Hiatus hernia

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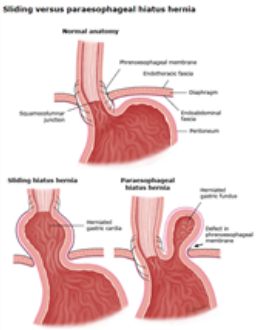
INTRODUCTION

Hiatus hernia is a frequent finding by both radiologists and gastroenterologists. This topic will review the classification, pathogenesis, clinical manifestations, diagnosis, and management of a hiatus hernia. The surgical management of paraesophageal hernia and the management of gastroesophageal reflux disease (GERD) are discussed separately. (See "Surgical management of paraesophageal hernia" and "Initial management of gastroesophageal reflux disease in adults" and "Approach to refractory gastroesophageal reflux symptoms in adults".)

CLASSIFICATION

Hiatus hernia refers to herniation of elements of the abdominal cavity through the esophageal hiatus of the diaphragm. Hiatus hernias are broadly divided into sliding and paraesophageal hernias (figure 1). The most comprehensive classification scheme recognizes four types of hiatus hernia.



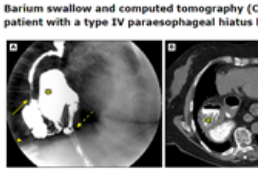
Sliding versus paraesophageal hiatus hernia

Figure 1 - larger image below

Type I: Sliding hernia — A type I or sliding hiatus hernia is characterized by the displacement of the esophagogastric junction (EGJ) above the diaphragm. The stomach remains in its usual longitudinal alignment, and the fundus remains below the EGJ.

Type II, III, IV: Paraesophageal hernias — A paraesophageal hernia is a true hernia with a hernia sac composed of peritoneum. It is characterized by an upward dislocation of the gastric fundus through a focal defect in the phrenoesophageal membrane [1].

- Type II hernias result from a localized defect in the phrenoesophageal membrane, where the gastric fundus serves as a lead point of herniation while the EGJ remains fixed to the preaortic fascia and the median arcuate ligament (figure 1) [2].
- Type III hernias have elements of both types I and II hernias and are characterized by both the EGJ and the fundus herniating through the hiatus. The fundus lies above the EGJ (image 1).
- Type IV hiatus hernias are associated with a large defect in the phrenoesophageal membrane and characterized by the inclusion of organs other than the stomach in the hernia sac (eg, colon, spleen, pancreas, or small intestine) (image 2).



EPIDEMIOLOGY

- **Type I (sliding)** – It is estimated that greater than 95 percent of hiatus hernias are type I (sliding). Estimates of prevalence of a type I hiatus hernia in the adult population in North America vary widely due to inconsistencies in the definition of small sliding hiatus hernias and the methodology used to detect them. Prevalence estimates for hiatus hernias are higher when diagnosed with endoscopy or a barium esophagram, compared with computed tomography (CT). Additionally, it can be difficult to distinguish a small sliding hiatus hernia from "physiological herniation" that occurs with swallowing.

Barium swallow and computed tomography (CT) scan in a patient with a type IV paraesophageal hiatus hernia

Image 2 - larger image below

- **Types II, III, and IV (paraesophageal)** – Approximately 5 percent are type II, III, or IV (paraesophageal) hernias. Of the paraesophageal hernias, more than 90 percent are type III. The least prevalent is type II.

- **Relation to age** – The prevalence of hiatus hernia increases with age [3]. In a population-based cohort in the United States, the prevalence of hiatus hernia as identified by CT increased from 2.4 percent in the sixth decade to 16.6 percent in the ninth decade [4]. Similarly, in an endoscopic series of 1260 patients, the reported prevalence was 14 percent in patients ages 18 to 39, 17 percent in those ages 40 to 49, 23 percent in those ages 50 to 59, 28 percent in those ages 60 to 69, 31 percent in those ages 70 to 79, and 42 percent in those ages >80 [5].

PATHOGENESIS

Although the etiology of most hiatus hernias is speculative, proposed mechanisms include age-related degeneration, obesity, trauma, congenital malformation, and iatrogenic factors [6].

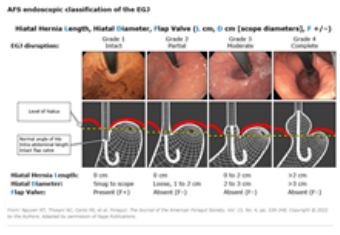
Anatomy and physiology of swallowing

- **Normal anatomy** – With normal esophagogastric junction anatomy, the esophagus inserts tangentially into the stomach approximately 2 cm distal to the diaphragmatic hiatus. The esophagus is held in that position by the phrenoesophageal membrane, an elastic structure formed by the fused endothoracic and endoabdominal fascia. The phrenoesophageal membrane inserts into the esophageal musculature close to the squamocolumnar junction, also known as the z-line.

- **Effects of swallowing** – During swallow-initiated peristalsis, the esophagus shortens, the phrenoesophageal membrane is stretched, and the squamocolumnar junction moves proximally. This is, in effect, "physiologic herniation" since the gastric cardia tents through the diaphragmatic hiatus with each swallow. Following each swallow, the elastic recoil of the phrenoesophageal membrane pulls the squamocolumnar junction back to its normal position. The globular structure seen radiographically that forms above the diaphragm and beneath the tubular esophagus during peristalsis is termed the phrenic ampulla. It is bounded from above by the distal esophagus and from below by the crural diaphragm (figure 2) [7]. Physiologically, the phrenic ampulla is the relaxed, effaced, and elongated lower esophageal sphincter (LES) [8].

- **Age-related degeneration** – The repetitive stress of swallowing, coupled with the episodic stresses of abdominal straining, vomiting, and belching, subject the phrenoesophageal membrane to substantial wear and tear and make it a plausible target of age-related degeneration.

Type I: Sliding hernia — Type I hiatus hernia results from progressive disruption of the esophagogastric junction (EGJ), first with proximal migration of the intra-abdominal length of the esophagus and progressive widening of the hiatus (figure 3) [9]. Widening of the muscular hiatus and circumferential laxity of the phrenoesophageal membrane allows a portion of the gastric cardia to herniate upward [9]. A sliding hernia does not have a hernia sac and slides into the chest since the EGJ is not fixed inside the abdomen. The phrenoesophageal membrane

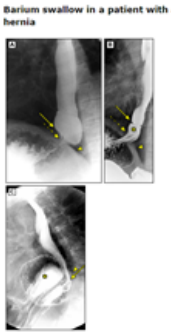


remains intact, albeit stretched, and the hernia is contained within the posterior mediastinum (figure 1 and image 3).

Type II, III, and IV: Paraesophageal hernias — Paraesophageal hernias are associated with abnormal laxity of the gastrosplenic and gastrocolic ligaments. These ligaments normally prevent displacement of the stomach. However, it is unclear whether their laxity causes or is an effect of the paraesophageal hernia. Type II, III, and IV (paraesophageal) hernias are also a recognized complication of surgical dissection of the hiatus as occurs during antireflux surgery, esophagomyotomy, or partial gastrectomy.

