Esophageal motility disorders (EMDs) represent a diverse group of conditions that alter normal peristalsis and passage of food from the esophagus into the stomach. Symptoms most commonly include dysphagia and chest pain. Differentiation from other common conditions such as coronary artery disease, gastroesophageal reflux disease and malignancy may be difficult. Standard evaluation includes upper endoscopy, barium esophagram and high-resolution esophageal manometry. The best-characterized EMD is achalasia, which causes esophageal aperistalsis and a poorly relaxing lower esophageal sphincter (LES). Treatment of achalasia focuses on reducing the pressure of the LES to allow gravity to enable passage of food into the stomach. Pneumatic dilation and laparoscopic Heller myotomy (LHM) with fundoplication are the standard treatments for achalasia. Per-oral endoscopic myotomy (POEM) represents the newest endoscopic treatment for achalasia and early data suggests efficacy comparable to that of Heller myotomy.

INTRODUCTION

The esophagus serves as a conduit for passage of food from the mouth to the stomach. The upper and lower esophageal sphincter, which are located on the proximal and distal ends of the esophagus, regulate passage of food into and out of the esophagus. Under normal circumstances swallowing occurs in a coordinated, sequential fashion using the musculature of the esophageal wall. This process is called peristalsis. The lower esophageal sphincter maintains a baseline tone to prevent gastroesophageal reflux disease. When peristalsis propels food to the lower esophageal sphincter, the muscle relaxes to permit food to pass into the stomach before re-establishing its baseline tone. Esophageal motility disorders (EMDs) are rare disorders of esophageal peristalsis and the lower esophageal sphincter. Although sometimes asymptomatic, they are usually characterized by symptoms of dysphagia, chest pain, regurgitation, and if severe may manifest as weight loss, aspiration pneumonia and malnutrition. Primary EMDs are not associated with systemic diseases whereas secondary motility disorders accompany a systemic disease such as scleroderma or malignancy.
In this review, the epidemiology, pathophysiology and presentation of most common EMDs will be addressed. Achalasia is the most well-described disorder of the group and its features will be highlighted. Workup for these conditions includes upper endoscopy, barium esophagram and high-resolution esophageal manometry. Management including the role of medications, injection of medications, dilation, surgery and novel endoscopic treatments will be addressed. Due to the increasing diagnostic and treatment options of EMDs, a multidisciplinary approach is required and referral to gastroenterology or surgery is strongly recommended for further management of these disorders.

**Epidemiology**

Esophageal motility disorders are rare. Achalasia, the best characterized disorder in this group, occurs in 1-2 persons per 100,000 population. More common disorders include esophageal spasm or ineffective motility disorder and are poorly characterized and described. There are some recent data suggesting that these disorders – achalasia in particular – may be increasing in incidence. However, this is most likely due to the increased use of high-resolution manometry which improves characterization and diagnosis of these conditions. Due to the rare nature of these disorders, demographic information is poorly understood. Achalasia occurs most commonly during the 4th and 5th decade however it can occur in children and in patients exceeding 90 years of age.

**Pathogenesis**

Esophageal motility disorders are disorders of the muscle that lines the esophageal wall. In achalasia, the neurons of the myenteric plexus are destroyed by chronic inflammation which results in esophageal aperistalsis and poor relaxation of the lower esophageal sphincter (LES). Patients with spastic disorders of the esophagus however have a normal myenteric plexus. The etiology of these motility disorders may be due to fragmentation of vagal nerve endings and mitochondria, esophageal muscle hypertrophy and anxiety.

**Clinical Presentation**

The classic presenting symptoms for achalasia are dysphagia to solids greater than liquids which often occurs for many years prior to diagnosis. Patients often learn to accommodate the dysphagia by altering their diet or performing physical maneuvers that help improve swallowing. Dysphagia is often accompanied by effortless regurgitation of poorly digested food or fluid and is usually worse in the supine position or after eating large meals. Occasionally regurgitation can lead to aspiration pneumonia. With poor nutrition, weight loss is inevitable. Patients with achalasia or spastic motility disorders may complain of chest pain which may or may not worsen with swallowing. Chest pain is often incorrectly attributed to gastro-esophageal reflux disease (GERD) which is rare in these patients with increased lower esophageal sphincter pressure.

