The Incidence of COVID-19 Patients in Oral and Maxillofacial Surgery

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Purpose: The SARS-CoV-2 global pandemic has resulted in widespread changes to healthcare practices across the United States. The purpose of this study is to examine the incidence of COVID-19 patients in the oral-maxillofacial surgery setting in order to help guide perioperative protocols during the pandemic.

Methods: In this retrospective cohort study, predictor variables (presence of preoperative symptoms on presentation, patient age, patient gender, patient race, hospital location, and presence of statewide stay-at-home orders) were examined with outcome variables (SARS-CoV-2 test results) over 10 months between March 2020 and December 2020 for patients undergoing surgical procedures in the operating room by the following Oral-Maxillofacial Surgery Departments:

- Louisiana State University Health Sciences Center (Baton Rouge, LA)

- University of Illinois at Chicago (Chicago, IL)

- University of Texas Health Science Center at Houston (Houston, TX)

Data analysis included Fisher exact tests to compare categorical variables across COVID test groups and Wilcoxon rank sum tests to compare continuous covariates. Two-sample tests of proportions were used to compare observed COVID-19 positivity rates to other study results.

Results: Out of 684 patients in 3 institutions, 17 patients (2.5%, 95% CI = 1.5 to 4.0%) tested positive for COVID-19 over a 10 month interval (March 1, 2020- December 31, 2020). The majority of patients that tested positive were asymptomatic in the preoperative setting (*P*-value = .09). They were significantly more likely to be African-American (*P*-value = .015) and less likely to have a stay-at-home order present at the time of surgery (*P*-value = .033). Age, gender, and hospital location did not play a statistically significant role.

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Conclusion: Our results demonstrate a 2.5% incidence of COVID-19 infection in the total population of patients undergoing scheduled oral-maxillofacial surgeries in 3 major healthcare systems across the United States. This data may help inform perioperative protocols and infection control measures during the COVID-19 pandemic.

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The COVID-19 pandemic has resulted in nearly 40 million positive cases and 640,000 deaths in the United States alone.[1] These numbers have widespread implications in the US healthcare system and, consequently, many healthcare facilities have implemented new standard-care practices based on Centers for Disease Control and Prevention (CDC) or Professional Society recommendations (ie American College of Surgeons [ACS]) in order to provide optimum patient care while limiting infection spread. Regarding dental and oral surgery procedures, CDC recommendations are based on the assertion that these procedures are high-risk due to detectable SARS-CoV-2 titers in nasal, oral, and pharyngeal secretions. Recommendations by the CDC include universal preoperative SARS-CoV-2 testing, postponement of elective procedures, implementation of teledentistry and triage protocols, respiratory and hand hygiene, exposure protocols, universal source control measures, physical distancing, and avoidance of aerosol generating procedures.[2]

Per the CDC, the use of targeted nucleic acid or antigen detection of SARS-CoV-2 for patients without signs or symptoms may be used to identify those with asymptomatic or pre-symptomatic SARS-CoV-2 infection and reduce exposure risk in some healthcare settings.[2] Presently, there is limited data on the outcomes or utility of universal preoperative testing for asymptomatic or pre-symptomatic SARS-CoV-2 infection. Some studies suggest that anywhere from 5 to 75% of those with COVID-19 could be asymptomatic.[3] There are similarly limited evidence-based outcomes for many other infection control recommendations.

Due to this scarcity of data and policy variation across the United States, hospital leaders and private practitioners have been forced to interpret and balance CDC and professional society recommendations, state policies, and institutional resources and priorities in delivering care while limiting disease spread. Many large hospital centers across the United States (including those involved in this study) thus implemented universal preoperative SARS-CoV-2 screening tests. The purpose of this study is to examine the results of these universal pre-procedure SARS-CoV-2 screening tests with the specific aim of obtaining objective data by which we can inform our infection control measures. The authors hypothesize that universal testing will reveal a higher incidence of COVID-19 patients than that reported in the existing literature due to the epidemic spread of the virus and its variants.

Materials and Methods

STUDY DESIGN

To address the research purpose, investigators designed and implemented a retrospective cohort study. The study population was composed of all patients that were taken to the operating room for elective surgery from March 1st, 2020 to December 31st, 2020. Predictor variables were the presence of preoperative symptoms on presentation, patient race, patient gender, hospital location, and presence of statewide stay-at-home orders. The outcome variable was the SARS-CoV-2 testing result. The following institutions participated:

- Louisiana State University Health Sciences Center (Baton Rouge, LA).
- University of Illinois at Chicago (Chicago, IL).
- University of Texas Health Science Center at Houston (Houston, TX).

Inclusion Criteria

- Patients ≥ 15 years of age.
- No known COVID exposure.
- Required surgical intervention by the oral-maxillofacial surgery service in the operating room.
- Underwent a COVID-19 test prior to procedure.

Exclusion Criteria

- A life-threatening procedure that did not allow preoperative SARS-CoV2 testing.
- Age <15 years.
- Pregnant females.
- Polytrauma cases or cases that required intervention with services other than oral-maxillofacial surgery.

