

*POST-SURGICAL COMPLICATIONS IN PATIENTS INFECTED BY
COVID-19: INTEGRATIVE REVIEW*

**COMPLICAÇÕES PÓS-CIRÚRGICAS EM PACIENTES INFECTADOS POR COVID-19:
REVISÃO INTEGRATIVA**

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ABSTRACT

Objective: to identify the main scientific evidence available concerning the main postoperative complications in post-COVID-19 patients. **Method:** integrative review, based on studies published online in the following databases: PubMed/MEDLINE, Virtual Health Library (VHL), SciELO, LILACS, with the guiding question: "What is the current scientific evidence available in the literature regarding postoperative complications in patients after COVID-19 infection?" with inclusion criteria: studies that addressed surgical complications in patients after COVID-19 infection, published in Portuguese and English, in the year 2020 to 202. The search strategy followed the PICOS strategy according to PRISMA assumptions. **Results:** 7 articles were selected. The following postoperative complications in patients with COVID-19 were identified: pulmonary complications, infectious complications (non-pulmonary), acute kidney injury, thromboembolic complications, septic shock, and increased mortality. **Conclusion:** Surgery can have a negative impact on COVID-19 patients, even those who are asymptomatic, raising mortality and the potential need for postoperative admission to the Intensive Care Unit (ICU), therefore, all non-urgent procedures should be postponed until the patient has met isolation and transmission care criteria and Covid-19 has entered the recovery phase.

Keywords: COVID-19; Coronavirus Infections; Surgical Procedure; Surgical Interventions; Postoperative Complications.

RESUMO

Objetivo: identificar as principais evidências científicas disponíveis relativas às principais complicações pós-operatórias em pacientes pós-COVID-19. **Método:** revisão integrativa, baseado em estudos publicados online nas seguintes bases de dados: PubMed/MEDLINE, Biblioteca Virtual em Saúde (BVS), SciELO, LILACS, com a questão norteadora: "Quais as atuais evidências científicas disponíveis na literatura a respeito das complicações pós-cirurgia em pacientes após infecção por COVID-19?" com critérios de inclusão: estudos que abordavam complicações cirúrgicas em pacientes após infecção por COVID-19, publicados em português e inglês, no ano de 2020 a 202. A estratégia de busca seguiu a estratégia PICOS conforme pressupostos do PRISMA.

Resultados: 7 artigos foram selecionados. As seguintes complicações pós-operatórias em pacientes com COVID-19 foram identificadas: complicações pulmonares, complicações infecciosas (não pulmonares), lesão renal aguda, complicações tromboembólicas, choque séptico e aumento da mortalidade. **Conclusão:** A cirurgia pode ter um impacto negativo em pacientes COVID-19, mesmo os que são assintomáticos, elevando a mortalidade e a necessidade potencial de internação pós-operatória em Unidade de Terapia Intensiva (UTI), portanto, todos os procedimentos não urgentes devem ser adiados até que o paciente tenha cumprido com os critérios de isolamento e cuidados de transmissão e a Covid-19 tenha entrado na fase de recuperação.

Palavras-chave: COVID-19; Infecções por Coronavírus; Procedimento Cirúrgico; Intervenções Cirúrgicas; Complicações Pós-Operatórias.

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INTRODUCTION

COVID-19, an infection caused by the SARS-CoV-2 coronavirus, was first identified in December 2019 in Wuhan, China, with the occurrence of pneumonia cases as a result of a previously unknown infectious agent. Later, the high power of contagion and infection was identified, and more severe cases of the disease that resulted in Severe Acute Respiratory Syndrome (SARS). In Brazil, the first case was registered in February 2020 in the state of São Paulo. It is currently configured as a public health emergency due to its high degree of dissemination and mortality⁽¹⁾.

COVID-19 disease is a serious disease, usually presenting with the symptoms of fever, cough, dyspnea, myalgia and/or fatigue and can infect anyone at any age, and in some cases may be asymptomatic. It manifests more severely in the elderly and in those with an underlying disease such as hypertension, cardiovascular disease, diabetes mellitus, renal disease from the University Hospital, obstructive pulmonary disease (COPD). It can result in progressive respiratory failure contributing to increased mortality rate⁽²⁾.

In the context of the pandemic, health systems had to readjust to the new need to face COVID-19. Many hospital services suspended elective surgical procedures and maintained only priority in urgent and emergency procedures, due to the need to

make more beds available for patients with COVID-19. However, the suspension of these elective procedures, but that presented an urgent character resulted in the increased mortality of patients who needed to undergo some surgical modality⁽²⁾.

