

LINX Procedure

A treatment for gastroesophageal reflux disease

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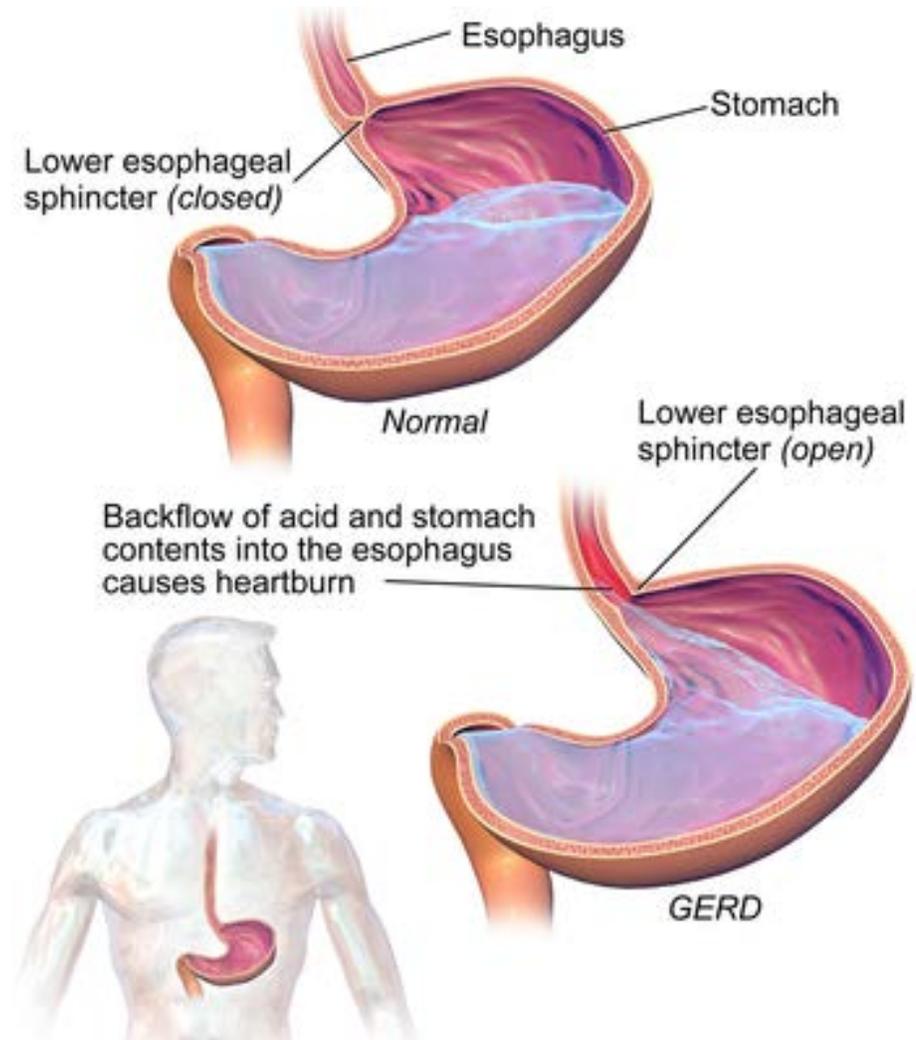
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Talk with your doctor about any questions you have.

What is gastroesophageal reflux disease (GERD)?

Gastroesophageal reflux disease (GERD) is a condition that affects the *esophagus*, the tube that carries food from the mouth to the stomach. GERD occurs when stomach acid flows back into the esophagus.



GERD occurs when stomach acid flows back into the esophagus.

GERD is the most common esophagus problem in the United States. It affects about 20% (20 out of 100) of people in the U.S. This number includes infants and children.

What causes GERD?

GERD is often caused by problems with the lower esophageal *sphincter* (LES) muscle. This muscle acts as a valve between the esophagus and stomach.

A healthy LES prevents reflux by closing right after you swallow. But, if the muscle is weak or relaxes at the wrong time, stomach acid can rise up into the esophagus.

All of these conditions can cause GERD:

- Damage to the LES or esophagus.
- A *hiatal hernia*, where part of the stomach pushes up through a large hole in the diaphragm and out of the abdominal cavity. This affects the LES and keeps it from working well. GERD does **not** occur in every person who has a hiatal hernia.
- Too much weight and fat from obesity or pregnancy can push on the stomach. This can move or put pressure on the LES.
- Acid and bile do not fully empty out of the stomach.
- Diet and lifestyle choices can make symptoms worse (see below).

What can make GERD worse?

