Research

Can Outpatient Plastic Surgery Be Done Safely During a COVID-19 Surge? Results of a July 2020 Los Angeles Survey and Literature Review

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Steven Teitelbaum, MD, FACS; John Diaz, MD, FACS; and
Robert Singer, MD, FACS

Abstract

Background: A moratorium was placed on nonurgent surgery throughout much of the United States in mid-March 2020 due to surging numbers of COVID-19 cases. Several months later, and with new safety precautions in place, elective surgery gradually resumed. However, no data exist on the safety of plastic surgery during the pandemic.

Objectives: This aim of this survey was to assess the safety of plastic surgery during the pandemic by quantifying: (1) the preoperative prevalence of SARS-CoV-2; (2) the risk of postoperative COVID-19; (3) outcomes and precious resource utilization for such cases; and (4) the risks to office staff.

Methods: Los Angeles plastic surgeons certified by the American Board of Plastic Surgery (ABPS) were sent an online survey in July 2020, during a local COVID-19 surge, querying about the number of procedures performed in the 8- to 10-week period since reopening, testing policies, surgical complications, and cases among staff.

Results: In total, 112 surgeons reported 5633 surgeries since resuming elective surgery. Of these, 103 (91.96%) surgeons obtained a preoperative SARS-CoV-2 polymerase chain reaction (PCR) test for every patient. The preoperative PCR test was positive in 41/5881 (0.69%). Positive tests within 2 weeks postoperation occurred in 7/5380 (0.13%) of surgical patients, 3/8506 (0.04%) of injection patients, and 6/2519 (0.24%) of energy therapy patients. Nine offices reported at least 1 staff member who developed COVID-19. All cases were mild, with no hospitalizations or deaths.

Conclusions: These data demonstrate that plastic surgery can be performed safely during a COVID-19 surge by ABPS diplomates. This has profound impact for patients, plastic surgeons, and health policy regulators.

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One cannot overstate the sense of portend that gripped the United States in March 2020. Cases of COVID-19 were rising rapidly, testing was limited, and there was fear that a deluge of critically ill patients would overwhelm the healthcare system. In a few dizzying days, most of the country went from normal to lockdown as various levels of government and health departments closed schools, issued stay-at-home orders, and shuttered nonessential businesses.

Dr Teitelbaum is an Associate Clinical Professor (Voluntary) of Plastic Surgery, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA. Dr Diaz is a plastic surgeon in private practice in Beverly Hills, CA. Dr Singer is Clinical Professor (Voluntary) of Plastic Surgery, University of California, San Diego, La Jolla, CA.

Corresponding Author:
Dr Steven Teitelbaum, 1301 20th Street #350, Santa Monica, CA 90404, USA.
E-mail: steve@drteitelbaum.com; Instagram: @drsteventeitelbaum

Most states also stopped nonurgent surgery. Hospitals needed to stock up on personal protective equipment (PPE), increase their supply of ventilators, convert operating rooms to ICUs, and conserve anesthetic drugs that were needed for ICU patients. Individual plastic surgeons and their societies responded by volunteering the use of their operating rooms, donating their PPE, and offering their ventilators to hospitals.[1]

By early May many states had passed their peak and started loosening restrictions on elective surgery. In many areas the backlog of postponed surgeries exceeded operating room availability. Systems were proposed to prioritize cases according to measures of necessity, urgency, and nonsurgical alternatives.[2,3] A group at UCLA developed a Plastic Surgery Acuity Scale to determine the ideal prioritization of plastic surgery patients.[4]

Whereas the fundamental issue for the hospital setting was rationing limited operating room time, office-based and freestanding ambulatory surgery centers had an overabundance of operating room availability. For plastic surgeons operating in those facilities, their singular concern was patient safety.

At the start of the pandemic, The Aesthetic Society President Charles Thorne MD appointed James Fernau MD to become chairman of a task force on COVID-19 safety. His group put on a number of webinars and distributed detailed information about how to reduce the risks of performing plastic surgery during the pandemic.[5] Plastic surgeons also received recommendations from other surgery societies, and via multiple publications that appeared throughout the surgical literature.[6-10] But there was no certainty that these inchoate recommendations would be sufficient to protect patients and operating room personnel.

There was great concern about preventing patients, staff, and surgeons from infecting one another. This led to many suggestions about protective equipment, air circulation in the operating room, sterilization of anesthesia circuits, etc. The other issue had to do with the risks of anesthesia and surgery on patients who were infected but asymptomatic. At least 1 paper from China reported an increased risk of complications and mortality from COVID-19 infections after surgery compared with historic controls.[11]

For these reasons many—but not all—organizations recommended preoperative polymerase chain reaction (PCR) testing. If a patient were known not to be infected when they entered the operating room, then theoretically surgery would be every bit as safe as it was before SARS-CoV-2 reached our shores. But there were destined to be false negative tests. Would the testing be sensitive enough to catch most of the infected patients? Would there be many patients who were false negative, got infected between testing and surgery, or who might get infected during surgery? If so, what was their risk of getting a serious infection? Would getting plastic surgery give them a worse case of COVID-19 than they otherwise would have had? If so, would these patients use limited hospital resources? Might some die?

Alongside their concern about the safety of performing plastic surgery, plastic surgeons were also aware that public health department officials and politicians might decide to place another moratorium on elective surgery. If surgery were unsafe, plastic surgeons would choose not to operate; but there was widespread concern that even in the absence of data, a health official might take the reactionary step of curtailing elective surgery. Thus the need to develop these data was important for patient safety as well as to inform public policy makers.

METHODS

The Los Angeles Society of Plastic Surgeons (LASPS) sent a 17-question survey (SurveyMonkey, Palo Alto, CA) to approximately 409 plastic surgeons certified by the American Board of Plastic Surgery (ABPS) in the greater Los Angeles area in the third week of July 2020, inquiring about their practices since their reopening in late May (Table 1). Recipients were assured the results would be anonymous. Reminders were sent every other day during the 1-week period the survey was open. The data were collectively analyzed by the 3 authors. Because the survey did not request patient-specific information and the respondents were untraceable, institutional review board approval was not required nor sought and patient consent was not required. We followed the Declaration of Helsinki Guidelines and best ethical practice guidelines. Information about the prevalence of COVID-19 during the period of the study was retrieved from the website of the Los Angeles County Department of Public Health (http://publichealth.lacounty.gov/media/coronavirus/) and appears in Figures 1-3.

