

GERD · Gastroesophageal Reflux Disease

Stomach acid flows backward into the food tube, burning it over and over.

THE STORY IN ONE SENTENCE

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“Stomach acid splashes up into your food tube (esophagus), and that tube has no armor against acid — so it burns.”

Normal anatomy — the body's job

At the bottom of your food tube (esophagus), a ring of muscle called the lower esophageal sphincter (LES) opens to let food into the stomach, then clamps shut like a one-way door. The stomach makes strong acid to digest food and has a thick mucus coat to protect itself. The food tube has no such armor — it is built to move food, not handle acid.

BODY'S JOB

The LES stays closed between swallows to keep stomach acid locked below. The stomach's protective lining lets acid do its job (breaking down food) without burning the stomach itself. The food tube stays clean and safe because acid never touches it.

What breaks

The muscle door (LES) at the bottom of the food tube loses its squeeze or relaxes at the wrong times, letting stomach acid splash upward where it does not belong.

CLINICAL TERM

Lower esophageal sphincter (LES) dysfunction with transient lower esophageal sphincter relaxations (TLESRs), decreased resting LES pressure, or anatomic disruption (hiatal hernia).

How the body compensates

The body has no good way to compensate for acid in the esophagus — it can only try to heal the burn or grow tougher tissue. Meanwhile symptoms may come and go, making it seem less serious than it is, until permanent damage (stricture, Barrett's, or cancer) shows up.

1. {'what': 'The esophagus makes more mucus and bicarbonate', 'why': 'The lining tries to coat itself and neutralize acid drops, but the esophagus cannot make nearly as much protection as the stomach does.', 'limit': 'This buy-time fix works only for mild, occasional reflux — daily acid overwhelms it and the burn continues.'}
2. {'what': 'Inflammation and healing cycles repeat', 'why': 'Each acid bath damages the surface cells (esophagitis). Between episodes the lining tries to patch itself, but if acid keeps coming back, healing cannot keep up.', 'limit': 'Chronic inflammation leads to scar tissue instead of normal lining, which makes the next problem worse.'}
3. {'what': 'Scar tissue tightens the tube (stricture)', 'why': 'Repeated burn-and-heal cycles lay down collagen like internal scabs. Scar tissue is stiff and does not stretch, so the tube narrows.', 'limit': 'Food gets stuck (dysphagia), and the stricture may need stretching (dilation) to open it again.'}
4. {'what': 'Metaplasia: the lining switches cell types (Barrett's esophagus)', 'why': 'Chronic acid irritation makes the normal squamous (flat) cells of the esophagus die off. The body replaces them with columnar (stomach-like) cells that handle acid better.', 'limit': 'Barrett's cells are tougher against acid, but they have a small risk (about 0.5 % per year) of turning into cancer (adenocarcinoma). This is the body's trade: short-term survival for long-term cancer risk.'}
5. {'what': 'Symptoms may disappear even as damage worsens', 'why': 'Severe, long-standing esophagitis can destroy nerve endings in the lining, so you stop feeling the burn — but the acid is still there, still doing harm.', 'limit': 'Silent reflux is dangerous because you lose the warning signal (pain) that would push you to get help before Barrett's or cancer develop.'}

Domino effect

1. The lower esophageal sphincter (LES) relaxes when it should not, or loses its grip strength. — The vagus nerve sends mistimed relax signals, smooth muscle weakens, or a hiatal hernia pulls the stomach up so the diaphragm cannot help pinch the door shut.
2. Stomach acid flows backward into the esophagus. — Without a tight one-way door, acid escapes upward — especially after meals, when lying flat, or when abdominal pressure (obesity, pregnancy) squeezes the stomach.
3. You feel burning behind your breastbone (heartburn). — Acid touching the unprotected lining of the esophagus activates pain nerves (nociceptors) that send a burning signal to your brain.

