

Impact of COVID-19 Restrictions on Outcomes of Patients with Cholelithiasis during the Pandemic

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ABSTRACT

Introduction: The COVID-19 pandemic restrictions forced the postponement of most elective surgeries for pathologies that did not represent an imminent risk to life. This delay caused significantly higher Re-admission and complication rates in patients with cholelithiasis during the pandemic, compared to those who presented before the pandemic (p-value=0.0001).

Objective: To evaluate the impact of delayed surgical management of symptomatic gallstones, during the Covid-19 pandemic, on the complication and re-admission rates.

Design Type: a descriptive retrospective.

Methods: A cohort of patients hospitalized with pancreatobiliary pathology during the pandemic was compared to a control group who presented before the pandemic. Two groups were compared for the incidence of gallstone complications and re-admission rates. Primary or secondary neoplastic pathologies associated with gallstones were excluded.

Results: During the pre-pandemic period, between March 2019 and March 2020, a total of 408 patients with pancreatobiliary pathology were hospitalized. Out of 408 patients, 204 (50%) were admitted with acute biliary cholecystitis, 132 patients with acute pancreatitis (32.4%), and 72 patients with extrahepatic cholestasis (17.6%). 324 (79%) patients underwent surgery and 36 (8.82%) patients out of the remaining 84 (20.6%) patients were readmitted. The average hospital stay for patients with surgery was 4 days ± 1.6 days, while for those with non-surgical treatment was 7 days ± 1.4 days. From March 2020 to March 2021, a total number of 536 patients were hospitalized, including 252 (47%) with acute biliary cholecystitis, 144 (26.9%) with acute pancreatitis, and 128 (23.9%) with extrahepatic cholestasis and 12 with acute cholangitis (2.2%). 308 (57.5%) patients underwent surgery and 104 (19.4%) patients of the remaining 228 (42.5%) patients were readmitted. The average hospital stay for patients with surgery was 3 days ± 1.3 days, while for those with non-surgical treatment was 7 days ± 1.5 days.

Conclusions: The comparison of both groups showed a higher incidence of gallstone complications during the pandemic, associated with the preference of medical over surgical management. The higher incidence of complications were seen and associated with a decrease in the number of scheduled laparoscopic cholecystectomies.

Keywords: COVID-19 • Gallstones • Evolutionary Complications • Difficult Laparoscopic Cholecystectomy • Cholelithiasis

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INTRODUCTION

During the successive phases of the COVID-19 pandemic, the postponement of elective surgical procedures was adopted as a global health policy, in line with the guidelines proposed by international societies such as the American College of Surgeons and the Royal College of Surgeons of Edinburgh. The objective was to avoid overloading and saturating the health care system and to reduce the exposure of staff and patients to the risk of contagion. This decision brought an increase in the progression of 50 oncological diseases as well as in the complications of benign pathologies, such as cholelithiasis, which is highly prevalent in our society, as well as becoming a limiting factor to the training of human resources [1-5].

At a national level, government guidelines established Mandatory Preventive Social Isolation (ASPO: Spanish acronym)

restricting surgical activity to oncological surgeries and emergency cases. The outcome was the postponement of all elective surgery for benign pathologies that did not put the patient's life at risk. In Latin America, cholelithiasis is highly prevalent, with an incidence that ranges between 5% and 22% [6-7]. 70%-80% of cases present as biliary colic. Moreover, it is associated with a higher incidence of gallbladder cancer in some areas, such as Chile, Colombia, and Bolivia [8].

The "gold standard" treatment for acute cholecystitis and acute biliary pancreatitis is laparoscopic cholecystectomy [9], which should be performed within the first 48 hours to 72 hours for the former and 4 days to 7 days for the latter. Postponing the procedure contributes to the development of progressive complications that are a frequent cause of re-hospitalization and increased morbidity [1,2-8].

