

Surgical initial experience in patients with COVID-19

Experiencia quirúrgica inicial en pacientes con COVID-19

Carlos O. Aguilar-Garduño¹, José C. Aguilar-Garduño², Ana K. Barreto-Rodríguez¹,
Vanessa Ortiz-Higareda¹, Eduardo Ferat-Orsorio³ and José L. Martínez-Ordaz^{3*}

¹Gastrosurgery Department, Specialty Hospital, Centro Médico Nacional Siglo XXI, Instituto Mexicano del Seguro Social (IMSS); ²Mexican Faculty of Medicine, Universidad La Salle; ³Directorate of Health Education and Research, Specialty Hospital, Centro Médico Nacional Siglo XXI, IMSS. Mexico City, Mexico

Abstract

Introduction: The COVID-19 pandemic has caused a reorganization of hospital and general surgery departments worldwide to assure the best medical and surgical treatment of patients with this disease and protection of the health-related personnel. Some of them will require surgical treatment either elective or urgent. **Objective:** Report the initial experience in the management of patients with COVID-19 in a third level hospital. **Material and Methods:** A review of the surgical protocols, personal protection equipment used by the surgical teams, and results of the treatment of forty-two patients submitted to surgery. **Results:** For four months (April-July 2020) forty-two patients with suspicion or confirmed infection of SARS-CoV2 underwent surgical treatment. The most common surgery was tracheostomy in 16 patients (38%) followed by exploratory laparotomy in 8 patients (19%). The median postoperative stay was 17 days, and the thirty-day postoperative mortality rate was 26%. **Conclusions:** Reorganization of the general surgery department and the hospital, favors adequate management and treatment of patients with COVID-19 and protection to the health-related personnel. Due to the usual co-existence of comorbidities and pulmonary complications the postoperative mortality of these patients is high.

Keywords: COVID-19. SARS-CoV-2. Surgery.

Resumen

Antecedentes: La pandemia de COVID-19 ha ocasionado que los servicios de cirugía y de salud en todo el mundo tengan que reorganizarse y planear para poder brindar la mejor atención a los pacientes, con la protección necesaria para el personal de salud. Algunos de estos pacientes requerirán tratamiento quirúrgico, ya sea electivo o de urgencia. **Objetivo:** Reportar la experiencia inicial en el manejo de pacientes con COVID-19 que ameritaron tratamiento quirúrgico por los servicios de cirugía de un hospital de referencia. **Método:** Revisión de los protocolos quirúrgicos, equipo de protección personal usado por los equipos quirúrgicos y resultados del tratamiento de 42 pacientes sometidos a cirugía en un periodo de 4 meses. **Resultados:** Fueron intervenidos 42 pacientes con COVID-19. Treinta pacientes tenían diagnóstico de infección por SARS-CoV-2 y en 12 casos el diagnóstico fue clínico y por imagen. Las cirugías más frecuentes fueron traqueostomía en 16 pacientes (38%) y laparotomías exploratorias en 8 pacientes (19%). La mediana de estancia posoperatoria fue de 17 días y la mortalidad durante los primeros 30 días fue del 26%. **Conclusiones:** Es necesaria la reorganización de los departamentos quirúrgicos y del hospital para poder atender adecuadamente a los pacientes con COVID-19 y proteger al personal de salud.

*Correspondence:

José L. Martínez-Ordaz

Avda. Cuauhtémoc, 330

Col. Doctores, Del. Cuauhtémoc

C.P. 06720, Ciudad de México, México

E-mail: jlmo1968@gmail.com

Date of reception: 03-09-2020

Date of acceptance: 27-11-2020

DOI: 10.24875/CIRUE.M20000248

Cir Cir (Eng). 2021;89(2):181-186

Contents available at PubMed

www.cirugiaycirujanos.com

2444-0507/© 2020 Academia Mexicana de Cirugía. Published by Permanyer. This is an open access article under the terms of the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Los pacientes pueden presentar patologías que requieran tratamiento quirúrgico. Relacionado con la infección y la mayor frecuencia de comorbilidad, la mortalidad de estos pacientes es elevada.

Palabras clave: COVID-19. SARS-CoV-2. Cirugía.

