



# Management of Anastomotic Ulcers After Roux-en-Y Gastric Bypass: Results of an International Survey

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## Abstract

**Background** Anastomotic ulcers (AUs) after Roux-en-Y gastric bypass (RYGB) occur in up to 16 % of patients. In an international survey among members of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), current preventative and therapeutic strategies in AU were analyzed.

**Methods** An Internet-based survey was performed.

**Results** One hundred eighty-nine surgeons completed the survey. Preoperative screening for *Helicobacter pylori* is performed by 65 %. Eighty-eight percent of them prophylactically prescribe antacids for 3 months after surgery (interquartile

range (IQR) 1–6). In case of AU, 99 % of participants opt for proton pump inhibitors (PPIs) either alone (60 %) or in combination with sucralfate (39 %). After ulcer resolution, 52 % continue PPI for 6 (3–6) months. In case of AU recurrence, 56 % continue with conservative treatment. In contrast, 41 % of them favor a renewal of the gastrojejunal anastomosis either combined with truncal vagotomy (18 %) or with gastric remnant resection (13 %), and only 2 % choose to resect both gastric pouch and gastric remnant with subsequent reconstruction by esophagojejunostomy. In case of recurrence after surgical revision, 46 % of participants opt again for a conservative approach, while 36 % chose to redo the gastrojejunostomy once again.

**Conclusions** The majority of bariatric surgeons recommend preoperative screening and eradication of *H. pylori* as well as prophylactic use of PPI. If an AU is diagnosed, the role of PPI as a first-line treatment seems to be undisputed. However, dosage and duration of therapy remain unclear. In refractory AU, there is no consensus among bariatric surgeons whether conservative treatment or surgical revision should be performed.

**Keywords** Roux-en-Y gastric bypass · Metabolic surgery · Bariatric surgery · Anastomotic ulcer · Marginal ulcer · Obesity

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## Introduction/Purpose

Roux-en-Y gastric bypass (RYGB) has become the gold standard among all applied bariatric procedures. In the bariatric outcome longitudinal database of the American Society of Metabolic and Bariatric Surgery containing 57,918 cases of bariatric surgery, RYGB accounts for 55 % of all procedures [1]. When compared with sleeve gastrectomy and gastric banding, RYGB provides the most enduring and effective long-term weight loss and reduction of obesity-associated comorbidities [2].

However, long-term complications do occur after RYGB and include events such as internal hernias [3] or micronutrient deficiencies [4]. In addition, the gastrojejunostomy has been shown to be susceptible to anastomotic ulcers (AUs). The underlying mechanisms are not entirely clear, but reduced local blood flow, anastomotic tension, and/or *Helicobacter pylori* infection may play a role [5–7]. Furthermore, the gastrojejunostomy is not reached by the alkaline fluid secreted by glands of the duodenum as the latter is excluded from the nutrient flow after RYGB. Therefore, the gastrojejunal anastomosis may be exposed to the undiluted acidic juice produced by the gastric pouch, subsequently leading to AU development [8]. The incidence of AU—also known as marginal ulcers—of the gastrojejunostomy after RYGB varies between 0.6 and 16 % [2, 9–11].

The clinical appearance of an AU ranges from asymptomatic to incapacitating pain, lack of appetite, abnormal weight loss, or nausea and vomiting. Furthermore, due to chronic occult bleeding, AU may cause anemia in as many as 10.2 % of patients after RYGB [12].

Prevention and management of AU after RYGB is still a matter of debate. Proton pump inhibitors (PPIs) are an efficient option for the prevention and treatment of peptic ulcers. However, despite the preventative use of treatment-dose PPIs, AU may still occur in up to 16 % of post-RYGB patients [2, 9–11]. Interestingly, AU may even occur after successful medical *H. pylori* eradication prior to surgery as Rasmussen et al. demonstrated that preoperative *H. pylori* infection, although adequately treated, was twice as common among patients who had an AU (32 %) as among those who did not (12 %) [6]. Nevertheless, the management of AU consists of eliminating known risk factors of peptic ulcers. Treatment with antacids and elimination of NSAIDs is effective in 68 to 88 % of cases [7, 13, 14].

