Obesity Surgery (2019) 29:3765–3768
https://doi.org/10.1007/s11695-019-03990-6

BRIEF COMMUNICATION

Ligamentum Teres Cardiopexy as a Late Alternative for Gastroesophageal Reflux Disease in a Patient with Previous Reversal of Gastric Bypass to Sleeve Gastrectomy and Hiatal Hernia Repair

Ramon Vilallonga[1] · Sergi Sanchez-Cordero[2] · Piero Alberti[3] · Ruth Blanco-Colino[3] · Amador Garcia Ruiz de Gordejuela[1] · Enric Caubet[1] · Oscar Gonzalez[1] · Renato Roriz-Silva[4] · Manel Armengol[3] · José Manuel Fort[1]

Published online: 7 June 2019

Abstract

An important percentage of the patient, undergoing primary or revisional bariatric surgery after sleeve gastrectomy, presents symptomatic gastroesophageal reflux disease (GERD). When and how surgical reinforcement of the lower esophageal sphincter should be performed to prevent acid reflux is still controversial. Here, we describe laparoscopic ligamentum teres cardiopexy, a surgical technique that reinforces the lower esophageal sphincter and restores its competence with a new valve, in patients with the previous conversion of gastric bypass to sleeve gastrectomy and hiatal hernia repair. We present the surgical technique performed on a patient with initial gastric bypass who underwent sleeve gastrectomy for hypoglycemia and hiatoplasty for severe GERD. Persistent GERD requested to undergo ligamentum teres cardiopexy. Ligamentum teres cardiopexy combined with the closure of the gastric crus is a late alternative treatment for GERD in patients with previous sleeve gastrectomy and hiatal hernia.

Keywords Sleeve gastrectomy · Ligamentum teres · Gastropexy · Gastroesophageal reflux · Bariatric surgery · Morbid obesity · Reversal

Introduction

Laparoscopic sleeve gastrectomy (LSG) is the most frequently performed bariatric surgery procedure due to its apparent technical simplicity and favorable weight loss outcomes. However, there have been reports of increased severity and prevalence of gastroesophageal reflux disease (GERD) [1, 2]. GERD is a disorder of the upper gastrointestinal tract that is defined by heartburn and acid regurgitation, which develops when reflux of the stomach contents causes troublesome symptoms and/or complications [3]. Management of the complications associated with LSG, including GERD and hiatal hernias, is mandatory. As per followed practice, LSG predisposes patients to GERD, and debate remains if it should or not be performed in obese patients with preexisting GERD or hiatal hernia [4]. When GERD appears after sleeve gastrectomy (SG), many options have been considered, including hiatal hernia repair, conversion to gastric bypass, and LINX® magnetic sphincter. We would like to reinforce the laparoscopic surgical alternative that can address postoperative GERD: cardiopexy using the ligamentum teres to achieve near-complete restoration of esophagogastric junction (EGJ) function and rehabilitation of damage caused by SG and hiatal hernia. We aim to show the technical aspects and discuss the teres cardiopexy technique utility.

✉ Ramon Vilallonga
vilallongapuy@hotmail.com

[1] Endocrine, Metabolic and Bariatric Unit, Center of Excellence for the EAC-BC, Vall d'Hebron University Hospital, Universitat Autònoma de Barcelona, Passeig de la Vall d'Hebron 119-129, 08035 Barcelona, Spain

[2] General Surgery Department, Consorci Sanitari de l'Anoia, Barcelona, Spain

[3] General Surgery Department, Vall d'Hebron University Hospital, Universitat Autònoma de Barcelona, Passeig de la Vall d'Hebron 119-129, 08035 Barcelona, Spain

[4] Division of General Surgery, Hospital de Base of Porto, Department of Medicine, Velho Federal University of Rondônia - Unir, Porto Velho, RO, Brazil

