



Heartburn and Gastroesophageal Reflux Disease

What Is Heartburn And Gastroesophageal Reflux Disease?

The esophagus, commonly called the food pipe, is a narrow muscular tube, about nine and a half inches long, that begins below the tongue and ends at the stomach. It consists of three basic layers: an outer layer of fibrous tissue, a middle layer containing smoother muscle, and an inner membrane, which contains numerous tiny glands. The esophagus is narrowest at the top and bottom; it also narrows to a lesser degree in the middle, where it passes the aorta. Wave-like muscle contractions, known as peristalsis, move food down through the esophagus and into the stomach. In the stomach, acid and various enzymes, notably hydrochloric acid and pepsin, break down and digest the starch, fat, and protein in food. Unlike the lining of the stomach, which has a thin layer of protective mucus, the lining of the esophagus offers only a weak defense against stomach acid and other harmful substances. Perhaps the most important structure in protecting the esophagus is the lower esophageal sphincter (LES), which is a band of muscle around the bottom of the esophagus where it meets the stomach. The LES opens after a person swallows to let food enter the stomach and then immediately closes to prevent regurgitation of the stomach contents, including gastric acid. It maintains this pressure barrier until food is swallowed again. If, in spite of LES pressure, there is some acid back-up (reflux), an additional defense mechanism, the peristaltic action of the esophagus, pushes the residue back down into the stomach.

If the LES or the peristaltic action is impaired or other protective mechanisms fail, then acid and other substances back up into the esophagus from the stomach, causing the condition known as gastroesophageal reflux disease (GERD). The most common symptoms of GERD are heartburn (a burning sensation in the chest and throat) and regurgitation (a sensation of acid backed up in the esophagus). In most people, the symptoms are short-lived and occur infrequently. In about 20% of cases, however, the



condition becomes chronic. In such cases, the acid can cause irritation, inflammation, and even erosion of the esophagus (a condition called esophagitis). Although acid is a primary factor in damage caused by GERD, other products of the digestive tract, including pepsin and bile, can also be harmful. In a small percentage of chronic patients, a serious form of GERD called Barrett's esophagus may eventually develop, in which the erosion can lead to cancerous changes in the tissue lining of the esophagus. It should be noted that symptoms of GERD may be present without any signs of injury to the esophagus.

What Causes Gastroesophageal Reflux Disease?

Mild temporary heartburn caused by overeating acidic foods can happen to anyone, particularly when bending over, taking a nap, or engaging in lifting after a large meal high in fatty, acidic foods. Persistent gastroesophageal reflux disease (GERD), however, may be due to abnormal biologic or structural factors, which include malfunction of the lower esophageal sphincter (LES) muscles, defects or injuries in the lining of the esophagus, peristalsis problems, over-acidic stomach contents, and other problems. Some people may be sensitive to digestive factors other than acid; such substances can cause GERD symptoms, but are likely to be missed during a medical examination.

Malfunction of the Lower Esophageal Sphincter (LES) Muscles

The band of muscle tissue called lower esophageal sphincter (LES) is responsible for closing and opening the lower end of the esophagus and is essential for maintaining a pressure barrier against contents from the stomach. If it loses tone, the LES cannot close up completely after food empties into the stomach; in such cases, acid from the stomach backs up into the esophagus. The LES is a complex area of smooth muscles and various hormones; dietary substances, drugs, and nervous system factors can impair its function.



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Impaired Stomach Function

In one study, over half of GERD patients showed abnormal nerve or muscle function in the stomach, which caused impaired motility--an inability of the muscles to contract normally. This causes delays in stomach emptying, increasing the risk for acid back-up.

Hiatal Hernia

Until recent years, it was commonly believed that most cases of persistent heartburn were caused by hiatal, or hiatus, hernia, a protrusion of the stomach muscle from the abdomen up into the chest. Although hiatal hernia may impair LES function, studies have failed to find a close causal association between gastroesophageal reflux and hiatal hernia. Some studies indicate that people with both GERD and hiatal hernia do have more severe gastroesophageal reflux.

Medical Conditions that Contribute to GERD

Asthma. About half of asthmatic patients also have GERD. It is not entirely clear, however, whether asthma is a cause or effect of GERD. Some experts speculate that the coughing and sneezing accompanying asthmatic attacks cause changes in pressure in the chest that can trigger reflux. Exercise-induced asthma does not appear to be related to GERD. Certain asthmatic drugs that dilate the airways may relax the LES and contribute to GERD. [See also , How Serious is Gastroesophageal Reflux Disease?, below].

Other Medical Conditions. *Crohn's disease* can cause inflammation in the esophagus. Other disorders that may affect areas that can contribute to GERD include diabetes, peptic ulcers, lymphomas, and cancer.



Genetic Factors

Genetic factors may play a role in susceptibility to Barrett's esophagus, a precancerous condition caused by very severe gastroesophageal reflux. One expert believes that an inherited risk exists in most cases of GERD.

Hypersensitive Esophagus

When the esophagus appears normal but GERD symptoms are present, the cause may be an exaggerated or hyperreactive response to irritants, which triggers the release of certain factors in the immune system that produce inflammation in the esophagus.

Foods that Contribute to GERD

Foods that can weaken LES tone include garlic, onions, chocolate, fat, peppermint, spearmint, and coffee. Caffeinated drinks and decaffeinated coffee increase acid content in the stomach. Other acidic foods include citrus and tomato products. All carbonated beverages increase the risk for symptoms of GERD by bloating the abdomen and causing pressure that forces acid to back up into the esophagus. Food allergies may be responsible for some cases of gastroesophageal reflux disease in children.

