

## Stenosis in gastric bypass: Endoscopic management

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### Abstract

Gastric bypass is a treatment option for morbid obesity. Stenosis of the gastrojejunal anastomosis is a recognized complication. The pathophysiological mechanisms involved in the formation of stenosis are not well known. Gastrojejunal strictures can be classified based on time of onset, mechanism of formation, and endoscopic aspect. Diagnosis is usually obtained by endoscopy. The two main treatment alternatives for stomal stricture are: endoscopic dilatation (balloon or bouginage) and surgical revision (open or laparoscopic). Both techniques of dilation [through-the-scope (TTS) balloon dilators, Bougienage dilators] are considered safe, effective, and do not require hospitalization. The optimal technique for dilation of stomal strictures remains to be determined, but many authors prefer the use of TTS balloon catheters. Most patients can be successfully treated with 1 or 2 sessions. The need for reconstructive surgery of a stomal stricture is extremely rare.

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**Key words:** Gastric bypass; Gastrojejunal anastomosis; Balloon dilation; Stricture; Endoscopic dilation; Bougienage dilation; Stenosis of the anastomosis; Obesity

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### INTRODUCTION

Obesity has become one of the main health problems in industrialized countries. This XXI century pandemic has important consequences: an increased risk of suffering from cardiovascular disease, diabetes, hypertension, dyslipidemia, gastroesophageal reflux disease, certain cancers, as well as an increased mortality<sup>[1]</sup>. Roux-en-Y gastric bypass (RYGBP) is currently one of the most common surgical procedures for the treatment of morbid obesity [defined as a body mass index (BMI)  $\geq 40$  kg/m<sup>2</sup>]<sup>[2-7]</sup>. The success of this procedure's restrictive component requires the construction of a small gastric pouch and a small gastrojejunostomy (GJ). Over the past years, laparoscopic bypass has undergone great development. This route offers clear advantages compared to open surgery, such as: less blood loss during surgery, less postoperative pain, a lower incidence of wound infections, a shorter hospital stay and a shorter period of recovery<sup>[1]</sup>. Stenosis of the GJ occurs in approximately 3%-27% after gastric bypass, and must be suspected when the patient experiences dysphagia (initially with solids and subsequently with liquids), nausea and vomiting<sup>[1,22]</sup>. The methods for treating anastomotic stricture range from surgery to various forms of endoscopic therapy. Endoscopic dilation (ED) by means of a balloon or bougie is considered the treatment of choice<sup>[1,4,6,8,9,11-20,22-30]</sup>. ED is safe, effective and reduces the need for revision surgery<sup>[11]</sup>.

### ETIOLOGY

The etiology of this complication is multifactorial. The

pathophysiological mechanisms involved in the formation of stenosis are not well known, although situations such as stomal ulcer, reflux, ischemia of the suture, retraction of the scar, or an inadequate technique, may contribute to its appearance<sup>[2,9]</sup>. Several technical features associated with the surgical procedure have been considered risk factors for the development of gastrojejunostomy strictures. These include the size of circular staple anastomoses<sup>[12,31]</sup>, the retrocolic or antecolic positioning of the Roux limb, or the initial size of the anastomosis<sup>[21]</sup>. The method of constructing the gastrojejunal anastomosis seems to have an impact, as it seems that circular staples are more implicated than either linear staples or a completely hand-sewn anastomosis<sup>[8,29,32,33]</sup>. The route of the Roux limb (antecolic *vs* retrocolic) does not appear to affect the rate of this complication<sup>[32,33]</sup>. Nguyen showed that this complication is more common after laparoscopic RYGBP than after open RYGBP<sup>[10]</sup>. It has been proposed that the precarious blood supply to the pouch or the development of a subclinical leak at the level of the gastrojejunostomy are the reasons that best explain the formation of stricture after laparoscopic RYGBP<sup>[8,30]</sup>. Intraoperative endoscopy or the infusion of methylene blue into the gastric pouch *via* a nasogastric tube to assess the integrity of the gastrojejunal anastomosis, reduces the likelihood of postoperative leaks, which complicate approximately 1.4% to 2% of RYGBP<sup>[11]</sup>. Gastro-gastric fistula can result in recurrent anastomotic strictures due to the large amount of acid that flows from the gastric remnant into the pouch, which results in marginal ulceration followed by stenosis<sup>[34,35]</sup>. An important factor that should be taken into consideration when analyzing the etiology of this complication is the anatomy and mechanism of RYGBP as a weight-loss procedure (it causes gastric restriction and prevents dumping syndrome). To date, there has been no consensus on the ideal size of the gastrojejunal anastomosis. Most surgeons will agree that 15 mm is a reasonable diameter that will prevent the formation of early strictures as well as dumping syndrome, while creating restriction<sup>[15]</sup>.

