

The Anatomical causes behind Heartburn and Acid Reflux

Posted on March 28, 2018

Introduction

Heartburn is a burning discomfort behind the breastbone that commonly occurs when stomach contents move upward into the esophagus. The original discussion correctly recognized that the stomach produces hydrochloric acid and that the stomach lining has protective defenses. However, it incorrectly treated low stomach acid as the usual cause of heartburn. Gastroesophageal reflux is primarily an anatomical and physiological problem involving the antireflux barrier at the junction of the esophagus and stomach. Acid makes the refluxate irritating, but the decisive event is that material crosses upward through a barrier that should normally limit that movement.

Occasional reflux is common. Gastroesophageal reflux disease, or GERD, is diagnosed when reflux produces troublesome symptoms, complications, or both. Understanding the condition therefore requires more than comparing “high” and “low” acid. The lower esophageal sphincter, crural diaphragm, angle of His, esophageal clearance, gastric pressure, hiatal anatomy, mucosal sensitivity, and patterns of transient sphincter relaxation all contribute to whether reflux occurs and whether it causes symptoms (National Institute of Diabetes and Digestive and Kidney Diseases, n.d.; Katz et al., 2022).

The Gastroesophageal Junction as an Antireflux Barrier

The esophagus carries swallowed material from the throat to the stomach. At its lower end, a specialized zone of smooth muscle called the lower esophageal sphincter maintains pressure above the pressure inside the stomach. The diaphragm also encircles the esophagus at the hiatus. During normal swallowing, the sphincter relaxes briefly so food can enter the stomach, and then it contracts again. The crural diaphragm supports this closure, especially during coughing, bending, lifting, and other activities that raise abdominal pressure.

Reflux can occur when the sphincter is weak, when it relaxes at inappropriate times, or when the diaphragm and sphincter no longer align effectively. Transient lower esophageal sphincter relaxations are normal reflexes that allow swallowed air to escape, but they are also a major pathway for reflux. GERD develops when reflux episodes become excessive, reach higher in the esophagus, persist because clearance is impaired, or encounter a particularly sensitive mucosa.

Hiatal Hernia and Pressure Across the Barrier

A hiatal hernia occurs when part of the stomach moves through the diaphragmatic opening into the chest. A hernia does not guarantee GERD, and many small hernias cause no symptoms. Nevertheless, separation between the lower esophageal sphincter and the diaphragmatic pinch can weaken the combined barrier, create a reservoir of refluxate above the diaphragm, and delay clearance. Larger hernias are more strongly associated with erosive disease and complications.

Pressure also matters. Obesity, pregnancy, tight garments, large meals, and certain patterns of physical strain can increase the pressure gradient from the abdomen toward the chest. Reflux is more likely when intragastric pressure rises while barrier pressure is low. Delayed gastric emptying may contribute in selected patients, but it is not the sole explanation for common GERD. Lying down soon after a large meal removes gravity's assistance and can increase nighttime reflux.

Why Acid Injures the Esophagus but Not the Stomach

Parietal cells in the stomach secrete hydrochloric acid, which supports protein digestion, activates pepsin, assists nutrient release, and helps limit ingested microorganisms. The stomach protects itself through a mucus-bicarbonate layer, tight epithelial junctions, blood flow, rapid repair, and regulatory mechanisms that balance secretion and defense. The esophagus does not possess the same degree of protection. When acidic gastric contents remain in contact with esophageal tissue, they can produce burning, inflammation, erosions, or ulceration.

Reflux can also contain pepsin, bile, gas, or food. Some patients have weakly acidic or non-acid reflux, especially while taking acid-suppressive medicine. Others have reflux hypersensitivity, in which physiologic reflux events trigger disproportionate symptoms, or functional heartburn, in which testing does not show a reflux-symptom relationship. This explains why symptoms cannot be diagnosed accurately by guessing whether the stomach contains “too much” or “too little” acid.

Heartburn, Regurgitation, and Other Manifestations

Typical symptoms are heartburn and regurgitation. Heartburn is usually felt in the central chest and may rise toward the throat. Regurgitation is the effortless return of liquid or food into the throat or mouth. Some people experience sour taste, belching, nausea, or symptoms after meals and when lying down. GERD may also be associated with chronic cough, hoarseness, throat discomfort, dental erosion, or asthma-like complaints, although these symptoms have many other possible causes.

Chest pain should never automatically be attributed to reflux. Cardiac disease can present with pressure, burning, nausea, shortness of breath, or discomfort radiating to the arm, jaw, back, or shoulder. Urgent assessment is appropriate for severe or unfamiliar chest symptoms. Difficulty swallowing, painful swallowing, gastrointestinal bleeding, persistent vomiting, anemia, unexplained weight loss, or progressive symptoms are also warning signs requiring medical evaluation.

Factors That Can Promote or Worsen Reflux

Excess body weight, pregnancy, tobacco exposure, hiatal hernia, and some medicines can weaken or challenge the antireflux barrier. Meals high in volume or fat can aggravate symptoms in some people by increasing distension or delaying emptying. Alcohol, caffeine, chocolate, mint, acidic foods, spicy foods, and carbonated drinks are often blamed, but triggers are individual. Universal exclusion diets can become unnecessarily restrictive. A symptom diary and targeted trials are more useful than prohibiting every commonly listed food.

Medicines that may worsen reflux in susceptible patients include some agents that relax smooth muscle or irritate the esophagus. A patient should not discontinue prescribed treatment without professional advice. Tablets can also cause pill esophagitis if swallowed with too little water or immediately before lying down. Review of timing, dose, swallowing technique, and alternatives can be more helpful than assuming that all symptoms reflect abnormal gastric acid production.