Smoking and Alcohol

Alcohol relaxes the LES muscles and also may irritate the mucous membrane of the esophagus. On the other hand, some studies have shown that small amounts of alcohol may actually protect the mucosal layer. Smoking can also reduce muscle function, increase acid secretion, reduce prostaglandins and bicarbonate production, and decrease mucosal blood flow.



Drugs that Increase the Risk for GERD

A number of drugs can cause the LES to relax and function poorly including calcium channel blockers, anti-cholinergics, beta- and alpha-adrenergic agonists, dopamine, sedatives, and common pain relievers. Calcium channel blockers and anti-cholinergics also weaken the peristaltic action of the esophagus and slow stomach emptying. The anti-osteoporosis drug alendronate (Fosamax) can cause damage to the esophagus. Patients should take this drug with six to eight ounces of water (not juice or carbonated or mineral water) on an empty stomach in the morning and should remain upright for 30 minutes afterward. Antibiotics can also effect the mucus membrane, making it more vulnerable to acids. Potassium and iron pills are corrosive and can cause ulcers (erosions) in the esophagus.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are common culprits in causing ulcers in the stomach. Until recently there was no strong evidence that they harmed the esophagus. A 1997 study reported however, that elderly people who took NSAIDs and also had GERD appeared to be at higher risk for complications, particularly strictures, abnormal narrowing of the esophagus, and also chest pain and Barrett's esophagus. There are dozens of NSAIDs including aspirin, ibuprofen (Motrin, Advil, Nuprin, Rufen) naproxen (Aleve), piroxicam (Feldene), diflunisal (Dolobid), indomethacin (Indocin), flurbiprofen (Ansaid), ketorolac (Toradol), ketoprofen (Actron, Orudis KT), and diclofenac (Voltaren). Most likely, taking an occasional aspirin or other NSAID will not harm someone who has GERD and no other risk factors for or indications of ulcers. Tylenol (acetaminophen) is usually a good alternative for those who want to avoid NSAIDs.

Other Causes of GERD

Weakened peristaltic movement in the esophagus may contribute to GERD. If the mucous membrane is impaired, even a normal amount of acid can harm the esophagus.



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Pressure on the abdomen caused by factors such as obesity or tight clothing can contribute to acid-back up into the esophagus.

Who Gets Gastroesophageal Reflux Disease?

Up to 15 million Americans experience heartburn daily. Some studies have reported that 36% to 44% of adults experience heartburn at least once a month, 14% every week, and 7% once a day. Gastroesophageal reflux disease itself is common. One study reported that 20% of people had frequent symptoms of GERD but that very few of them sought help for the condition . People at all ages are susceptible to GERD. Elderly people with GERD tend to have a more serious condition than younger people with the problem.

Eating-Pattern Risk Factors

Anyone who eats a heavy meal, particularly if one subsequently lies on the back or bends over from the waist, is at risk for an attack of heartburn. Anyone who snacks at bedtime is at high risk for GERD.

Children at Risk

About 65% of all babies regurgitate milk occasionally. Some simply spit up ; others vomit large amounts after feedings. When babies cry they often swallow a lot of air, which leads to gas if babies are not burped. Some mothers may even suspect their babies have GERD when they only need to be burped frequently during and after feeding. Even severe vomiting, however, is not necessarily a sign of GERD, which affects about 5% of American children. A physician should examine children who vomit frequently and have prolonged symptoms with or without complications, such as anemia, failure to gain weight, or respiratory problems, as soon as possible. Children at highest risk for GERD are those with neurologic impairments or problems in the lungs, ear, nose,



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or throat. Symptoms of such conditions may include, among others, chronic coughing, frequent infections, wheezing, and disturbed breathing while asleep. Other risk factors for GERD in children include food allergies, scoliosis, cyclic vomiting, cystic fibrosis, and medical conditions that affect the digestive tract. One study suggested that food allergies may be responsible for gastroesophageal reflux disease in children.

Pregnant Women

Pregnant women are particularly vulnerable to GERD in their third trimester as the growing uterus puts increasing pressure on the stomach. Heartburn in such cases is often resistant to dietary interventions and even antacids.

People with Asthma

People with asthma are at very high risk for GERD.

What Are The Symptoms Of Gastroesophageal Reflux Disease?

Typical Symptoms

The primary symptoms of gastroesophageal reflux are heartburn, a burning sensation that radiates up from the stomach to the chest and throat, and regurgitation, in which the patient can feel the acid backing up. Sometimes acid regurgitates as far as the mouth and may come out forcefully as vomit or be experienced as a "wet burp". Up to half of GERD patients have dyspepsia, which is a syndrome consisting of heartburn, fullness in the stomach, and nausea after eating. The symptoms are most likely to occur after a heavy meal, while bending over, lifting, or lying down, particularly on one's back. It should be noted that the severity of symptoms does not necessarily reflect actual injury in the esophagus. For example, Barrett's esophagus, which causes precancerous changes in the esophagus, may cause few symptoms, particularly in elderly people. On



the other hand, people can suffer severe heartburn without actual damage to the esophagus.

Atypical Symptoms

Between 10% and 15% of people with GERD have so-called atypical symptoms, which occur with or without heartburn or acid regurgitation. These symptoms can resemble other serious conditions and may lead to an intensive diagnostic work-up.

