Chapter 5

Endoscopy for Diseases with Esophageal Dysphagia

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Additional information is available at the end of the chapter

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1. Introduction

The Standards of Practice Committee of the ASGE prepared the data to update the previous ASGE guidelines [1]. Guidelines for the appropriate use of endoscopy are based on critical reviews of the available data and the expert consensus on the guidelines when they are drafted. Esophagogastroduodenoscopy (EGD) is an effective tool for the diagnostic evaluation and management of patients with dysphagia. Varadarajulu reported a diagnostic yield of 54% with EGD in the initial evaluation of patients aged >40 years who presented with dysphagia and concomitant heartburn, odynophagia, and weight loss [2]. The American Gastroenterological Association (AGA) previously reviewed the treatment of patients with dysphagia, which is caused by benign disorders of the distal esophagus [3,4]. The most important examination for these diseases is endoscopy. Specimens of esophageal lesions obtained by biopsy and brush cytology may be used to establish a diagnosis of neoplasms or specific infections [5]. Malignant esophageal tumors are also diagnosed by biopsy on endoscopy. Endoscopic evaluation is recommended for most patients with dysphagia of the esophageal origin as an effective means of establishing or confirming a diagnosis, seeking evidence of esophagitis (excluding malignancies), and implementing therapy when appropriate.

The AGA has recommended endoscopic dilation by both bougie and balloon for the endoscopic management of diseases involving dysphagia [3,4], but more recent reports also describe therapy by endoscopic injection of corticosteroid, triamcinolone, or botulinum, or endoscopic fundoplication for GERD. Peroral endoscopic myotomy (POEM) is another new endoscopic procedure used for the treatment of achalasia.

In this review we report the usefulness of endoscopy for the evaluation and management of diseases involving dysphagia.

2. Evaluation

The most common causes of esophageal dysphagia are listed in Table 1.

	Endoscopic dilation		Other endoscopic treatments
	Bougie	Balloon	
Benign diseases	Yes		
Peptic stricture	Yes		Transoral incisionless fundoplication
			Radiofrequency ablation
			Injection of corticosteroids or triamcinolone
Schatzki ring	Yes		Electrocautery incision with a needle-knife papillotome
Esophageal web	Yes		
Eosinophilic esophagitis	Yes		
Caustic injury	Yes		
Anastomotic stricture	Yes		Biodegradable stent
Radiation injury	Yes		
Drug-induced stricture	Yes		
Postendoscopic therapy stricture	Yes		
Malignant diseases			
Head and neck tumor	No		Self-expanding metal stents (SEMS)
Esophageal carcinoma (adeno and squamous cell)	Yes		Self-expanding metal stents (SEMS)
Extrinsic compression	No		Self-expanding metal stents (SEMS)
Motility disorders			
Achalasia	Yes		Peroral endoscopic myotomy (POEM)
			Injection of botulinum toxin
Diffuse esophageal spasm	No		

Table 1. Common diseases of esophageal dysphagia and endoscopic management

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The acceptance of endoscopy as a gold standard for testing for mucosal disease may bias evaluations of the sensitivity of other diagnostic modalities. Given that endoscopy was used as the gold standard for mucosal disease, the sensitivity of radiology could not have exceeded that of endoscopy [3].

If the patient history, barium swallow, or both suggest achalasia, manometry to confirm the diagnosis should generally precede the endoscopic evaluation, to better prepare for endoscopic therapy.

2.1. GERD: Peptic esophageal stricture

White light endoscopy is now the standard investigation procedure for identifying esophageal injury. An experienced endoscopist who takes the time to methodically inspect the esophagus is generally expected to succeed in diagnosing reflux esophagitis. There has been evidence, however, of interindividual variability in the endoscopic diagnosis of erosive reflux esophagitis and other lesions of the upper gastrointestinal tract. Krugmann reported detailed endoscopic findings for GERD [4]. Peptic esophageal stricture as a consequence of gastroesophageal reflux disease is the most frequent among benign esophageal strictures [6]. The typical case of peptic esophageal stricture is shown in Figure 1. There are multiple etiologies for benign esophageal stricture or stenosis, but the most frequent is the peptic stricture resulting from pathologic acid exposure in GERD. Dysphagia is a common symptom. When dysphagia is encountered, accurate diagnostic procedures (barium esophagogram, upper endoscopy with biopsies) have to be performed to exclude malignant causes first. Strictures can be divided into two categories anatomically: “simplex” or “complex.” The former are short, focal, nonangulated, and wide enough to allow an endoscope to easily pass through. The latter are long and angulated, with a severely narrowed diameter. The strictures are also sometimes scored based on three parameters to optimize the therapeutic decisions: the stricture diameter, stricture length, and degree of difficulty of stricture dilation [7]. After this scoring, the stricture can be classified as type I (mild), type II (moderate), or type III (severe or critical). This classification is also useful for predicting the most appropriate therapeutic option.

