ORIGINAL ARTICLE

CONTENTS

Improving the management of morbidly obese patients with postoperative bleeding undergoing Roux-en-Y gastric bypass

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ABSTRACT

Aim: To improve the management of morbidly obese patients who undergo gastric bypass surgery to reduce the number of postoperative complications, in particular, bleeding.

Materials and Methods: From 2011 to 2022, a total of 348 patients with morbid obesity (MO) underwent laparoscopic gastric bypass treatment at the clinical base of the Department of General Surgery №2 of Bogomolets National Medical University. The retrospective group included 178 patients who received treatment between 2011 and 2019. 170 patients were enrolled in the prospective group for the period from 2019 to 2022.

Results: Retrospective group had 8 episodes of postoperative bleeding, representing a rate of 4.49%, prospective group – 3 episodes of postoperative bleeding, representing a rate of 1.76% Four factor characteristics associated with the probability of bleeding were identified: "number of comorbid conditions", "arterial hypertension", "chronic liver diseases" and "chronic obstructive pulmonary disease"

Conclusions: The factors responsible for the occurrence of postoperative bleeding in morbidly obese patients after laparoscopic gastric bypass surgery were the number of comorbid conditions, the presence of arterial hypertension, the presence of chronic liver diseases, and chronic obstructive pulmonary disease. A new strategy for the management of morbidly obese patients after laparoscopic gastric bypass was developed. This strategy involves changing cassettes to create gastroentero- and enteroenteroanastomoses, reducing the period of use of the nasogastric tube, drains, and urinary catheter from 3-4 days to 1 day, and resuming the drinking regimen 6 hours after extubation.

KEY WORDS: metabolic surgery, gastric bypass, complication, bleeding, treatment, prevention, ERAS protocol

Wiad Lek. 2024;77(6):1127-1133. doi: 10.36740/WLek202406103 DOI

INTRODUCTION

The prevalence of obesity has become a major concern in the healthcare system, as it is associated with an increase in morbidity rates and is indicative of a global epidemic. In May 2022, the World Health Organisation released data showing that 59% of the European population suffers from obesity, with excess body weight observed in 8% of children under the age of 5 and in one out of every 3 school-age children [1].

Obesity is a significant risk factor for nonalcoholic fatty liver disease, cardiovascular disease, diabetes, 12 types of malignancy, and psychiatric disorders [2].

Laparoscopic gastric bypass is a highly efficient method for managing morbid obesity. According to the IFSO (8th Global Registry Report, 2023), a total of 480,970 bariatric operations were performed in 2022. Out of these, laparoscopic gastric bypass was the initial procedure in 28.8% of patients [3].

Global research indicates that postoperative complications following laparoscopic gastric bypass arise in 5.8-6.4% of patients. Postoperative bleeding is categorised as either early (within 30 days) or late (beyond 30 days). It is further classified based on its location within the gastrointestinal tract, either within the lumen (intraluminal) or within the abdominal cavity (intraperitoneal). Within a 24-hour period after surgery, bleeding occurs in 43% of patients [4].

Recent studies have identified several common risk factors for postoperative bleeding. They include the therapeutic use of anticoagulants, renal insufficiency, coagulopathy, chronic liver disease, hypertension, chronic lung disease, and being over the age of 45 [5].

AIM

The aim of the study was to improve the management of morbidly obese patients who undergo gastric bypass surgery to reduce the number of postoperative complications, in particular, bleeding.

MATERIALS AND METHODS

From 2011 to 2022, a total of 348 patients with morbid obesity (MO) underwent laparoscopic gastric bypass treatment at the clinical base of the Department of General Surgery No. 2 of Bogomolets National Medical University.

