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Obesity Surgery Mortality Risk Score: Can we Go Beyond Mortality Prediction?

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Abstract

Introduction: High morbidity and low mortality has been linked to bariatric surgery. The Obesity surgery mortality risk score (OS-MRS) is a validated scale for mortality risk assessment. The aim of this study was to evaluate if OS-MRS scale can also be used as a predictor of postoperative complications in obese patients submitted to primary laparoscopic gastric bypass.

Methods: Retrospective study including all patients submitted to primary laparoscopic gastric bypass between January and December 2014. The OS-MRS scale was applied preoperatively, and postoperative to access morbidity and mortality at 30 and 90 days. Complications were classified according to Clavien-Dindo's grades (I to V). The association between different OSMRS classes and the occurrence of adverse events was analyzed.

Results: 85 patients were included and classified as class A (n=33; 38.8%), class B (n=48; 56.5%) and class C (n=4; 4.7%). No mortality cases were registered. The morbidity rate at 30 days was 23.5% (n=20), and 25.9% at 90 days (n=22). The complications rate in each of OS-MRS subgroups, was 9.1% in class A (both at 30 and 90 days), 31.3% and 35.4% in class B (at 30 and 90 days respectively), and 50% in class C (both at 30 and 90 days). There was a statistically significant independent relationship between OS-MRS scale, ASA physical status and the risk of developing pulmonary embolism, both at 30 and 90 postoperative days. Patients from classes B and C showed a greater risk of complications when compared to class A (at 30 days, OR 4.9, 95% IC: 1.3-18.2; p=0.019 and at 90 days, OR 5.8, 95% IC: 1.5-21.4; p=0.009).

Conclusion: There is increasing evidence that OS-MRS scale is a useful tool to predict morbidity after gastric laparoscopic bypass in morbidly obese patients.

Keywords: Obesity; Morbidity; Bariatric surgery; Predictive factors; OS-MRS; Laparoscopic gastric bypass; Complications

Introduction

Obesity is a global health problem defined as a body mass index (BMI) greater than 30 kg/m^2. World Health Organization states that worldwide obesity more than doubled since 1980 and in 2014 it was estimated that about 13% of the adult population were obese. In Portugal, this prevalence reached 20.1% [1].

Bariatric Surgery experienced new developments in the last few decades, and with the advent of laparoscopy become progressively less invasive. Laparoscopic gastric bypass (LGB) is currently the most common procedure for the treatment of morbid obesity [2]. Bariatric surgery, even as an elective procedure, is associated with considerable morbidity, even though it presents low mortality (under 1.5%) [3]. Values reported for morbidity are quite discrepant varying from 3 to 20% [4].

Recently, many scoring systems have been used to predict the mortality risk of patients proposed to bariatric surgery. Obesity surgery mortality risk score (OS-MRS) is used for patient's risk stratification and mortality risk assessment at 90 days postoperatively, and is validated by multiple centers [5-8]. Simplicity is its main advantage, consisting in assigning 1 point for each of the following preoperative variables: male, age ≥ 45 years, BMI ≥ 50 kg/m^2, and arterial hypertension (ATH), known risk factors for pulmonary thromboembolism (PTE). Patients with 0-1 points are classified as class A (low risk), with 2-3 points as class B (moderate risk) and with 4-5 points as class C (high risk).

Given the low mortality described for this type of surgery, stratifying patients according to their risk of postoperative complications, rather than mortality, seems a more logical and useful approach. However, only few authors have studied the possibility of using the OS-MRS with morbidity's prediction as an end point. Sarela et al. concluded that the patients included in OSMRS class C presented more adverse events, when compared to those from classes A+B, [9]. Lorente et al [10] found complications in patients from classes B+C to be more frequent then in those from class A. However, these studies had several limitations: patients were submitted to different bariatric surgical procedures, there were multiple interventions at the same operative time, and post-operative records were analyzed only in the first 30 days.

The aim of this study was to evaluate OS-MRS as a predictor of complications at 30 and 90-days postoperative in morbidly obese patients submitted to primary laparoscopic gastric bypass.

Methods

A retrospective study was performed including all consecutive patients who underwent primary laparoscopic gastric bypass between

January 1st and December 31st 2014, at Centro Hospitalar do Porto, Portugal.

The usual multidisciplinary preoperative evaluation (including Surgery, Endocrinology, Anesthesia, Psychiatry and Nutrition) took place in our institution, which is considered national reference for laparoscopic bariatric surgery. Patients with co-existing surgical procedures besides LGB were excluded. Most patients were admitted one day before surgery and were discharged on the 3rd postoperative day. Anesthesia technique included induction with propofol and maintenance with desflurane to a bispectral index (BIS®) target of 40-60. A perfusion of remifentanil was used during the procedure. Muscle relaxation was achieved with rocuronium and reversed with sugammadex, under train-of-four neuromuscular monitoring.