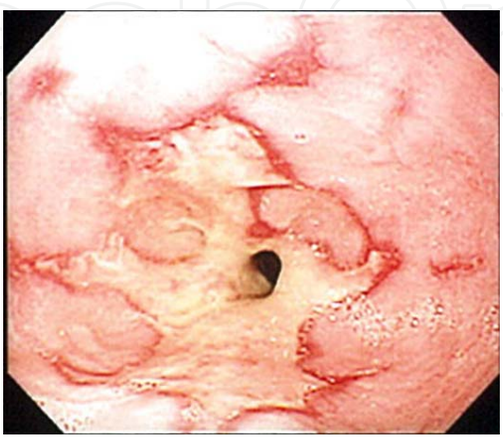

Figure 1. Peptic structure

2.2. NERD (Nonerosive Reflux Disease)

NERD is a subcategory of GERD characterized by troublesome reflux-related symptoms in the absence of esophageal mucosal erosions or breaks on conventional endoscopy, without recent acid-suppressive therapy [8]. Most patients with typical reflux symptoms show no evidence of erosive esophagitis on endoscopy. Upper gastrointestinal endoscopy is required to establish a diagnosis of NERD. Further investigation is required when alarming symptoms are present. Routine random biopsy is not currently recommended for the diagnosis of NERD. Additional diagnostic information is provided by ambulatory 24-hour intraesophageal pH-metry and impedance measurement with reflux-related symptom correlation.

2.3. Schatzki ring and esophageal web

Narrowing of the esophagus can be due to either a benign or malignant stricture formation, webs (mucosa or submucosa alone), or rings (mucosa, submucosa, and muscle). Esophageal rings and webs are both membranous structures in which a thin fold of tissue creates at least a partial obstruction of the esophageal lumen. Esophageal webs usually measure 2–3 mm wide. The obstruction is a smooth extension of normal esophageal tissue made up of mucosa or submucosa alone. Webs can be found anywhere along the esophagus, but classically they appear in the anterior postcricoid area of the upper esophagus. A web at this site constitutes the Paterson Brown–Kelly syndrome, otherwise known as Plummer–Vinson syndrome in the USA [9].

Esophageal rings are concentric, smooth, thin extensions of normal esophageal tissue, usually 3–5 mm thick. They consist of mucosa, submucosa, and muscle. Rings are often detected incidentally at barium studies or endoscopy. There is no sex difference in the incidence of rings overall, though multiple rings are usually found in young men. Rings are classified as types A, B, and C [9]. The A ring, an uncommon type located a few centimeters proximal to the esophagogastric squamocolumnar junction, is thought to be caused by normal physiologic smooth muscle contractions. The B ring (more commonly known as Schatzki ring) is actually a web, as it involves only mucosa and submucosa and tends to appear in the distal esophagus and as the proximal part of a hiatus hernia. The B ring is nonprogressive and usually presents in patients aged over 50 who experience intermittent dysphagia to solid food over periods spanning months or years. The C ring, another rare type, is found in the most distal portion of the esophagus. On X-ray, the C ring manifests as an indentation caused by diaphragmatic crural pressure. A and C rings are both unlikely to be readily seen on upper endoscopy. Hence, the B ring (Schatzki ring) is the most common esophageal ring found on either esophagogram or endoscopy. Schatzki rings rarely cause symptoms. Overall, esophageal rings with luminal narrowing significant enough to cause symptoms (13 mm or less) are seen in only about 0.5% of all esophagograms.

2.4. Head and neck tumor and esophageal tumor

A core cancer-specific symptom of head and neck tumors is difficulty in swallowing [10]. Most patients with tumors of the head and neck or esophagus present for medical attention because of dysphagia.

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Among the many symptoms of esophageal cancer, dysphagia may have an especially adverse effect on quality of life (QOL) [11]. Dysphagia is the predominant symptom in more than 70% of patients with esophageal cancer. The optimum management of dysphagia caused by advanced primary EC has not yet been established, although continued progress toward this goal has been achieved in recent years.