Therefore, in the current context of the SARS-CoV-2 pandemic, a protocol should be implemented for patients who need to undergo a surgical procedure, defining how the preoperative preparation, the management of the intraoperative period and the postoperative surveillance should be carried out in order to avoid complications and ensure the safety of patients and of the healthcare team⁽³⁾.

The return of elective surgeries in the stabilization phase of the pandemic of COVID-19 demonstrated the difficulties of health institutions in determining the ideal time to perform surgical procedures in patients who recovered from COVID-19, since the disease can complicate the perioperative course and raise the mortality rate even in small surgeries⁽³⁾.

Due to the scarcity of information about the clinical characteristics and outcomes of patients infected with COVID-19 undergoing surgery, considering that asymptomatic patients with COVID-19 suffer rapid deterioration of clinical status after surgery and, therefore, the surgical area, in the context of the pandemic, faces a need for several adaptations. In this sense, this integrative literature review was proposed

with the objective of identifying, in the scientific literature, the available evidence regarding the main post-surgical complications in patients with COVID-19, expanding the knowledge and scientific basis for the care practice to the Coronavirus-infected individual with the need to undergo a surgical procedure.

METHODS

This is an integrative review conducted in June 2021, following the following steps: problem identification; literature search; data evaluation; data analysis and data presentation.

The search strategy for the primary studies and guiding question followed the PICOS strategy (Population, Intervention, Comparison Group, Outcomes and Study Design)⁽⁴⁾.

The population (P) of interest consisted of patients undergoing surgical procedure after infection by COVID-19; In this study, the intervention (I) was replaced by exposure (E) because it was a harmful event to health, therefore, not subject to randomization. COVID-19 infection was considered the exposure (E). There was no comparison or control group (C). The outcome (O) was postoperative complications after COVID-19. And the type of study (S) was original studies with qualitative synthesis.

Six stages were followed to conduct this literature review: 1st stage - Development

of the guiding question; 2nd stage - Literature search or sampling; 3rd stage - Data collection; 4th stage - Critical analysis of the included studies; 5th stage - Discussion of results; 6th stage - Presentation of the integrative review.

The 1st phase "elaboration of the guiding question" can be defined as the most important phase in the development of the review being: What is the current scientific evidence available in the literature regarding postoperative complications in patients after COVID-19 infection?

The 2nd phase "Search or sampling in the literature". For this study, the following electronic databases were chosen for the searches: Medical Literature Analysis and Retrieval System Online (MedLine/PubMed), Virtual Health Library (VHL), Electronic Library Online (SciELO), Latin American Literature (LILACS).

To conduct the search strategies with a focus on retrieving the largest number of studies that answered the guiding question, a structured vocabulary of Health Sciences Descriptors (DeCS) was used, combined with the Boolean operators AND and OR. The following search strategy was used to list the primary studies: "New coronavirus" OR "Novel Coronavirus" OR "SARS-CoV-2" OR "COVID-19" AND "Trauma" OR "Emergency trauma care" OR "Emergency trauma care" AND "Emergency surgery" OR "Emergency surgery" AND "Infection prevention" OR "infection prevention".

The eligibility criteria were guided by the research question. Studies that addressed surgical complications in patients after infection by COVID-19, published in Portuguese and English, in the period from 2019 to 2021, which had the searched descriptors were included. The excluded studies were secondary studies, response letters, editorials, and duplicate articles. Following the search criteria, a flow chart (according to PRISMA) was prepared in the database search ⁽⁵⁾.

The 3rd phase was carried out data collection extracting the identification data of the articles (title, year of publication and country) and the methodological characteristics of the study (type of study, research subject and main results and conclusions) from a table prepared by the authors.

The 4th phase soon after, after the instrument was filled out, the analysis of the results was performed, describing, and classifying the data. Then, the articles were grouped, according to the main issues addressed.