Clinical electronic records were accessed to evaluate age, gender, preoperative weight, height, BMI, American Society of Anaesthesiology physical status (ASA), ATH and increased risk of PTE, defined as if there was previous history of PTE, hypoventilation ($PaCO_2$>45mmHg), presence of inferior vena cava filter or a diagnosis of pulmonary hypertension.

Morbidity and mortality at 30 and 90 days following surgery were recorded. If there was not a medical appointment during this period, patients were contacted by telephone to clarify their clinical status.

Complications were classified according to Clavien-Dindo's grades [11-13]. This classification stratifies adverse events into one of 5 grades: grade I includes any deviation from normal postoperative course without the need for pharmacological or other treatment (allowing antiemetics, analgesics, diuretic, electrolytes and physiotherapy); grade II complications require blood transfusion, total parenteral nutrition or pharmacological treatment besides the one allowed on grade I; grade III requires surgical, endoscopic or radiological intervention; grade IV are life-threatening complications; and finally grade V refers to the death of a patient.

The OS-MRS was calculated, as previously described. Patients were then classified into three groups according to their score.

Microsoft Excel® (2010) was used for statistical analysis. Odds Ratio was used to analyze the influence of OS-MRS classes on the development of postoperative complications. The chi-square test or the Fisher's test was used to analyze the association between different individual risk factors and the development of postoperative complications.

Results

Eighty-five consecutive patients submitted to primary laparoscopic gastric bypass were included, of which 70 (82.4%) were female. The mean age was 44 years old (range 20-65) and the mean BMI was 44.3 ± SD 5.8 kg/m^2. Concerning the ASA physical status, 56 patients (65.9%) were classified as ASA II, and the remaining as ASA III. The prevalence of the risk factors included in OS-MRS and their co-existence, is presented in Tables 1 and 2.

On the OS-MRS scale, 33 patients were classified as class A (38.8%), 48 as class B (56.5%) and 4 as class C (4.7%).

No mortality cases were registered. Twenty patients (23.5%) presented at least one complication during the first 30 days. A total of 22 patients had some complication by the 90th postoperative day (25.9%) (Table 3). It should be noted that one patient presented one grade I complication at the first 30 days, and another of grade III during the 90 postoperative days.

	Total of patients	%
Age ≥ 45	44	51.8
Body mass index ≥ 50 kg/m2	15	17.6
Male	15	17.6
Arterial Hypertension	52	61.2
Risk of Pulmonary Thromboembolism	23	27.1
Totality of Patients included	85	100

Table 1: Prevalence of the risk factors used to calculate OS-MRS.

	Age ≥ 45	BMI ≥ 50	Male	AHT	Risk of PTE
Age ≥ 45	44	5	6	36	13
BMI ≥ 50		15	4	9	4
Male			15	13	4
AHT				52	15
Risk of PTE					23

BMI: Body Mass Index; AHT: Arterial Hypertension; PTE: Pulmonary Thromboembolism

Table 2: Relation and frequency of risk factors used to calculate OS-MRS in the 85 patients.

For statistical analysis purposes, at 90 days, this patient was considered only once, with the complication of higher grade. Of the registered complications, 5% (n=1) at 30 days, and 9% (n=2) at 90 days, were considered major, requiring surgical or endoscopic intervention.

Unimodal analysis showed statistical significance for OS-MRS scale, ASA physical status and the risk of developing PTE, regarding the occurrence of postoperative complications, both at 30 and 90 postoperative days (Table 4).

The rate of complications in each of OS-MRS subgroups at 30 and 90 days was: 9.1% in class A (both evaluations), 31.3% and 35.4% in class B (at 30 and 90 days, respectively) and 50% in class C (both evaluations).

Due to the small sample of high-risk patients, classes B (moderate risk) and C (high risk) were grouped together for analysis. When patients classified as class A were compared to those from classes B and C, we found that the risk of general complications was significantly greater in the last group, with an odds ratio of 5.8 at 90 days (95% IC: 1.5-21.4; p=0.009). Similar results were obtained at 30 days with an odds ratio of 4.9 (95% IC: 1.3-18.2; p=0.019).

However, when excluding minor adverse events (Clavien-Dindo grade I) the results did not show the same statistically significant difference between Class A and Classes B+C, with an OR=1.5 at 90 days (95% IC: 0.37-6.49; p=0.54) and an OR=2.4 at 30 days (95% IC: 0.47-12.39; p=0.29).

