

Otosclerosis and Stapes Surgery

How to prepare and what to expect

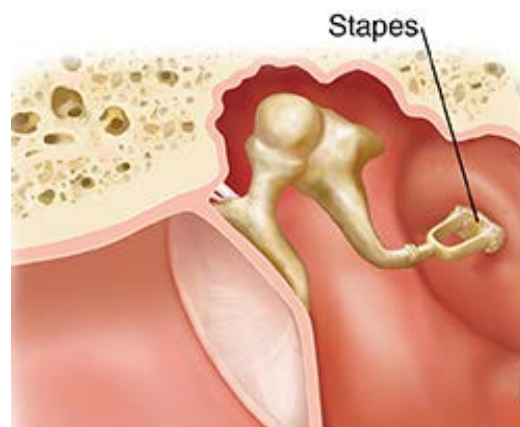
This handout explains otosclerosis, an ear problem that causes hearing loss. It also describes stapes surgery, which is done to improve hearing.

What is otosclerosis?

Otosclerosis (oh-toh-skleh-ROH-sis) is abnormal growth on the tiny *stapes* (stirrup) bone in your middle ear. This growth keeps the stapes from vibrating in response to sound.

Otosclerosis is the most common cause of *conductive* hearing loss in adults. Conductive hearing loss is when sound waves cannot move normally in the ear (see page 3).

At first, otosclerosis does not cause any symptoms. Hearing loss begins when the bone growth starts to affect how the stapes works. As the bone keeps growing, the hearing loss gets worse.



Otosclerosis affects the stapes, a tiny bone in your middle ear.

The good news is that hearing loss occurs in only 10% of people (10 out of 100) who have otosclerosis. Profound (severe) hearing loss and deafness are very rare.

What causes otosclerosis?

Otosclerosis can be *hereditary*, which means it may be passed from parents to their children. Someone in your family may have had the condition and passed it down to you. If you have otosclerosis, your children may inherit it. Hearing loss may not occur in all generations.

The measles virus may affect whether or not you develop otosclerosis, but measles alone do not cause it.

How is it treated?

Your doctor may advise hearing aids or that you have stapes surgery to treat otosclerosis. Sometimes, both surgery and a hearing aid are needed.

It is very rare for otosclerosis to cause total deafness. But if this happens, a *cochlear implant* is an option. Please see our handout “Cochlear Implant” to learn more.

Normal Ear Function

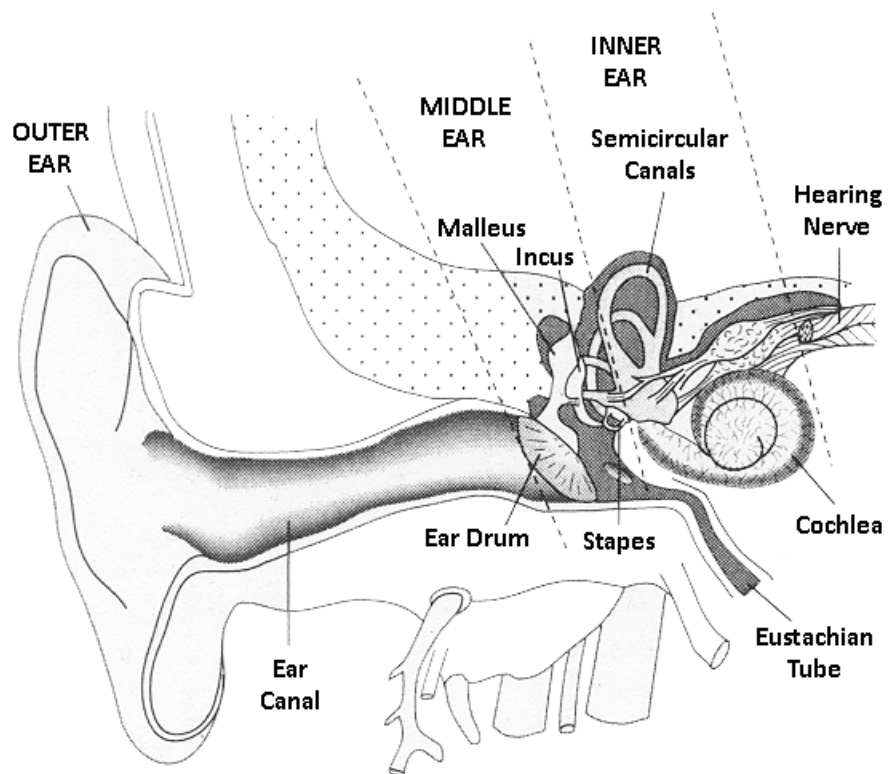
The ear has 3 parts:

- The **outer ear** collects sound waves.
- The **middle ear** increases the sound energy and sends the sound to the inner ear.
- The **inner ear** changes the sound waves into nerve impulses that are sent to the brain.

As sound waves pass through the ear canal, the eardrum vibrates. This vibrating motion is sent through 3 small *ossicle* bones in the middle ear: the *malleus* (hammer), *incus* (anvil), and *stapes* (stirrup).

When the stapes bone receives sound waves, it pushes on a thin membrane called the *oval window*. This causes movement in the *cochlea*, a sense organ in the inner ear.