A retrospective analysis was conducted on patients with morbid obesity who underwent laparoscopic gastric bypass surgery to assess patient management and reduce postoperative bleeding. The retrospective group included 178 patients who received treatment between 2011 and 2019. Of these patients, 86 (48.3%) were male and 92 (51.7%) were female. The mean body weight was 144.8 (95% CI: 142.7–146.8) kg, and the mean body mass index (BMI) was 45.44 (95% CI: 44.67–46.22) kg/m2. The surgical and anaesthetic risk, as assessed by the ASA scale, was 3.36 (95% CI: 3.25-3.47). There were 8 episodes of postoperative bleeding, representing a rate of 4.49% (Table 1).

Preoperative assessment included: complete blood count, complete urinalysis, biochemical blood count (total protein, ALT, AST, total bilirubin with fractions, urea, creatinine), coagulogram, blood group and rhesus, electrocardiography, echocardiography, a chest X-ray, an abdominal ultrasound, cardiologist and pulmonologist consultation, spirometry, lower extremity vascular ultrasound, glycosylated haemoglobin (Hb1Ac), blood C-peptide, TSH blood test, ACTH blood test, cortisol blood test, acid-base blood test, and an electrolyte panel (K, Na, Cl, Ca).

Before the surgery, the patient was given saline laxatives 12 hours prior to the procedure. The patient also had the epidural space and central venous access catheterized. Antibiotic prophylaxis was administered, either with ertapenem at a dosage of 1 g per day for 5 days or with moxifloxacin at a dosage of 400 mg per day for 5 days. Additionally, low-molecular-weight heparins and enoxaparin at a dosage of 0.4 were administered 12 hours before the operation.

All patients underwent laparoscopic Roux-en-Y Gastric Bypass surgery. A laparoscopic gastric bypass procedure was performed by creating a cross-section of the small intestine at a distance of 50 cm from the ligament of Treitz using a stapler and a cutter (ETHICON ECHELON FLEX 60 (USA)) and a blue cassette (staples 3.8 mm in height). The formation of a "small" stomach with a volume of 20-30 ml was carried out using a stapler (ETHICON ECHELON FLEX 60 (USA)) and a green (staples 4.1 mm in height) and a yellow cassette (staples 3.9 mm in height).

A gastroenteroanastomosis was applied side-to-side between the "small" stomach and the alimentary loop of the small intestine. The back lip of the anastomosis was formed using a stapler (ETHICON ECHELON FLEX 45 (USA)) and a blue cassette (staples 3.8 mm in height). A continuous suture technique was employed to create the front lip of the anastomosis using atraumatic suture material (Vicril 3/0).

If the operation lasted more than 2 hours, the elimination of pneumoperitoneum for 10 minutes every 2 hours prevented rhabdomyolysis. Elastic compression of the lower extremities was performed for thromboprophylaxis. A nasogastric tube was installed for 3-4 days. The urinary catheter was removed one day after the operation. Abdominal cavity drainage was carried out using two drains. The average duration of a surgical intervention was 179.43 minutes. All patients received an intraoperative administration of a 40 mg proton pump inhibitor and 4 mg ondansetron.

In the postoperative period, all patients underwent elastic compression of the lower extremities; verticalization of the patient in the intensive care unit was conducted 6 hours after extubation; and a small saline enema was prescribed the next day after the operation. Low-molecular-weight heparins were administered once a day at 0.4 for 14 days. The drinking regimen was resumed on the 6th day during gastrography with liquid contrast to assess the failure of the gastroenteroanastomosis. Video esophagogastroscopy was performed, if necessary, in the presence of complaints. According to the scheme, all patients received PPIs at 20 mg twice a day within 30 days after the operation.

The research was conducted in accordance with modern principles of bioethics. Statistical analysis was performed using IBM SPSS Statistics Base software (version 26).

RESULTS

Approaches to the management of patients in the retrospective group in the pre-, intra-, and postoperative periods were analysed, with the aim of identifying risk factors for postoperative complications, in particular bleeding, and reducing their level in the future (Table 2).