## CLASSIFICATION

Gastrojejunal strictures can be classified based on time of onset (acute or late), mechanism of formation (membranous, cicatricial, granulomatous), and endoscopic aspect (grade 1 to 4)<sup>[7,15,21]</sup>.

### Time of onset

Acute strictures are rare and appear in the immediate postoperative period. The reason behind acute strictures is a technical error in judgment. Late strictures are the most common form and are seen, on average, 52 d postoperatively, when patients transition from soft to solid food<sup>[8,12,29]</sup>.

### Mechanism of formation

Membranous strictures occur after a period of pro-

longed fasting. These are easily treated by endoscopic balloon dilatation; cicatricial strictures are a direct consequence of erosion by a foreign body, ulceration, and anastomotic leaks. These are characterized by intense fibrosis and respond unpredictably to endoscopic balloon dilatation. Surgical revision is not uncommon. The pathogenesis of granular strictures is not completely understood. It has been suggested that granular strictures occur from either a lack of mucosa-to-mucosa apposition (edges separated by two thicknesses of bowel wall), which would cause the raw edges to heal by secondary intention, or from tissue necrosis beyond the staple line with subsequent inflammation, delayed epithelization, and fibrosis. This type of stenosis was seen in anastomoses with ischemia due to tension<sup>[12,15,21]</sup>.

### Endoscopic aspect

Post-gastric bypass gastrojejunostomy strictures can be graded endoscopically and classified into four groups<sup>[7]</sup>: grade I: Mild stenosis, which will allow a 10.5-mm endoscope to pass; grade II: Moderate stenosis, which will accommodate an 8.5 mm pediatric endoscope; grade III: Severe stenosis, through which a guide-wire can be passed; grade IV: Complete/near-complete obstruction, which is nontraversable.

## DIAGNOSIS

In order to arrive to a correct diagnosis, it is crucial to have a clinical suspicion of anastomotic stricture. Strictures can be suspected by symptoms of dysphagia, nausea, vomiting, and abdominal pain. Diagnosis is usually obtained by endoscopy, which also allows to rule out other causes of pain, nausea or vomiting. It can also be diagnosed by radiological studies with Gastrografin, especially if leakage is suspected<sup>[1,7,11,15,29]</sup>.

### Time to stricture

The mean time to diagnosis of GJ stenosis from surgery to the initial endoscopy is variable. However, most patients with anastomotic strictures were diagnosed within 3 mo from the surgery<sup>[1,6-9,12-14,17,19,21-23,28-30]</sup>.

### Criteria for diagnosing stenosis of the gastrojejunal anastomosis

Stomal stricture is usually defined by a resistance or inability to pass a standard gastroscope through the gastrojejunal anastomosis, suggesting a luminal size of < 10 mm. The outer diameter of the endoscope used in different studies ranges between 8.5 mm and 9.6 mm<sup>[1,5,6,8,9,12,14,17,19,28-30]</sup>.

## TREATMENT OPTIONS

The two main treatment alternatives for stomal stricture are: endoscopic dilatation and surgical revision (open or laparoscopic).

