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Efficacy of Standard Triple Therapy for *Helicobacter pylori* Eradication and Early Postoperative Complications in Patients Undergoing Roux-en-Y Gastric Bypass

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Objective: We aimed to evaluate the efficacy of standard triple therapy (STT) for *Helicobacter pylori* (HP) eradication and early postoperative complications in patients undergoing Roux-en-Y gastric bypass (RYGB).
Methods: This prospective observational study included 543 patients submitted to RYGB (81.6% females, aged = 38 ± 9 years, body mass index = 41.7 [38.4–45.4] kg/m^2). Before surgery, they collected biopsies through upper gastrointestinal endoscopy (UGE), which were HP-positive or HP-negative. STT-treated HP-positive patients who collected intraoperative gastric mucosa specimens. These patients were reclassified according to HP-eradication or HP-noneffective through histological analysis. All patients were followed up for 30 days after surgery to assess complications.
Results: Before surgery, 36.4% of patients were HP-positive, and the first-line STT was effective at 90.9%. No differences between groups were detected for clinical complications and UGE data, except for the percentage of endoscopy and dilations, predominantly occurring in the HP-negative group. Symptoms of gastrointestinal bleeding and stenosis were reported, respectively, in 2% and 6.4% of HP-negative patients, with no difference between groups. No patient of the HP-positive group underwent endoscopic dilation. No postoperative clinical complications were noticed in the HP-noneffective group.
Conclusions: Before surgery, STT effectively eradicated HP infection in most treated patients, but HP persistence did not influence complications or mortality during 30 days after surgery.

Keywords: obesity, bariatric surgery, *Helicobacter pylori* infection, morbidity, mortality

Introduction

Bariatric surgery (BS) is the most effective treatment for severe obesity, inducing weight loss, improving or remitting comorbidities, and reducing mortality.[1] Mortality rate of laparoscopic BS is low, ranging from 0.03% to 0.20%. However, some adverse events may happen, such as reoperation, prolonged hospitalization, venous thromboembolism, gastrogastric fistula, stenosis, intestinal obstruction, marginal ulceration, and digestive hemorrhage.[2]

Helicobacter pylori (HP) infection has a high prevalence rate globally.[3] HP is a gram-negative bacterium that colonizes the human stomach. It is the main etiological factor of gastritis, peptic ulcer, and gastric adenocarcinomas.[4] Positivity for HP before surgery may increase postoperative morbidity[5] and cause a systemic inflammatory response, epithelial damage locally, and gastrointestinal diseases.[6] Surgeons usually opt for HP eradication before surgery.[7] But, this is still controversial. Individuals with HP-positive preoperatively have more marginal ulceration, bleeding, fistulas,

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and extended hospital stays.[8,9] In addition, detection and eradication of HP before surgery reduced postoperative foregut symptoms, perforated ulcers, gastrointestinal bleeding, marginal ulcers, stenosis, and the need for endoscopic reevaluation.[10] In contrast, Mocanu et al.[11] found comparable bleeding, leak, and hospital length of stay rates between HP-positive and HP-negative patients. Therefore, it is still a matter of debate whether HP infection influences surgical complications[12] or if preoperative eradication lowers these chances.

Histological evaluation is the gold standard test for diagnosing HP, and a standard triple therapy (STT) consisting of a proton pump inhibitor and two antibiotics (usually clarithromycin and amoxicillin)[12,13] is the first-line option. However, clinical infection management runs into increased rates of antibiotic resistance, resulting in a lower effectiveness of STT in eradicating HP infection.[14] This is a factor that can influence surgical decisions. Our study aimed to evaluate the efficacy of STT for HP eradication and early postoperative complications in patients undergoing Roux-en-Y gastric bypass (RYGB).

Material and Methods

Patients and study design

A prospective cohort of 543 patients who underwent RYGB, 81.6% females, aged 38 ± 9 years, body mass index (BMI) 41.7 [38.4–45.4] kg/m^2, between 2022 and 2023 in a private health care unit of Rio de Janeiro city (RJ, Brazil) participated in the study. Patients were allocated into HP-negative or HP-positive groups according to the absence or biopsy-proven active HP infection before surgery. The HP-positive group was further stratified regarding the eradication or persistence of HP infection, detected through histological analysis of gastric mucosa collected during surgery (HP-eradication or HP-noneffective groups).