4. Acid may reach your throat and voice box (larynx), causing a sour taste, cough, hoarseness, or wheezing. — Reflux that climbs high enough irritates the larynx and can spill tiny drops into the airways (microaspiration), triggering cough and asthma-like symptoms.
5. Repeated acid baths inflame and erode the esophageal lining (esophagitis). — Hydrochloric acid and pepsin digest the surface cells just as they would digest food, leaving raw, bleeding spots (erosions or ulcers).
6. Scar tissue forms and tightens the tube (stricture). — Chronic inflammation triggers collagen deposition (fibrosis). Scar tissue shrinks as it matures, narrowing the esophagus and making swallowing hard (dysphagia).
7. The lining may change to Barrett's esophagus (intestinal metaplasia). — Constant acid damage kills the normal flat (squamous) cells, and the body replaces them with tougher, stomach-like (columnar) cells to survive the acid environment.
8. Barrett's esophagus carries a small but real risk of turning into cancer (esophageal adenocarcinoma). — Metaplastic cells are more prone to DNA mutations. Over years, some cells pick up enough mutations to become dysplastic (pre-cancer) and then invasive cancer.

Symptoms · what the patient feels, and why

- Burning feeling in the chest (heartburn): Stomach acid backs up into the esophagus (the food tube between your mouth and stomach). The lining of the esophagus is thin and not built to handle acid the way the stomach is, so the acid irritates it and causes a burning ache.
- Sour or bitter taste in the mouth (regurgitation): The valve at the bottom of the esophagus (the lower esophageal sphincter) doesn't close all the way, so stomach acid and partly digested food wash back up into the throat and mouth.
- Trouble swallowing (dysphagia): Years of acid burning the esophagus can cause swelling and scarring, which narrows the tube and makes it harder for food to slide down smoothly.
- Chest pain (non-cardiac chest pain): Acid irritating the esophagus can trigger sharp or squeezing chest pain that feels like heart pain but comes from the food tube instead. The nerves in the esophagus and heart share similar pathways, so the brain sometimes confuses the signals.
- Chronic cough or throat clearing: Tiny drops of stomach acid can spray up into the throat and airway (laryngopharyngeal reflux). This irritates the voice box and windpipe, triggering a protective cough reflex to clear the acid.
- Hoarse voice or sore throat: Acid reaching the voice box (larynx) inflames the vocal cords, making them swollen and stiff. Swollen cords vibrate differently, so the voice sounds raspy or weak.

- Worsening asthma or wheezing: Acid can trickle into the airways or trigger a reflex through the vagus nerve (a big nerve connecting the esophagus and lungs). Both pathways make the airway muscles tighten, causing wheezing and trouble breathing.
- Unintended weight loss: Severe reflux can make swallowing so painful or difficult that the person eats less to avoid the discomfort. Weight loss can also signal a serious complication like a stricture (narrowing scar) or cancer blocking the esophagus.
- Vomiting blood or black, tarry stools: Chronic acid can erode blood vessels in the esophagus, causing bleeding. Fresh blood may appear in vomit (looking bright red or like coffee grounds), and digested blood turns stools black and sticky (melena).
- Pain with swallowing (odynophagia): Deep ulcers or severe inflammation in the esophagus make swallowing extremely painful because each swallow stretches or rubs the raw, damaged tissue.

Focused exam

- Ask about chest burning, especially after meals or when lying down: Chest burning is the main signal that acid from the stomach is splashing up and touching the esophagus (the food tube). In GERD, the lower esophageal sphincter (a ring of muscle at the bottom of the food tube) relaxes when it should stay tight, so acid washes up over and over.
- Ask if they spit up sour liquid or taste it in their mouth (regurgitation): When the sphincter muscle relaxes too much, stomach contents — food, acid, and bile — flow backward up into the throat or mouth. This sour or bitter taste is the hallmark of GERD and confirms that the one-way valve is not holding.
- Listen to the lungs for wheezing or crackles, and ask about chronic cough or hoarse voice: Acid can splash high enough to reach the larynx (voice box) and airways. This triggers coughing, wheezing, and voice changes — GERD can hide as asthma or bronchitis. Lung complications need urgent attention because ongoing aspiration (breathing in acid) can scar the lungs.
- Ask about trouble swallowing (dysphagia) or pain when swallowing (odynophagia): Repeated acid burns can scar and narrow the esophagus (peptic stricture), making it hard for food to pass. New or worsening trouble swallowing (dysphagia) is an alarm feature that demands upper endoscopy to rule out stricture, Barrett's esophagus, or cancer.
- Check weight and ask about unintentional weight loss: Weight loss with reflux symptoms is a red flag. It can mean the esophagus is so scarred or narrowed that the patient cannot eat normally, or it can signal esophageal cancer. Guideline (AGA, ACG) criteria list unexplained weight loss as an alarm feature requiring urgent endoscopy.

