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ORIGINAL CONTRIBUTIONS

Assessment of the clinical and laboratorial profile of patients with obesity and asymptomatic COVID-19 undergoing bariatric surgery in Brazil

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Abstract

Purpose to outline the clinical and laboratorial profile of patients with obesity undergoing bariatric surgery who presented positive reverse transcription-polymerase chain reaction (RT-PCR) for severe acute respiratory syndrome coronavirus-2 (Sars-CoV-2) in the preoperative period without symptoms presentation.

Methods Case series of 17 patients undergoing bariatric surgery who presented positive RT-PCR for Sars-CoV-2 in the preoperative period, with no reported symptoms. Data collected included demographic characteristics, length of hospital stay, waiting time for surgery, inflammatory markers, serum levels of micronutrients and dengue virus (DENV) serology.

Results In total, 219 patients underwent bariatric surgery in our institution during the study period. The incidence of asymptomatic cases was 7.7%. The sample comprised 88.2% of women, with mean age of 39.3 years and mean preoperative body mass index (BMI) of 37.7 kg/m2. Thirty five percent of the sample had previous diagnosis of diabetes and 29.4% had hypertension. The mean time elapsed between positive RT-PCR and the operation was 17 ± 7.5 days and the mean length of postoperative hospital stay was 1.9 ± 0.43 day. Mean lymphocytes count was 2,409.7/mm3 and the mean platelet-to-lymphocyte ratio was 126.3. Mean C-reactive protein value was 5.8 mg/dL, while ferritin marked 107.4 µg/L. DENV IgG was identified in all patients who tested for it. Mean levels of vitamin D and zinc were 25.6 ng/mL and 79.9 µg/dL, respectively. There were no postoperative complications reported.

Conclusion None of the included patients presented any of the laboratory markers related to disease severity. Moreover, it is important to notice that all patients who tested for DENV, had the specific IgG detected in their serum.

Keywords COVID19 · Bariatric surgery · Sleeve gastrectomy · Obesity

Introduction

The current COVID-19 pandemic has already infected around 180 million people worldwide, reaching over 4 million deaths in just over a year of its beginning, and Brazil figures as one of the 3 countries with the highest number of deaths[1]. The mortality related to this infection increases in the presence of several risk factors, which are frequently reported in the literature, including obesity, diabetes, hypertension and other cardiovascular morbid conditions[1, 2].

Obesity has been pointed as the main risk factor for the aggravation of COVID-19 cases, with several studies showing higher necessity of mechanical ventilation, longer hospital stay and higher mortality rates in this population [3, 4]. Patients with obesity who get infected by Sars-CoV-2 present a 113% higher chance of hospitalization when compared with patients with BMI < 30 kg/m2, 74% higher chance of needing intensive care and 48% higher chance of death [5].

Despite all the alarming evidence regarding obesity and disease severity, we observed successive cases of patients with grade II obesity presenting positive RT-PCR for Sars-CoV-2, without symptoms presentation. Taking this scenario

Key points
- COVID19 Asymptomatic patients did not present any alterations in the serum inflammatory markers
- COVID19 Asymptomatic patients did not present any alterations in the serum micronutrients values
- DENV IgG was present in all patients

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into consideration, the present study aimed to outline the clinical and laboratorial profile of patients with obesity undergoing bariatric surgery who presented positive RT-PCR for Sars-CoV-2 in the preoperative period without symptoms presentation.

Methods

Study design

This case series included all patients aged between 18 and 65 and BMI ≥ 35 kg/m^2 who underwent bariatric surgery in our Institution during the COVID-19 pandemic, from April 2020 until March 2021. A total of 219 patients were operated on, among which, only 17 presented asymptomatic COVID-19, confirmed by a preoperative polymerase chain reaction (RT-PCR) test. This study was approved by the Ethics Committee of our institution, under the following identification number CAAE: 48,206,421.1.0000.8807.

Data collection

All patients undergoing bariatric surgery were submitted to a RT-PCR for Sars-CoV-2 within 3 days before the surgery schedule in order to screening asymptomatic COVID-19 cases. Those patients who tested positive had their surgery temporarily cancelled and a social isolation of 10 days was recommended. After this period, another RT-PCR test was realized and, if negative, the surgery would be rescheduled. However, if still positive, it would remain cancelled and the social isolation would be reinforced.

