



Research

Special Topic

Evaluating Postoperative Outcomes of Patients Undergoing Elective Procedures in an Ambulatory Surgery Center During the COVID-19 Pandemic

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Abstract

Background: Despite the rapid increase in the number of publications pertaining to COVID-19, there is a lack of data examining patient outcomes following elective procedures performed during this pandemic.

Objectives: The purpose of this investigation was to examine the postoperative outcomes of patients who underwent elective procedures in an ambulatory surgery center during the COVID-19 pandemic, and to share the preoperative screening and patient selection protocol implemented in our center.

Methods: Elective procedures performed in an ambulatory surgery center between March 1, 2020 and April 16, 2020 were retrospectively reviewed. The primary outcomes were occurrence of COVID-19–related postoperative complications. These complications include pneumonia, stroke, myocardial infarction, and clotting disorders. The predictive variables analyzed in this study were age, American Society of Anesthesiologists score, specialty conducting the procedure, operating time, and the type of plastic and reconstructive surgery procedure being performed.

Results: A total of 300 consecutive elective cases were included in the study. The most common procedures were pain management (43.0%), gastrointestinal (26.0%), aesthetic (14.0%), orthopedic (10.3%), reconstructive (4.0%), otorhinolaryngology (2.0%), and gynecology (0.67%). The median age of the cohort was 54.6 years (range, 1–90 years) and the median procedure time was 47 minutes (range, 11–304 minutes). COVID-19–related symptoms or complications following the procedures were not observed in any of the patients or in the healthcare care personnel.

Conclusions: In this cohort of 300 elective cases, we found no patients with COVID-19–related symptoms postoperatively. This suggests that with proper preoperative screening and patient selection, elective procedures can be safely performed in an ambulatory surgery center during this pandemic.

Level of Evidence: 4

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As the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) swept across the globe, the coronavirus 2019 (COVID-19) pandemic has paralyzed our society, economy, and healthcare system. Elective surgical procedures are among the elements disrupted both in hospitals and ambulatory surgery centers (ASCs). In an attempt to maximize medical resources and minimize infection rates, on March 13, 2020, the American College of Surgeons issued a recommendation to “minimize, postpone, or cancel electively scheduled operations.”¹ Almost 2 months later, Texas is strategically reopening its economy, and its Governor has lifted the restriction on performing elective procedures.

Although there has been a rapid increase in the number of publications pertaining to this virus and its overall disease state, there is a paucity of data examining the postoperative outcome of patients undergoing elective procedures during this crisis. In other words, is it still safe for us to perform elective surgery? The only study examining postoperative outcomes following elective procedures during this pandemic has considerable demographic and epidemiologic limitations, which render the data difficult to apply to other healthcare settings.^{2,3} As we move forward in restarting our practices, the safety of our patients and medical personnel remains, as always, the main priority. Therefore, the objective of this study was to examine the postoperative outcomes of patients who underwent elective procedures in an ASC during the pandemic, and to share the preoperative patient screening and selection protocol implemented in our center.

METHODS

A retrospective review of all elective cases performed in an ASC in Dallas, TX between March 1, 2020 and April 16, 2020 was performed. Guidelines of the Declaration of Helsinki were followed. The ASC’s monthly deidentified procedure data sheet was reviewed, and all the physicians were surveyed for any potential postoperative COVID-19–related complications recorded among their patients or any of the medical staff. The primary outcome was occurrence of COVID-19–related symptoms postoperatively. These complications include pneumonia, stroke, myocardial infarction, and clotting disorders. Predictive variables analyzed in this study were age, American Society of Anesthesiologists (ASA) score, specialty conducting the procedure, operating time, and the type of plastic and reconstructive surgery procedure being performed. As the COVID-19 outbreak unfolded, our ASC immediately applied a rigorous protocol for preoperative screening and selection of patients derived from recommendations from multiple organizations, including The Aesthetic

Society Covid-19 Safety Taskforce.^{4,5} This protocol is delineated below.

Seven Days Prior to Procedure

We ask the patient 7 days before the procedure to self-monitor by taking their temperature and check for any symptoms such as fever, cough, shortness of breath, malaise, diarrhea, or loss of taste/smell. Furthermore, we instruct the patient to call their primary care physician immediately if they develop any symptoms.