Patients with BMI ≥ 35 kg/m^2 with at least one obesity-associated comorbidity or BMI ≥ 40 kg/m^2 who underwent laparoscopic RYGB surgery were included independently of HP infection. Exclusion criteria were a history of revisional surgery (sleeve gastrectomy to RYGB) or other surgical techniques, as well as those who had positivity for HP infection and did not adhere to STT. Clinical history, physical examination, and anthropometric assessment were obtained during medical appointments. Indication for RYGB or other bariatric techniques was based on current clinical criteria,[15,16] and the same surgeon performed all procedures. This prospective observational study was approved by the local Ethics Committee (CAAE: 42329120.9.0000.5259). All procedures were performed according to the principles of the Declaration of Helsinki. A signed consent form was obtained from each participant. Figure 1 shows the participants' enrollment, allocation, follow-up, and data analysis flowchart.

Data assessment

Body mass and height were measured using a calibrated electronic scale and stadiometer (Welmy™ W300A, São Paulo, SP, Brazil). Preoperative BMI was calculated as weight in kg/height in m^2. According to the American College of Gastroenterology Guidelines, the diagnosis of HP infection was assessed preoperatively through upper gastrointestinal endoscopy (UGE) with gastric biopsy.[17] Biopsy samples were obtained from the center, curvatures, and stomach antrum for histopathological examinations using Giemsa stain, as described elsewhere.[13] HP-positive patients were treated with 14 days of STT: omeprazole (40 mg twice a day), clarithromycin (500 mg twice a day), and amoxicillin (1 g twice a day)[17] due to the low resistance to clarithromycin 8%, and none to amoxicillin.[18,19] Another biopsy of the gastric mucosa assessed HP infection and its eradication during surgery. A gastric mucosa sample for histopathological examination was taken with laparoscopic Maryland dissecting forceps (Bhiosuply, Esteio, RS, Brazil) after gastric pouch manufacturing to perform the gastrojejunal anastomosis. Patients were followed 30 days after surgery for clinical assessment and postoperative complications, which included the presence of gastrointestinal bleeding, leak, marginal ulceration, stenosis symptoms (intolerance of food, gastroesophageal reflux, nausea, vomiting, abdominal pain, and dysphagia), fistulas, and factors that caused reoperations, hospital length of stay, hospitalization in the intensive care unit, or death.

Statistical analysis

The Shapiro–Wilk test was used to evaluate the distribution of the variables. Unpaired Student *t*-test and chi-square test compared between-group differences for continuous or categorical variables (HP-negative vs. eradication groups and HP-negative versus HP-noneffective groups). Results were expressed as mean ± standard deviation, median (25th–75th percentile), or absolute (relative frequency) when appropriate. All calculations were performed using NCSS™ statistical software (Kaysville, UT, USA). The significance level was set at $p \leq 0.05$.

Results

Demographic characteristics, clinical complications, and UGE data of patients are displayed in Table 1. Of 543 patients who underwent BS, 42 were excluded by the eligibility criteria (Fig. 1), and 36.4% were diagnosed with HP infection. STT for HP infection was effective in 90.9% of patients. The groups were similar in regards to all variables, except for the percentage of endoscopy and dilatations performed, which were higher in the HP-negative versus HP-positive group and the HP-negative versus HP-eradication group (4.9% vs. 1% and 2.6% vs. 0% respectively, $p < 0.05$ for all comparisons).

Symptoms suggestive of gastrointestinal bleeding and stenosis were reported by 2% and 6.4% of patients from the HP-negative group without difference between groups ($p \geq 0.19$). None of the patients who had HP infection preoperatively had endoscopic dilation performed. In addition, no postoperative clinical complications were observed in the HP-noneffective group. There were no occurrences of fistulas, reoperations, or death.

Discussion

The present study evaluated the efficacy of STT for HP eradication and the possible occurrence of complications 30 days after surgery in patients undergoing RYGB. Preoperative