AFS endoscopic classification of the EGJ

Figure 3 - larger image below



Barium swallow in a patient with a hiatus hernia

Image 3 - larger image below

CLINICAL MANIFESTATIONS

Type I: Sliding hernia

- **Gastroesophageal reflux disease** – Type I hiatus hernias are often associated with reflux esophagitis [10] and/or symptoms of gastroesophageal reflux disease (GERD), the most common of which are heartburn, regurgitation, and dysphagia (see "Clinical manifestations and diagnosis of gastroesophageal reflux in adults", section on 'Clinical manifestations'). Endoscopic and radiographic studies suggest that 50 to 94 percent of patients with GERD have a type I hiatus hernia [11].

  The likelihood of GERD increases with anatomic compromise of the esophagogastric junction (EGJ) and hernia size. Normally, the EGJ limits the reflux of gastric contents, including gastric acid, into the esophagus. Type I hiatus hernias degrade the competence of the EGJ in preventing reflux and compromise esophageal acid clearance once reflux has occurred. (See "Pathophysiology of gastroesophageal reflux disease".)

- **Other complications** – Other complications rarely occur in patients with type I hiatus hernia and are usually related to reflux esophagitis (see "Complications of gastroesophageal reflux in adults"). However, large type I hernias can be associated with Cameron lesions, which are linear erosions at the level of the hiatus that can cause iron deficiency anemia [12].

Type II, III, and IV: Paraesophageal hernias

- **Common symptoms** – Patients with type II, III, and IV (paraesophageal) hernias can be asymptomatic or have only vague, intermittent symptoms [1]. The most common symptoms are epigastric or substernal pain, postprandial fullness, nausea, and retching. GERD symptoms are less prevalent than in individuals with a type I hernia.

- **Volvulus** – Gastric volvulus can occur with large paraesophageal hernias, causing dysphagia, postprandial pain, ischemia and, rarely, strangulation. As the hernia enlarges, the greater curvature of the stomach rolls up into the thorax. Because the stomach is fixed at the EGJ, the herniated stomach tends to rotate around its longitudinal axis, resulting in an organoaxial volvulus (figure 4) [13]. Infrequently, rotation occurs around the transverse axis, resulting in a mesenteroaxial volvulus. Over time, the entire stomach can eventually herniate, with the pylorus juxtaposed to the gastric cardia, forming an upside-down, intrathoracic stomach.

- **Bleeding** – Bleeding, although infrequent, occurs from gastric ulceration, gastritis, or erosions within the incarcerated hernia pouch.

- **Dyspnea** – Dyspnea can result from limited lung expansion when a large part of the stomach or other organs herniate through the hiatus.

Radiographic findings — In patients with paraesophageal hernias, an upright radiograph, computed tomography (CT) scan, or magnetic resonance imaging (MRI) of the chest may reveal a retrocardiac air-fluid level within a paraesophageal hernia or intrathoracic stomach (image 4). In type IV paraesophageal hernia, other organs within the hernia sac can be identified on CT or MRI of the chest (image 2).

DIAGNOSIS

When to suspect the diagnosis — Because hiatus hernias are often asymptomatic or present with nonspecific symptoms, they are usually diagnosed incidentally on upper endoscopy, imaging studies, or manometry done for other reasons. Additionally, we suspect a paraesophageal hernia in individuals with symptoms of epigastric or substernal pain or fullness, nausea, or vomiting and a history of surgical dissection of the hiatus (eg, antireflux procedures, esophagomyotomy, or partial gastrectomy). (See 'Radiographic findings' above and "Approach to the evaluation of dysphagia in adults", section on 'Symptom-based differential diagnosis' and "Clinical manifestations and diagnosis of gastroesophageal reflux in adults", section on 'Differential diagnosis'.)

Establishing the diagnosis — The diagnosis of hiatus hernia is typically established radiographically or by upper gastrointestinal endoscopy. However, small sliding hiatus hernias (<2 cm in axial span) can only be diagnosed with certainty during surgery [14].

Diagnostic approach

- **Initial diagnosis** – Most hiatus hernias are diagnosed incidentally as part of the diagnostic evaluation of upper gastrointestinal symptoms, such as heartburn, reflux, nausea and vomiting, or dysphagia. In these patients, hiatus hernias are typically not the "end diagnosis," and specific management is targeted to the symptoms that initiated the diagnostic evaluation. (See 'Management' below.)

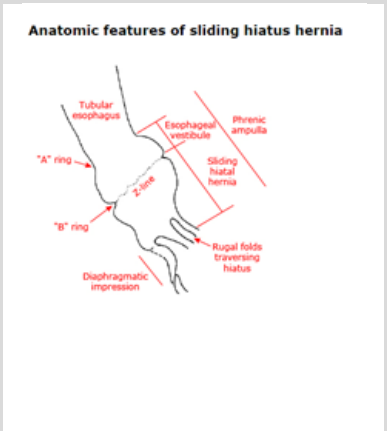
  Diagnostic tests that may reveal hiatus hernias include barium swallow, upper gastrointestinal endoscopy, and imaging of the chest or abdomen with computed tomography (CT), magnetic resonance imaging (MRI) or plain radiography. Specific features of these tests as they pertain to the diagnosis of hiatus hernia are discussed below. (See 'Specific tests' below.)

- **Patients with known paraesophageal hernia and new symptoms** – Individuals with known paraesophageal hernias may require additional work-up if they develop symptoms that suggest worsening herniation (eg, dyspnea) or hernia complications (eg, volvulus or strangulation). In this clinical scenario, we typically use barium swallow for initial testing, if available. In settings where barium swallow is not available, CT is an appropriate modality. In individuals with known paraesophageal hernia who develop symptoms or signs of upper gastrointestinal bleeding, we perform upper endoscopy.

Specific tests

Barium swallow — Barium swallow can diagnose sliding and paraesophageal hiatus hernias and determine the anatomy and size of the hernia, orientation of the stomach, and location of the esophagogastric junction (EGJ) (image 3).

- Sliding hiatus hernia – A barium swallow can diagnose sliding hiatus hernias that are larger than 2 cm in axial span. A sliding hiatus hernia is characterized by a greater than 2 cm separation between the mucosal B ring at the site of the squamocolumnar junction and the diaphragmatic hiatus (figure 2). If a B ring is not evident, demonstration of at least three rugal folds traversing the diaphragm is diagnostic of a sliding hiatus hernia (image 5). Barium swallow is unreliable for defining smaller sliding hiatus hernias because the EGJ is highly mobile, and a lack of standardization exists regarding the timing of hernia measurement during peristalsis.



- Paraesophageal hernia – A barium swallow is the most sensitive diagnostic test for types II and III paraesophageal hernias. Visualization of a portion of the gastric fundus herniating along the distal esophagus on barium swallow is diagnostic of a paraesophageal hernia (image 6).

