

PREFACE

In general, primary care providers, family practitioners, and gastroenterologists have a limited knowledge of abdominal surgical operations, the medical aspects of these surgical procedures, and their immediate and late complications. In addition, these patients traditionally are not followed up by the surgeons, and thus the internist must become familiar with postsurgical problems in order to provide appropriate long-term care. A clear understanding of the concepts that underlie the surgery is crucial for proper management of these patients.

In addition, within the last 10 years, laparoscopic surgery has become increasingly commonplace, with new laparoscopic procedures being developed at a rapid pace. There are vast differences between traditional and laparoscopic surgery, not only in the way these procedures are performed, but also in their outcomes and complications. Many internists, as well as surgeons, have very limited understanding of these procedures. Therefore, the need exists for a book that can provide useful clinical information in an easy to access format, covering a variety of abdominal surgical procedures.

Almost all surgical books provide great detail about the technical aspects of surgical procedures and their surgical complications. However, the physician who needs to manage the patient who has undergone gastrointestinal (GI) surgery, currently must go through surgical texts to find the disease, and then the type of surgery the patient has undergone, wading through pages of details about the surgical procedure, without dealing with the issues relevant to the medical management of the patient. Thus, it is currently difficult for the nonsurgically trained physician to extract the relevant medical information. *An Internist's Illustrated Guide to Gastrointestinal Surgery* is a comprehensive textbook describing all of the surgical and laparoscopic procedures for the GI tract in a simple way, with artistic illustrations to educate the physician about surgery of the GI tract, and to provide not only clear descriptions of the changes in the anatomy and physiology, but also advice on medical management of the postsurgical patient.

An Internist's Illustrated Guide to Gastrointestinal Surgery describes in detail the indications, contraindications, anatomical alterations, and physiological alterations that result from various GI operations and procedures. Comparison between alternative operations, complications, medical management issues, and costs of these surgical procedures and operations are discussed. Clear, detailed, artist-rendered illustrations of the anatomy before and after surgery are included and, where appropriate, radiological images before and after surgery.

This is a unique textbook, written primarily for primary care physicians, general internists, and gastroenterologists to educate them about those aspects of GI surgery—including laparoscopic surgery—that are pertinent to an internist. It should also be a suitable textbook for medical students, residents, nurses and nurse practitioners, nutritionists, dietitians, and various subspecialists, who often take care of postsurgical patients.

The editors are indebted to the invaluable assistance of Jocelynn Albert. This project would not have been possible without her dedication and organizational skills.

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Zenker's Diverticulum

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INTRODUCTION

The Zenker's diverticulum is an out pouching of the hypopharynx arising between the fibers of the cricopharyngeus inferiorly and the inferior constrictor superiorly. This region of herniation is known as Killian's triangle. Patients often present with a longstanding history of gradually increasing dysphagia of both solids and liquids. Regurgitation of undigested food hours after a meal is a classic presentation. In addition, patients often complain of hoarseness, choking episodes, halitosis, and in severe cases, may have significant weight loss to the point of cachexia. Patients may also present with recurrent pneumonia.

Friederich von Zenker described the diverticulum and assigned his name in 1877 (1). The pathophysiology of the Zenker's diverticulum is thought to be chronic spasm or stricture of the cricopharyngeus muscle. Distal obstruction of the hypopharynx gradually causes proximal dilatation and eventual herniation. As time progresses, the herniation becomes large enough to produce a false passage to a blind sac (Fig. 1A,B). The same spasm or stricture that caused the initial herniation tends to divert ingested boluses into the sac and prevent transit into the esophagus (2).

There has been controversy over the years regarding the surgical treatment of this condition. Opinions have differed regarding the need for excision of the pouch and/or lysis of the cricopharyngeus muscle. Lysis of the muscle has been determined as the essential step in the treatment of the disorder and has prompted several treatment options ranging from chemo-denervation of the muscle to surgical lysis via either endoscopic or open approach.