- Some eating habits, such as eating:
 - Too much spicy, fatty, or citrus food
 - Too much caffeine, alcohol, and chocolate
 - Large meals
 - Too close to bedtime
- Using tobacco of any kind
- Using some medicines
- Wearing clothing that is tight around your waist

What are the symptoms of GERD?

- The most common symptom of GERD is *heartburn*. Heartburn is a feeling of pain behind the *sternum* (breastbone) or in the abdomen. Other symptoms include:
 - Chest pain or heartburn
 - Bad breath and a sour taste in the throat
 - Nausea after eating
 - *Regurgitation* (food or stomach acid comes up into your esophagus from your stomach)
 - Burping
 - Bloating

- *Dysphagia* (pain or problems when you swallow)
- Hoarseness or voice changes
- Airway problems
 - Coughing
 - Throat-clearing
 - Pneumonia
 - Asthma
 - Lung diseases

Almost everyone has acid reflux at some time. Talk with your doctor if you have reflux 2 or more times a week for 3 months.

What other problems can occur with GERD?

- Over time, stomach acid can harm the sensitive lining of the esophagus. This can cause *esophagitis* (inflammation, irritation, or swelling of the esophagus), which can lead to *esophageal ulcers* (sores).
- Damage to the esophagus from stomach acid can cause scar tissue to form. This can make the esophagus more narrow and lead to problems with swallowing.
- Stomach acid can change the cell structure of the esophagus so that it becomes more like the inner lining of the stomach and intestine. This is called *Barrett's esophagus*. It is linked with a higher risk of esophageal *adenocarcinoma* (cancer), especially in older adults.
- Cancer of the larynx.
- Asthma.
- *Pulmonary aspiration*, in which secretions, food or drink, or stomach contents rise into the larynx (voice box) and lower respiratory tract.
- *Pulmonary fibrosis*, a disease in which scars are formed in the lung tissues, causing serious breathing problems.

How is GERD treated?

At first, doctors most often prescribe changes in diet and lifestyle to treat GERD symptoms. Medicine may also be used. Your doctor may advise surgery if these things do not work or become less effective over time.

Diet Changes

- Keep your weight in a healthy range
- Eat smaller meals
- Eat fewer fatty, fried, and spicy foods

- Avoid foods such as
 - Peppers
 - Onions
 - Citrus
 - Chocolate
 - Caffeine
 - Carbonated beverages

See our handout “Managing Reflux” to learn more about dietary guidelines when you have GERD.

Lifestyle Changes

- Exercise more.
- Avoid wearing clothes that fit tightly around your waist.
- Eat your last meal at least 2 to 3 hours before you go to bed.
- Quit smoking and avoid secondhand smoke.
- Stop drinking alcohol.
- Raise the head of your bed. Use a pillow to raise your head above your chest level while sleeping.

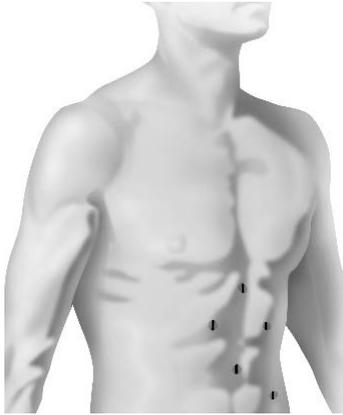
Medicines

Your doctor may prescribe medicines to help reduce your stomach acid. These medicines either *neutralize* the acid or keep your stomach from producing them.

- **Antacids** are used to help control mild to moderate heartburn. Your doctor may prescribe an antacid, or advise you to use one you can buy without a prescription, such as TUMS, Mylanta, or Alka-Seltzer. These medicines neutralize stomach acid. But, because the stomach needs acid to work well, taking antacids too often can affect how well you digest food. They can also cause diarrhea and other side effects.
- **Histamine H2-blockers** (Ranitidine, Cimetidine, Zantac, and Tagamet) work well for mild, occasional reflux. These medicines block *histamine*, a hormone in the body that causes stomach cells to create acid. These are not as strong as proton pump inhibitors.
- **Proton pump inhibitors** (Nexium, Prilosec, and Prevacid) are prescribed when GERD symptoms are moderate to severe. They are strong drugs that suppress the secretion and release of stomach acids.
- **Mucosal protective agents** (*alginic acid* and *sucralfate suspension*) are gels or foams that coat the inside of the esophagus. This protects the esophagus from being damaged by refluxed stomach acid.



The LINX device is a flexible ring of magnetic beads.



In laparoscopic surgery, several tiny incisions are made in your abdomen.

LINX Procedure

The LINX device is used to help prevent reflux. It is a flexible ring of magnetic beads. The beads are connected by titanium links that allow the beads to open when you swallow or belch.

