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RESEARCH ARTICLE

Incidence of Marginal Ulcer 1 Month and 1 to 2 Years After Gastric Bypass: A Prospective Consecutive Endoscopic Evaluation of 442 Patients with Morbid Obesity

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Abstract
Background Marginal ulcer (MU) is an occasional complication after gastric bypass. We studied the incidence of this complication by a prospective routine endoscopic evaluation.
Methods 441 morbidly obese patients were studied prospectively. There were 358 women and 97 men, with mean age 41 years and mean BMI 43 kg/m^2. An endoscopic evaluation was performed in all 1 month after surgery, which was repeated in 315 patients (71%) 17 months after surgery, independent of the presence or absence of symptoms. Patients were submitted either to laparotomic resectional gastric bypass (360 patients), employing a circularstapler-25 or to laparoscopic gastric bypass (81 patients), in whom a hand-sewn anastomosis was performed.
Results One month after surgery, 15 patients (4.1%) of the 360 laparotomic gastric bypass and 10 (12.3%) of the 81 laparoscopic gastric bypass presented an "early" marginal ulcer ($p<0.02$). Seven patients among the 25 with MU were asymptomatic (28%). Endoscopy was repeated 17 months after surgery. Among 290 patients with no early MU, one patient (0.3%) presented a "late" MU 13 months after surgery. From the 25 patients with "early" MU, one patient (4%) presented a "late" MU. All these patients were treated with PPIs.
Conclusion By performing prospective routine endoscopic study 1 month and 17 months after gastric bypass, two different behaviors were seen regarding the appearance MU: (a) "early" MU, 1 month after surgery in mean 6% and (b) "late" MU, in a very small proportion of patients (0.6%). Among patients with "early" MU, those who had undergone resectional gastric bypass showed significantly less ulcers compared to those patients in whom the excluded distal gastric segment had been left in situ. The operative method may play a significant role in the pathogenesis of MU after gastric bypass.

Keywords Marginal ulcer · Gastric bypass · Endoscopy · Morbid obesity

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Introduction

Marginal ulcer (MU), also called as anastomotic or jejunal ulcer, corresponds to a peptic ulcer at the jejunal mucosa near the site of the gastrojejunal anastomosis after partial gastrectomy for benign diseases. Its incidence has varied between 1% to 16% among patients who submitted to gastric bypass for morbid obesity [1–3]. Several factors have been advocated in order to explain the relatively high incidence of this complication. However, we believe that three main aspects have a strong influence on these variable incidences: (a) the majority of the studies are retrospective, (b) endoscopic studies have been performed only in selected symptomatic patients, therefore no information on what happens in the asymptomatic patients, and (c) these selected endoscopic studies have been performed usually several months later after surgery and therefore no information on what happens earlier after surgery. The purposes of the present prospective and consecutive study were (a) to perform routine endoscopic evaluation 1 month after gastric bypass and (b) to repeat this study 1 to 2 years after surgery, in order to determine the real incidence of MU in

Table 1 Incidence of marginal ulcer 1 month after gastric bypass determined by consecutive endoscopic examination (N=441)

Type Op.	*n*	Marginal ulcer
Resectional GBY (laparotomic)	360	15 (4.1%)
GBY (laparoscopic)	81	10 (12.3%)

GBY Gastric bypass
$p<0.02$

a consecutive group of patients with morbid obesity who submitted to gastric bypass.

Materials and Methods

Patients Studied

This is a prospective clinical trial, including all patients with morbid obesity operated on between August 2002 and August 2007, at the Department of Surgery, University Hospital. All the patients were operated on by one of the authors (AC). They were 358 women and 97 men with a mean age of 41.5 years (range 15–70). The mean body mass index was 43 kg/m^2 (range 33–64). All the patients gave their written consent to be included in this investigation, except 13 patients who refused to be submitted to endoscopy and were excluded from this study, having 442 patients for the present study.

Endoscopic Evaluation

After 12-h high fast, upper endoscopy was performed in all patients by the main author, employing an Olympus Video-endoscope. After a slight pharyngeal anesthesia and premedication with Midazolan and Buscapine, the endoscope was introduced through the mouth in a gentle way, avoiding the "pull and push" effect. The macroscopic aspect of the small gastric pouch, the size of the gastrojejunal anastomosis and the aspect of the jejunal mucosa were carefully evaluated. For the purpose of the present study, special care was taken to the aspect of the jejunal mucosa immediately distal to the anastomotic site.

This examination was performed in all patients 4 weeks after surgery (range 3 to 6), and it was repeated 1 to 2 years after surgery (mean 17 months).