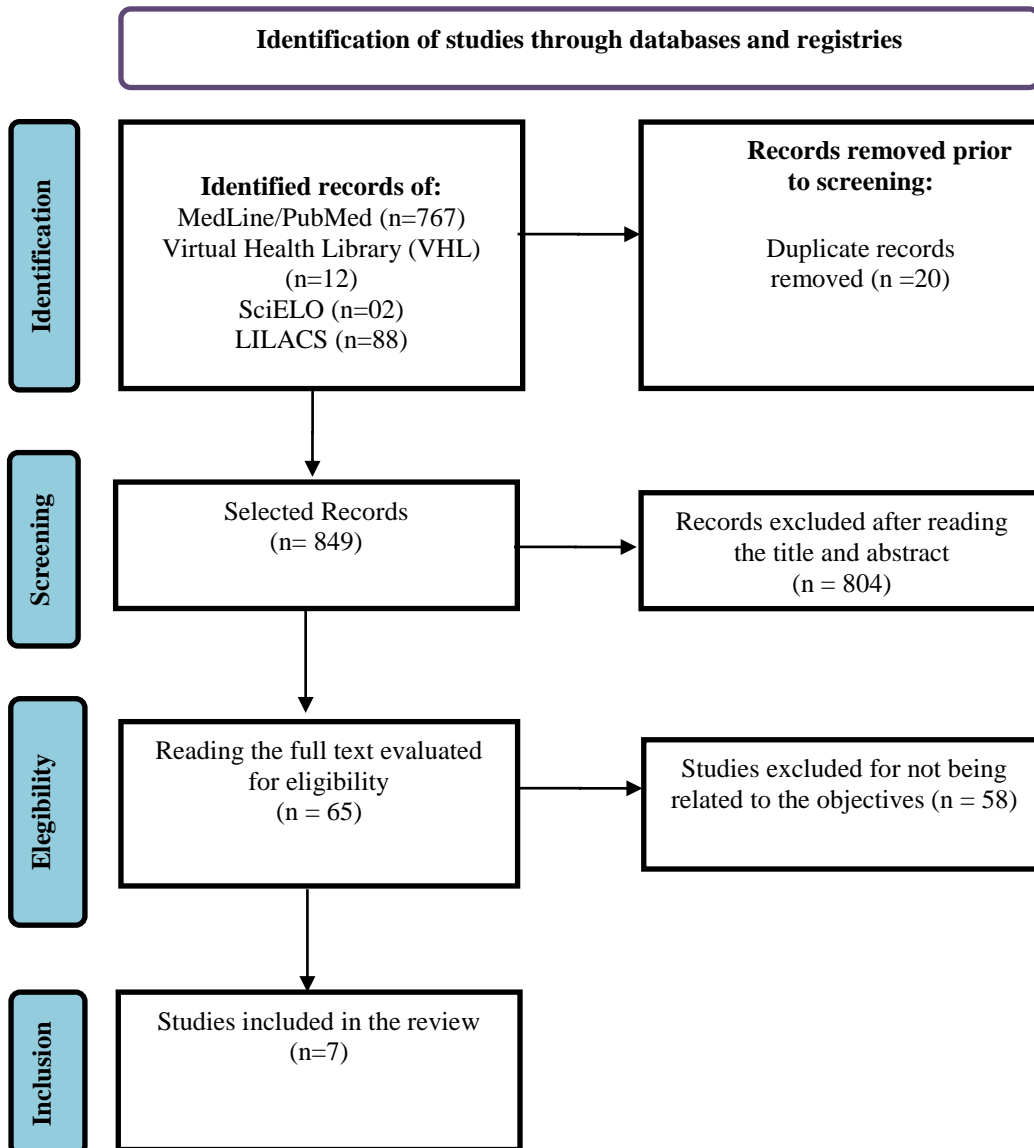
The 5th phase, "Discussion of results", in which analyses of the data obtained were

performed and presented in tabular form, enabling the identification of the theme of this research. The 6th phase "It was the Presentation of integrative review", which relates to a presentation of all relevant information in a detailed and objective way, with clear and complete description for the feasibility of the critical evaluation of the results.

RESULTS

The initial search resulted in 767 studies in the MedLine/PubMed database, 12 in the Virtual Health Library (VHL), 02 in SciELO and 88 in LILAC, totaling 869 publications. Then the selection was performed, considering the potentially eligible studies, in this step 849 publications were elected. Of this total, 804 publications were excluded for not meeting the inclusion criteria. Then, 65 studies remained for reading of the titles and abstracts, after thorough reading 58 studies were excluded for not answering the research question, seven studies were selected at the end for the synthesis of evidence, according to the PRISMA model (Figure 1).

Figure 1- Flowchart of the selection of included articles.



Source: <http://prisma-statement.org/prismastatement/flowdiagram.aspx>.

The analysis of the seven articles that comprised the sample showed that all were from international journals and published in English. The seven articles were conducted from 2020 to 2021, in China/Singapore (n=3),

the United States (n=1), Spain (n=1), Canada (n=1) and one study did not inform the country where the study was conducted. The characterization of the articles included in the review was presented in Table 1.