Patient and Methods

We present the management of GERD post-LSG and the surgical technique performed on a 56-year-old patient with initial gastric bypass. Her preoperative weight was 116 kg, and her body mass index (BMI) was 44 kg/m^2. The patient suffered from severe hypoglycemia and decision was made to convert the Roux-en-Y gastric bypass (RYGB) to normal anatomy, including SG. At this stage, in the early short experience of our department regarding RYGB conversions to normal anatomy or sleeve, hiatal hernia repair was not performed systematically. Thus, postoperatively, she had experienced severe GERD and regurgitation and did not respond to medical treatment. Endoscopic dilation of the previous gastrogastric anastomosis was done in order to attempt better passage through the sleeve in order to avoid possible stenosis. Endoscopy, barium swallow, and a computed tomography scan revealed severe reflux and regurgitation with hiatal hernia, so we performed complete hiatoplasty for severe GERD. Postoperatively, she presented a BMI of 32 kg/m^2. Unfortunately, the patient presented with persistent GERD, and a decision was made to undergo ligamentum teres cardiopexy. Inform consent was received from the patient. All procedures were accepted according to the research committee.

Under general anesthesia, the patient was placed in a supine position with the hips abducted, using the 4-port technique with three 5-mm ports, one 10-mm port, and a 30° laparoscope.

The procedure began by dissecting the adhesions between the liver and the sleeve stomach. The pars flaccida was dissected with an energy device. The right crus was exposed, and the esophagus was mobilized for an appropriate intra-abdominal length. The remaining fundus was dissected from the left crus, after which the right crus was exposed. The crus was sealed using a figure of non-absorbable sutures to close the crus anteriorly over a 36-French bougie tube.

An energy device was used to release the ligamentum teres from its umbilical connection ensuring that there was enough length up to the liver with the preservation of its blood supply (Fig. 1) The ligamentum teres was then passed around the gastroesophageal junction (GEJ) in a 360° manner (Fig. 2) It is very important to note that the ligamentum teres is above the remaining fundus to correct the axis at the angle of His and to ensure that the ligamentum teres is positioned at the GEJ to create the new sphincter. Sutures were added to secure the repair and prevent its displacement.

Then, the suture was performed to fix the apex of the angle of His, one at the gastroesophageal junction, and one joining the gastric fundus to the esophagus. The remainder of the ligamentum teres was fixed over itself with four to six stitches, forming a necktie cardiopexy (Fig. 3).

All the procedure is shown in the video attached (VIDEO).

Fig. 1 An energy device was used to release the ligamentum teres from its umbilical connection

Results

Short-term follow-up of the patient indicated a successful procedure, as evident in the postoperative barium swallow, which showed no hiatal hernia or reflux. At 6 months, the patient achieved successful results, defined as a resolution of GERD symptoms, no proton pump inhibitors use, and a manometric measurement of over 12 mmHg at 6 months.

Discussion

A national analysis in the USA conducted by Du Pree et al. showed that 84.1% of patients who had pre-existing GERD continued to have GERD symptoms post-SG, while 8.6% developed GERD postoperatively [5]. Multiple mechanisms have been proposed in the development of worsening GERD after SG. The mechanisms in which GERD may improve after

Fig. 2 The ligamentum teres was then passed around the gastroesophageal junction (GEJ) in a 360° manner