Surgical Procedure

In all the patients, a gastric bypass was performed, creating a small gastric pouch of 15 to 20 ml. However, two different approaches were employed:

(a) In 360 patients, a laparotomic resectional gastric bypass was performed as described before [4]. Briefly, in this technique, the distal gastric segment was resected, not left in situ. The gastrojejunal anastomosis was created employing a circular stapler no. 25 (Covidien, USA), which creates an internal diameter of 15 mm.

(b) In 81 patients, a laparoscopic gastric bypass was performed, leaving the distal excluded gastric segment in situ. The gastrojejunal anastomosis was performed manually, employing, one-layer running suture of Vycril 3-0. The internal diameter of the anastomosis was checked by a 32 F bougie in order to avoid anastomotic strictures. In all the patients, at the end of the gastrojejunal anastomosis, the methylene blue test was performed. At the fourth day after surgery, in all the patients, a barium swallow was performed under fluoroscopic examination in order to detect leaks or other anastomotic complications.

Statistical Analysis

For statistical evaluation, the Fisher exact test and the chi-square test were employed, taking a $p<0.05$ as significative.

Results

One patient (0.2%) died 27 days after surgery due to septic complications. The incidence of marginal ulceration, 1 month after laparotomic or laparoscopic gastric bypass is shown in Table 1. From 25 patients with MU (5.6%), seven patients were asymptomatic (28%), while the main symptoms were epigastric pain (15 patients), vomits (six patients), and upper gastrointestinal hemorrhage in one patient. After resectional gastric bypass, there were 15 patients (4.1%) with a marginal ulcer, with a mean size of 11.3 mm ± 1.1 (range 10–12). After laparoscopic gastric bypass, there were ten patients (12.3%) with MU, which was significantly higher ($p<0.02$). The mean size of the ulcer was 14.5 ± 9.6 (range 5 to 35 mm). Two patients from the laparotomic group and one patient from the laparoscopic group had two ulcers. In four cases of the 15 laparotomic patients (27%) and in four of the ten laparoscopic patients (40%), a partial anastomotic stricture was associated. All these patients were treated with Omeprazol 20 mg daily for 6 months.

Table 2 shows the second endoscopic evaluation 1 or 2 years after surgery in 315 patients. The mean time of endoscopy for the laparotomic group was 18 months after surgery and for the laparoscopic group 14 months after surgery. In the laparotomic group, 240 patients were submitted to this endoscopic evaluation. Among 225 patients who had no MU 1 month after surgery, one male patient

Table 2 Endoscopic evaluation 12 or more months after gastric bypass (*N*=315)

Type operation	Marginal ulceration (after surgery)	
	1 month	1–2 years
Laparotomic resectional GBY (*N*=240)	a, No ulcer 225 b, Ulcer 15	1 MU (13 months) 0.4% No ulcer
Laparoscopic GBY (*N*=75)	a, No ulcer 65 b, Ulcer 10	No ulcer 9 No ulcer 1 recurrent ulcer 22 months

MU marginal ulcer, *GBY* gastric bypass

(0.4%) developed a MU of 10 mm diameter 13 months after surgery and was treated for 6 months with PPT'1; a third endoscopy performed 21 months after surgery showed normal appearance of gastrojejunal anastomosis, without ulcer or stricture. All 15 patients with MU 1 month after surgery showed normal endoscopic appearance of the gastric pouch and the gastrojejunal anastomosis. In the laparoscopic group, upper endoscopy was repeated in 75 patients. Among those without an ulcer 1 month after surgery, endoscopic evaluation was normal 14 months after surgery. From the ten patients with MU 1 month after surgery, this ulcer healed and disappeared in nine, while in one patient, whose second endoscopy 3 months after surgery was normal, developed an anastomotic ulcer 22 months after surgery, with a diameter of 10 mm. Biopsy samples, from the gastric pouch and jejunal mucosa informed normal fundic mucosa and nonspecific jejunitis. She is actually under PPI treatment. This means that from the entire group of 290 patients without MU, one case (0.3%) developed "late" MU, while among the 25 patients with "early" MU, one patient (4%) developed a "late" MU.

Discussion

The results of this prospective endoscopic study suggest that there are two different behaviors regarding the appearance of marginal ulcer after gastric bypass:

(a) A relative high incidence (between 4 to 12%) of MU 1 month after surgery.
(b) A very low incidence 1 or 2 years after surgery.