Despite the best conservative therapy efforts, one third of patients will need surgical revision for therapy refractory or recurring AU [7, 14, 15]. The rationale behind surgical revision is the correction of technical risk factors for AU including large gastric pouches, vertically oriented pouches [16], gastrogastric fistulas [17], or local ischemia caused by anastomotic tension [5].

Evidence-based guidelines or data from randomized controlled trials on the management of AU are lacking. The aim of this survey was therefore to determine if there is a consensus among expert bariatric surgeons on preventative and therapeutic strategies against AU after RYGB surgery.

## Material and Methods

An Internet-based survey was sent directly by electronic mail to members of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), a federation of 46

national associations of bariatric surgeons. The survey consisted of 20 multiple choice questions and could be completed in less than 5 min. One month later, the presidents of the national societies for bariatric surgery of Argentina, Australia, New Zealand, Belgium, Bolivia, Brazil, Chile, Columbia, Costa Rica, Czech Republic, Egypt, Finland, France, Germany, Greece, Guatemala, Hungary, Iceland, India, Israel, Italy, Japan, Kuwait, Lithuania, Mexico, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Serbia, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Arab Emirates, UK, USA, Canada, as well as Venezuela were also asked to issue the online poll among their members. The survey was open between 14 March and 3 September 2011.

## Statistical Analysis

Data were collected in a study database using Excel™ (version 12.0, 2007, Microsoft Switzerland, Wallisellen, Switzerland). Descriptive statistics was performed using GraphPad™ Prism version 5.00 for Windows (GraphPad™ Software, San Diego, California, USA). Data are presented as median (interquartile range) as not otherwise stated. The chi-squared test was used as appropriate. The level of significance was set at  $p < 0.05$ .

## Results

### Experience of Participating Bariatric Surgeons

Of the 189 participants who completed the survey, 81 % reported to have performed more than 50 RYGB operations (Table 1).

### Operative Details for RYGB

To date, the majority of surveyed bariatric surgeons perform their RYGB operations laparoscopically. In most cases (81 %,  $n = 153$ ), either a circular ( $n = 63$ ) or linear stapler ( $n = 90$ ) is used to fashion the gastrojejunostomy (Table 1). Only 19 % ( $n = 36$ ) of the participants prefer to hand sew the gastrojejunostomy, of which most ( $n = 30$ ) use resorbable, and only a minority ( $n = 6$ ) uses nonresorbable suture material.

Thirty two percent ( $n = 20$ ) of surgeons using a circular stapler additionally oversew the anastomosis either with resorbable ( $n = 16$ ) or nonresorbable suture material ( $n = 4$ ). In contrast, linear anastomoses are more frequently oversewn (60 %,  $n = 54$ ;  $p = 0.009$ ) using resorbable material in most of the cases ( $n = 45$ ). Preferences for alimentary limb lengths are summarized in Table 1.

**Table 1** Experience of surgeons and operative details for RYGB,  $n=189$ 

	% (n) of participants
Experience (number of RYGB)	
<50	19 (36)
50–200	33 (63)
>200	48 (90)
Approach	
Laparoscopic	91 (172)
Open	9 (17)
Technique of gastroenterostomy	
Circular stapler	33 (63)
Linear stapler	48 (90)
Hand sewn	19 (36)
Length of alimentary limb (cm)	
<100	7 (14)
100	42 (80)
150	43 (82)
>150	7 (13)

### Onset

In the experience, 28 % ( $n=52$ ) of survey participants expect the onset of AU to lie within the first 3 months after surgery. All others expect AU to arise later than 3 months or even after more than a year postoperatively [48 % ( $n=90$ ) and 25 % ( $n=47$ ), respectively]. The time of AU onset does not correlate with the reported operative experience of the participating surgeons or the preferred anastomotic technique.

### Etiology

The participants were asked to name the most important surgical and nonsurgical risk factor for the development of an AU in their experience. The responses are shown in Table 2.

### Prevention

While 65 % ( $n=123$ ) of survey participants reported to screen their patients for presence of *H. pylori* before RYGB, 35 % ( $n=66$ ) reported to omit *H. pylori* screening. Of those who perform preoperative *H. pylori* screening, the vast majority of 98 % ( $n=121$ ) performs an eradication therapy if screening reveals a *H. pylori* infection; only 2 % ( $n=2$ ) of survey responders do not eradicate in such a case. No participant would opt for a gastric remnant resection in a *H. pylori*-positive patient.