From: *Clinical Gastroenterology: An Internist's Illustrated Guide to Gastrointestinal Surgery*
Edited by: George Y. Wu, Khalid Aziz, and Giles F. Whalen © Humana Press Inc., Totowa, NJ

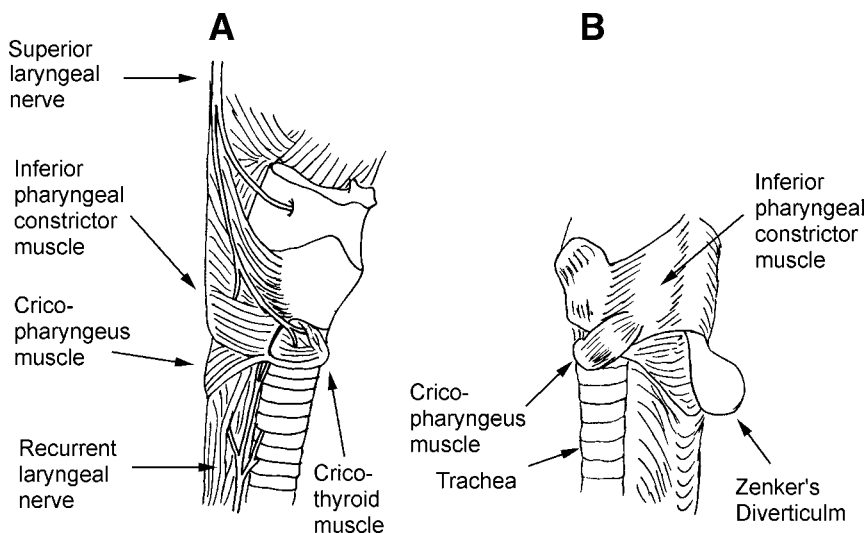


Fig. 1. (A) Normal anatomy. (B) Anatomical relationships of Zenker's diverticulum.

EVALUATION

Dysphagia is the presenting symptom for a large number of ailments of the upper aerodigestive tract. Diligent history taking and examination are required to elicit the correct diagnosis. Tumors of the hypopharynx, larynx, and esophagus may present with a similar spectrum of symptoms. Careful history-taking regarding the exact nature of symptoms, associated symptoms, comorbid conditions, and risk factors for carcinoma are vital. A thorough examination including indirect visualization of the oropharynx, hypopharynx, and larynx is needed to evaluate anatomy, as well as pathology. Pooling of secretions may be noted in the postcricoid region. A subtle fullness of the neck may be appreciated on palpation.

If no pathology is noted on physical exam, a barium esophagram is usually extremely helpful in determining the degree and area of obstruction. With Zenker's diverticulum there is often a blind pouch that fills with contrast (Fig. 2). Often there are filling defects within the pouch, which correlate with retained food particles. There is often a "cricopharyngeal bar" seen on the lateral view of the swallow, which is present as a result of persistent spasm of the cricopharyngeus (CP). Contrast will pass through the spasm and into the esophagus in variable amounts. One must be vigilant for other causes of obstruction and look for irregularities of the mucosa and filling defects. Computed tomography (CT) scan with contrast can help to rule out other causes of obstruction and can demonstrate the Zenker's as an air-filled sac.

TREATMENT

Pharmacological treatment of the CP muscle is now available for patients with significant CP spasm. Botulinum toxin, which when injected locally prevents release of acetylcholine from muscle nerve endings, has been successfully used to treat dystonia of the neck, face, and larynx. Injection into the CP muscle via transcutaneous route (done in an office setting) utilizing electromyogram (EMG) guidance or via direct esophagoscopy



Fig. 2. A barium swallow showing a Zenker's diverticulum filled with contrast.

in the operating room (OR) can provide temporary relief of CP spasm (3,4). The procedure is well tolerated and has a low complication rate, which can include recurrent laryngeal nerve palsy, infection, and local bleeding, all of which are usually minor and self-limited. Botulinum injection, if successful, will usually sustain an effect for a 4–14-mo period. Reinjection is then necessary when symptoms recur. If the diverticular sac is large, treatment of the muscle alone may not be adequate to relieve the symptoms and the sac itself may need to be addressed either by suspension or excision.