The device is about the size of a quarter. It is placed around the esophagus just above the stomach (the *lower esophageal sphincter*). The strength of the magnets helps keep the weak LES closed. This keeps stomach acid from flowing back up into the esophagus.

But, when you swallow, the pressure of the food or liquid overcomes the magnetic attraction, and the beads separate. This lets the food and liquid (*bolus*) pass normally into the stomach.

Minimally Invasive Surgery

Instead of open surgery, where a large incision is made in your abdomen, the LINX procedure uses a *laparoscopic* (minimally invasive) method. Several tiny incisions are made in your abdomen. Your surgeon will insert tiny instruments and a fiber-optic camera through these incisions.

The LINX procedure is done as an outpatient procedure. This means you do not need to stay overnight in the hospital. You can expect to go home the same day of surgery, unless problems occur.

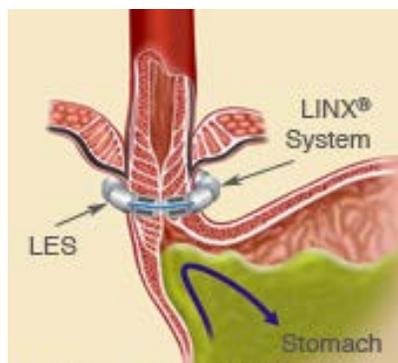
It takes about 3 to 4 months to fully heal from the surgery. You may have dysphagia (problems swallowing) after surgery. This occurs in about 80% of patients (80 out of 100 patients). This problem will resolve on its own.

After Your LINX Surgery

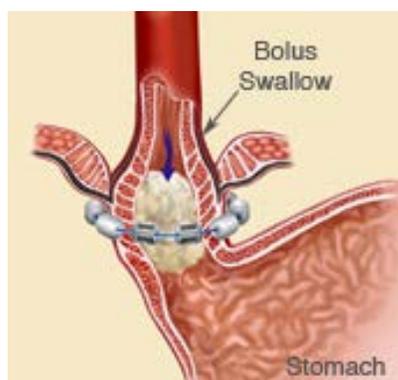
In the Recovery Room

- You will spend about 2 to 3 hours in the recovery room before going home.
- Your family may be able to visit you in the recovery room. This depends on your situation and the care of other patients in the recovery room.
- When you wake up, you will have:
 - An **oxygen mask** over your face to give you extra oxygen. You will be switched to nasal prongs (oxygen under your nose) when your lungs are ready.
 - An **IV** to give fluids and medicines during and after surgery.
 - **Sequential compression devices (SCDs) on your legs.** These wraps are used to keep blood from pooling in the calves. This helps with blood flow and prevents blood clots. The wraps inflate from time to time and squeeze your legs.

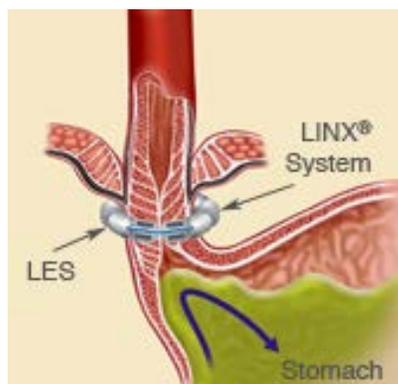
How the LINX System Works



The LINX device helps the LES resist pressure from the stomach acid.



The LINX device expands to allow you to swallow food.



The magnetic beads close the LES right after you swallow.

Breathing Exercises

You will be given a device call an *incentive spirometer* to help you exercise your lungs. **It is important to exercise your lungs to prevent problems such as pneumonia.**

Using the incentive spirometer will help prevent pneumonia and other serious problems. **It is very important to use it.** To use the incentive spirometer:

- Hold your mouth around the tube and inhale. Your breath will raise a small ball.
- Inhaling more deeply will make the ball stay up longer. Deep breathing exercises your lungs more than shallow breaths.

Going Home

Follow the self-care guidelines in this handout to avoid problems after surgery. If you have any questions, please call your surgical team.

- We expect you to go home on the same day of surgery unless there are problems.
- You will receive a LINX Implant Card after your surgery. Carry your LINX Implant Card with you at all times. If you lose this card, please call your doctor's office to get a replacement card.

Driving

- Do **not** drive for at least 2 weeks after surgery.
- Do **not** drive as long as you are taking prescription pain medicine (*opioids*). These medicines can make you sleepy, affect your judgment, and delay your reactions.
- You may begin driving when you feel that your reaction time is normal.