Prophylactic therapy is prescribed by 88 % ( $n=166$ ) after RYGB operation, 91 % ( $n=151$ ) of which prefer PPI. Dosage and choice of agents used are summarized in Table 3.

**Table 2** Single most important surgical and nonsurgical risk factor for AU after RYGB,  $n=189$ 

	% (n) of participants
Surgical risk factors	
Tissue ischemia	33 (63)
Pouch size	22 (41)
Foreign bodies (sutures, staples)	19 (36)
Acid vertically oriented pouch	15 (29)
Tension on anastomosis	6 (12)
Staple line dehiscence/gastrogastric fistula	4 (8)
Nonsurgical risk factors	
Smoking	46 (86)
NSAID use	29 (55)
Lack of PPI use	16 (30)
<i>Helicobacter pylori</i>	7 (14)
Alcohol consumption	2 (4)

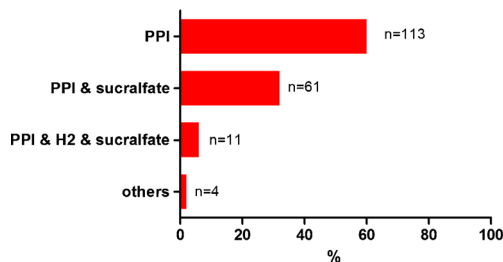
Prophylactic medication is prescribed for a period of 1 month postoperatively for 25 % ( $n=42$ ), 3 months for 37 % ( $n=62$ ), 6 months for 28 % ( $n=47$ ), more than 6 months for 4 % ( $n=7$ ), or lifelong for 5 % ( $n=8$ ) of the participants. The median duration of prophylaxis is 3 months (interquartile range (IQR) 1–6).

### Treatment of Primary AU

Primary AU was defined as the first occurrence of ulceration at the level of the gastrojejunostomy. In case of primary AU, 99 % of participants favor a conservative approach. Sixty percent of participants use PPI, 32 % a combination of PPI and sucralfate, and 6 % a triple combination of PPI, H2 blocker, and sucralfate. Less frequently, H2 blockers alone or in combination with sucralfate are used (Fig. 1). Forty-nine percent ( $n=93$ ) of participants using a first-line medical therapy continue treatment until ulcer resolution is demonstrated by endoscopy. Others continue medical therapy either for a

**Table 3** Prophylactic antacid after RYGB,  $n=166$ 

	% (n) of participants
PPI	
Prophylactic dosage	45 (75)
Therapeutic dosage	43 (72)
Prophylactic dosage+sucralfate	1 (2)
Therapeutic dosage+sucralfate	1 (2)
H2 blocker	
Prophylactic dosage	1 (2)
Therapeutic dosage	4 (6)
Sucralfate alone	1 (1)
Others	4 (6)



**Fig. 1** Conservative therapy for AU,  $n=189$

fixed period of 3 months (31 %,  $n=58$ ), while 20 % continue for up to 2 years ( $n=37$ ).

