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Evaluation of the COVID-19 Infection Rate in the Perioperative Period of Elective Surgeries of the Hand and Microsurgery

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Abstract

Background: After the beginning of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic (coronavirus disease 2019 [COVID-19]), the world started reducing the number of elective surgeries to reduce the transmission of the coronavirus. Some priority elective surgeries were performed, and there was no increase in contagion rates due to safety protocols and protection measures. The study aims to present the coronavirus infection rate of elective hand surgeries and microsurgery performed during pandemics. **Methods:** A retrospective study evaluating 188 patients submitted to elective surgical procedures. The exclusion criteria were patients infected by COVID-19 before the surgery and patients who submitted to trauma surgery. Only 108 patients were eligible for this study. The mean age was 47.8 years (range: 15 days-81 years). There were 63 females and 45 males. They were divided into 2 groups: outpatient (n = 49) and inpatient (n = 59) procedures. **Results:** The overall COVID infection rate was 6.48%. The outpatient infection rate was 2.08%, whereas the inpatient infection rate was 10.17% (Student *t* test: $P = .089$). The main factor correlated with infection in the postoperative period was the number of postoperative outpatient visits (Student *t* test: $P = .089$). No statistical differences were observed between the variables studied, but there was a tendency for patients who submitted to inpatient surgery to get infected by COVID-19 ($P = .089$). The statistical power was 0.8 (Cohen's *d* test), showing that large samples are needed to analyze the correlation better. **Conclusion:** We concluded that the safety of performing elective hand surgery during the pandemic remains unclear, and more studies with larger samples are needed.

Keywords: COVID, coronavirus, hand surgery, microsurgery, pandemic

Introduction

The end of 2019 and the beginning of 2020 were marked by a global catastrophe in health systems, caused by the pandemic by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), or a new coronavirus, in a disease that was named COVID-19 (coronavirus disease 2019). Due to its high mortality and transmissibility by aerosols, precautions for social isolation and lockdowns were initiated, which caused terrible therapeutic damage to orthopedic conditions in the health system, among other specialties.[1,2]

Elective surgeries were suspended, and hospitals began to be overcrowded by inpatients due to the severe forms or sequelae of COVID-19. On the contrary, patients with orthopedic injuries on an urgent and emergency basis were also submitted to surgeries. Fortunately, most of these patients did not acquire COVID-19 during the perioperative period, either since admission or during follow-up.[1-5]

As the COVID-19 pandemic was being controlled, some "urgent" or priority outpatient surgeries were performed throughout the year 2020 and at the beginning of the year 2021, before the "second wave" of the disease (COVID-19). In addition, most of these patients were not contaminated with COVID-19 during the perioperative period, hospitalization, and outpatient visits. However, there are no studies at the international level that correlate this information with hand, microsurgery, and upper limb surgery. And the main

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question was: Is it safe to subject patients to surgical procedures during this pandemic?

Thus, studies carried out in a quaternary hospital, such as the Hospital in the State of Sao Paulo, become fundamental for understanding, considering that this hospital is the only quaternary hospital in its administrative region ("Health Regional Departments or "Departamento Regional de Saúde/DRS") and in the heartland of the state of São Paulo. The Hospital was the main reference center for serious cases of COVID-19, and for other urgencies and emergency diseases that continued to exist in parallel. Thus, we proposed this study to correlate these data, being able to create guidelines for future safe protocols, as well as assessing which surgeries have a lower risk of transmission of COVID-19. The aim of this study is to evaluate the safety of operating patients for elective hand surgery and microsurgery.

Methods

We retrospectively reviewed medical records of 188 patients who underwent elective hand surgeries during the pandemic between April 2020 and April 2021 on a quaternary Hospital, in Ribeirão Preto city, in the heartland of the State of Sao Paulo. The inclusion criteria were patients submitted to elective hand surgeries and microsurgeries according to urgency criteria for each disease. Each patient who underwent surgery was previously instructed and knew about the risk of undergoing elective surgical procedures during the pandemic, as stated in the consent form for each surgery. The exclusion criteria were patients infected by COVID-19 before the surgery and patients who submitted to trauma surgery. None of the patients operated on was infected by COVID (positive polymerase chain reaction [PCR]) or have any symptoms on the day of the procedure. None of the patients had received any vaccine yet. All the surgeries were performed when the COVID-19 hospitalization rate and the local number of new cases were under control. So there was a suppleness to restart elective surgery scheduling in patients at risk of functional loss or in advanced stages of diseases.

Scheduling of Surgery and COVID Screening of Patients

The surgeries were scheduled according to the specific urgency for each disease. Patients received a phone call the day before surgery, asking if they had any symptoms or were awaiting test results for COVID (PCR test). On the day of surgery, patients attended the Hospital for surgery by appointment and without a companion. They underwent an assessment of symptoms and measurement of temperature. In case of normality, the surgery was performed. In case of abnormality, we rescheduled the surgery, and the patient was transferred to a COVID care area.