Pain Control

- You will have some pain in your incision. For minor pain, you can take acetaminophen (Tylenol) or ibuprofen (Advil, Motrin).
- Cold packs on your incisions can help ease pain. If you use ice, do not place it directly on your skin. Wrap the ice in a towel first. Apply ice for 20 minutes at a time, then remove for 20 minutes.
- You will receive a prescription for opioid pain medicine to help control stronger pain. **Only** use opioids if acetaminophen or ibuprofen do not ease your pain.
- If you need a refill for opioids:
 - Before we can refill an opioid prescription, a provider must assess you, either over the phone or in person.

- If you are approved for an opioid refill, we cannot send the prescription to your pharmacy. You must take it to your pharmacy in person. To get the prescription, you can either come to the hospital to pick it up, or you can call us and ask us to mail it to you. If you want us to mail you the prescription, be sure to call us several days before you will need your refill.
- You may have some shoulder pain for the first few days after your surgery. This is caused by the gas (carbon dioxide) that was used to inflate your abdomen during surgery. This pain usually lasts 4 to 5 days. Prescription pain medicines do not have much effect on this shoulder pain. Walking, massage, and heating pads may be helpful if this pain bothers you.
- Some pain medicines can make you dizzy. Ask for help when you get out of bed so that you do not fall.
- Some prescription pain medicines can cause constipation. A laxative can help. Take the laxative as prescribed. Stop taking it if you start having loose stools.

Medicines

- The LINX surgery should stop your need for antacid medicines such as Nexium, Protonix, or Prevacid.
- You may resume all of your other usual medicines, unless your healthcare provider tells you not to.
- If your doctor prescribes an antibiotic, keep taking it unless your provider tells you to stop. It is important to take the entire prescription as instructed.

Activity

- For 6 weeks after your LINX procedure, do not lift, push, or pull anything that weighs more than 15 pounds.
- As you heal, slowly increase your activity as long as it does not cause a lot of discomfort or stress your abdominal muscles. Let pain be your guide. If something hurts, stop doing it.
- It is important to walk at least 3 times a day, for a total of at least 1 mile a day. Start walking as soon as you can after surgery.
- You may resume sexual activity 2 weeks after surgery, as long as you follow all activity precautions.

Dressing and Skin Care

- You will have 5 small incisions on your abdomen. You may remove your dressings (gauze and Tegaderm) 48 hours after your surgery.

- You will have white tape called Steri-Strips under your dressing. Do not peel off these strips. They will fall off by themselves in 1 or 2 weeks.

Showering

- You may shower the day after surgery. The Tegaderm dressing is plastic and will repel water.
- It is OK get the Steri-Strips wet in the shower. Gently pat them dry after showering. Do **not** rub them dry.
- Do not take a bath, go swimming, sit in a hot tub, or soak your incisions for 2 weeks after your procedure, or until the incisions are fully healed.

Diet and Nutrition

Avoid going on a liquid diet.

Day of Surgery

- We advise a *soft mechanical diet* right after surgery and **only** for the day of your LINX procedure. With this diet, you will eat only foods that are physically soft. The goal is to reduce the need to chew your food.
- Start eating your regular foods the next day. **It is very important that you eat a normal diet right away.** This will help the implant site heal.
- For 7 to 10 days after your procedure, you will most likely have a hard time swallowing, more belching, or chest pain.

Weeks 1 to 2

We call this the “honeymoon” stage. Many patients report that food goes down well. During this time, we suggest you:

- Take small bites of food.
- Chew food very well.
- Eat slowly.
- Eat often – 5 to 7 small meals, every 2 to 3 hours.
- Eat very little dry food such as chips, hard bread, and crackers.
- Keep a drink nearby in case you need to sip liquids with your food.
- Avoid taking large amount of fluids at one time. Drinking too much at once may cause tightness or discomfort.

Weeks 3 to 8

- Scar tissue will be forming at this time. This is a good thing! This is your body’s way of healing. The scar tissue forms a capsule around the device. This keeps it from moving up or down.

- You may have some problems swallowing, more belching, or chest pain. This is caused by inflammation and *edema (swelling)* as your body gets used to the LINX device.
- You may also have chest pain that is caused by spasms of the esophagus. Your esophagus is a muscle. Like any other muscle in your body, it may spasm as a result of being stressed during the procedure. This pain is sometimes described as “sharp” or “stabbing,” but it does not last long.
- If your food “sticks” or you have problems swallowing, drink warm water or tea. This can help relax your esophagus.

These are all known and expected symptoms. Keep eating a regular diet and eat small meals often to help ease these symptoms.

Eat Often

To keep the LINX device from scarring into a fixed position, it is important to do “physical therapy.” What is physical therapy for the LINX?