Data collected included patients baseline characteristics such as age, gender, BMI and presence of diabetes or hypertension; time elapsed between positive RT-PCR for Sars-CoV-2 and bariatric surgery; overall incidence of COVID-19; length of postoperative hospital stay; and serum laboratory markers including leukocyte, lymphocyte and platelet counts, platelet-to-lymphocyte ratio (PLR), C-reactive protein (CRP), glycosylated hemoglobin (A1c), ferritin, iron, vitamin D, zinc, vitamin B12 and dengue virus (DENV) serology test results. Data were prospective collected through the routine pre- and postoperative consultation with the bariatric surgeon responsible for the case.

Statistical analysis

A spreadsheet in Microsoft Excel was created to analyze the data, which was moved to a SPSS software, version 25, to perform the analysis. Next, percentage frequencies of the variables were calculated and the frequency distributions determined to evaluate the demographic profile of the patients. Results related to all quantitative variables were also analyzed through descriptive statistics.

Results

In total, 219 patients underwent bariatric surgery in our institution during the study period. Among these, only 17 presented positive RT-PCR for Sars-CoV-2 in the preoperative period, with no reported symptoms, in other words, the overall incidence of asymptomatic cases in our sample was 7.7%. Among the 17 included patients, 4 did not undergo surgery within the study period. All patients were submitted to Sleeve gastrectomy. The sample comprised 88.2% of women, with mean age of 39.3 years and mean preoperative BMI of 37.7 kg/m^2. Thirty five percent of the sample had previous diagnosis of diabetes and 29.4% had hypertension. The mean time elapsed between a positive RT-PCR and the operation (waiting time) was 17 ± 7.5 days and the mean length of postoperative hospital stay (LOS) was 1.9 ± 0.43 day (Table 1). Among those patients who were operated on, there were no report of postoperative complications.

Table 2 shows the data of each individual patient. Lymphocytes count was 2,409.7/mm^3 and the mean platelet-to-lymphocyte ratio (PLR) was 126.3. Mean C-reactive protein value was 5.8 mg/dL, while ferritin marked 107.4 µg/L. Mean glycosylated hemoglobin (A1c) was 5.7%. It is important to notice that among those patients who tested for dengue virus (DENV) serology, all of them had the specific IgG detected in their serum.

Table 3 shows the data related to serum micronutrient levels. Mean levels of vitamin D and zinc were 25.6 ng/mL and 79.9 µg/dL, respectively. Mean serum calcium was 9.0 mg/dL, while B12 and iron were 467.7 and 81.6, respectively.

Discussion

Herein, we gathered the data amidst all patients with obesity presenting asymptomatic COVID19 in the preoperative period of bariatric surgery. Our intention, with this purely descriptive analysis, was to outline their clinical and laboratorial profile and estimate the incidence of asymptomatic cases of COVID19 among patients with obesity.

Currently, bariatric surgery is the most effective treatment for obesity within the short and long terms[6]. This surgery contains a restrictive mechanism, which lead to reduction of food intake and, thus, sustained weight loss, and also several metabolic effects, which contribute for the improvements in the glycemic and lipid profile of patients, besides the reduction in the cardiovascular risk and attenuation of

Table 1 Individual patient data: demographic characteristics

Patient	Sex	Age (years)	BMI (Kg/m^2)	T2D	Hypertension	Waiting time (days)	LOS (days)
1	F	36	35.1	No	No	14	2
2	F	36	40.6	No	No	12	2
3	F	37	35.9	Yes	Yes	10	2
4	F	34	35.5	No	No	31	2
5	F	36	42.2	No	No	11	2
6	F	39	38.3	Yes	No	17	2
7	F	20	38.1	No	No	17	2
8	F	64	37.0	Yes	Yes	30	2
9	F	35	37.6	No	No	28	1
10	F	42	41.1	No	Yes	N/A	N/A
11	M	57	35.0	Yes	Yes	N/A	N/A
12	F	25	45.6	No	No	12	1
13	F	41	35.3	No	No	12	1
14	F	47	35.2	No	No	12	2
15	F	37	35.2	Yes	No	15	2
16	M	40	35.4	Yes	Yes	N/A	N/A
17	F	43	38.4	No	No	N/A	N/A
Total	88.2% (F) 11.8% (M)	-	-	35%	29.4%	-	-
Mean ± SD	-	39.3 ± 10.2	37.7 ± 3.1	-	-	17 ± 7.5	1.9 ± 0.43

BMI: body mass index; T2D: type 2 diabetes; LOS: length of stay; N/A: not applicable; M: male; F: female

