Can the Obesity Surgery Mortality Risk Score predict postoperative complications other than mortality?

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Abstract

Introduction: *Laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) are bariatric procedures with acceptable risk of postoperative morbidities and mortalities, but identification of high-risk patients is an ongoing issue. DeMaria et al. introduced the Obesity Surgery Mortality Risk Score (OS-MRS), which was designed for mortality risk assessment but not perioperative morbidity risk.*
Aim: *To assess the possibility to use the OS-MRS to predict the risk of perioperative complications related to LSG and LRYGB.*
Material and methods: *Retrospective analysis of patients operated on for morbid obesity was performed. Patients were evaluated before and after surgery. We included 408 patients (233 LSG, 175 LRYGB). Perioperative complications were defined as adverse effects in the 30-day period. The Clavien-Dindo scale was used for description of complications. Patients were assigned to five grades and three classes according to the OS-MRS results, then risk of morbidity was analyzed.*
Results: *Complications were observed in 30 (7.35%) patients. Similar morbidity was related to both procedures (OR = 1.14, 95% CI: 0.53–2.44, p = 0.744). The reoperation and mortality rates were 1.23% and 0.49% respectively. There were no significant differences in median OS-MRS value between the group without and the group with perioperative complications. There were no significant differences in OS-MRS between groups (p = 0.091). Obesity Surgery Mortality Risk Score was not related to Clavien-Dindo grades (p = 0.800).*
Conclusions: *It appears that OS-MRS is not useful in predicting risk of perioperative morbidity after bariatric procedures.*

Key words: *complications, bariatric surgery, Obesity Surgery Mortality Risk Score.*

Introduction

Laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) are associated with acceptable risk of postoperative morbidity and mortality [1–7]. However, identification of high-risk patients plays an important role in everyday work of the bariatric team [8, 9]. It may help in the process of selection of the most appropriate procedure for those patients, preoperative optimization of therapy for co-morbidity, and enhanced vigilance in the perioperative period [9–12].

DeMaria *et al.* introduced the Obesity Surgery Mortality Risk Score (OS-MRS) [13], which was validated in a US multi-center study [14] and in a Canadian study [15]. The OS-MRS uses five clinical

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risk factors for assignment to one of three distinct classes. The OS-MRS has been applied previously for mortality risk assessment, but not risk of perioperative morbidity.

Since mortality from laparoscopic bariatric surgery is a rare event, we tried to apply OS-MRS in assessment of perioperative bariatric procedures' morbidity.

Aim

We aimed to assess the use of the OS-MRS to predict the risk of perioperative complications related to LSG and LRYGB.

Material and methods

Material

From April 2009 to October 2015, 415 patients were operated on for morbid obesity in the 2nd Department of General Surgery of Jagiellonian University Medical College. In the study we included 408 patients (256 women, 152 men, 42.5 years old on average). In 233 patients LSG was performed (159 women, 74 men, mean age: 40.34 ±10.83) and in 175 LRYGB (97 women, 78 men, mean age 45.95 ±10.06) (Figure 1). Patients' clinical characteristics, including surgical data, are presented in Table I. The association between OS-MRS class and incidence of the study endpoint in laparoscopic bariatric surgery is presented in Table II.

Methods

The study was based on retrospective analysis of prospectively collected data of patients operated on for morbid obesity. Inclusion criteria for bariatric operations were Guidelines of the Metabolic and Bariatric Section of the Polish Surgical Society, i.e. body mass index (BMI) ≥ 35 kg/m^2 with obesity comorbidities or BMI ≥ 40 kg/m^2 with or without comorbidities. Patients were evaluated prior to surgery and afterwards underwent LSG or LRYGB. Patients' demographic and clinical data, including a detailed description of the intraoperative adverse effects and perioperative complications, were obtained. Perioperative complications were defined as adverse effects which occurred in the 30 days after the procedure. The Clavien-Dindo scale was used for description of complications [16].

The risk of postoperative complications was assessed using the OS-MRS scale. One point was assigned to each of 5 preoperative variables including BMI ≥ 50 kg/m^2, male gender, arterial hypertension, known risk factors for pulmonary embolism, e.g. previous thromboembolism, preoperative vena cava filter, hypoventilation, pulmonary hypertension and age ≥ 45 years. Patients were divided into five categories according to the OS-MRS results. The class of the risk assigned to each patient was dependent on the total points obtained. A score of zero or one point = class A; two or three points = class B; and four or five points = class C.