Anatomic features of sliding hiatus hernia

Figure 2 - larger image below

Upper endoscopy — Upper endoscopy can diagnose sliding and paraesophageal hiatus hernias.

- Sliding hiatus hernia – To diagnose a sliding hiatus hernia, the endoscopist measures the hernia's axial length calculated as the degree of separation between the squamocolumnar junction and the diaphragmatic impression, from a retroflexed view (picture 1) [9].

- Paraesophageal hernia – In patients with a type II paraesophageal hernia, a retroflexed view shows a portion of the stomach herniating upward through the diaphragm adjacent to the endoscope. In patients with a type III paraesophageal hernia, a retroflexed view shows the EGJ above the diaphragm with a portion of the stomach herniating upward, adjacent to the esophagus.

Computed tomography — Large paraesophageal hernias are evident on CT scan as an intrathoracic stomach (image 4). With type IV paraesophageal hernia, CT images may also reveal additional organs, most commonly colon, within a hernia sac in the thoracic cavity (image 2).

High-resolution manometry — Esophageal manometry may be the most accurate modality for diagnosing hiatus hernia. On high-resolution manometry (HRM), spatial separation between the crural diaphragm (CD) contraction and lower esophageal sphincter (LES) indicates a sliding hiatus hernia [14,15]. HRM allows for prolonged observation that enables the identification of intermittent herniation (figure 5). Small sliding hiatus hernias with less than 2 cm separation between the LES and CD often reduce spontaneously during prolonged manometric recordings. (See "High resolution manometry", section on 'Anatomic sphincters'.)

An analysis comparing the accuracy of HRM, endoscopy, and barium radiography to surgery for detecting and sizing hiatus hernia [16] concluded that HRM, using the LES-CD separation metric, outperformed the other modalities with a sensitivity of 94 percent, specificity of 92 percent, and kappa (measure of interrater reliability) of 0.85. HRM attained both optimal sensitivity and specificity for detecting hiatus hernia, with a threshold LES–CD separation of 1.2 cm.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of hiatus hernia includes other etiologies of epigastric or substernal pain, dysphagia, heartburn, or regurgitation. These etiologies include esophagitis, esophageal motility disorders, functional dyspepsia, and coronary artery disease. Although an evaluation to exclude these diagnoses is not required to diagnose a hiatus hernia, it may be necessary in patients with refractory symptoms and is discussed separately. (See "Clinical manifestations and diagnosis of gastroesophageal reflux in adults", section on 'Evaluation in selected patients'.)

MANAGEMENT

Our approach to the management of hiatus hernia is shown in an algorithm (algorithm 1).

Sliding hiatus hernia

- **Asymptomatic** – Asymptomatic type 1 hiatus hernias do not require surgical repair.

- **Symptomatic** – The initial management of patients with a symptomatic sliding hiatus hernia consists of medical treatment of reflux esophagitis and/or reflux-like symptoms (see "Initial management of gastroesophageal reflux disease in adults"). Antireflux surgery is typically reserved for individuals with objectively documented gastroesophageal reflux disease (GERD)

(ie, reflux esophagitis or abnormal pH monitoring) who have refractory symptoms despite maximal medical therapy. (See "Surgical treatment of gastroesophageal reflux in adults", section on 'Indications'.)

Paraesophageal hernia

- **Importance of assessing for symptoms** – The first step in the management of patients with paraesophageal hernia is a careful assessment of the patient's symptoms. Because most symptoms of paraesophageal hernia are nonspecific, such as postprandial fullness or dyspnea, patients may not attribute them to the hernia. Patients may have also modified their behaviors (eg, eating smaller meals) to minimize or avoid symptoms. Persons with type IV hiatus hernia are rarely asymptomatic.

  We also counsel patients who are asymptomatic regarding the importance of monitoring for the development of new symptoms and informing clinicians if these occur.

- **Asymptomatic** – The optimal management of patients with truly asymptomatic paraesophageal hernias is controversial. Some experts [17], including the authors of this topic, prefer watchful waiting for most asymptomatic patients based on a lack of high-quality evidence that demonstrates the superiority of early surgical intervention [18]. Although mortality rates for elective surgical repair have decreased over past decades, and most procedures are laparoscopic, the natural history of patients with asymptomatic paraesophageal hernia is uncertain. Some estimates suggest that even in those with large (type III or IV) hiatus hernias, the likelihood of hernia-related death or complications requiring emergency surgery is less than five percent over five years, and many patients do not have a change in their clinical course in the short-term [19].

Other experts advocate elective surgical repair in healthy individuals with asymptomatic paraesophageal hernias, based in part on a decision analysis that found improved life expectancy with surgical repair compared with watchful waiting [20]. Persons who may be most likely to benefit include younger patients and those with large hernias. The rationale for early surgical intervention in patients with paraesophageal hernia is discussed separately. (See "Surgical management of paraesophageal hernia", section on 'Elective presentation'.)

- **Symptomatic** – Surgical repair is indicated in patients with a symptomatic paraesophageal hernia [21]. Emergent repair is required in patients with a gastric volvulus, uncontrolled bleeding, obstruction, strangulation, perforation, or respiratory compromise secondary to a paraesophageal hernia [1,21]. The indications for surgical repair, preoperative evaluation, and the technical aspects of surgical repair of paraesophageal hernias are discussed separately. (See "Surgical management of paraesophageal hernia".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Hiatal hernia".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Hiatal hernia (The Basics)" and "Patient education: Hiatal hernia – Discharge instructions (The Basics)")

SUMMARY AND RECOMMENDATIONS

- **Classification** – Hiatus hernia refers to herniation of elements of the abdominal cavity through the esophageal hiatus of the diaphragm. Hiatus hernias are broadly divided into sliding and paraesophageal hernias (figure 1). (See 'Classification' above.)
  - **Types I (sliding)** – A type I or sliding hiatus hernia is characterized by the displacement of the esophagogastric junction (EGJ) above the diaphragm. The stomach remains in its usual longitudinal alignment, and the fundus remains below the EGJ.
  - **Types II, III, and IV (paraesophageal)** – Type II, III, and IV hiatus hernias (paraesophageal hernias) are characterized by an upward dislocation of the gastric fundus.
- **Epidemiology** – Approximately 95 percent of all hiatus hernias are sliding, and 5 percent are paraesophageal. (See 'Epidemiology' above.)
- **Pathogenesis** – Although the pathogenesis of most hiatus hernias is speculative, age-related degeneration, obesity, trauma, congenital malformation, and iatrogenic factors have been implicated. A sliding hiatus hernia results from progressive disruption of the EGJ that allows a portion of the gastric cardia to herniate upward (figure 3). Paraesophageal hernias are a recognized complication of prior surgical dissection of the hiatus. (See 'Pathogenesis' above.)
- **Clinical features** – Type I hiatus hernias are often associated with symptoms of gastroesophageal reflux disease (GERD). Many individuals with paraesophageal hernias are asymptomatic or have vague upper gastrointestinal symptoms, such as epigastric pain or fullness, nausea, or vomiting. However, gastric volvulus can occur with large paraesophageal hernias, causing dysphagia, postprandial pain, ischemia and, rarely, strangulation. (See 'Clinical manifestations' above.)
- **Diagnosis** – Because hiatus hernias are often asymptomatic or present with nonspecific symptoms, they are usually diagnosed incidentally on upper endoscopy, manometry, or imaging studies done for other reasons. Sliding hiatus hernias larger than 2 cm in axial span can be diagnosed by barium swallow, endoscopy, computed tomography (CT), or esophageal manometry, but smaller sliding hernias are often only detected during surgery.