We searched for publications about COVID-19 and surgery. The PubMed database (US National Library of Medicine) was used to search the medical and scientific literature. No time range or language restrictions were specified in order to capture as many articles as possible. The following search terms were used individually: “COVID,” “COVID-19,” and “SARS-CoV-2.” The following terms were used in combination with COVID/COVID-19/SARS-CoV-2: “Surgery,” “Elective Surgery,” “Plastic Surgery,” and “Complications.” The search was conducted in August 2020 (J.F.D.). The results were reviewed by all 3 authors. Articles were grouped into 3 categories: (1) articles relevant to plastic surgery protocols during the COVID pandemic; (2) articles describing the clinical characteristics of COVID infection; and (3) articles relevant to rates of complications after surgery. The content of the articles was analyzed and a consensus was made about which articles were most applicable to the manuscript.

Table 1. Survey Questions

1. How many surgeries have you performed since you restarted operating?
2. Do you do a preoperative PCR screening test on all surgical patients?
3. How many such tests have you done?
4. How many of those were positive?
5. How many patients who were negative preoperatively had a positive COVID-19 test within 14 days after surgery?
6. If any, how many were admitted to the hospital?
7. Please describe the clinical course of any patients who tested positive after surgery. Where was the case performed (hospital, ASD, or office surgi-center)?
8. How many patient visits did you have to inject fillers or toxin since reopening?
9. How many of those patients tested positive for COVID-19 within 14 days after the injection?
10. If any, please provide details
11. How many patient visits did you have for a noninvasive "plug-in-the-wall" procedure such as radiofrequency, ultrasound, laser, etc?
12. How many of those patients tested positive for COVID-19 within 14 days after the procedure?
13. If any, please provide details
14. How many members of your staff have tested positive for COVID-19?
15. How many of those were due to exposure in the office?
16. If any, please provide details
17. What is the city of your main office?

ASD, ambulatory surgery center; PCR, polymerase chain reaction.

RESULTS

In total, 128 responses (32%) were received. Eleven responses were from outside Los Angeles County and were discarded because the study was meant to focus on that county alone. Public health data in this region are listed by county and so a correlation of complications relative to prevalence could only be made if the sampled area corresponded with the available public health data. Five other respondents were deleted because they provided answers to some questions that conflicted with their answers to other questions, denoting an error in documenting their response—eg, answering that they always did preoperative testing, but responding that they had done zero tests, or listing more postoperative COVID-19 cases than surgeries done. All 3 authors agreed on these 5 deleted responses.

After eliminating those 16 responses, the remaining 112 responses used in this study yielded a net response rate of 27%. However, some of those 409 originally surveyed practiced outside of Los Angeles County, some were residents, practitioners in institutional or HMO settings, or even retired. Therefore, the response rate of actively practicing physicians in Los Angeles County was undoubtedly significantly higher than 27%, and represents a very high response rate for a survey of this type, indicating the high level of interest plastic surgeons have in this safety information.

The respondents' primary offices were in the following areas: Beverly Hills (47%), Los Angeles (19%), Santa Monica (7%), Torrance (6%), Pasadena (5%), and the other 16% divided between cities with less than 3% each.

The survey did not ask for a breakdown of the types of procedures that were done, but because it was sent to all surgeons in the area, presumably there were responses from surgeons with predominantly reconstructive practices, predominantly aesthetic practices, and mixed practices.

The respondents reported a total of 5633 surgeries (average 50/surgeon) since recommencing operating. Most LASPS members resumed in either the third or fourth week of May (assessed by J.D.). With the closure of the survey at the end of the third week of July, most respondents would have been reporting on 9 or 10 weeks of surgery.

Figure 1 shows the average daily number of new COVID-19 cases in Los Angeles County during the spring and summer of 2020; the period of time during the case collection is within the highlighted box. Figure 2 shows the running 7-day average of the percentage of tests that were positive, which is considered to be a leading indicator of the trend of infection growth. Figure 4 shows hospitalization rates. All 3 figures show strong upward trends during the period sampled by the study. These and many other relevant graphs and tables are available at http://publichealth.lacounty.gov/media/coronavirus/.

A SARS-CoV-2 PCR test was ordered for every preoperative surgical patient by 103 (91.96%) of the surgeons. Nine said that they did not always order a test, but the questionnaire did not ask details about the criteria or frequency with which they would order tests. Of those 9, 2 (performing 97 and 15 surgeries, respectively) documented that they had never ordered a test, meaning that of all the surgeons who answered the survey, only 2 never ordered a PCR test, and those 2 surgeons collectively performed only 112 surgeries. Of the other 7 who said they did not always order a test, 1 documented 145 surgeries and also 145 tests, so it is possible that their answer that they did not always obtain a preoperative test was a mis-entry. The 9 surgeons who said they did not always do a test ordered