Table 2 Individual patient data: laboratory inflammation markers

Patient	Leukocytes (/mm^3)	Lymphocytes (/mm^3)	Platelets (/mm^3)	PLR	CRP (mg/dL)	A1c (%)	Ferritin (µg/L)	DENV IgG
1	7800	1872	224,000	119	0.6	4.9	10.7	(+)
2	7300	2190	347,000	158	8.9	6.2	101	NC
3	8400	2604	273,000	104	31.5	5.7	94	NC
4	8000	2480	294,000	118	7.8	5.5	39	(+)
5	8980	3040	284,000	93	0.7	5.7	44	NC
6	7300	2628	291,000	110	4.6	5.5	51	(+)
7	5600	2632	198,000	75	2.0	5.2	93	(+)
8	9600	3648	261,000	71	4.2	6.5	73	(+)
9	6900	2773	296,000	106	19.8	6.0	98	(+)
10	6800	3264	328,000	100	0.6	5.3	18	NC
11	6300	2016	185,000	91	3.5	7.4	186	NC
12	9040	2480	277,000	111	0.4	5.4	44	NC
13	4860	1409	332,000	235	9.8	5.7	61.5	NC
14	8100	2025	283,000	139	1.7	5.3	103	(+)
15	7050	2157	273,000	126	0.5	5.4	133.2	NC
16	7600	2508	370,000	147	2.2	6.0	615	NC
17	11,540	1240	303,000	244	0.3	5.5	61	NC
Mean ± SD	7715.8 ± 1564.7	2409.7 ± 613.4	283,470.6 ± 48,652	126.3 ± 48.4	5.8 ± 8.3	5.7 ± 0.6	107.4 ± 137.7	

PLR: platelet-to-lymphocyte ratio; CRP: C-reactive protein; A1c: glycosylated hemoglobin; DENV: dengue virus; NC: not collected

Table 3 Individual patient data: micronutrients

Patient	Zinc (µg/dL)	Vitamin D (ng/mL)	Calcium (mg/dL)	Vitamin B12 (pg/mL)	Iron (µg/dL)
1	75.4	27.2	10	252	80
2	88.8	18.7	9.2	834	135
3	90.1	24.1	9.1	509	52
4	95.2	18.8	9.4	475	146
5	84.0	16.0	9.1	376	57
6	88.6	26.4	8.4	551	65
7	87.1	27.6	9.1	580	74
8	80.5	47.7	9.2	712	63
9	91.6	23.5	9.1	284	77
10	68.8	20.8	10.5	267	44
11	87.9	31.5	8.5	663	108
12	68.0	26.0	8.6	328	63
13	52.7	22.1	7.9	562	73
14	92.5	24.2	8.8	625	77
15	50.6	23.0	8.5	309	63
16	86.0	20.6	9.2	333	109
17	72.0	37.0	9.2	291	101
Mean ± SD	79.9 ± 13.5	25.6 ± 7.6	9.0 ± 0.6	467.7 ± 178.5	81.6 ± 28.7

the pro-inflammatory status related to obesity *per se* [7–9]. Despite all the largely demonstrated benefits, bariatric surgery suffered serious restrictions during these times of pandemic due to the shortage of resources and the intention of limiting exposure of healthy patients [10]. Faced with this scenario, several researchers and bariatric surgeons seek for evidences that would establish the real impacts of performing these procedures during the current period and, thus, allow patients, doctors and public authorities to weight its costs and benefits based on actual Figs. [10].

In the present study, when a patient had a surgery schedule but presented a positive RT-PCR for Sars-CoV-2, the surgery would be cancelled and the patients required 10 days of social isolation before getting another test in order to re-schedule the procedure. The mean waiting time for surgery, namely, the time elapsed between a positive RT-PCR and the operation, was 17 days. Hu et al. found that the median period between a positive and a negative RT-PCR was 9.5 days, with a maximum of 21 days [11]. Pan et al. found slightly different results, observing that their patients required 10–36 days until the last positive RT-PCR [12]. Despite that, the role of RT-PCR as a tool to assess infectivity in asymptomatic patients is still unclear [13].

As the pandemic progressed, scientific knowledge also evolved and, throughout observation, different laboratory markers were highlighted as possible predictive factors for severe COVID-19, including leukocytosis, lymphopenia, low platelet counts and elevated levels of CRP and ferritin [14].