  Barium swallow is the most sensitive diagnostic test to detect type II or III paraesophageal hernias. With large paraesophageal hernias, CT scan or magnetic resonance imaging (MRI) of the chest may reveal an intrathoracic stomach (image 4 and image 2). (See 'Diagnosis' above.)
- **Management**
  - **Type I (sliding)** – Asymptomatic sliding hiatus hernias do not require repair (algorithm 1). Management of patients with a symptomatic sliding hiatus hernia consists of management of GERD, which is detailed elsewhere. (See 'Sliding hiatus hernia' above and "Initial management of gastroesophageal reflux disease in adults".)
  - **Types II, III, and IV (paraesophageal)** – The first step in the management of patients with paraesophageal hernia is a careful assessment of the patient's symptoms. Most symptoms of paraesophageal hernia are nonspecific, and patients may have also modified their behaviors to avoid them.

    We typically reserve surgical repair for paraesophageal hernias for symptomatic patients (algorithm 1). Emergent repair is required in patients with a gastric volvulus, uncontrolled bleeding, obstruction, strangulation, perforation, or respiratory compromise. The optimal management of patients with asymptomatic paraesophageal hernias is controversial, with some experts preferring watchful waiting and others advocating for surgical intervention. (See 'Paraesophageal hernia' above and "Surgical management of paraesophageal hernia".)

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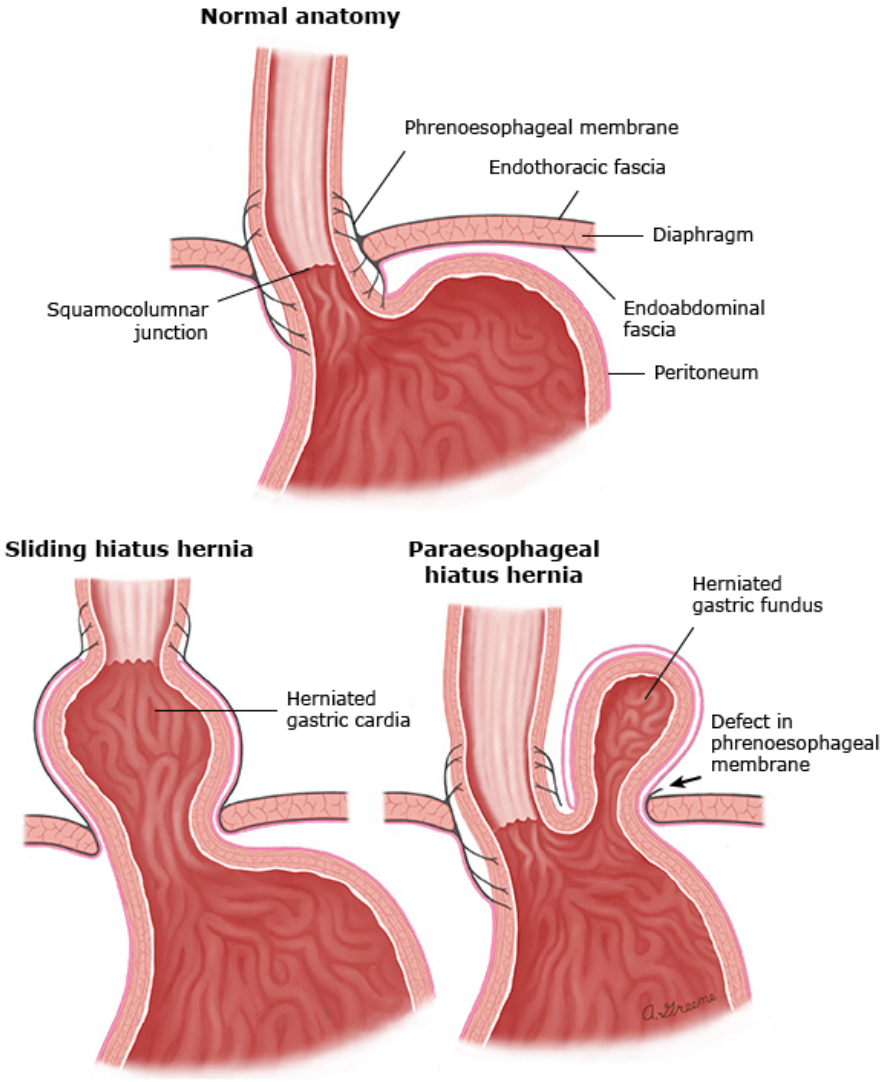
GRAPHICS

Figure 1: **Sliding versus paraesophageal hiatus hernia**



Distinction between a sliding hiatus hernia (type I) and paraesophageal hernia (type II). With type I hernia, the leading edge is the gastric cardia while with type II it is the gastric fundus. The squamocolumnar junction maintains its native position in the paraesophageal hernia while it is displaced upward with the sliding hernia.

SC: squamocolumnar.

Modified from:

1. Skinner DB. Hernias (hiatal, traumatic, and congenital). In: Gastroenterology, Berk JE (Ed), WB Saunders 1985.

2. Kahrilas PJ, Kim HC, Pandolfino JE. Approaches to the diagnosis and grading of hiatal hernia. Best Pract Res Clin Gastroenterol 2008; 22:601.

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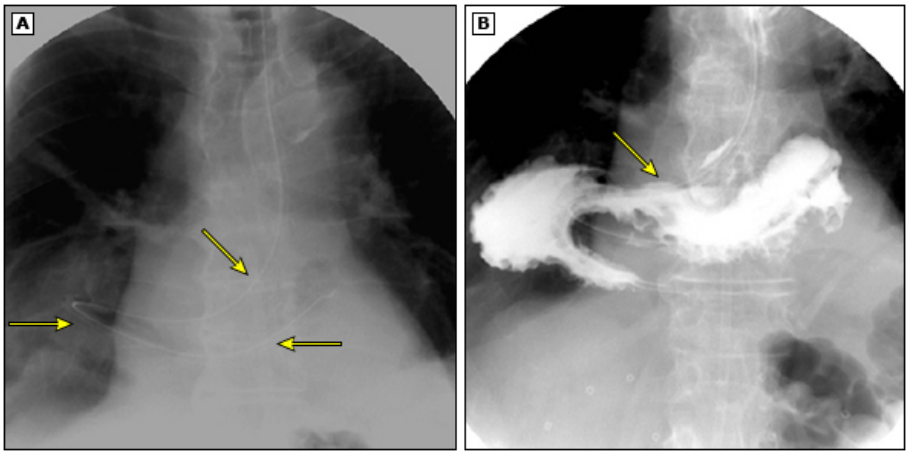
Image 1: **Barium swallow in a patient with a type III paraesophageal hernia**



(A) A chest x-ray prior to contrast administration shows the nasogastric tube coiled in the chest (arrows).
(B) Following barium administration through the nasogastric tube, the gastroesophageal junction and the entire stomach are noted within the chest.