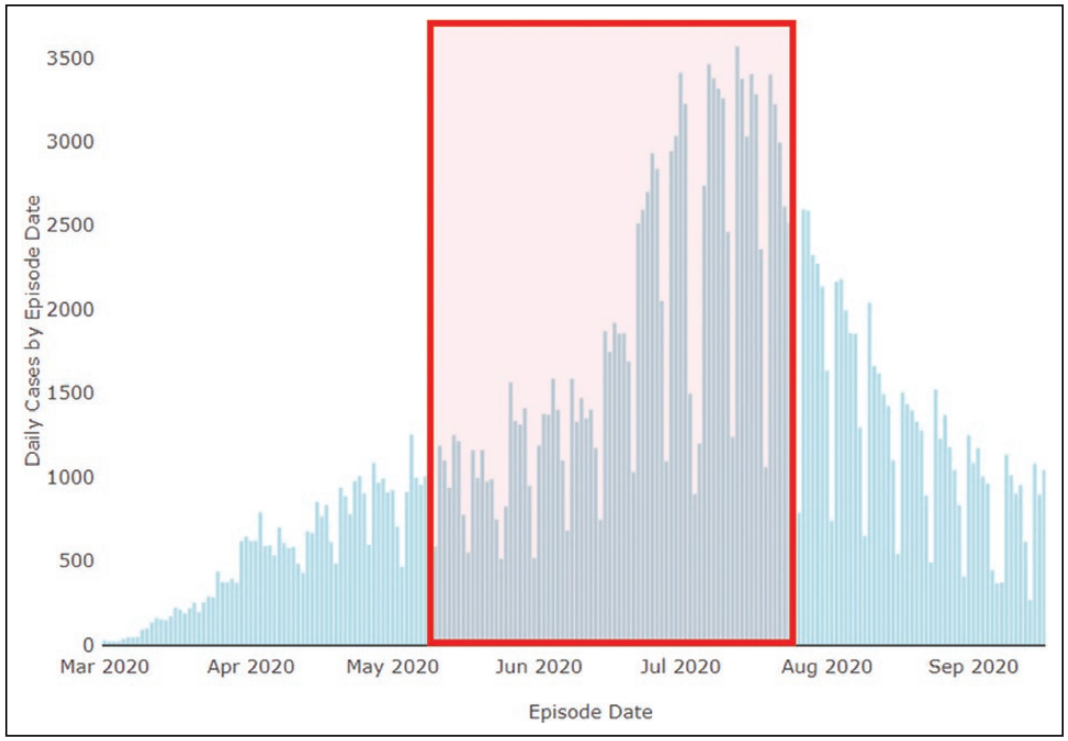

Figure 1. Daily diagnosed new cases COVID-19 in Los Angeles County. Shaded purple area shows the period during which the cases surveyed in the poll were completed. Note that this was during a precipitous rise of new cases. Accessed September 22, 2020 from http://dashboard.publichealth.lacounty.gov/COVID-1919_surveillance_dashboard/.

a total of 220 tests and performed 463 surgeries for a net rate of 48%; if the surgeon who did 145 actually did test everyone, then the remaining 8 surgeons who said they did not always do a test had a net test ordering rate of 24%. In all, 253 of the 5633 surgical patients (4.5%) did not receive a preoperative test.

A total of 5881 preoperative tests were run, of which 41 were positive (0.69%). The number of preoperative tests exceeded the number of operations because those with positive tests did not have surgery, some patients had more than one test done, and some patients might have canceled or rescheduled surgery for a variety of reasons after having a test. The questionnaire specifically asked about a PCR test, but did not ask whether it was a saliva or swab sample, what area was swabbed, whether the swab was done by a healthcare worker, how many days preoperatively the test was performed, or what laboratory processed the tests.

Testing after a surgery or procedure was not routinely done and occurred only if a patient had a COVID-19 exposure or developed suspicious signs or symptoms; the survey did not query as to the total number of these post-procedure tests. A total of 7 patients with a negative preoperative test had a positive postoperative test within 2 weeks after surgery (0.13%). All had mild clinical course, with no hospitalizations and no deaths. Three of 8506 (0.04%) injection patients and six of 2519 (0.24%) energy therapy patients tested positive within 2 weeks of their treatment, also with no hospitalizations or deaths. The case-collection period and follow-up period ended at the same time, and therefore cases done during the last 2 weeks may have developed a COVID-19–related complication after the study was closed; this may mean that the number of complications could have been slightly higher than recorded. The survey did not query about the development of postoperative COVID-19 in patients who were not documented negative before surgery.

A total of 9 surgeons reported having at least 1 COVID-19 infection of a staff member, but surgeons answered that only 5 of those employees were thought to have been exposed at work. Of those 5, 1 was a nurse infected by a surgeon, 1 was a fellow thought to be infected by a surgeon who was believed to have become infected at a meeting, and the other 3 offices did not offer details. A total of 5 offices reported having a single employee who had tested positive; 2 offices had 2 people test positive, 1 office had 4 people test positive, and 1 had 5 people test positive. The greatest number of staff infected in a single office and attributed to the workplace was 2. The total number of staff who had COVID-19 was 35, but in the freeform answers many of the surgeons described the staff getting it during the stay-at-home period, prior to the office reopening, or

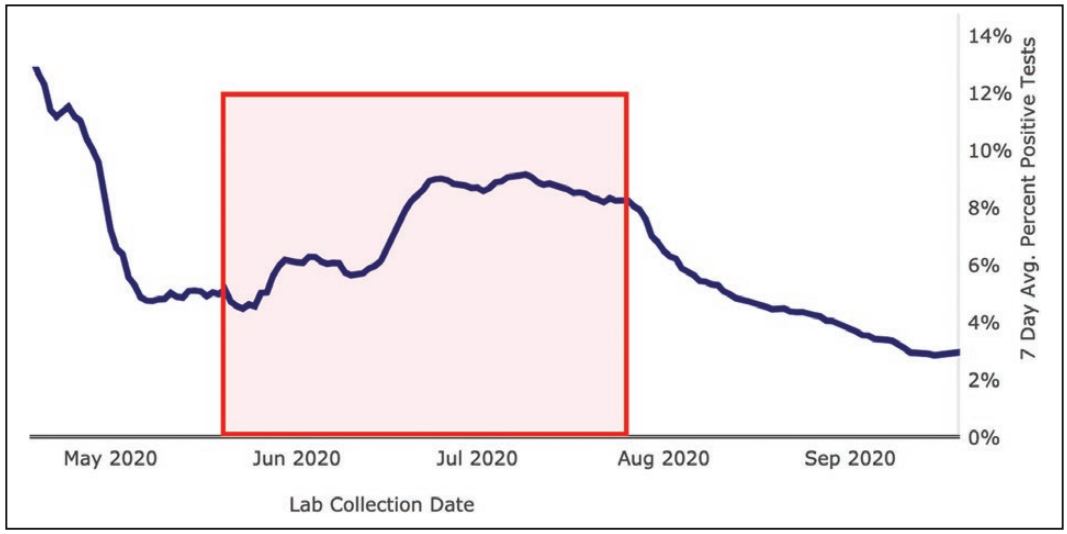

Figure 2. Seven-day average percentage testing positivity rate in Los Angeles County. Shaded red area shows the period during which the cases in the study were completed. Test positivity rate is considered a strong early indicator of whether prevalence is increasing or decreasing. At the time Los Angeles surgeons resumed operating, test positivity was about 4%; it rose to an apogee of 9% during the collection period and was 8% at the conclusion; 3 weeks later it was down to 6%. Therefore cases were done during a particularly endemic period. Accessed on September 23, 2020 from http://dashboard.publichealth.lacounty.gov/COVID-1919_surveillance_dashboard/.

attributed it to going to a party or meeting a family member known to previously be infected.