### Dilatation

**TTS balloon dilators:** There are several options for

dilating a stenotic gastrojejunal anastomosis. The optimal technique for dilation of stomal strictures is yet to be determined; however many authors prefer the use of through-the-scope (TTS) balloon catheters and dilating them to at least 15 mm in the first session to decrease the chance of recurrence<sup>[11]</sup>. After having followed this protocol, most patients require only one or two dilations<sup>[1,5,6,8,9,12,17-19,21,22,28,29]</sup>. TTS balloon dilators provide radial dilation and gradual expansion, thus preventing excessive pain and minimizing the likelihood of perforation. The balloons may be inflated with water, saline solution, or water-soluble contrast medium. The inflation device, which attaches to the balloon catheter hub, contains a pressure gauge in order to ensure proper balloon inflation. Fluoroscopy is not required for positioning the balloon, but should be used liberally in difficult cases<sup>[22]</sup>. The patient is positioned in the left lateral position and conscious sedation is applied. The anastomotic stricture is visualized, and the deflated balloon is inserted through the working channel of the endoscope and past the stricture under direct visualization. The deflated balloon should be positioned so that the anastomotic stricture is aligned with the balloon's midpoint. Given that the optimal diameter of the gastric outlet is of about 12 mm, the 12-15 mm balloon is ideal. While monitoring for signs of patient discomfort, the balloon is gradually inflated. The position and inflation of the balloon are monitored by direct endoscopic visualization. The position of the balloon is maintained for 1 min after complete inflation to ensure adequate dilatation of the stricture. Once the dilatation is complete, the patient is discharged home and dietary instructions are given.

**Bougienage dilators:** The efficacy of Bougie dilations (Savary-Gilliard, Eder-Puestow) in the treatment of stomal strictures after bariatric surgery is very limited<sup>[7,14,20,27,30]</sup>. Dilation with Savary-Gilliard bougies is a popular method for treating esophageal strictures. Savary-Gilliard dilators (Wilson-Cook Medical Inc, Winston-Salem, NC) are tapered dilators made of polyvinyl chloride. They are relatively rigid and possess a hollow central channel, which allows for insertion over a guide-wire. Savary dilators are available in 1 mm (or 3-French) increments from 5 mm in diameter to 20 mm (15 to 60 French). The procedure is usually performed in an outpatient endoscopy-suite, using a combination of narcotic analgesic and sedative hypnotic agents to produce conscious sedation. The patient is placed in the left lateral decubitus position on a fluoroscopy-table. A diagnostic upper endoscopy is performed, and the approximate size of anastomotic stricture is determined. A Savary guide-wire is inserted through the working channel of the endoscope and passed through the stricture under endoscopic visualization. The position of the guide wire is usually confirmed by fluoroscopy. The endoscope is removed while an assistant holds the wire in place. Serial fluoroscopic spot images are taken to verify that the guide wire does not migrate during the removal of the

endoscope or during the transfer of the dilators. The initial size of the dilator should be slightly smaller than the diameter of the stricture. An assistant is necessary to control the long guide wire and transfer dilators to the endoscopist during the procedure. Insertion and removal of the first dilator should be visualized fluoroscopically. Incrementally larger dilators are passed serially until moderate resistance is met. Once resistance is encountered, no more than three consecutive dilators should be passed ("rule of threes"). Additionally, the procedure should be terminated soon after traces of blood are visualized on the tip of the dilator. Dilatation to at least 12 mm (36 French) is optimal. A repeat endoscopy is advised so as to visualize the newly dilated segment and to exclude the presence of active bleeding. The patient is then allowed to recover from conscious sedation and discharged home on a clear liquid diet. Once tolerated, a soft diet is recommended for 24 h to 48 h after the procedure, after which the standard post-gastric bypass diet is encouraged.

### **Radioscopic monitoring**

An important aspect to consider is when the fluoroscopic monitoring during dilation is needed. Published studies are not clear when it comes to describing this aspect. The minority of them clearly manifest not using fluoroscopy during dilation<sup>[5,8,22,27,29]</sup>, others claim to have used it in all or in one of their patients<sup>[9,10,12,14,18,24,25,28]</sup>, and finally, others do not make any sort of comment in this regard in their publications<sup>[1,4,6,7,13,17,19,21,30]</sup>. Our experience demonstrates that carrying out dilations in patients with stenosis of the gastric bypass anastomosis is possible without fluoroscopic guidance, allowing to carry out the technique in the simplest manner, in the same endoscopy room, without radiation for the patient or for the medical staff, and probably for a shorter duration<sup>[22]</sup>.