The stepwise inclusion/exclusion of variables (Stepwise) method was used to select the minimum set of factor characteristics associated with the occurrence of bleeding in patients with MO after laparoscopic gastric bypass. Four factor characteristics associated with the probability of bleeding were identified: "number of comorbid conditions", "arterial hypertension", "chronic liver diseases" and "chronic obstructive pulmonary disease" (Table 3).

The findings of this study allowed us to develop a new strategy for managing patients with MO. This strategy

Table 1. Episodes of postoperative bleeding in patients with MO after laparoscopic gastric bypass (retrospective group)

Site of bleeding	Intraabdominal/ intraluminal	Age/ years	Sex	Weight/ kg	Height/ m	BMI kg/ m2	Treatment
Marginal ulcer of gastroentero anastomosis	Intraluminal	58	Female	152	1,79	47,4	Conservative treatment
Short vessels of the stomach	Intraabdominal	31	Male	145	1,8	44,7	Relaparoscopy
Line of sutures in the area of gastroentero anastomosis	Intraluminal	48	Female	154	1,78	48,6	Endoscopic haemostasis
Line of sutures of the stomach remnant	Intraluminal	49	Male	145	1,8	44,7	Relaparoscopy. Gastrotomy. Blood clot removal.
Line of sutures of the stomach remnant	Intraluminal	35	Female	152	1,81	46,4	Relaparoscopy. Gastrotomy. Blood clot removal.
Marginal ulcer of gastroentero anastomosis	Intraluminal	57	Male	142	1,78	44,8	Conservative treatment
Marginal ulcer of gastroentero anastomosis	Intraluminal	51	Female	168	1,71	57,5	Conservative treatment
Line of sutures in the area of gastroentero anastomosis	Intraluminal	37	Male	140	1,79	43,7	Conservative treatment

includes the implementation of the ERAS protocol guidelines and our clinical experience, and it consists of four stages: preoperative assessment as well as the pre-, intra-, and postoperative periods. 170 patients were enrolled in the prospective group for the period from 2019 to 2022. The group was comparable to the retrospective group in terms of age, sex, height, body weight, BMI, total number, and severity of comorbid conditions. Among them were 73 (42.9%) men and 97 (57.1%) women. The mean body weight was 145.7 (95% CI: 143.8–147.6) kg, and the mean body mass index (BMI) was 45.88 (95% CI: 45.14–46.63) kg/m2. The surgical and anaesthetic risk, as assessed by the ASA scale, was 3.3 (95%CI: 3.19-3.42). There were 3 episodes of postoperative bleeding, representing a rate of 1.76% (Table 4).

The preoperative assessment was not different from the retrospective group. Patients in the prospective group received the following preoperative preparations: saline laxatives 12 hours before surgery; catheterization of the epidural space and central venous access under ultrasound control; a carbohydrate mixture 4 hours before the start of the operation (5% 200 ml of glucose); dexamethasone 8 mg intravenously 10 minutes before the incision; and antibiotic prophylaxis 30 minutes before surgery.

In the prospective group, all operations were performed laparoscopically. Local infiltration anaesthesia of the areas where trocars were installed was added intraoperatively; instead of elastic compression, pneumocompression of the lower extremities was performed to prevent blood clot formation.

The formation of a "small" stomach, enteroentero and gastroentero anastomoses was carried out using Tri Staple EGIA60AMT (staple height: 3 mm, 3.5 mm, 4 mm) and EGIA60AVM (2 mm, 2.5 mm, 3 mm) instead of the blue, green, and yellow ECHELON 60 STAPLER cassettes. Paracetamol was administered intravenously at the start of the skin suturing procedure. Tranexamic acid preparations of 5 ml were given to the prospective group at the end of the procedure, as well as 12 and 24 hours later.

After the operation, the urinary catheter was immediately removed; the nasogastric tube was removed within 1 day; and drains were removed 2-3 days after the operation.