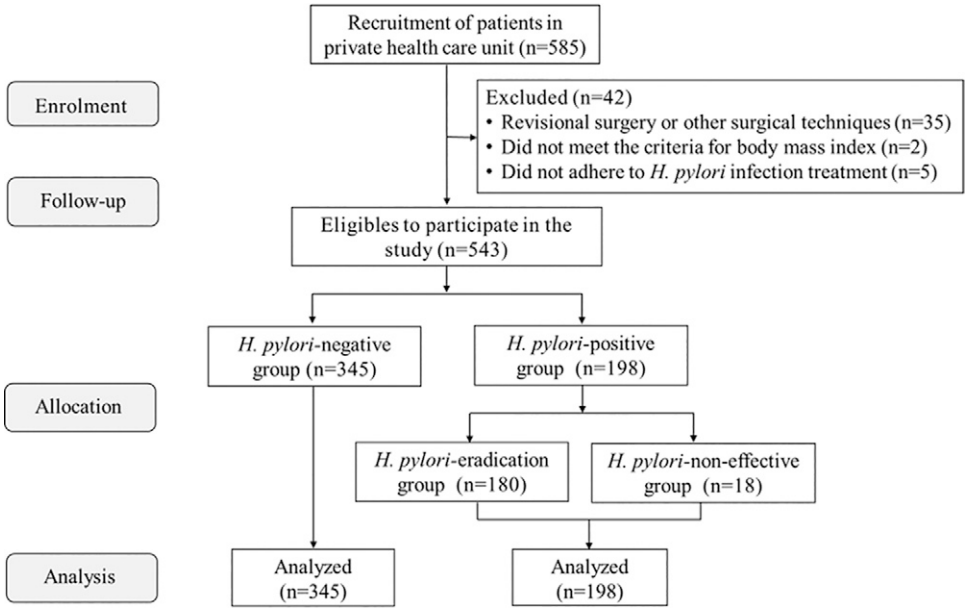


FIG. 1. Flow diagram of participants' enrollment, allocation, follow-up, and data analysis.

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eradication of HP potentially improving post-RYGB outcomes is still debatable. Guidelines diverge regarding routine endoscopy in the preoperative period for all patients or only for symptomatic ones. These heterogeneities in routine recommendations made our work relevant, and we may add knowledge to this topic.

All patients were subjected to preoperative UGE. In 36.4%, HP infections were diagnosed, a prevalence rate similar to that observed by Azagury et al.[20] All included HP-positive patients were treated with a first-line regimen, and during surgery, a biopsy of the gastric mucosa was performed to assess whether or not the HP infection persisted. HP positivity persisted in 9%, showing that first-line STT was effective. It is known that suboptimal eradication rates may be related to the increase in bacterial resistance.[14] Some guidelines have evaluated the possibility of antibiotic resistance and treatment failure, recommending STT in areas of <15% clarithromycin resistance or proven >85% eradication success or no prior macrolide exposure according to the Toronto Consensus.[21] In our population, 8% had clarithromycin resistance, while none had it to amoxicillin.[18,19] These findings coincide with our own.

The preoperative routine screening and eradication of HP infection remain controversial.[11,22,23] The European Association for Endoscopic Surgery recommends UGE before BS in any patient, independent of symptoms aiming to treat any lesions, including HP infection that may cause postoperative complications.[24,25] On the counterpart, the Society of American Gastrointestinal and Endoscopic Surgeons suggests a UGE only for symptomatic patients.[24,26] We performed UGE in all patients before surgery. We detected no differences between HP-negative versus HP-positive groups (HP-eradication or HP-noneffective groups) during 30 days after surgery in complication rates, suggesting that HP eradication was not associated with improved outcomes after RYGB.

We should highlight that our findings are related to the early postoperative period since evidence regarding endoscopic findings of patients who were candidates for BS reveals several upper digestive tract abnormalities, such as gastroesophageal reflux disease, Barrett's esophagus, gastric ulcer, erosive gastritis, duodenal ulcer, and gastric adenocarcinoma.[5] Therefore, these patients need regular follow-ups with routine UGE to clarify if histopathological abnormalities of the gastric mucosa diagnosed before surgery may interfere with long-term postoperative complications. Chronic HP infection has a carcinogenic potential, as demonstrated in multiple studies. However, it depends on a series of interrelated components, such as HP-strain-specific virulence factors, host genotype, environmental factors, diet, nutritional deficiencies, and alterations in resistance cells and their microbiome.[4,5]

This study showed low rates of gastrointestinal bleeding and symptoms suggestive of stenosis (1.5% and 5.9%, respectively) in 30 days postoperative. Gastrointestinal bleeding in BS patients is a rare adverse event[27] ranging from 1% to 4% after laparoscopic RYGB.[28,29] It usually occurs in the staple line of the gastrojejunal anastomosis or the gastric pouch during hospitalization days.[29] Although some studies have related the exposure to HP infection with gastrointestinal bleeding and subsequent marginal ulceration,[27–29] our findings showed that only 1.5% of patients had bleeding, of which 0.6% had preoperative HP-positive diagnosis.