### **Advantages and disadvantages of endoscopic treatment**

Both techniques (TTS balloon dilators, Bougienage dilators) are safe and do not require hospitalization. Advantages of balloon dilatation include the fact that fluoroscopy is often not required and the stricture is dilated under direct endoscopic visualization. Balloon dilatation also takes less time than guide-wire techniques. Additionally, balloon dilatation allows the ability to dilate the stoma while performing the diagnostic endoscopy<sup>[27]</sup>. Savary dilatation requires multiple bougie passages to dilate a strictured segment, which may contribute to an increased awareness and pain during the procedure. Even so, it is important to be familiar with both techniques, because balloon dilatation may not be technically possible in patients with very tight strictures<sup>[28]</sup>. The possibility of reusing the Savary-Gilliard dilator also allows for a lower cost than that of balloon dilatation<sup>[14,30]</sup>.

### **Endoscopic alternatives**

Endoscopic diathermia incision has also been used as anecdotal treatment of stomal stenosis<sup>[1,23,36,37]</sup>. The en-

**Table 1** Dilatation treatment of gastrojejunal strictures after gastric bypass-clinical data of reported series

Author	n	Stricture rate (%)	Time to stricture	Dilatation method	Strategy	No. of Sessions	Success rate (%)	Complications	Follow-up
Rossi <sup>[18]</sup>	38	17	NR	TTS balloon	Stoma no larger than 15 mm	1: 47.3% 2: 47.3% 3: 5.2%	100	No	12 m
Goitein <sup>[7]</sup>	19	5.1	45 d	TTS balloon Savary (10/19)	Initial: 8-18 mm	1: 22% 2: 39% ≥ 3: 35%	100	1 microperforation 1.60%	21 m
Barba <sup>[12]</sup>	24	11	< 3 mo	TTS balloon	Minimum: 15 mm	1: 67% 2: 30% 3: 3%	100	No	> 6 m
Ahmad <sup>[8]</sup>	14	3.1	2.7 mo	TTS balloon	Minimum: 15 mm	1: 64% 2: 29% 3: 7%	100	No	18 m
Escalona <sup>[30]</sup>	53	6.9	51 d	Savary	Up to 11 mm	1: 75.5% 2: 16.9% 3: 5.7% 4: 1.9%	100	1 microperforation 1.90%	NR
Go <sup>[29]</sup>	38	6.8	7.7 wk	TTS balloon	Initial: 12-15 mm	1-2: 71% ≥ 3: 29%	95	1 pneumothorax + pneumomediastinum (3%)	1 m
Peifer <sup>[9]</sup>	43	5.4	50 d	TTS balloon	Up to 15 mm	1: 79% 2: 13.9% ≥ 3: 6.9%	93	No	1 y
Lee <sup>[11]</sup>	40	3.7	1855 d	TTS balloon	Stoma > 11 mm < 15-18 mm	1: 42.5% 2: 17.5% 3: 27.5% >3: 12.5%	100	No	6 m
Kretzschmar <sup>[23]</sup>	13	3	2.5 mo	Fogarty Grüntzig balloon	Stoma ≥ 12	1: 86.3%	77	No	3.7 y
Bell <sup>[28]</sup>	3	11	10 wk	TTS balloon Savary	Stoma ≥ 12	1: 33.3% ≥ 2: 66.6%	100	No	12 m
F-Esparrach <sup>[14]</sup>	24	6	69 d	Savary	Final diameter: 12.8 mm	1: 45.8% 2: 50% 3: 4.1%	100	No	343 d
Matthews <sup>[21]</sup>	13	27	< 3 mo	TTS balloon	NR	1: 53.8% 2-4: 46.1%	100	No	12 m
Da Costa <sup>[19]</sup>	105	7.8	3 mo	TTS balloon	NR	1: 57.1% 2: 27.6% ≥ 3: 15.2%	100	Perforation 1.8%	NR
Campillo <sup>[13]</sup>	5	8.1	< 3 mo	TTS balloon	Maximum: 15 mm	1: 60% 2: 40%	100	No	24 m
Ukleja <sup>[17]</sup>	61	6	2 mo	TTS balloon	Ranged from 6 to 18 mm	1: 28% 2: 33% 3: 26% > 3: 13.1%	100	Perforation 2.2%	NR
Alasfar <sup>[5]</sup>	29	23	Median: 52 d	TTS balloon	12 mm	1: 86% 2: 3.5% 3: 10.5%	100	No	NR
Mathew <sup>[6]</sup>	58	6.5	66.2 d	TTS balloon	Stoma no larger than 12 mm	1: 40% 2: 31% 3: 16% > 3: 10%	97	Perforation 3.2%	NR
Espinel <sup>[22]</sup>	22	4.1	126 d	TTS balloon	Initial: 12-15 mm	1: 68.1% 2: 27.2% ≥ 3: 4.5%	100	1 microperforation (4.5%)	27 m

