Bariatric Surgery is Safe for Patients After Recovery from COVID-19

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Abstract

Background: Studies of patients who have undergone surgery while infected with COVID-19 have shown increased risks for adverse outcomes in both pulmonary complications and mortality. It has become clear that the risk of complications from perioperative COVID-19 infection must be weighed against the risk from delayed surgical treatment. Studies have also shown that prior bariatric surgery conveys protection against mortality from COVID-19 and that obesity is the biggest risk factor for mortality from COVID-19 infection in adults under 45 years of age. Studies in patients who have fully recovered from COVID-19 and underwent elective surgery have not become widely available yet.

Objectives: This multi-institutional case series is presented to highlight patients who developed COVID-19, fully recovered, and subsequently underwent elective bariatric surgery with 30-day outcomes available.

Setting: Nine bariatric surgery centers located across the United States.

Methods: This multicenter case series is a retrospective chart review of patients who developed COVID-19, recovered, and subsequently underwent bariatric surgery. Fifty-three patients are included, and 30-day morbidity and mortality were analyzed.

Results: Thirty-day complications included esophageal spasm, dehydration, and ileus. There were no cardiovascular, venous thromboembolism (VTE) or respiratory events reported. There were no 30- day mortalities.

Conclusions: Bariatric surgery has been safely performed in patients who made a full recovery from COVID-19 without increased complications due to cardiovascular, pulmonary, venous
In December 2019, COVID-19, caused by SARS-CoV-2, originated in Wuhan, China [1]. COVID-19 disseminated rapidly throughout China and subsequently to the rest of the world, resulting in a declaration of the disease as a pandemic by the World Health Organization on March 11, 2020 [2]. This disease produces a wide clinical spectrum in infected patients, ranging from asymptomatic carriers to critical illness and fatalities. After the first 70,000 cases, the mortality rate was reported to be 2.3% [3].

On March 13, 2020, the United States declared a national emergency due to COVID-19 [2]. Case numbers of COVID-19 surged, and patient care facilities faced a significant influx of patients with varying disease severity states and limited testing capacity. As a result of the rapidly changing situation, public health measures were put into place by the Department of Public Health along with governmental leadership. The state of Massachusetts, for example, halted elective, nonemergent surgeries on March 15, 2020 to protect patients and healthcare professionals and to preserve critical supplies of personal protective equipment [4]. At the time this paper was written, the United States had recorded 29,573,712 cases and 537,417 deaths due to COVID-19 [5].

Initial reports from Aminian et al. on a series of 3 patients who underwent uneventful elective surgeries and contracted COVID-19 in the perioperative period (incisional hernia repair, cholecystectomy, and cholecystectomy with concomitant hysterectomy) showed very concerning outcomes. Nonspecific symptoms such as fever and cough, combined with the lack of readily available and reliable testing and effective treatment strategies, led to a high morbidity and mortality rate in patients infected after surgery (2 patients developed acute respiratory distress syndrome, which progressed to death, and the third made a full recovery) [6]. Additionally, perioperative COVID-19 diagnoses have been found to cause up to a 50% risk of postoperative pulmonary complications with a high resulting mortality risk. This has resulted in recommendations to weigh the risk of surgery in COVID-19-positive patients versus the risk of delayed surgical treatment [7].

On June 8, 2020, elective surgical procedures were allowed to resume under Phase II of Massachusetts reopening due to improving public health data related to COVID-19 [8].

The patient series presented in this paper consists of patients who contracted COVID-19 during the pandemic. Prior to surgery, they each made a recovery from the disease and then underwent elective surgical weight loss procedures at 1 of 9 bariatric centers across the United States. The rationale for this study was to identify if 30-day morbidity or mortality rates were increased in patients who recovered from COVID-19 prior to bariatric surgery. We also sought to determine whether consistencies existed in preoperative workup or postoperative care for these individuals within this cohort.

Methods

This study was approved by the Mount Auburn Hospital and Harvard Medical School institutional review boards. Institutional review board approval and data transfer agreements were contracted as required by each participating institution. Patient consent was waived due to the retrospective nature of the study. All patients with a COVID-19 diagnosis prior to undergoing weight loss surgery at 9 institutions in the United States were identified by electronic medical record review and included. All patients underwent multidisciplinary evaluation prior to surgery. Electronic medical records were retrospectively reviewed by the authors at their respective institutions to collect data. Deidentified data was transferred in a HIPAA-compliant manner to the lead institution via data transfer agreement protocols. Degree of symptoms with COVID-19 infection was categorized as asymptomatic, mild (outpatient management), moderate (inpatient management), and severe (intensive care unit admission). Descriptive statistical analysis was used.