- Ask if they have vomited blood (hematemesis) or seen black, tarry stool (melena): Bleeding means acid has eroded through the esophageal lining deep enough to damage blood vessels (esophagitis or ulcer). This is a medical emergency requiring immediate endoscopy and resuscitation if hemodynamically unstable.

Diagnostics · every test answers a question

- Clinical diagnosis (history and symptom response to PPI trial) → Does the patient have typical GERD symptoms (heartburn, regurgitation) that improve with acid suppression?
- Upper endoscopy (esophagogastroduodenoscopy, EGD) → Is there visible damage to the esophagus (erosions, ulcers, stricture, Barrett's, or cancer)?
- Ambulatory 24-hour esophageal pH monitoring (or pH-impedance) → How much acid is actually refluxing into the esophagus, and when?
- Esophageal manometry → Is the lower esophageal sphincter pressure too low, or is there a motility disorder that mimics GERD?
- Barium esophagram (upper GI series) → Is there a stricture, hiatal hernia, or anatomic abnormality causing reflux or swallowing trouble?
- Empiric PPI trial (omeprazole 20–40 mg daily or equivalent for 8 weeks) → Do symptoms improve when you turn off stomach acid production?

Treatment logic

- Proton pump inhibitor (PPI) once daily 30–60 minutes before breakfast for 8 weeks (e.g. omeprazole 20 mg, esomeprazole 40 mg, pantoprazole 40 mg) → PPIs block the H^+/K^+ -ATPase pump (the final step in acid production) in the stomach's parietal cells, cutting acid secretion by > 90 %. Less acid means less burning, and the esophageal lining can heal. Heals erosive esophagitis in 80–90 % of patients in 8 weeks (ACG, AGA guidelines).
- Lifestyle modification: lose weight if BMI > 25, elevate head of bed 6–8 inches, avoid meals 2–3 hours before lying down → Weight loss reduces intra-abdominal pressure that pushes acid upward. Elevation uses gravity to keep acid in the stomach at night. Not eating before bed keeps the stomach empty so there is less volume to reflux. These changes lower acid exposure time and reduce nighttime symptoms.
- Avoid trigger foods and substances: caffeine, alcohol, chocolate, peppermint, fatty or spicy foods, smoking cessation → Caffeine, alcohol, chocolate, and peppermint directly relax the lower esophageal sphincter. Fatty foods slow gastric emptying, leaving more acid sitting in the stomach. Smoking reduces sphincter tone and saliva (which neutralizes acid). Avoiding these reduces reflux episodes.

- H₂-receptor antagonist at bedtime if breakthrough nighttime symptoms (e.g. famotidine 20 mg) → H₂ blockers (famotidine, ranitidine) block histamine type-2 receptors on parietal cells, a second pathway for acid secretion. Adding one at night can cover the window when PPI levels drop and nocturnal acid secretion peaks.
- Alginate-antacid combination after meals (e.g. Gaviscon) → Alginate forms a physical foam raft that floats on top of stomach contents and blocks acid from splashing upward during the postprandial (after-meal) period. Provides mechanical barrier for 30–60 minutes.
- Upper endoscopy if alarm features present (dysphagia, painful swallowing (odynophagia), GI bleeding, weight loss, age > 60 with new-onset symptoms, family history of GI cancer) → Visualizes the esophageal mucosa to detect erosive esophagitis, peptic stricture, Barrett's esophagus, or adenocarcinoma. Biopsies can diagnose eosinophilic esophagitis or dysplasia. Early detection of cancer improves survival.
- Anti-reflux surgery (laparoscopic Nissen fundoplication) if medical therapy fails or patient prefers to stop lifelong PPI → Wraps the top of the stomach around the lower esophagus to create a new mechanical valve, restoring sphincter pressure and stopping reflux. Eliminates acid exposure in well-selected patients. Requires normal esophageal motility on manometry.

