



Diagnosis of COVID-19 and the bariatric surgery population: a single center experience

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Abstract

Background While many cases of the coronavirus disease 2019 (COVID-19) are mild, patients with underlying medical conditions such as hypertension (HTN), diabetes mellitus (DM), older age, and morbid obesity are at higher risk of hospitalization and death. These conditions are characteristic of patients eligible for bariatric surgery, many of whom underwent weight loss procedures in the months prior to cessation of elective surgery in March 2020. The effects of the virus on these high-risk patients who had increased healthcare exposure in the early days of the pandemic are currently unknown.

Objectives To describe the experience of patients who underwent bariatric surgery during the early evolution of the COVID-19 pandemic.

Methods This is a cross-sectional study including patients from a single center who underwent bariatric surgery from January 1st, 2020 to March 18th, 2020. A database was created to analyze patients' demographics, operative variables, and postoperative outcomes. All patients were contacted and a telephone survey was completed to inquire about COVID-19 exposure, symptoms, and testing 30 days before and after surgery.

Results A total of 190 patients underwent bariatric surgery during the study period. Laparoscopic sleeve gastrectomy was the most common procedure (71.6%). One hundred seventy-eight patients (93.7%) completed the telephone survey. Postoperatively, 19 patients (10.7%) reported COVID-19 compatible symptoms, and six patients (3.4%) went on to test positive for COVID-19. There were no COVID-19-related hospital admissions or mortalities in this population.

Conclusions Morbidly obese patients are at high risk of severe disease secondary to COVID-19, and those undergoing bariatric surgery during the evolution of the pandemic reported symptoms at a rate of 10.7% 30 days after the surgery. While none of these patients suffered severe COVID-19 disease, the temporal relationship of their symptomatology and increased exposure to the healthcare system as a result of their surgery suggest an increased risk of disease with elective surgery.

Keywords Bariatric surgery · Laparoscopic · Roux-en-Y gastric bypass · Gastric bypass · Sleeve gastrectomy · COVID-19

The coronavirus disease 2019 (COVID-19) outbreak caused by the SARS-CoV-2 virus, is considered a public health emergency of international concern by the World Health Organization (WHO), [1, 2] which started in the province of Wuhan, China in December 2019, was first documented in the United States (US) in January 2020 [3]. While the first case in New York City was identified on February 29th 2020, a study from Icahn School of Medicine at Mount Sinai

demonstrated that the virus was circulating in New York City as early as January 2020 [4, 5]. Due to limited understanding of the scope of the pandemic, elective surgeries, including bariatric surgery, continued through March 18th, 2020 when the US Surgeon General recommended cancellation of elective procedures to conserve medical resources [6].

This period of overlap between the first diagnosed case and the cessation of elective surgeries in New York City may have unnecessarily placed many patients at risk of COVID-19 due to continued exposure to the healthcare system through hospitalizations and clinic visits. This risk of increased exposure is of concern for patients with

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documented risk factors for hospitalization and death from COVID-19, including those with hypertension (HTN), diabetes mellitus (DM), older age and morbid obesity, which are by definition characteristic of patients undergoing elective bariatric surgery for weight loss [7–10].

The exposure risk of an active bariatric cohort in an area heavily affected by COVID-19 has not been studied. While bariatric patients are at an increased risk for severe symptoms of COVID-19, they present to the hospital feeling well for elective procedures. A study on liver transplant patients collected surveys to assess the prevalence of COVID-19 symptoms and determine the impact of the disease [11]. In this study, 5.3% of the patients experienced flu-like symptoms and 1.25% were ultimately diagnosed with COVID-19. While these patients also present for what can be considered an “elective” surgery, transplant patients generally suffer from a more tenuous baseline state of health. Similarly, bariatric patients are a unique population with many underlying risk factors when they present for elective surgery. Despite this, bariatric patients are generally optimized when they present for surgery and their risk of may thus be more attributable to their healthcare exposure than to other factors.

We sought to study the diagnosis of COVID-19 in bariatric patients who underwent surgery in the early phases of the pandemic.

Methods

Patient cohort

This is a cross-sectional study from the department of Minimally Invasive Surgery at Montefiore Medical Center (MMC) (Bronx, NY, USA). All adult patients, greater than 18 years, who underwent bariatric surgery from January 1st, 2020 to March 18, 2020 were included. This study was approved by Institutional Review Board (IRB) prior to data collection and analysis.