Chest Pain. GERD is a common cause of chest pain. It is very important to differentiate chest pain caused by GERD from that caused by heart conditions, particularly angina and heart attack. In general, if the pain does not occur after exertion or is worse at night, then it is less likely to be due to a heart problem. Chest pain from either GERD or from severe angina, however, can occur after a heavy meal. It should be noted that the two conditions often coexist; some patients with coronary artery disease may develop anginal chest pain from acid reflux. Some experts believe that this is because the acid in the esophagus of such patients may activate nerves that temporarily impair blood flow to the heart.

Bleeding. Dark-colored, tarry stools (indicating the presence of blood) or vomiting blood may occur if ulcers have developed in the esophagus. This is a sign of severe damage and requires immediate attention.

Trouble Swallowing and Choking. Almost half of GERD patients report having trouble swallowing (dysphagia). In severe cases patients may even choke or experience the sensation that food is trapped behind the breast bone. These are symptoms of serious esophageal damage or of a temporary spasm that narrows the tube. Choking may also occur because of spasm in the larynx.



Coughing and Asthmatic Symptoms. Asthmatic symptoms, including coughing and wheezing, may occur. GERD is, in fact, the second most common cause of persistent coughing, which can occur without other symptoms of asthma.

Chronic Nausea and Vomiting. Nausea that persists for weeks or even months that is not attributable to a common cause of stomach upset may be a symptom of acid reflux. Vomiting may also occur, in rare cases, as often as once a day. Other causes of chronic nausea and vomiting should be ruled out, including ulcers, stomach cancer, obstruction, or pancreas or gallbladder disorders.

Other Problems in the Throat. If stomach acid reaches the larynx (the voice box), it may cause a condition called acid laryngitis, which can produce hoarseness, a dry cough, the sensation of having a lump in the throat, and the need to repeatedly clear the throat. GERD is also a common cause of chronic sore throat and may also trigger persistent hiccups.

How Serious Is Gastroesophageal Reflux Disease?

General Outlook

Nearly everyone has an attack of heartburn at some point in their lives, and in the vast majority of cases, the condition is temporary and mild, causing only transient discomfort. If patients develop persistent gastroesophageal reflux disease with frequent relapses, however, and it remains untreated, serious problems can develop over time. These can include severe narrowing (called stricture) of the esophagus, erosion of the lining of the esophagus, ulcers, and precancerous changes in the cells of the esophagus. The risk for recurrent and serious GERD increases if the esophagus is very inflamed, if the initial symptoms are severe, if symptoms persist in spite of treatments that are successfully healing the esophagus, or if there are severe underlying muscular abnormalities. In



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addition to its effect on the esophagus, GERD can also cause complications in other areas, including the teeth, the throat, and the airways leading to the lungs. The condition is more severe in older people.

Barrett's Esophagus and Cancer of the Esophagus

Barrett's esophagus is caused by chronic and severe exposure to acid and bile reflux caused by GERD. In such cases, cellular changes can occur that, over time, may develop into cancer. Barrett's esophagus is a proven risk factor for cancer in the mucus lining of the esophagus, which is one of most rapidly increasing cancers in North America. It occurs only in a small number of GERD patients; at risk are patients who develop GERD at an early age and whose symptoms last longer than average . To date, no treatments can reverse the cellular damage done after Barrett's esophagus has developed. Patients with this condition need to be monitored periodically with endoscopy and biopsy in order to detect cancer early [see How Is Gastroesophageal Reflux Diagnosed?, below?].

Also of concern was a recent study that reported a higher risk for esophageal cancer in GERD patients, regardless of whether they developed Barrett's esophagus. Some experts believe that bile--not acid--back up may be a particular risk factor for causing cancerous changes. Standard GERD anti-drug treatments then may not be protective. Some experts stress the importance of Nissen fundoplication, a surgical procedure that is effective in suppressing both bile and acid reflux.

Bleeding

If ulcers (erosions) develop in the esophagus, they can cause bleeding. Persistent bleeding can result in iron deficiency anemia, and in some cases, may even require emergency transfusions. This condition may occur even without heartburn or other warning symptoms.



Respiratory Disorders

Asthma. GERD is a suspect in causing asthma attacks in patients with this respiratory disorder who have no allergies or history of lung disease. In such cases, some experts believe that the acid leaking from the lower esophagus stimulates the vagus nerves that are located nearby. These stimulated nerves, in turn, trigger the airways in the lung to constrict, causing asthmatic symptoms. In some cases, asthma may be triggered by aspirated fluid from the esophagus. On the other hand, some researchers think that asthma is actually a cause of GERD [see What Causes Gastroesophageal Reflux Disease?, above]. People with both asthma and GERD report higher than normal rates of choking during the night, burning at the back of the throat, sore throat, regurgitation, and hoarseness.

Other Respiratory Conditions . In addition to asthma, people with GERD appear to have an above-average risk for a number of respiratory disorders. These include chronic bronchitis, emphysema, pulmonary fibrosis, and pneumonia. If a person inhales fluid from the esophagus (aspirates) into the lungs, serious pneumonia can occur. It is not yet known whether treatment of GERD would also reduce the risk for these respiratory conditions.

Sleep Apnea

Acid reflux can cause spasms of the vocal cords (larynx), thereby blocking the flow of air to the lungs. One study reported that such spasms may cause sleep apnea in adults. In sleep apnea, breathing stops repeatedly-but temporarily-during sleep. Patients often experience restless sleep, morning headaches, and afternoon drowsiness. In time, they are at higher risk for high blood pressure.



Dental Problems

Dental erosion is a very common problem in GERD patients due to the acid backing up into the mouth and eroding enamel in the teeth.

