ORIGINAL ARTICLE

CONTENTS

Optimizing the management of obese patients after bariatric interventions to prevent thromboembolic complications

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ABSTRACT

Aim: To optimize the management of obese patients in the perioperative period to prevent thromboembolic complications.

Materials and Methods: From 2011 to 2024, a total of 988 patients with obesity underwent laparoscopic bariatric surgery at the clinical base of the Department of General Surgery No. 2 of Bogomolets National Medical University. The retrospective group included 498 patients who received treatment between 2011 and 2020. 490 patients were enrolled in the prospective group for the period from 2020 to 2024.

Results: Retospective group had 1 episodes of postoperative thromboembolic complication, representing a rate of 0,2%, prospective group – 0 episodes of postoperative bleeding, representing a rate of 0% 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 M0 after laparoscopic gastric bypass.

Conclusoins: Shortening the thromboembolic complications prophylaxis regimen from 14 to 7 days in combination with the use of elements of the ERAS protocol did not cause an increase in the level of venous thromboembolism in the prospective group – 0/490 (0%) compared to the retrospective group – 1/498 (0.2%). Intraoperative pneumocompression of the lower extremities as a method of thromboembolic complications prophylaxis is effective in combination with the use of LMWH for a short period (7 days). The use of tranexamic acid preparations together with low molecular weight heparins does not affect the level of thromboembolic complications.

KEY WORDS: obesity, thromboembolism, prophylaxis, gastric bypass, complication

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INTRODUCTION

Obese patients are at high risk of thromboembolic complications. Bariatric surgery increases this risk, so rational anticoagulant prophylaxis is an important element of the perioperative period.

Thromboembolic complications occur in 0.3-2.4% of patients after bariatric surgery [1-3]. Deep vein thrombosis occurs in 0-5.4%, pulmonary embolism (PE) – 0-6.4%. Mortality due to pulmonary embolism occurs in 0.22% of patients, and in the first 30 days – 40% of mortality from PE [1-7].

After laparoscopic gastric bypass, venous thromboembolism (VTE) occurs in 0-1.1%, after laparoscopic sleeve gastrectomy – 0-2.9%, after repeated bariatric surgeries – 0-6.4%. [8].

Risk factors for VTE are divided into those that depend on the patient and on the procedure itself. Male gender, age, weight and BMI before surgery, smoking, heart failure, arterial hypertension, hormonal therapy, sedentary lifestyle, hypercoagulable state, COPD, previous history of VTE are factors that depend on the patient. The length of surgery, the type of bariatric surgery and the presence of other postoperative complications are factors that depend on the procedure itself. [9].

The European guidelines for perioperative VTE prophylaxis recommend the use of LMWH rather than heparin, rivaroxaban, or apixaban in obese patients (evidence level 2C). An increase in the standard dose is recommended if the patient weighs more than 150 kg or has a BMI greater than 40 kg/m2 (evidence level 2B).

AIM

The aim of the study was to optimize the management of obese patients in the perioperative period to prevent thromboembolic complications.

MATERIALS AND METHODS

To improve the management of obese patients and optimize thromboprophylaxis, a retrospective and prospective analysis of obese patients undergoing laparoscopic gastric bypass was conducted.

RETROSPECTIVE GROUP

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).

In order to prevent rhabdomyolysis, if the operation lasted more than 2 hours, pneumoperitoneum was eliminated for 10 minutes. As a thromboprophylaxis, elastic compression of the lower extremities was performed intraoperatively. A nasogastric tube was installed for 3-4 days. Removal of the urinary catheter was performed 1 day after the operation. Drainage of the abdominal cavity was performed with two drains. The average duration of the surgical intervention was 179.43 minutes. Intraoperatively, all patients were administered an intravenous proton pump inhibitor 40 mg, ondansetron 4 mg.

In the postoperative period, elastic compression of the lower extremities was continued; the patient was verticalized in the ICU 6 hours after extubation; a small saline enema was performed the next day after surgery. Low-molecular-weight heparins (LMWH) were administered once daily subcutaneously at 0.4 for 14 days. The drinking regimen was resumed on the 6th day during gastrography with liquid contrast to assess the capacity of the gastroenteroanastomosis. All patients received PPIs for 30 days after surgery, according to the following scheme: PPI 20 mg 2 times a day.

