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Esophageal replacement for benign disease

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ABSTRACT

Esophageal resection is most frequently undertaken for malignancy. Indications for esophagectomy with reconstruction for benign disease include perforation, obstruction, and dysmotility. Considerations for operative planning must include the underlying disorder, localization, and extent of disease, and options for esophageal conduit based on prior surgical anatomical adjustment. We will review the indications and technical approaches to reconstruction in these circumstances, addressing the risks and benefits of each reconstruction option.

Introduction

Techniques for esophageal replacement following resection for benign diseases, and their outcomes, are well described. Given the considerable physiological derangement and risk of complications following surgery, esophagectomy is often considered only after less invasive approaches have been attempted. Consequently, operative candidates for esophagectomy and reconstruction have often undergone multiple interventions, or have advanced disease processes, that may lead to technically difficult procedures. Several factors must be considered in operative planning and decision making in order to promote maximal functional outcomes. The purpose of this article is to review the indications, options for reconstruction, techniques, and outcomes for patients requiring esophageal replacement for benign diseases.

Indications

Benign indications for esophageal replacement can be broken down generally into 3 categories: perforation, obstruction, and dysmotility.

Perforations of the esophagus may occur spontaneously, iatrogenically during attempted esophagogastroduodenoscopy and other procedures, or as the result of trauma. Although esophagus-sparing management strategies such as observation, primary repair, drainage, diversion, and esophageal stent placement are often adequate, there are several factors that predict the need for resection. Large esophageal perforations (greater than 5 cm) and preexisting benign or malignant strictures were associated with the need for urgent esophagectomy in a retrospective review of 127 patients with esophageal perforations, 67% of whom ultimately required surgical management [1]. In a meta-analysis that included 75 studies over 12 years, Biancari et al [2] found a pooled mortality of 11.9% for esophageal perforation with the highest mortality occurring in patients with intra-abdominal perforations (13.2%). Additionally, delays in treatment >24 hours were found to be associated with a significant increase in mortality (20.3% vs 7.4%). Given this, prompt intervention is crucial for the management of these patients. In general, primary repair is undertaken for perforations identified early after their development. Drainage and diversion with delayed esophageal reconstruction are performed for patients with delayed identification of perforations, particularly for those who are unstable and septic. Close observation with intravenous fluids, broad-spectrum antibiotics, total parenteral nutrition, and no oral intake can be considered in patients with contained leaks on contrast imaging, no signs of sepsis, and evidence of minimal extraluminal contamination. This is most commonly appropriate for cervical perforation.

Esophageal perforations are increasingly being managed with esophageal stenting for selected patients as stent technology and physician comfort with this intervention improve. This technique has been found to be safe and effective when performed in conjunction with mediastinal or pleural drainage, intravenous antibiotics, gastric decompression, and nutritional support. Technical and clinical success rates of >90% and >80%, respectively, have been reported. The most common complication requiring reintervention is stent migration [3]. Esophagectomy is generally required for patients who fail attempts at stenting.

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Causes of benign esophageal obstructions include peptic strictures, strictures related to Barrett esophagus, pill esophagitis, congenital defects such as webs or rings, eosinophilic esophagitis, corrosive ingestion, and complications of sclerotherapy, photodynamic therapy, or radiation. The most common cause of esophageal stricture is reflux esophagitis and 7%-23% of patients develop strictures [4]. Progression to stricture occurs as chronic esophagitis spreads transmurally, and occasionally even into surrounding periesophageal tissues. Subsequent fibrosis and scarring may lead to luminal narrowing and esophageal foreshortening. Although simple strictures are often relieved by serial dilation, longer, angulated, or more narrowed strictures may be refractory to serial dilation. The underlying pathophysiology should be considered when selecting the method of neoesophagus creation, as recurrent reflux-related injury and strictures can occur in the remaining cervical esophagus after esophagectomy with gastric conduit creation.

Unlike malignant strictures, which are managed by resection or palliative stent placement, the cornerstone of management of benign strictures is dilation. Outcomes for bougie dilation (longitudinal and radial force) or balloon-type dilation (radial force only), plus or minus steroid injection for local inhibition of an inflammatory response, vary widely depending on complexity and length of the stricture. Simple strictures are successfully treated with 1-3 dilations in nearly 75% of cases [5]. Overall, repeated dilation is successful in 70%-90% of benign strictures [6]. Stricture characteristics known to be associated with failed dilation include length greater than 2 cm, irregular shape, and severe narrowing or angulation. Furthermore, inflammatory strictures are unlikely to resolve without initial resolution of the inflammatory process. Potential complications of dilation include perforation (0.1%-0.4%), bleeding, and bacteremia.