Table 1 - Distribution of references included in the integrative review, according to year of publication, country, authors, type of study, main results, and conclusions.

Nº	TITLE	YEAR AND COUNTRY	TYPE OF STUDY	RESEARCH SUBJECT	MAIN RESULTS/ CONCLUSIONS
01	Emergency trauma care during the outbreak of corona virus disease 2019 (COVID-19) in China (Yang Li) ⁽⁶⁾ .	2020, Wuhan, China.	Observational descriptive.	Patients with COVID-19 who required emergency surgical procedure.	Acute lung injury caused by COVID-19 may exist preoperatively or worsen postoperatively; Occurrence of respiratory failure and septic shock postoperatively.
02	Perioperative Considerations in Urgent Surgical Care of Suspected and Confirmed Coronavirus Disease 2019 Orthopaedic Patients: Operating Room Protocols and Recommendations in the Current Coronavirus Disease 2019 Pandemic (Mohamed) ⁽⁷⁾ .	2020, United States.	Cross-sectional descriptive.	Confirmed COVID-19 urgent orthopedic patients.	A severe COVID-19 subset can cause a "cytokine storm syndrome," which is an under-recognized hyperinflammatory syndrome characterized by a fatal hyper fulminant with multiple organ failure.
03	Emergency Surgery and Trauma Care During COVID-19 Pandemic. Recommendations of the Spanish Association of Surgeons (Aranda-Narváez) ⁽⁸⁾ .	2020, Spain	Descriptive retrospective.	Emergency surgery and care of the polytrauma patient.	The surgical injury itself could be a trigger for a disproportionate immediate inflammatory response that in COVID-19-infected patients can be deleterious.
04	The management of surgical patients in the emergency setting during COVID-19 pandemic: the WSES position	2021, Not informed.	Retrospective descriptive.	Emergency surgeries for surgical patients	Surgery can have a negative impact in COVID-19 patients, even if they are asymptomatic, with mortality of 20.5% and the

	paper ⁽⁹⁾ .				potential need for postoperative ICU care.
05	Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection ⁽¹⁰⁾ .	2020, Wuhan, China.	Retrospective descriptive.	Patients undergoing selective surgery during the COVID-19 incubation period.	COVID-19 is associated with poor prognosis for patients undergoing surgery, especially for those with chronic diseases.
06	Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study ⁽¹¹⁾ .	2020, China and Singapore.	Cross-sectional descriptive.	Patients undergoing surgery who had confirmed SARS-CoV-2 infection 7 days before or 30 days after surgery.	The primary outcome was mortality, followed by pulmonary complications.
07	Postoperative outcomes in surgical COVID-19 patients: a multicenter cohort study ⁽¹²⁾ .	2021, Canada	Longitudinal descriptive.	COVID-19 patients undergoing surgery.	Pulmonary complications Infectious complications (non-pulmonary) Acute kidney injury Thromboembolic complications

Source: The authors

From the analysis of Table 1, the research subjects were defined as patients with COVID-19 who needed to undergo emergency surgical procedures^(6, 9, 12), confirmed COVID-19 urgent orthopedic patients⁽⁷⁾, emergency surgery and care of the polytrauma⁽⁸⁾ patient, patients undergoing selective surgery during the incubation period of COVID-19⁽¹⁰⁾, patients undergoing surgery who had confirmed SARS-CoV-2 infection 7 days before or 30 days after surgery⁽¹¹⁾.

The surgical procedure had a negative impact on the clinical picture of these patients, even those who were asymptomatic in the preoperative period had a significant increase in postoperative mortality⁽⁹⁾. The main complications identified in the postoperative period of these patients cited in the studies who had active or recent COVID-19 infection were: acute lung injury caused by COVID-19, respiratory failure, septic shock, "cytokine storm syndrome", which is an under-recognized hyperinflammatory syndrome characterized by a hyper fulminant



and fatal with multiple organ failure, the surgical injury itself as a factor to trigger a disproportionate immediate inflammatory response, acute kidney injury, thromboembolic complications and increased need for admission to Intensive Care Unit (ICU).

DISCUSSION

The pandemic caused by COVID-19 has worried the authorities and health professionals because it is one of the greatest challenges currently faced by health services, since little is known about the disease, which is why many of the procedures that have been carried out since the beginning of the disease were based on empiricism⁽¹³⁾.