MATERIALS AND METHODS

Based on the retrospective analysis of a prospective database, the medical records corresponding to patients hospitalized during an emergency due to gallstone pathology in the "Dr. Carlos A. Bocalandro" General Surgery Service. The hospital database was retrospectively analyzed between March 2019 and March 2021 for medical records of patients hospitalized with a gallstone pathology. Patients were divided into two cohorts as follows: March 2019-2020 (pre-pandemic stage) and March 2020-2021 (pandemic stage). We obtained an exemption from the Institutional Ethics Committee, as the study did not handle any personal data. According to the 2018 Tokyo Guidelines for diagnosis [10-16] and 2012 Atlanta Criteria [15], following entities were included as complications of gallstone disease: acute

cholecystitis, exacerbated chronic cholecystitis, acute biliary pancreatitis, and acute cholangitis. Patients with primary or secondary malignancies of the gallbladder were excluded. For a detailed analysis of COVID-19's impact on the complication incidence, the cohort group was divided into 4 quarters, corresponding to 3 ASPO phases, as follows: the first two quarters corresponding to phase 1 (March 2020-September 2020), the third quarter corresponding to phase 2 (October 2020-December 2020) and fourth quarter corresponding to phase 3 (January 2021-March 2021).

The data analysis was performed using SPSS version 25. The following demographic variables were analyzed: age, gender, body mass index, associated comorbidities (smoking, diabetes, hypertension, alcohol use disorder, and hypothyroidism), anesthetic risk according to the American Society of Anesthesiology (ASA), and type of treatment.

The variables in the numerical scale were summarized using the arithmetic mean and standard deviation, whereas the nominal ones were reported in percentages. Odds Ratios (OR) were calculated as measures of association. We used independent sample t-tests for comparison of the means of continuous variables, X² tests with Yates' correction for continuity, and the chi-square test for linear trends.

RESULTS

The demographic data corresponding to both cohorts is summarized in Table 1. During the March 2019-2020 period (pre-pandemic stage), 408 patients with complications of biliary lithiasis were hospitalized. Admitting diagnoses included acute biliary cholecystitis (50%), acute pancreatitis (32.4%), and extrahepatic cholestasis (17.6%). There were no registered cases of cholangitis (Table 2). 324 (79.4%) patients underwent surgery and of the remaining 84 (20.6%) patients who received non-surgical treatment, 36 (8.82%) patients were readmitted with new complications (Table 3). Surgical treatment was not performed, due to the patient's refusal, inadequate staffing, or lack of availability of an operating room.

The intraoperative findings of the 324 operated patients were: laparoscopic cholecystectomy grade I (easy/uncomplicated cholecystectomy)-II (medium difficulty, cystic duct or artery obscured by adhesions or fatty tissue) 133 (41%), acute cholecystitis 130 (40%), frozen biliary hilum (Parkland stage III/IV classification) in 23 cases (7%), subacute cholecystitis 18 (5%), gangrenous cholecystitis in 15 (5%) and Mirizzi 116 syndrome 5 (2%). The average hospital stay for patients who underwent surgery during the first hospitalization was 4 days \pm 1.6 days and for those with non-surgical treatment 7 days \pm 1.4 days.

Table 1: Demographic data.

	Pre-pandemic	Pandemic	p-value	Odds Ratio (I.C. 95%)
Admissions	408	536	-	-
Age (DE)	45, 32 (15)	40, 26 (14)	0,000	-
Female (%)	240 (58, 8%)	332 (61, 9%)	0,116	-
BMI (DE)	28, 11 (4)	28,35 (3,8)	0,367	-
ASA 2	275 (84, 9%)	246 (80%)	0,019	-
Acute cholecystitis	204 (50%)	252 (47, 01%)	0,011	1,35 (1,07-1,69)
Acute biliary pancreatitis	132 (32, 35%)	144 (26, 87%)	0,715	1,06 (0,81-1,38)
Extrahepatic cholestasis	72 (17, 64%)	128 (24%)	0,000	1,93 (1,41-2,63)
Acute cholangitis	0	12 (2, 24%)	-	-