NR: Not reported; TTS: Through-the-scope.

doscopic incision was performed by placing the papillotome deep within the stoma and directing the cutting

wire against the staple line. An alternate cutting and coagulating current was applied in repeated, short (1-3 s)

bursts until the desired diameter was reached. However, cannulation of the narrowed stoma with the papillotome can be difficult and hazardous in the hands of inexperienced endoscopists.

### Surgical revision

The need for reconstructive surgery of a stomal stricture is extremely rare (0.4%)<sup>[15]</sup>. This therapeutic option is generally used when no improvement is achieved after four consecutive endoscopic dilations. In most cases surgical revisions are performed laparoscopically. Laparoscopic revision of a strictured anastomosis is a technically challenging procedure that is expensive and carries a significant morbidity.

## GOAL OF THE TREATMENT

The endpoint for gastrojejunal anastomotic stricture dilatation is yet to be established. While the immediate goal is to provide symptomatic relief, a narrow stomal outlet must be maintained so that long-term weight loss is achieved. In a 1996 survey of the American Society for Bariatric Surgery, members generally agreed on a gastrojejunal anastomotic diameter of 12 mm<sup>[38]</sup>. For Lee *et al*<sup>[1]</sup> the goal of dilation was to obtain a stoma > 11 mm in diameter, but not excessively large (they do not recommend to dilate the stoma above 15-18 mm), in order to maintain the restrictive integrity of the bypass surgery to ensure continued weight loss and to minimize the risk of major complications. Barba *et al*<sup>[12]</sup> dilate to get at least a size of 15 mm in order to reduce the possibility of symptomatic recurrence.

## RESULTS

The results of the various series are shown in Table 1. Stenosis of the GJ occurs in approximately 3%-27% after gastric bypass. Most patients with anastomotic strictures were diagnosed within 3 mo of surgery. ED by means of a balloon or bougie is considered the treatment of choice. Both techniques (TTS balloon dilators, Bougienage dilators) are safe and do not require hospitalization. The optimal technique for dilation of stomal strictures remains to be determined, but many authors prefer the use of TTS balloon catheters. The dilation strategy is variable among different authors, although the goal of treatment is similar: dilating them to at least 15 mm to decrease the chance of recurrence. The success rate ranges from 77%-100%, and in the majority, it is achieved in the first or second session. Complications are rare. Cases of perforation are generally managed conservatively without surgical revision.

## CONCLUSION

Stomal stenosis (gastrojejunal anastomotic stricture) occurs in approximately 3% to 12% of patients after RYGB and should be suspected when patients pres-

ent with dysphagia, nausea, and vomiting. Endoscopic dilation of stomal stenosis *via* through-the-scope balloon dilation or wire-guided bougie dilation is safe and highly effective, and should be considered the primary treatment for this complication. Most patients can be successfully treated with 1 or 2 sessions, and surgical revision is rarely necessary. Overaggressive dilation should be avoided in order to reduce the risk of perforation and avoid dumping symptoms.