Open surgical management of a Zenker's diverticulum is directed toward elimination of symptoms by transecting the stenotic cricopharyngeus muscle. Variations on the procedure include CP myotomy alone, CP myotomy with resection of the sac, or suspension of the sac. Elderly patients with significant comorbidities who are poor surgical candidates may be able to get relief from the symptoms with cricopharyngeal lysis alone. Some authors have recommended lysis of the CP muscle with suspension of the sac without excision (no mucosal incision). The open procedure allows for excellent visualization of the pathology and lysis of the CP muscle. The procedure does require an incision, can be time-consuming, and often requires retraction on the great vessels of the neck. Tension of the recurrent laryngeal nerve can cause vocal fold dysfunction, which can be permanent. Patients can also develop wound infections, hematomas, esophageal

fistulae, and leaks at the site of the sac excision (5). Drains are typically placed postoperatively and removed when drainage is minimal. Barium swallow is often carried out prior to feeding the patient to assure the wound has closed.

In an attempt to decrease morbidity of treatment, as well as decrease operative and recovery time, direct endoscopic visualization and lysis of the cricopharyngeus was explored. Mosher first described endoscopic treatment of Zenker's diverticulum in 1917, but the first large series describing outcomes was put forth by Dohlman and Mattson (6). The procedure is now often referred to as the Dohlman procedure. The procedure has the advantages of no external incisions, generally shorter OR time, as well as generally shorter recovery time. The procedure does require general anesthesia and does have its own set of complications associated with it. Results of the Dohlman procedure in his series were excellent. They reported 90% improvement, and only a 7% incidence of residual sac. In this series, the esophagus and the party wall were divided by electrocautery. Modifications to this procedure have included section of the party wall with lasers, as well as a technique using a stapling device similar to that used in lung resections (7). Use of the stapler has the advantage of sealing the cut mucosa. Patients tend to recover more quickly and often can start a liquid diet on the day of surgery. Patients can be discharged home the next day if the postoperative course is uneventful.

Success of the endoscopic procedure is largely reliant on adequate visualization and access to the involved structure. The procedure is done through the open mouth and the patient's anatomy must be amenable to this type of exposure to ensure a successful outcome. Adequate visualization can be limited by patient anatomy including presence of teeth, a large neck, macroglossia, an anteriorly situated larynx, and redundant hypopharyngeal tissue. If adequate visualization is not possible, an attempt at endoscopic repair should be aborted and the open procedure performed. Preoperative counseling and informed consent should reflect this algorithm. The incidence of complications with the procedure increases significantly if visualization is difficult. Patients with cervical spine disorders or TMJ joint problems may not be suitable for the endoscopic approach.

PROCEDURE

A bivalve laryngoscope or specially designed upper esophagoscope is placed into the oral cavity and gently advanced into the oropharynx. Once the postcricoid region is in view, the scope is suspended. The jaws of the scope are then opened with the anterior part of the scope in the proximal esophagus and the posterior part of the scope in the diverticulum. This exposes the party wall. Once the true and false lumens have been sufficiently opened, the party wall must be secured and retracted toward the surgeon to allow for proper placement and firing of the stapler. This is usually accomplished by endoscopically passing one or two retracting sutures with an endoscopic needle passer. Once this accomplished, the stapler is carefully passed through the laryngoscope so that one jaw sits in the true lumen and one in the false lumen. When the location is confirmed, the stapler is fired in the standard fashion and then withdrawn. The resulting wound is then carefully examined and inspected to see that the staple lines are intact. Repeat stapling is sometimes required for larger diverticula. The distal end of the jaws of the stapler do not cut or staple and, as a result, the distal-most sac is often intact. This does not seem to cause a problem as long as 1 cm or less remains. Some surgeons