SAMPLE AND DATA COLLECTION

The initiating site (LSU) obtained Institutional Research Board (IRB) approval No. 20-1047 which was forwarded to all participating departments. Each respective department then obtained respective IRB approval and a Data Utilization Agreement (DUA) was signed to share data. A working data spreadsheet was then created and shared among participating departments. The following information was collected in the data set: presence of preop symptoms, age, gender, race, procedure, type of SARS-CoV-2 test performed, dates of testing and result, personal protective equipment (PPE) used during procedure, number of surgical team members scrubbed in during the procedure, presence of a state-wide stay-at-home order at time of surgery, and dates that the procedures were stopped and resumed.

STATISTICAL ANALYSIS

Categorical covariates were summarized in each COVID test group by reporting the count (%) of each category, while continuous covariates were summarized by mean (sd). Fisher exact tests were used to compare categorical variables across COVID test groups, while Wilcoxon rank sum tests were used to compare continuous covariates. A *t* based confidence interval is reported for the mean age of the population. Regression analyses were not performed to predict a positive COVID-19 test since there were too few patients who had COVID-19 to produce appropriate results. Two-sample tests of proportions were used to compare observed COVID-19 positivity rates to other study results.

Results

Seventeen of 684 patients (2.5%, 95% CI = 1.5 to 4.0%) tested positive for COVID-19 over a 10 month interval. Descriptive characteristics of this cohort of patients are shown in Table 1. The majority of patients were asymptomatic in the preoperative setting (97.6%), African-American or Caucasian (38.5 and 41.2%, respectively), and had male or unknown gender identity (38.9 and 38.5%, respectively). The majority of patients were tested when a stay-at-home order was not in place (92.4%). Patients had an average age of 43 (SD = 18.51, 95% CI for mean = 41.61 to 44.39). Patients who tested positive were significantly more likely to be African-American (70.6 vs 37.6%, *P*-value = .015) and less likely to have a stay at home order (6.1 vs 0%, *P*-value = .033). Interestingly, preop symptoms did not depend on whether or not a patient later developed COVID-19. Among the 17 patients who tested positive, 5 had their operations re-scheduled, while the other 12 had their operations completed. The most commonly-performed procedures were incision and drainage with and without extractions (162 cases, 24%), open reduction internal

Table 1. DESCRIPTIVE CHARACTERISTICS OF SAMPLE

Variable	All (684)	Positive (17)	Negative (667)	PVALS
Preop Symptoms?				.09
Asymptomatic	668 (97.6)	15 (88.2)	653 (97.9)	
Symptomatic	14 (2.05)	2 (11.8)	12 (1.8)	
Unknown	2 (.03)	0 (0)	2 (0.1)	
Race				.015
Black	263 (38.5)	12 (70.6)	251 (37.6)	
Asian	31 (4.5)	2 (11.8)	29 (4.3)	
Hispanic	41 (6)	0 (0)	41 (6.1)	
White	282 (41.2)	2 (11.8)	280 (42)	
Other/Unknown	67 (9.8)	1 (5.9)	66 (9.9)	
Gender				.668
Male	266 (38.9)	7 (41.2)	259 (38.8)	
Female	158 (23.1)	5 (29.4)	153 (22.9)	
Unknown	260 (38)	5 (29.4)	255 (38.2)	
Hospital location				.610
LSU	260 (38)	5 (29.4)	255 (38.2)	
UIC	246 (36)	6 (35.3)	240 (36)	
UT Houston	178 (26)	6 (35.3)	172 (25.8)	
Stay at home order?				.033
Yes	41 (6)	0 (0)	41 (6.1)	
No	632 (92.4)	15 (88.2)	617 (92.5)	
Unknown	11 (1.6)	2 (11.8)	9 (1.3)	
Age	43 (18.51)	35.88 (13.73)	43.18 (18.59)	0.135

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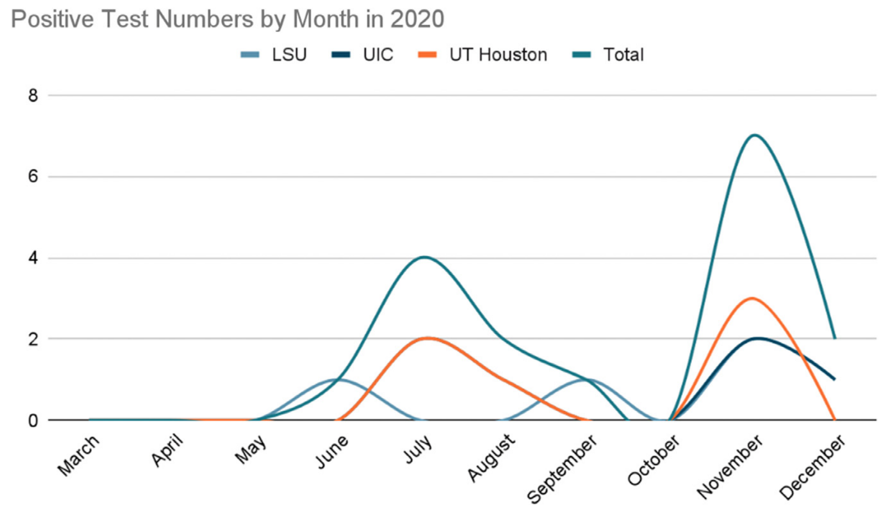

FIGURE 1. Positive test numbers by month in 2020.

