

Changing characteristics of emergency surgery during COVID-19 pandemic: a retrospective cohort study

Cambio en las características de las cirugías de emergencia en la pandemia de COVID-19: estudio de cohorte retrospectiva

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Abstract

Background: In other countries, researchers have noticed diverse variations in the features of patients undergoing emergency surgery during the COVID-19 pandemic. In Mexico, there is not information about this issue. **Methods:** Workers of the Mexican Government, who required emergency surgeries were studied by the general surgery service of a General Hospital administered by the Institute of Social Security and Services for State Workers Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE), through the periods from March-August 2019 (non-exposed) and March-August 2020 (exposed). The analysis included: demographic data, laboratory information, post-operative diagnoses, symptoms' length, days of emergency stay, and post-operative stay. **Results:** One hundred and ninety-three emergency surgeries were analyzed; 106 in 2019 and 87 in 2020 (a decrease of 18%). Throughout the pandemic, the number of days between the symptoms' onset and surgery was greater: 2019, 7.6 ± 4.6 days; 2020, 14 ± 6.7 days ($p < 0.0001$). In addition, cases of acute appendicitis decreased (2019-60.3%; 2020-42.5%), and those of acute calculous cholecystitis increased (2019-12.2%; 2020-24.1%). **Conclusion:** Through the COVID-19 pandemic, there were notable changes in the characteristics of Mexican Government's workers who warranted emergency surgery.

Keywords: Abdominal pain. Abdominal surgery. COVID-19. Emergency. Lockdown.

Resumen

Antecedentes: En otros países, han notado diversos cambios en las características de los pacientes sometidos a cirugía de emergencia durante la pandemia de COVID-19. En México no existe información sobre este tema. **Método:** Estudiamos a los trabajadores del gobierno mexicano que requirieron tratamiento quirúrgico de emergencia por el servicio de cirugía general de un Hospital General del Instituto de Seguridad y Servicios Sociales para los Trabajadores del Estado (ISSSTE), durante los períodos de marzo-agosto de 2019 (no expuestos) y marzo-agosto de 2020 (expuestos). El análisis incluyó: datos demográficos, datos de laboratorio, diagnósticos postoperatorios, duración de los síntomas, días de estancia en emergencias y estadía postoperatoria. **Resultados:** Se analizaron 193 cirugías de emergencia; 106 en 2019 y 87 en 2020 (una disminución del 18%). En la pandemia, el número de días entre el inicio de los síntomas y la cirugía fue mayor: 2019, 7.6 ± 4.6 días; 2020, 14 ± 6.7 días ($p < 0.0001$). Además, disminuyeron los casos de apendicitis aguda (2019-60.3%; 2020-42.5%) y aumentaron los de colecistitis litiasica aguda (2019-12.2%; 2020-24.1%). **Conclusión:** Durante la pandemia de COVID-19, hubo cambios notables en las características de los trabajadores del gobierno mexicano que ameritaron cirugías de emergencia.

Palabras clave: Cirugía abdominal. Confinamiento. COVID-19. Dolor abdominal. Emergencia.

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Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 coronavirus, generated notable changes in all human activities^{1,2}. Therefore, medical and surgical practice also had great modifications². The pandemic transformed the functioning of general surgery services worldwide³; while elective surgeries were suspended, emergency surgeries had to continue⁴.

In other countries, most researchers have noticed diverse changes in the features of cases that warrant emergency surgery during the 2020 COVID-19 pandemic⁵. In Mexico, there is no information about this issue. The study was carried out to evaluate the features of the Mexican Government's workers who required emergency surgery in the general surgery service at a General Hospital administered by the Institute of Social Security and Services for State Workers Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE) during the 2020 COVID-19 pandemic compared to a non-exposed group in 2019.

Methods

It was a retrospective cohort study. This investigation was approved by the institutional Research and Education Division. All procedures performed and studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. We analyzed the medical records of Mexican Government's workers, or their relatives, undergoing emergency surgery during the periods from March-August 2019 and from March-August 2020 (COVID-19 pandemic), at the Hospital General Tacuba. From March-2020, our institution was adapted in a COVID-19 hospital. Patients undergoing surgery outside the hospital were excluded, and cases with insufficient information or lost records were eliminated.

Initially, at the emergency department, all cases were assessed with a full clinical history and a thorough physical examination. Their evaluation included complete blood count, glucose, urea, creatinine, and activated partial thromboplastin time. Besides, abdominal, or pelvic ultrasound, and chest X-rays were done. According to individual clinical data, the evaluation was extended to thoracic, or abdominopelvic computed

tomography (CT scan). With the diagnosis of an abdominal emergency, the staff of the general surgery department evaluated the patients, determining the diagnosis, and the surgical management.