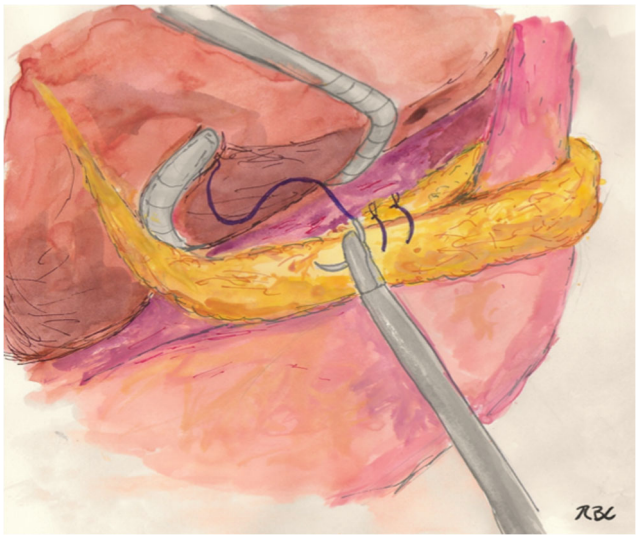

Fig. 3 The remainder of the ligamentum teres was fixed over itself with four to six stitches

undergoing SG include the decrease in intraabdominal pressure due to weight loss, reduced acid production related to resection of the acid-producing gastric fundus, accelerated gastric emptying, and reduced gastric volume.

Surgical reinforcement of the lower esophageal sphincter at the GEJ to restore function is necessary to prevent acid reflux. In patients who have undergone LSG and failed conservative medical treatment after the development of GERD, the best option to manage GERD is conversion to RYGB. However, some patients opt to not undergo bypass and have the option to have surgical reinforcement of the lower esophageal sphincter to prevent acid reflux. A recent study showed that patients with obesity and GERD who underwent LSG improved their pHmetric and manometric results after weight loss [6].

The ligamentum teres of the liver is a degenerative string of tissue that exists at the free edge of the falciform ligament of the liver. It forms a fibrous strand in adults and is a remnant of the umbilical vein. It receives its blood supply from a small arterial branch of the hepatic artery, thus preventing long-term resorption. The cardiopexy procedure was initially called "technique du collet" (collar technique) and proposed by Pedinielli [7]. He suggested using a ling around the GEJ that involved a strip of skin that was cut from the abdominal wall, slung around the distal esophagus, sutured over it, and then attached to the anterior abdominal wall. The main objective of the procedure, once the hiatal hernia is fixed into the abdominal cavity, was to prevent the subsequent reflux. By creating an artificial valve and restoring the angle of His, the teres cardiopexy can be useful for GERD. The initial results were satisfactory; however, the absence of blood supply to the cutaneous strip made it necrotic. In 1964, Rampal [8, 9] adopted this technique using the round ligament. The principle is to dissect the ligament from its umbilical insertion, while keeping its fat, by severing the falciform ligament. The round ligament is thus pediculated on the liver and placed around the left and right cardia, then fixed on itself by ligatures supported by non-resorbable suture. This procedure was later proposed in laparoscopy [10].

To avoid gastric acid reflux, it is necessary to restore the normal anatomy of the EGJ and reinforce the lower esophageal sphincter with surgical procedures. It is important to create an artificial valve at the EGJ, preferably behind the esophagus, lengthening the subdiaphragmatic esophagus and maintaining the sphincter mechanism in the positive pressure environment of the abdominal cavity. In patients with SG who present hiatal hernia and GERD only partially controlled with proton-pump inhibitors (PPIs), gastric bypass is an accepted surgical solution [1]. Teres' cardiopexy alone is not sufficient for reflux prevention; therefore, the closure of the hiatus must be performed concomitantly. This has previously been attempted by Galvez-Valdovinos et al. [11], showing a successful resolution of GERD in 86.6% of the patients. However, if the patient declines this procedure, there are no other surgical options.

Although this technique is reported to be not effective in the long term for the normal stomach [12], its purpose with LSG is to prevent GERD that is caused by intrathoracic migration of the gastric tube by pulling it caudally with the liver during inspiration, maintain the LES (lower esophageal sphincter) intra-abdominally, and lengthen the intraabdominal esophagus. When a patient after SG might deal with GERD, weight must be assessed. Full screening of the SG is mandatory, including gastrografin swallow, pHmetry, manometry, and endoscopy. The final diagnosis or causes that might affect the overall GERD should be treated, including hiatal hernia repair, stenosis, twists, kinking, and the redundant fundus of previous surgery (or neo-fundus). According to all these data, an RYGB could be considered as the most effective bariatric procedure for GERD symptoms as it limits acid production into the small gastric pouch and reduces esophageal reflux, especially in a patient with insufficient weight loss [13]. For the resizing of the upper part of the SG (re-sleeve), Hill plasty and teres ligament cardiopexy should be considered. Some authors have proposed the techniques for patients with well-conformed SG (no twist nor stenosis) and sufficient weight loss [14].