Severe Dysphagia

If the esophagus becomes severely injured, over time narrowed regions called strictures can develop, which may impair swallowing (dysphagia). Stretching procedures or surgery may be required to restore normal swallowing. Paradoxically, strictures may actually improve other GERD symptoms by helping to prevent acid from traveling up the esophagus.

GERD in Infants and Children

Gastroesophageal reflux disease in children, as in adults, is usually mild, causing only frequent spitting up. In one study of children diagnosed with GERD in infancy, after one year parents reported that spitting up was no longer a major problem, although they tended to report negative dining experiences ("too slow", "upsetting"). The children who had infancy GERD had no greater risk for respiratory illnesses than other one-year olds. In rare, severe cases, however, GERD increases susceptibility for severe vomiting, impaired growth, anemia, a syndrome of choking, coughing and gagging, and pneumonia. Acid reflux that causes spasms in the larynx that block the airways in infants can be life-threatening. Some experts believe this action may contribute to sudden infant death syndrome (SIDS). More research is needed to determine whether this association is valid.



How Is Gastroesophageal Reflux Diagnosed?

In the great majority of cases, a diagnosis of gastroesophageal reflux disease is straightforward, particularly if heartburn and acid regurgitation are present and are lessened by taking antacids for short periods. About 600,000 people come to the emergency rooms each year with chest pains. Over 100,000 of these people are believed to actually have GERD. At this time, expensive and invasive tests such as endoscopy are often used to identify these patients. Laboratory or invasive tests are also often required if heartburn is persistent or if atypical symptoms or complications, such as signs of bleeding or difficulty in swallowing, are present.

A Trial of Omeprazole.

A simple noninvasive trial using a relatively high dose of omeprazole, a drug that blocks stomach acid secretion, may help avoid some invasive tests for identifying GERD in patients with chest pain. In one small trial, 18 out of 23 patients who actually had GERD reported relief after seven days and only 2 out of 14 patients who did not have GERD experienced improvement.

Barium-Swallow Radiograph.

A barium swallow radiograph (x-ray) is useful for identifying structural abnormalities and severe esophagitis (inflammation). When taking this test, the patient drinks a solution containing barium, then x-rays are taken, which can show stricture, active ulcer craters, hiatal hernia, erosion, or other abnormalities. This test cannot, however, reveal mild irritation.

Upper Endoscopy.

Upper endoscopy, also called esophagogastroduodenoscopy or panendoscopy, is more accurate than a barium-swallow radiograph, although it is more invasive and expensive. Endoscopy may be performed either in a hospital or in a doctor's office. The doctor first



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administers a local anesthetic using an oral spray and an intravenous sedative to suppress the gag reflex and to relax the patient. Next, the physician places an endoscope, a thin, flexible plastic tube, into the patient's mouth and down the esophagus. The procedure does not interfere with breathing. It may be slightly uncomfortable, but some patients even fall asleep through it. A tiny camera in the endoscope allows the physician to see the surface of the esophagus and to search for abnormalities, including damage to the mucus lining and hiatal hernia. If a patient has moderate to severe symptoms and the procedure reveals injury in the esophagus, usually no further tests are needed to confirm a diagnosis of GERD. The test is not fool-proof, however; a visual view misses about half of esophageal abnormalities. A biopsy (the removal and microscopic examination of small tissue sections) may detect tissue injury indicative of GERD and can rule out or confirm cancer or infective organisms, such as yeast (*Candida albicans*) or certain viruses (e.g., herpes simplex and cytomegalovirus). Such organisms are more likely to occur in people with impaired immune systems. Periodic endoscopy is important for detecting early cancer in people with Barrett's esophagus. For such patients, it is recommended that endoscopy be performed every other year in those with normal cells and then annually if precancerous changes are detected. Complications of the procedure are uncommon, and if they occur, are almost always mild, including minor bleeding from the biopsy site or irritation where medications have been injected.

PH Monitor Examination

The pH monitor examination uses a tubular probe that is inserted through the nose into the esophagus. The probe is left in place for 24 hours while the patient engages in normal activities. The probe measures the amount of acid backing up in the esophagus and the pattern of its occurrence during the day. This information is useful when GERD symptoms are present, but endoscopy has not detected damage to the mucous lining in the esophagus. It is particularly beneficial for determining if respiratory symptoms,



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including wheezing and coughing, are related to reflux episodes in patients with unexplained asthma. Because it is only a measure of acidic content, however, other digestive agents in the stomach content that can be causing harm may be overlooked.

Manometry

Manometry is a test that measures internal pressure. Such measurements of the pressure exerted by the lower esophagus sphincter muscles may help determine which patients need or are appropriate candidates for surgery. It is also useful for detecting muscle action abnormalities, including impaired stomach motility (an inability of the muscles to contract normally), which cannot be surgically corrected with standard procedures. Manometry may also be used to detect impaired peristalsis or other motor abnormalities in people with chest pain and GERD. To reproduce chest pain during manometry, the patient may be given acid and a drug to stimulate nerves that affect the heart.

Other Tests

Stool tests may show traces of blood that are not visible, and blood tests may reveal anemia in those who have bleeding ulcers. For patients with chest pain in which the diagnosis is uncertain, a procedure called the Bernstein test may be useful, although it is rarely used now. It employs concentrated hydrochloric acid and a neutral solution, which are infused separately into the esophagus. If the acid infusion causes chest pain and the neutral solution does not, then a diagnosis of GERD is established.

What Are The General Guidelines For Preventing And Treating Gastroesophageal Reflux?