Introduction

In December 2019, the presence of viral pneumonias started being reported in the city of Wuhan, China. After the study of cases, a new virus, SARS-CoV-2, was identified and COVID-19 disease was described. The first case in Mexico was confirmed on February 28, 2020. It was declared a pandemic by the World Health Organization on March 9, 2020. At the time this report is written, there are more than 647,000 confirmed cases and 69,000 deaths related to this disease in the country. As a consequence, strategies were designed in the health sector and hospitals for the care of patients with the disease, separating them from those without it, and for containing the spread both in other populations and among health sector workers.

Patients with acute surgical pathologies will continue to show up, and some of these conditions may be life-threatening and require urgent surgery. Indications for surgery in patients with COVID-19 are the same as in the general population¹. The goal is to provide appropriate and timely treatment to patients, optimizing the use of hospital resources (beds, intensive care, personal protective equipment [PPE], ventilators, among others). There is no substitute for surgical criteria, surgery should be performed if deferring it may cause harm to the patient, longer stay or hospital readmission, or if medical treatment has failed^{2,3}.

The purpose of this work is to report the experience with COVID-19 patients who underwent surgical treatment in a tertiary care hospital during a four-month period.

Patients and methods

During a 4-month period (April 1 to July 31, 2020) all patients who underwent surgery with a diagnosis or suspicion of SARS-CoV-2 infection in a tertiary care hospital were included. The infection had to be corroborated by polymerase chain reaction (PCR) test determination or suspected based on clinical signs and symptoms and consistent changes demonstrated by chest computed tomography (CT).

For the care of patients with COVID-19, two separate emergency care areas, independent between each other, were differentiated: that which is regularly used, and a second one where patients with data consistent with airway infection or suspected of having COVID-19 (respiratory triage) are directed to. Hospital preparations also included developing a COVID-19 hospitalization and intensive care area, with ventilators and personal protective equipment (PPE) for the health personnel in charge of patient management, who received training for putting it on and taking it off. According to hospital distribution, 4 operating rooms were exclusively designated for patients with COVID-19. In the rest of the hospital, elective surgeries were hierarchized by department, whereby the number of surgeries was reduced from 596 elective and 255 emergency procedures in March, to 83 elective and 117 emergency surgeries on average during these 4 months. Appointments at outpatient clinics decreased in the same period from 13,700 to 5,980 monthly appointments on average.

Data related to COVID-19, demographic data, presence of comorbidities, surgical indication, type of surgical intervention (emergency or elective and major or minor surgery), surgical procedure that was performed, postoperative evolution and outcome (discharge or death) were obtained from the group of patients.

For COVID-19 patient admission to the operating room, there is an exclusive route, demarcated and signposted, with direct entrance to the operating rooms. The entire participating surgical team used PPE consisting of waterproof gown, surgical cap, goggles with lateral protection, N95 respirators, boots, and double pair of latex gloves. Directly over it, after washing the gloves with alcohol gel, a new surgical gown, and another pair of gloves were put on with sterile technique.

Results

Within a 4-month period, a total of 699 suspected or confirmed SARS-CoV-2-infected patients were admitted to the COVID area. Out of them,

Table 1. Demographic characteristics, comorbidities, and clinical manifestations in 42 patients with COVID-19 or suspected of SARS-CoV2 infection

	n	Percentage
Gender		
Males	19	45%
Females	23	55%
Comorbidities		
Hypertension	21	50%
Diabetes mellitus	18	43%
Obesity	17	40%
Chronic kidney disease	2	8%
Other	1	4%
COVID-19 PCR		
Positive	30	71%
Negative	12	29%
CT consistent with COVID-19		
Positive	37	88%
Negative	5	12%
Signs and Symptoms		
Fever	35	83%
Myalgia and arthralgia	27	64%
Dry cough	22	52%
Dyspnea	20	48%
Abdominal pain	11	26%
Headache	9	21%

CKD: chronic kidney disease; CT: chest computed tomography; n: number; PCR: polymerase chain reaction; type 2 DM: type 2 diabetes mellitus.

42 patients (6%) required surgical treatment during hospitalization.

The study population consisted of 19 men and 23 women, with a median age of 61 years (IQR: 49.7-74). Comorbidities were recorded in 31 patients (74%), with the most common being hypertension in 21 (50%), diabetes mellitus in 18 (43%) and obesity in 17 patients (40%) (Table 1).