DISCUSSION

Implications for Patient Safety

A retrospective review from Wuhan, China published at the beginning of April looked at 34 patients who developed COVID-19 during the early stages of the pandemic following elective surgery. Their results showed higher rates of complications and a mortality rate of 20.5%.[11] These were alarming findings and prompted grave concerns about the safety of elective surgery. At that time, there was very little understanding of the pathophysiology of COVID-19 infection and its impact on surgery. Was COVID-19 making patients more hypercoagulable? Was positive-pressure ventilation, barotrauma, and the immunosuppressive stress of surgery causing their COVID-19 to become more severe than it otherwise would have been? Did those patients actually have COVID-19 preoperatively or were they infected while in the hospital? These were real concerns raised by emerging studies into the clinical course of this disease.[12,13] What was not clear was the applicability of those outcomes to plastic surgery patients. The patients had not been tested for COVID-19 preoperatively and could have been infected in hospital during the early stages of the pandemic when infection control may have not yet been ideal; they were older than most elective plastic surgery patients, most had significant underlying medical problems, many had cancer, some of the operations were large and required routine postoperative ICU admission, etc. Although these shortcomings were profound and likely rendered the findings inapplicable to plastic surgery, it was clear that data from plastic surgery patients would be necessary.

Several subsequent studies, in contrast to initial reports, showed minimal risk of COVID-19 infection or complications after elective surgery.[14-20] One study by Couto et al[14] reviewed a retrospective series of 300 patients in an outpatient ambulatory surgery center, and found no cases of postoperative COVID-19 infections. A personal communication with the senior author revealed that 1500 surgeries, including but not exclusively plastic surgery, had since been done at the center without a COVID-19–related complication through August 21, 2020. To the best of our knowledge, there have been no studies focused exclusively on elective surgery plastic surgery procedures.

The results of our study represent a relief for plastic surgeons and their patients. A response rate of over 27% is very high for a survey of surgeons, 2 months is a significant sampling of cases and adequate follow-up time for COVID-19 complications, and 5663 is a very large number of operations. With no serious cases of postoperative COVID-19, no hospitalizations, and no deaths, this shows that plastic surgery can safely be done during the pandemic. Undoubtedly, this is a reflection of safety protocols such as those developed by The Aesthetic Society's COVID-19 Task Force being followed, the fact that plastic