PROSPECTIVE GROUP

In the prospective group, ERAS recommendations were applied. Intraoperatively, local infiltration anesthesia of the trocar sites was added; instead of elastic compression, intraoperatively pneumocompression of the lower extremities was performed to prevent thrombosis. For this purpose, LX size cuffs with additional inserts were used. Compression was performed along the entire length of the legs with a pressure of 40 mmHg throughout the entire period of surgery. After surgery, the system was removed and elastic compression was subsequently performed using bandages. Intraoperatively, all patients were administered tranexamic acid preparations at a dose of 1 g, and in the postoperative period after 12 and 24 hours.

After surgery, the urinary catheter was removed immediately; the nasogastric tube was removed within 1 day; the drainage was removed 2-3 days after surgery.

In the postoperative period, early activation of patients was carried out after 2 hours; the drinking regimen was started 6 hours after surgery with a stepwise increase in fluid volume and a decrease in infusion therapy. On the 3rd day, all patients without complications underwent contrast gastrography to assess the capacity of the gastroentero anastomosis. A course of proton pump inhibitors was prescribed for 6 months (20 mg 2 times a day).

Thromboprophylaxis was performed according to an abbreviated regimen, using low molecular weight heparins, which were administered subcutaneously once a day at 4000 anti-Xa IU for 7 days. Patients who had a high risk of thromboembolic complications (according to the Caprini scale >3) received thromboprophylaxis for 14 days and were not included in the prospective group. After surgery, elastic compression was used.

While preparing for surgery, one patient was diagnosed with thrombosis of the left great saphenous vein during Dopplerography of the vessels of the lower extremities. As a stage of preparation for gastric bypass surgery, a crossectomy operation was performed in 1 patient.

The study was conducted in accordance with modern principles of bioethics. Statistical analysis was performed using IBM SPSS Statistics Base software (version 26). Normality of distribution was checked using the Shapiro-Wilk W criterion. Under normal distribution, data are presented as the mean, standard deviation, and/or 95% confidence interval. To determine the relationship between complications and factorial features, we will use the method of constructing a univariate and multivariate logistic regression model with the stepwise inclusion of the most significant features (Stepwise). The value of the strength of the relationship between factorial features will be estimated by the odds ratio (OR) with its 95% confidence interval (CI).

RESULTS

During 2011-2024, 988 obese patients were treated with bariatric surgery at the Department of General Surgery No2 of the Bogomolets National Medical University.

The retrospective group included 498 patients treated during 2011-2019, 240 (48.2%) men and 258 (51.8%) women. The average body weight was 144.8 (95% CI: 142.7–146.9) kg, the average BMI was 45.44 (95% CI: 44.67–46.22) kg/m2. Laparoscopic gastric bypass was performed in 178 patients, laparoscopic sleeve resection in 154 patients, laparoscopic mini-gastric bypass in 69 patients, and two-stage treatment (intragastric balloon placement + laparoscopic gastric bypass) in 97.

The prospective study included 490 patients treated during 2020-2024, 233 (47.6%) men and 257 (52.4%)

Table 1. Comparison of the main indicators in the retrospective and prospective groups

Factor sign	Retrospective group	Prospective group	P, value
Preoperative			
Sex (1 – male, 2 – female)	1,51±0,5	1,61±0,48	0,232
Age, years	44,79±8,46	43,47±9,44	0,168
Height, sm	1,78±0,08	1,77±0,07	0,697
Weight, kg	144,8±13,93	145,1±14,99	0,834
BMI, kg/m^2	45,44±5,23	45,67±5,51	0,689
Comorbidity, n (%)	206 (41,5)	155 (31,7)	0,238
Arterial hypertension, n (%)	257 (51,6)	230 (47,1)	0,563
Diabetes mellitus, n (%)	142(28,6)	185(37,9)	0,004
Hyperlipidemia, n (%)	274(55,0)	316(64,6)	0,772
Sleep apnea syndrome, n (%)	106(21,3)	232 (47,5)	0,001
Chronic obstructive lung disease, n (%)	223(44.9)	223(45,6)	0,768
Intraoperative			
Time of operation, min	179,4±16,45	135,7±8,87	0,001
Postoperative			
Complication, n (%)	36(7,2)	12 (2,4)	<0,001
Revision operation, n (%)	17(3,41)	4(0,8)	<0,001
Re-hospitalization, n (%)	9(1,8)	2(0,4)	<0,001
Thromboembolic complication, n (%)	1(0,2)	0(0)	<0,001

Source: compiled by the authors of this study

women. The mean body weight was 145.1 (95% CI: 142.9–147.3) kg, and the mean BMI was 45.67 (95% CI: 44.85–46.49) kg/m2. The study groups are comparable in terms of the main indicators, except for type 2 diabetes, sleep apnea syndrome, and average operation time (table 1). Laparoscopic gastric bypass was performed in 278 patients, laparoscopic sleeve resection in 122 patients, and laparoscopic mini-gastric bypass in 90 patients.

