

Laparoscopic Collis-Nissen approach for shortened esophagus treatment in children

Procedimiento de Collis-Nissen laparoscópico para el tratamiento del esófago corto en niños

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Abstract

Background: Short esophagus is a disability to obtain a proper portion of abdominal esophagus, thus a lengthening technique is required. Collis approach is the best option. **Objective:** The objective of the study was to demonstrate the effectiveness of laparoscopic Collis-Nissen approach in children. **Methods:** Retrospective and descriptive case series performed in children with reflux and short esophagus, Collis esophagoplasty was carried out with stapler, together with fundoplication. Age, symptomatology, surgical background, oral nutrition beginning, hospital stay, complications, and reflux control were recorded. **Results:** Eight children, 4-15 years old were treated from 2005 to 2017. Three of them with slipped fundoplication background and two with esophageal atresia. The rest of the children had no background, two of them with stenosis. Symptoms: cough 8/8, abdominal pain 5/8, and dysphagia 3/8. Without complications. Oral nutrition beginning at the 5th day. Up to 10 years follow-up, with complete remission of the symptomatology in 6 years. **Discussion:** Since a true short esophagus diagnosis depends on transurgical findings, pediatric surgeons should notice this entity when practicing any antireflux procedure. Laparoscopic Collis-Nissen approach is safe and efficient in these patients.

Key words: Collis. Esophagoplasty. Laparoscopy.

Resumen

Antecedentes: El esófago corto es la imposibilidad de obtener una porción adecuada de esófago abdominal, por lo que se requiere alguna técnica de alargamiento. La mejor opción es el procedimiento de Collis. **Objetivo:** Demostrar la eficacia del procedimiento de Collis-Nissen por laparoscopia en niños. **Método:** Estudio retrospectivo, descriptivo, serie de casos, niños con reflujo y esófago corto, esofagoplastia de Collis con engrapadora y funduplicatura. Se analizaron edad, sintomatología, antecedentes quirúrgicos, tiempo quirúrgico, inicio de vía oral, tiempo de hospitalización, complicaciones y control del reflujo. **Resultados:** De 2005 a 2017 se trataron ocho niños de 4 a 15 años. De ellos, tres con antecedente de funduplicatura deslizada y dos con antecedente de atresia esofágica. El resto sin antecedentes, dos con estenosis. Síntomas; tos 8/8, dolor abdominal 5/8, disfagia 3/8. Sin complicaciones. Inició de vía oral al quinto día. Seguimiento de hasta 10 años, con remisión total de la sintomatología en seis casos. **Discusión:** Debido a que el diagnóstico de esófago corto verdadero depende de los hallazgos transoperatorios, los cirujanos pediatras deben reconocer esta condición al momento de practicar cualquier procedimiento antirreflujo. El procedimiento de Collis-Nissen laparoscópico es una opción segura y eficaz en estos pacientes.

Palabras clave: Collis. Esfagoplastia. Laparoscopia.

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Introduction

Short esophagus is defined as the inability to obtain a 2-3-cm portion of abdominal esophagus without tension during dissection for the construction of some anti-reflux procedures^{1,2}.

Horvath et al.³ defined three subtypes: apparent short esophagus, reducible true short esophagus, and non-reducible true short esophagus. In the first type, the esophagus has normal length, and after abdominal dissection and 2-3 cm without tension are obtained. In type 2, extensive mediastinal dissection (5 cm) is required to restore the esophagogastric junction 2-3 cm below the diaphragm. In type 3, this is not possible despite extensive mediastinal dissection and some esophageal lengthening procedure is required³.

The prevalence in adults varies ranges from 8 to 10% in patients who undergo fundoplication. Its incidence in children is not known, since publications in pediatric patients are scarce^{4,5}.

Most cases of short esophagus are acquired and are related to the presence of gastroesophageal reflux, composed of acid, bile, and pancreatic juice, which allow hydrogen ions to penetrate into the deep layers of the esophagus wall and cause edema, scarring, fibrosis and longitudinal muscle layer scar contraction, and with intrinsic esophageal shortening^{2,6,7}.

Short esophagus treatment is aimed at controlling gastroesophageal reflux; if it is associated with stenosis, it also requires esophageal dilations to be performed after the reflux has been solved.

To build an adequate fundoplication, it is essential:

- To determine the esophagogastric junction height.
- Making sure that there are 2-3 cm of intra-abdominal esophagus without tension
- If the above is not possible despite a wide mediastinal dissection, some procedure should be carried out to keep the fundoplication below the diaphragm free of tension.