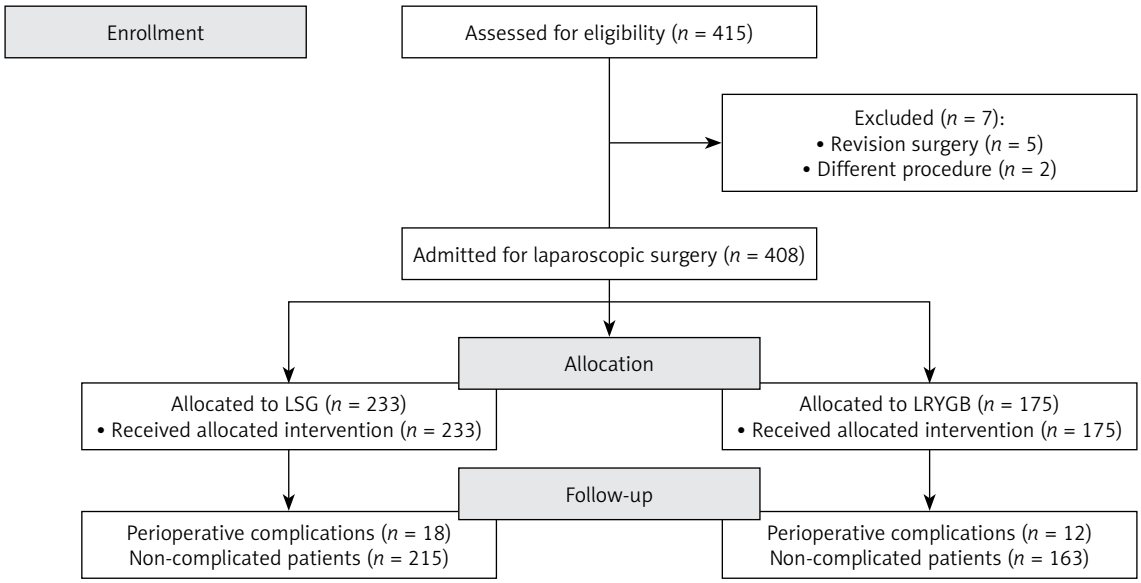

Figure 1. Study flow chart

Table I. Patients' characteristics

Parameter	LSG	LRYGB	*P*-value
Factors dependent on patient:			
Number of patients, *n* (%)	233 (57.11)	175 (42.89)	–
Females, *n* (%)	159 (38.97)	97 (23.77)	0.008
Males, *n* (%)	74 (18.14)	78 (19.12)	
Age, mean ± SD [years]	40.34 ±10.83	45.95 ±10.06	0.302
Maximal preoperative weight, median (IQR) [kg]	132 (120; 147)	141 (126; 160)	< 0.001
Maximal preoperative BMI, median (IQR) [kg/m^2]	45.91 (42.48; 50.19)	48.83 (44.08; 54.08)	< 0.001
Weight on day of surgery, median (IQR) [kg]	130 (117; 143)	135 (120; 155)	0.004
BMI on day of operation, median (IQR) [kg/m^2]	44.82 (41.33; 48.55)	46.76 (41.87; 52.63)	0.002
Preoperative weight loss, median (IQR) [kg]	2 (0; 6)	4 (0; 9)	0.002
Factors dependent on procedure:			
Operative time, median (IQR) [min]	110 (85; 140)	140 (100; 180)	< 0.001
Additional procedure during procedure, *n* (%)	3 (1.29)	4 (2.29)	0.702
Intraoperative adverse effects, *n* (%)	4 (1.72)	10 (5.71)	0.055
Operated on by experienced operator, *n* (%)	28 (12.02)	104 (59.43)	< 0.001
Operated on by operator on bariatric learning curve, *n* (%)	205 (87.98)	71 (40.57)	

Table II. Association between OS-MRS class and incidence of the study endpoint in laparoscopic bariatric surgery (total *N* = 408)