In all cases, SARS-CoV-2 infection was suspected or confirmed prior to surgery. In 30 patients (71%), the infection was demonstrated by PCR test for SARS-CoV-2. In the remaining 12 patients, it was suspected by radiological and CT imaging consistent with COVID-19 (Fig. 1). The most common COVID-19-related symptoms were fever in 35 patients (83%), dry cough in 20 (48%), respiratory distress in 22 (52%), and myalgia and arthralgia in 27 (64%) (Table 1).

Surgeries were considered emergency procedures in 24 patients (58%). In total, surgical procedures were classified as major surgery in 22 patients (52%), and in 20, as minor surgery (48%). The most common indication for surgical treatment was prolonged intubation with inability to withdraw mechanical ventilatory



Figure 1. Chest computed tomography image showing lung parenchyma with presence of multiple diffuse consolidation areas with peripheral and subpleural, multi-segmental distribution associated with adjacent ground-glass pattern, as well as sub-segmental atelectasis at both lung bases. These are commonly reported imaging findings of COVID-19 pneumonia.

support in 16 patients (38%), which is why the most commonly performed surgery was tracheostomy. Median days of intubation during which the procedure was carried out was 22.5 days (IQR: 19-24). The rest of indications and surgical procedures that were performed are found in table 2 and table 3, respectively. All procedures were carried out under general anesthesia.

Median postoperative hospital stay was 17 days (IQR: 12-41). There were no unscheduled reoperations. Eleven patients (26%) died during the first 30 postoperative days. The causes of death were respiratory complications in 8 patients (19%), abdominal sepsis in 2 (4.7%) and postoperative hemorrhage in 1 (4%).

Discussion

There is the possibility that patients with COVID-19 require surgery either due to concomitant diseases or complications deriving from this disease. This work presents the experience of patients with COVID-19 or suspected of SARS-CoV-2 infection who underwent surgery in a tertiary care hospital. To determine the need for surgical intervention, these conditions can be hierarchically ordered from those that must be immediately resolved within a period of up to two weeks, to those that can be addressed in 8 or more weeks^{3,4}. In patients with COVID-19, surgeries that are not considered urgent should be postponed⁵. The risk increase SARS-CoV-2 infection implies should be weighed

Table 2. Surgical indications in forty-two patients diagnosed with or suspected of having COVID-19

Preoperative Diagnosis	n	Percentage
Prolonged intubation	16	38%
Acute arterial insufficiency	4	9.5%
Complicated diverticular disease	3	7.1%
Ruptured brain aneurysm	2	4.7%
Right sub-phrenic abscess	2	4.7%
Acute cholecystitis	2	4.7%
Necrotizing fasciitis	2	4.7%
Mucormycosis	2	4.7%
Fournier's gangrene	2	4.7%
Foreign body in esophagus	1	2.3%
Acute appendicitis	1	2.3%
23.1-WOG pregnancy + fetal distress	1	2.3%
Left eye endogenous endophthalmitis	1	2.3%
Gross hematuria	1	2.3%
Oral route intolerance	1	2.3%
Communicating hydrocephalus	1	2.3%

Table 3. Surgical interventions in forty-two patients diagnosed with or suspected of having COVID-19

Performed surgery	n (%)	Complications
Tracheostomy	16 (38%)	NO
Exploratory laparotomy	8 (19%)	YES (2)*
Arterial examination	4 (9.5%)	NO
Surgical lavage	4 (9.5%)	NO
Craniotomy	3 (7%)	NO
Cesarean section	1(4.1%)	YES**
Other***	7(29.16%)	NO

*Bleeding (1), abdominal sepsis (1); **Abdominal sepsis; ***Foreign body extraction, cervical approach (1), ocular evisceration (1), transurethral endoscopic prostatic examination (1), gastrostomy (1), nasopharyngeal biopsy (1), total maxillectomy (1).

against the risk of delaying surgical treatment, as well as individually take into account the poor prognostic factors found in patients who more often require hospitalization, such as age > 50 years and presence of comorbidities such as obesity, diabetes mellitus, pulmonary complications and heart disease. Protective measures before, during, and after surgical treatment

need to be more stringent and be individualized during this pandemic. There is no substitute for surgical criteria².