The early activation of patients was carried out postoperatively. The drinking regimen was resumed 6 hours after the operation, with a gradual increase in the liquid volume and a decrease in infusion therapy. On the 4th day, all patients who did not have any complications underwent contrast gastrography to assess the capacity of gastroentero anastomosis. A video esophagogastroscopy was indicated in the presence of complaints, and a 6-month course of proton pump inhibitors (20 mg twice a day) was administered (Table 5).

DISCUSSION

Modifications are required in the management of morbidly obese patients who have undergone laparoscopic gastric bypass surgery in order to decrease postoperative complications and enhance the quality of life of patients during the perioperative period.

Table 2. Analysis of univariate logistic regression models of bleeding episodes in patients with MO in the postoperative period after laparoscopic gastric bypass

Factor sign	The value of the coefficient of the model, $b \pm m_b$	Significance difference of the coefficient from 0, p	Area under the ROC curve of the model, AUC (95% CI)	Odds ratio indicator of the model, OD (95% CI)	Significance difference of the OD from 0, p
Age, years	0,13±0,01	0,01	0,78 (0,61-0,94)	1,14 (1,02-1,28)	0,01
Sex (1 – male, 2 – female)	0,46±0,74	0,53	0,56 (0,48–0,63)	1,59 (0,37–6,86)	0,53
Weight, kg	0,02±0,02	0,32	0,63 (0,56–0,71)	1,02 (0,98–1,07)	0,32
Height, sm	5,16±4,44	0,24	0,62 (0,54-0,69)	174,61(0,03-1058055,75)	0,24
BMI, kg/m^2	0,002±0,07	0,97	0,52 (0,44-0,59)	1,00(0,87-1,15)	0,97
Time of operation, min	0,04±0,03	0,13	0,66 (0,58-0,73)	1,05 (0,98-1,12)	0,13
ASA, class	0,02±0,47	0,95	0,52 (0,44-0,59)	1,02(0,4-2,62)	0,95
Number of comorbidities, n	1,37±0,46	0,003	0,85(0,79-0,9)	3,94(1,57-9,82)	0,003
Chronic obstructive lung disease (1 –yes, 0 – no)	0,93±0,39	0,01	0,69(0,62-0,76)	2,53(1,16-5,5)	0,01
Chronic liver disease (1 –yes, 0 – no)	2,02±0,58	0,0006	0,86(0,66-1,00)	7,6(2,4-24,04)	0,0006
Arterial hypertension, (1 –yes, 0 – no)	0,91±0,42	0,03	0,72(0,65-0,78)	2,5(1,09-5,7)	0.03
Diabetes mellitus, (1 –yes, 0 – no)	-0,93±0,72	0,19	0,55(0,31-0,8)	0,39(0,09-1,63)	0,19
Alcohol consumption (1 –yes, 0 – no),	-0,11±0,72	0,87	0,51(0,43-0,59)	0,88(0,21-3,67)	0,87
GERD, (1 –yes, 0 – no)	-0,62±0,74	0,39	0,72(0,48-0,96)	0,53(0,12-2,3)	0,39
Ability to move independently (1 – yes, 0 – no)	-0,82±1,11	0,45	0,53(0,45-0,6)	0,43(0,04-3,91)	0,45
Myocardial infarction in medical history, (1 –yes, 0 – no)	-19,84±7521,56	0,33	0,56(0,36-0,75)	2,4(0,31-5,8)	0,33
Deep vein thrombosis, (1 –yes, 0 – no)	1,17±0,72	0,1	0,63 (0,55-0,7)	3,25(0,77-13,5)	0,1
Chronic venous insufficiency, (1 –yes, 0 – no)	-0,54±0,75	0,47	0,55(0,48-0,63)	0,58(0,13-2,53)	0,47
Cholecystectomy during surgery, (1 –yes, 0 – no)	-1,31±1,08	0,22	0,61(0,53-0,68)	0,26(0,032-2,23)	0,22
Duration of drains, days	0,46±0,51	0,36	0,58(0,51-0,66)	1,58(0,57-4,34)	0,36
Duration of the nasogastric tube, days	0,79±0,48	0,1	0,65(0,57-0,72)	2,22(0,85-5,76)	0,1
Gastrography, day	0,41±0,74	0,57	0,55(0,47-0,62)	1,51(0,35-6,54)	0,57
Administration of tranexamic acid, (1 –yes, 0 – no)	0,81±0,74	0,27	0,6(0,52-0,67)	2,26(0,52-9,8)	0,27
Level of discomfort from drains, probe, urinary catheter, points	0,38±0,33	0,25	0,61(0,53-0,68)	1,46(0,75-2,83)	0,25