Stenosis is a critical complication in patients subjected to BS occurring in 5% to 27% and 0.7% to 4% of patients after an RYGB or sleeve gastrectomy, respectively.[30,31] Most cases of stenosis involve gastrojejunal anastomosis and occur in the first few weeks following surgery, with symptoms of dysphagia, nausea, gastroesophageal reflux, and vomiting.[30] Possible causes include ischemia causing scarring, excessive nonischemic scarring, recurrent marginal ulceration, tension or poor positioning of the anastomosis, and the surgical technique itself.[30] Schirmer et al. have demonstrated that postoperative stenosis occurs in up to 9.6% of patients with HP infection.[32] Multiple studies relate HP infection with postoperative stenosis. However, no differences have been shown between patients infected or not with preoperative HP, which

Table 1. Demographic Characteristics, Clinical Complications, and Upper Gastrointestinal Endoscopy Data of Patients According to *H. pylori* Infection Status

Variable	*Pooled sample* (n = *543*)	*HP-negative group* (n = *345*)	*HP-positive group* (n = *198*)			
			HP-eradication group (n = *180*)	p-*value*	*HP-noneffective group* (n = *18*)	p *value*
Demographic characteristics						
Age (years)	38 ± 9	38 ± 9	39 ± 9	0.96	38 ± 9	0.97
Female (*n*, %)	443 (81.6)	282 (81.7)	146 (81.1)	0.86	15 (83.3)	0.86
Preoperative BMI (kg/m^2)	41.7 [38.4–45.4]	41.8 [38.6–45.4]	41.6 [37.8–45.7]	0.86	42.2 [40–45.1]	0.47
Grade 2 obesity (*n*, %)	188 (34.6)	120 (34.8)	64 (35.6)	0.86	4 (22.2)	0.27
Grade 3 obesity (*n*, %)	293 (54)	184 (53.3)	98 (54.4)	0.80	11 (61.1)	0.51
BMI 50–59.9 kg/m^2 (*n*, %)	55 (10.1)	36 (10.4)	17 (9.4)	0.72	2 (11.1)	0.92
BMI ≥60 kg/m^2 (*n*, %)	7 (1.3)	5 (1.4)	1 (0.6)	0.36	1 (5.6)	0.18
Clinical complications						
Gastrointestinal bleeding (*n*, %)	8 (1.5)	7 (2)	1 (0.6)	0.19	0 (0)	0.54
Stenosis symptoms (*n*, %)	32 (5.9)	22 (6.4)	10 (5.6)	0.71	0 (0)	0.27
Upper gastrointestinal endoscopy						
Endoscopy (*n*, %)	19 (3.5)	17 (4.9)*	2 (1.1)	**0.02**	0 (0)	0.33
Endoscopic dilatation (*n*, %)	9 (1.7)	9 (2.6)*	0 (0)	**0.03**	0 (0)	0.49
One dilatation (*n*, %)	7 (1.3)	7 (2)	0 (0)	0.11	0 (0)	0.90
Two dilatations (*n*, %)	2 (0.4)	2 (0.6)	0 (0)	0.11	0 (0)	0.90
Three dilatations (*n*, %)	2 (0.4)	2 (0.6)	0 (0)	0.11	0 (0)	0.90

$p < 0.05$ for statistical significance are in bold. BMI, body mass index. *p-value for comparisons between HP-negative versus HP-eradication groups and HP-negative versus HP-noneffective treatment groups, unpaired Student t-test or chi-square test; results expressed as mean ± standard deviation or median [25th–75th percentile] and absolute (relative frequency).

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agrees with our findings.[10] Our data showed that 5.9% of individuals presented stenosis symptoms, of which 3.5% underwent UGE, and only 1.7% required endoscopic dilatation. Of those who required dilatation, none had preoperative HP infection.

Some limitations of the study must be mentioned. We had a higher proportion of females in our sample (81.6%), but this is usual since females constitute the majority of patients undergoing BS. Only patients who performed RYGB were included, limiting our results from inferences to other surgical techniques. RYGB is our country's most-performed surgical technique. A prospective randomized controlled study, in which the voluntaries are randomized according to eradication therapy or not, would be more accurate. The UGE and histopathological exams have been performed in multiple centers; the sample collection technique and histopathological analysis performed in different laboratories can vary. Intraoperative biopsy was performed only in the gastric body. However, the treatment was standardized, and intraoperative biopsy was assessed by the same professional and technique, reducing possible bias.