Postoperative Follow-Up and COVID Screening of Patients After Surgery

After surgery, patients were instructed to contact the Hospital if they had any symptoms of COVID or temperature changes. A return to an outpatient consultation was scheduled after 1 week, and the patient was evaluated. If any of them had symptoms, we performed a teleconsultation, and a new consultation was scheduled after 15 days. Symptomatic patients were also instructed to go to the nearest health facility for COVID PCR testing. If the patient was at the hospital reception for the outpatient consultation and reported or had any symptom or temperature change, he was referred to a COVID area for evaluation. He also received an evaluation by the hand surgery team (wearing N95, face shield, gloves, and clothing).

Personal Protective Equipment for Health Care Professionals in the Operating Room and on Returns

For patients without symptoms of COVID or temperature changes, health workers wore surgical masks. N95 masks and face shield were optional during surgery.

Health Care Professionals Screening

Health professionals needed to answer a questionnaire if they had any symptoms every time they logged into their virtual medical record account. If symptoms, the health professional needed to go to the occupational medicine section to attend to COVID. In addition, it is essential to remember the ethical aspects of self-care and the medical oath not to harm the patient; therefore, it is expected that no health professional has worked with symptoms of COVID.

Only 108 patients were eligible for this retrospective study. The mean age was 47.8 years (range: 15 days-81 years). There were 63 females at the mean age of 51.2 years (range: 3-81 years) and 45 males at the mean age of 42.9 years (range: 15 days-80 years). According to the procedure, there were 52 soft tissue, 48 bone, and 8 infection surgeries. The type of procedure was divided into 2 groups: outpatient (n = 49) and inpatient (n = 59). All the postoperative COVID-19 infections occurred after 15 days of surgery.

Table 1 presents the details about the surgery (age, gender, total procedure time, type of anesthesia, and type of procedures) in both groups and several health professionals in the operation room. The number of health care professionals included the overall number of people in the room.

Table 1. Details about Patients and Surgery Performed Divided in 2 Groups.

	Gender (F/M)	Age Mean (years)	Procedure time (minutes)	Anesthesia (general/ WALANT[b])	Surgeries performed	Number of professionals in OR Mean (range)
Inpatient (n = 59)	23/36	41.4 (15 days-81 years)	237 (42-800)	43/16	Arthrodesis (11) Tendon (1) Infection (10) Osteosynthesis (10) Vascularized fibula (10) Free flap (4) Nerve surgery (2) Implant removal (6) Congenital (3)	4 (2-9)
Outpatient (n = 49)	40/9	55.49 (27-80 years)	69 (31-199)	7/42	Carpal tunnel release (27) Trigger (8) De Quervain (2) Ganglia/tumor (12)	3 (2-5)
Total (N = 108)	63/45	47.81 (15 days-81 years)	161 (31-800)	50/58	—	4 (2-9)
P value[a]	<.001	<.001	<.001	<.001	<.001	<.001

Note. OR = operative room.
[a]Student *t* test; Mann-Whitney *U* test.
[b]WALANT = Wide Awake Local Anesthetic No Tourniquet.

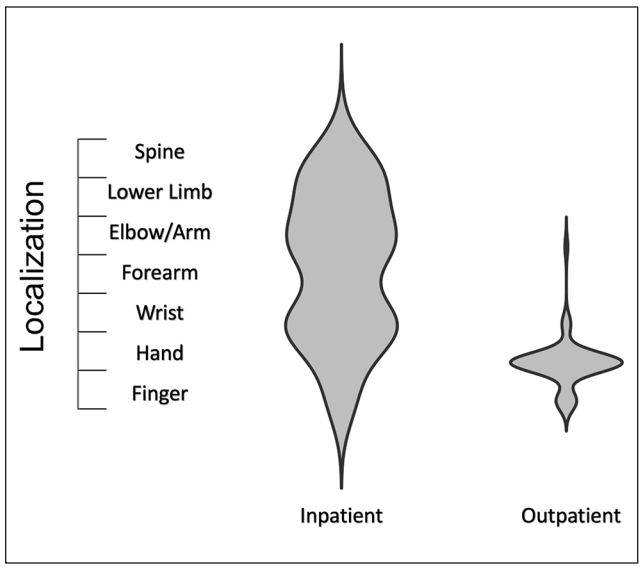

Figure 1. Distribution of the location of surgeries performed. Elbow/Arm, lower limbs, and spine refer to the localization where microsurgeries were performed.

Some procedures were performed only with a hand surgeon and the fellow, using local anesthesia.