Medications

Omeprazole (Prilosec), Esomeprazole (Nexium), Lansoprazole (Prevacid), Pantoprazole (Protonix) · Proton Pump Inhibitor (PPI)

A PPI blocks the tiny pumps inside the stomach lining that squirt acid into the stomach. With fewer pumps working, the stomach makes much less acid. Less acid means less burning when stomach juice flows backward into the throat. Most people take one pill in the morning, thirty minutes before eating, for eight weeks. Some people with severe GERD need two doses a day or long-term treatment.

1. The pill travels to the small intestine and enters the blood.
2. The drug reaches the parietal cells in the stomach lining.
3. It locks onto the proton pumps (the H⁺/K⁺-ATPase enzyme) that normally push acid into the stomach.
4. The pumps stay blocked for about 24 hours, so the stomach makes 70–90% less acid.
5. Over a few days, this lets the inflamed esophagus (food pipe) heal.

SAFETY WATCH

Long use (more than a year) may slightly raise the risk of bone fractures, low magnesium, kidney problems, and gut infections like *C. difficile*. · Take the lowest dose that controls symptoms, and talk with your doctor about whether you still need it after eight weeks. · PPIs work best when taken 30 minutes before breakfast, not at bedtime.

Famotidine (Pepcid), Nizatidine (Axid) · H₂ Receptor Antagonist (H₂ blocker)

An H₂ blocker sits on the histamine docking sites (H₂ receptors) on the stomach's acid-making cells. When histamine cannot land, the cells get a weaker signal to make acid, so acid production drops by about 50–70%. H₂ blockers work faster than PPIs (within an hour) but wear off after 6–12 hours, so they are often used at bedtime to prevent nighttime reflux or as a backup when a PPI does not fully cover symptoms.

1. The pill dissolves and enters the blood.
2. The drug reaches the parietal cells in the stomach lining.
3. It blocks the H₂ receptors, which are one of three signals (histamine, gastrin, and acetylcholine) that tell the cell to make acid.
4. With histamine blocked, the cell makes less acid for the next 6–12 hours.
5. Acid levels drop, easing heartburn and letting the esophagus heal.

SAFETY WATCH

Generally safe for short-term use. · The body can build tolerance after a few weeks, so the drug may work less well over time (tachyphylaxis). · High doses or long use may rarely cause confusion in older adults or people with kidney problems.

Calcium carbonate (Tums), Magnesium hydroxide (Milk of Magnesia), Aluminum hydroxide, Sodium bicarbonate · Antacid

An antacid is a base (the chemical opposite of an acid) that instantly neutralizes stomach acid already in the stomach. It does not stop new acid from being made; it just turns the acid that is there into water and salt, raising the pH and giving fast relief from heartburn. Antacids work within minutes but last only 30–60 minutes, so they are used for quick rescue, not for healing the esophagus.

1. You chew or swallow the antacid, and it dissolves in the stomach.
2. The base molecules grab hydrogen ions (H⁺) from the stomach acid (HCl).
3. The acid is neutralized into water and a salt, so the stomach contents become less acidic.
4. Heartburn eases within minutes because the juice flowing back into the esophagus is no longer as burning.

SAFETY WATCH

Calcium antacids can cause constipation and, in very high doses over time, may raise blood calcium (hypercalcemia). · Magnesium antacids can cause diarrhea and should be used carefully in people with kidney disease. · Aluminum antacids can bind phosphate and, with long-term use, may weaken bones. · Sodium bicarbonate can cause bloating and should be avoided by people on low-sodium diets or with high blood pressure.

Sodium alginate + antacid (Gaviscon) · Alginate-antacid combination

Alginate is a seaweed extract that reacts with stomach acid to form a thick, sticky foam raft that floats on top of the stomach contents. This raft acts like a physical barrier, so when you lie down or bend over and stomach juice sloshes upward, the foam reaches the esophagus first instead of the burning acid. The antacid part neutralizes acid to help the foam form and gives quick symptom relief. Alginate is taken after meals and at bedtime.

1. You swallow the liquid or chewable tablet after eating.
2. In the stomach, alginate meets acid and forms a gel raft that floats on the gastric contents.
3. The antacid neutralizes some of the acid, helping the raft to set and easing heartburn.
4. If reflux happens, the foam barrier backs up into the lower esophagus instead of the acid, protecting the lining.
5. The raft lasts about 3–4 hours, then breaks down and passes into the intestine.

