Isoperistaltic gastric tube: a surgical alternative in a pharyngoesophageal burn – a clinical case

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ABSTRACT

Introduction. Caustic burns still cause complex esophageal lesions in the pediatric population. However, therapeutic possibilities in severe cases are limited. A surgical approach allowing for a longer neoesophagus, an isoperistaltic esophagus, and a better vascularization, with a lower risk of complications such as necrosis, stenosis, or perforation, is proposed.

Clinical case. 16-month-old patient who accidentally ingested caustic soda. This caused a IIIb degree burn compromising the pharynx down to the stomach. Esophageal replacement with an isoperistaltic gastric tube was carried out, which allowed for a neoesophagus of appropriate length, an optimal vascularization for the graft, and physiological peristalsis.

Comments. The surgical approach proposed allows the esophagus to be irrigated from the right gastro-omental artery, thus preserving irrigation of the greater curvature. It also allows for a longer esophagus, and thanks to anatomical positioning, for physiological peristalsis.

KEY WORDS: Caustics; Chemical burn; Gastric tube; Esophageal replacement; Surgery; Pediatrics.

TUBO GÁSTRICO ISOPERISTÁLTICO, ALTERNATIVA QUIRÚRGICA EN QUEMADURA FARINGOESOFÁGICA. CASO CLÍNICO

RESUMEN

Introducción. Las quemaduras por ingesta de cáusticos en la población pediátrica continúan siendo causa de lesiones esofágicas complejas. Sin embargo, las posibilidades terapéuticas en casos severos son limitadas. Se propone un abordaje quirúrgico en el cual se obtiene mayor longitud del neoesófago, esófago isoperistáltico y mejor vascularización con el subsecuente menor riesgo de complicaciones (necrosis, estenosis, perforación).

Caso clínico. Paciente de 16 meses de edad, quien presenta ingesta accidental de sosa cáustica que ocasiona quemadura grado IIIb que compromete desde la faringe hasta el estómago. Se realizó reemplazo esofágico con tubo gástrico isoperistáltico, con lo cual se obtuvo un neoesófago de longitud apropiada, vascularización óptima para el injerto y peristaltismo fisiológico.

Comentarios. El abordaje quirúrgico propuesto permite obtener un esófago con irrigación proveniente de la arteria gastroepiploica derecha, preservando irrigación de la curvatura mayor, una longitud mayor y por el posicionamiento anatómico del esófago con un peristaltismo fisiológico.

PALABRAS CLAVE: Cáusticos; Quemadura química; Tubo gástrico; Reemplazo esofágico; Cirugía; Pediatría.

INTRODUCTION

Caustics cause liquefactive necrosis. Damage varies according to various factors, such as ingested amount and exposure time[1]. 90% of accidental intoxications in pediatric patients occur in children under 5 years of age. In Colombia, some 4.000 intoxication cases were reported in children under 4 years of age in 2017, most of them as a result of the accidental intake of solvents and caustics[2]. Esophageal burns are classified according to the degree of necrosis evidenced at upper digestive tract endoscopy, which determines surgical approach. IIIb degree burns typically represent a therapeutic challenge[3]. In patients with a complex esophageal pathology requiring esophageal replacement, various techniques such as gastric pull-up, reverse gastric tube, or colonic or jejunal transposition can be used[4]. Over the last decade, reverse gastric tube, gastric pull-up, and esophageal replacement with colon have been the most widely used surgical techniques. However, in the long term, they end up being associated with gastroesophageal reflux, Dumping syndrome, and delayed gastric voiding[4,5]. In patients undergoing esophageal replacement with reverse gastric tube, anastomotic leak and extrinsic esophageal compression at the level of the hiatus are the

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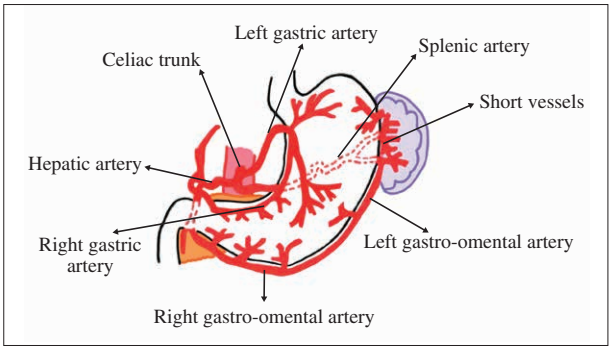

Figure 1. Normal gastric anatomy.