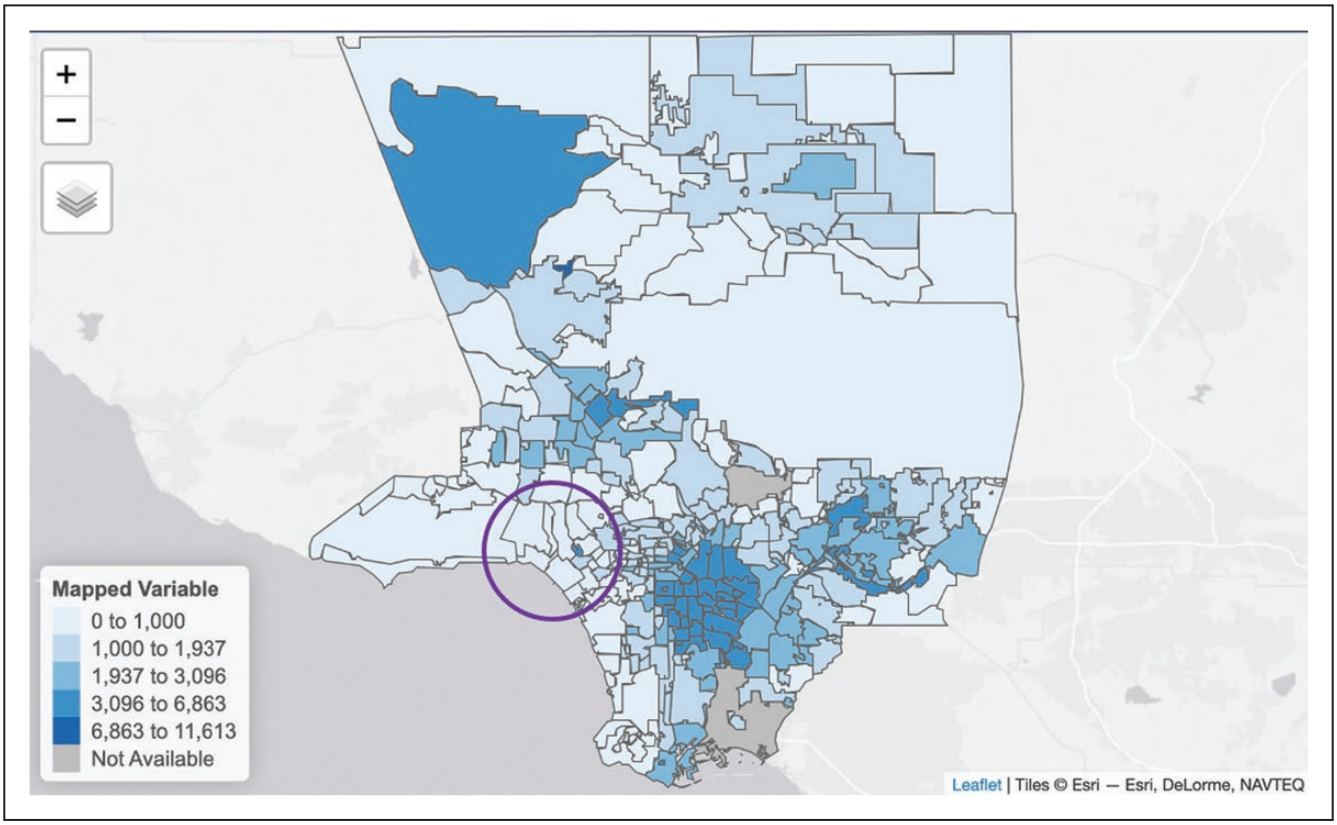

Figure 3. Cumulative confirmed cases in Los Angeles County by region. Los Angeles County has 10 million residents and the entire county is shown. The circle contains the region of Los Angeles County were most of the operations in this survey were performed. This map divides the City of Los Angeles into multiple regions. Respondents were only asked for the city of their practice, so other than the cities of Beverly Hills and Santa Monica, no more specificity of location can be provided. The residences of patients, staff, and surgeons was not queried. Accessed August 22, 2020 from http://dashboard.publichealth.lacounty.gov/COVID-1919_surveillance_dashboard/.

surgery patients tend to be younger and healthier than patients requiring emergency or urgent surgery, and that many elective plastic surgery procedures are not classified as major surgery. It would be interesting to note which of the recommendations of The Aesthetic Society Task Force on COVID-19 were followed by each surgeon, but to have asked detailed questions about each of them would have made the survey so long and daunting that the reply rate would have been much lower, and the goal of this survey was to receive the maximum number of responses in order to catch as many complications as possible. Even if such questions were to have been included, because there were no adverse sequelae from COVID-19, such a survey would have failed to determine which measures were the most important. And as important as the protocols were that the offices followed, the degree of anxiety that was prevalent during those first months back in the operating room following the shutdown may have prompted an high level of compliance by patients and staff which was an important factor in achieving these excellent outcomes.

The data do not allow us to conclude that preoperative testing is necessary or the difference that it made, because only 253 of the 5663 surgery patients were not tested. The questionnaire also only asked about whether there was a positive test within 2 weeks after surgery among patients who were negative preoperatively; it did not ask whether untested patients developed COVID-19 after surgery and the course of their illness. The study by Couto et al in Dallas did not involve preoperative testing and they did not have any postoperative COVID-19 cases. Given that so few of the Los Angeles patients in this survey were not tested, the application of the findings of this study to patients not undergoing preoperative testing is limited. In order to determine if testing is necessary, one would have to give both screening tests and extensive preoperative screening questionnaires to preoperative patients, and determine whether the questions alone missed any cases of COVID-19, and ultimately whether there was a difference in outcomes.

Although we cannot state from the present data that testing is necessary, testing is sufficiently available that we

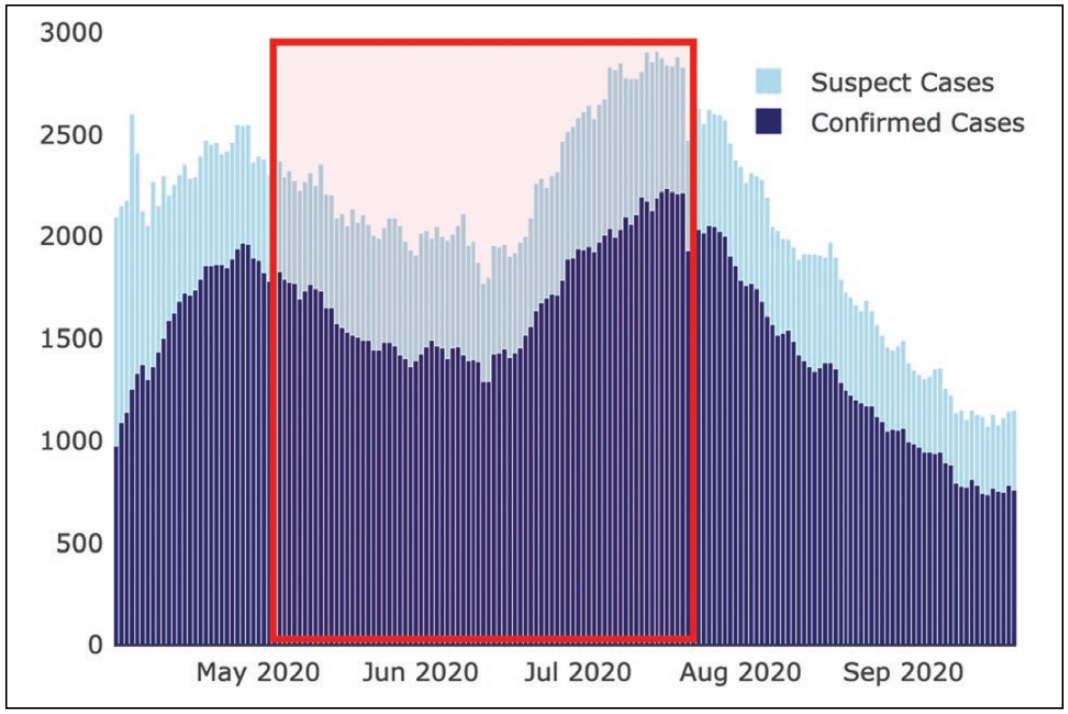

Figure 4. The number of patients hospitalized for COVID-19 in Los Angeles County. The area shaded in red represents the case-collection period for the survey and demonstrates rapidly rising case numbers. Accessed on September 23, 2020 from http://dashboard.publichealth.lacounty.gov/COVID-1919_surveillance_dashboard/.

see no reason not to do it; indeed 0.69% of the patients were identified with a positive preoperative test. Seven out of 1000 patients may not sound like a lot, but if hundreds of thousands of surgeries were done at that prevalence it would mean that hundreds of patients positive for SARS-CoV-2 would be undergoing surgery, possibly at an increased risk to themselves, to other patients, to office personnel, and to anyone taking care of them after surgery. Much like physicians are taught to guaiac-test stool to identify occult blood when doing a physical exam for any reason, so too is testing for this virus an opportunity to identify a potentially infectious patient. Indeed 41 such patients were found among these 112 practices during these 2 months in Los Angeles, informed of their situation, and presumably put into isolation so they could not infect others. It is believed that some presymptomatic and asymptomatic patients may have a sufficient viral load to spread the disease, and based upon today's understanding of SARS-CoV-2, testing may be able to detect infectious individuals not identifiable by screening questions and vital signs.