Apart from the weight loss that may result, an inability to swallow comfortably or a tendency to regurgitate food may spoil meals shared with families and friends or induce patients to withdraw from social situations.

Granular cell tumors and solitary fibrous tumors of the cervical esophagus also cause dysphagia [12, 13].

2.5. Eosinophilic esophagitis and infection

The incidence of eosinophilic esophagitis (EoE) is registering an increase in adults. An allergic reaction to food is now established to play an important role in its etiology, and dietary interventions and biologic agents to block the inflammatory cascade are thought to hold promise as novel fields of clinical research. Biopsies should be obtained from the proximal and distal esophagus to evaluate for eosinophilic esophagitis in patients who present with dysphagia together with endoscopic findings suggestive or not suggestive of EoE, and also in patients without esophageal mechanical obstruction. Patients usually present with dysphagia, food impaction, and/or reflux-like symptoms, and biopsy of the esophagus typically shows more than 15 eosinophils per high-power field [14]. The dysphagia predominantly seen in EoE has been attributed to both organic and nonorganic (i.e., motility) disorders. Endoscopically, a normal-appearing esophagus is usually incompatible with a diagnosis of EE, although the findings can be subtle. EGD findings implicative of EoE include an attenuation of the subepithelial vascular pattern, linear furrowing (possibly extending along the whole length of the esophagus), surface exudates composed of eosinophils, or abscesses or strictures [15,16].

Endoscopic evaluation of the gastrointestinal tract remains a cornerstone of diagnosis, especially in patients with advanced immunodeficiency who are at risk for opportunistic infections (OIs) [17]. Infectious esophagitis may be caused by fungal, viral, bacterial, or even parasitic agents [18]. Acute onset of symptoms such as dysphagia and odynophagia is typical of this condition. Candida esophagitis most commonly appears in patients with hematologic malignancies or AIDS, or who use steroids for the treatment of disorders. Candida esophagitis is usually diagnosed when white mucosal plaque-like lesions are seen on esophagogastroduodenoscopy. HSV esophagitis occurs most frequently in solid organ and bone marrow transplant recipients.

The diagnosis of herpes simplex virus esophagitis is usually based on endoscopic findings confirmed by histopathological examination. Well-circumscribed ulcerous lesions with a "volcano-like" appearance may appear in the mucosa of the distal esophagus, typically with diameters of less than 2 cm. Diffuse erosive esophagitis may also be present.

Cytomegalovirus esophagitis is observed in patients who have undergone transplantation, are on long-term dialysis, are infected with HIV, or are receiving chronic steroid

therapy. Esophagogastroduodenoscopy usually reveals large solitary ulcers or erosions in the distal esophagus.

2.6. Esophagitis induced by caustic injury, radiation injury, or drugs

A patient with a usual history of caustic substance ingestion and prolonged hospitalization for severe caustic damage was hospitalized again because of an increase in dysphagia and odynophagia [19]. The gold standard of safely assessing the depth, extent of caustic ingestion injury, and appropriate therapeutic regimen is EGD. The patients underwent EGD within 24 hours of admission and mucosal damage was graded using Zagar's modified endoscopic classification scheme [19].

Radiation therapy (RT), the primary modality for patients with tumors of the upper aerodigestive tract, allows larynx preservation [20]. Proximal esophageal strictures occur in 2–16% of patients after radiation therapy for cancers of the lung or head and neck. RT-induced laryngeal edema (due to inflammation and lymphatic disruption) is a common and expected side effect. Progressive edema and associated fibrosis detected by endoscope or barium swallowing can lead to long-term problems with phonation and swallowing. Aspiration pneumonia associated with dysphagia after intensive chemo radiation therapy has recently been reported at a growing frequency.

Drug-induced esophagitis mainly presents as chest pain, odynophagia, and dysphagia. In the agents known to induce esophagitis, antibiotics are the most common culprit. Other causative agents include nonsteroidal anti-inflammatory drugs, antihypertensive drugs, acetaminophen, oral hypoglycemic agents (glimepiride), bisphosphonates (alendronate, ibandronate), ascorbic acid, and warfarin [21]. The most frequent endoscopic site of drug-induced esophagitis is the middle third of the esophagus. On endoscopy, drug-induced esophagitis manifests as ulcers of various forms such as kissing ulcers, erosions, or ulcers with bleeding, as patchy sections coated with drug materials or impacted pill fragments, or sometimes as strictures.