SAFETY WATCH

Generally very safe; the alginate is not absorbed into the body. · The antacid component can have the same side effects as other antacids (constipation, diarrhea, or electrolyte shifts with long-term high-dose use). · Some formulations are high in sodium, so check the label if you are on a low-salt diet.

Metoclopramide (Reglan) · Prokinetic agent (dopamine D2 antagonist)

Metoclopramide blocks dopamine receptors in the gut's nerve network, which speeds up stomach emptying and tightens the lower esophageal sphincter a bit. Faster emptying means less time for food and acid to sit in the stomach and reflux backward. It is used only when GERD symptoms persist despite acid-suppressing drugs and when delayed stomach emptying (gastroparesis) is part of the problem. It is not a first-line GERD drug because of side-effect risks.

1. The pill enters the blood and reaches the gut's nerve plexus.
2. It blocks dopamine D2 receptors, which normally slow gut movement.

3. With dopamine blocked, the stomach muscles contract more strongly and the stomach empties faster.
4. The lower esophageal sphincter also tightens slightly, reducing reflux.
5. Food and acid spend less time in the stomach, so there is less chance for backward flow.

SAFETY WATCH

Can cause drowsiness, restlessness, and fatigue. · Long-term use (more than 12 weeks) or high doses can cause tardive dyskinesia (involuntary muscle movements, especially of the face and tongue) that may be permanent. · Can worsen depression and should be avoided in people with Parkinson disease (because it blocks dopamine). · Use only for short courses and when clearly needed; the FDA has a black-box warning about tardive dyskinesia.

Red flags

- Trouble swallowing or pain when swallowing
- Unintended weight loss
- Vomiting blood or passing black, tarry stools
- New reflux symptoms starting after age 60
- Anemia (low red blood cell count) without an obvious cause

Nursing priorities

1. Check for alarm signs - trouble swallowing, painful swallowing, weight loss, bleeding, age over 60 with new symptoms, or frequent vomiting - and notify provider immediately if present — These red flags suggest cancer, stricture (narrowing), or severe ulcers in the esophagus (food tube) that need urgent endoscopy (camera test) before starting treatment
2. Teach patient to take PPI medicine 30 to 60 minutes before breakfast on an empty stomach every day — Proton pump inhibitors (PPIs) block acid pumps in stomach cells but only work when pumps are active during eating; taking before meals gives maximum acid suppression
3. Educate patient to stop eating 2 to 3 hours before bedtime and avoid lying flat after meals — Gravity helps keep stomach acid down; lying down allows acid to flow backward into the esophagus causing mucosal (lining) damage and symptoms
4. Teach patient to raise the head of bed 6 to 8 inches using blocks under bed legs, not just pillows — Elevating the entire upper body uses gravity to prevent nocturnal (nighttime) reflux; pillows alone bend at waist and increase abdominal pressure pushing acid up
5. Review trigger foods to avoid - caffeine, alcohol, chocolate, peppermint, spicy foods, fatty foods, citrus, tomatoes — These foods relax the lower esophageal sphincter (LES valve) or increase gastric acid production making reflux worse and delaying healing

6. Encourage weight loss if BMI over 25 through diet and exercise referrals — Excess abdominal fat increases intra-abdominal pressure (pressure inside belly) that pushes stomach contents up through the LES valve into the esophagus
7. Assess for medication causes - calcium channel blockers, nitrates, benzodiazepines, anticholinergics - and discuss alternatives with provider — These medicines relax the lower esophageal sphincter allowing more acid reflux; switching drugs can improve symptoms without adding more medicine
8. Schedule 8-week follow-up to assess symptom response and check if PPI can be stepped down to lowest effective dose — Long-term PPI use increases risk of bone fractures, low magnesium, vitamin B12 deficiency, and infections; using minimum dose reduces complications

Sources

- ACG Clinical Guideline: Diagnosis and Management of Gastroesophageal Reflux Disease (2022)
- American Gastroenterological Association
- UpToDate Clinical Decision Support
- NEJM Review Articles on GERD

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