Data collection and analysis

Patient baseline characteristics including age, gender, race, comorbidities, body mass index (BMI), perioperative characteristics including type of the procedure and length of stay, postoperative outcomes including re-admission and emergency department visits were collected from the patient’s medical records. When available, COVID-19 testing was extracted from the medical records including chest x-ray, polymerase chain reaction (PCR) and antibody testing (IgG). All patients were called to complete a survey (Table 1) to quantify the number of symptomatic patients, those who were tested, and those who were diagnosed with COVID-19. Data were analyzed in SPSS Version 25.0 (IBM Corp, Armonk, NY).

Results

In total, 190 patients underwent bariatric surgery during the study period. Most ($n = 178$, 93.7%) patients were reached by phone for completion of the follow-up survey. The mean age of the cohort was 41.8 ± 12.3 years with a predominance of female patients (82.1%). Hispanic and Black patients accounted for the majority of the population with 96 (50.5%) and 50 (26.3%) patients, respectively. All the patients had obesity with a mean body mass index (BMI) of 43.8 ± 8.0 . On average, patients had 1.7 ± 1.5 comorbidities. Hypertension, diabetes mellitus, and chronic kidney disease were seen in 89 (46.8%), 38 (20.0%) and 5 (2.6%) patients, respectively. Seventy-eight of the patients (40.5%) had history of chronic obstructive pulmonary disease (COPD) or asthma. One hundred fifty-nine patients (79.5%) were class three by the American Society of Anesthesiologist (ASA) with a mean 10-year survival based on Charlson Score of $85.1\% \pm 21.2\%$. Remaining patient demographics are summarized in Table 2.

With regards to the type of surgery, laparoscopic sleeve gastrectomy (LSG) was the most common procedure

Table 1 Patient COVID-19 survey

Preoperative

During the 30 days prior to the surgery did you experience any symptoms concerning of COVID-19 including: Fever, cough, shortness of breath, diarrhea, body aches, loss of smell or taste. Yes/ no. Which?

Postoperative

During the 30 days after the surgery did you experience any symptoms concerning of COVID-19 including: Fever, cough, shortness of breath, diarrhea, body aches, loss of smell or taste. Yes/ no. Which?

During the 30 days after the surgery were you exposed to people who were diagnosed with COVID-19? Yes/ no. How?

During the 30 days after the surgery were you diagnosed* or hospitalized with COVID-19? Yes/ no. How?

*Patients who reported symptoms within the 30 days postop and had IgG testing done more than 30 days after the surgery were considered positive

Table 2 Patient demographics

Patients demographics (<i>n</i> = 190)	
Age (mean, SD)	41.8 ± 12.3
Gender (no, %)	34 (17.9)
Male	156 (82.1)
Female	
Race/ethnicity (no, %)	2 (1.0)
White non-hispanic	96 (50.5)
Hispanic	50 (26.3)
Black non-hispanic	0 (0)
Asian	42 (22.1)
Other/missing	
Comorbidities (mean, SD)	1.7 ± 1.5
Charlson score (mean, SD)	85.1 ± 21.2
ASA class (no, %)	0 (0)
ASA 1	37 (19.5)
ASA 2	151 (79.5)
ASA 3	2 (1.0)
ASA 4	
BMI (mean, SD)	43.8 ± 8.0
Obesity (no, %)	190 (100)
Hypertension (no, %)	89 (46.8)
COPD or asthma (no, %)	77 (40.5)
Diabetes (no, %)	38 (20.0)
CKD (no, %)	5 (2.6)

SD standard deviation, *ASA* American society of anesthesiologist, *BMI* body mass index, *COPD* chronic obstructive pulmonary disease, *CKD* chronic kidney disease

performed in 136 patients (71.6%), followed by Roux-en-Y gastric bypass (RYGB) in 40 (20.9%) patients, and 14 (7.4%) who underwent conversion from prior LSG to RYGB. Surgical variables are shown in Table 3. The average length of stay was 2.1 ± 0.8 days. Seven patients (3.7%) had a postoperative complication (3 had surgical bleed, 2 small bowel obstruction, 1 non-COVID pneumonia and 1 gastrointestinal bleed); 2 (1.0%) of which were found during the index admission and 5 (2.6%) required re-admission. Twenty-three patients (12.1%) presented to the emergency department

Table 3 Surgical variables

Surgical variables (<i>n</i> = 190)	
Type of surgery (no, %)	136 (71.6)
Sleeve gastrectomy	40 (20.9)
RYGB	14 (7.4)
Sleeve gastrectomy to RYGB	
OR time in minutes (mean, SD)	62.1 ± 28.3
Length of stay in days (mean, SD)	2.1 ± 0.8
Complications (no, %)	7 (3.7)
ED visits 30 days (no, %)	23 (12.1)
Re-admission 30 days (no, %)	11 (5.8)

RYGB Roux-en-Y gastric bypass, *SD* standard deviation, *ED* emergency department

after discharge and 11 (5.8%) had to be readmitted. Readmissions were related to the prior mentioned complications in five patients and the rest were related to PO intolerance.