During the period March 2020-2021 (pandemic stage), 536 patients with complications of biliary lithiasis were hospitalized. Their admitting diagnoses included acute biliary cholecystitis (47%), acute pancreatitis (26.9%), extrahepatic cholestasis (23.9%), and acute cholangitis (2.2%) (Table 1). 308 (57.5%) patients underwent surgery and of the remaining 228 (42.5%), 104 (19.4%) were readmitted with new complications (Table 3). No surgical treatment was carried out due to the pandemic context during the period March-September 2020, inadequate surgical opportunity, or lack of availability of an operating room due to national regulations because of the ongoing pandemic. The patients who received surgical treatment, 180 (58.42%) of the cases corresponded to acute cholecystitis, 60 (19.5%) to acute pancreatitis, 56 (18.18%) to extrahepatic cholestasis, and 12 (3.9%) to cholangitis (of which 10 had percutaneous resolution and 2 endoscopic). The intraoperative findings of the 308 operated patients were: laparoscopic cholecystectomy grade I (easy uncomplicated cholecystectomy) II (medium difficulty, cystic duct or artery obscured by adhesions or fatty tissue) 42 (14%), acute cholecystitis 40 (13%), frozen biliary tract (Parkland

stage III/IV classification) in 47 cases (15%), subacute cholecystitis in 73 (24%), gangrenous cholecystitis in 73 (24%), Mirizzi 138 syndrome in 21 (7%), and cholangitis in 12 (3%). The average hospital stay in patients who underwent surgery during the first hospitalization was 3 days ± 1.3 days and for those with non-surgical treatment 7 days ± 1.5 days. 6 patients out of 8 patients diagnosed with COVID-19 (positive PCR) presented with acute cholangitis (4 mild and 2 severe) requiring percutaneous drainage, while 2 patients had mild acute cholecystitis, which was managed medically. The two patients with severe cholangitis had died from complications of COVID-19 pneumonia.

Table 2: Risk factors.

	Pre-pandemic	Pandemic
DBT	7.84%	10.45%
HTA	19.60%	13.50%
Hypothyroidism	1%	12%
Embolism	2%	3%
Tobacco	28, 7%	37.60%

Table 3: Results: Type of treatment and readmissions.

	Pre-pandemic	Pandemic	p-value	O.R. (I.C. 95%)
Evolutionary complications	408 (100%)	536 (100%)	0,000	2, 40 (1.89-3,06)
Surgical treatment	324 (79, 4%)	308 (57, 5%)	0,000	0, 55 (0,26-0,47)
Readmissions	36 (8, 82%)	104 (19, 4%)	0,000	2, 42 (1,62-3,63)
Length of stay surgical treatment (DE)	4 (1,6)	3 (1.3)	-	-
Length of stay non-surgical treatment (DE)	7 (1,4)	7 (1, 5)	-	-

Table 4: Results during the pandemic period (March 2020-March 2021): Comparison by quarters.

	1 st quarter	2 nd quarter	3 rd quarter	4 th quarter	p-value
Admissions	140	240	104	52	-
Surgical treatment (%)	56 (40%)	130 (54, 2%)	84 (80%)	38 (73, 1%)	0,000
Re-admissions (%)	8 (5, 7%)	54 (22, 5%)	38 (36, 5%)	4 (7, 7%)	0,003

In summary, 79.4% of cases were treated surgically during the pre-pandemic period, compared to 57.5% during the pandemic. Percentages of patients managed surgically during the pandemic are as follows by quarters: 40% in the first, 54.2% in the second, 80% in the third, and 73.1% in the last quarter (Table 4). The analysis by quarters showed that the number of hospitalizations and readmissions peaked during the second quarter, while the readmission rate of hospitalized patients was highest during the third quarter (36.5%). In other words, our data suggests that higher incidence of complications were observed following the ASPO phase 1 (March-September 2020), during which only 40% (first quarter) to 54.2% (second quarter) of patients were managed surgically. In contrast, the majority (80%) of patients underwent surgery during the third quarter, which was followed by a substantial decrease in readmission rates to 7.7% during the last quarter (Table 4).

DISCUSSION

In March 2020, the WHO declared COVID-19 a pandemic and health emergency. The global trend was to direct resources towards containing the pandemic and caring for affected patients, therefore limiting or canceling those surgeries scheduled for benign pathology. However, postponing the timely resolution of a benign pathology increases the risk of complications and recurrence [17-19]. During the COVID 19 pandemic, international surgical societies, including the ACS and the Royal College of Surgeons of England [20], recommended postponing all elective surgeries for conditions that did not represent an imminent risk of death. For this reason, the number of scheduled cholecystectomies decreased globally by 50 to 100% at the beginning of the pandemic [20, 21]. In some countries, surgical management was reserved exclusively for complicated pathology. In others like ours, the authorities imposed the absolute cessation of cholecystectomies for simple or complicated gallstone disease [19-26].