The majority of cases of gastroesophageal reflux can be managed with lifestyle changes and the use of antacids for episodes of heartburn. Drug manufacturers have recently been aggressively promoting more powerful drug treatments for GERD that



should be reserved for severe cases only. Only if conservative measures fail to relieve symptoms, are more intensive treatments needed to prevent persistent acid reflux. In such cases, the aim of drug therapy is to reduce the amount of acid present and improve any abnormalities in muscle function of the lower esophagus sphincter (LES), the esophagus, or the stomach. If drugs fail to relieve symptoms, other conditions may be present. As examples, the drug may be unable to control acid reflux during the night, or bile, rather than acid, may be backing up into the esophagus. Bile is a fluid composed mostly of water, bile salts, lecithin, and cholesterol that is present in the small intestine and gallbladder. Even when symptoms are completely relieved by medication, they usually return within a few months after drug treatment has stopped. Surgery may be indicated under certain circumstances: if lifestyle changes and drug treatments have failed; in patients with medical complications; or in younger people with chronic GERD who face a lifetime of expense and inconvenience with maintenance drug treatment. Because minimally invasive surgical procedures are becoming more widely available, some experts are recommending surgery as treatment for many patients with chronic GERD. They argue that acid-suppressing treatment does not heal the condition, while surgery offers a possible cure. Furthermore, persistent GERD appears to be much more serious than previously believed, and the long-term safety of acid suppression is still uncertain.

What Are The Lifestyle Changes For Managing Gastroesophageal Reflux?

1) Dietary Changes

People with heartburn should first try lifestyle and dietary changes. In one study, 44% of patients who experienced symptoms of GERD reported improvement after changing their diet. People with heartburn should avoid or reduce consumption of foods and beverages that contain caffeine, chocolate, peppermint, spearmint, alcohol, and fat.



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Both caffeinated and decaffeinated coffee increase acid secretion. All carbonated drinks increase the risk for GERD.

2) Prevention of Nighttime GERD

Lying flat can produce intense acid reflux. After meals, chronic heartburn sufferers should take a walk or, at the very least, remain upright. Bedtime snacks should be avoided. To help keep acid in the stomach at night, a patient may need to raise the bed at an angle using four- to six-inch blocks at the head of the bed or a wedge-support that elevates the top half of the body so that the patient's body is tilted up. Extra pillows that only raise the head actually increase the risk for reflux.

3) Chewing Gum

Because saliva helps neutralize acid and contains a number of other factors that protect the esophagus, chewing gum 30 minutes after a meal has been found to help relieve heartburn and even protect against damage caused by GERD. In fact, chewing on anything at all can help, since it stimulates production of saliva.

4) Avoiding NSAIDs

Many physicians advise GERD patients to avoid nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, ibuprofen (Motrin, Advil,) or naproxen (Aleve), among others. Tylenol (acetaminophen) is a good alternative.

5) Other Lifestyle Changes

Quitting smoking is, of course, essential. People who are overweight should try to reduce. People with GERD should avoid tight clothing, particularly around the abdomen.



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Managing Infants and Children with GERD.

During feeding, and for a while after, any infant should be positioned vertically and burped frequently. If a baby with GERD is fed formula, a mother should ask the doctor about making it thicker to help prevent splashing up from the stomach. Because food allergies may trigger GERD in children, parents may want to discuss with their physicians a dietary plan that starts with a formula using non-allergenic proteins and then adds other foods back one at a time until symptoms are triggered. Studies have found that infants with gastroesophageal reflux who spend prolonged periods of time in infant seats, including car seats, have more than those who spend waking time on their stomachs. Parents of infants with GERD should discuss their baby's sleeping position with their pediatrician. Experts strongly recommend that all healthy infants sleep on their backs to help prevent sudden infant death syndrome. For babies with GERD, however, lying on the back may obstruct their airways. If the physician recommends that such babies sleep on their stomachs, parents should be sure that their infant's mattress is very firm and possibly tilted up at the head, that there are no pillows, and that the baby's head is turned so that the mouth and nose are completely unobstructed.

What Are The Drugs Used For Treating Gastroesophageal Reflux?

A number of drugs are effective in managing both episodic heartburn and persistent GERD. Over-the-counter antacids, which neutralize digestive acids, are the primary drugs for mild symptoms. Also available over the counter are the H₂ blockers, such as Tagamet HB, Pepcid AC, Axid AR, and Zantac 75, which block acid production. These drugs provide relief for about half of people with chronic symptoms. Another important class of anti-acid drugs are proton-pump inhibitors (omeprazole or lansoprazole), which suppress acid production. They can relieve symptoms in almost all people with GERD, but are currently used only when symptoms are severe and there is damage to the esophagus lining. Cisapride is known as a prokinetic drug it does not affect acid production but works on motor function, improving the muscle action of the esophagus,



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the LES, and stomach to enhance peristaltic action, LES pressure, and stomach emptying.

Experts argue about the best way to initiate treatment for GERD with typical symptoms (heartburn and regurgitation) that do not respond to lifestyle changes and antacids. Using a so-called step-up approach, the physician first prescribes an H₂ blocker drug. If the condition fails to improve, then therapy is "stepped up" to the more powerful proton pump inhibitor, usually omeprazole. Other physicians, however, advocate a step-down approach, in which the proton pump inhibitor is used first. Treatment is then "stepped down" as the patient improves. Some experts believe, however, that by using the more powerful drug first, symptoms of peptic ulcer, if present, may be masked and persist undiagnosed. They argue that at this time the step-down approach should be reserved for patients who have complications.