Results

Complete patient data are listed in Table 1. Results from the data analysis are listed in Table 2. Data on 53 patients were collected from 9 bariatric programs in the United States. Most patients (81.1%) were women. The average age was 42.9 years (range 16–64). The average body mass index was 47.3 kg/m² (range 27–86.6). Average time from COVID-19 diagnosis to surgery was 82.5 days for the entire cohort (range 12–290), 54 days for asymptomatic patients, and 102.5 days for mildly symptomatic patients. Twenty (37.7%) patients had asymptomatic disease, 30 (56.6%) patients had mild disease, 2 (3.8%) patients had moderate disease, and 1 (1.9%) patient had severe disease. Most patients (77.4%) had a negative confirmatory, molecular COVID-19 test prior to surgery; however, few patients had post-COVID, preoperative chest imaging (24.5%). Fifty-two of 53 (98.1%) patients had resolved their COVID-19.
Table 1
Multi-institutional data of 53 COVID-19 patients undergoing elective bariatric surgery

| Age, yr | Sex | Preop BMI | Symptoms during COVID-19 infection | Preoperative symptom resolution | Preoperative negative molecular COVID-19 test | Days from positive COVID-19 test to surgery | Procedure type | LOS (d) | Postdischarge DVT prophylaxis | 30-d complications |
|---------|-----|-----------|-----------------------------------|--------------------------------|---------------------------------------------|-------------------------------------------|---------------|--------|-------------------------------|-------------------|
| 27      | M   | 76.5      | Asymptomatic                      | NA                             | Yes, Normal CXR                             | 58                                        | SG            | 1      | Yes: 14-d LMWH                | None              |
| 47      | F   | 37.6      | Asymptomatic                      | NA                             | No, None                                    | 31                                        | SG            | 1      | No                            | None              |
| 16      | M   | 51.0      | Asymptomatic                      | NA                             | Yes, Normal CXR                             | 137                                       | SG            | 4      | No                            | Esophageal spasm, resolved with lorazepam |
| 43      | F   | 50.1      | Asymptomatic                      | NA                             | Yes, None, pulmonology eval                 | 44                                        | GBP           | 2      | No                            | None              |
| 48      | M   | 43.0      | Asymptomatic                      | NA                             | Yes, None, pulmonology eval                 | 145                                       | SG            | 1      | No                            | None              |
| 37      | F   | 45.0      | Asymptomatic                      | NA                             | No, pulmonology eval                        | 12                                        | SG            | 1      | No                            | None              |
| 40      | F   | 43.1      | Asymptomatic                      | NA                             | Yes, None, pulmonology eval                 | 34                                        | SG            | 1      | No                            | None              |
| 39      | F   | 44.2      | Asymptomatic                      | NA                             | Yes, None                                  | 53                                        | DS            | 2      | No                            | None              |
| 36      | F   | 53.2      | Asymptomatic                      | NA                             | Yes, None                                  | 25                                        | GBP           | 2      | Yes: 21-d LMWH               | Readmission for dehydration |
| 31      | F   | 42.2      | Asymptomatic                      | NA                             | No, None                                   | 47                                        | SG            | 2      | No                            | None              |
| 47      | F   | 41.6      | Asymptomatic                      | NA                             | No, None                                   | 23                                        | Revision      | 3      | Yes: 21-d LMWH               | None              |
| 49      | M   | 46.0      | Asymptomatic                      | NA                             | Yes, None                                  | 42                                        | GBP/HH        | 1      | No                            | None              |
| 40      | F   | 38.8      | Asymptomatic                      | NA                             | Yes, None                                  | 49                                        | SG/HH         | 1      | No                            | None              |
| 43      | F   | 48.6      | Asymptomatic                      | NA                             | Yes, CXR: bilateral basilar infiltrates with patchy opacities | 22                                        | GBP           | 1      | No                            | None              |
| 53      | F   | 36.9      | Asymptomatic                      | NA                             | Yes, None                                  | 28                                        | Revision      | 1      | No                            | Ileus requiring readmission |
| 57      | F   | 63.1      | Asymptomatic                      | NA                             | Yes, None                                  | 36                                        | SG            | 1      | Yes: 14-d LMWH               | None              |
| 42      | F   | 46.7      | Asymptomatic                      | NA                             | Yes, None                                  | 41                                        | GBP           | 3      | No                            | None              |
| 59      | M   | 33.9      | Asymptomatic                      | NA                             | No, None                                   | 70                                        | GBP           | 1      | No                            | None              |
| 64      | F   | 39.7      | Asymptomatic                      | NA                             | Yes, None                                  | 121                                       | SG/cholecystectomy | 2      | No                            | None              |
| 40      | F   | 41.0      | Asymptomatic                      | NA                             | Yes, None                                  | 62                                        | GBP           | 1      | No                            | None              |
| 45      | F   | 41.0      | Mild                              | Yes                            | Yes, Normal CXR                             | 105                                       | SG/HH         | 1      | No                            | None              |
| 40      | F   | 49.5      | Mild                              | Yes                            | Yes, Normal CXR                             | 101                                       | SG/HH         | 1      | No                            | None              |
| 31      | F   | 39.7      | Mild                              | Yes                            | Yes, Normal CXR                             | 122                                       | SG/HH         | 1      | No                            | None              |
| 24      | M   | 86.6      | Mild                              | Yes                            | Yes, No, pulmonology eval                   | 69                                        | SG            | 4      | Yes: LMWH bridge to coumadin | None              |
| 47      | F   | 47.0      | Mild                              | Yes                            | Yes, persistent mild dyspnea               | 50                                        | SG            | 1      | Yes: 14-d LMWH               | None              |
| 43      | M   | 36.0      | Mild                              | No, persistent mild dyspnea    | Yes, Normal CXR                             | 73                                        | SG            | 1      | No                            | None              |
| 28      | M   | 46.0      | Mild                              | Yes                            | No, pulmonology eval                        | 148                                       | SG            | 1      | No                            | None              |