Three Days Prior to Procedure

Patients undergo a telephone screening 3 days before their procedure. During this telephone call, our nurses utilize the most recent screening guidelines provided by United Surgical Partners International.⁶ Any positive responses result in a delay of procedure and the recommendation that patients self-quarantine and follow the current US Centers for Disease Control and Prevention (CDC) recommendations for testing.

On the Day of the Procedure

The patient and their visitor/guardian (of which we only allowed one) must both wear a mask on the day of the procedure. If they do not have a mask, one is provided to them on arrival. With the exception of pediatric or incapacitated patients, we advise the visitor/guardian not to accompany the patient after check-in at the facility during the preoperative stage. They are asked to wait outside the facilities or at home during the procedure. Visitors/guardians are routinely updated via telephone about the status of the procedure, and upon completion of the procedure.

Upon arrival, the patient is greeted by one of our staff. Staff wear gloves, masks, and face shields. At this time, patients and visitors are screened for potential COVID-19 symptoms, including temperature scanning. If the patient and/or visitor has a temperature of 100 °F or higher, we isolate them and serially record the patient’s temperature for a period of 30 to 60 minutes. If consistent fever is noted, we then reschedule the procedure, and ask the patient to practice social isolation/quarantine and to follow the current US CDC recommendations for testing.

Cleared patients then enter the ASC and proceed to the individual registration bays. A specialized sneeze-guard is installed on each of the registration counters. The registrant is instructed to wear a mask at all times.

After registration, patients proceed alone to the preoperative unit. Only visitors/guardians of pediatric or incapacitated patients are allowed to accompany the patient to the preoperative unit. Although a large waiting room is

Table 1. Patient Demographics, ASA Score, Type of Anesthesia, and Procedure Time

	Cohort
	N = 300
Demographics	
Median age, years (range)	27 (1-90)
ASA score, n (%)	
I	66 (22.0)
II	134 (44.7)
III	99 (33.0)
IV	1 (0.3)
Type of anesthesia, n (%)	
General	96 (32.0)
Monitored anesthesia care	24 (8.0)
Intravenous sedation	169 (56.3)
Local anesthesia/blocks	8 (2.7)
No anesthesia	3 (1.0)
Procedure time, minutes (range)	
Median time	47 (11-304)

ASA, American Society of Anesthesiologists.

available, family members are asked to wait in their car, in the plaza outside, or in a nearby establishment.

At the preoperative unit, all staff members are instructed to wear an N-95 mask or 3-ply OR masks, gloves, and face shields if desired. Meticulous hand hygiene before and after treating is mandated.

In the operating room, the anesthesiologist and circulating nurse are the only personnel allowed during intubation and extubation. All staff are required to wear N95 masks and are recommended to wear protective equipment as well. Surgeons/surgical teams don N95 masks for higher-risk airway procedures; however, surgeons and team members wear masks of choice for other procedures.

Patients are always extubated in the operating room before transport to the postoperative anesthesia recovery unit. Patients are treated by a single recovery room nurse from arrival to discharge to minimize provider-patient interactions.

RESULTS

A total of 300 consecutive elective cases were included in the study (mean age, 27 years; range, 1-90 years). The median procedure time was 47 minutes (range, 11-304

Table 2. Procedures Stratified by Specialties

	Cohort, n (%) (N= 300)
Pain management	129 (43.0)
Gastrointestinal medicine	78 (26.0)
Aesthetic surgery	42 (14.0)
Orthopedic	31 (10.3)
Reconstructive surgery	12 (4.0)
Otorhinolaryngology	6 (2.0)
Gynecology	2 (0.67)

minutes) (Table 1). The cases included pain management (43.0%), gastrointestinal (26.0%), aesthetic (14.0%), orthopedic (10.3%), reconstructive (4.0%), otorhinolaryngology (2.0%), and gynecology (0.67%) (Table 2). Seventy-five aesthetic and reconstructive procedures were performed: mastopexy (12.0%), liposuction (12.0%), breast implant exchange (10.7%), breast augmentation (9.3%), Mohs reconstruction (9.3%), blepharoplasty (8.0%), CO₂ laser (6.7%), facelift and necklift (6.7%), abdominoplasty (5.3%), rhinoplasty (4.0%), breast fat grafting (2.7%), breast reduction (2.7%), closed nasal reduction (2.7%), gluteal augmentation with fat transfer (2.7%), abdominoplasty revision (1.3%), breast augmentation-mastopexy (1.3%), and buccal fat resection (1.3%) (Table 3). The majority of the patients had an ASA score of II (44.7%), followed by scores of III (33.0%), I (22.0%), and IV (0.3%). The most common anesthesia modalities were intravenous sedation (56.3%), followed by general anesthesia (32.0%), monitored anesthesia care (8.0%), and blocks (2.7%) (Table 1). Documented positive COVID-19 diagnoses or COVID-19–related symptoms following the procedures were not reported in any of the patients among the healthcare care personnel. One preoperative nursing staff was diagnosed with COVID-19; however, she had elected not to work in the center during this