In addition, patients admitted on an outpatient basis who require elective surgery considered to be essential, should be monitored for fever, respiratory symptoms and history of contacts with suspected cases⁶. Given that the number of tests is limited and the time for obtaining results is not practical, in case of doubt in the presence of urgent situations, every patient should be managed as suspicious of having the disease^{1,7}.

Ideally, COVID-19 patients should be in isolated rooms or assigned as a cohort together with other positive patients. The personnel included in the management of these patients should not circulate through the rest of the hospital¹.

If available, operating rooms should have negative pressure and be exclusive for positive or suspicious patients^{6,8}. In our hospital, it was possible to assign two blocks of operating rooms. In case of not having the possibility to do this, ideally, the patient should be scheduled as the last one of the day³. The operating room assigned for COVID-19 patients must be the first from the entrance to the operating room block in order to avoid contamination of the rest⁷. The patient enters directly without remaining in the preoperative room. Within the operating room, it is advisable to have the least possible number of surgical instruments and specific pieces of furniture for the surgery⁹.

N95 respirators or those that provide higher protection should be used in cases of aerosol-generating procedures⁸. The procedures that most cause them include (without being limited to) intubation and extubation, intrapleural tube insertion, bronchoscopy, ventilation, tracheostomy, endoscopy, laparoscopy (pneumoperitoneum evacuation or fluid aspiration, cardiopulmonary resuscitation) and electrocautery use^{7,8,10}.

Safety of the entire surgical team must be ensured. Proper PPE includes, in addition to N95 respirators, double pair of gloves, glasses with lateral protection (goggles), face shields, hat, boots and waterproof gown to perform the procedure^{1,9,10}. Ideally, both PPE donning and doffing should be meticulous and supervised by a trained person¹¹. Participants donned gowns and sterile gloves on the PPE.

All surgeries performed in this study were under general anesthesia. In those that are carried out with an awake patient, he/she must remain with an N95 respirator on to reduce the risk of aerosols generated by

him/her⁷. In cases in which general anesthesia is required or decided, anesthetic induction should preferably involve rapid sequence and intubation^{7,10}. Surgeons and the rest of the surgical team not required for intubation should remain outside the room until the induction and intubation procedure has been completed. Preferably, waiting for an approximate period of 3 minutes to allow air exchange in the room is recommended^{6,8,9}. Staff entering the operating room should be the fewest possible, with no observers or visitors, and the doors should be kept closed. Once inside, they should not exit until the surgery is concluded and, once outside, they should not enter again^{1,7,8}.

Regarding the surgeries we performed, they involve different surgical areas, both for elective and emergency procedures. The approach was that which was considered ideal for the treatment of the condition according to the disease and the treating department¹¹.

When planning the intervention, the surgeon must prioritize approaches that reduce exposure of the surgical team and surgery duration⁵. Some considerations related to our surgical group. Given that COVID-19 is a condition mainly with respiratory involvement, a high frequency of tracheostomies (which accounted for more than one third of surgeries) was to be expected due to the need for prolonged ventilatory mechanical support in many patients. The recommended timing for its performance has not yet been determined, with groups referring early intervention (in less than 7 days), and others, longer times¹². The decision in our hospital is to carry it out after two to three weeks, due to the possibility of an improvement in patient evolution and thereby mechanical ventilation withdrawal and patient viral load decrease with this wait. Another aspect is related to general surgery procedures, our second largest group of patients. Some authors prefer to avoid the laparoscopic approach and perform open or conventional surgery in order to reduce surgical time and the risk of aerosol generation^{1,8}. In case laparoscopic surgery is preferred, care must be taken when aspirating fluids during surgery and when pneumoperitoneum drainage is performed, with this being preferable through a closed system or by placing a filter. In our patients, open management was decided in all cases. The use of electrocautery is recommended with the lowest possible intensity, and even avoiding it, to prevent the generation of aerosols^{1,9}.

At surgery conclusion, recovery of the patient in the room and taking him directly to his bed in the COVID

area or to the intensive care unit is recommended. Transfer personnel should use the corresponding PPE, which should not be the same as that of the surgical procedure. The staff who participated in the surgery must completely change clothes and even shower, and is advisable for them to leave the hospital⁸.