One hundred seventy-eight patients (93.7%) completed the survey and the results are summarized in Table 4. Of those, 19 (10.7%) reported flu-like symptoms postoperatively. Not all patients underwent testing; however, 6 of the symptomatic patients (3.4%) tested positive (three with PCR, two with IgG and one with X-ray) for COVID-19.

A total of 25 (14.0%) underwent testing for COVID-19, some due to symptomatology and others for close contact with individuals who either tested positive or were symptomatic. Others were required to undergo testing as screening for work. Of those 25 patients who were tested, the majority were negative (76%) and only six were positive (24%). None of the patients with postoperative complications reported COVID-19 symptoms; however, one of the 11 readmitted patients subsequently reported COVID-19 symptoms and tested positive. None of the patients with symptoms or positive test were admitted for COVID-19 respiratory disease. There were no deaths due to any cause.

Twelve patients (6.3%) were not able to be reached to complete the survey. However, for these 12 patients, there was documentation of postoperative follow-up with no issues and no visits to the emergency room with flu-like symptoms with a mean follow-up of 77 days (11–125 days).

Discussion

During the initial peak of the COVID-19 pandemic, the decision to cease all elective surgery was driven by both a dearth of resources and a desire to limit exposure of new patients. All resources at MMC were redirected to the care of the over 5000 patients who presented for treatment tested positive for COVID-19 [12]. Furthermore, it was challenging to perform elective procedures in a way that was safe for both patients and providers [13]. As a retrospective analysis of

Table 4 COVID variables

COVID Variables (<i>n</i> = 178)	
Symptoms 30 days prior to surgery (no, %)	13 (7.3)
Symptoms 30 days after surgery (no, %)	19 (10.7)
Known COVID community exposure (no, %)	22 (12.3)
Patients tested (no, %)	25 (14.0)
Symptomatic patients tested (no, %)	9 (5.0)
Positive patients (no, %)	6 (3.4)
Positive patients with community exposure (no, %)	3 (1.7)
Admitted patients (no, %)	0 (0)
Severe disease (no, %)	0 (0)

COVID coronavirus disease

our practices, it is necessary to weigh the costs and benefits of elective bariatric surgery during a potential second wave of the pandemic.

Bariatric surgery is officially elective, but it is the most effective treatment for obesity and metabolic disease [14, 15]. It also provides long-term benefits beyond weight loss including management of hypertension and diabetes [16]. There are negative consequences to delaying bariatric surgery with significant impact on the patient and on cost to the healthcare system [17]. Furthermore, because the comorbidities of obesity increase the likelihood of severe COVID-19 infection, bariatric surgery itself can improve the conditions that confer this increased risk of severe COVID-19 infections. These include obesity, diabetes, and hypertension, and there are data to suggest that bariatric surgery-induced weight loss may improve overall immune function and lower baseline systemic inflammation [18, 19]. Obesity is known to alter the immune system and patients have been described as having a higher baseline pro-inflammatory state, which may explain the inferior outcomes seen in this population during viral diseases [8].

Conversely, while bariatric surgery may provide these long-term benefits, obesity remains one of the highest risk factors for mortality in adults with COVID-19. Morbid obesity was identified as an independent risk factor for mortality in the H1N1 influenza pandemic of 2009 [8, 9]. Extrapolation of this information indicated that patients with morbid obesity were at higher risk for complications and death during the COVID-19 pandemic and the observation was confirmed [20]. This is true especially in younger adults, and therefore any additional exposure could be considered unjustified [21].

Because of these competing goals, it is important to address the appropriate threshold of stopping bariatric surgery with a critical lens, considering the risks and benefits to our catchment population. The Bronx is hit particularly hard by both obesity and COVID-19. We decided to look at the patients who had surgery just before the shutdown, when the virus began flourishing in our community, and the day-to-day functions of our healthcare system likely inadvertently contributed to COVID-19 spread and exposure. As an American Society for Metabolic and Bariatric Surgery (ASMBS) certified bariatric center performing over 1000 bariatric procedures a year for the past 5 years, in one of the most affected zip codes by COVID-19, we carefully evaluated our outcomes related to this disease as we plan to resume bariatric surgery and we face the possibility of a second peak.