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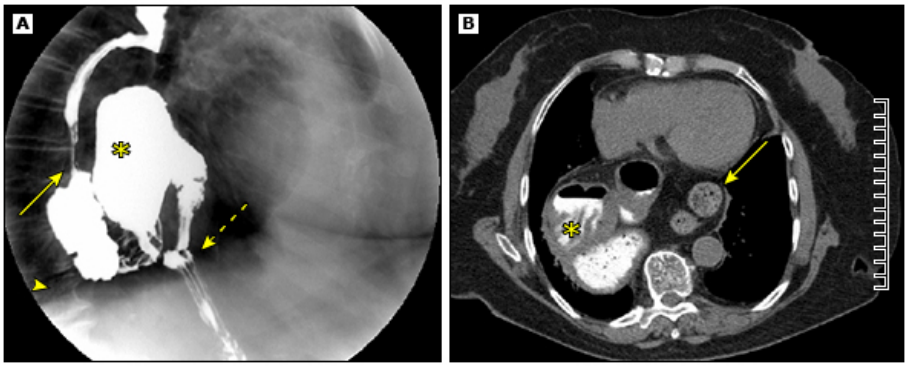
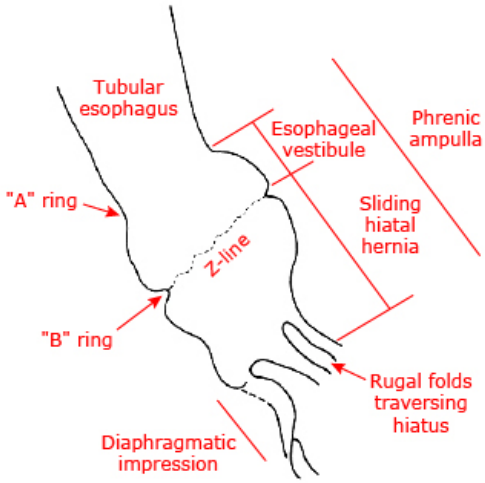
Image 2: **Barium swallow and computed tomography (CT) scan in a patient with a type IV paraesophageal hiatus hernia**



(A) A barium swallow showing the entire stomach within the chest (asterisk). The gastroesophageal junction (arrow) is above the diaphragm (arrowhead) and the first part of the duodenum (dashed arrow) is at the level of the diaphragm.
(B) A CT scan through the lower chest showing the herniated stomach (asterisk) and portions of the colon within the hernial sac in the chest (arrow).

Graphic 90300 Version 2.0

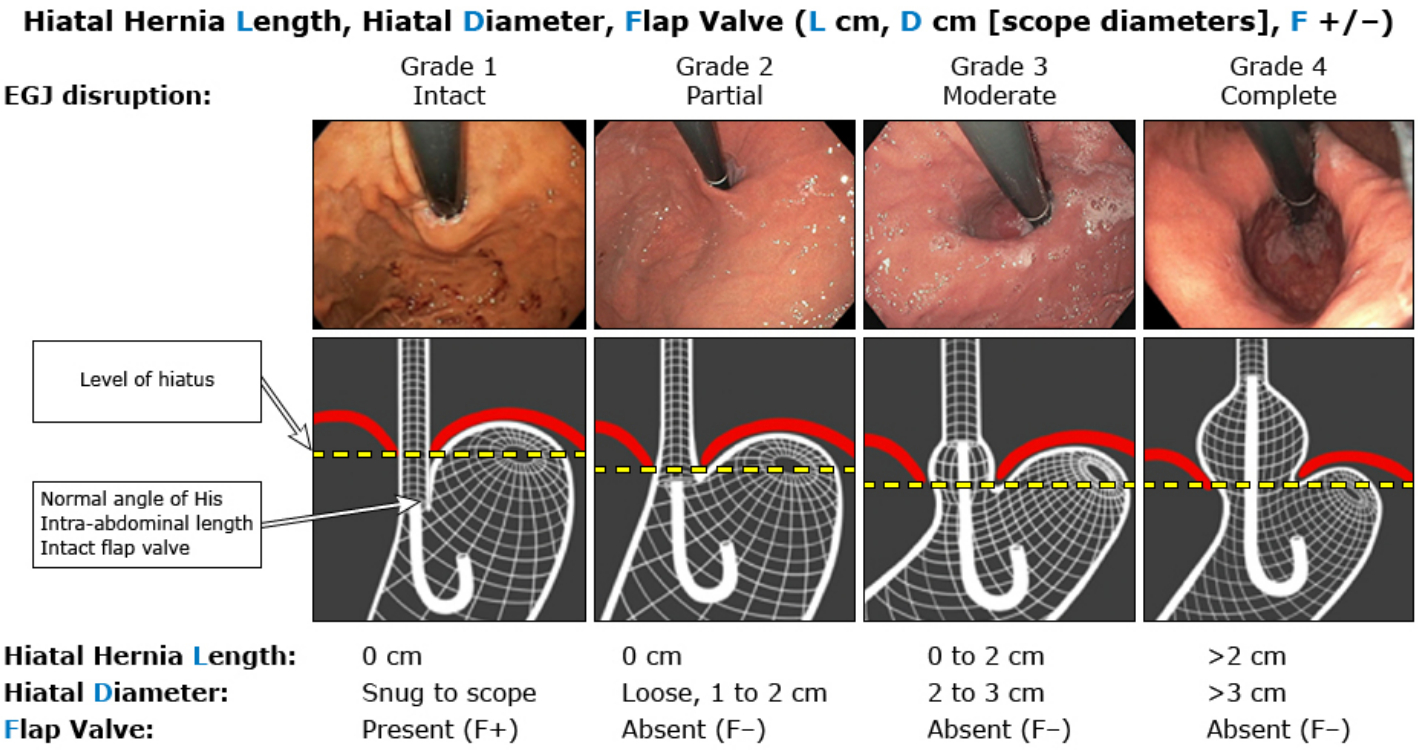
Figure 2: **Anatomic features of sliding hiatus hernia**



Representation of the anatomic features of a sliding hiatus hernia viewed radiographically during swallowing. The "A" ring is a muscular ring visible during swallowing which demarcates the superior margin of the lower esophageal sphincter. The "B" ring at the squamocolumnar junction is present in only about 15 percent of individuals; it permits accurate division of the phrenic ampulla into the esophageal vestibule (A ring to B ring) and the sliding hiatus hernia (B ring to the subdiaphragmatic stomach). Rugal folds traversing the hiatus support the conviction that a portion of the stomach is supradiaphragmatic.