Raising the diaphragm above the fundoplication has been proposed, in a procedure called extended hiatoplasty⁴.

However, the best option is the one devised by Collis in 1957, whereby the lesser curvature of the stomach is used to lengthen the esophagus^{8,9}. The feasibility and advantages of carrying out this procedure by minimally invasive surgery in adults have been demonstrated^{2,7-9}.

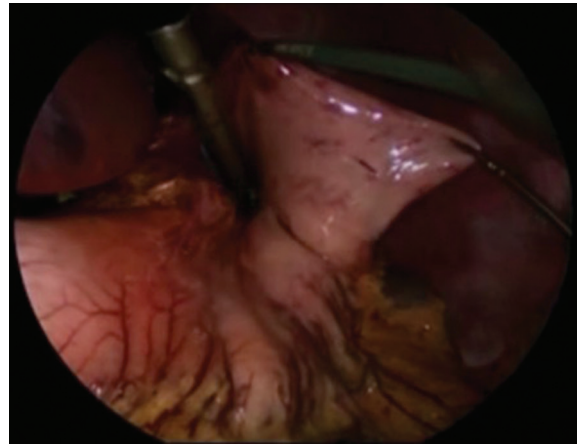


Figure 1. Placement of stapler for esophageal lengthening.

The purpose of the present work is to demonstrate the efficacy of Collis-Nissen minimally-invasive abdominal approach procedure for the treatment of short esophagus associated with gastroesophageal reflux in children.

Methods

Retrospective and descriptive case series study, where pediatric patients with gastroesophageal reflux disease and a true short esophagus who required an esophageal lengthening procedure (Horvath type 3) were included in the study.

All patients underwent laparoscopic esophageal dissection, using a four-port approach, with 5 mm and 30° optics, and 10-mmHg pressure, insufflating 1 L/min, and digestive endoscopy at that moment to determine the localization of the esophagogastric junction.

In those patients in whom obtaining 2 cm of abdominal esophagus despite an extensive mediastinal dissection (5 cm) was not possible, a Collis procedure was practiced through an abdominal incision in the epigastrium. Without trocar, a 45-mm linear endoscopic stapler was inserted, which was placed at the native esophagogastric junction, to lengthen the esophagus with the lesser curvature of stomach (Figs. 1 and 2). It was associated with a Nissen procedure by completely wrapping (360°) this new esophagus with the new gastric fundus, with three 2-0 polyester sutures being placed (Fig. 3). Previously, abutment plasty was performed with 2-0 polyester.

In patients with stenosis, video-assisted gastrostomy was also performed. All underwent a contrast study 5 days after the operation and at 1 month.

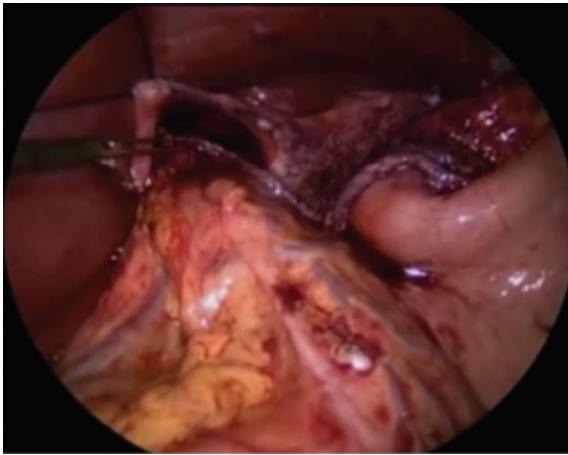


Figure 2. Appearance of the 4.5-cm neoesophagus.

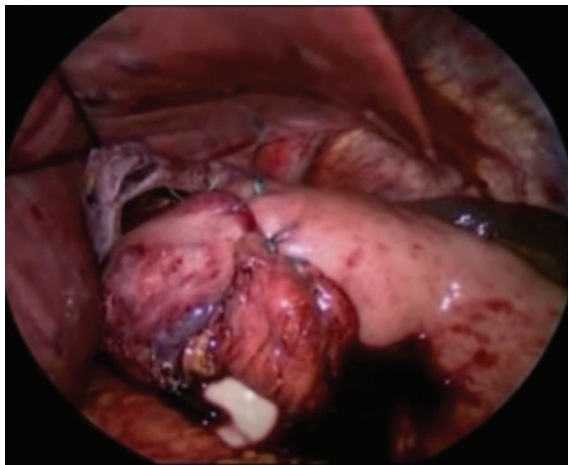


Figure 3. Creation of the new fundoplication around the elongated esophagus portion.