From all medical files, the following variables were analyzed: demography (age, gender), anthropometry (weight, height, and body mass index), biochemical (hemoglobin, hematocrit, leukocytes, platelets, glucose, urea, and creatinine), and comorbidity (diabetes, metabolic syndrome, arterial hypertension, obesity, and so on) that were registered upon admission to the emergency service. In addition, post-operative diagnoses (acute appendicitis, acute calculous cholecystitis, intestinal occlusion, and etcetera), days of stay in the emergency room before surgery, days from the onset of symptoms until emergency surgery, post-surgery stay, and post-surgical complications were examined.

Continuous variables were expressed as absolute values or their mean with standard deviation. The categorical variables were presented in numbers with their percentage. The analysis of the continuous variables, with normal distribution, was performed with the two-tailed student's t-test for independent samples. The categorical variables' analysis was carried out with the "X²" test, or Fisher's exact test; the latter, if any of the values in the 2 × 2 table were ≤ 5. For all assessments, the statistic program OpenEpi version 3 (Dean AG, Sullivan KM, Soe MM. OpenEpi: Open-Source Epidemiologic Statistics for Public Health, Versión. www.OpenEpi.com. USA) was used. All values of $p < 0.05$ were considered statistically significant.

Results

Two hundred and fourteen patients undergoing emergency surgery were identified; however, 21 cases were excluded from the study. Finally, 193 patients were analyzed: 106 from 2019 and 87 from 2020 (Table 1). This represented a decrease of 18% in surgical emergencies. Both groups were similar (Table 1).

In the pandemic, the days elapsed between the onset of symptoms, and the emergency surgery increased (Table 1). Meanwhile, the days spent in the emergency room were reduced. In addition, the number of cases of appendicitis decreased 29.6% (Table 2). While an increased by 97.8% occurred for the surgeries for acute calculous cholecystitis (Table 2). Only five patients had an emergency surgery and simultaneously COVID-19 infection (two

Table 1. Demography, anthropometry, comorbidities, and pre-post-operative information

Characteristic	2019 (n = 106)	2020 (n = 87)	p
Age	47.5 ± 19.7	51.4 ± 18.2	0.15 [#]
Women, n (%)	53 (50)	87 (60)	0.11 ^{\$}
Body mass index	27.2 ± 5	28.3 ± 5.6	0.15 [#]
Patients without comorbidity, n (%)	55 (51.8)	42 (48.2)	0.97 ^{\$}
Days of stay in the emergency room	1.5 ± 0.6	1.3 ± 0.6	0.02 [#]
Days from the onset of symptoms to surgery	7.6 ± 4.6	14 ± 6.7	< 0.0001 [#]
Days of post-operative stay	5.2 ± 8.6	5.2 ± 5.4	> 0.99 [#]

[#]Statistical test used: Two-tailed student's t-test for independent samples, ^{\$}The "χ²" test,[¶]Fisher's exact test**Table 3. Acute appendicitis cases**

Characteristic	2019 (n = 64)	2020 (n = 37)	p
Age	39.1 ± 17.5	44.7 ± 17.7	0.12 [#]
Patients without comorbidity, n (%)	41 (64)	19 (51.3)	0.69 ^{\$}
Body mass index	24.6 ± 9.3	24 ± 9.6	0.76 [#]
Initial leukocytes	15.8 ± 4.7	15.1 ± 6	0.54 [#]
Days of stay at the emergency room	1.4 ± 0.5	1.3 ± 0.5	0.33 [#]
Days of symptom onset to surgery	2.6 ± 1.4	3.5 ± 1.4	0.002 [#]
Days of post-operative stay	3 ± 1.3	2.9 ± 1.2	0.7 [#]
Grade IV appendicitis, n (%)	16 (25)	11 (29.7)	0.30 ^{\$}

[#]Statistical test used: Two-tailed student's t-test for independent samples, ^{\$}The "χ²" test,[¶]Fisher's exact test**Table 2. The most frequent surgical pathologies**

Characteristic	2019 (n = 106), n (%)	2020 (n = 87), n (%)	p
Acute appendicitis	64 (60.3)	37 (42.5)	0.007 ^{\$}
Acute calculous cholecystitis	13 (12.2)	21 (24.14)	0.02 ^{\$}
Complicated abdominal wall hernias	13 (12.2)	9 (10.3)	0.34 ^{\$}
Bowel occlusion due to adhesions	3 (2.8)	3 (3.4)	> 0.99 [¶]
Intestinal volvulus	3 (2.8)	1 (1.1)	0.47 [¶]
Mesenteric thrombosis	1 (0.9)	1 (1.1)	> 0.99 [¶]