## REFERENCES

- 1 Lee JK, Van Dam J, Morton JM, Curet M, Banerjee S. Endoscopy is accurate, safe, and effective in the assessment and management of complications following gastric bypass surgery. *Am J Gastroenterol* 2009; **104**: 575-82; quiz 583
- 2 de-la-Cruz-Vigo F, de-la-Cruz-Vigo JL. Stenosis in gastric bypass for morbid obesity. *Rev Esp Enferm Dig* 2010; **102**: 151-158
- 3 Sanyal AJ, Sugeran HJ, Kellum JM, Engle KM, Wolfe L. Stomal complications of gastric bypass: incidence and outcome of therapy. *Am J Gastroenterol* 1992; **87**: 1165-1169
- 4 Podnos YD, Jimenez JC, Wilson SE, Stevens CM, Nguyen NT. Complications after laparoscopic gastric bypass: a review of 3464 cases. *Arch Surg* 2003; **138**: 957-961
- 5 Alasfar F, Sabnis AA, Liu RC, Chand B. Stricture rate after laparoscopic Roux-en-Y Gastric bypass with a 21-mm circular stapler: the Cleveland Clinic experience. *Med Princ Pract* 2009; **18**: 364-367
- 6 Mathew A, Veluona MA, DePalma FJ, Cooney RN. Gastrojejunal stricture after gastric bypass and efficacy of endoscopic intervention. *Dig Dis Sci* 2009; **54**: 1971-1978
- 7 Goitein D, Pappasavvas PK, Gagné D, Ahmad S, Caushaj PF. Gastrojejunal strictures following laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Surg Endosc* 2005; **19**: 628-632
- 8 Ahmad J, Martin J, Ikramuddin S, Schauer P, Slivka A. Endoscopic balloon dilation of gastroenteric anastomotic stricture after laparoscopic gastric bypass. *Endoscopy* 2003; **35**: 725-728
- 9 Peifer KJ, Shiels AJ, Azar R, Rivera RE, Eagon JC, Jonnalagadda S. Successful endoscopic management of gastrojejunal anastomotic strictures after Roux-en-Y gastric bypass. *Gastrointest Endosc* 2007; **66**: 248-252
- 10 Nguyen NT, Stevens CM, Wolfe BM. Incidence and outcome of anastomotic stricture after laparoscopic gastric bypass. *J Gastrointest Surg* 2003; **7**: 997-1003; discussion 1003
- 11 Huang CS. The role of the endoscopist in a multidisciplinary obesity center. *Gastrointest Endosc* 2009; **70**: 763-767
- 12 Barba CA, Butensky MS, Lorenzo M, Newman R. Endoscopic dilation of gastroesophageal anastomosis stricture after gastric bypass. *Surg Endosc* 2003; **17**: 416-420
- 13 Campillo-Soto A, Torralba-Martínez JA, Martín-Lorenzo JG, Lirón-Ruiz R, Bento-Gerard M, Pérez-Cuadrado E, Aguayo-Albasini JL. Gastrojejunal anastomosis stricture after laparoscopic gastric bypass. Our experience with 62 patients. *Rev Esp Enferm Dig* 2010; **102**: 187-192
- 14 Fernández-Esparrach G, Bordas JM, Llach J, Lacy A, Delgado S, Vidal J, Cárdenas A, Pellisé M, Ginès A, Sendino O, Zabalza M, Castells A. Endoscopic dilation with Savary-Gilliard bougies of stomal strictures after laparoscopic gastric bypass in morbidly obese patients. *Obes Surg* 2008; **18**: 155-161
- 15 Rosenthal RJ. Dilating the stenotic gastrojejunostomy after laparoscopic Roux-en-Y gastric bypass for morbid obesity: when things go wrong. *J Gastrointest Surg* 2009; **13**: 1561-1563
- 16 Caro L, Sánchez C, Rodríguez P, Bosch J. Endoscopic bal-