Figures 1 and 2 present the localization and percentage of the surgeries performed for the inpatient and outpatient procedures.

A 2-tailed *P* value of less than .05 was considered statistically significant. All analyses were performed using SPSS for OS X, Version 22.0.0 (SPSS; IBM Corp., Armonk, New York).

Results

There were 7 patients (6.48%) who got infected by COVID-19 during the postoperative period in outpatient care. The inpatient infection rate was 10.17%, whereas the outpatient infection rate was 2.08% (Student *t* test: $P = .089$). There were no infections during the inpatient care. There were no statistical differences between the total time of the procedure (Student *t* test: $P = .805$), the number of health care professionals in the operating room (Student *t* test: $P = .554$), type of the procedure (Student *t* test: $P = .250$), and the use of public transportation (Student *t* test: $P = .235$).

Patients with more outpatients' visit records (Student *t* test: $P = .089$) and associated diseases presented a tendency of COVID-19 infection in the outpatient postoperative period (Student *t* test: $P = .077$). None of the 108 patients died of COVID-19, and the only 1 who needed intensive care was discharged after 4 weeks. There was a tendency for patients submitted to inpatient surgery to have acquired COVID-19 during the postoperative period (Mann-Whitney *U* test: $P = .089$), as observed in Table 2.

There was a gender difference between the groups, with more women in the inpatient group ($P < .001$) who were also older ($P < .001$). Although more women acquired COVID during outpatient visits, there was no statistical difference between the inpatient and outpatient groups ($P = .472$).

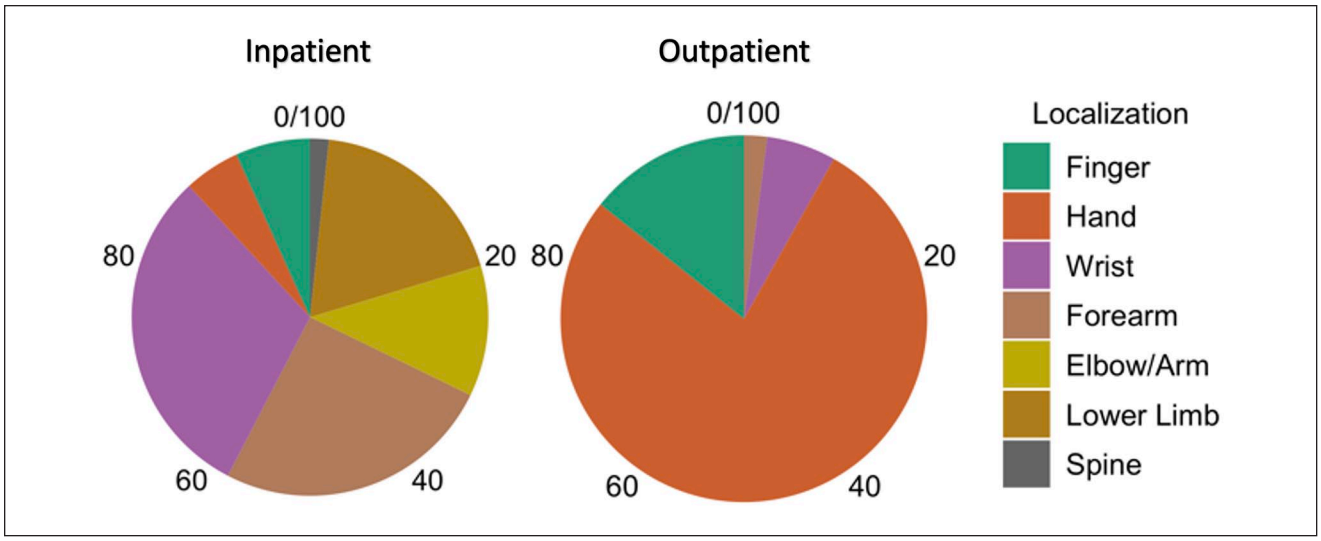

Figure 2. Inpatient versus outpatient surgical localization percentage.

Table 2. Type of Procedure and Rate of COVID-19 Infection.

	Infected[a]	Not infected
Inpatient (n = 59)	6 (10.17%)	53 (89.83%)
Outpatient (n = 49)	1 (2.05%)	48 (97.95%)
Total (N = 108)	7 (6.48%)	101 (93.52%)

Note. COVID-19 = coronavirus disease 2019.
[a]Student *t* test; Mann-Whitney *U* test: $P = .089$.

The statistical power was more significant than 0.8 based on Cohen's *d* test for each variable, showing that large samples are needed to analyze the correlation better.

