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Mini Review

Posterior Partial Fundoplicature with Continuous Barbed Suture

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Abstract

The purpose of this article is to describe the fundoplication Posterior partial technique step by step with barbed suture and take advantage of all the advantages it offers, such as avoiding knots and reducing surgical time.

Keywords: *Posterior Partial Fundoplicature; Continuous Barbed Suture; Surgical Time*

Introduction

The prevalence of patients with heartburn or regurgitation at least once a week is around 18% - 27% in the USA [1] and around 12% in our country [2]. Medical treatment - proton pump inhibitors (PPIs) - is currently the first line of treatment. However, up to 13% of medically managed patients have disease progression identified with the appearance of new symptoms or the need to increase the dose of PPSI [3]. In this group of patients, objective documentation of gastroesophageal reflux is justified through endoscopic identification of damage to the esophageal mucosa or pathological acid exposure through pH monitoring [4], the latter being the best predictor of success surgery in patients with typical symptoms of GERD [5]. Once the diagnosis is confirmed, surgical candidates are considered to be those patients who present a lack of response to medical management, decreased quality of life, presence of complications associated with GERD (Barrett, erosive esophagitis, stenosis) and those who wish to undergo the surgical procedure to avoid prolonged use of medications [4,6].

Since Toupet's original publication [7], there have been some modifications to the posterior partial fundoplication technique. The objective of this document is to describe a new technique that, taking into account the technological development of our era, incorporates a barbed suture to carry out said procedure.

Selection and preoperative evaluation

Following international recommendations, we carry out the GERD diagnostic approach in all patients whose symptoms do not improve or have stopped improving after a period of management with PPIs or when the patient does not want to depend on these medications for a long time. To do this, we again carry out a detailed clinical history because we consider it important to distinguish patients whose symptoms are associated with GERD and not with functional disorders, since the effectiveness of a fundoplication depends largely on the presence of the typical symptoms/acid exposure binomial. Pathological [8]. The simple presence of typical symptoms or their response to management with PPIs are not sufficient for diagnosis since between 30% and 50% of patients with reflux symptoms do not have pathological acid exposure [8,9] with positive predictive values ranging between 50% and 60% [10] and therefore would not benefit from a fundoplication. The presence of atypical symptoms - mainly respiratory - is not considered by us a surgical contraindication due to the good results reported with fundoplication [11-13].

To document pathologic acid exposure, we began by performing an upper endoscopy looking for evidence of mucosal lesions that could be associated with GERD such as esophagitis, peptic strictures, or Barrett's esophagus; the absence of esophagitis is not a predictor of poor surgical results, since patients with non-erosive disease achieve the same symptomatic results after laparoscopic fundoplication [14]. The presence of hiatal hernia by this method is an important finding not only because it is one of the mechanical factors responsible for the pathophysiology, but also because it is associated with more severe lesions in GERD [15] and therefore its correction is a priority.

Due to the low sensitivity of these mucosal changes (S = 50%) and the fact that their absence by endoscopy does not rule out the diagnosis of GERD [10], we complement the approach with a pH-metry - considered the gold standard for the diagnosis of GERD - except in cases of long-segment Barrett's esophagus [8,10]. A transnasal catheter is placed that measures esophageal exposure to a Ph < 4 for a period of 24 hours; we make sure that the patient has suspended PPIs for at least 7 days prior to the study. With a positive pH according to the Deemester score [16], we are practically ensuring good surgical results, as this parameter is the most powerful predictor of a successful fundoplication [5].

Our protocol includes performing an esophageal manometry to firstly rule out achalasia or some other motor disorder that could explain the patient's symptoms and secondly, to evaluate motility without this influencing the type of surgery we perform, since the long-term results in the presence of esophageal dysmotility they are similar for complete or partial techniques [17].

Finally, although we do not consider it necessary, the barium esophagram helps us to evaluate some anatomical details such as the presence of a diverticulum or paraesophageal hernia that requires correction in the same surgical act, since the demonstration of reflux by this means has a sensitivity that is around 40% [10].