Patients underwent a control endoscopy. Those who also had stenosis underwent esophageal dilation with a Savary-type probe on the second post-operative week.

Age, gender, weight, symptoms, surgical history, presence of stenosis, surgical time, bleeding, fistulas, oral route initiation, hospitalization time, and complications were analyzed.

Results

From 2005 to 2017, eight patients (five males and three females), whose ages ranged from 4 to 15 years, were treated.

Three children had undergone a laparoscopic fundoplication that presented migration in the presence of a paraesophageal hernia. The ages of these

patients were 5, 7, and 9 years. Anti-reflux surgery had been practiced 6, 8, and 14 months before this evaluation. In all three children, it was indicated due to medical treatment failure in the presence of gastroesophageal reflux, with respiratory manifestations, and recurrent pneumonias. The symptoms the patients experienced again were cough, pyrosis, abdominal pain, and vomiting, with an evolution time of 2, 3, and 6 months, respectively. The esophagogastroduodenal series showed fundoplication migration, with the presence of a paraesophageal hernia. Pre-operative endoscopy showed an image consistent with a paraesophageal hernia with fundoplication migration in all three children.

Two patients had a history of type C esophageal atresia, with no associated malformations, treated with primary anastomosis without complications in the neonatal period. At the time of the short esophagus diagnosis, the patients were 4 and 5 years old. Both had gastroesophageal reflux, with the presence of regurgitation, pyrosis, sialorrhea, irritability, abdominal pain, and cough, which had been treated with prokinetics and antacids for 14 and 18 months. The esophagogastroduodenal series showed strictures at the site of the esophageal anastomosis in one patient and the presence of gastroesophageal reflux on the dynamic study in both patients. Pre-operative endoscopy showed stenosis at the anastomosis site in one patient, which allowed the endoscope to pass, as well as esophagitis and Z-line above the diaphragmatic clamping in both patients.

Two apparently healthy patients, with no history of surgery or ingestion of any caustic substance, presented with progressive dysphagia, with a symptom evolution time of between 9 and 12 months. The contrasted study showed stenosis of the esophageal lower third (Fig. 4). Pre-operative endoscopy corroborated esophageal stenosis with the presence of esophagitis (Fig. 5).

The other patient, who had no surgical history, had a 2-year history of gastroesophageal reflux symptoms, characterized by cough, bronchospasm, pyrosis and sialorrhea and had received different medical treatments with no response. An esophagogastroduodenal series was performed that showed the presence of a migration-related hiatal hernia, which was confirmed by endoscopy.

All patients underwent impedance pH monitoring, which reported the presence of pathological acid reflux in all of them.

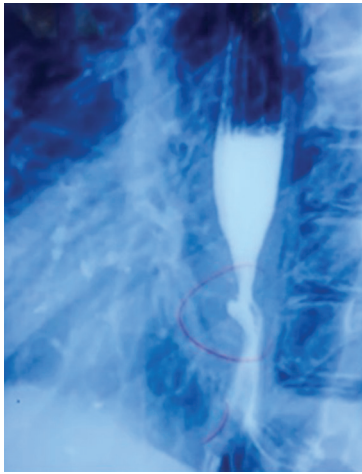


Figure 4. Pre-operative contrasted study where esophageal stenosis is appreciated.



Figure 5. Pre-operative stenosis endoscopic image.

The true short esophagus diagnosis was established by trans-operative endoscopy in all patients.

On average, 4.5-cm neoesophagus was obtained. Surgical time ranged from 120 to 150 min. There were no trans-operative complications. Without dehiscence or fistulas present, oral route was started on day 5 with clear fluids and a soft food diet in all patients, with adequate tolerance. Hospitalization time ranged from 6 to 8 days.

In the three patients with stenosis, these were resolved with two dilation sessions in two patients and with four dilation sessions in another patient, started on postoperative day 15, with one dilation session carried out per week. There was no stenosis recurrence in any of these children.

The longest follow-up time was 10 years in one patient and the shortest was 8 months, which is the time



Figure 6. Post-operative contrasted study with stenosis resolution.

elapsed from the operation to the time this publication was prepared.

In six patients with minimum follow-up of 1 year, gastroesophageal reflux symptoms disappeared; they adequately tolerate the oral route and do not receive any antacid medication.

Two patients with a history of fundoplication migration who underwent Collis-Nissen surgery 12 and 20 months before this publication, still refer abdominal pain and occasional heartburn that improves with antacid administration.

