

Late Complications of MGB: Prevention and Treatment

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Mario Musella and Alessio Bocchetti

8.1 Introduction

Late complications are defined as complications occurring from the second postoperative month and up to 10 years from surgery. The most frequent complications, their rate and the suggested management are shown in Table 8.1. In a recent multi-center review from Italy, the late complications rate of MGB-OAGB was 10.9% for primary procedures and 7% for revisional/re-do operations [1]. The learning curve, intended as the first 50 cases, significantly influenced the late complication rate [1].

Table 8.1 Late complications of MGB: rate and treatment

Complications	Rate (range)	Treatment
GER	0.5–4%	<ul style="list-style-type: none"> – Conservative (PPI) – RYGB laparoscopic conversion – Braun laparoscopic anastomosis
Anemia	1.7–30%	<ul style="list-style-type: none"> – Drug therapy/Iron supplementation
Weight regain	1.6%	<ul style="list-style-type: none"> – Laparoscopic pouch resizing – Loop resizing
Marginal ulcer	0.6–4%	<ul style="list-style-type: none"> – PPI treatment – Laparoscopic repair – Laparotomic repair
Excessive weight loss	0.2–1.2%	<ul style="list-style-type: none"> – Conservative treatment – Restorative laparoscopic surgery – Loop resizing
Internal hernia	0.1–0.4%	<ul style="list-style-type: none"> – Laparoscopic repair
Anastomotic stenosis	0.1–0.4%	<ul style="list-style-type: none"> – Endoscopic repair – RYGB laparoscopic conversion

GER gastro-esophageal reflux, PPI proton pump inhibitors, RYGB Roux-en-Y gastric bypass

M. Musella, MD (✉) · A. Bocchetti, MD
 Department of Advanced Biomedical Sciences, “Federico II” University, Naples, Italy
 e-mail: mario.musella@unina.it

8.1.1 Gastro-esophageal Reflux (GER)

Gastro-esophageal reflux (GER) is defined as the presence of duodenal contents coming up the gastric pouch into the esophagus [2, 3]. GER has been mainly addressed by clinical findings identified through validated questionnaires [4]. In the presence of symptoms, endoscopy and high-resolution impedance manometry are used to detect histological damage caused by alkaline reflux affecting a normally acid environment [2, 3].

This complication is reported to range between 0.5 and 4%, and a correlation with a gastric pouch shorter than 9 cm and with the presence of preoperative gastro-esophageal reflux disease (GERD) has been observed. However, *de novo* GER has been reported in 2% of patients [1].

EG junction function has been evaluated pre- and postoperatively [5] through endoscopy, high-resolution impedance manometry, and 24-h pH-impedance monitoring, and in MGB demonstrates low intragastric pressure with a lack of GE reflux. These results have been compared with patients who had undergone laparoscopic sleeve gastrectomy (SG), who demonstrate a high-pressure gastric pouch with GE reflux [6]. After MGB, no heartburn or regurgitation, esophagitis, or presence of bile, were reported. After MGB, intragastric pressure, GE pressure gradient, and GE reflux events (acid, weakly acid, and even weakly alkaline) all significantly diminished. The need for surgical revision following MGB-OAGB due to intractable bile reflux is rare, especially when standard operative techniques are performed [7–9]; this ranges from 0% to 0.7%.

In Chevallier series, seven patients presented with an intractable biliary reflux. They were reoperated after a mean of 23 months when mean BMI was 25.7 kg/m². These patients were then cured after conversion to a RYGB: the bile reflux (GER) then disappeared [7].

In other series, sporadic clinical GER was reported in ~2%, and the few episodes were associated with dietary transgressions, especially at night. Endoscopic studies revealed the presence of some bile in the stomach with mild to moderate pouch gastritis, but did not document any esophagitis [8–10].

The main condemning argument against MGB-OAGB through years has been the potential consequences for bile reflux. Although biliary reflux into the stomach may be frequent both physiologically [11] and after some operations [12], symptomatic, endoscopic, and histologic repercussions have neither been relevant nor conclusively proven [13].

The anatomical configuration makes gastric and/or esophageal symptomatic bile reflux after MGB-OAGB quite rare [6, 14–16], especially when a correct technique is performed.

Treatment of GER includes dietary and healthy lifestyle recommendations, continued follow-up by nutritionists, PPIs (40 mg/day for 6 months), and sucralfate (1 g before every meal and before bedtime for 3 months, followed by 1 g before bedtime for another 3 months) [10].

When conservative treatment fails (42.8% of all patients presenting GER), a surgical revision is advised. The suggested procedures, in such cases, are

RYGB laparoscopic revision, or Braun side-to-side anastomosis between the afferent and the efferent limb, about 15–20 cm before to beyond the gastrojejunal anastomosis [1].

8.1.2 Malnutrition

After MGB-OAGB, a few patients develop excessive weight loss (WL) and/or nutrient deficits (usually within the first 2–3 postoperative years). This complication ranges between 0.2 and 1.2%. Revisional surgery, by reducing the length of bypassed bowel, or reversal surgery, by restoring original anatomy, is then required. This occurs in 0.7% of patients presenting malnutrition [1, 7, 8, 17, 18]. Most patients are in fact generally controlled and treated on an ambulatory basis, and recover with dietary recommendations, once intestinal adaptation is complete [10]. Iron deficiency is rather common, especially in fertile women with copious menstrual bleeding. Up to one-third require oral supplements beyond the expected time for intestinal adaptation, and up to 1.3% may require parenteral iron [10].

The relatively low rate of anemia (1.7%) in some experiences [1] can be explained by the large use of iron, vitamins, and folate implementation prescribed postoperatively. Furthermore a relationship between anemia and the learning curve has been reported [1].