Table 3. Aesthetic and Reconstructive Procedures

	Cohort, n (%) (N = 75)
Liposuction	9 (12.0)
Mastopexy	9 (12.0)
Implant exchange	8 (10.7)
Mohs	7 (9.3)
Breast augmentation	7 (9.3)
Blepharoplasty	6 (8.0)
CO ₂ laser	5 (6.7)
Facelift	5 (6.7)
Abdominoplasty	4 (5.3)
Rhinoplasty	3 (4.0)
Gluteal fat transfer	2 (2.7)
Closed nasal reduction	2 (2.7)
Breast fat grafting	2 (2.7)
Breast reduction	2 (2.7)
Abdominal skin excision	1 (1.3)
Buccal fat removal	1 (1.3)
Breast implant removal	1 (1.3)
Breast augmentation-mastopexy	1 (1.3)

period and her husband had contracted COVID-19 elsewhere. The mean follow-up time for physicians, patients, and healthcare personnel was the 6-week perioperative period. Although urgent elective procedures were performed throughout this time period, elective aesthetic and reconstructive surgery cases were stopped after recommendations by the state of Texas.

DISCUSSION

The rapid progression of COVID-19 has caused an unprecedented disruption in our healthcare system, but particularly regarding elective surgical procedures. Despite the rapid growth of COVID-19 literature, there is a lack of data regarding patient outcomes following elective procedures performed in an ASC during this critical time. At the present time, a study by Lei et al³ is the only one examining the postoperative outcome of patients following elective procedures performed during this pandemic. They retrospectively reviewed 34 patients with COVID-19 infection who underwent elective surgical procedures at a hospital center in Wuhan, China. In their cohort, 44.1% of patients

required ICU admission and 20.5% died. Furthermore, they showed that age, comorbidities (especially hypertension and cardiovascular disease), complexity of surgery (ie, Levels 2 and 3), and operating time were possible risk factors for ICU admission.³ They suggested that surgery and operating time were risk factors for exacerbation and increased the severity of COVID-19 symptoms. Although this study provides important information, it has a number of flaws and limitations, particularly with respect to epidemiologic and demographic characteristics, that make its findings less applicable to ASCs within the United States. The study was conducted in a hospital in Wuhan, the city where the COVID-19 outbreak originated, just weeks after its first reported case of COVID-19.⁷ At such an early stage, the recognition of this disease was not evident, and therefore proper preoperative screening and patient selection most likely had not yet been implemented in this institution. Another major flaw of this study is that it is not known when the patients contracted COVID-19. The authors assume that the patients were infected during surgery because the average time for onset of symptoms following surgery was 5 days. However, it is inaccurate to conclude that this represents outcomes for asymptomatic COVID-19 patients. There is a high likelihood that these patients contracted the disease postoperatively from a nosocomial exposure.

Furthermore, 58.8% of the patients had at least 1 comorbid condition, including malignancy (26.2%) and cardiovascular disease (20.6%). The case mix of the Chinese study, which included esophageal and renal carcinoma resections, was also quite dissimilar to typical ASC elective procedures. In the current situation, these high-risk patients would have undergone a more rigorous screening and testing before undergoing elective surgery. It is for these reasons that we have decided to present our data, as it depicts a patient population, and a clinical setting, that better reflects the majority of ASCs in the United States.