All patients underwent control endoscopy at 6 months and seven children at 12 months postoperatively, with no evidence of stenosis. In those patients who had had it or reflux-associated inflammation in all, there was also competence of the new esophago-gastric junction and fundoplication integrity during the endoscopic maneuver (Fig. 6).

Discussion

Nissen fundoplication controls gastroesophageal reflux disease in 95% of patients. For its correct performance, the gastric fundus must be placed 2-3 cm above the esophagogastric junction¹⁰.

When obtaining 3 cm of abdominal esophagus without tension is not possible despite a wide mediastinal dissection, it should be recognized that it is a true acquired short esophagus^{2,3} that requires some form

of different treatment to control gastroesophageal reflux, just as it was established in the patients described in this work.

There are numerous publications on the treatment of short esophagus in adults, but in children they are scarce; hence, the frequency of this condition in pediatric patients is not known^{4,5}.

In 1957, Collis⁸ published a technique whereby the esophagus is lengthened with the stomach lesser curvature, which was later complemented by a Nissen-type anti-reflux procedure.

This procedure has been safely performed using minimally-invasive approaches in adult patients⁹. Vargas et al.¹¹ reported this technique for patients with esophageal atresia in open surgery, while Rothenberg and Chin⁵ published the application of this technique by laparoscopic approach, with good results in children with gastroesophageal reflux and short esophagus associated with esophageal atresia.

In this work, we found that this technique is also useful when short esophagus occurs in children with fundoplication migration and in patients with severe gastroesophageal reflux associated with stenosis.

In adults, this operation requires a combined approach that involves inserting the stapler through the chest.

In this work, we demonstrate that it is possible to safely perform this procedure by an exclusively abdominal approach, which favors better recovery.

True short esophagus diagnosis depends on intra-operative findings. Pediatric surgeons must recognize this situation when practicing any anti-reflux procedure to be able to offer adequate treatment and prevent fundoplication displacement.

In this work, we found that the Collis-Nissen procedure practiced using an exclusively abdominal minimally-invasive approach associated with the use of mechanical sutures showed no complications, such as bleeding or suture line dehiscence. Furthermore, we also found that this procedure controlled the symptoms caused by reflux.

Control of the disease without the presence of complications shows that the Collis-Nissen approach is a

safe and efficacious procedure in the treatment of reflux in children with short esophagus.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Ethical disclosures

Protection of people and animals. The authors declare that no experiments were performed on humans or animals for this research.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

References

1. Spechler SJ, Goyal RK. The columnar-lined esophagus, intestinal metaplasia, and Norman Barrett. *Gastroenterology*. 1996;110:614-21.
2. Hoang CD, Koh PS, Maddaus MD. Short esophagus and esophageal stricture. *Surg Clin N Am*. 2005;85:433-51.
3. Horvath KD, Swanson LL, Jobe BA. The short esophagus: pathophysiology, incidence, presentation, and treatment in the era of laparoscopic antireflux surgery. *Ann Surg*. 2000;232:630-40.
4. Bustorff-Silva J, Moreira APP, Cavalaro MA, Melo Filho AA. Extended hiataloplasty: early experience with a simple technique to increase the intra-abdominal esophageal length in complicated gastroesophageal reflux. *J Pediatr Surg*. 2001;36:555-8.
5. Rothenberg SS, Chin A. Laparoscopic Collis-Nissen for recurrent severe reflux in pediatric patients with esophageal atresia and recurrent hiatal hernia. *J Lap Adv Surg Tech*. 2010;20:787-90.
6. Gozzetti G, Pilotti V, Spangaro M, Bassi F, Grigioni W, Carulli N, et al. Pathophysiology and natural history of acquired short esophagus. *Surgery*. 1987;102:507-14.
7. Yau P, Watson DI, Jamieson GG, Myers J, Ascott N. The influence of esophageal length on outcomes after laparoscopic fundoplication. *J Am Coll Surg*. 2000;191:360-5.
8. Collis JL. An operation for hiatus hernia with short oesophagus. *Thorax*. 1957;12:181-8.
9. Richardson JD, Richardson RL. Collis-Nissen gastroplasty for shortened esophagus: long-term evaluation. *Ann Surg*. 1998;227:735-42.
10. Lobe TE, Schropp KP, Lunsford K. Laparoscopic Nissen fundoplication in childhood. *J Pediatr Surg*. 1993;28:358-61.
11. Vargas-Gómez MA, Méndez-Martínez D, Andrade-Sepúlveda V. Sustitución de esófago con técnica de Scharli y Collis-Nissen. *Rev Mex Cir Pediatr*. 2008;15:130-5.