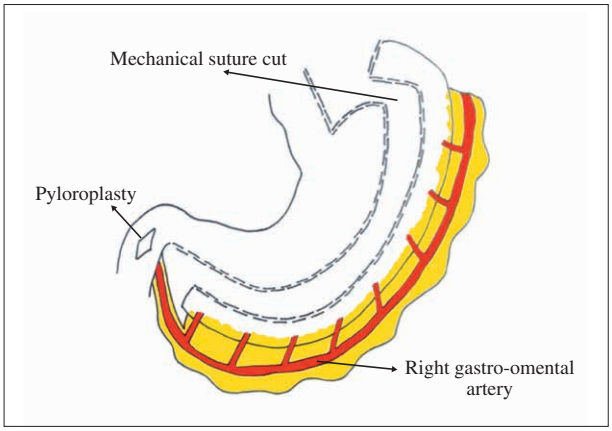

Figure 2. Isoperistaltic gastric tube.

main complications reported during follow-up[6]. Isoperistaltic gastric tube was used in the 1970s in pediatric esophageal replacement, with good results. In France, a close follow-up of one patient undergoing surgery in 1995 was carried out until 2006, with a good clinical evolution[5,7]. In most cases, this technique is used in adults with esophageal cancer, and in children with esophageal atresia[8]. In Colombia, there are no reports of isoperistaltic esophageal replacement in pediatric patients.

CLINICAL CASE

16-month-old patient who accidentally ingested caustic soda. This caused a IIIb degree burn compromising the pharynx and the esophagus, and generated a gastric ulcer. In the initial approach, an upper digestive tract endoscopy was carried out, which demonstrated the IIIB degree burn with esophageal perforation and mediastinitis. Esophagectomy through thoracotomy, supra-infraumbilical laparotomy, gastrotomy for hemostasis in the bleeding ulcer of the gastric body, and lateral esophagectomy until sepsis control were carried out. Multiple esophageal dilations were also performed at the esophageal stoma.

Given how vast the lesion was, esophageal replacement was decided upon two months later. During surgery, decision was made to perform an isoperistaltic gastric tube, which allowed for a longer esophagus and pharyngeal anastomosis. The procedure ensured blood supply from the right gastro-omental artery and preservation of the vascular arch of the greater curvature (Fig. 1).

On postoperative day 7, the patient had esophagocutaneous cervical fistula, which was canalized through a Penrose drain and spontaneously closed after 20 days. During the postoperative period, parenteral nutrition and endovenous antibiotics were administered in the first 7 days. Oral tolerance started on day 45, with an adequate solid and liquid food intake. Five months later, endoscopic control demonstrated stenosis of the pharyngoesophageal junction, which was dilated using an esophageal pneumatic balloon. The patient had good oral tolerance without gastroesophageal reflux or gastric voiding alterations, which allowed for adequate weight and size gain. The patient had been receiving 10 mg esomeprazole every 24 hours since the beginning of the postoperative period.

Anatomical considerations

Gastric arterial irrigation of the lesser curvature is provided by the left gastric artery coming from the celiac trunk, which forms a vascular arch with the right gastric artery coming from the hepatic artery. Arterial flow in the greater curvature is provided by the right gastro-omental artery, which forms a vascular arch with the left gastro-omental artery – a branch of the splenic artery – through the short vessels (Fig. 1). There are many normal anatomical variants.

Surgical technique

A supra-infraumbilical laparotomy was performed. Postoperative gastric adhesions to the liver, the spleen, and the abdominal wall were freed, as well as the gastrostomy stoma. The greater curvature of the stomach was measured to assess the possibility of reverse gastric tube, but length proved insufficient for anastomosis until the pharynx. Therefore, isoperistaltic gastric tube was considered as it provides with increased length, even though it requires two anastomoses instead of one. The procedure was carried out while preserving the right gastro-omental artery and the arch until the left gastro-omental artery. The gastric tube was built with four 65 mm mechanical suture linear cutter reloads, with sufficient length for retro-sternal pull-up, as evidenced in figure 3. Proximal pharyngoesophageal anastomosis was performed with 4-0 polyglactin separate stitches, while anastomosis of the neoesophagus to the gastric fundus was carried out using 4-0 polyglactin separate stitches. A Penrose drain was left in place close to the cervical anastomosis. Last, a new gastrostomy and an extramucosal pyloroplasty were conducted (Figs. 2, 3 and 4).