Inflammatory/immune response markers

Among the aforementioned risk factors for severe COVID-19, the sustained decrease in the lymphocyte count appears to be the most critical [15]. Yang reported that lymphopenia ($< 1000/mm^3$) was common feature among their critically ill adult patients, occurring in 85% of these cases [16]. Fan et al. found that a lymphocyte count lower than $600/mm^3$ was a predictive factor for ICU admission in their cohort [17]. In the present study, which included only asymptomatic patients, there were no cases with lymphopenia.

PLR is a new index that has been related to systemic inflammation and thrombosis, reflecting a pro-inflammatory status [18]. Studies have recently shown that higher values of PLR, especially higher variations of PLR, present a linear correlation with the length of hospital stay and severity of COVID-19 cases, probably due to the reflex of the cytokine storm [19]. We did not find, in our sample, any alteration in platelet counts nor in PLR values.

CRP and ferritin are both non-specific acute-phase proteins produced by the liver that, generally, present early elevation of their levels in acute inflammatory conditions [14, 20]. Studies have pointed to a direct relationship between COVID-19 severity and these markers, with recent observations that values of CRP and ferritin greater than 41.8 mg/dL and 500 µg/L, respectively, are related to a higher likelihood of developing severe disease [20, 21]. Taking another glance at our results, it is possible to observe that none of the included patients attended to these criteria.

Micronutrients

Currently, vitamin D and zinc are the most studied micronutrients under the scope of COVID-19. In this sense, vitamin D deficiency is reported as a factor associated with greater inflammatory response in COVID-19, and therefore greater disease severity [22–24]. However, these data are mostly verified by observational studies, and a recent clinical trial showed that the administration of a single high dose of vitamin D3 did not change the length of hospital stay in patients with moderate or severe COVID-19 [25, 26]. Furthermore, zinc, which is consistently related to the immune response, is also the object of studies seeking to correlate their serum levels and the severity of COVID-19, but there is still no robust data to trace this prognostic relationship [27, 28]. Evidence of the possible benefit of normal serum zinc levels comes from studies that point to its anti-inflammatory and antioxidant action on the pulmonary epithelium, as well as on the regulation of tight junction proteins and improvement of mucociliary clearance [29]. Therefore, what we currently have, in the literature, regarding micronutrients deficiencies and COVID-19 prognosis, is purely assigned to a biological plausibility, with no objective data until now.

Dengue virus serology

The intriguing relationship between COVID-19 and dengue fever in tropical regions does not only apply to the similarities in the initial clinical presentation of these diseases, but also to a hypothesis which fall within the immunological and prognostic scope [30–32]. The presence of false-positive results in serological tests for dengue fever in individuals with COVID-19 was initially observed [33]. These data raised hypotheses about the cross-reaction between antibodies to these diseases, which was corroborated by a cohort that identified positive serological tests for dengue fever in 22% of patients with COVID-19 and showed similarity between SARS-CoV-2 Spike Protein and Dengue Envelope Protein [34]. In addition to the repercussions on diagnostic tests in this scenario, a previous history of symptomatic dengue was reported as a factor associated with better prognosis in COVID-19 [35].

Limitations

There are several limitations implicated in the present study. Firstly, its purely descriptive nature and the small number of patients included weakens our analysis and does not allow us to take any solid conclusions based on the results. However, it contains some strengths by bringing some novelty to the current literature. It is an attempt of outlining the clinical and laboratorial profile of patients with obesity who present asymptomatic COVID-19, and contains important data such as the assessment of the PLR of the patients and the results of DENV IgG serology tests, which have been recently implicated in the prognosis of COVID-19 patients, as aforementioned.

Final considerations

To sum up, we presented the general profile of patients with obesity undergoing bariatric surgery who presented positive RT-PCR for COVID-19 in the preoperative period. It calls attention that none of the included patients, despite having at least grade II obesity, presented any of the alterations related to disease severity. Furthermore, it is important to notice that all patients who tested for DENV, had the specific IgG detected in their serum. Moreover, among those patients who were operated on after the isolation period, there were no complications reported. In order to take any solid conclusion, it is of paramount importance that further prospective studies are conducted with larger samples and, preferably, control groups. For the meantime, our data raises a new hypothesis worthy to be tested.

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Declarations

Disclosure Authors have nothing to disclose.

Ethical approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and the 1964 Helsinki declaration and its later amendments, or comparable ethical standards. This research project was approved by the Ethics Committee of our institution under the protocol CAAE: 48206421.1.0000.8807.

Informed consent All patients signed an informed consent prior to their inclusion in the study.

Conflict of interest The authors declare that they have no conflicts of interests.
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