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Original article

Factors associated with complications or failure of endoscopic balloon dilation of anastomotic stricture secondary to Roux-en-Y gastric bypass surgery

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Abstract

Introduction: Roux-en-Y gastric bypass is a commonly used technique of bariatric surgery. One of the most important complications is gastrojejunal anastomotic stricture. Endoscopic balloon dilation appears to be well tolerated and effective, but well-designed randomized, controlled trials have not yet been conducted.

Objective: Identify factors associated with complications or failure of endoscopic balloon dilation of anastomotic stricture secondary to Roux-en-Y gastric bypass surgery.

Setting: Gastrointestinal endoscopy service, university hospital, Brazil.

Methods: The records of 64 patients with anastomotic stricture submitted to endoscopic dilation with hydrostatic balloon dilation were reviewed. Information was collected on gastric pouch length, anastomosis diameter before dilation, number of dilation sessions, balloon diameter at each session, anastomosis diameter after the last dilation session, presence of postsurgical complications, endoscopic complications, and outcome of dilation. Comparisons were made among postsurgical and endoscopic complications; number of dilations, balloon diameter; anastomosis diameter before dilation; and dilation outcome.

Results: Success of dilation treatment was 95%. Perforation was positively and significantly associated with the number of dilation sessions ($P = .03$). Highly significant associations were found between ischemic segment and perforation ($P < .001$) and between ischemic segment and bleeding ($P = .047$). Ischemic segment ($P = .02$) and fistula ($P = .032$) were also associated with dilation failure.

Conclusion: Ischemic segment and fistula were found to be important risk factors for balloon dilation failure. The greater the number of dilation sessions, the greater the number of endoscopic complications. (Surg Obes Relat Dis 2016;12:582–586.)

Keywords: Morbid obesity; Bariatric surgery; Endoscopy; Stenosis; Endoscopic dilation

Obesity is considered a major risk factor for the development of multiple co-morbidities [1]. Weight loss surgery is available for morbidly obese patients (body mass index [BMI] > 35 associated with co-morbidities, or >40

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regardless of co-morbidities) in whom weight loss and changes in gastrointestinal tract anatomy and gastrointestinal hormones would significantly improve conditions like hypertension and diabetes [2].

Roux-en-Y gastric bypass (RYGB) is a popular technique of bariatric surgery. Whether open or laparoscopic, the rate of RYGB-related complications has decreased considerably in recent years, but one of the most important complications, gastrojejunal anastomotic stricture (AS), can lead to significant postoperative problems such as dysphagia, nausea, pain, and the need for further, invasive endoscopic/surgical interventions. AS is multifactorial and of variable prevalence (1.6%–31%) [3–17]. Csendes et al. submitted bariatric surgery patients with and without dysphagia symptoms to esophagogastroduodenoscopy and found an incidence of AS of 25.4% [5]. According to certain pathophysiologic hypotheses, associations may exist among AS and gastrogastric fistula, large gastric pouch, use of nonsteroidal antiinflammatory drugs, presence of *Helicobacter pylori*, scar retraction, anastomotic technique, and ischemic segment [9,16–24].

AS is treated by dilating the stenotic area with a hydrostatic balloon or a thermoplastic Savary-Gilliard bougie. Endoscopic treatment appears to be well tolerated and effective, but well-designed randomized, controlled trials have not yet been conducted [3,5,9,11,16–23,25–30].

The complications of AS dilation are well documented and include bleeding and perforation. Moreover, some patients may need multiple additional dilation sessions and even surgical treatment [4,5,16,19,22,25,26,29–33]. Nevertheless, and despite great medical interest, factors associated with complications or failure of AS dilation have to our knowledge never been fully investigated. The objective of this study was to identify factors associated with complications or failure of endoscopic balloon dilation of anastomotic stricture secondary to Roux-en-Y gastric bypass surgery.

Materials and methods

In this retrospective study, we reviewed the records of 64 patients with AS secondary to RYGB surgery submitted to endoscopic dilation with a low-compliance hydrostatic balloon with controlled radial expansion (CRE Balloon Dilator, Boston Scientific Corporation, Marlborough, MA, USA). The patients were treated at the gastrointestinal endoscopy service of Hospital das Clínicas (School of Medicine, University of São Paulo/HCFMUSP) and at Hospital São Luiz (Unidade Morumbi/HSL-M) between January 2000 and December 2012.

All patients included in the study underwent laparoscopic RYGB. End-to-side anastomosis was performed with a 45-mm laparoscopic linear stapler (white cartridge, 2.5 mm staple height) followed by closing of the stapler orifice with manual running suture using monofilament synthetic absorbable (p-diaxanone) or nonabsorbable (polypropylene) thread. After surgery, all patients were discharged with prescription for proton pump inhibitors.