In 1 patient (0.2%, 95% CI: 0.005-0.016) in the retrospective group, on the 30th day after surgery, we observed splenic vein thrombosis with the formation of splenic infarction. The patient was re-hospitalized and underwent laparoscopic splenectomy. In the prospective group, the VTE rate was 0/208 patients.

The total number of all possible complications in the prospective group decreased compared to the retrospective group.

DISCUSSION

Thromboembolic complications are the main cause of mortality after bariatric surgery. Due to the significant development of thromboprophylaxis over the past 20 years, there has been a clear decrease in the number of VTE after bariatric surgery from 30% to 0.5%, but they still remain a cause of mortality after bariatric surgery. Preoperative examination and prevention of VTE is an important element of the management of obese patients who are scheduled for laparoscopic gastric bypass.

A study of the use of elements of the ERAS protocol in combination with a reduction in the duration of thromboprophylaxis for obese patients after laparoscopic gastric bypass showed the safety of this approach.

The European guidelines on perioperative thromboprophylaxis clearly regulate the mandatory use of anticoagulants, but there is currently no consensus on the optimal timing. [12] Almarshad, (2020), used a 10-day period of THA, resulting in 0.5% VTE. Only medical interventions were used, without the use of the ERAS protocol and mechanical pneumocompression of the lower extremities [13]. The randomized trial Kröll D, (2023) found no difference in the short THA regimen of 7 days versus the long THA regimen of 28 days, with only one case of VTE in the long THA group, but the postoperative bleeding rate was 3 (short group) versus 7 (long) [14]. The study by Almalki, A. S. (2023) also found no difference between short (2-4 days) and long (14 days) thromboprophylaxis [15].

According to the ERAS protocol (2021) for bariatric patients, the use of the elements we used is evidence-based and safe. [10] In the study by Leeman (2020), a combination of short-term thromboprophylaxis and the ERAS protocol was proposed to reduce

the number of bleedings and the impact on the level of VTE [11]. In the study by Blanchet, M. C. (2018), the elements of the ERAS protocol were the basis of TP, and anticoagulants were additionally used only for patients at risk (Caprin >3), for a duration of 10 days. No difference in the number of VTEs was found [16].

One of the elements of the management of obese patients in the prospective group was mechanical prevention of VTE, namely pneumocompression of the lower extremities. The effectiveness of this technique is confirmed and approved by numerous recommendations, but there are no clear boundaries in the use of pharmacological thromboprophylaxis in parallel specifically for obese patients after laparoscopic gastric bypass, due to an increase in the level of bleeding and possible other complications [18]. The study by Calzada, M. G. (2021) confirmed the positive combined effect of the ERAS protocol + lower limb pneumocompression + pharmacological TP for 10 days on reducing the number of VTEs [17]. In the study by Abuoglu, H. H. (2019), there were no VTEs, a positive effect of the combination of pneumocompression and LMWH administration (administration period 15 days after surgery) [19].

In the prospective group, all patients were administered tranexamic acid preparations. It was important to determine the possibility of combining hemostatics with anticoagulants for a short period (7 days). The number of bleedings in the prospective group decreased from 8 to 2, and no cases of VTE were detected. The effect of tranexamic acid occurs due to the inhibition of plasminogen, blocking fibrinolysis occurs, and blood loss is reduced. But in the case of thrombus formation in the venous bed, this may lead to blocking its dissolution [20]. Due to the lack of direct interaction of tranexamic acid with LMWH and the effect on different links of hemostasis, such a combination is possible. In the study of Hossain, N. (2024) the use of TC (intraoperatively 1 g) contributed to a decrease in the amount of bleeding and did not affect the rate of VTE, but thromboprophylaxis was not taken into account here [21].

CONCLUSIONS

Shortening the thromboembolic complications prophylaxis regimen from 14 to 7 days in combination with the use of elements of the ERAS protocol did not cause an increase in the level of venous thromboembolism in the prospective group – 0/490 (0%) compared to the retrospective group – 1/498 (0.2%).

Intraoperative pneumocompression of the lower extremities as a method of thromboembolic complications prophylaxis is effective in combination with the use of LMWH for a short period (7 days).

The use of tranexamic acid preparations together with low molecular weight heparins does not affect the level of thromboembolic complications.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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