The countywide test positivity rate during the case-collection period started at 5% in May, reached a peak of over 9% in early July, and was at 8% when the case collection ended; 2 months later in late September the test positivity rate in Los Angeles County was down to 3%. This is a critical indicator of the growth rate of cases and shows that the results in this study occurred during a period rapid growth of the disease. These numbers are also substantially higher than the 0.69% positivity rate found in the preoperative patients. Presumably that is because the county numbers reflect all tests done, which obviously includes patients undergoing the test because they are symptomatic. As demonstrated in Figure 4, cases are not distributed evenly throughout Los Angeles County. Although the respondents indicated the city of their office, there was no breakdown of where the patients lived or worked, or of their ethnic or socioeconomic background, and those are more relevant indicators of an individual patient's likelihood of being infected with the coronavirus than the location of the office.

It is worth noting that not all of the 41 patients who tested positive were necessarily infectious. Although the PCR test is very specific, it can detect very small quantities of viral RNA that are not indicative of active infection. Some of those patients could have been recovering from an earlier infection, and the test might have just detected inactive RNA particles. And although PCR is very sensitive at detecting viral RNA, it obviously can only detect RNA if it is collected within the specimen. Patients shed variable amounts at different parts of their respiratory tract during the course of the illness, and thus there could be sampling error. Or patients could have just been infected at the time of their test and viral loads were too low to detect. There is

a technique to swabbing, and failing to obtain an adequate specimen is a possibility. Finally, patients could have become infected subsequent to their test in the preoperative period, at the time of surgery, or during recovery.

It is intriguing to consider the patients who had a false negative test. The 41 patients with positive tests did not demonstrate the safety of operating on an infected patient because they did not have surgery; it was the unrecognized patients infected with SARS-CoV-2 at the time of surgery who demonstrated that surgery did not bring about worse outcomes. Because sensitivity is not 100%, undoubtedly there were some infected patients who underwent surgery. One could only know the number of these patients if the prevalence in the studied population and the test sensitivity were both known. For instance, if the prevalence in the patient population were 1%, then one would predict there to have been 58.4 (1% of 5840) positive patients. Preoperative screening actually identified 41 positive patients, so in that hypothetical scenario, 17.4 (58.4 minus 41) patients were not recognized by the preoperative testing. False negatives could be calculated another way: if testing had a false negative rate of 25%, then one would expect one-quarter of the 58.4 predicted cases to be missed, which is about 14.6 patients. Given the range of testing methods and laboratories, it is impossible to know the blended false negative rate for all the patients tested.

This issue does remind one that the closer the preoperative test is done to the time of surgery, the better the chance that the patient will be clear when they enter the operating room. During the case-collection period there were long delays in the reporting of results by laboratories in Los Angeles County. But the actual delay does not matter as much as how many days before surgery the testing was done; if a test were done 5 days before surgery it would not matter if the turnaround was 1 day or 4 days, only the interval between testing and surgery matters. Surgeons were not asked how long before the procedure the testing was done, but given our experience with testing at that time, it is likely that only a few patients had a test done on preoperative days 1 and 2; most were probably done 3 to 6 days preoperatively. As test results come back more rapidly, testing can be scheduled closer to the time of surgery and there will be confidence that a smaller percentage of patients will be positive at the time of surgery than during the course of this study.

The postoperative rate of 0.13% is lower than the preoperative rate of 0.69% for several reasons. First, all preoperative patients were tested, but presumably only symptomatic postoperative patients were tested. And it is possible that a surgeon might have been unaware of a patient who developed postoperative COVID-19 if the patient were not seen for ongoing care. The reason that the rate was lower still following energy therapies and injections presumably is that those patients typically have little or no postprocedure follow-up. Indeed, because they were neither tested preoperatively nor convalescing like a surgical patient, one would presume their actual postprocedure rates would be higher than those of postsurgical patients because they would be subject to more exposures.

Implications for Public Health Policy

It is expected that COVID-19 will wax and wane throughout the world in the coming months and even years. Governments and health policy officials will consider options to reduce spread, such as imposing stay-at-home orders and closing bars, restaurants, businesses, houses of worship, and schools. But a thorough search of the medical literature shows that there are no documented cases of “super-spreader” events related to elective surgery. This study demonstrated that 5633 surgeries performed over fully one-sixth of a year in a city with a surging number of cases led to no reported COVID-19–related complications. Stopping elective surgery would not help to “flatten the curve,” mitigate, contain, or reduce the spread of COVID-19. The only plausible reason to restrict elective surgery would be if there became an overwhelming shortage of essential resources, such as medications or PPE. The safety of individual patients and community spread are not a rationale for restricting surgery.

The findings of this survey should come as a shock to no one. The gloves, masks, gowns, and sterile technique being used to prevent COVID-19 infections were developed for surgery, and generations of surgeons have been trained to don and doff them appropriately. Indeed the father of American surgery, William Halsted, was said to have invented the surgical glove in 1894. While the country discusses the difficulty of breathing through masks during a brief sojourn to the grocery store and the frustration at stopping oneself from touching them, it is second nature for surgeons to breathe through masks for many hours at a time. Some have irrationally proposed canceling cosmetic surgery because they perceive it as not being essential; however, the only rational threshold is safety and not necessity. Surgeons are uniquely competent to work safely during a pandemic.