advocate lysis of the distal-most sac with bovie or laser following stapling. Once adequate lysis of the party wall has taken place, the stapler and then the scope are removed. Patients are watched carefully postoperatively and broad-spectrum antibiotics are continued. The patient is maintained on iv fluids and is kept strictly NPO. Particular attention is paid to temperature, respiratory rate, and pulse. The neck and superior chest are carefully monitored for erythema or tenderness, which could suggest a leak. Any of the above signs or symptoms warrants aggressive management with imaging studies to rule out a leak and appropriate management of a leak if it is found. If the postoperative period is uneventful, the patient is started on a liquid diet postoperative day 2 or 3. The diet is usually advanced as tolerated and the patient discharged shortly thereafter if a diet is tolerated. Some surgeons obtain a barium swallow prior to initiating oral intake regardless of postoperative course. Patients should be treated for reflux with a proton pump inhibitor as acid reflux onto freshly cut tissues may result in excessive scar formation (7).

COMPLICATIONS

Acute minor complications can include damage to teeth or alveolar ridge, scrapes of the oral mucosa, and pressure on the tongue causing transient pain or numbness. These problems usually resolve with conservative management and observation. An avulsed tooth may necessitate a dental consult. Recurrent laryngeal nerve dysfunction has been reported and is likely as result of pressure from the laryngoscope (8).

More severe complications include lacerations of the pharyngeal mucosa by the scope, mediastinitis from a leak at the transection site, and anesthesia-related morbidity and mortality. A large perforation of the pharynx may be noted intraoperatively and may require conversion to an open procedure if there is concern of a significant leak. A leak resulting from the procedure may not be suspected until many hours postoperatively. Patients may complain of increasing neck pain, odynophagia, and chest pain. Temperature curves will trend upward and erythema may be noted on the neck and superior chest. A barium swallow may show extravasation of contrast from the pharyngeal lumen into the mediastinum. CT scan may be needed for diagnosis and to fully assess extent of spread. If a collection is seen in the mediastinum, it must be drained either via open techniques or with the assistance of interventional radiology. The patient should be kept NPO and broad-spectrum antibiotics maintained. A feeding tube may need to be passed under fluoroscopic guidance to feed the patient. The mortality of this complication has been reported to be as high as 30% (9). Patients who have this complication may have persistent morbidity as a result of intense scarring including prolonged severe dysphagia requiring long-term nutritional support by feeding tube.

Chronic complications are rare. Recurrence of the diverticulum has been reported. This is thought to be caused by incomplete lysis of the pathologic cricopharyngeus muscle. Direct visualization of the muscle is not possible with the endoscopic approach and cricopharyngeal fibers may be preserved. This may lead to eventual relapse (10). Postoperative barium swallows have shown small residual pouches following the endoscopic procedure even in asymptomatic patients. Other long-term complications are exceedingly rare.

Long-term follow-up of patients undergoing the Dohlman procedure have been very promising. The majority of patients is satisfied with the result and can resume a nearly normal diet. Cook et al. reviewed a series of 74 patients. Sixty-eight of these patients

underwent endoscopic repair. Of these patients, 74% reported complete resolution of symptoms and 96% reported improvement. Average hospital stay was 1.3 d with only two patients staying in the hospital more than 1 d.

COST

The cost for the excision of a diverticulum is approx \$1500 (surgeon's fee) and the cost for Botox injection including esophagoscopy is approx \$1000.

SUMMARY

1. Zenker's diverticulum is an uncommon condition caused by out pouching of hypopharynx between cricopharyngeus muscle and inferior constrictor.
2. The exact etiology is unknown, but is thought to be caused by spasm or stricture of the cricopharyngeus muscle.
3. Several treatment options are available in the symptomatic patients. These include pharmacological therapy with botulinum toxin injection either transcutaneously or via esophagoscopy, endoscopic therapy, or open cricopharyngeus myotomy with or without resection of the hernia sac.
4. Surgical therapy is highly successful with very few immediate or late complications.

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