Graphic 72582 Version 4.0

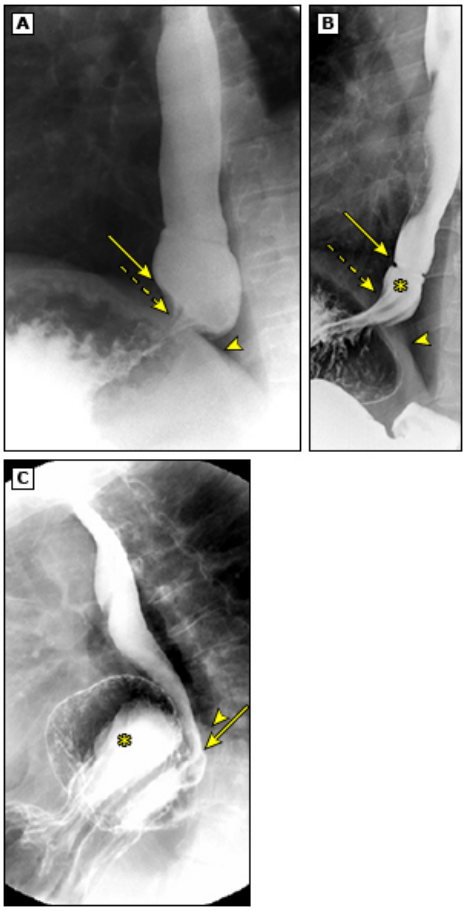
Figure 3: **AFS endoscopic classification of the EGJ**



From: Nguyen NT, Thosani NC, Canto MI, et al. Foregut: The Journal of the American Foregut Society, Vol. 15, No. 4, pp. 339-348. Copyright © 2022 by the Authors. Adapted by permission of Sage Publications.

Graphic 140578 Version 6.0

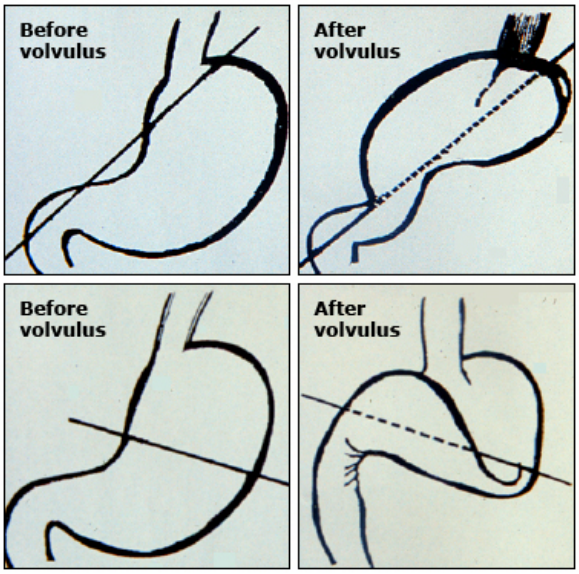
Image 3: **Barium swallow in a patient with a hiatus hernia**



(A) Normal barium swallow showing the gastroesophageal junction (arrow) is at the level of the diaphragm (arrowhead) and the gastric folds (dashed arrow) are at the same level as the diaphragm.
(B) Barium swallow showing a sliding hiatus hernia (asterisk). The gastroesophageal junction (arrow) is above the diaphragm (arrowhead) and the gastric folds (dashed arrow) are above the diaphragm.
(C) Barium swallow showing a paraesophageal hernia (asterisk). The gastroesophageal junction (arrow) is below the diaphragm (arrowhead).

Graphic 90296 Version 2.0

Figure 4: **Volvulus in hiatus hernia**

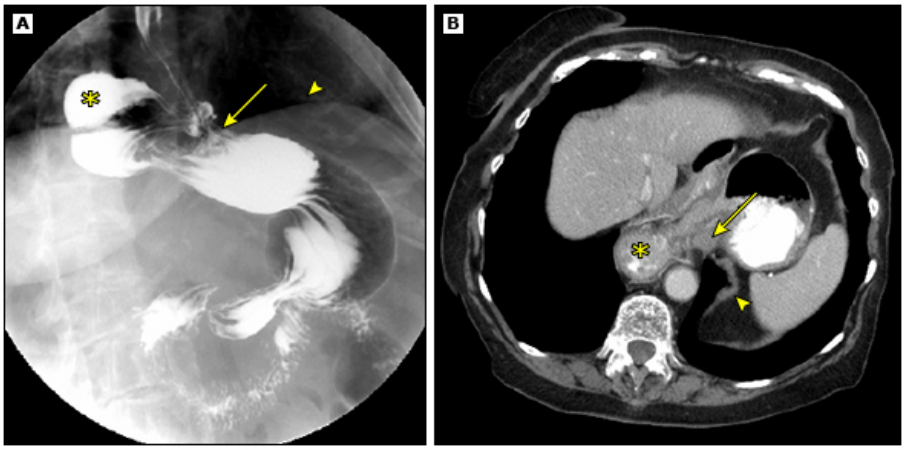


Paraesophageal hernias are associated with abnormal laxity of structures normally preventing displacement of the stomach, the gastrosplenic and gastrocolic ligaments. As the hernia enlarges, the greater curvature of the stomach rolls up into the thorax. Because the stomach is fixed at the gastroesophageal junction, the herniated stomach tends to rotate around its longitudinal axis, resulting in an organoaxial volvulus (top panels); infrequently, rotation occurs around the transverse axis resulting in a mesenteroaxial volvulus (bottom panels).

Adapted from: Peridikis G, Hinder RA. Paraesophageal hiatal hernia. In: Hernia, Nyhus LM, Condon RE (Eds), JB Lippincott, Philadelphia 1995. p.544.

Graphic 73205 Version 4.0

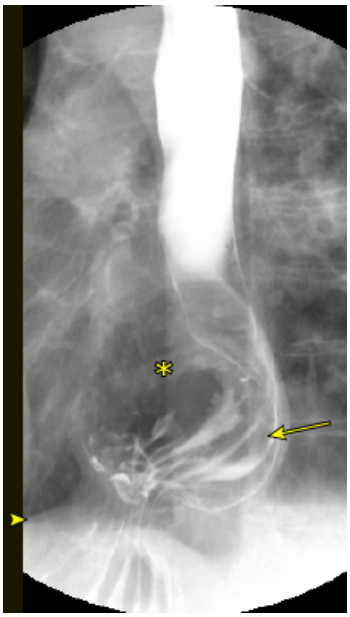
Image 4: **Barium swallow and computed tomography (CT) scan in a patient with a paraesophageal hernia**



(A) A barium swallow showing a paraesophageal hernia (asterisk). The gastroesophageal junction (arrow) is at the level of the diaphragm (arrowhead).
(B) An axial CT scan through the lower chest showing the region of the gastroesophageal junction (arrow) at the level of the diaphragm (arrowhead) with a paraesophageal hernia (asterisk).