Particular attention should be given to the growth of cases in Los Angeles during the case-collection period as shown in Figures 1 and 2. That these results were obtained during a rapid rise of cases demonstrates that plastic surgery can be conducted even when infection rates are high. For instance, when the case collection began, daily test positivity rates were about 5%, but they rose to nearly 12% during the collection period; just a month later the rate was back down to about 5%, and 2 months later down to 3%. Hospitalization rates were also rapidly rising during

the period. During the collection period there was talk throughout the county of hospitals being overrun with patients, but despite that, plastic surgery was done without strain on the hospital system (Figure 4).

It is also important to consider that during the time of this study, test results were facing very long delays throughout Los Angeles. Surgeons were not specifically queried about how long before surgery the patients were getting tests, but it is likely that it was at least 2 days. As testing becomes more available and results returned with greater alacrity, it is likely that testing closer to the time of surgery will become more widely available and further enhance safety.

Much is being learned about COVID-19 daily. Just as death rates have dropped since the early surges in the spring of 2020, one can expect that improvements in testing, infection control, and COVID-19 treatments will make operating during the pandemic even safer than it was shown to be during this case-collection period. As the number of previously infected and ultimately vaccinated patients increases, the number of susceptible patients and staff will decrease and plastic surgery will become even safer.

At times plastic surgery has been treated with opprobrium by the lay press, but that is not an excuse for public health officials to act upon anything but data. Health policy decisions should always be made in a scientifically rational manner. The authors believe the vast majority of plastic surgeons certified by the ABPS would support a moratorium if it were shown to be of benefit, but not if it were done capriciously and with disregard for data.

It is interesting to note an unintended benefit of plastic surgery procedures during the pandemic. All the cases identified in preoperative testing were only caught because of the impending surgery, and hence those individuals were identified and kept from spreading it to others. Furthermore, the postoperative recovery creates a quasi-forced isolation for patients for days or weeks. The net effect of plastic surgery during those critical months in 2020 was therefore to flatten the curve, if only by a small amount.

Limitations of the Study

Although the response rate is high for a study of a local surgeon population, several general limitations of all surveys must also be considered. Some surgeons may not have understood the intent of specific questions and because of misinterpretation bias given answers that did not accurately respond to the intent of a particular question. Although the survey asked for specific answers, it is possible that some surgeons merely gave estimates that were subject to recollection bias, rather than going back to their records and counting case numbers. This recall error could have led to inaccuracies. It is not known whether the surgeons who answered were representative of plastic surgeons in the community. Perhaps those who had experience of COVID-19 complications were reluctant to respond because they were not confident the results would remain confidential and that a complication could be traced back to them; alternatively those with COVID-19 complications may have responded in disproportionately higher rates in order to demonstrate that any such complications were commonplace. Given that the poll was anonymous, the latter may be the more likely scenario. The survey also represents a very limited geography at a specific point in time. Questions were not asked about patient, surgeon, and staff demographics; perhaps with different patient populations and with different community disease rates, the findings may differ.

The study was intentionally kept short because the priority was in capturing the maximal number of adverse results over granular data, and a longer questionnaire with difficult questions would reduce the response rate. Details about the policies and procedures surgeons followed to prevent infections were not analyzed. Even if this had been done, the data would have been very limited, because no complications occurred. It would therefore have been difficult to determine which specific protocols were important. Patients' medical conditions, risk factors, ages, and procedures were not queried, and so it is unknown the extent to which these findings can be projected to other surgical specialties.

The survey only queried surgeons certified by the ABPS, and the results cannot be extrapolated to physicians performing plastic surgery without this training, certification, and educational society affiliations. The major plastic surgery societies created extensive educational programs to prepare their members to operate safely during the pandemic. These societies also require that surgery be done in an accredited operating facility. These factors may have played a significant role in determining the excellent outcomes in this survey.

This study reports on a large number of cases, but it is possible that severe COVID-19 cases would be recognized in an even larger sample size. It cannot be concluded that there is no risk to plastic surgery, only that no significant complications were reported in this survey.

Although these results occurred during a period of rising cases, they also occurred following the reopening of offices, a period when there was a pervasive fear of COVID-19. Patients, surgeons, and office personnel may have been particularly diligent about infection avoidance protocols, and if they become complacent in the future, there is a risk of inferior outcomes to those found in this survey.

Respondents were asked whether they tested preoperative patients, but not about how many days preoperatively

the tests were done. We tested our patients as close to surgery as testing delays would allow and did not accept results greater than a week old; this generally meant testing 3 to 5 days before surgery. It is our impression from discussions with colleagues that this was a common approach during the collection period for this survey. Obviously the closer the testing is done to the time of surgery, the lower the risk of a patient become infected during that interval.

The number of identified postoperative COVID-19 cases was lower in the energy and injection patients than among the surgical patients. There is no reason to expect the rate to be lower; if anything, one might postulate the rate should be higher because surgical patients were tested before surgery and were relatively isolated after surgery while they recovered. In contrast, the energy and injection patients would typically resume normal activities almost immediately after their procedure. We surmise that cases after injections and energy were underreported because care and communication was more intensive following an operation than after a noninvasive procedure.

Future Studies

The COVID-19 situation will remain fluid for the foreseeable future. Prevalence, treatment, and practice patterns will change. Having readily available data will help surgeons to refine technique and increase safety. An ideal way to accomplish this would be for accrediting agencies, such as AAAASF, AAAHC, and the Joint Commission, to require reporting of these data and to post them on a website. They already require reporting in a manner with which ABPS-certified plastic surgeons are accustomed to reply, and no development of another reporting mechanism would be necessary. Because surgeons know their answers will be audited during one of the regular site visits, it is likely that reporting will be highly accurate.

Further studies could capture the outcomes of a greater number of procedures, explore the need for testing, the effectiveness of various infection control measures, and evaluate data from other areas of the country. This study did not inquire as to the specific infection-control procedures offices followed, and it would be helpful to do so in order to understand how these results can be replicated.