Hypochlorhydria Is a Separate Clinical Question

Hypochlorhydria means reduced gastric acid secretion. It can occur with atrophic gastritis, autoimmune disease, *Helicobacter pylori*-related changes, gastric surgery, aging-related conditions, or prolonged acid suppression. It may affect absorption of selected nutrients and alter susceptibility to some infections. However, low acid is not the standard explanation for heartburn, and patients should not attempt to “test” the theory by drinking acidic substances or taking unregulated acid supplements.

A person can have both reduced acidity and reflux because the direction of movement and the acidity of the material are different variables. Even weakly acidic material can trigger symptoms through distension or hypersensitivity. Conversely, a stomach with normal acid secretion may cause severe esophageal injury if the barrier fails frequently. Clinical assessment should therefore focus on symptom pattern, anatomy, response to treatment, and objective testing when necessary.

Diagnosis

Many adults with classic heartburn and regurgitation and no alarm features can begin with a clinical assessment and an appropriate treatment trial. Endoscopy is used when alarm symptoms, bleeding

risk, persistent symptoms, suspected complications, or alternative diagnoses are present. It can identify erosive esophagitis, strictures, Barrett's esophagus, tumors, and eosinophilic esophagitis, but a normal endoscopy does not exclude GERD (Gyawali et al., 2018).

Ambulatory reflux monitoring measures acid exposure and the relationship between reflux episodes and symptoms. Combined impedance-pH monitoring can also detect weakly acidic and non-acid movement. Esophageal manometry assesses motility and sphincter function and is particularly useful before antireflux procedures or when swallowing disorders are suspected. Tests should answer a defined question rather than being ordered simply because heartburn exists.

Management Based on Mechanism and Risk

Behavioral measures include avoiding meals close to bedtime, reducing individually demonstrated triggers, stopping tobacco use, moderating alcohol, and pursuing weight loss when excess weight contributes. Elevating the head of the bed can help nighttime symptoms; stacking ordinary pillows is less effective because it may bend the abdomen. Smaller evening meals and remaining upright after eating can reduce reflux in some patients.

Antacids can provide short-term relief. Histamine-2 receptor antagonists reduce acid secretion, while proton pump inhibitors provide stronger suppression and are central treatment for frequent GERD and healing erosive esophagitis. These medicines reduce the acidity of refluxate; they do not mechanically tighten the sphincter. Correct timing and adherence matter. Long-term therapy should use an indication-based plan and periodic review rather than abrupt discontinuation or indefinite self-medication without evaluation.

Antireflux surgery and selected endoscopic procedures may be considered for objectively confirmed reflux, troublesome regurgitation, large hiatal hernia, medication intolerance, or patient preference after careful assessment. Procedures can restore anatomy and reinforce the barrier, but they carry risks such as difficulty swallowing, gas-bloat symptoms, recurrent reflux, and need for revision. They are not substitutes for accurate diagnosis.

Complications and Prevention

Persistent reflux can produce erosive esophagitis, bleeding, peptic stricture, and Barrett's esophagus. Barrett's involves replacement of the usual lower-esophageal lining with intestinal-type tissue and is associated with increased risk of esophageal adenocarcinoma, although most people with Barrett's never develop cancer. Screening is not appropriate for everyone; clinicians consider age, duration of symptoms, sex, obesity, smoking, family history, and other risk factors.

Prevention centers on reducing modifiable pressure and exposure factors, treating established disease, and investigating warning signs. It does not require eliminating normal stomach acid, which

serves important physiological functions. The goal is to control symptoms, heal injury, prevent complications, and use the least burdensome effective approach.

Reflux During Pregnancy and Across the Lifespan

Pregnancy can promote reflux through hormonal relaxation of smooth muscle and increasing abdominal pressure as pregnancy advances. Management should begin with meal timing, position, and discussion of pregnancy-appropriate medicines with a clinician. Older adults may report less typical burning despite more severe injury, and they often take medicines that affect swallowing or sphincter function. Age therefore changes assessment but does not make reflux an inevitable or harmless condition.

Children and infants have different patterns and should not be diagnosed through an adult symptom checklist. Feeding difficulty, poor growth, recurrent vomiting, or respiratory symptoms require pediatric evaluation because many conditions can resemble reflux.

Conclusion

Heartburn and acid reflux arise principally when the gastroesophageal antireflux barrier fails or is overwhelmed. The lower esophageal sphincter, diaphragm, hiatal anatomy, pressure gradient, esophageal clearance, and sensory processing are more important than the popular claim that heartburn usually means low stomach acid. Acid suppression can reduce irritation, but diagnosis and treatment should reflect the actual mechanism and the presence of complications. Persistent, severe, or alarming symptoms require professional evaluation rather than self-directed attempts to raise or lower gastric acidity.

References

National Institute of Diabetes and Digestive and Kidney Diseases. (n.d.). *Symptoms and causes of GER and GERD*.

<https://www.niddk.nih.gov/health-information/digestive-diseases/acid-reflux-ger-gerd-adults/symptoms-causes>

Katz, P. O., Dunbar, K. B., Schnoll-Sussman, F. H., Greer, K. B., Yadlapati, R., & Spechler, S. J. (2022). ACG clinical guideline for the diagnosis and management of gastroesophageal reflux disease. *American Journal of Gastroenterology*, 117(1), 27-56.

Gyawali, C. P., Kahrilas, P. J., Savarino, E., et al. (2018). Modern diagnosis of GERD: The Lyon Consensus. *Gut*, 67(7), 1351-1362.