2.7. Achalasia

Achalasia is regarded as a disease exclusively involving the smooth muscle. About 70–80% of patients have absent or incomplete lower esophageal sphincter (LES) relaxation with wet swallows, while the remainder have complete but shortened relaxation [22]. The typical endoscopic findings are shown in Figure 2A,B. Patients with esophageal stasis are often unaware of this condition. Heartburn, though not infrequent, bears little relationship to the esophageal acid exposure in achalasia, regardless of whether heartburn is elicited by GER or esophageal stasis. Endoscopic examination can readily differentiate these disorders in most cases, although manometry may sometimes be required to make the distinction in equivocal cases. Readers may find interest in the AGA’s recent technical review of the clinical uses of esophageal manometry and detailed descriptions of the procedure. Esophageal manometry is the gold standard test for esophageal motility disorders [23]. Esophageal manometry has been shown to be especially useful for definitively diagnosing achalasia or diffuse esophageal spasm and for detecting esophageal motor abnormalities associated with collagen-vascular disease.

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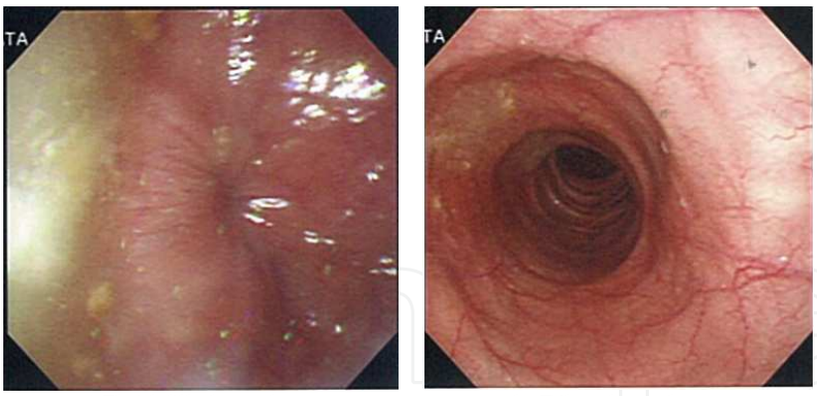


(a) Fluid-filled esophagus (b) Dilated esophagus

Figure 2. Achalasia

2.8. Diffuse esophageal spasm

Diffuse esophageal spasm (DES) is an uncommon disorder characterized by an impairment of ganglionic inhibition in the distal esophagus. Upper endoscopy should be performed as an initial evaluation of esophageal symptoms consistent with spastic disorders [24]. No specific endoscopic abnormality appears in most cases, but the endoscopist may notice disordered esophageal contractions. DES is defined by the presence of simultaneous contractions on conventional manometry. In higher resolution recordings by HRM with EPT, however, the propagation velocity varies greatly along the length of the esophagus and often progresses rapidly in some regions. Esophageal manometry, the putative gold standard in the diagnosis of achalasia, classically shows aperistalsis and failure of relaxation of the lower esophageal sphincter.

2.9. Extrinsic compression

Dysphagia is also caused by extrinsic compression of the esophagus associated with mediastinal diseases, tumors such as lung cancer and lymphoma, or infections such as tuberculosis or histoplasmosis [1,3].

3. Treatment method for diseases with dysphagia

A general approach to the treatment of adult patients with dysphagia caused by benign disorders of the distal esophagus is outlined in the "Medical Position Statement on Treatment of Patients with Dysphagia Caused by Benign Disorders of the Distal Esophagus" from the American Gastroenterological Association (AGA) [3]. The review describes the management of dysphagia, peptic stricture, lower esophageal mucosal rings, and achalasia. More recently, the Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE) updated its previous guideline. In sections covering the role of endoscopy in evaluation and management, the uses of endoscopy evaluating dysphagia and dilation techniques

for various dysphagic diseases are discribed [1.3]. The endoscopic management of esophageal dysphagia is summarized in Table 1.

3.1. Preparation and dilation technique

Patients who have esophageal stasis because of underlying achalasia, diverticula, or tight strictures may require a prolonged nasogastric tube placement to minimize the risk of aspiration and are instructed to refrain from intake of solids for 6 hours and clear liquids for 2 hours before the procedure in the outpatient setting. The esophageal dilation procedure carries a high risk of adverse bleeding events. In patients considered low risk for thromboembolic events, oral anticoagulation with warfarin should be withheld for 5–7 days before the procedure. Bridging therapy with heparin before restarting warfarin is often recommended for patients at high risk for thromboembolic events. Thienopyridines (e.g., clopidogrel) are usually withheld for 7–10 days before the procedure.