AS was defined as anastomosis with a diameter of ≤ 10 mm associated with symptoms (nausea, dysphagia, vomiting, or excessive weight loss). The diameter of the anastomosis was estimated by comparison with the size of the endoscopy tube (9.2 or 9.8 mm).

Information was collected on gender, age, use of gastric ring (silastic ring), length of gastric pouch (mm), anastomosis diameter before dilation (mm), number of dilation sessions, balloon diameter at each session, anastomosis diameter after the last dilation session, postsurgical complications (ring slippage, ring prolapse, ulcer, bleeding, fistula, axis deviation, ischemic segment and jejunojejunal AS), endoscopic complications (bleeding and perforation), and dilation outcome. Success of dilation was defined as resolution of symptoms. Failure of dilation was defined as the absence of any improvement in dysphagia symptoms or the impossibility of maintaining an adequate caliber of the anastomosis after 4 consecutive dilations. The occurrence of severe complications (e.g., perforation) preventing the continuation of endoscopic treatment was also considered treatment failure. Axis deviation was defined when a torsion or acute angle between the gastric pouch and jejunum was observed. Ischemic segment was any stricture longer than 2 cm in the jejunum.

Comparisons were made between postsurgical and endoscopic complications; all complications versus use of gastric ring, number of dilations, balloon diameter, pouch length, anastomosis diameter before dilation and dilation outcome.

All dilation procedures were performed by the same endoscopist. The dilation technique consisted of advancing the tip of the balloon dilation catheter through the working channel of the endoscope, centering the balloon in the stricture and inflating/deflating it 3 times during 1 minute each. Once the lumen had been dilated, the endoscope was advanced through the anastomosis to complete the evaluation and register complications, if any. The initial balloon size was chosen according to the size of the anastomosis. Dilation was then repeated weekly with progressive increase in balloon size until the resolution of symptoms and the achievement of an adequate anastomosis caliber. Balloon size ranged from 8 to 20 mm to maintain an anastomosis caliber between 12 and 15 mm. Larger balloons were used in patients who failed to achieve an adequate caliber after the first few dilations.

Statistical analysis

The statistical analysis was performed with the software R 3.0.2 (The R Foundation for Statistical Computing). Independent samples of quantitative variables were compared with the Mann-Whitney test, and multiple groups of quantitative variables were compared with the

Kruskal-Wallis test. Fisher's exact test was used to verify associations between 2 nominal qualitative variables when N was <20 in one of the groups. The level of statistical significance was set at 5% ($P < .05$). P values between .05 and .10 were considered a trend toward significance.

Results

The records of 64 patients (87% women) with AS were reviewed. The mean age was 39.8 years (±11.3). Among them 18.7% had some surgical complication associated with the AS. These complications included fistula (3.1%), axis deviation (9.3%), ischemic segment (4.6%), and jejunojejunal AS (1.5%). Gastric rings were observed in 20.3% of the patients. The presence of restriction rings was significantly related to the presence of surgical complications ($P = .01$).

Dilation was successful in 95%. The initial and final diameter of the anastomosis was 7.5 mm (±3.2) and 11.8 mm (±2.6). The diameter of the balloon used ranged from 8 to 20 mm (Table 1). Sixty-four patients (100%) had at least 1 dilation session, 25 (39%) had 2 sessions, 11 (17%) had 3 sessions, 4 (6.2%) had 4 sessions, 3 (4.6%) had 5 sessions, and 2 (3.1%) had 6 or more sessions.

Endoscopic complications included perforation (3.1%) and bleeding requiring endoscopic treatment (1.5%).

When comparing the presence of surgical complications with response to dilation treatment, the presence of fistula ($P = .032$) and the presence of ischemic segment ($P = .02$) were found to be significantly associated with dilation failure. With regard to endoscopic complications, fistula was not associated with bleeding but revealed a near-significant tendency toward perforation ($P = .062$). The presence of ischemic segment was associated with both perforation ($P = .001$) and bleeding ($P = .047$). On the other hand, neither gastric pouch length, nor axis deviation, jejunojejunal AS or the presence of a restriction ring was associated with dilation failure or endoscopic complications (Table 2).

A trend toward statistical significance ($P = .09$) was observed between small initial anastomosis diameter and endoscopic complications. The use of balloons with a diameter >15 mm (16–20 mm) was not associated with bleeding, but the association between larger balloon diameter and perforation displayed a trend toward significance ($P = .09$).

A significant and positive association was found between perforation and the number of dilation sessions ($P = .03$). Thus, on the average, patients with perforation had 8 sessions, whereas patients without perforation had only 1.6 ($P = .015$). As shown by the Spearman correlation coefficient (.36), the number of dilation sessions was significantly and positively associated with the number of endoscopic complications, regardless of their combination ($P = .003$).