(continued on next page)
| Age, yr | Sex | BMI | Symptoms during COVID-19 infection | Preoperative symptom resolution | Preoperative negative molecular COVID-19 test | Preoperative imaging | Days from positive COVID-19 test to surgery | Procedure type | LOS (d) | Postdischarge DVT prophylaxis | 30-d complications |
|--------|-----|-----|-----------------------------------|-------------------------------|---------------------------------------------|----------------------|------------------------------------------|----------------|--------|-------------------------------|-----------------|
| 34     | F   | 47.0| Mild                              | Yes*                          | Yes                                         | None, pulmonology eval | 246                        | SG/HH          | 1      | No                            | None            |
| 37     | F   | 36.0| Mild                              | Yes                           | Yes                                         | None                 | 290                        | Revision       | 3      | No                            | None            |
| 33     | F   | 41.0| Mild                              | Yes*                          | Yes                                         | None                 | 26                         | SG             | 1      | No                            | None            |
| 37     | F   | 44.1| Mild                              | Yes                           | Yes                                         | None                 | 63                         | Revision       | 1      | No                            | None            |
| 51     | F   | 44.3| Mild                              | Yes                           | Yes                                         | None                 | 31                         | GBP/HH         | 2      | No                            | None            |
| 25     | F   | 49.1| Mild                              | Yes                           | Yes                                         | None                 | 36                         | GBP            | 1      | No                            | None            |
| 40     | F   | 59.3| Mild                              | Yes*                          | Yes                                         | None                 | 36                         | SG             | 1      | No                            | None            |
| 37     | F   | 42.0| Mild                              | Yes                           | Yes                                         | None                 | 150                        | SG             | 1      | No                            | None            |
| 51     | F   | 48.7| Mild                              | Yes                           | Yes                                         | None                 | 38                         | SG             | 1      | No                            | None            |
| 47     | F   | 37.7| Mild                              | No                            | None                                         | 34                        | SG                         | 1              | No | None                        |
| 56     | F   | 46.2| Mild                              | Yes*                          | No                                          | CXR: peribronchial wall thickening, CT chest: scarring within the lingula | 90                        | GBP, umbilical hernia repair | 1      | No | None                        |
| 51     | F   | 56.8| Mild                              | Yes                           | No                                          | Normal CXR           | 97                         | GBP            | 3      | No                            | None            |
| 32     | F   | 44.0| Mild                              | Yes                           | No                                          | Normal CXR           | 97                         | GBP            | 3      | No                            | None            |
| 30     | F   | 42.9| Mild                              | Yes                           | No                                          | None                 | 47                         | GBP            | 1      | No                            | None            |
| 60     | F   | 46.4| Mild                              | Yes                           | No                                          | None                 | 49                         | SG             | 2      | Yes: 14-d LMWH readmission for dehydration, elevated troponin and ventricular tachycardia | None            |
| 52     | F   | 59.5| Mild                              | Yes                           | Yes                                         | Normal CXR           | 49                         | SG             | 2      | Yes: 14-d LMWH None          | None            |
| 63     | F   | 73.3| Mild                              | Yes                           | Yes                                         | None                 | 57                         | SG             | 2      | Yes: 14-d LMWH None          | None            |
| 36     | F   | 39.8| Mild                              | Yes                           | No                                          | None                 | 63                         | SG             | 1      | No                            | Readmission for abdominal pain |
| 58     | F   | 42.5| Mild                              | Yes                           | Yes                                         | None                 | 114                        | GBP            | 1      | Yes: 14-d LMWH None          | None            |
| 32     | F   | 43.9| Mild                              | Yes                           | Yes                                         | None                 | 122                        | SG             | 1      | No                            | None            |
| 32     | F   | 71.3| Mild                              | Yes                           | Yes                                         | None                 | 174                        | SG             | 1      | Yes: 14-d LMWH None          | None            |
| 39     | F   | 71.3| Mild                              | Yes                           | Yes                                         | None                 | 249                        | SG             | 2      | No                            | None            |
| 47     | M   | 27.5| Mild                              | Yes                           | Yes                                         | None                 | 249                        | Revision       | 1      | No                            | Readmission for dehydration |
| 60     | F   | 48.0| Moderate                          | Yes                           | Yes                                         | None, pulmonology eval | 93                        | Revision       | 1      | No                            | None            |
| 60     | F   | 50.0| Moderate                          | Yes                           | Yes                                         | Normal CXR           | 81                         | SG/HH          | 4      | Yes: therapeutic Lovenox for recent DVT | None            |
| 44     | M   | 27.0| Severe                            | Yes                           | Yes                                         | CXR: small bilateral pleural effusions with patchy airspace opacities, s/p tracheostomy | 45                        | LAGB adjustment then emergent removal | 1      | No | None                        |