Bougie dilators exert both radial and axial forces along the entire length of the stricture. In the technique of wire-guided bougie dilation, a guidewire is passed through the esophagus and its tip is positioned in the antrum.

Balloon dilators exert only a radial force along the length of the stricture. This circumferential pressure, called hoop stress, is a product of the diameter and pressure within the balloon.

3.2. GERD: Peptic strictures

Various methods for endoscopic management of peptic stricture were reported [25]. The AGA recommend progressive dilatation to 40–60 F using polyvinyl bougies or balloons for both simple (diameter<10 mm, not tortuous) and complicated (diameter >10 mm, tortuous) strictures, and mercury bougies for only simple strictures [3]. The ASGE reported that patients with peptic strictures may be treated with Maloney, push-type dilators and balloon dilators with similar efficacy. The degree of dilation in a session should be based on the severity of the stricture [1]. The first dilator that causes resistance to passage is counted as 1. The "rule of three" states that only two additional dilators of sequential size should be passed (three dilators in total). The "rule of three" for bougie dilation has been accepted but not formally studied for safety. The initial dilator is selected based on the stricture diameter. This is estimated to be about the same size as the lumen of the stricture, or not more than 1–2 mm larger than the lumen. Sequential dilation is then performed.

The AGA described the endoscopic therapy for GERD and concluded that radiofrequency ablation is generally effective for the treatment of GERD [26].

Endoscopic fundoplication is also successfully performed in many institutes [27]. Transoral incisionless fundoplication (TIF) with the EsophyX TM device is effective for creating a continent gastroesophageal valve and obtaining good functional results, as measured by pH impedance in patients with gastroesophageal reflux disease (GERD). TIF significantly improved both atypical and typical symptoms in patients: the corresponding GERD health-related quality of life (HRQL) and reflux symptom index (RSI) score was reduced by 50% or more compared to baseline on proton pump inhibitors (PPIs).

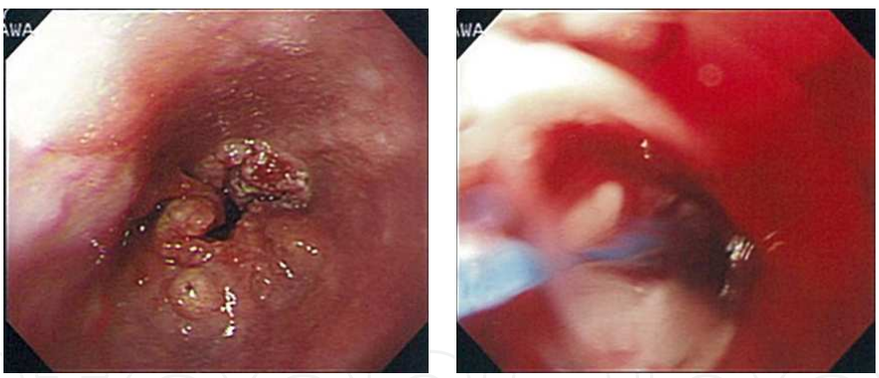
Several reports confirmed the beneficial effect of intralesionally administered corticosteroids or triamcinolone in benign esophageal strictures of different etiologies [6].

3.3. Lower esophageal mucosal ring

Large-bore endoscopic dilation or bougienage (15 mm/45 Fr or larger) is the mainstay therapy for both upper and lower esophageal lesions. The AGA recommends progressive dilatation to 45–60 F using mercury or polyvinyl bougies or balloons [3]. This procedure is frequently performed with either Savary or Maloney dilators, though balloon dilation has also been reported. The ASGE pointed out that dilation with a single large (16–20 mm) dilator leads to rupture of the Schatzki ring and symptomatic relief in almost all patients. Electrocautery incision with a needle-knife papillotome and four-quadrant biopsies of the ring has been performed together with dilation as adjunctive methods.

3.4. Head and neck and esophageal tumors: extrinsic compression

Bougie dilation and balloon dilation are both unavailable for malignant tumors of the esophagus and head and neck, as dilation is considered a high-risk procedure for adverse bleeding and perforation events. Endoscopic dilation is performed temporarily for nutritional support in patients who are to undergo tumor resections. Figure 3A,B showed the typical esophageal advanced cancer and endoscopic balloon dilation for its stricture.



(a) Esophageal advanced cancer (b) Pneumatic balloon dilation

Figure 3. Endoscopic balloon dilation for esophageal cancer

Self-expanding metal stents (SEMS) are a well-established palliation modality for dysphagia in patients with tumors of the esophagus and head and neck [28]. Stenting is also temporarily effective for extrinsic compression. Health-related quality of life (HRQoL) is becoming a major issue in the evaluation of any therapeutic or palliative intervention.