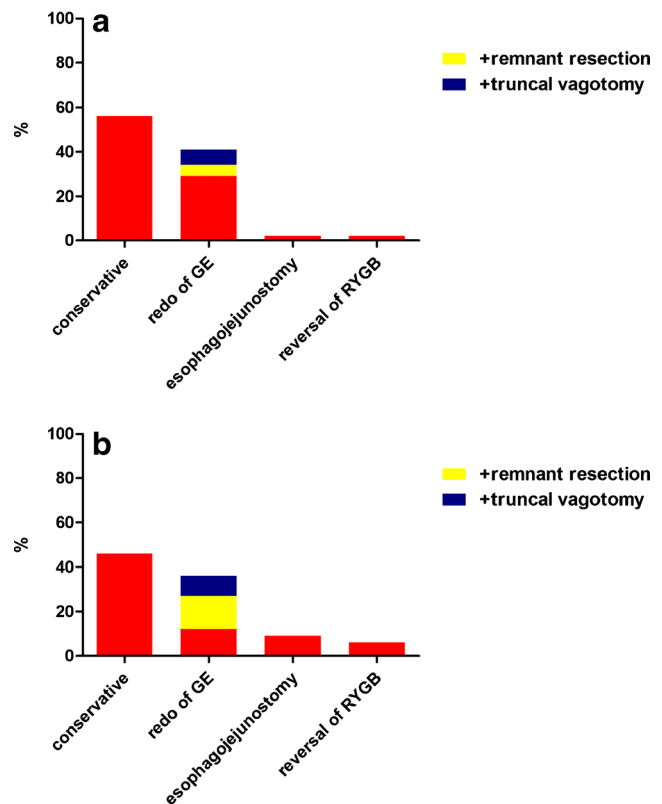
After AU healing, 52 % ( $n=99$ ) of all participants, who treated an ulcer conservatively, continue medical therapy for a median of 6 months (IQR 3–6) to prevent ulcer recurrence. Seventy-eight percent ( $n=77$ ) use PPI alone, while 19 % ( $n=19$ ) choose a combination of PPI and sucralfate. Again, H2 blockers alone or in combination with sucralfate are only rarely employed. The participating surgeons expected conservative treatment to be successful in 79 % of cases within 3 months (IQR 65–83 %).

#### Treatment for Refractory AU

Refractory AU was defined as persistence after initial conservative treatment. In case of refractory AU, 56 % ( $n=105$ ) of participants continue with the conservative approach and consider surgery only if complications such as perforation, bleeding, or obstruction occur. However, 41 % ( $n=77$ ) choose to resect and redo the gastrojejunostomy. Of the latter, 18 % ( $n=14$ ) add a truncal vagotomy, and another 13 % ( $n=10$ ) resect the gastric remnant. Esophagojejunostomy and RYGB reversal are only rarely performed (Fig. 2a). Of note, there is a strong correlation between surgical experience and choice of therapy. While 51 % ( $n=46$ ) of surgeons with more than 200 RYGB operations under their belt would treat refractory AU surgically, surgeons with less RYGB experience prefer a conservative approach (64 %,  $n=63$ ,  $p=0.041$ ).

#### Treatment for Recurrent AU After Surgical Therapy

Recurrent AU was defined as AU reoccurrence after surgical therapy. In case of recurrent AU, 46 % ( $n=87$ ) of all participants would choose a conservative treatment again, whereas 36 % ( $n=68$ ) would prefer resection and subsequent redo of the gastrojejunostomy. Of the latter, 41 % ( $n=28$ ) would add a truncal vagotomy and 25 % ( $n=17$ ) a gastric remnant resection. Another 9 % ( $n=17$ ) reported to carry out a gastric pouch and gastric remnant resection with subsequent esophagojejunostomy. The remaining 6 % ( $n=12$ ) would choose RYGB reversal (Fig. 2b).



**Fig. 2** Therapy in case of **a** refractory AU and **b** recurrent AU after surgical revision,  $n=189$

#### Discussion

The real incidence of AU after RYGB is still unclear. Most studies including large patient numbers do not provide useful insights regarding the occurrence of this specific complication [18, 19]. So far, up to 16 % of RYGB patients have been reported to develop an AU at their gastrojejunostomy [10, 14–16]. However, high level evidence and guidelines on prevention and management of AU do currently not exist. Using an international survey, this study sets out the common clinical practice of 189 bariatric surgeons, 81 % of which have performed more than 50 RYGB procedures. The heterogeneity of answers in this international survey among expert bariatric surgeons suggests that a consensus on the best treatment of refractory AU is missing.

According to the literature, 60 % of AUs develop within 6 months after RYGB. However, they can occur up to 5 years postoperatively [11, 20]. However, there was no agreement on the time of AU onset after RYGB among the participants of our survey: 25 % of participants reported AU to occur within the first three postoperative months, 50 % between 3 months and 1 year after surgery, and 25 % even after more than 1 year postoperatively.