Graphic 90298 Version 2.0

Image 5: **Barium swallow in a patient with a sliding hiatus hernia**



A barium swallow shows a moderate sized sliding hiatus hernia (asterisk) above the diaphragm (arrowhead), with well-defined gastric folds (arrow).

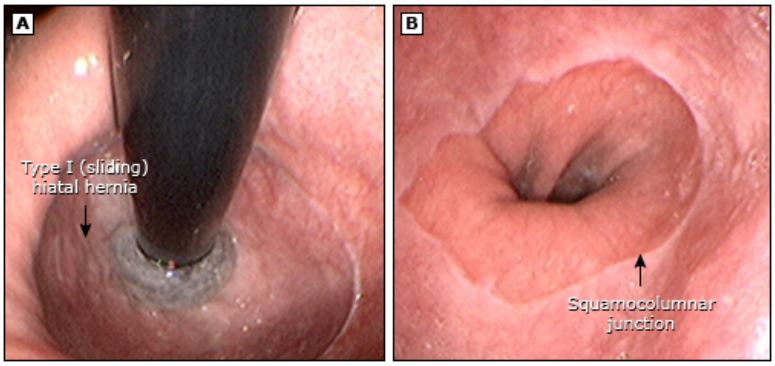
Graphic 90297 Version 2.0

Image 6: **Barium swallow of a large paraesophageal hernia**

Barium swallow of a paraesophageal hernia. Note that as the herniated stomach enlarges, it inverts and twists causing a volvulus. In the extreme, this results in an upside-down stomach. The esophagus is not seen in this image, but if the gastroesophageal junction is at the level of the diaphragm, this would be a type II (paraesophageal) hernia. More commonly, it is above the diaphragm, which makes it a type III (paraesophageal) hernia.

Graphic 93824 Version 1.0

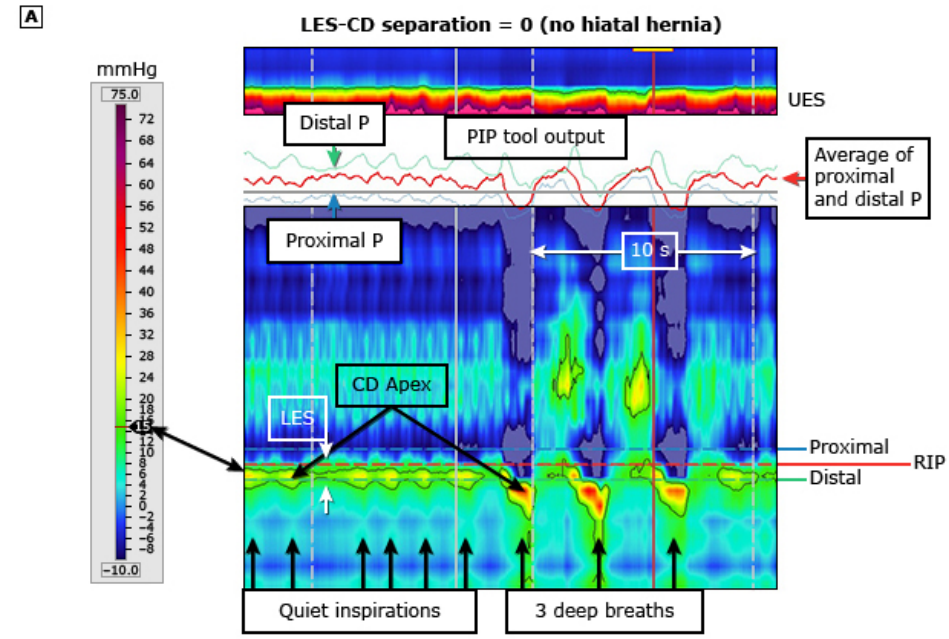
Picture 1: **Endoscopic image of a type I sliding hiatus hernia**

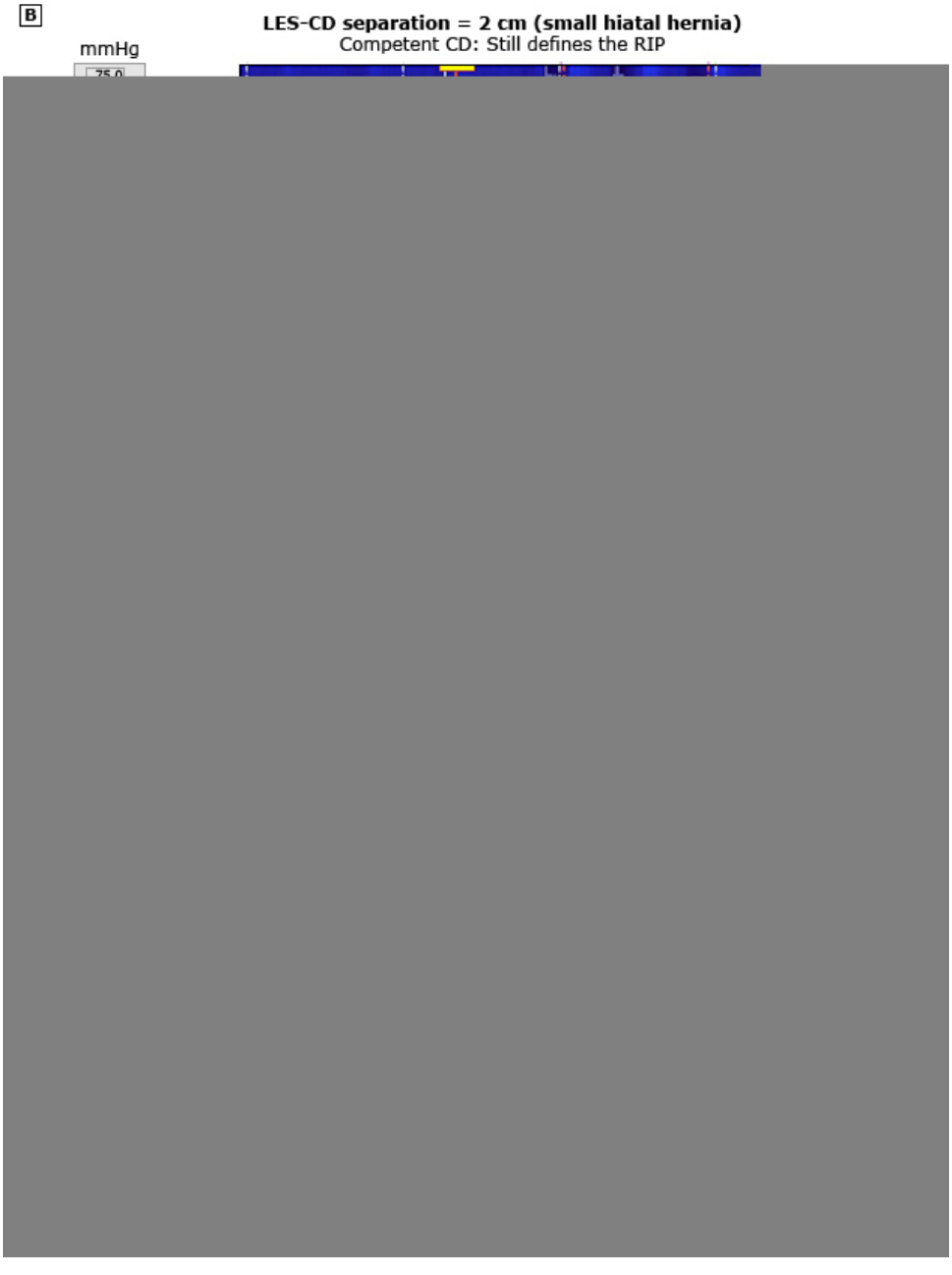


Retroflexed (A) and forward-looking (B) endoscopic views of a sliding (type I) hiatus hernia. The squamocolumnar junction (SCJ) marks the distal limit of the esophageal epithelium. Distal to the SCJ is the constriction of the diaphragmatic hiatus.