It should be noted that no current drugs cure GERD or reverse Barrett's esophagus. Those that block or neutralize acid also have no effect on regurgitation and so may not be very effective against asthmatic symptoms caused by aspiration. Even when they

relieve symptoms completely, the condition usually recurs within months after drugs are discontinued. In chronic cases, drugs may need to be taken life-long. Also of concern are studies that have reported cancerous change in the stomachs of patients taking long-term acid-suppressing drugs, either H₂ blockers or proton-pump inhibitors, although the risk appears to occur in those who are also infected with the H. pylori bacteria, but who have not received antibiotic therapy.



Antacids.

Many antacids are available without prescription and are the first drugs recommended to relieve heartburn and mild symptoms. They are best used alone for relief of occasional and unpredictable episodes of heartburn. Despite the many brands, they all rely on various combinations of three basic ingredients, and they all work by neutralizing the acid in the stomach. They may also stimulate the defensive systems in the stomach, by increasing bicarbonate and mucous secretion.

There are three basic salts used in various antacids: magnesium, calcium, and aluminum. Magnesium salts are available in the form of magnesium carbonate, magnesium trisilicate, and most commonly, magnesium hydroxide (Milk of Magnesia). The major side effect of magnesium salts is diarrhea. The most common side effect of antacids containing aluminum salts (Amphogel, Alternagel) is constipation. People who take large amounts of antacids that contain aluminum may also be at risk for calcium loss, which can lead to osteoporosis. Long-term use of antacids also increases the risk for kidney stones. The aluminum and magnesium salts are often offered in combination products (Mylanta and Maalox) which balances the side effects of diarrhea and constipation. Calcium carbonate (Tums, Titalac, and Alka-2) is a potent and rapid acting antacid that can cause constipation. These antacids are actually sources of calcium. There have been rare cases of hypercalcemia (elevated levels of calcium in the blood) in people taking calcium carbonate for long periods of time. This can lead to kidney failure and is very dangerous. None of the other antacids have this side effect.

It is generally believed that liquid antacids work faster and are more potent than tablets, although evidence suggests that they all work equally well. Antacids can interact with a number of drugs in the intestines by reducing their absorption. These drugs include tetracycline, ciprofloxacin (Cipro), propranolol (Inderal), captopril (Capoten), and H₂ blockers. Interactions can be avoided by taking the drugs one hour before or three hours after taking the antacid.



Foaming Agents.

Foaming agents are available over the counter and work by forming a barrier that floats over the contents of the stomach, thereby preventing reflux. Such medications may be useful for patients who have GERD but no signs of injury to the esophagus.

H2 Blockers.

H2 blockers block or antagonize the actions of histamine, a chemical found in the body that encourages acid secretion in the stomach. Four H 2 blockers are currently marketed in the U.S. and are available over the counter: famotidine (Pepcid AC), cimetidine (Tagamet), ranitidine (Zantac), and nizatidine (Axid). All have few side effects and good safety profiles. These drugs inhibit acid secretion for six to 24 hours and are very useful for people who need persistent acid suppression. They may also prevent heartburn episodes in people who are able to predict its occurrence. One major study reported that H 2 blockers are effective in more than 70% of people with mild or intermittent GERD in whom there is no injury to the esophagus. In those with moderate symptoms, H 2 blockers provide symptom relief in about half of patients. Studies are also indicating that H 2 blockers may also improve asthmatic symptoms in people who suffer from both conditions. The drugs are usually taken at bedtime; some people may need to take them twice a day. It should be strongly noted that even though these drugs are available without a prescription, patients should seek medical advice for persistent heartburn. The drugs have few side effects. Headache is the most common; others include mild temporary diarrhea, dizziness, rash, nausea, and headache. Of concern, however, are reports that long-term acid suppression with these drugs may cause cancerous changes in the stomach in patients who also have untreated H. pylori infections.

Famotidine (Pepcid AC) is the most potent H2 blocker. Cimetidine (Tagamet), the first H2 blocker, has few side effect, but it interacts with a number of commonly used medications, such as phenytoin, theophylline, and warfarin. Long term use of excessive



doses (more than 3 grams a day) of cimetidine may cause impotence or breast enlargement; these problems resolve after the drug is discontinued. Ranitidine (Zantac) interacts with very few drugs. Famotidine and nizatidine (Axid), the latest H₂ blocker, are nearly free of drug interactions. Even so, the physician must always be aware of any other drugs a patient is taking. One study found that two daily 75 mg doses of ranitidine was effective for pregnant women with GERD. Animal studies have not shown any adverse effects of ranitidine on pregnancy, although no studies have been conducted on its safety in pregnant women. In spite of different marketing claims, they are all about equally effective. Even the chewable version of Pepcid AC offers no additional advantage.

Proton-Pump Inhibitors.

Proton-pump or acid-pump inhibitors work by inhibiting the so-called gastric acid pump that is required for the stomach's cells to secrete acid. Omeprazole (Prilosec) and lansoprazole (Prevacid) are the proton-pump inhibitors currently available by prescription; they are expected to eventually become available over the counter.

