the institutional ethics committee of the Universidad Industrial de Santander. Anonymity has been preserved at all times and the authors obtained the informed consent of the patients included in the article.

Conflicts of interest: The authors declare that they have no conflicts of interest.

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Author's contributions:

Conception and design of the study: Ada M. Bustos-Guerrero, Silvia I. Guerrero-Macías.

Data acquisition: Ada M. Bustos-Guerrero, Germán A. Gómez-Rincón.

Data analysis and interpretation: Ada M. Bustos-Guerrero, Silvia I. Guerrero-Macías, Edgar F. Manrique-Hernández.

Drafting the manuscript: Ada M. Bustos-Guerrero, Silvia I. Guerrero-Macías, Germán A. Gómez-Rincón, Edgar F. Manrique-Hernández.

Critical review: Ada M. Bustos-Guerrero, Silvia I. Guerrero-Macías, Germán A. Gómez-Rincón, Edgar F. Manrique-Hernández.

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