OS-MRS class	OS-MRS Grade[a]	Number of patients, *n* (%)	Endpoint[b], *n* (% of patients)
A	0–1	199 (48.77)	20 (4.9)
B	2–3	115 (28.19)	4 (0.98)
C	4–5	94 (23.04)	6 (1.47)

[a]*Number of risk factors: age ≥ 45 years, male gender, BMI ≥ 50 kg/m^2, hypertension (or treatment for hypertension) and high-risk status for thromboembolism.*
[b]*End point: perioperative morbidity, including mortality, defined as laparoscopic bariatric surgery adverse effects diagnosed in the 30-day perioperative period.*

Ethics

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The study was approved by the Bioethics Committee of the Jagiellonian University.

Statistical analysis

To assess the significance of the observed intergroup differences of frequencies of qualitative data, the χ^2 test with and without Yates' correction and Fisher's exact test were used. The quantitative data were processed with Student's *t*-test or the Mann-Whitney test for non-parametric variables. Univariate logistic regression analyses were conducted for OR with 95% CI calculations. Statistical significance was observed with *p*-value under 0.05. Statistica 10.0 PL software was used for the conducted analysis.

Results

Complications were observed in 30 (7.35%) patients. Similar morbidity was related to both procedures (LRYGB vs. LSG; OR = 1.14, 95% CI: 0.53–2.44, $p = 0.744$). The most common complication was rhabdomyolysis, observed in 9 patients (2.2% of total). The 30-day reoperation rate and mortality rate were 1.23% and 0.49% respectively. Causes of death were pulmonary embolism and rhabdomyolysis in the first (OS-MRS class C), and operation site's strangulated hernia with peritonitis and jejunojejunal anastomo-

sis leak in the second patient (OS-MRS class B). Both patients were submitted to LRYGB (Table III).

The OS-MRS yields quantitative, but it could be converted to qualitative categories. The Mann-Whitney test revealed no statistically significant difference between the median OS-MRS value of 3 (2-3) of the group without perioperative complications and the median OS-MRS value of 3 (1-3) calculated for the group with perioperative complications.

The study revealed no statistically significant difference in OS-MRS class between the group with complications and the group without complications (p = 0.091). We did not observe a significant difference between groups A and B in OS-MRS class (p = 0.059), or between A and C (p = 0.513) or B and C (p = 0.303) or A and B + C (p = 0.095) (Table IV).

We did not observe any statistically significant difference in OS-MRS between different Clavien-Dindo grades (p = 0.8). There was no significant relation between frequency of A or B + C OB-MRS class categories and Clavien-Dindo class I–II or III–V categories (p = 0.648) (Table V).

Finally, we used univariate logistic regression to assess the influence of increasing OS-MRS class or grade on the odds ratio of morbidity. The odds ratio of perioperative complications did not increase

Table III. Perioperative (≤ 30 days) complications according to Clavien-Dindo scale

C-D Grade	Complications	*N* (%)	LSG	LRYGB
5	Pulmonary embolism and rhabdomyolysis (patient death)	1 (0.25)	0	1 (0.57%)
	Peritonitis, strangulated operation site hernia, jejunojejunal anastomosis leak (relaparotomy, patient death)	1 (0.25)	0	1 (0.57%)
4b	Cardiorespiratory failure (ICU stay)	2 (0.49)	1 (0.43%)	1 (0.57%)
4a	Pneumonia, ARDS (ICU stay)	1 (0.25)	0	1 (0.57%)
3b	Gastrointestinal leakage	6 (1.53)	5 (2.15%)	1 (0.57%)
	Bleeding from suture line (relaparoscopy)	2 (0.49)	1 (0.43%)	1 (0.57%)
	Petersen's space hernia (relaparoscopy)	1 (0.25)	0	1 (0.57%)
2	Pneumonia	1 (0.25)	0	1 (0.57%)
	Fever of unknown origin	1 (0.25)	0	1 (0.57%)
1	Delayed gastric emptying*	5 (1.23)	4 (1.72%)	1 (0.57%)
	Dehydration*	1 (0.25)	1 (0.43%)	0
	Prolonged drainage	1 (0.25)	1 (0.43%)	0
	Rhabdomyolysis	8 (1.96)	6 (2.58%)	2 (1.14%)
	Total	30 (7.35)	18 (7.73%)	12 (6.86%)