Our study demonstrated that with proper preoperative screening and patient selection, elective procedures could be safely performed during this time of crisis, and perhaps most importantly, this suggests that we can maintain excellent patient safety during similar future outbreaks with the protocols we have established within our practice. Preoperative screening consisted of a comprehensive medical history and physical examination. Because reliable diagnostic tests were not readily available at the time of the procedures, none of these patients underwent diagnostic testing prior to their procedure. Instead, any patient with symptoms or risk factors relevant to COVID-19 had their procedure delayed. Now that tests are becoming more available, there is a strong drive to test all patients preoperatively, as this will theoretically help identify patients who are either asymptomatic or have mild

symptoms. This patient population would be the primary target in outpatient facilities; however, the benefit of this widespread testing is determined by the accuracy of these tests and this currently is not established. In fact, even the original CDC real-time polymerase chain reaction (RT-PCR) test has turned out to have a 35% false-negative rate, and now with over 90 different tests available, both RT-PCR and antibody, it is not clear whether these tests are sufficiently reliable, available, and reproducible to make widespread preoperative testing a reality. Our center has not mandated universal testing for these reasons, and the reality is that the current testing accuracy and time lag prevents it from being realistic to test every patient at this time point. A recent CDC report shows that the overall symptomatic case fatality rate of COVID-19 is 0.4%.⁸ The same CDC report also cites that 35% of patients are asymptomatic and they are not included in that rate; thus the infection fatality rate will be lower as it takes into account both symptomatic and asymptomatic patients. Furthermore, given the recent remodeling of the actual mortality and hospitalization rates of COVID-19, which approximates those of seasonal flu,⁹ we must ask whether universal preoperative testing for influenzas should be implemented in addition to COVID-19 testing. Alternatively, routine screening and temperature checks have worked quite well for screening seasonal flu patients, and based on the data from our series also have worked similarly with COVID-19.

Currently, the recommended diagnostic test is RT-PCR of nasopharyngeal swab samples. Nonetheless, the accuracy of these RT-PCR tests is limited, as the only reported results for their sensitivity and specificity have been in non-peer-reviewed articles.¹⁰ Ren et al¹¹ reported a sensitivity and specificity of 78.2% and 98.8%, respectively. Furthermore, the sensitivity for patients with mild symptoms was 62.5% and the negative predictive value of the test is poor; thus, a single negative result does not rule out COVID-19. On the other hand, several peer-reviewed articles have reported false-negative results with RT-PCR tests as described below.^{12,13} Based on all of this, we question the logic of universal testing until a quick bedside “pregnancy-like” test for COVID-19 is available. It is important to note that COVID-19 preoperative screening tests were not performed in this studied patient population; however, now that tests are readily available, preoperative COVID-19 screening tests are performed on patients who are at high risk for exposure (eg, medical health workers), have medical comorbidities, or are undergoing facial surgery. Based on the experience in this study, and now another 2 months of procedures after this dataset was analyzed with similar outcomes, the need for routine blanket testing should be reassessed.

Another key issue is the concept of the asymptomatic patient who is screened negative, has a normal

temperature, and tests negative (if any testing has been performed). Current data suggest that COVID-19 was in the United States in December 2019 and perhaps earlier.¹⁴⁻¹⁶ Asymptomatic patients comprise 35% of the population infected with COVID-19, and it is highly likely that many elective procedures were done on asymptomatic COVID-19 patients in the early part of 2020. Additionally, it is known that 20% of influenza cases are asymptomatic and by default that would mean that thousands of elective surgeries are done every year on asymptomatic flu carriers;¹⁷ however, there have been no unexplained postoperative complications in healthy patients, which would question the logic of assuming asymptomatic COVID-19 patients would have a problem with elective surgery. Because preoperative testing is not routinely performed during influenza season in asymptomatic patients, and because the influenza viruses and COVID-19 appear to act in a similar fashion regarding the potential for severe complications (especially in susceptible patients), such testing does not seem to be indicated due to the data not showing significant postoperative morbidity occurring in the low-risk population. Of course, it goes without saying that if symptoms exist, especially in a high-risk group, and surgery is important, but potentially able to be delayed, testing may be worthwhile.

There have been several reports of an association between COVID-19 and Kawasaki-like inflammatory response in the pediatric population.¹⁸⁻²¹ Although the etiology of Kawasaki disease is unknown, there are substantial data suggesting that it is likely due to a viral etiology.²²⁻²⁹ The viruses associated with Kawasaki disease include influenza, enterovirus, adenovirus, rhovirus, respiratory syncytial virus, varicella, Epstein-Barr, measles, and dengue.^{22-25,27-29} Furthermore, an association between Kawasaki disease and coronavirus has been previously described.²⁸ It has been hypothesized that certain pediatric patients may be genetically predisposed to a hyperinflammatory response to specific viruses and manifest a spectrum of Kawasaki disease.²⁶ Our study included 7 patients aged 21 years and younger, and there was no report of hyperinflammatory issues. This is an evolving spectrum of COVID-19 infections, and there is much to learn; however, we must put these findings in the context of what is already known and be careful not to create new clinical diagnoses or to exaggerate previous clinical entities because of their association with COVID-19.²⁶