Figure 1: *Trocar arrangement. 1, Supraumbilical (left hand). 2, Right hand. 3, First Assistant. 4, Laparoscope. 5, Nathanson.*

Surgical technique

With the patient in the French position and the surgeon between the legs, we used 4 trocars (3 5mm and 1 12 mm). We created the pneumoperitoneum using a 5 mm supraumbilical optical trocar (surgeon's left hand) and inflated to a pressure of 12 mmHg. Under direct vision, we place the Nathanson retractor immediately below the xiphoid. The 5 mm optical port is placed 2 cm below and to the left of the spacer; we use a 0º lens, so we consider it essential that it enters the surgical area directly. Another 5 mm trocar is placed midway between the costal margin and the iliac crest in the anterior axillary line (first assistant). Finally, we placed a 12mm trocar in the midclavicular line 1-2 cm above the supraumbilical; it is the trocar of the surgeon's right hand through which we introduce the suture and sometimes gauzes.

With the stomach retracted caudally from its anterior face by the first assistant, we began the dissection by cutting the pars condensate of the hepatogastric ligament with the help of an advanced bipolar, thus exposing the right crus covered by peritoneum. Next, the surgeon's left hand grasps the right pillar with a Babcock forceps and the plane between the pillar and the right side of the esophagus is dissected, dissecting inferiorly to the junction with the other pillar; superiorly and attached to the pillar, the phrenoesophageal membrane is cut. The upper dissection should extend into the mediastinum far enough to achieve an intra-abdominal esophageal length of > 2 cm. Both vagus nerves are identified and respected. Next, retracting the esophagogastric junction caudally and to the right, dissection of the left crus is continued along its entire length until reaching the junction with the right crus; it is necessary to release the gastrophrenic ligament to allow free passage of the gastric fundus behind the esophagus. The next step is to create the retroesophageal window with blunt dissection, lifting the gastroesophageal junction. It is necessary to mention that our technique does not include the section of the short vessels, as suggested by Toupet's original technique. With the esophagus freed from the hiatus, we advance a Babcock forceps and slide the anterior aspect of the fundus through the window; at this stitch, the first assistant holds the right lip of the fundoplication with a grasper exposing the posterior aspect of the stomach and the "v" of the pillars (Figure 2). Unlike the original technique, we do close the pillars and it is precisely on this stitch that the originality of this work is based: using a 00 barbed suture (15 cm long), we close the pillars with a stitch, we take the posterior face of the stomach and we give another stitch of confrontation of pillars from left to right. With the needle outside the right abutment, we join the right lip of the fundoplication to the peritonized right abutment with a 3-stitch suture. After the most superior stitch, we make a stitch in reverse taking only the right lip and therefore coming out adjacent to the right side of the esophagus. We continue the surgete uniting the esophagus - fundus in a caudal direction to the gastroesophageal junction, giving around 3 stitchs and we consider this side of the fundoplication finished. Using a new suture, we perform a 3-stitch fundus-esophageal suture on the left side and conclude the procedure; we rarely attach the left fundus to the ipsilateral pillar. We never use esophageal sizing and control Intraoperative endoscopic surgery is not routine.