CONCLUSIONS

This survey found a very low rate of COVID-19 in patients following plastic surgery operations and nonsurgical procedures done by plastic surgeons certified by the ABPS during a COVID-19 surge in Los Angeles. A low rate of cases was also observed among plastic surgeons and their staff. All postprocedure and staff cases were of a very mild nature and did not lead to any hospitalizations or deaths. The data unequivocally demonstrate that plastic surgery can be done safely even during a significant pandemic surge. Further investigations of the steps taken to mitigate risks are important. Beyond these technical measures, it is likely that the profound uncertainty about COVID-19 pervading society during the case-collection period prompted surgeons, staff, and patients to be extremely fastidious about following instructions, and this may have been a contributing factor to these excellent outcomes. We warn surgeons not to become complacent and to remain conscientious about following safety and infection-control protocol, and to continue to impart this to their staff and patients. Indeed, infection control, sterile technique, and the donning and doffing of PPE has long been a core competence of surgeons, so these results are not unexpected. Nationally recognized surgical facility accrediting agencies should ask that operating facilities document pre- and postoperative COVID-19 rates and make thes available so that surgeons can assess risk, patients can be informed, and health policy makers can be directed by data. At this point in time there is no evidence to suggest placing restrictions on elective plastic surgery would be helpful in reducing the spread of SARS-CoV-2.

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REFERENCES

1. Freifeld K. No more tummy tucks: US plastic surgeons idled by coronavirus offer help. *Reuters*. 2020 https://www.reuters.com/article/us-health-coronavirus-usa-plasticsurgeon/no-more-tummy-tucks-u-s-plastic-surgeons-idled-by-coronavirus-offer-help-idUSKBN21C3O1. Accessed March 26, 2020.
2. COVID-19: Recommendations for Management of Elective Surgical Procedures. American College of Surgeons. https://www.facs.org/COVID-19/clinical-guidance/elective-surgery. Published March 13, 2020. Accessed March 24, 2020.
3. Prachand VN, Milner R, Angelos P, et al. Medically necessary, time-sensitive procedures: scoring system to ethically and efficiently manage resource scarcity and provider risk during the COVID-19 pandemic. *J Am Coll Surg*. 2020;231(2):281–288.
4. Dorfman R, Saadat S, Gupta N, Roostaeian J, Da Lio A. The COVID-19 pandemic and plastic surgery: literature review, ethical analysis, and proposed guidelines. *Plast Reconstr Surg*. 2020;146(4):482e-493e.
5. The Aesthetic Society Statement: Recommendations for Reopening Office and Resuming Elective Procedures. The Aesthetic Society. https://www.surgery.org/professionals/

COVID-19/reopening-offices-and-resuming-elective-procedures/foreword. Published May 5, 2020. Accessed May 5, 2020.
6. Considerations for the Resumption of Elective Surgery and Visits. ASPS statement. American Society of Plastic Surgeons. https://www.plasticsurgery.org/for-medical-professionals/COVID-1919-member-resources/resumption-of-elective-surgery. Approved April 21, 2020. Accessed April 22, 2020.
7. Cárdenas-Camarena L, Bayter-Marin JE, Durán H, et al. Elective surgery during SARS-Cov-2/COVID-19 pandemic: safety protocols with literature review. *Plast Reconstr Surg Glob Open*. 2020;8(6):e2973.
8. Kaye K, Paprottka F, Escudero R, et al. Elective, non-urgent procedures and aesthetic surgery in the wake of SARS-COVID-19: considerations regarding safety, feasibility and impact on clinical management. *Aesthetic Plast Surg*. 2020;44(3):1014-1042.
9. Singh P, Pirayesh A, Mosahebi A. Aesthetic surgery during COVID-19. *Aesthet Surg J*. 2020;40(9):NP566-NP568.
10. Squitieri L, Chung KC. Surviving the COVID-19 pandemic: surge capacity planning for nonemergent surgery. *Plast Reconstr Surg*. 2020;146(2):437-446.
11. Lei S, Jiang F, Su W, et al. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine*. 2020;21:100331.
12. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382(18):1708–1720.
13. Bikdeli B, Madhavan MV, Jimenez D, et al.; Global COVID-19 Thrombosis Collaborative Group, Endorsed by the ISTH, NATF, ESVM, and the IUA, supported by the ESC Working Group on Pulmonary Circulation and Right Ventricular Function. COVID-19 and thrombotic or thromboembolic disease: implications for prevention, antithrombotic therapy, and follow-up: JACC state-of-the-art review. *J Am Coll Cardiol*. 2020;75(23):2950-2973.
14. Couto RA, Wiener TC, Adams WP. Evaluating postoperative outcomes of patients undergoing elective procedures in an ambulatory surgery center during the COVID-19 pandemic. *Aesthet Surg J*. 2020;sjaa180. doi:10.1093/asj/sjaa180.
15. Jiang L, Ma H. Surgical protocol in a West China day surgery center during the COVID-19 pandemic: practice and experience. *Surg Innov*. 2020. doi:10.1177/1553350620950590.
16. Ji C, Singh K, Luther AZ, Agrawal A. Is elective cancer surgery safe during the COVID-19 pandemic?. *World J Surg*. 2020;1–5. doi:10.1007/s00268-020-05720-x.
17. Maldonado-Marcos E, Caula-Freixa C, Planellas-Giné P, et al. Impact of SARS-COV-2 pandemic on elective and emergency surgery in a university hospital. *Cir Esp*. 2020;S0009-739X(20)30263-3. doi:10.1016/j.ciresp.2020.07.013.
18. Brar S, Ofo E, Hyde N, et al. Outcomes of elective head and neck confirmed or suspected cancer surgery during the COVID-19 pandemic. *Eur Arch Otorhinolaryngol*. 2020;1–6. doi:10.1007/s00405-020-06194-2.
19. Hernigou J, Valcarenghi J, Safar A, et al. Post-COVID-19 return to elective orthopaedic surgery—is rescheduling just a reboot process? Which timing for tests? Is chest CT scan still useful? Safety of the first hundred elective cases? How to explain the “new normality health organization” to patients? *Int Orthop*. 2020;1–9. doi:10.1007/s00264-020-04728-1.
20. Shih KC, Wong JKW, Lai JSM, Chan JCH. The case for continuing elective cataract surgery during the COVID-19 pandemic. *J Cataract Refract Surg*. 2020;46(6):921.