3.5. Eosinophilic esophagitis and infection

Pharmacological, endoscopic, and dietary interventions are used as treatment modalities for patients with eosinophilic esophagitis (EE), either singly or in combination.

For endoscopic dilatation, the balloon is positioned across the gastro-esophageal junction and inflated to the smallest diameter. The endoscopist grasps the catheter to assess the tension during pull through and then slowly withdraws the endoscope to the proximal esophagus. The procedure is repeated using a sequentially larger diameter balloon until adequate dilation is achieved [3,14].

3.6. Postradiation stricture

Several sessions of bougie dilation may be necessary for adequate treatment for radiation-induced strictures because most strictures are complex. The ASGE report summarizes a combined antegrade–retrograde rendezvous approach described in case reports and case series for the management of severe radiation-induced strictures with complete occlusion of the proximal esophagus. After dilation, the endoscopist performing this technique passes a standard endoscope or small-caliber endoscope through the stomach into the esophagus via an existing gastrostromy tract.

3.7. Achalasia

Esophageal dilation for achalasia involves forceful disruption of the lower esophageal sphincter. This is usually accomplished with 30- to 40-mm-diameter pneumatic balloon dilators. Dilation is generally performed over a wire under fluoroscopic guidance, although nonfluoroscopically guided dilation using endoscopic visualization alone has been reported.

POEM is a new endoscopic procedure used for the treatment of achalasia [29]. This novel endoscopic esophagomyotomy method was first reported by Pasricha et al. in porcine models and then by Inoue et al. in humans. POEM is performed by dissection and division of the inner circular muscle layer of the esophagus through a submucosal tunnel created endoscopically by a small proximal opening of the esophageal mucosa. A study evaluating the role of POEM reported a significant improvement in dysphagia scores.

A further option is endoscopic botulinum toxin injection into the lower esophageal sphincter. This technique offers good short-term results.

Ham et al. identified the currently available biodegradable stents for benign esophageal strictures [30]. This technique will also be available for the treatment of achalasia.

3.8. Postesophagectomy anastomotic strictures

Anastomotic strictures have been reported in 9–48% of patients after esophagectomy for esophageal cancer. The strictures are diagnosed in patients with dysphagia in whom a standard flexible esophagoscope cannot be passed across the anastomosis. Both bougie and balloon dilation have been used for the treatment of anastomotic strictures with success rates of up to 93%. In Figure 4A,B showed the typical anastomotic stricture and endoscopic balloon dilation for it. There is a high recurrence rate, however, and patients often require frequent sessions.

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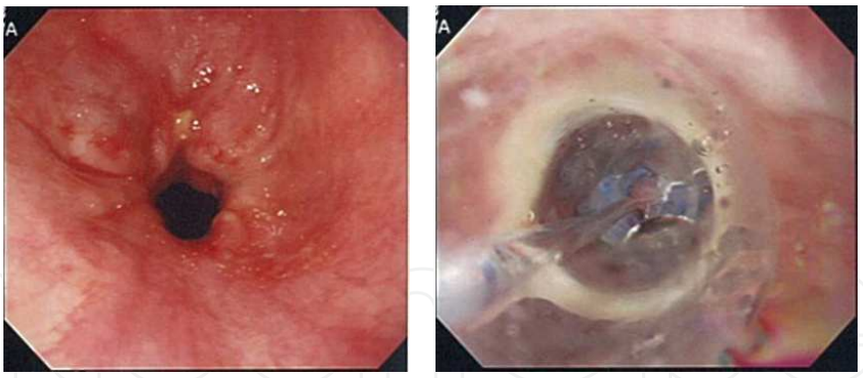

(a) Anastomotic stricture (b) Pneumatic balloon dilation

Figure 4. Endoscopic balloon dilation for Anastomotic stricture

4. Conclusion

This chapter is based on the ASGE guidelines and recommendations by AGA. Endoscopy is more sensitive than radiology for identifying subtle mucosal lesions of the esophagus such as mild esophagitis caused by gastroesophageal reflux or infection. A cost analysis also showed that EGD with therapeutic intent is more cost effective than an initial diagnostic approach with barium swallow in patients with histories suggestive of benign or malignant esophageal obstruction.

Various endoscopic treatments are useful for diseases with dysphagia and minimally invasive compared to surgical procedures.

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