EATING! Just as it is important to exercise a knee after knee surgery, you must exercise the device by eating often.

Constant movement helps the device stay mobile. This will prevent long-term problems with swallowing. Every time you swallow food, the device opens and closes, stretching the scar tissue. This results in the best healing.

- We encourage eating 5 to 7 small meals throughout the day, about every 2 to 3 hours.
- For most patients, *dysphagia* (problems swallowing) is at its worst about 6 to 8 weeks after the procedure. After that, it should start to improve. By 12 to 16 weeks, dysphagia goes away in 90% of patients (90 out of 100 patients). Most patients are able to handle foods without any problem at this time.
- Experiment with your food! Eat a variety of different foods.

Diet Tips

- Avoid eating bread crust, pasta, rice, and pizza for 3 weeks.
- Avoid eating steak, boiled chicken, or any dense meat for 3 weeks. If you want to eat any of these denser cuts of meat, moisten in stew with sauces or liquids.
- If you feel nauseated right after the procedure, eat bland foods like mashed potatoes, yogurt, and chicken noodle soup.

Foods to Try

- Moist fish such as tuna, cod, and halibut
- Ground meat with gravy, meatballs with meat sauce
- Meat loaf

- Well-cooked, chopped spaghetti
- Eggs: scrambled, in an omelet, or in a quiche
- Cooked vegetables
- Bananas, canned fruits, and mangoes
- Soups, stews

Follow-up Care

You will have several follow-up visits with the surgical team after your LINX procedure. These visits are:

- **2 weeks after your procedure:** We want to make sure you are recovering well from the procedure. You may start having dysphagia.
- **6 weeks after your procedure:** We will monitor how your diet is progressing. Dysphagia at its peak or will start to resolve.
- **3 months after your procedure:** We will make sure your diet has progressed and that any dysphagia is resolving.
- **1 year after your procedure:** We will do an *esophagram* (barium swallow X-ray) to check the status of LINX device. This study shows well your esophagus is working, how well you are swallowing, and how the device is working.

Questions You May Have

Can I belch or vomit with LINX?

Yes.

Can I sense or feel the implant?

No.

Can I go through airport security?

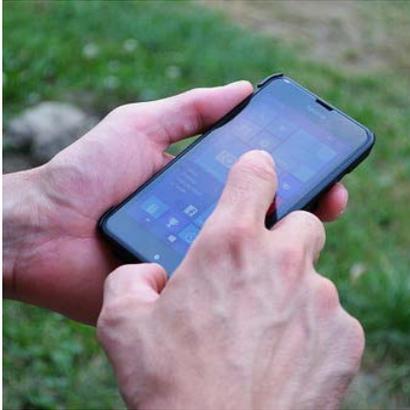
Yes. We will give you an implant card to have with you, in case an issue arises.

How long will the device last?

It uses permanent magnets that are designed to never wear out.

Can I have an MRI scan?

Yes, MRI (*magnetic resonance imaging*) scans can be done, but **you must tell the MRI technicians about the device** so they can limit the strength of the magnet used in the MRI (up to 1.5 Tesla). Some newer MRI machines use a stronger magnet (3 Tesla), and these need to be avoided.



Call your surgical team if you have any of the symptoms listed on this page.

When to Call Your Surgical Team

In the 7 days after your procedure, call your surgical team if you have any of these symptoms:

- You cannot swallow solid foods or can handle only liquids
- You cannot keep fluids down
- You are vomiting even if you are taking medicines to prevent nausea
- Your vomit is bloody or looks like coffee grounds
- You have back or shoulder pain that does not go away
- There is an increase in bleeding from your incision
- You have chest pain or shortness of breath
- You feel very full and your abdomen is bloated
- You cannot have a bowel movement or you have diarrhea
- Your stool looks black or tarry
- You feel dizzy or faint when you stand up
- One of your legs or arms feels warm, tender, painful, or it is swollen and red
- Any sign of infection:
 - Fever higher than 100.5°F (37.8°C)
 - Shaking or chills
 - Increase in drainage from your incision
 - Drainage that has become thick or smelly
 - Redness or swelling around the incision
 - Growing pain or tenderness at the incision site, or spreading away from it

If you think you have an urgent, life-threatening condition, call 911 right away.

Illustrations in this handout are used with permission from TORAX Medical, Inc.

Questions?

Your questions are important. Call your doctor or healthcare provider if you have questions or concerns.

Your surgeon's office:

Weekdays from 8 a.m. to 5 p.m., call 206.598.4477 and press 8 when you hear the recording.

After hours and on weekends and holidays, call 206.598.6190 and ask to page the Surgery O team.