Furthermore, the concerns regarding COVID-19 and coagulopathies, stroke, myocardial infarction, and respiratory failure are known to occur in patients with both influenza A and B.³⁰ Published studies describe these medical conditions, and as mentioned, they tend to occur in more critically ill patients. These problems may be more an effect of critical illness rather than due to a specific strain of

viral infection.^{31,32,33} We did not see any of these types of complications in our patient series.

Safety of healthcare personnel is a priority, and this is another reason why in our center we delay any elective procedure on a patient with a remarkable COVID-19–related history or physical exam; however, implementing a routine RT-PCR preoperative testing protocol for every procedure to prevent potential infections among healthcare personnel may be a misuse of resources and is not cost effective. SARS-CoV-2 replicates on the epithelial cells of the upper respiratory tract, and thus the highest viral load is found in the nasopharynx, peaking 4 to 6 days after the onset of symptoms. Although low viral RNA loads have been found in stool samples, viral RNA has not been detected in urine or blood samples.³⁴ Furthermore, there is a correlation between symptoms and viral load.³⁵ Different procedures have different relative risks of transmission: a transnasal procedure may have a higher transmission risk than a breast or body-contouring operation. Therefore, it may be prudent to perform preoperative RT-PCR testing for a procedure that involves or is close to the nasopharynx or oropharynx, but not for an operation that does not involve these anatomic regions. All medical personnel should wear proper personal protective equipment (PPE) during the preoperative, intraoperative, and postoperative stages. The effectiveness of PPE among healthcare workers during the care of COVID-19–infected patients has been demonstrated.^{36,37} There was an incident in a hospital in Wuhan where 14 healthcare workers were allegedly infected with COVID-19 after caring for a patient who underwent endonasal endoscopic surgery for a pituitary adenoma. This case was inaccurately cited multiple times for the concerns it raised about surgical personnel; consequently, the physicians involved in this case decided to publish this incident to clarify all misinformation.³⁷ In their case report, the authors established that although 14 medical staff were infected during this patient's hospitalization, none of them had participated in the surgery. The infected personnel included 4 nurses who had been in direct contact with the patient but had not worn PPE and 10 medical staff who had no contact with the patient. Furthermore, none of the staff, including the surgeons, who had been in contact with the patient and had worn proper PPE got infected. It is important to note that the patient was diagnosed with COVID-19 postoperatively; thus, it is possible that the patient may have been infected after undergoing this procedure. These details underscore the importance of being objective and data driven when reporting observations and conclusions regarding COVID-19. There has been more misinformation and fake news on COVID-19 than about any other medical condition.

A key limitation of our study is that it is retrospective. We also recognize that the study does not have positive (COVID-19 infected) and negative (COVID-19 noninfected) groups; however, the aim was to identify the incidence of postoperative COVID-19–related complications in patients or personnel, which would include any positive COVID-19 tests if indicated based upon symptoms and national recommendations, in a cohort of patients undergoing elective surgery during this pandemic. Furthermore, it would be problematic from a safety and ethics standpoint to perform elective procedures on a patient with a known, symptomatic COVID-19 diagnosis, just as it would be to operate on a patient with a known, symptomatic influenza diagnosis. Because of our limited access to patient information we were not able to collect additional data (ethnicity, gender, medical conditions, etc). A multicenter review study should be considered in the future, because this could provide us with greater sample size, and thus stronger evidence. This study, however, may represent a crucial first step in that direction regarding proven patient safety when undergoing elective surgery within the United States during a viral pandemic.

CONCLUSIONS

We found no COVID-19–related complications in a cohort of 300 patients who underwent elective procedures at an ASC following a strict preoperative screening protocol. This is further evidenced by the fact that no patients or staff studied developed viral prodromes or went on to get a COVID-19 test that resulted positive or had any postoperative complications. Careful preoperative screening and specific assessment enabled us to exclude any potential COVID-19 symptomatic patient without blanket mandated testing, thus maintaining safety among patients and medical personnel. We hope this investigation stimulates further interest in the study of this topic.

Disclosures

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