Excessive weight loss is basically due to loop length >250 cm. Nevertheless, over time, Carbajo et al. have progressively increased the extent of bypassed small bowel from <200 cm, to a range of 250–305 cm, based both on total small bowel length and preoperative BMI [10]. This small bowel tailoring, has also been suggested by other MGB-OAGB surgeons [19–21]. Although increased malabsorption could theoretically lead to more side-effects and malnutrition, only 14 patients (1.1%) suffered protein malnutrition [10]. In this series, severe malnutrition occurred in two patients who had excessive weight loss (%EBMIL >100% and albuminemia <30 g/L). Their mean BMI at 5 years was 19 kg/m² and %EBMIL was 124 and 122%. They were treated in a specialized medical unit with parenteral alimentation and psychiatric support, before a reversal of the OAGB was performed [10].

Malabsorption is only one of many factors that lead to malnutrition; among others, these include psychologic, personal, family, social, and even economic issues. Malnutrition can thus be seen after procedures which entail none, or less malabsorptive components [22–24]. Malnutrition is often temporary; after a support program including I.V. therapy followed by a strict program of enteral supplementation and counseling (aimed at improving all other factors that influence nutritional status), and once intestinal adaptation is reached [25], it often poses no further problems [10].

Rutledge reported excessive WL in 1% in his series [26] and suggested selected reversal to normal anatomy as the reoperation of choice. Lee revised 23 of 1322 patients (1.7%) [8]; the most common cause was malnutrition in 9 patients (0.7%). A conversion to SG, due to efficacy in improving malnutrition without regaining body weight, was in this case recommended. Noun et al. [20] reported excessive weight loss in 4 patients (0.4%) with reversal in 2 and conversion to SG in the other

2. The Italian group [27] submitted 7 of 818 patients (0.8%) to late reoperations; indication was EWL of >100% in only one (0.1%).

Although the argument remains debated, the ideal length of small bowel to be bypassed has been estimated to be about one-third of its total length.

8.1.3 Weight Regain

Weight regain is measured as both postoperative body mass index (BMI) and excess weight loss (EWL%) changes [7, 17]. It is mostly associated with the learning curve, and is due to pouch and loop size. In weight regain, the use of a surgical approach (pouch and loop resizing) is suggested. Five percent ($n = 49$) of patients from a French series had $\leq 25\%$ EBMIL and were considered as weight-loss failures. Dilatation of the gastric pouch occurred in four patients 24 months following MGB-OAGB. The dilatation was assessed by an x-ray upper gastrointestinal series. Revision surgery was done by pouch resizing using a calibration tube in all patients [7]. A lower rate from an Italian series was reported in 11/683 patients (1.6%) with 5-years follow-up; the management was pouch resizing in 4 and loop lengthening in 7 patients [1].

8.1.4 Marginal Ulcer

The pathogenesis of marginal ulcers (MU) is probably different from that of peptic ulcers, and might involve acid secretion and impaired blood supply to gastric mucosa. MU is reported only when it is extremely bothersome or of surgical interest, being therefore probably underestimated. It is a common complication following RYGB, ranging from 1 to 9% [28], while the MU rate seems to be lower following MGB-OAGB, ranging from 0.5 to 4% in a recent systematic review [16]. An association with smoking and the learning curve has been suggested [1, 14]. MU is commonly diagnosed with endoscopy.

A total of 6 patients (0.5%) in Carbajo's series developed anastomotic or marginal ulcers; 5 were acute and presented without warning signs or symptoms, with upper GI bleeding [10].

Critics of MGB-OAGB emphasized that it would lead to a higher rate of MU and with less responsiveness to medical management [29]. Various risk factors independent of bile reflux have been identified [30]. Increased acid production in an oversized pouch is a potential cause, but some authors hypothesized that the presence of bile within the anastomotic area in MGB-OAGB may actually have a protective effect by buffering acid ulcerogenic action [7]. In Carbajo's series, the marginal ulcer rate of 0.5% is one of the lowest reported for any type of gastric bypass [10]. Moreover, this longer follow-up demonstrates that MU was as responsive to medical therapy as MU after RYGB. Patients in most MGB-OAGB series [1, 10, 14, 16, 20] normally respond to PPIs, sucralfate, and HP eradication [10]. Treatment with PPI is the first step. When conservative management fails, the therapy is surgical.

8.1.5 Internal Hernia

Unlike RYGB, in which the internal hernia rate may reach a worrisome 16.1% [22], MGB-OAGB presents a negligible rate of internal hernias (0.1%–0.4%) [1, 7, 8, 10]. It is likely due to the different surgical technique; in MGB-OAGB there is no interruption of mesenteric continuity. CT scan may be of help in reaching a diagnosis. When this complication appears, the only treatment is surgical.

8.1.6 Anastomotic Stenosis

Anastomotic stenosis is due to anastomotic tension, ischemia, or subclinical leaks. However, the linear anastomosis described for the MGB-OAGB [10, 26] is large, ranging from 3 to 6 cm. This is in opposition to the RYGB which includes a narrower (~1.2 cm) anastomosis [30]. The stenosis rate reported recently for MGB-OAGB on 3/683 patients at 5 years from surgery was 0.4% [1, 7, 10].

Carbajo had 6 stomal stenosis (0.5%), 4 successfully treated by a single session endoscopic dilation 2 to 3 months following surgery. Another patient (lost at follow-up) was submitted at another hospital to repeated dilations and suffered a perforation that required urgent operative treatment [10].

The recommended management of this complication is endoscopic balloon dilation, or laparoscopic RYGB conversion when endoscopic treatment fails.

Conclusion

Late complications after MGB are uncommon, but important. Alkaline GER, anemia, weight regain, malnutrition, excess weight loss, internal hernia and anastomotic stenosis demand follow-up and proper management.

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