Pantoprazole is under investigation. Proton pump inhibitors are more effective than either H₂ blockers or the prokinetic drug cisapride [see below]. They are currently recommended for patients with moderate symptoms that do not respond to H₂ blockers, for those with severe symptoms, those who have respiratory complication, patients who have ulcerated or eroded esophagi, and those who have persistent nausea. Some experts believe, however, that they should be the first drugs of choice even for patients with milder symptoms, and some studies indicate they are effective even if the esophagus does not show signs of inflammation. Studies report symptom relief in up to 93% of patients who take omeprazole or lansoprazole. In addition to relieving most common symptoms, including heartburn, they are also effective in relieving chest pain and laryngitis caused by GERD. They may have little or no effect on regurgitation or



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controlling asthmatic symptoms. Side effects are uncommon, but may include an allergic reaction, headache, stomach pain, and diarrhea. They should not be used unless necessary by pregnant women or nursing mothers, although recent studies suggest that they do not pose an increased risk of birth defects. They appear to be safe and effective for children with severe GERD and may help some avoid surgery. As with H₂ blockers, long-term use of the proton-pump inhibitor in some patients, particularly those who are infected with *H. pylori*, causes changes in the cells of the stomach that could be precursors to cancer.

Drugs to Improve Stomach Emptying and Muscle Action.

Prokinetic drugs, the most important of which is cisapride (Propulsid) increases LES pressure, enhances stomach emptying, and improves peristaltic action (the wave-like muscular movement) in the esophagus. It is useful as a primary drug when the esophagus is not injured or eroded by acid reflux and may be beneficial in combination with acid-suppressing drugs, particularly in patients with symptoms such as dyspepsia and nausea, which are indications of muscle abnormalities. An analysis of a number of studies reported that patients who were treated for acute attacks of mild GERD with cisapride experienced a lower relapse rate six months later than those on maintenance therapy with an H₂ blocker. Of concern, however are reports of heart rhythm disturbances and 38 deaths, including in a few children, between 1993 and 1998 in people taking the drug. These serious effects are very rare and usually occurred in patients who were also taking certain antifungal medications or antibiotics. Other drugs that may have serious interactions with cisapride include certain antidepressants, protease inhibitors, potassium-sparing diuretics, and various other drugs. Patients should discuss any medications they are taking with their physician. Cisapride should be avoided by people with certain disorders, including but not limited to almost any heart disease, kidney failure, apnea, emphysema, chronic bronchitis, advanced cancer, and conditions that increase the risk for electrolyte disorders (imbalances in potassium,



magnesium, sodium, or calcium). People with liver disorders should use it with caution. Its safety in children is unproven.

Another drug that helps muscle tone in the digestive tract is metoclopramide (Reglan); a few reports of neurologic side effects in children have also raised concern. It should be noted, however, that serious side effects are still very rare and these drugs may offer significant benefit for adults and children who have delayed stomach emptying. Erythromycin has also been used to improve stomach emptying.

Sucralfate.

Sucralfate (Carafate) seems to work by adhering to an ulcer crater and protecting it from further damage by the stomach acid and pepsin. It may be used for maintenance therapy in people with mild to moderate GERD. Other than constipation, which occurs in 2.2% of patients, the drug has few side effects. Sucralfate interacts with a wide variety of drugs, including warfarin, phenytoin and tetracycline.

Drug Combinations.

A number of studies have investigated combinations of anti-GERD drugs. One study suggested that a combination of over-the-counter antacids and H₂ blockers may be the best approach for many people who experience heartburn after eating. Both classes of drugs are effective in relieving GERD but have different timing. Antacids neutralize the acid already in the stomach and work within a few minutes, but their effects do not last more than an hour or so. H₂ blockers suppress acid production, so it takes between a half hour to 90 minutes for them to work, but their benefits persist for hours. Because these drugs have different actions, they may be taken in combination without concern that the effects are additive, although some research indicates that antacids may slow down absorption of H₂ blockers and therefore reduce their effectiveness.



For severe cases, some experts recommend a combination of one of the acid-reducing drugs (either an H₂ blocker or a proton-pump inhibitor) with a prokinetic drug (usually cisapride), which works on muscle action. Some suggest that such combinations be considered under the following circumstances: when single drugs fail; when the primary symptom is acid regurgitation; when symptoms occur mostly at night; when respiratory problems accompany GERD; when reflux symptoms persist, but tests do not show abnormally high acid levels in the esophagus; or when patients are seriously ill and also have severe GERD. It should be noted that combination therapies are expensive and should not be used until other options have failed. For severe cases, some experts believe combination therapy has no benefit over high doses of a proton-pump inhibitor, because symptom severity is mostly likely due to injury to the esophagus from acid, against which the prokinetic drug has no effect.

What Are The Surgical Treatments For Gastroesophageal Reflux?

Fundoplication.

Candidates for Fundoplication. The standard surgical treatment for GERD is fundoplication, usually a specific variation called Nissen fundoplication. About 90% of patients are free of heartburn after the operation. It also cures GERD-induced asthmatic or respiratory symptoms in up to 85% of patients. The procedure may enhance stomach emptying, and it improves peristalsis in about half of patients. It may actually cause abnormal peristalsis in about 14% of patients. This complication, however, does not appear to cause many problems. Although fundoplication is not thought to be very effective for Barrett's esophagus, it is the only treatment that suppresses both bile and acid reflux. Bile reflux is thought to play a role in the development of early cancer in Barrett's esophagus. It is recommended for patients whose condition includes one or more of the following: esophagitis (inflamed esophagus); recurrent or persistent symptoms in spite of drug treatment; strictures; evidence of severe asthmatic symptoms caused by GERD; or in children, failure to gain or maintain weight. Surgery has, until



recently, been the primary treatment for children with severe complications from GERD, because drugs had severe side effects, were ineffective, or had not been optimized for children. With the introduction of omeprazole, some children may be able to avoid surgery. The procedure has little benefit for patients with impaired stomach motility (an inability for the muscles to move spontaneously).