**1 patient was diagnosed with both complications.*

Table IV. Pearson's χ^2 test of intergroup differences in OS-MRS frequencies

OS-MRS class	Group with complications	Group without complications	*P*-value			
			A vs. B	B vs. C	A vs. C	A vs. B + C
A	4 (13.33%)	111 (29.37%)	0.059	0.303	0.513	0.095
B	20 (66.67%)	179 (47.35%)				
C	6 (20.00%)	88 (23.28%)				

Table V. OS-MRS classes categorized according to Clavien-Dindo grades

OS-MRS class		Clavien-Dindo grade					*P*-value
		I	II	III	IV	V	
A	*n* (% of total)	2 (6.67)	0 (0.00)	1 (3.33)	1 (3.33)	0 (0.00)	0.800
B	*n* (% of total)	9 (30.00)	1 (3.33)	7 (23.33)	2 (6.67)	1 (3.33)	
C	*n* (% of total)	3 (10.00)	1 (3.33)	1 (3.33)	0 (0.00)	1 (3.33)	

significantly with either OS-MRS grade (OR = 1.24, 95% CI: 0.94–1.63, $p = 0.133$) or with OS-MRS class (OR = 0.78, 95% CI: 0.46–1.32, $p = 0.352$).

Regarding mortality, OS-MRS did not predict an increase in the odds ratio of patients' death (OS-MRS grade: OR = 1.95, 95% CI: 0.58–6.60, $p = 0.281$; OS-MRS class: OR = 0.31, 95% CI: 0.03–3.12, $p = 0.316$).

Discussion

One of the first attempts to create a simple tool for preoperative assessment of a morbidly obese patient's mortality risk was the OS-MRS, proposed in 2007 by DeMaria *et al.* [13], which was validated by the author [14] and in other studies [15, 17]. Sarela *et al.* tried to use it for prediction of perioperative morbidity [18]. Orłowski *et al.* reported that the OS-MRS can be a useful clinical tool in the decision about an optimal bariatric procedure, depending on the risk of postoperative complications [19]. Other scoring systems were developed by Flum *et al.* based on analyzing the results of the Longitudinal Assessment of Bariatric Surgery (LABS) [20], or metabolic acuity score by Blackstone *et al.* [21] or scales of Gupta *et al.* and Turner *et al.* derived from the National Surgical Quality Improvement Program (NSQIP) database of the American College of Surgeons [22, 23].

The simplicity of the OS-MRS scale encourages its use in common surgical practice, while using five clinical variables to estimate patients' postoperative risk preoperatively. A limitation is that this scale was developed for the analysis of mortality after LRYGB, although it was tested in predicting morbidity [18].

In this study we found limited value of OS-MRS for estimating the perioperative morbidity risk of morbidly obese patients submitted to laparoscopic bariatric procedures, including laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass. In our study there were no significant differences in OS-MRS grade between groups with and without perioperative complications. The OS-MRS classes did not significantly differ between groups.

Only a few studies have evaluated use of the OS-MRS in predicting postoperative morbidity risk. Sarela *et al.* demonstrated that the OS-MRS is independently predictive of the risk of postoperative adverse events after gastric band, Roux-en-Y gastric bypass, sleeve gastrectomy, or biliopancreatic diversion [18]. An increase in OS-MRS class resulted in an increase of postoperative adverse effects by 300%. Similar results were recently presented in an analysis performed by Lorente *et al.* [24]. They demonstrated a significant association between the OS-MRS scale and morbidity increasing from 7.3% in group A to 50% in group C. Our group included a similar number of patients, but univariate logistic regression did not demonstrate an influence of OS-MRS class or grade on increase in morbidity or mortality.

The use of the OS-MRS in prediction of mortality was recently confirmed in a systematic review by Thomas *et al.* [17]. Likew in our study, patients who died in the perioperative period were in higher OS-MRS classes. Despite encouraging advantages, the OS-MRS failed to identify patients at higher postoperative morbidity risk and should be used according to its primary purpose.

Conclusions

The OS-MRS is not a useful tool in predicting risk of perioperative morbidity after bariatric procedures.

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Conflict of interest

The authors declare no conflict of interest.

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