Table 3. Analysis of the multivariate logistic regression model of bleeding episodes in patients with MO in the postoperative period after laparoscopic gastric bypass

Factor sign	The value of the coefficient of the model, $b \pm m_b$	Significance difference of the coefficient from 0, p	Odds ratio indicator of the model, OD (95% CI)
Number of comorbidity, n	0,347±0,04	<0,0001	0,078(0.006-0.988)
Arterial hypertension, (1 –yes, 0 – no)	0,038±0,01	<0,0001	443,0(1,42-13900,0)
Chronic liver disease (1 –yes, 0 – no)	0,049±0,01	<0,0001	81,7(2,34-2850,0)
Chronic obstructive lung disease (1 –yes, 0 – no)	0,031±0,01	0,01	41,3(1,08-139,0)

Table 4. Episode of postoperative bleeding in a patient with MO after laparoscopic gastric bypass (prospective group)

Site of bleeding	Intraabdominal/ intraluminal	Age/ years	Sex	Weight/ kg	Height/ m	BMI kg/ m^2	Treatment
Line of sutures in the area of gastroentero anastomosis	**Intraluminal**	49	Female	167	1,76	53,91	Conservative
Marginal ulcer of gastroentero anastomosis	**Intraluminal**	55	Male	141	1,84	44,6	Conservative
Line of sutures in the area of gastroentero anastomosis	**Intraluminal**	52	Female	141	1,8	43,52	Conservative

Table 5. Comparison of the main indicators in the retrospective and prospective groups

Indicators	Retrospective group	Prospective group	p
Age, years	44,79±8,46	44,83±8,55	0,96
Sex (1 – male, 2 – female)	1,51±0,5	1,57±0,49	0,318
Weight, kg	144,8±13,93	145,7±12,55	0,516
Height, sm	1,78±0,08	1,78±0,07	0,749
BMI, kg/m^2	45,44±5,23	45,88±4,92	0,424
Time of operation, min	179,4±16,44	139,2±8,93	<0,001
ASA, class	3,36±0,76	3,30±0,75	0,510
Number of comorbidity, n	8,86±1,88	8,39±2,11	0,068
Chronic obstructive lung disease (1 –yes, 0 – no)	1,06±0,93	1,05±0,88	0,928
Chronic liver disease (1 –yes, 0 – no)	1,21±0,9	1,18±0,86	0,787
Arterial hypertension, (1 –yes, 0 – no)	1,365±0,95	1,341±0,93	0,81
Diabetes mellitus, (1 –yes, 0 – no)	0,7±0,12	0,67±0,47	0,454
Alcohol consumption (1 –yes, 0 – no),	0,52±0,5	0,42±0,49	0,065
GERD, (1 –yes, 0 – no)	0,47±0,32	0,38±0,48	0,062
Ability to move independently (1 –yes, 0 – no)	0,93±0,24	0,92±0,26	0,590
Myocardial infarction in medical history, (1 –yes, 0 – no)	0,24±0,42	0,2±0,4	0,353
Deep vein thrombosis, (1 –yes, 0 – no)	0,24±0,43	0,22±0,41	0,603
Chronic venous insufficiency, (1 –yes, 0 – no)	0,73±0,44	0,67±0,46	0,223
Cholecystectomy during surgery, (1 –yes, 0 – no)	0,33±0,47	0,28±0,45	0,328
Duration of drains, days	5,27±0,74	1,28±0,64	<0,001
Duration of the nasogastric tube, days	4,00±0,84	1,06±0,51	<0,001
Gastrography, day	5,52±0,50	3,34±0,55	<0,001
Level of discomfort from drains, probe, urinary catheter, points	5,51±1,20	3,26±0,61	<0,001
Number of bleeding, n	8	3	< 0,05