Postoperative follow-up is as usual; however, many patients hospitalized for COVID-19 have comorbidities, and mortality may therefore be higher¹. Since many of our patients already had respiratory manifestations prior to surgery, it is very difficult to differentiate whether patient postoperative evolution in this aspect was secondary to the surgical disease or to COVID-19. However, one study reported postoperative respiratory complications in 28% of COVID-19 patients compared to a historical record of 8% of postoperative patients¹³. One third of our patients underwent tracheostomy (which was regarded as elective surgery), and therefore it is not possible either for an association to be established between evolution and scheduled and elective surgery¹³.

The overall mortality in patients who underwent surgical treatment recorded in our unit is 26%, which is similar to that referred in the largest series of patients undergoing surgery reported so far¹³.

Conclusion

Patients with COVID-19 may require surgical treatment. It is necessary to have an established protocol on the best management of these patients according to the hospital characteristics and infrastructure. PPE is essential for health personnel involved in the treatment of patients in order to decrease the risk of infection. This study includes patients undergoing any type of surgical procedure, which generalizes the results. Patients with COVID-19 often have comorbidities and respiratory complications that increase postoperative mortality, which is why the surgeon's opinion on the need for surgery is highly important.

Conflicts of interest

The authors declare that they have no conflicts of interest relevant to this work.

Ethical disclosures

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

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 have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

References

1. Gao Y, Xi H, Chen L. Emergency Surgery in Suspected COVID-19 Patients with Acute Abdomen: Case Series and Perspectives. *Ann Surg* 2020;1.
2. guidance_for_triage_of_nonemergent_surgical_procedures_general_surgery.pdf [Internet]. [citado 2020 may 19]; Available from: https://www.facs.org/-/media/files/covid19/guidance_for_triage_of_nonemergent_surgical_procedures_general_surgery.ashx
3. Al-Jabir A, Kerwan A, Nicola M, Alsafi Z, Khan M, Sohrabi C, et al. Impact of the Coronavirus (COVID-19) pandemic on surgical practice - Part 1. *Int J Surg* 2020;79:168-79.
4. Flemming S, Hankir M, Ernestus R-I, Seyfried F, Germer C-T, Meybohm P, et al. Surgery in times of COVID-19—recommendations for hospital and patient management. *Langenbecks Arch Surg* [Internet] 2020 [citado 2020 may 19]; Available from: <http://link.springer.com/10.1007/s00423-020-01888-x>
5. Spolverato G, Capelli G, Restivo A, Bao QR, Pucciarelli S, Pawlik TM, et al. The management of surgical patients during the coronavirus disease 2019 (COVID-19) pandemic. *Surgery* 2020;168(1):4-10.
6. Yeo D, Yeo C, Kaushal S, Tan G. COVID-19 and the General Surgical Department – Measures to Reduce Spread of SARS-CoV-2 Among Surgeons: *Ann Surg* 2020;1.
7. Coccolini F, Perrone G, Chiarugi M, Di Marzo F, Ansaloni L, Scandroglio I, et al. Surgery in COVID-19 patients: operational directives. *World J Emerg Surg* 2020;15(1):25.
8. considerations_optimum_surgeon_protection.pdf [Internet]. [citado 2020 may 19]; Available from: https://www.facs.org/-/media/files/covid19/considerations_optimum_surgeon_protection.ashx
9. Orthopoulos G, Fernandez GL, Dahle JL, Casey E, Jabbour N. Perioperative Considerations During Emergency General Surgery in the Era of COVID-19: A U.S. Experience. *J Laparoendosc Adv Surg Tech* 2020;30(5):481-4.
10. Al-Balas M, Al-Balas HI, Al-Balas H. Surgery during the COVID-19 pandemic: A comprehensive overview and perioperative care. *Am J Surg* 2020;S0002961020302221.
11. Balibrea JMose, Badia JMose, Rubio Pérez I, Martín Antona E, Álvarez Peña E, García Botella S, et al. Manejo quirúrgico de pacientes con infección por COVID-19. Recomendaciones de la Asociación Española de Cirujanos. *Cir Esp* 2020;98(5):251-9.
12. Chiesa-Estomba CM, Lechien JR, Calvo-Henríquez C, Fakhry N, Karkos PD, Peer S, et al. Systematic review of international guidelines for tracheostomy in COVID-19 patients. *Oral Oncol* 2020;108:104844.
13. Nepogodiev D, Bhangu A, Glasbey JC, Li E, Omar OM, Simoes JF, et al. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *The Lancet* 2020;396(10243):27-38.