We found that 10.7% of the patients who underwent bariatric surgery at our institution during the evolution of the pandemic developed flu-like symptoms postoperatively and 3.4% were diagnosed with COVID-19. Our study has the limitations of cross-sectional studies including the

possibility of recall bias. Our follow-up phone calls and Epic records are main strengths of our data; we were able to reach 97.3% of our patients by phone for a detailed conversation about their COVID-19 compatible symptoms and experience. Therefore, we captured data that would have gone unrecognized by simple chart review looking for positive test results, as only 14% of our patients were tested, especially during a time when testing was so limited. Our ability to see documentation for last follow-up even in patients who did not complete our phone survey also supports our claim that it is unlikely that we are underestimating the rate of COVID-19 in our study cohort. Our data are, therefore, more statistically conservative and accurate, as many other COVID-19 studies rely on the result of testing that was limited at the time of evaluation.

A study similar to ours in liver transplant patients in Italy, found that 5.3% of their patients developed flu-like symptoms, which indicates that our rate is likely high [11]. A weakness of this data is that due to this dearth of testing results, in order to be conservative, we must assume that any patient with flu-like symptoms was harboring a COVID-19 infection. We also can't account for other high-risk exposure opportunities and must assume that the interaction with our healthcare system was the highest risk exposure that our patients had. Even though officially SARS-CoV-2 was not detected in New York City until February 29th, there is some evidence the virus was already circulating the months prior [4, 5]. We hypothesize that our patients were likely exposed to the virus as they were in the hospital for their surgery, had close follow-up in the clinics and a few visited the emergency room after their surgery.

Despite the significant associations between obesity and severe COVID-19 disease, especially in patients in the Bronx at our own healthcare system, the patients in our study had extremely good outcomes [12]. None of our patients who reported symptoms or were diagnosed with COVID-19 had severe symptoms or was admitted. These findings are inconsistent with published literature regarding the obese population, where patients with comparable comorbidities had higher rates of morbidity and mortality [22, 23].

One main question that our data raise is why our patients did not develop severe COVID-19 infections if, in fact, they were exposed when the virus was circulating and up to 10.7% of patients had some form of COVID-19 infection. We can conjecture that our study population did have the protective benefit of being young with mean age of the cohort of 41.8 ± 12.3 , while age above 61 was associated with a greater risk of severe infection in patients at our center, as well as being predominantly female, as male sex was also associated with a statistically significant greater risk of mortality [12]. Patients involved in a bariatric program are also a particularly compliant segment of the population who are actively engaged in a program to improve

their health. For example, of the 2672 patients who attended an initial seminar in our program in 2018, 1149 patients (43%) were able to successfully complete the program and have surgery. The program is extremely rigorous and requires information seminars, two office visits, up to six dietician visits, a class, support group, and depending on insurance requirements, a psychiatric evaluation, sleep apnea screening, cardiology evaluations and pulmonary clearance. Our patients are likely highly motivated to have mitigated their exposure in other ways once the disease was declared prevalent. There is evidence of this in the fact that 53% of our patients reported limitations in their exercise regimens because they were not leaving home once the outbreak was declared prevalent. Furthermore, when these patients did interact with the healthcare system, they were arriving for elective surgery and therefore their metabolic parameters were under better control. Despite being obese, relatively immunosuppressed, they were at their peak of health at the time of admission and discharged within 72 h.

Conclusion

Morbidly obese patients are at high risk for COVID-19, and those undergoing bariatric surgery during the evolution of the pandemic were exposed with 10.7% reporting symptoms 30 days after the surgery. While our data do not demonstrate a high rate of severe infection, we must protect up to 10% of our patients who could have contracted COVID-19 through their surgical experience. It would be beneficial for other centers to look at their outcomes in the 3 months prior to discontinuing surgery to give our data more context. While there are significant benefits to patients pursuing bariatric surgery overall, the consequences of COVID-19 for obese patients are too great for it to continue in another full wave of the pandemic.

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Compliance with ethical standards

Disclosures Gustavo Romero-Velez, Xavier Pereira, John Paul Skendelas, Shauna Costinett, Rachel Grosser, Collin Creange, Jorge Humberto Rodriguez-Quintero, Fernando Munoz Flores, Erin Moran-Atkin, Jenny Choi, Diego L Lima, Diego R Camacho have no conflicts of interest or financial ties to disclose.

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