



# Time of Bariatric Surgery and Hospitalization for SARS-CoV-2: a Nationwide Study

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Received: 20 February 2021 / Revised: 21 April 2021 / Accepted: 22 April 2021 / Published online: 2 May 2021  
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**Keywords** Bariatric surgery · Hospitalization · SARS-CoV-2 · Mortality · Intensive care unit admission

## Introduction

In less than a year, the SARS-CoV-2 pandemic has become responsible for more than 2 million deaths, leading to the disruption of all health systems and economic disaster. There is now clear evidence that severe obesity is a significant risk factor for mortality, independently of diabetes, chronic renal failure, and cancer in patients with SARS-CoV-2 [1, 2]. Bariatric surgery (BS) is the only effective long-term treatment for severe obesity [3]. During the first wave of SARS-CoV-2, BS activity almost completely stopped for several months. One of the reasons put forward was that a recent BS could expose obese patients to the risk of a severe form of SARS-CoV-2 due to massive weight loss, transient immune dysfunction, or vitamin and mineral deficiencies, which is

frequent during the first year following BS. To further investigate the topic, we conducted a French nationwide cohort study to investigate the association between the time of bariatric surgery and the risk of hospitalization for SARS-CoV-2.

## Methods

### Data Source

The data source used for the cohort study was the database of the Programme de Médicalisation des Systèmes d'Information (PMSI). This database contains all diagnoses coded using ICD-10 in private or public hospital in France.

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### Key points

- SARS-Cov 2 pandemic has become responsible for million deaths.
- Obesity is a severe risk factor for mortality.
- Bariatric surgery is the only effective long-term option for severe obesity.
- During the pandemic, bariatric surgery has been largely limited.
- Protective association of a recent bariatric surgery for SARS-Cov2 severe infection hospitalization in patients with severe obesity.

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This cohort study was declared to the French Data Protection Authority (MR-005, n° 5714251020).

### Patients

We included all patients suffering from obesity and undergone a bariatric surgery between January 1, 2015, and December 31, 2019, by combining the bariatric surgery procedure codes and E66 (overweight and obesity) ICD-10 codes. For these patients, we identified all hospitalizations with SARS-COV-2 diagnosis, between January 1, 2020, and August 31, 2020, identified by the following ICD-10 codes: U0710, U0711, U0712, U0714, U0715. For all included patients, we extracted (BMI) classes ([40–50],  $\geq 50$  kg/m<sup>2</sup>), high blood pressure diagnosis codes (I10), and diabetes codes (E11) at the time of SARS-COV-2 infection hospitalization. We also extracted death during the hospitalization for SARS-COV-2 infection.

### Statistical Methods

For each calendar year between 2015 and 2019, a number of patients having had a BS and among them those hospitalized for SARS-CoV-2 were recorded. For 2019, to get further insight into recent BS, these numbers were recorded by trimester. We then estimated standardized hospitalization ratios and their 95% confidence intervals (95% CI), with patients having had BS in 2015 as a reference age distribution. This allows taking into account the fact that those who had their surgery in 2015 were older than those operated more recently. We also estimated odds ratios (OR, 95% CI) for being hospitalized for SARS-CoV-2 infection for the different risk factors (hypertension, diabetes, BMI  $\geq 50$  kg/m<sup>2</sup>) in the total cohort.

### Results

Between January 1, 2015, and December 31, 2019, a total of 227,681 patients were hospitalized for a BS in France (Fig. 1). Among them, 477 (2.1 per 1000 patients) were hospitalized for SARS-CoV-2 infection between January 1, 2020, and

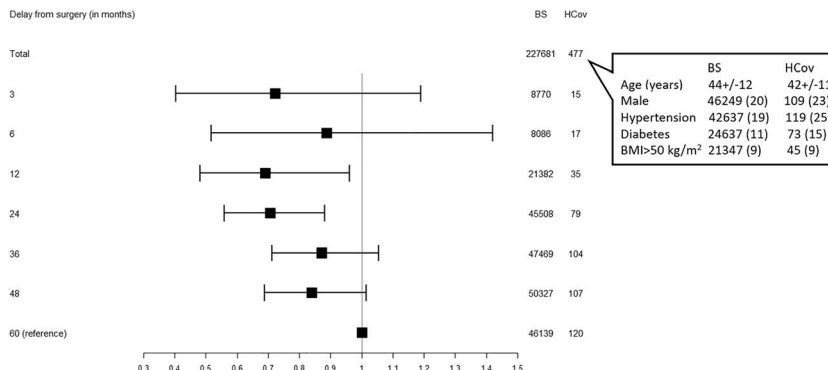
August 31, 2020. Hypertension (OR=1.4 [1.2; 1.6],  $p<0.001$ ) and diabetes (OR=1.5 [1.2; 1.9],  $p=0.002$ ) at the time of BS significantly increased hospitalization risk for SARS-CoV-2. BMI greater than 50 kg/m<sup>2</sup> at the time of BS was not associated with hospitalization risk. The probability to be hospitalized for SARS-COV-2 significantly increases with date of BS (Fig. 1): the hospitalization risk standardized for age in 2020 was significantly reduced for patients having a BS in the past 2 years compared to those who had a more remote BS (Fig. 1).

### Discussion

To our knowledge, this is the first study to assess the association between the risk of hospitalization for confirmed SARS-CoV-2 infection and time of BS on a large nationwide cohort. Hospitalization rate for patients with BS history was low and significantly increases with date of surgery. Despite the lack of direct evidence in our study, we could assume that BS could have a positive effect through weight loss and improvement of comorbidities. Indeed, obesity is an independent risk factor for mortality in SARS-CoV-2. By obtaining a substantial weight loss, BS could also by domino effect protect operated patients.

Previous studies have reported that malnutrition could worsen infectious lung disease [4] and bariatric surgery in certain situations induces malnutrition [5, 6]. Even if this has been described outside the context of SARS-CoV-2 infection, we did not find that patients having experienced a BS recently at the time of SARS-CoV-2 outbreak had an increased risk of BS. By combining our finding, with the results of the GENEVA study which showed that 30-day morbidity and mortality following BS during the SARS-CoV-2 pandemic with locally appropriate perioperative SARS-CoV-2 protocols in place seemed to be similar to pre-pandemic levels, we have several arguments in favor of maintaining normal BS activity during the SARS-CoV-2 pandemic [7]. In addition, a previous French nationwide study showed that BS is associated with a reduced risk of death and invasive mechanical ventilation in obese patients with SARS-CoV-2 [8].

**Fig. 1** Standardized hospitalization ratios for Covid-19 and their 95% confidence intervals (95% CI) according to the delay from bariatric surgery\*. \*Baseline characteristics of patients hospitalized for Covid-19 infection according to having had bariatric surgery (BS) or not (HCov: hospitalization for Covid-19 in patients with BS history). Data are:  $n = (\%)$  or  $m \pm$  standard deviation if specified



## Conclusion

In conclusion, this cohort study showed that patients who have had a recent bariatric surgery were not at increased risk for hospitalization in case of SARS-CoV-2 infection. Further prospective studies will help to untangle this complex issue.

## Declarations

**Ethics Approval** For this type of study, formal consent is not required.

**Informed Consent** Informed consent does not apply.

**Conflict of Interest** The authors declare no competing interests.

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