Given the rather high incidence of bleeding following laparoscopic gastric bypass (0.5–5.8%) [6] and based on the findings of two research groups, we created a set of measures aimed at minimising postoperative bleeding episodes.

According to Sharma G. et al. (2016), the most frequent locations of bleeding are the gastroenteroanastomotic suture line (56%), and the enteroenteroanastomotic suture line (11%) [7]. Therefore, an important stage of the research was the comparison of two types of cassettes, ECHELON 60 STAPLER (retrospective group) and Tri Staple (prospective group), to study their effect on the occurrence of bleeding. The peculiarity of the Tri Staple technique is that the staples are arranged in three rows. Each row has a different height. This contributes to a greater chance of suturing all layers of the wall of the stomach or intestine and provides better tissue perfusion. For ECHELON 60 STAPLER cassettes, where the staples have the same height, achieving this effect is more difficult [8-10].

In addition, we added 5 ml of tranexamic acid to the therapy protocol at the stage of skin suturing, as well as 12 and 24 hours afterwards. The drug was given to all 170 patients in the prospective group and to 77 patients (43.3%) in the retrospective group.

According to various studies, long-term use of a nasogastric tube and urinary catheter increases the risk of complications associated with them and significantly reduces the quality of life [11,12]. After analysing a retrospective group, we concluded that the prolonged use of nasogastric tubes, drains, and urinary catheters, as well as delayed resumption of drinking, do not contribute to bleeding. Therefore, we made modifications to these practices for the patient's benefit. Based on VAS pain scale data, drains, nasogastric tubes, urinary catheters, and lack of drinking caused discomfort at a level of 5.51±1.2. Therefore, taking into account that bleeding most often occurs during the first 24 hours, for the prospective group, in the absence of complications, the nasogastric tube, urinary catheter, and drainage were removed 24 hours after the operation. This reduced the level of discomfort on the VAS scale to 3.24±0.42.

The application of multimodal anaesthesia as part of the ERAS protocol is proven, so the administration of Paracetamol probably reduces the pain syndrome, which can also have an impact on the frequency of bleeding. Installation of the epidural catheter was carried out under ultrasound control, which is more accurate and safer, contributes to the effectiveness of analgesia, and probably influences the rate of complications [13-15].

CONCLUSIONS

The factors responsible for the occurrence of postoperative bleeding in morbidly obese patients after laparoscopic gastric bypass surgery were identified. They include the number of comorbid conditions, the presence of arterial hypertension, the presence of chronic liver diseases, and chronic obstructive pulmonary disease. A new strategy for the management of morbidly obese patients after laparoscopic gastric bypass was developed. This strategy involves changing cassettes to create gastroentero and enteroenteroanastomoses, reducing the period of use of the nasogastric tube, drains, and urinary catheter from 3-4 days to 1 day, and resuming the drinking regimen 6 hours after extubation. The implementation of the new strategy led to a decrease in postoperative bleeding from 4.49% to 1.76% ($P < 0.05$).

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The study was carried out as part of the scientific research work «Management of complications after laparoscopic gastric bypass in obese patients» for obtaining the scientific degree of PhD.

CONFLICT OF INTEREST

The Authors declare no conflict of interest

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RECEIVED: 10.02.2024
ACCEPTED: 20.05.2024