BMI = body mass index; DVT = deep vein thrombosis; LOS = length of stay; CXR = chest X-ray; SG = sleeve gastrectomy; GBP = gastric bypass; HH = hiatal hernia repair; LMWH = low-molecular-weight heparin; LAGB = laparoscopic adjustable gastric band.

* Diminished taste and smell persisted.
surgery for the most common symptoms of COVID-19, which include fever, cough, dyspnea, and myalgias/fatigue [1]. Persistent loss of taste and smell occurred in a small number of patients who were otherwise considered symptom free at the time of surgery in this study.

Repeating COVID-19 testing with the goal of a negative molecular test result before surgery occurred 77.4% of the time but was not considered standard of care in all institutions. If surgeons choose to employ this approach, tests should be performed as close to the day of surgery as possible while factoring in turnaround time of testing [10]. With new variants, it is clear that unvaccinated patients who have already had COVID-19 could get it again. Patients should be instructed to self-isolate from the time of testing until surgery. Negative preoperative testing may also be important for operating room workflow and resource allocation—for example, not needing to use designated COVID-19 operating room and recovery space.

Post–COVID-19 recovery chest imaging took place in 24.5% of patients before surgery. This suggests routine chest radiography after recovery from COVID and prior to bariatric surgery may not be necessary in all cases. The benefit would be that if a characteristic pulmonary abnormality is detected, it may be pertinent to postpone surgery and pursue further workup, including pulmonary function testing [11]. Preoperative pulmonology consultation was routinely done in only 9.4% of patients in this study and revealed no abnormalities.

Reports of immune system–mediated COVID-19–induced coagulopathy have been reported in recent literature. These complications have been associated with increased morbidity and mortality in the acute illness phase and for weeks afterward [12,13]. In this series, postdischarge extended VTE prophylaxis was administered in 22.6% of patients. In most cases, VTE prophylaxis was extended beyond the time of hospitalization for an underlying risk factor or disease process but not because of the history of COVID-19 diagnosis specifically [14]. No VTE-related events occurred in this series of patients.

Obesity is the most significant risk factor for mortality in patients under 45 years old who contract COVID-19 [15]. Given evidence that bariatric surgery may be protective, there is no indication that surgery should be delayed [16]. This study shows that in patients with obesity who have survived COVID-19, bariatric surgery is still safe. It is in agreement with a recently published case series including 35 European patients who underwent bariatric surgery after recovery from COVID-19 [17]. Bariatric surgery should not be considered elective in the setting of this pandemic as patients with obesity are at increased risk of mortality and the surgery can be conducted safely both before and after infection.

Limitations of this study include recall bias as the participating surgeons generated included patients from various methods including memory and electronic medical record review. Small sample size makes it difficult to draw accurate conclusions on ongoing needs for the best approach to

### Discussion

This case series of 53 patients who recovered from COVID-19 and underwent bariatric surgery revealed no 30-day mortalities. Morbidity related to cardiovascular, pulmonary, or venous thromboembolism (VTE) complications was also not observed. In general, complication rates of 4% and mortality rates of 0.1% have been found for patients undergoing metabolic and bariatric surgery in the United States [9].

There was variability in terms of preoperative workup for patients after initial COVID-19 diagnosis. The most consistently reported criterion was complete resolution of symptoms (98.1% of patients) before surgery. It stands to reason that patients should be screened immediately before surgery.
preoperative workup in these patients as well as need for extended VTE prophylaxis after surgery. Most patients in this study fell into the asymptomatic or mildly symptomatic categories with initial COVID-19 diagnosis. Complication rates may be different for patients with moderate or severe disease.

**Conclusion**

Elective bariatric surgery after recovery from COVID-19 in this cohort of patients was not associated with increases in morbidity or mortality rates compared to national averages.

**Disclosures**

The authors have no commercial associations that might be a conflict of interest in relation to this article.

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Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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