Conclusion

The STT for eradicating HP infection before RYGB proved effective and should be indicated for all HP-positive patients. However, in our study, eradication of it did not change 30 days postoperative course. Although we still recommend routine preoperative HP screening and the first-line treatment option, maybe prospective studies could elucidate the link between HP infection (with active virulence or not), metabolic parameters, and multiple comorbid conditions in the long term.

Authors' Contributions

V.J.C.R. and P.R.F.L.: Conception and design of the study. V.J.C.R., K.G.L., L.G.K.-A., and P.R.F.L.: Investigation, methodology, data curation, formal analysis, and interpretation of data. V.J.C.R., K.G.L., L.G.K.-A., and P.R.F.L.: Writing—original draft. K.G.L., L.G.K.-A., and P.R.F.L.: Writing—review and editing. All authors approved the final version of the article.

Author Disclosure Statement

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

1. Adams TD, Gress RE, Smith SC, et al. Long-term mortality after gastric bypass surgery. N Engl J Med 2007;357(8): 753–761; doi: 10.1056/NEJMoa066603
2. Arterburn DE, Telem DA, Kushner RF, et al. Benefits and risks of bariatric surgery in adults: A review. JAMA 2020; 324(9):879–887; doi: 10.1001/jama.2020.12567
3. Hooi JKY, Lai WY, Ng WK, et al. Global prevalence of *Helicobacter pylori* infection: systematic review and meta-analysis. Gastroenterology 2017;153(2):420–429; doi: 10 .1053/j.gastro.2017.04.022
4. Suerbaum S, Michetti P. *Helicobacter pylori* infection. N Engl J Med 2002;347(15):1175–1186; doi: 10.1056/NEJMra020542
5. Muñoz R, Ibáñez L, Salinas J, et al. Importance of routine preoperative upper GI endoscopy: Why all patients should