**Differential Diagnosis**

When middle-aged patients report chest pain as part of their symptom complex, coronary artery disease (CAD) and GERD must be initially considered. Difficulty distinguishing motility disorders from CAD is particularly difficult in patients who may have other risk factors for CAD such as diabetes, hypertension, tobacco use or family history. However, chest pain with esophageal motility disorders often accompanies food intake and is often sharp, non-radiating and rarely lasts for longer than a few minutes. This is in contrast to chest pain from angina which is often related to exercise and exertion and is a long lasting, crescendo, dull or heavy chest pain that may radiate to the jaw or left arm.

Patients with esophageal motility disorders are often incorrectly diagnosed with GERD and placed on anti-secretory therapy with H2 receptor antagonists or proton pump inhibitors. These medications usually provide no benefit for the reported symptoms which may be the first clue that
reflux of gastric acid is not a contributing factor to
the patient’s illness. Patients with a hypertensive
lower esophageal sphincter (i.e. achalasia) experience regurgitation rather than GERD and a
careful history can usually distinguish between
the two symptoms. Regurgitation is the effortless
return of liquid or poorly digested food from the esophagus proximally higher into the upper
esophagus or mouth. The contents do not have
gastric acid, therefore there is usually no reported
or burning sensation. GERD, on the other hand
requires a loose or intermittently relaxed lower
esophageal sphincter. The passage of gastric
contents into the esophagus usually is accompanied
by a burning sensation in the chest or mouth and
is usually well controlled with the addition of H2
blockers or PPIs.

Dysphagia and weight loss are common
symptoms of achalasia but also primary esophageal
or gastro-esophageal junction malignancy.
Gastroesophageal junction malignancy can cause
rapid weight loss and dysphagia and is termed
pseudo-achalasia. These symptoms may also
be seen in esophageal strictures, esophagitis,
esophageal ulceration or extrinsic compression
from a mediastinal mass.

Testing
Upper endoscopy (EGD) and esophagram are often
the first tests performed in patients with suspected
achalasia or EMDs. Patients with achalasia have
a nonperistaltic (atonic) esophagus which may be
dilated with retained fluid or food. The hypertonic
LES makes it difficult for ingested oral contrast or
an endoscope to pass into the stomach. Ingested
barium often produces the classic “bird’s beak”
appearance at gastroesophageal junction. Other
motility disorders such as esophageal spasm
or jackhammer esophagus usually demonstrate
random, haphazard esophageal contractions seen
on endoscopy or esophagram.

The most important test for the diagnosis of
esophageal motility disorders is high resolution
esophageal manometry (HRM). This test requires
passage of a soft flexible catheter through the
nose and into the upper stomach. The catheter has
pressure sensors every 1-2 cm. During HRM the
patient is asked to ingest about 10 liquid swallows.
Machine software generates topographs showing
time, length and pressure which are used to further
subclassify these disorders. The most commonly
used classification system is termed the Chicago
Classification version 3.0. In this classification,
disorders of esophagogastric junction (EGJ) outflow
obstruction are defined as having an elevated
integrated relaxation pressure (IRP) at the lower
esophageal sphincter and include the three subtypes
of achalasia and EGJ outflow obstruction (EGJO).0
Major motility disorders have normal IRPs and are
termed aperistalsis, distal esophageal spasm and
hypercontractile (Jackhammer) esophagus. Minor
disorders include ineffective esophageal motility
or fragmented peristalsis.

Treatment
Therapy for esophageal motility disorders focuses
initially on the status of the pressure in the lower
esophageal sphincter. If the pressure is elevated
then medical or surgical treatment aimed at
lowering this pressure is required. In the spastic
motility disorders (jackhammer esophagus, type
III achalasia, esophageal spasm), treatment may
also focus on relaxing the muscle of the esophageal
body.

Medications
Pharmacologic therapy to lower the esophageal
sphincter is currently limited to nitrates such as
isosorbide dinitrate and calcium channel blockers
like diltiazem or nifedipine. These medications
may lower pressure and improve swallowing in
some patients. However, adverse events such as
dizziness, orthostasis and hypotension limit their
use in this population. Noncardiac chest pain
in spastic esophageal disorders may respond to
treatment with tricyclic antidepressants (TCAs)
or selective serotonin reuptake inhibitors (SSRIs).
These medications may also often successfully treat
anxiety that often accompanies these disorders. The
lowest dose required to successfully treat the chest
pain is recommended.