Graphic 93823 Version 1.0

Figure 5: **High Resolution Manometry (HRM) recording of esophagogastric junction (EGJ) pressure**


A
LES-CD separation = 0 (no hiatal hernia)
mmHg
75.0
72
68
64
60
56
52
48
44
40
36
32
28
24
20
18
15
12
10
8
6
4
2
0
-2
-4
-6
-8
-10.0
Distal P
PIP tool output
UES
Average of proximal and distal P
Proximal P
10 s
CD Apex
LES
Proximal
RIP
Distal
Quiet inspirations
3 deep breaths


B
LES-CD separation = 2 cm (small hiatal hernia)
Competent CD: Still defines the RIP
mmHg

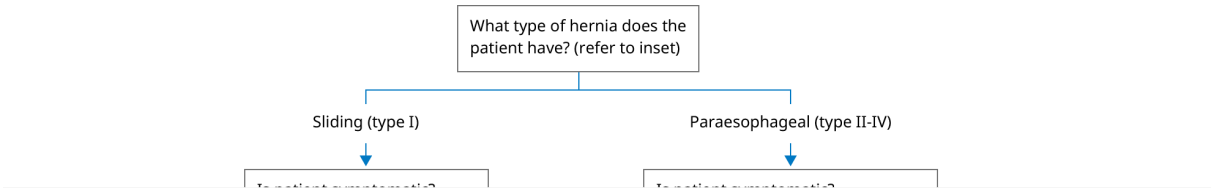
Panel A: High resolution manometry (HRM) recording of esophagogastric junction (EGJ) pressure in an individual without a hiatal hernia as evident by the crural diaphragm (CD) being completely superimposed on the lower esophageal sphincter (LES) pressure signature, ie, the LES-CD separation is 0. Both during quiet respiration and deep breaths, the LES is only evident between inspirations when the CD signal is minimal. In this example, the pressure inversion point (PIP) tool has been positioned to optimally isolate the respiratory inversion point (RIP) as evident by the PIP tool output shown as an insert. Barely visible on the pressure topography are a horizontal blue dashed line and green dashed line indicating the locations of the proximal and distal pressure (P) recordings shown in the PIP tool output. The red line in the PIP tool output box is the computed average of those signals. In using the tool, the area of interrogation is scrolled up and down to find the location at which the red line in the PIP tool output box is most nearly flat, indicative of the site at which the respiratory increases in pressure are offset by the respiratory decreases in pressure seen on the blue line. The area of interest is during quiet respiration and the RIP is seen to localize toward the upper margin of the CD signal. This positions the majority of the LES signal within the hiatus, being pulled downward during the three deep breaths.

Panel B: HRM recording of EGJ pressure in an individual with a small hiatal hernia as evident by the CD being only partially superimposed on the LES pressure signature, ie, the LES-CD separation is 2 cm. Formatting of the figure is identical to that of Panel A, with the dominant EGJ pressure profile highlighted by the black line (the 15 mmHg isobaric contour) and the PIP tool optimally positioned to isolate the RIP. Note how the LES-CD separation is measured. The center of the LES and CD high pressure zones (white and black horizontal arrows, respectively) are isolated with the help of the isobaric contour tool (set at 15 mmHg in this example), and the separation between the two rounded off to the nearest cm. In this example, the RIP continues to localize toward the upper margin of the CD signal, implying that the CD still exerts sufficient sphincteric effect such that it closes the lumen isolating the stomach below from the hernia and LES above. This is particularly evident during the three deep breaths where the strongly negative intrathoracic pressure (deep blue) is seen to abut directly on the CD-apex signal.

Panel C: HRM recording of EGJ pressure in an individual with a moderate-sized hiatal hernia as evident by the CD being isolated from the LES pressure signature, ie, the LES-CD separation is 4 cm. Formatting of the figure is identical to that of Panels A and B, with the dominant EGJ pressure profile highlighted by the black line (the 25 mmHg isobaric contour in this case) and the PIP tool optimally positioned to isolate the RIP. However, in this example, the RIP no longer localizes the CD signal, instead localizing at the proximal margin of the LES. Even without the aid of the PIP tool, that is evident by the inspiratory bursts of red on the LES recording. Consequently, the CD no longer functions as a competent extrinsic sphincter, and the entire hiatal hernia up to the lower margin of the LES is subject to intra-gastric pressure throughout the respiratory cycle.

Graphic 129815 Version 1.0

Algorithm 1: **Approach to the management of hiatus hernia**



This algorithm presents an approach to the management of hiatus hernia and should be used with UpToDate content on hiatus hernia.

GERD: gastroesophageal reflux disease; PCAB: potassium-competitive acid blocker; PPI: proton pump inhibitor.

* In patients with paraesophageal hernia, careful history is imperative because most symptoms are nonspecific. GERD symptoms are less common than with sliding hiatus hernia. Uncommonly, paraesophageal hernias can cause bleeding, volvulus, and dyspnea secondary to herniation of the stomach and/or other organs into the intrathoracic cavity.

¶ Initial treatment typically involves a 4- to 6-week trial of acid suppression therapy with a PPI or PCAB. Refer to UpToDate content on the management of GERD for details.

Δ Symptomatic patients should undergo elective surgical repair unless they have symptoms requiring urgent intervention. Surgical repair is an emergency in patients with gastric volvulus, uncontrolled bleeding, strangulation, perforation, and respiratory compromise secondary to the hernia.

◇ Experts differ with respect to whether these patients should undergo elective surgical repair. Because the risks and benefits of surgery versus watchful waiting are uncertain and likely closely matched, these should be discussed with patients, and decisions should be individualized based on patient age, risk factors, and preference and the individual surgeon's or institution's rates of perioperative mortality with elective hiatus hernia repair.

Inset illustration modified from:

1. Skinner DB. Hernias (hiatal, traumatic, and congenital). In: Gastroenterology, Berk JE (Ed), WB Saunders 1985.

2. Kahrilas PJ, Kim HC, Pandolfino JE. Approaches to the diagnosis and grading of hiatal hernia. Best Pract Res Clin Gastroenterol 2008; 22:601.

Graphic 150312 Version 1.0

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