These findings suggest that there are probably different etiological factors in the pathogenesis of MU after gastric bypass. Previous publications have revealed different incidence of MU at different periods of time after surgery. These differences can be explained in part to the fact that the majority of the reports are retrospective studies and in part due to the fact that endoscopy was performed only in symptomatic patients and not as routine investigation. The only prospective publication is that of Dallal et al. [5] who followed 201 patients up to 19 months after surgery. Only symptomatic patients were evaluated and this is the typical problem in all these reports: They found seven patients with MU, which should correspond to 3.5% of the total group. However, these seven patients were found among only the symptomatic patients and therefore do not reflect the reality of the whole group. Many authors assume that all MU patients are symptomatic. However, this is not the truth and as Sapala [6] points out not all are symptomatic and do not undergo endoscopy. In our prospective study we found 28% of patients with MU who were asymptomatic. This was also reported by Gumbs et al. [7], who reported 16 symptomatic patients in whom endoscopy was performed. However, they also included in their study ten patients with pain, without endoscopic evaluation, assuming that they also had a MU.

The strength of the present investigation is double: (a) it is a prospective study, therefore avoiding the well known problems of retrospective analysis, and (b) it is a consecutive routine endoscopic evaluation, including all patients operated on a certain period of time. None of the previous studies have performed endoscopic studies 1 month after surgery. Even it has been suggested not to perform endoscopy before 1 month of surgery and proposed to employ gastrographin [6], which in our experience is a very weak contrast medium.

Which is the etiology of MU immediately after surgery? It is hard to believe that it is due to an excessive production of acid, when it occurs 3 to 4 weeks after surgery in a small gastric pouch, with very few parietal cell mass. However, the significant difference seen in the incidence of MU comparing resectional vs nonresectional gastric bypass suggests that this type of approach may have a most important role in the pathogenesis of MU after gastric bypass. We employ only absorbable sutures (Byosin and Vycril), and therefore the possibility of erosions or "stitch ulcers" as described by MacLean [8] does not exist. It is probable due to a combination of factors: use of electrocautery, some degree of isquemia, inflammatory reaction to the surgical suture, etc. It can be associated to the presence of partial anastomotic stricture, which is produced by the same inflammation reasons. Cappella et al. [9] also reported that the change from silk to absorbable sutures decreased dramatically the incidence of postoperative MU.

When this "early" MU is found by endoscopy, acid suppression therapy is employed because it is the only treatment that we can employ [3, 9, 10], although it is not related to excess of acid. This treatment should be employed at least 3 to 6 months. As can be seen in our study, from the original 25 patients with MU after gastric bypass, in 24 (96%), the endoscopic appearance of the

gastrojejunal anastomosis was entirely normal 1 to 2 years after surgery, and only one patient (4%) showed recurrence of anastomotic ulcer.

The second type of MU, denominated by us as "late" MU, occurs usually 1 year or more after surgery, and probably this is the ulcer to which the majority of authors refer to [2, 5–7, 9, 10]. In this situation, we believe that a higher rate of gastric acid output is the main responsible of the appearance of this MU [11, 12] as we saw many years ago among patients with duodenal ulcer submitted to partial or subtotal gastrectomy. This higher acid output as shown by Hedberg et al. [2] is mainly due to either a greater gastric pouch constructed when performing the gastric bypass or either to a dilatation of this gastric pouch, increasing in both situations the parietal cell mass. In our study, from 417 patients without "early" MU, endoscopy was repeated 1 or 2 years after surgery in 315 patients (76%), finding a true "late" MU in only one patient (0.3%), which is in accordance to the findings of Sapala et al. [6]. In this situation, a gastrinoma should be discarded, and patient should be put on PPI's therapy for a long period of time. These "late" MU can behave very aggressive, producing acute perforation or severe bleeding, situations which need emergency surgery [13, 14].

In conclusion, we performed a prospective and consecutive endoscopic evaluation in a group of 441 patients submitted either to laparotomic or laparoscopic gastric bypass and in whom in all an endoscopic procedure was performed 1 month after surgery and repeated in 76% of the patients 1 to 2 years after surgery. We found two types of marginal ulcers: (a) the "early" MU occurring 3 to 4 weeks after surgery, with a real incidence between 4% to 12% and (b) the "late" MU, occurring one or more years after surgery, with a very low incidence (less than 1%). The statistically significant incidence of early MU comparing resectional vs nonresectional gastric bypass could suggest a different pathogenic role of leaving or resecting the distal excluded gastric segment. Therefore, both MU may have different etiologies, but medical treatment is similar. This is the only prospective routinely endoscopic evaluation of a group of patients 1 month after surgery.

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