Discussion

During the COVID-19 pandemic, Brazil was not the best example of combating the new coronavirus. However, regarding the entire social, economic, and political context observed in the country and considering the postoperative infection rates of elective surgeries performed in a quaternary hospital, we reached a COVID-19 postoperative infection rate of 6.48% for hand surgery, microsurgery, and upper limb. Furthermore, this Hospital is still the main reference center for admissions of severe cases of COVID-19.

The ASA classification did not interfere with the surgical intervention performed, as our hospitals have 2 patient patterns. Patients requiring complex surgeries due to the disease, the need for a specialist, or surgical complications generally have fewer comorbidities (ASA I or II), or patients ASA (American Society of Anesthesiologists Classification) III or IV with less complex surgeries need a more experienced anesthesiology team. The anesthesiology team helped to perform more outpatient procedures. Surgical triage scoring tests were widely used during the pandemic, such as the MeNTS (Medically Necessary Time-Sensitive) scoring system described by the American College of Surgeons. Unfortunately, our team has not yet adhered to this system.[6]

Transmission rates in Brazil during the same period were reported between 2358 to 4474 cases per million, and mortality of 156.6 to 331.8 cases per million.[4,5] It is also important to emphasize that our hospital followed the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) determinations, creating guidelines that meet the standards of excellence in other hospitals.

In addition, the Hospital is part of one of the largest universities in the world, having other teams that contributed to the research, creation, and testing of vaccines and protocols to control the new coronavirus. These factors are to demonstrate the contrast experienced by different medical teams during this catastrophic period. It is also important to emphasize that all patients in this study are from a hospital belonging to the free public health system ("SUS" or "Sistema Único de Saúde"). It is reiterated that the socioeconomic and cultural profile of patients referred to this Hospital is shallow. However, there was no statistical difference between patients. We emphasize that many of the patients who were operated on at this Hospital used public transport, ambulances, and vehicles for transportation. We were unable to identify whether COVID-19 contamination occurred within the Hospital, during the patient's journey to medical care, or at home. However, of the 7 patients infected during outpatient consultations, 1 became symptomatic 4 weeks after surgery and 6 patients after 12 weeks. No patient was infected on the same day of the outpatient consultation.

While this article was written, the death rate in Brazil was 454 429, with 9.09% of the population fully vaccinated, with a rate of 80 486 new cases in 24 hours. These values for the state of São Paulo were 109 241 deaths and 16 671 new cases in 24 hours. It is also essential to consider that none of these patients had symptoms of COVID before surgery, and none of the patients had received any dose of vaccines. All patients were operated on by the authors of this study, who had their vaccine doses completed after March 2021.[5,7-10]

None of the health care professionals had COVID symptoms before, during, or after the surgeries. The hospital has an efficient communication network between employees and patients, which prevents inadequate exposure. Despite honestly, we are in an underdeveloped country, which was not an excellent example of combating the pandemic. For us, who live through all these difficulties and live within this precarious situation in a country with high socioeconomic contrast, the fact of having this outpatient infection rate is something encouraging. However, we agree that these rates are high and stormy considering developed countries like the United States and Europe. Given this, we considered that the safety of performing elective hand surgery during the pandemics remains unclear.

On the contrary, regarding the 2.08% outpatient infection rate, and considering that Brazil had one of the worst international scenarios for coronavirus control, there might be a light on the end of the tunnel, providing that there is control of the preventive measures recommended by the WHO/CDC. Our outcomes demonstrate that outpatient surgeries with a low number of outpatient consultations did not result in any contamination, even in older patients. Furthermore, our results are comparable with data in other reports that presents no deaths in patients submitted to elective surgeries.[7-9]

It is important to emphasize that the number of 188 surgeries performed electively in 1 year during the pandemic may seem significant compared with the approximate number of 500 surgeries/year without pandemics—our maximum staff capacity limit per hospital structural conditions. Before the pandemic, we had more than 2000 patients awaiting a vacancy for outpatient care for evaluation by our team for the possibility of elective surgery in our surgical schedule. Our team used to provide outpatient care for 300 patients a day. During the pandemics, we provided only preoperative and postoperative care outpatient consultations. This information may sound aberrant, but it is part of the reality experienced by an underdeveloped country that has a health system that, despite being contrasting, can manage patients with dignity.

Other studies presented alternatives to postoperative follow-up, as virtual clinics consultation could reduce the exposition to the postoperative evaluation.[10,11] But it did not exclude the risk of changing wound dressing during follow-up or the necessity to do a radiographic evaluation. We also find similar results comparing with other reports that evaluated orthopedic surgery (trauma or elective).[12,13]

Conclusion

We concluded that the safety of performing elective hand surgery during the pandemic remains unclear, and more studies with larger samples are needed to clarify this question. However, no study can reproduce the reality of each country's health system.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

This report has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Statement of Informed Consent

The patient and his family were informed that data from the case would be submitted for publication and gave their consent.

Declaration of Conflicting Interests

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