Numerous mechanisms underlying the development of AU are currently discussed in the literature and can be divided into surgical and nonsurgical risk factors. Concerning surgical risk



factors, small-vessel ischemia and anastomotic tension are regarded as the most important causes [7]. Less relevant contributing factors are persistent acidity in a large gastric pouch [21] and the use of nonabsorbable sutures to reinforce a circularly stapled gastrojejunostomy [22, 23]. In contrast, the technique used to fashion the gastrojejunostomy (hand sewn vs. linear vs. circular) was not found to have an impact on AU development [24].

Among the nonsurgical risk factors, especially smoking as well as NSAID intake and *H. pylori* status are associated with an increased risk for AU and refractory ulcer occurrence [20, 25, 26]. Accordingly, the results of our survey corroborate the multifactorial etiology of AU as well as the variability of importance ascribed to the single factors by bariatric surgeons (Table 1).

While it may be difficult for physicians to influence smoking habits as well as joint pain due to arthritis, requiring NSAID use, *H. pylori* can be easily eradicated prior to surgery. Indeed, AU occurs more frequently in *H. pylori*-positive patients. However, it has been questioned whether preoperative *H. pylori* eradication can lower the risk for AU development since *H. pylori*-positive patients were found to have an increased AU risk even if eradication was performed. Damage to the mucosal barrier has been proposed as the underlying mechanism [6, 27]. Our survey indicated that, before surgery, the majority of bariatric surgeons routinely screen for *H. pylori* and consequently perform eradication when positive. This practice seems reasonable since *H. pylori* testing and eradication is simple, inexpensive, and effective [28]. Beyond that, *H. pylori* is a strong risk factor for peptic ulcer development irrespective of bariatric surgery. Therefore, the vast majority of bariatric surgeons prescribe antacids after RYGB either at prophylactic or therapeutic dosage. However, there is no consensus on the duration of such therapy.

In principal, AU after RYGB can be treated either conservatively or surgically. The published success rate of conservative therapy ranges between 68 and 88 % [7, 13, 14] which corresponds to the estimated success rate of 79 % in our survey. Accordingly, conservative treatment was the first choice of our participants in the case of AU diagnosis. Hereby, the majority of bariatric surgeons employ PPI as the first-line and single treatment (Fig. 1). Importantly, there was no consensus on the duration of therapy and whether therapy should be continued after AU resolution. Furthermore, the correct dosage and the need for combination of different acid-reducing agents remain unclear.

Refractory AU after RYGB represents a clinical and therapeutic challenge. Surgical options are various and include redoing of the gastrojejunostomy combined with pouch resizing. In a cohort study dating back to 1984, it was shown that redoing of the gastrojejunostomy was a successful treatment in up to 87 % of cases. However, in the same study, gastrogastic fistulas were identified as the underlying cause

of AUs in 72 % [7]. As gastrogastic fistulas are rare nowadays, the relevance of the reported high success rate is questionable. Other options are reduction of acid production by truncal vagotomy or gastric remnant resection, pouch resection with subsequent esophagojejunostomy, and RYGB reversal. The latter offers the possibility of building a new anastomosis in healthy, untouched, and well-vascularized tissue [29]. Although feasible, RYGB reversal has not been shown to be an effective AU treatment [30, 31].

Our survey revealed that two thirds of those surgeons with less than 200 procedures in their pocket opt for another conservative treatment in the case of refractory ulcer. In contrast, half of the bariatric surgeons with more than 200 procedures seem to prefer a surgical approach. Among those, most consider resection and redoing of the gastrojejunostomy as the procedure of choice. If surgical therapy fails and AU reoccurs, measures of the last resort are truncal vagotomy and gastric remnant resection. Our survey suggests a clear correlation between surgical experience and preferred therapy—the more experienced a bariatric surgeon, the more often he chooses a surgical approach to treat refractory AU. Whether an aggressive surgical strategy to treat refractory AU is more effective than a conservative approach is unclear and needs to be tested in future studies.

In conclusion, there is no consensus for the prevention and management of primary or refractory anastomotic ulcer, and no recommendations can be drawn from the available literature. Given the increasing numbers of bariatric procedures performed worldwide, multicenter prospective studies are desperately needed to define strategies to prevent and treat this painful and unresolved condition after RYGB.

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**Conflict of Interest** D. C. Steinemann, M. Bueter, M. Schiesser, I. Amygalos, P.-A. Clavien, and A. Nocito declare that they have no competing interests.

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