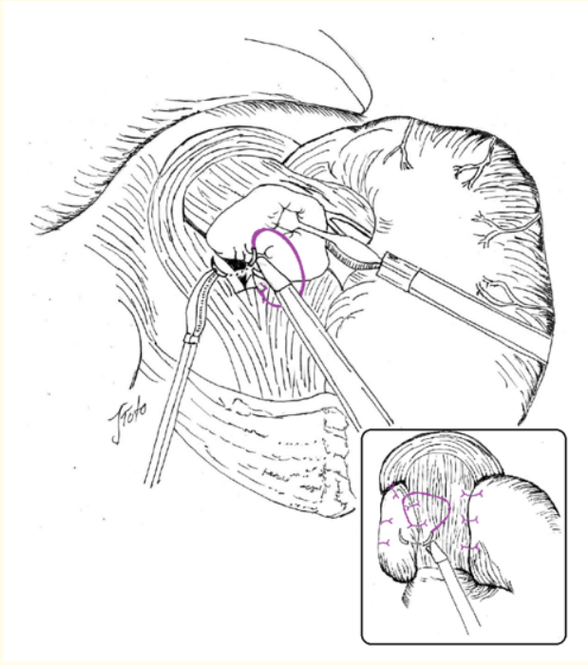

Figure 2: *Posterior hiatogastropexy with barbed suture 00. The pillars are faced in the first stitch; the second stitch incorporates the posterior wall of the stomach. Box: Gastrophrenoplasty and Esophagogastroplasty.*

Immediate postoperative

The patient is monitored on the floor for 24 hours, starting clear liquids 4 hours after surgery and a porridge diet the same night of surgery. We insist on out-of-bed mobilization and work with incentive spirometers. We use elastic compression stockings as an antithrombotic measure and only when necessary we start prophylactic anticoagulation with Enoxaparin 8 hours after the procedure. We do not make a drink with water-soluble material and the patient is discharged the next day.

Discussion

One of the most difficult tasks in laparoscopy is the creation of laparoscopic knots; the surgeon must overcome the challenges imposed by the lack of haptic perception and limited movement, while maintaining the fundamental principles of any knot: safety, efficiency and adequate tension [18]. It has been shown that those surgeons who receive simulator training during their training demonstrate better performance in complex procedures such as fundoplication [19] a situation that is not the most frequent in our country. To the above we add that the surgical knot represents not only the weakest part of the suture, but also the largest amount of foreign body, especially in the case of slip knots; this material can generate an adjacent inflammatory response with potential harmful effects on tissue support, development of infections or formation of adhesions [20]. For example, fibroblast proliferative activity and tensile strength have been shown to be lower when a tissue is knotted too tightly [21]. In addition, considering that extracorporeal knots emerged as an alternative to the difficulty imposed by intracorporeal knots, it should be mentioned that it has been reported in *in vitro* studies that laparoscopic sliding knots achieve lower tensile strength compared to conventional and intracorporeal square knots, adding a potential risk to the integrity of the fundoplication [22,23].

The barbed suture was patented by Dr. John H. Alcamo in 1964 and the first reports of clinical use appeared in 1967 [24]. Animal studies with this type of suture have shown greater resistance to gastropexy dehiscence in dogs [25], a tighter closure and less urinary leakage in bladder repairs in pigs [26] and the same rate of adhesions after closure of myometrial incisions in sheep [27].

Lukish., *et al*. in a series of 20 pediatric patients who underwent Nissen-type fundoplication and laparoscopic gastrostomy using a unidirectional barbed suture, demonstrated a 30% reduction in surgical time (79 min vs. 113 min, p = < 0.05) compared to a standard Nissen; stitch out that it is a practical and simple technique to save surgical time and thus avoid the risks of prolonged exposure to CO_2 [28]. Ferrero., *et al*. in their series of 45 Nissen-type fundoplications created with barbed suture, indicate a surgical time of 40 average min and outpatient management in 40% of cases. The same author stitchs out that as of 2018, 100% of the fundoplications in his center are performed with this technique [29].

A recent meta-analysis has shown a shorter operative and suture time in patients undergoing gastric bypass with this type of suture [30] a situation that has not been demonstrated in fundoplications due to the lack of comparative studies; however, it is logical to think that this type of suture saves time in complex laparoscopic procedures, as demonstrated by the two previously mentioned case series.

Conclusion

Barbed sutures represent a safe and effective alternative in some complex laparoscopic procedures such as fundoplications. In this article we describe our technique using a 00 barbed suture, which we consider to be, in addition to being safe, 100% reproducible.

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