Table 1
Anthropometric data and endoscopic findings of 64 patients submitted to hydrostatic balloon dilation for gastrojejunal anastomotic stricture secondary to Roux-en-Y gastric bypass surgery, São Paulo, Brazil, January 2000 and December 2012

	Mean	Standard deviation	Minimum	Maximum
Age	39.8	11.3	21	68
Gastric pouch lengh (mm)	33.7	11.2	10	70
Anastomosis diameter before dilation (mm)	7.5	3.2	1	10
Anastomosis diameter after the last dilation (mm)	11.8	2.6	5	20
Number of dilation sessions	1.8	1.7	1	13

Table 2
Endoscopic complications, postsurgical complications and dilation outcome in 64 patients submitted to hydrostatic balloon dilation for gastrojejunal anastomotic stricture, São Paulo, Brazil, January 2000 and December 2012

	Perforation P	Bleeding P	Dilation failure P
Number of sessions	.003	.003	
Balloon diameter	.09	ns	
Initial anastomosis diameter	.09	.09	ns
Pouch length	ns	ns	ns
Gastric ring	ns	ns	ns
Fistula	.062	ns	.032
Ischemic segment	.001	.047	.002
Axis deviation	ns	ns	ns
Jejunojejunal AS	ns	ns	ns

AS = anastomotic stricture; ns = not significant ($P > .1$).

Discussion

The safety profile and effectiveness of AS balloon dilation is well documented. However, complications do occur, mainly perforation, which deserves special attention because of its association with failure of dilation treatment and even death. Da Costa et al. [25] observed an incidence of perforation similar to that reported in the literature (0%–3%) and evaluated possible associations between perforation and the number of dilations, AS diameter, AS diameter after the last dilation session, gender, age, BMI, presence of ulcer, and postoperative time, but none were significant.

In our evaluation of dilation-related complications, smaller initial diameter of the anastomosis tended toward an association with endoscopic complications ($P = .09$) but did not reach statistical significance. Balloon diameter was not associated with bleeding, but the association between balloon diameter and perforation displayed a trend toward significance ($P = .09$). An association between complications and the number of dilation sessions was observed, which may be explained by the increasing invasiveness required at each dilation session [31–33]. The incidence of perforation was strongly associated with both ischemic

segment and fistula. Moreover, these 2 parameters were also significantly associated with one another and may constitute factors predictive of poor outcome of AS balloon dilation. The identification of such factors was the objective of the present study.

Yimcharoen et al. [22] classified AS into 3 types, one of which granulomatous and strongly linked with ischemic segment. This type of AS is associated with smoking, anastomotic tension, and marginal ulcers and leads to inflammation, delayed epithelialization, and fibrosis, greatly increasing the difficulty of AS balloon dilation. Such a mechanism of AS formation would explain the relation between failure of dilation and ischemic segment observed in our study. Likewise, the presence of inflammation and scarring increases the risk of bleeding, probably more so during the first 90 days after RYGB surgery because of neoangiogenesis.

Some of the patients in our series had small ulcers or fibrin in the anastomosis. Superficial ulcerations associated with AS were dilated. The presence of large and deep ulcerations increases the risk of perforation during dilation. In these patients, before endoscopic treatment was attempted, a nasojejunal tube was inserted and a double dose of proton pump inhibitors was administered for 2 weeks or longer. Two patients had fistula associated with anastomotic stricture. These patients were treated with laparoscopic drainage, antibiotics, and AS dilation to reduce the pressure on the pouch and facilitate healing of the fistula.

Other techniques, such as needle-knife electroincision of the anastomosis (which carries an increased risk of perforation) and postdilation steroid injection, have been used with some success in patients with endoscopic dilation failure to avoid reoperation [34,35]. In our series, 2 patients were treated with 40 mg triamcinolone acetonide per session for 4 weeks without improvement. Another option for these patients is the use of endoluminal stents. Although temporary placement of a fully covered stent in selected patients with refractory strictures may be successful at achieving immediate stoma patency, a high rate of stent migration ($>50\%$) and stricture recurrence has been observed [34,36,37].

The small size of the sample was a limitation in some of our analyses, such as when evaluating the association between balloon diameter and perforation, which merely displayed a trend toward significance. The diameter of the anastomosis was estimated comparing the size of the endoscopy tube with the anastomosis, making measurements less accurate. Another limitation was the variation in the time from surgery to balloon dilation. According to Yimcharoen et al., AS treatment >90 days after surgery is associated with higher rates of dilation failure [22].

Based on our findings, it may be concluded that ischemic segment and fistula are important risk factors for AS balloon dilation failure and the incidence of perforation is strongly associated with this 2 parameters. The greater the number of dilation sessions, the greater the number of endoscopic complications.

Disclosures

None of the authors has conflicts of interest or financial ties to disclose.

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