Type	Complication	At 30 days	Cumulative at 90 days
I	Accentuated nutritional deficit	0	1
	Persistent vomiting requiring postponing discharge, non-scheduled medical consultation or hospital readmission	11*	11*
II	Surgical wound infection	2	2
	Dysrhythmia	1	1
	Digestive haemorrhage with transfusion	1	1
	Respiratory insufficiency with noninvasive ventilation	2	2
	Respiratory infection	1	1
	Acute Kidney Injury with dehydration	1	1
III	Anastomosis dehiscence	1	1
	Anastomosis stenosis	0	1*
Total of Patients with Complications		20	22*

*Note that one patient presented episodes of vomit at 30-days and anastomosis stenosis at 90 days. For analysis purposes at 90 days it was considered only once, with the highest grade complication.

Table 3: Postoperative complications at 30 and 90 postoperative days, divided according to Clavien-Dindo's classification.

Discussion

In our series, there were no cases of mortality, which seems to be in line with the extremely low mortality rate described in other studies.

Although our complications' rate was higher when compared to the existing literature, only 2 major complications (2.4%) were registered, which is consistent with other studies [10,14]. In addition, even though most complications occurred in the first 30 days, we analyzed a longer time period (90 days).

Although there are some scores designed for predicting morbidity in bariatric surgery, such as the ones developed by Gupta et al. and Turner et al., some limitations have been reported [15,16]. Some are not exclusively designed for LGB, or are difficult to apply and their calculation is time-consuming, others are not validated in multiple centers or do not stratify patients in risk groups. OS-MRS, previously only a tool for estimating mortality, is a much simpler tool, as most of its variables are routinely gathered in a preoperative consultation. We found that OS-MRS is useful in predicting the risk of postoperative complications after laparoscopic gastric bypass, which is of great importance both for selection, patient information and decisions regarding the perioperative period and the follow-up. This seems to be in accordance with findings of both Sarela et al. and Lorente et al. [9,10].

In our study, when different risk factors were individually analyzed, only the risk of PTE, OS-MRS and ASA classification were related to the occurrence of complications. However, previous studies also found correlations with age, BMI, sex and ATH [16-19].

Regarding both periods analyzed (30 versus 90 days) the conclusion reached for each of them are similar; thus, although there is an advantage of predicting morbidity at 90 days, future studies for validation of this score may draw conclusions from a shorter follow-up period such as 30 days.

The OS-MRS score was useful in predicting general morbidity; the same was not valid when excluding minor complications. This, however, does not minimize its importance in the preoperative setting as a tool to stratify patients. In fact, complications of grade I, even though not demanding specific or invasive therapeutics, require postponing discharges, patients' re-admissions or additional complementary laboratorial and imagiologic exams, bringing important social and economic implications for both the patient and the institution.

			At 30 days		At 90 days	
		Total	Complications	P	Complications	P
Age ≥ 45 years	Yes	44	13	0.279	15	0.123
	No	41	7		7	
	Total	85				
BMI ≥ 50 kg/m^2	Yes	15	3	1	4	1
	No	70	17		18	
	Total	85				
Male	Yes	15	5	0.3301	5	0.521
	No	70	15		17	
	Total	85				
Arterial Hypertension	Yes	52	15	0.1929	17	0.0818
	No	33	5		5	
	Total	85				
Risk of PTE	Yes	23	12	0.0005*	12	0.002*
	No	62	8		10	
	Total	85				
ASA physical status	II	56	9	0.0474*	9,0	0.0091*
	III	29	11		13,0	
	Total	85				
OS-MRS	A	33	3	0.0172*	3,0	0.0052*
	B+C	52	17		19,0	
	Total	85				

BMI: Body Mass Index; PTE: Pulmonary Thromboembolism; ASA: American Society of Anaesthesiology; OS-MRS: Obesity Surgery Mortality Risk Score; *p<0.05.

Table 4: Analysis of the association between each risk factor individually and the occurrence of postoperative complications.

The study presents some limitations: small sample size, patients from only one institution, retrospective design. Even though it clearly demonstrates the ability to identify the patients with higher risk of postoperative adverse events, a larger sample might be needed to

address the possibility of predicting high-grade complications. However, the prevalence of higher-grade complications in our sample seems in accordance with the literature [10,14]. Lastly, although retrospective, the study variables included in OS-MRS are routinely assessed and registered in the clinical anesthesia pre-operative assessment of these patients.

In conclusion, there is increasing evidence that OS-MRS scale might be a useful tool to predict general morbidity after gastric laparoscopic bypass in morbidly obese patients.

This evidence allows physicians to better inform patients and decide on which strategies they could benefit for in the perioperative period.

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