Stenting of benign esophageal strictures to bridge symptoms while inflammatory processes are allowed to resolve has become increasingly popular. This can facilitate planning of more definitive stricture management. As a definitive therapy, placement of partially covered metal stents for benign strictures rarely results in resolution of dysphagia (29%) and can be complicated by ulceration and tissue ingrowth, preventing easy removal [7]. In a pooled data analysis of plastic stenting for benign stricture, dilation-free remission was accomplished in 52% of patients with benign strictures. However, migration rates at less than 1 month were 24%. Reintervention was frequently required, resulting in poor long-term success rates [8]. Biodegradable stenting has shown promising preliminary results, but further evaluation is necessary.

Persistent or recurrent dysmotility following myotomy for achalasia and other motility disorders is an indication for esophageal resection and replacement with a suitable, nonpathologic conduit. Attempts at primary, or repeat, nonresectional therapy are unlikely to be successful when a dilated and tortuous megaesophagus has developed. Inflammation and scarring can make these procedures technically challenging.

Surgical planning

When the aforementioned situations are encountered and less invasive means of management are deemed inappropriate, or have resulted in treatment failure, surgical planning for esophagectomy must be entertained. Considerations for operative planning must include the underlying disorder, localization and extent of disease, and options for esophageal conduit based on prior surgical anatomical adjustment. For example, in the setting of stricture or perforation after multiple failed anti-reflux operations, a gastric conduit may not be a viable option secondary to fundal devascularization and scarring, and the risk of recurrent cervical peptic strictures. Other key factors in surgical planning include the experience and comfort of the operating surgeon.

Options for conduits in esophageal reconstruction include the stomach, colon, and jejunum. Each conduit has potential benefits and drawbacks. Additional reconstructive considerations include the surgical approach and the location for placement of the conduit. Conduits may be placed through the posterior mediastinum, anterior mediastinum, subcutaneous tissue, or pleural space. Goals include obtaining a tension-free reach without jeopardizing vascular flow by compression of the pedicle. The posterior mediastinum is the most frequently used route as it does not require creation of an extra-anatomical space or adjustment of bony thoracic structures. In addition, the neoesophagus follows the shortest route and natural course of the esophagus, minimizing kinking and maximizing length needed for a tension-free repair [9]. The substernal space can be accessed by tunneling or sternotomy, but the conduit can be compressed unless partial resection of the manubrium, clavicle, and first rib is performed to increase thoracic inlet space. The subcutaneous and pleural routes for conduit placement have limited utility, but may be considered in situations where resection of the esophagus is not possible and alternative diversion is required.

Other factors that may influence the surgical approach, conduit choice, and location include previous abdominal and thoracic procedures, and the timing of the reconstruction. For example, placement of the conduit in the anterior mediastinum would be preferable in patients who have undergone emergent esophageal reconstruction or diversion at the time of a previous procedure. Additionally, the thoracic approach may be safer in patients who have undergone previous transabdominal esophageal procedures. When dealing with benign processes vs underlying esophageal cancer, it is important to appreciate differences in patient populations and long-term goals. Overall, there is a longer life expectancy for patients undergoing esophagectomy for benign disease. Consequently, long-term functional outcomes of the neoesophagus and subsequent quality of life must weigh heavily on decision making.

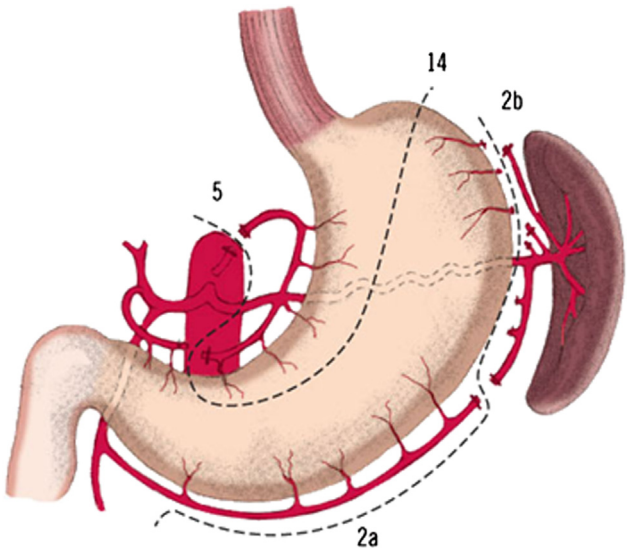

Fig. 1. Gastric blood supply for gastric conduit. Dashed lines show plane of resection. (Reprinted with permission from Earlam [11].) (Color version of figure is available online.)