Conclusions

Cardiopexy with the ligamentum teres ensures the lengthening of the abdominal portion of the esophagus and anchors the antireflux assembly within the positive pressure environment of the abdomen in a strong and flexible way. It seems to be an advisable procedure for the treatment of gastroesophageal reflux. Ligamentum teres cardiopexy combined with the closure of the gastric crus is a late alternative treatment for GERD in patients with previous SG and hiatal hernia.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethical Approval This article has been written in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

1. Tai CM, Huang CK, Lee YC, et al. Increase in gastroesophageal reflux disease symptoms and erosive esophagitis 1 year after laparoscopic sleeve gastrectomy among obese adults. Surg Endosc. 2013;27:1260–6.
2. Laffin M, Chau J, Gill RS, et al. Sleeve gastrectomy and gastroesophageal reflux disease. J Obes. 2013;2013:741097.
3. Vakil N, van Zanten SV, Kahrilas P, et al. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Am J Gastroenterol. 2006;101:1900–120.
4. Oor JE, Roks DJ, Ünlü Ç, et al. Laparoscopic sleeve gastrectomy and gastroesophageal reflux disease: a systematic review and meta-analysis. Am J Surg. 2016;211:250–67.
5. Dupree CE, Blair K, Steele SR, et al. Laparoscopic sleeve gastrectomy in patients with preexisting gastroesophageal reflux disease. JAMA Surg. 2014;149:328–34.
6. Rebecchi F, Allaix ME, Giaccone C, et al. Gastroesophageal reflux disease and laparoscopic sleeve gastrectomy: a physiopathologic evaluation. Ann Surg. 2014;260(5):909–14. discussion 914–5
7. Pedinielli L. Traitement chirurgical de la hernie hiatale par la "technique du collet". Ann Chir. 1964;18:1461–74.
8. Rampal M, Perillat P, Rouzaud P. Preliminary notes on a new technic for surgical treatment of hiatal hernias: cardiopexy by the round ligament. Mars Chir. 1964;16:488–91.
9. Narbona B, Olavarrieta L, Lloris JM, et al. Le traitement du reflux gastro-oesophagien par pexie avec le ligament rond. A propos de 100 opérés suivis entre 16 et 23 années. Chirurgie. 1990;116:201–10.
10. Nathanson LK, Shimi S, Cuschieri A. Laparoscopic ligamentum teres (round ligament) cardiopexy. Br J Surg. 1991;78:947–51.
11. Gálvez-Valdovinos R, Cruz-Vigo JL, Marín-Santillán E, et al. Cardiopexy with ligamentum teres in patients with hiatal hernia and previous sleeve gastrectomy: an alternative treatment for gastroesophageal reflux disease. Obes Surg. 2015;25:1539–43.
12. Meyer C, De Manzini N, Rohr S. Prospective randomized comparison of teres cardiopexy and Nissen fundoplication in the surgical therapy of gastro-oesophageal reflux disease. Br J Surg. 1994;81:153–4.
13. Stenard F, Iannelli A. Laparoscopic sleeve gastrectomy and gastroesophageal reflux. World J Gastroenterol. 2015;21:10348–57.
14. Al-Sabah S, Akrouf S, Alhaddad M, et al. Management of gastroesophageal reflux disease and hiatal hernia post-sleeve gastrectomy: cardiopexy with ligamentum teres. Surg Obes Relat Dis. 2017;13:2032–6.