- loon dilation of anastomotic strictures occurring after laparoscopic gastric bypass for morbid obesity. *Dig Dis* 2008; **26**: 314-317
- 17 **Ukleja A**, Afonso BB, Pimentel R, Szomstein S, Rosenthal R. Outcome of endoscopic balloon dilation of strictures after laparoscopic gastric bypass. *Surg Endosc* 2008; **22**: 1746-1750
  - 18 **Rossi TR**, Dynda DI, Estes NC, Marshall JS. Stricture dilation after laparoscopic Roux-en-Y gastric bypass. *Am J Surg* 2005; **189**: 357-360
  - 19 **Da Costa M**, Mata A, Espinós J, Vila V, Roca JM, Turró J, Ballesta C. Endoscopic dilation of gastrojejunal anastomotic strictures after laparoscopic gastric bypass. Predictors of initial failure. *Obes Surg* 2011; **21**: 36-41
  - 20 **Sataloff DM**, Lieber CP, Seinige UL. Strictures following gastric stapling for morbid obesity. Results of endoscopic dilatation. *Am Surg* 1990; **56**: 167-174
  - 21 **Matthews BD**, Sing RF, DeLegge MH, Ponsky JL, Heniford BT. Initial results with a stapled gastrojejunostomy for the laparoscopic isolated roux-en-Y gastric bypass. *Am J Surg* 2000; **179**: 476-481
  - 22 **Espinel J**, De-la-Cruz JL, Pinedo E, Canga J, De-la-Cruz F. Stenosis in laparoscopic gastric bypass: management by endoscopic dilation without fluoroscopic guidance. *Rev Esp Enferm Dig* 2011; **103**: 508-510
  - 23 **Kretzschmar CS**, Hamilton JW, Wissler DW, Yale CE, Morrissey JF. Balloon dilation for the treatment of stomal stenosis complicating gastric surgery for morbid obesity. *Surgery* 1987; **102**: 443-446
  - 24 **Lineaweaver W**, Ryckman F, Hawkins I, Robertson J, Woodward ER. Endoscopic balloon dilation of outlet stenosis after gastric bypass. *Am Surg* 1985; **51**: 194-196
  - 25 **Rajdeo H**, Bhuta K, Ackerman NB. Endoscopic management of gastric outlet obstruction following surgery for morbid obesity. *Am Surg* 1989; **55**: 724-727
  - 26 **Al-Halees ZY**, Freeman JB, Burchett H, Brazeau-Gravelle P. Nonoperative management of stomal stenosis after gastroplasty for morbid obesity. *Surg Gynecol Obstet* 1986; **162**: 349-354
  - 27 **Wolper JC**, Messmer JM, Turner MA, Sugerma HJ. Endoscopic dilation of late stomal stenosis. Its use following gastric surgery for morbid obesity. *Arch Surg* 1984; **119**: 836-837
  - 28 **Bell RL**, Reinhardt KE, Flowers JL. Surgeon-performed endoscopic dilatation of symptomatic gastrojejunal anastomotic strictures following laparoscopic Roux-en-Y gastric bypass. *Obes Surg* 2003; **13**: 728-733
  - 29 **Go MR**, Muscarella P, Needleman BJ, Cook CH, Melvin WS. Endoscopic management of stomal stenosis after Roux-en-Y gastric bypass. *Surg Endosc* 2004; **18**: 56-59
  - 30 **Escalona A**, Devaud N, Boza C, Pérez G, Fernández J, Ibáñez L, Guzmán S. Gastrojejunal anastomotic stricture after Roux-en-Y gastric bypass: ambulatory management with the Savary-Gilliard dilator. *Surg Endosc* 2007; **21**: 765-768
  - 31 **Perugini RA**, Mason R, Czerniach DR, Novitsky YW, Baker S, Litwin DE, Kelly JJ. Predictors of complication and suboptimal weight loss after laparoscopic Roux-en-Y gastric bypass: a series of 188 patients. *Arch Surg* 2003; **138**: 541-55; discussion 541-55;
  - 32 **Higa KD**, Boone KB, Ho T. Complications of the laparoscopic Roux-en-Y gastric bypass: 1,040 patients--what have we learned? *Obes Surg* 2000; **10**: 509-513
  - 33 **Schauer PR**, Ikramuddin S, Gourash W, Ramanathan R, Luketich J. Outcomes after laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Ann Surg* 2000; **232**: 515-529
  - 34 **Abdel-Galil E**, Sabry AA. Laparoscopic Roux-en-Y gastric bypass--evaluation of three different techniques. *Obes Surg* 2002; **12**: 639-642
  - 35 **Schwartz ML**, Drew RL, Roiger RW, Ketover SR, Chazin-Caldie M. Stenosis of the gastroenterostomy after laparoscopic gastric bypass. *Obes Surg* 2004; **14**: 484-491
  - 36 **Frøyen J**, Rosseland AR, Helsing N. Endoscopic diathermy incision in the treatment of stoma obstruction after gastroplasty for obesity. *Endoscopy* 1985; **17**: 91-93
  - 37 **Goff JS**. The nonoperative widening of obstructed gastroplasties with a papillotome. *Gastrointest Endosc* 1984; **30**: 32-34
  - 38 **Talieh J**, Kirgan D, Fisher BL. Gastric bypass for morbid obesity: a standard surgical technique by consensus. *Obes Surg* 1997; **7**: 198-202

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