[#]Statistical test used: Two-tailed student's t-test for independent samples, ^{\$}The "χ²" test,[¶]Fisher's exact test. All values of p <0.05 were considered statistically significant.**Table 4. Acute calculous cholecystitis cases**

Characteristic	2019 (n = 13)	2020 (n = 21)	p
Age	61.9 ± 14.1	48.9 ± 15.1	0.01 [#]
Patients without comorbidity, n (%)	4 (30.7)	9 (42.8)	0.51 [¶]
Body mass index	26.2 ± 3.5	29 ± 2.5	0.01 [#]
Initial leukocytes	9.6 ± 3.6	13.6 ± 6.1	0.02 [#]
Days of stay at the emergency room	1.8 ± 0.5	1.3 ± 0.6	0.001 [#]
Days of symptom onset to surgery	17.5 ± 5.3	35.5.1 ± 8.9	< 0.0001 [#]
Patients with gangrenous cholecystitis, n (%)	1 (7.6)	9 (42.8)	0.03 [¶]

[#]Statistical test used: Two-tailed student's t-test for independent samples, ^{\$}The "χ²" test,[¶]Fisher's exact test. All values of p <0.05 were considered statistically significant.

acute appendicitis and three acute calculous cholecystitis); no one died. From the 87 cases attended in the pandemic, just six had a pre-operative COVID-19 test, all done outside the hospital.

In cases of appendicitis, during the pandemic, the days elapsed between the onset of symptoms, and the surgery increased (Table 3). Just six cases were managed with laparoscopic appendectomy. In the cases of acute calculous cholecystitis, during the pandemic, the patients age, and the days of stay in the emergency room decreased (Table 4). However, the body mass index, the days elapsed between the onsets of symptoms until the surgery, leukocytes and

cases with gangrenous cholecystitis increased (Table 4). Just six cases were managed with laparoscopic cholecystectomy.

Discussion

In this investigation, notable changes were identified in emergency surgeries during the 2020 COVID-19 pandemic at a general hospital that insured workers of the Mexican Government: these surgeries decreased. In other parts of the world, the behavior of these operations was heterogeneous. While, in few countries these surgeries were maintained with the same

frequency⁵⁻⁸, in most reports, a reduction was described^{3,9-16}. This diverse conduct was due to the heterogeneous manner of the pandemic in the different countries⁷.

In this research, it was identified that the number of days between surgery, and the onset of the surgical disease increased. This finding is like the reports from other regions of the World^{9,15,17}. Authors agree that this circumstance was by several factors, including the “stay at home” recommendation from authorities or the patients’ fear of going to hospitals, delaying their timely management^{3,9-16}.

Herein, a decrease in the number of cases of acute appendicitis was found. In other parts of the world, the behavior of this disease was also heterogeneous. A few medical units identified an increase in these cases^{16,18,19}; however, most hospitals recognized a reduction²⁰⁻²³. This diverse conduct was also due to the heterogeneous behavior of the pandemic in the World⁷.

In a singular way, in our work an increase in cases of acute calculous cholecystitis was identified. Meanwhile, few authors did not detect changes in the frequency of this disease^{5,20}; most centers noticed a decline in cases of cholecystitis^{9,10,21,22}. In our cholecystitis cases, a significant increase in their body mass index, initial leukocytes, cases with gangrenous cholecystitis, as well as in the number of days between the onset of symptoms and cholecystectomy were identified. This was consistent with what happened with appendicitis, where patients did not go to hospitals in a timely manner due to the “stay at home” recommendation from authorities or the patients’ fear of contracting COVID-19^{3,9-16}.

Alike all studies this one has limitations. This work is the result of a single urban hospital population. Our patients were exclusively workers of the Mexican Government or their relatives. In addition, retrospective cohort studies have intrinsic limitations due to their design. Notwithstanding the former data, our findings are consistent with other surveys.

Conclusion

During the COVID-19 pandemic in 2020, in our patients the cases that warrant emergency surgery decreased. The number of days between the symptoms’ onset and surgery was greater. Cases of acute appendicitis diminished, and those of acute calculous cholecystitis increased.

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Conflicts of interest

The authors declare no conflicts of interest.

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 they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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