Surgical patients, both those who had contact with COVID-19 before undergoing a surgical procedure and those who are exposed to a high risk of contracting the disease postoperatively have a high risk of morbidity and mortality and a greater chance of requiring admission to an Intensive Care Unit⁽¹³⁾.

From the analysis of the results, it was found that most of the patients involved in the studies had a history of previous exposure to COVID-19 before hospital admission, some had symptoms and others did not have any signs or symptoms of COVID-19 before surgery, however, they underwent surgical procedure due to being emergency situations⁽¹⁴⁾.

Patients with COVID-19 have a higher postoperative mortality rate, and Postoperative patients with COVID-19 required Intensive Care Unit care in a much higher proportion than in COVID-19 patients hospitalized without surgery, and most patients were older, had more underlying comorbidities and longer surgical time, and underwent more difficult surgeries. This suggests that advanced age associated with comorbidities, surgical time and surgical difficulties may be risk factors for unfavorable outcomes⁽¹⁵⁾.

Trauma and surgery can impair the patient's immune function. Clinically, some asymptomatic patients with COVID-19 deteriorate rapidly after surgery. Surgeons and anesthesiologists should be aware that acute lung injury caused by COVID-19 may exist preoperatively or worsen postoperatively⁽¹⁶⁾.

It is noteworthy that postoperative pulmonary complications were identified in half of the patients undergoing surgical procedures with prior COVID-19 infection⁽¹⁷⁾.

Pulmonary complications were defined as pneumonia, acute respiratory distress syndrome (ARDS) or unexpected postoperative ventilation. These are the most frequent pulmonary complications related to COVID-19 in surgical patients. Additional secondary outcomes included pulmonary embolism, ICU admission, reoperation, 7-day mortality, and length of stay⁽¹⁸⁾.

Therefore, the characterization and differentiation of symptoms can help the health team to identify patients with potential unfavorable outcomes. Thus, the postoperative evaluation aims to identify possible complications arising from the patient's clinical picture⁽¹⁹⁾.

Each health care institution and surgical team should carefully review all elective procedures with the goal of evaluating the cost benefit of the procedure amid the risk of likely complications due to COVID-19, preventing adverse events in these patients of low morbidity and mortality, but that can course as fatal procedures in infected by COVID-19⁽²⁰⁾.

Therefore, given the current context, one should postpone or cancel non-essential elective surgeries and carefully evaluate the timing and the risks and benefits in performing these essential elective surgical procedures that may have important clinical repercussions by not performing surgery⁽²¹⁾.

It is emphasized that the local and regional epidemiological evaluation is a determining and fundamental factor to be evaluated before considering the resumption of elective surgeries, it is recommended as the moment when occurs the sustained reduction of new cases of COVID-19 at least 14 consecutive days in the geographical area⁽¹⁵⁾.

Health institutions should formulate strategies and guidelines for surgical quality and safety aimed at the care of these patients, in addition to the evaluation of the structural

conditions of the health service, availability of several hospital beds to care for post-surgical patients and the demand for cases of COVID-19⁽²¹⁾.

To assist health services, the National Health Surveillance Agency (ANVISA) released a technical note with guidelines for the prevention and control of infections by the new coronavirus (SARS-CoV-2) in surgical procedures in order to ensure the safe resumption of elective surgical procedures, defining how the surgical schedule should be made, the composition of the surgical team and safety measures adopted in the surgical environment⁽¹⁵⁾.

CONCLUSION

Surgery has a negative impact on patients with COVID-19, even those who are asymptomatic, raising the risk of mortality and the potential need for postoperative admission to the Intensive Care Unit (ICU).

The research that integrated the present review reveals that the main postoperative complications in patients infected with COVID-19 or who were recovering from a recent infection of the disease are: pulmonary complications, infectious (non-pulmonary) complications, acute kidney injury, thromboembolic complications, septic shock and the cytokine storm syndrome, characterized as an under-recognized hyperinflammatory syndrome resulting in multiple organ failure due to its hyper fulminant state.

Given the results found, it is found that all non-urgent procedures should be postponed until the patient has complied with the isolation and transmission care criteria and the disease has entered the recovery phase.

It is believed that this study can encourage new scientific productions related to the topic, considering that it is a current problem and of great impact on public health, representing a potential agent of complications for surgical patients.

As a limitation of this study, we highlight the reduced number of both national and international literature on the theme. Therefore, there is a need for future research on the theme in order to contribute to the clarification of the still unknown complications of COVID-19 in patients submitted to surgery.

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