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fixation of mandible fractures (127 cases, 19%), and isolated tooth extractions (64 cases, 9%). The most commonly used PPE for both negative and positive patients was standard PPE with N95 respirators. In all study locations, PPE guidelines throughout the study period were not significantly modified despite the outcomes of testing results and epidemiologic trends throughout the pandemic.

Discussion

Coronaviruses are a large group of viruses that derive their name from their distinctive microscopic appearance- each virion is surrounded by a halo, or "corona."[4] In 2019, scientists identified a novel coronavirus that was named severe acute respiratory syndrome-related coronavirus, or SARS-CoV-2 and the disease caused by this virus is called coronavirus disease 2019, or COVID-19.[5] Diagnosis is based on either viral component testing (Rapid, polymerase chain reaction) or antibody testing and following CDC and professional society guidelines, many institutions have implemented universal pre-procedure SARS-CoV-2 testing as a means to curb infection spread. The purpose of this study is to examine the results of this testing with the specific aim of obtaining objective data to inform infection control measures. The authors hypothesized that universal testing would reveal a higher incidence of COVID-19 patients than that reported in the existing literature due to the epidemic spread of the virus and its variants. In our study, all preoperative tests were polymerase chain reaction and 17 of 684 patients (2.5%, 95% CI = 1.5 to 4.0%) over a 10 month interval tested positive for SARS-CoV-2. Among these, the number of positive cases was comparable across locations (LSU- 5, UIC-6, UT Houston- 6) and there was a peak incidence rate during the winter months of 2020 (Fig. 1). Interestingly, there were no cases identified during time periods when statewide stay-at-home orders were implemented. When compared to similar studies, the overall incidence level found in our study is significantly higher than rates published by Lin et al, Morris et al, and the University of North Carolina (Table 2).[6-8] This rate was higher than the observed 0.13% positivity rate reported by Singer et al, but it was not a significant difference (*P*-value = .171).[9] It is difficult to attribute causation for these differences.

Table 2. COMPARATIVE STUDIES

Comparative Studies of Preoperative COVID-19 Incidence[6-9]

Author	Location	n	%	*P*-value
Lin et al	The Children's Hospital of Philadelphia	12/1295	0.93%	.011
Morris et al	University of Alabama at Birmingham	18/2437	0.74%	<.001
Internal Database	University of North Carolina	61/7100	0.86%	<.001
Singer et al	UCLA	10/739	0.13%	.171

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Additionally, 88% (15/17) of patients who tested positive were asymptomatic. This number is remarkably higher than that found in the literature; for example, a systematic meta-analysis by Jingjing et al in 2020 found only 15.6% of confirmed COVID-19 patients to be asymptomatic.[10] Our study did identify a significantly higher incidence in the African American population, however, this is consistent with the disproportionate infection and death rates on those communities as identified in other studies.[11] The findings of our study support our hypothesis; however, it is unknown whether this proportion is due to a higher incidence in the general population, inherent demographic characteristics of the study population, or other unknown variables.

The strengths of this study were the large sample size and multicenter nature of data collection. The weaknesses of this study arise from the rapidly-evolving epidemiology of the SARS-CoV-2 virus. The study may represent an inherently higher or lower risk population because the study period encompassed time frames during which some healthcare systems postponed all elective surgery. It is unknown if healthcare facilities implemented additional pre-screening processes that occurred prior to pre-procedure testing. Vaccination rollout, virus mutation, and evolving herd immunity may have all played critical roles in the reliability of our findings. Finally, there may be inherent demographic differences in patient populations that required oral-maxillofacial surgery intervention at tertiary referral centers as per our selection criteria.

In conclusion, this study identified a 2.5% incidence of COVID-19 infection in oral-maxillofacial surgery patients at participating institutions. Interestingly, this incidence level is significantly higher than incidence rates mentioned in several comparative studies (Table 2). Given the rapidly-evolving nature of the disease, it is difficult to determine scalability of our findings or apply this incidence to broader populations. This is particularly true with the implementation of widespread vaccinations with consequent theoretical herd immunity and the emergence of new global variants such as the delta variant, UK variant (B.1.1.7), South African variant (B.1.351), etc.[12] However, given the number of unknown variables associated with asymptomatic COVID-19 transmission and pathogenicity, it is reasonable to continue universal preoperative SARS-CoV-2 testing as recommended by the CDC with plans to adjust based on the outcomes of evolving epidemiologic trends. Future studies involving the evaluation of asymptomatic patients may prove valuable as a guide for healthcare systems to individualize safe practices during the COVID-19 pandemic.

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