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be evaluated? Obes Surg 2009;19(4):427–431; doi: 10.1007/s11695-008-9673-x
6. Crowe SE. Helicobacter infection, chronic inflammation, and the development of malignancy. Curr Opin Gastroenterol 2005;21(1):32–38.
7. Pellicano R. Similar *Helicobacter pylori* eradication rate in obese patients undergoing gastric bypass surgery and in general population. Obes Surg 2018;28(2):553–554; doi: 10.1007/s11695-017-3038-2
8. Gómez García de Las Heras S, Galindo Fernández C, Ruiz Tovar J, et al. Preoperative management of obese patients undergoing bariatric surgery: role of endoscopy and helicobacter eradication. Obes Res Clin Pract 2021;15(3):289–290; doi: 10.1016/j.orcp.2021.05.002
9. Di Palma A, Liu B, Maeda A, et al. Marginal ulceration following roux-en-Y gastric bypass: risk factors for ulcer development, recurrence and need for revisional surgery. Surg Endosc 2021;35(5):2347–2353; doi: 10.1007/s00464-020-07650-0
10. Shahraki MS, Pouramini A, Heydari Y, et al. Does bariatric surgery change the recurrence of *Helicobacter pylori* infection? Obes Surg 2021;31(9):4210–4212; doi: 10.1007/s11695-021-05507-6
11. Mocanu V, Dang JT, Switzer N, et al. The effect of *Helicobacter pylori* on postoperative outcomes in patients undergoing bariatric surgery: a systematic review and meta-analysis. Obes Surg 2018;28(2):567–573; doi: 10.1007/s11695-017-3024-8
12. Kamboj AK, Cotter TG, Oxentenko AS. Helicobacter pylori: The past, present, and future in management. Mayo Clin Proc 2017;92(4):599–604; doi: 10.1016/j.mayocp.2016.11.017
13. Elbehiry A, Marzouk E, Aldubaib M, et al. *Helicobacter pylori* infection: current status and future prospects on diagnostic, therapeutic and control challenges. Antibiotics (Basel) 2023;12(2); doi: 10.3390/antibiotics12020191
14. Fallone CA, Moss SF, Malfertheiner P. Reconciliation of recent *Helicobacter pylori* treatment guidelines in a time of increasing resistance to antibiotics. Gastroenterology 2019;157(1):44–53; doi: 10.1053/j.gastro.2019.04.011
15. Eisenberg D, Shikora SA, Aarts E, et al. American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): indications for metabolic and bariatric surgery. Surg Obes Relat Dis 2022;18(12):1345–1356; doi: 10.1016/j.soard.2022.08.013
16. Bray GA, Heisel WE, Afshin A, et al. The science of obesity management: an endocrine society scientific statement. Endocr Rev 2018;39(2):79–132; doi: 10.1210/er.2017-00253
17. Chey WD, Leontiadis GI, Howden CW, et al. ACG clinical guideline: treatment of infection. Am J Gastroenterol 2017;112(2):212–239; doi: 10.1038/ajg.2016.563
18. Eisig JN, Silva FM, Barbuti RC, et al. *Helicobacter pylori* antibiotic resistance in Brazil: clarithromycin is still a good option. Arq Gastroenterol 2011;48(4):261–264; doi: 10.1590/s0004-28032011000400008
19. Martínez MJD, Henao RSC, Lizarazo RJI. Resistencia antibiótica del *Helicobacter pylori* en América Latina y el Caribe. Rev Colomb Gastroenterol 2014;29(3):218–227. set. 2014.2014.
20. Azagury D, Dumonceau JM, Morel P, et al. Preoperative work-up in asymptomatic patients undergoing Roux-en-Y gastric bypass: is endoscopy mandatory? Obes Surg 2006;16(10):1304–1311; doi: 10.1381/096089206778663896
21. Fallone CA, Chiba N, van Zanten SV, et al. The Toronto consensus for the treatment of *Helicobacter pylori* infection in adults. Gastroenterology 2016;151(1):51–69.e14; doi: 10.1053/j.gastro.2016.04.006
22. Renshaw AA, Rabaza JR, Gonzalez AM, et al. *Helicobacter pylori* infection in patients undergoing gastric bypass surgery for morbid obesity. Obes Surg 2001;11(3):281–283; doi: 10.1381/096089201321336601
23. Pintar T, Kaliterna N, Carli T. The need for a patient-tailored *Helicobacter pylori* eradication protocol prior to bariatric surgery. J Int Med Res 2018;46(7):2696–2707; doi: 10.1177/0300060518769543
24. Arieira C, Boal Carvalho P, Dias de Castro F, et al. Esophagogastroduodenoscopy findings in patients on the waiting list for bariatric surgery. GE Port J Gastroenterol 2019;26(6):389–395; doi: 10.1159/000495770
25. Sauerland S, Angrisani L, Belachew M, et al. Obesity surgery: Evidence-based guidelines of the European Association for Endoscopic Surgery (EAES). Surg Endosc 2005;19(2):200–221; doi: 10.1007/s00464-004-9194-1
26. Evans JA, Muthusamy VR, Acosta RD, et al. The role of endoscopy in the bariatric surgery patient. Gastrointest Endosc 2015;81(5):1063–1072; doi: 10.1016/j.gie.2014.09.044
27. Susmallian S, Danoch R, Raskin B, et al. Assessing bleeding risk in bariatric surgeries: a retrospective analysis study. Dig Dis 2020;38(6):449–457; doi: 10.1159/000506456
28. Spaw AT, Husted JD. Bleeding after laparoscopic gastric bypass: case report and literature review. Surg Obes Relat Dis 2005;1(2):99–103; doi: 10.1016/j.soard.2005.02.013
29. Nguyen NT, Rivers R, Wolfe BM. Early gastrointestinal hemorrhage after laparoscopic gastric bypass. Obes Surg 2003;13(1):62–65; doi: 10.1381/096089203321136601
30. Palermo M, Acquafresca PA, Rogula T, et al. Late surgical complications after gastric bypass: a literature review. Arq Bras Cir Dig 2015;28(2):139–143; doi: 10.1590/s0102-67202015000200014
31. Agnihotri A, Barola S, Hill C, et al. An algorithmic approach to the management of gastric stenosis following laparoscopic sleeve gastrectomy. Obes Surg 2017;27(10):2628–2636; doi: 10.1007/s11695-017-2689-3
32. Schirmer B, Erenoglu C, Miller A. Flexible endoscopy in the management of patients undergoing Roux-en-Y gastric bypass. Obes Surg 2002;12(5):634–638; doi: 10.1381/096089202321019594

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