In the pandemic stage, it is worth noting the notable decrease in the number of consultations in emergency departments and the postponement of elective consultations, even in the face of prolonged illnesses. Wong L.E. et al were among the first to demonstrate that strict adherence to

restrictions and limitations to timely surgical access entailed additional risks for the lives of patients [22]. Pirracchio R, et al. considered that severe restriction measures might have a significant negative impact on prognosis, increasing the incidence of complications and their severity [23]. Bozovich G. suggested that the prolonged persistence of the restrictions would result in an inevitable increase in delayed diagnoses and complications [24].

Several studies [1,17,19,26] showed that above measures increased the risk of developing gallstone complications (acute cholecystitis, acute pancreatitis, extrahepatic cholestasis, or cholangitis), resulting in longer and repetitive hospitalizations, with the consequent increase in hospital costs. The delay or lack of surgical management in cases of acute gallstone pancreatitis predisposes to recurrence with a potential for more severe presentation [27-34].

In our hospital, by following the regulations issued by the ministerial authority, the Argentine Association of Surgery, the Argentine Society of Infectious Diseases, and international surgical societies, all non-emergent surgeries scheduled for benign pathologies were suspended beginning March 20, 2020 [20,21,31-32]. The two cohorts that make up the study were comparable in terms of age, gender distribution, ASA category, and associated comorbidities (TBQ, DBT, hypertension, enolism, and hypothyroidism). This suggests that the increase in evolutionary complications during the pandemic is due to the delay or lack of surgical treatment. Due to the predominance of non-surgical over surgical management, an increase in the readmission rates was observed (Table 3).

Complications and readmissions were more frequent during the pandemic period, during which 21 cases (6.82%) of Mirizzi Syndrome, 47 cases (15.26%) of frozen biliary hilum, and 73 cases (23.7%) of gangrenous cholecystitis were detected. Whereas complication rates were much, lower during the pre-pandemic era, as follows: 1.54% for Mirizzi Syndrome, 7.1% for the frozen biliary tract, and 4.63% for gangrenous cholecystitis. Under the directives imposed by the regulatory authorities, all patients who entered the operating room during ASPO phase 1 underwent an epidemiological survey, temperature control, and imaging

studies. PCR was performed on close contacts of cases with confirmed COVID 19 and suspected cases of COVID based on the clinical picture. The preoperative systematic PCR was performed on all patients during ASPO phases 2 and phase 3.

COVID-19's impact has gone far beyond its direct effect on morbidity and mortality. In addition to adversely affecting non-COVID health care utilization, the pandemic has resulted in a deep global economic contraction. As a result, Buenos Aires population was also impacted by higher levels of impoverishment, increasing unemployment, and malnutrition rates. For this affected population, the state public hospitals might represent the only viable access to health care. Given these circumstances, the list of medically necessary surgeries that need emergent attention should be redefined.

Said-Degerli, et al. reported that a patient with gallstone ileus, a rare complication of cholelithiasis, brought by the postponement of elective cholecystectomies. In their report, they concluded that the postponement of elective surgeries should be questioned with some more concrete data [30]. In conclusion, the restriction of scheduled care

was understandable in the context of a pandemic due to an unknown new pathogen. However, the allocation of care resources for those affected by COVID-19, resulted in the lack of timely surgical resolution of gallstone disease, increasing the incidence of its complications and readmissions.

Postponing elective surgeries not only affected the patients but also the resident doctors in training by the decreasing number of procedures and increasing level of intraoperative complexity, delaying the development of surgical skills on their part. If a similar circumstance arises in the future, the implementation of surgical restrictions should be critically evaluated for the benefit of our patients.

CONCLUSION

The comparison of both groups showed a higher incidence of gallstone complications during the pandemic, associated with the preference of medical over surgical management. The higher incidence of complications were seen and associated with a decrease in the number of scheduled laparoscopic cholecystectomies.

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