Many experts now believe that because of advances in techniques, particularly the use of laparoscopy, surgery should be considered as primary treatment in patients who are now candidates for long-term maintenance drug therapy. They argue that medications cannot cure GERD. Moreover, only surgery improves regurgitation, and it is far more effective in improving asthmatic symptoms than drug treatment. One study reported that the life-time costs of surgical treatment are less than treatment using proton pump inhibitors, assuming a patient took the medication for one-third of a normal life-span. Complications, although uncommon, can still occur even with minimally invasive surgeries, and patients should always consider any elective surgery very carefully.

The Procedures Standard Nissen fundoplication, employs invasive surgical procedures. The fundus (the upper part) of the stomach is wrapped completely around the esophagus. The goal of the procedure is to increase LES pressure so that acid reflux is prevented and to repair any present hiatal hernia.

A recent and less invasive fundoplication procedure uses laparoscopy, in which tiny incisions are made in the abdomen and small instruments and a tiny camera are inserted through tubes. Laparoscopic fundoplication appears to be safe and effective in people of all ages, even very small babies. When performed by experienced surgeons, the procedure is showing results that are equal to those from standard fundoplication and recovery time is faster. In about 8% of laparoscopies, it is necessary to convert to conventional surgery during the procedure. Of some concern, are reports of the need for repeat surgery in 1% to 7% of cases. These rates may decline as experience



increases. The procedure is more difficult in certain patients, including those who are obese, who have a short esophagus, or a history of previous surgery in the upper abdominal area.

A number of variants of the fundoplication procedure employ only a partial wrap or a more tailored approach and are finding favor with many surgeons, who are reporting a lower incidence of complications.

Complications.

After surgery, there may be a delay in intestinal functioning that causes bloating, gagging, and vomiting, which resolves in a few weeks. If symptoms persist or if they start weeks or months after surgery, particularly if vomiting is present, then surgical complications are likely. Complications are uncommon, but include bowel obstruction, wound infection, and injury to near-by organs. Respiratory complications can occur but are uncommon, particularly with laparoscopic fundoplication. If the fundus is wrapped too tightly, patients may have difficulty swallowing or be unable to burp. In rare cases following surgery, muscles spasms after swallowing food can cause intense pain, and patients may require a liquid diet, sometimes for weeks. The surgery may need to be repeated under certain circumstances: if the wrap has slipped or is too loose; or if the patient has persistent difficulty in swallowing, hernia, or recurrent ulcers. Even with repeat surgery, results are excellent. The complication rate can be very high in children with neurologic abnormalities, who are, unfortunately, at very high risk for GERD in the first place.

Esophagectomy.

Esophagectomy is the surgical removal of all or part of the esophagus. Patients with Barrett's esophagus who are otherwise healthy are candidates for this procedure if endoscopy shows developing cancer.



Ablation Procedures.

Procedures using laser or heat probes are being investigated for ablating (removing) injured tissue in the mucus lining of the esophagus. Researchers are hoping that such techniques will be successful in treating precancerous cells and small cancers that are detected in Barrett's esophagus. Studies on the use of ablation procedures along with aggressive standard anti-GERD drug or surgical treatments are encouraging.

Prosthetic Devices.

The Angelchik prosthesis is a silicone collar that is placed around the LES. Complications are very common, however, particularly difficulty in swallowing. GERD can recur, and even more serious, the device can migrate and puncture organs. The procedure, then, is generally not recommended. Under investigation is an inflatable cone that may allow pressure adjustment after implantation.

Procedures for Complications of GERD.

- Treatments for Bleeding . Endoscopic treatment of bleeding involves using a probe passed through the endoscopic tube that applies electricity or heat to coagulate blood and stop the bleeding.
- Treatment of Strictures . Strictures (abnormally narrowed regions) may need to be dilated (opened) with endoscopy. Dilatation may be performed by inflating a balloon in the passageway. About 30% of patients who need this procedure require a series of dilation treatments over a long duration in order to fully open the passageway. Long-term use of proton-pump inhibitors may reduce this duration.
- Phototherapy for Barrett's Esophagus . An experimental procedure called photodynamic therapy is showing promise for removing local cancers and precancerous tissue found in patients with Barrett's esophagus.



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Where Else Can Information About Gastroesophageal Reflux Disease Be Obtained?

National Digestive Diseases Information Clearinghouse
Two Information Way
Bethesda, MD 20892-3570
call (301-654-3810)
Offers patient information and educational materials.

American Gastroenterological Association
American Digestive Health Foundation
7910 Woodmont Avenue, 7th Floor
Bethesda, MD 20814
call (301 654-2055) or call (800-NO-ULCER)
or on the Internet (<http://www.gastro.org>)

American Society for Gastrointestinal Endoscopy
13 Elm Street
Manchester, MA 01944
on the Internet (<http://www.asge.org/>)

Helicobacter Pylori Foundation
Box 7965
Charlottesville, VA 22902
on the Internet (<http://www.helico.com/>)



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call (301-601-9541)

or on the Internet (<http://www.reflux.org>)

Society for Surgery of the Alimentary Tract, Inc.

6900 Grove Road

Thorofare, NJ 08086-9447

Call (609-251-0558)

or on the Internet (<http://www.ssat.com/>)

Children's Motility Disorder Foundation

Peachtree Center, South Tower

Suite 1430

225 Peachtree St.

Atlanta, GA 30303

call (800-809-9492) or (404-529-9200)

or on the Internet (<http://www.motility.org/>)

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