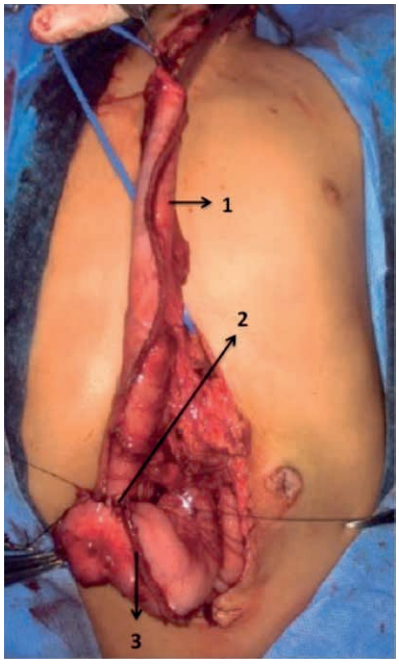

Figure 3. Neoesophagus achieved following surgery. 1) Gastric tube with adequate perfusion. 2) Neoesophagus-gastric anastomosis. 3) Gastric fundus.

Figure 4. Digestive tract image allowing neoesophagus location to be identified.

Discussion and comments

Conservative management is frequent in patients with esophageal burn in order to preserve the native esophagus. However, in severe cases, esophageal replacement should be carried out while trying to preserve oral feeding in the most physiological fashion possible[5,9].

The first report of esophageal replacement using reverse gastric tube dates back from 1912. It was first performed in Romania in 1951. Isoperistaltic gastric tube was first described in 1970[9,10].

The higher blood supply of the greater curvature of the stomach is provided by the right gastro-omental artery. However, various factors may impact graft vitality, such as normal anatomical variants, short vessel or left gastric artery sacrifice, insufficient venous drainage, and erroneous construction of a narrow and short gastric tube[9].

The creation of the isoperistaltic tube is based on gastric arteriography studies, which demonstrate the advantages of maintaining irrigation through the right gastro-omental artery[8]. Given that the new esophagus has its own vascularization, the risk of necrosis and the need for more complex procedures such as jejunal graft with microsurgery are lower. Necrosis of the new esophagus is not frequent given the blood supply of the submucosal plexus. In addition, gastro-omental veins in an anatomical position allow for a better venous drainage and less edema, thus reducing ischemic complications in the immediate postoperative period[9,11]. In the reverse gastric tube approach, graft length is limited by vascular irrigation. However, this technique allows for a longer neoesophagus, and therefore, for anastomoses at higher levels such as the pharynx.

It is worth noting that this procedure requires two anastomoses: pharyngoesophageal anastomosis and esophagogastric anastomosis, which increases operating times and involves leak, stenosis, and fistula risks.

In a retrospective study carried out in Thailand from 2006 to 2016, various surgical techniques of esophageal replacement in children were compared, such as isoperistaltic gastric tube, reverse gastric tube, and colonic and gastric transposition. However, no significant differences were found in terms of patient outcome[9].

In gastric tube patient follow-up, gastric pH should be monitored 24 hours, and endoscopies and manometries should be performed. In a study carried out in Bombay in 10 children with esophageal replacement (4 isoperistaltic gastric tubes, 2 reverse gastric tubes, and 4 gastric pull-ups), circadian gastric cycle was normal, and even though no adequate peristaltic waves were found, there were mass contractions in all cases[12].

Esophageal replacement with isoperistaltic gastric tube allows for a longer neoesophagus, a lower risk of necrosis, and physiological peristalsis[13,14].

To some up, isoperistaltic gastric tube is a very useful technique which has been used for several years. However, it is not usually applied in the pediatric population. Further studies comparing the long-term impact of isoperistaltic gastric tube *vs.* other techniques are required to establish the best therapeutic option.

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