Proton pump inhibitors (PPIs) and H2 receptor
antagonist have essentially no role in treating
esophageal motility disorders. Acid reflux does
not readily occur in patients with achalasia who
have a hypertensive lower esophageal sphincters.
Patients with EMDs and a normal LES pressure
(continued on page 23)
**Endoscopy**

Injection of botulinum toxin into a hypertensive LES or spastic esophageal body during upper endoscopy has been used for decades to treat esophageal motility disorders. Botulinum toxin is an inhibitor of acetylcholine release from neurons and when placed into the esophageal body or LES, it will lower the amplitude of contractions and sphincter pressure, respectively. Standard injection dose is 80-100 units in four quadrants about 1-2 cm above the LES. This leads to rapid improvement in about 80% of patients with achalasia. However, at 12 months following injection, only 40-50% of patients maintain response and require repeat injections to maintain efficacy. Therefore, treatment for a hypertensive LES (achalasia or EGJOO) with botulinum toxin in 2019 is reserved for diagnostic purposes or for patients averse to or high risk for laparoscopic surgery (e.g. elderly with extensive comorbidities). For spastic esophageal disorders, injection of 100 units of botulinum toxin into the mid- or distal esophagus may decrease chest pain but similarly requires repeat treatment in most patients for maintenance of response.

Endoscopic pneumatic dilation for achalasia or EGJOO utilizes balloons that measure 30mm, 35mm, or 40mm in diameter, which are larger than those used for dilation of typical esophageal strictures. During the procedure, the balloon is placed across the LES and inflation results in disruption of the muscles of the sphincter. Short term treatment is effective in 85-90% of patients. However, at 12 months, relief is seen in only 60-70% and repeat dilation is required for those who lose response. Complications of pneumatic dilation include chest pain in 10-15% and perforation at the gastroesophageal junction in 2-3% of patients. Perforation is usually managed conservatively with endoscopic closure or stenting.

**Surgery**

The standard surgical procedure for achalasia is laparoscopic Heller myotomy (LHM). This procedure creates a three-inch myotomy across the LES on the anterior lower esophageal and upper gastric wall. This myotomy is followed in most patients by a fundoplication to decrease the risk of GERD after the procedure. Multiple long-term studies demonstrate efficacy of LHM in 85-90% in most patients.

**Novel Treatments**

The newest endoscopic treatment for achalasia and related esophageal motility disorders is per-oral endoscopic myotomy (POEM). This procedure replicates the myotomy from LHM but without the fundoplication. The four steps with POEM involve: 1) mucosal incision of the esophageal wall; 2) creation of a submucosal tunnel to the upper stomach; 3) myotomy of the circular and/or longitudinal muscle from the distal esophagus to the upper stomach and 4) closure of the mucosal incision used to enter the esophageal wall. Case series have demonstrated relief of dysphagia equal to that of Heller myotomy but with shorter recovery times, lower cost, and decreased cardiopulmonary complications. GERD is seen more commonly with POEM, however since fundoplication is not performed after myotomy. Randomized trials comparing POEM with Heller myotomy are ongoing.

**CONCLUSION**

Under normal circumstances, esophageal peristalsis occurs in a coordinated, sequential fashion to propel food into the stomach. Esophageal motility disorders represent a diverse group of conditions that alter this peristalsis either in the esophageal body or lower esophageal sphincter. Symptoms most commonly include dysphagia and chest pain. Differentiation from other common conditions such as coronary artery disease, gastro-esophageal reflux disease and malignancy may be difficult. Standard workup includes upper endoscopy, barium esophagram and high resolution esophageal...
manometry. Treatment of achalasia focuses on reducing the pressure of the lower esophageal sphincter. Pneumatic dilation and laparoscopic Heller myotomy are the most commonly used treatments. Per oral endoscopic myotomy (POEM) represents the newest endoscopic treatment option and early data suggests efficacy comparable to that of Heller myotomy. Due to the increasing diagnostic and treatment options of EMDs, a multidisciplinary approach is required and referral to gastroenterology or surgery is recommended for further management of these disorders.

References