Inside the cochlea are tiny hair cells that convert these vibrations to electrical impulses. A hearing nerve carries these impulses to the brain. The brain interprets these impulses as sound. This allows you to hear.



Parts of the ear

Types of Hearing Loss

- **Conductive hearing loss** occurs when there is a problem in the outer or middle ear that lessens the flow of sound vibration to the inner ear. In other words, sound vibrations are not “conducted” well through the ear. In otosclerosis, the new bone growth next to the stapes acts like cement and affects how well these vibrations are conducted through the hearing bones (ossicles).
- **Sensory hearing loss** occurs if the problem is in the inner ear.

Otosclerosis most often causes conductive hearing loss, but sometimes there is a mix of both types. It is very rare for the hearing nerve to be involved.

Hearing Loss from Otosclerosis

Stapedial Otosclerosis

In about 10% of people (10 out of 100) who have otosclerosis, the new bone growth affects the stapes and the oval window. The usual vibration of the stapes on the membrane is restricted (in early cases) or gone (in late cases). This is called *stapedial otosclerosis*.

Cochlear Otosclerosis

About 1% to 2% of people (1 to 2 out of 100) who have otosclerosis develop *cochlear otosclerosis*. This is when the bone growth spreads to the inner ear. If this occurs, the hearing loss is permanent.

Treatment for Otosclerosis

Medical

There is no medicine or treatment that can be applied directly to the ear that will help your hearing if you have otosclerosis. Some doctors have used *sodium fluoride* to try to stop the bone growth, but we are unclear how effective it is.

The 2 ways to help your hearing loss are by using a hearing aid or doing surgery, and sometimes both. In some cases where bone has grown into the inner ear and caused total deafness, a *cochlear implant* may help.

Hearing Aids

A hearing aid works well to make up for the hearing loss from otosclerosis. We may advise using a hearing aid, since they are safe and work well. Most health insurance plans do not cover the full cost of hearing aids.

Surgery

Your doctor may talk with you about stapes surgery. There are 2 types: *stapedectomy* (removing the entire stapes) and *stapedotomy* (removing only part of the stapes, called the *crura*). The choice between these types of surgery depends on how severe the otosclerosis is.

After total removal, the patient has better low-frequency hearing but poorer high-frequency hearing than with a partial removal. A partial removal may be done with a laser or a microdrill to help lessen the effects of the surgery on the inner ear.

The operation may be done under *local anesthetic* or *general anesthesia*. In local anesthesia, you will receive medicine to block pain, but you will stay awake. With general anesthesia, you will receive medicine that will both block pain and make you sleep.

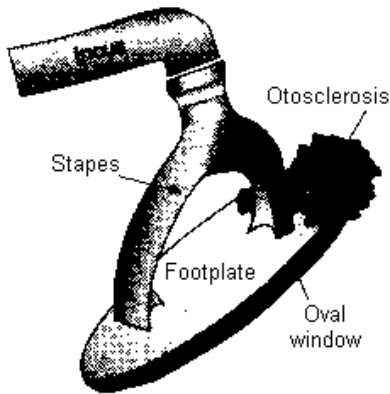
Stapes surgery can usually be done as an *outpatient* procedure. This means you do not have to stay overnight in the hospital. But, if you feel dizzy after the operation, you may need to stay overnight.

Recovery after stapes surgery usually goes quickly. Over 90% of these surgeries (90 out of 100) improve or fully restore hearing. In 1% to 2% of patients (1 to 2 out of 100), there is total hearing loss in the operated ear and short-term severe dizziness.

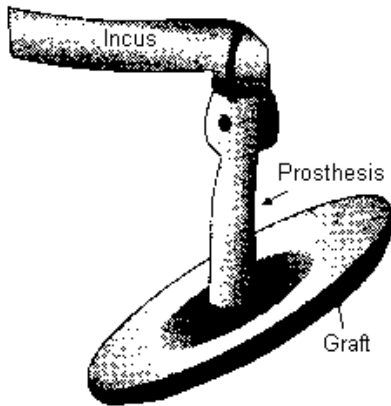
Surgery Options

Your doctor will consider the level of hearing loss in both of your ears and the level of inner ear function when advising you on what kind of surgery to have. If you have:

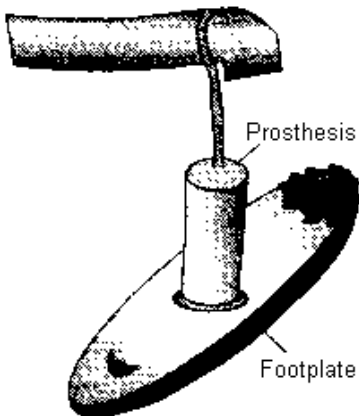
- **A small amount of stapedial otosclerosis:** We do not advise surgery until the condition gets worse. A hearing aid will help if your hearing is affected.
- **Unilateral (one-ear) otosclerosis:** Stapes surgery will improve hearing in the affected ear, make it easier for you to know where sound is coming from. It should also improve your ability to hear in a noisy setting.
- **Good inner ear function and poor hearing in both ears:** Stapes surgery in the poorer ear has a 90% chance (90 out of 100) of resulting in normal hearing after surgery, without the need for hearing aids.
- **Some inner ear damage:** The success of surgery depends on how much hearing loss there is. Sometimes, the inner ear works better so that a hearing aid is not needed. But, a *mild-gain* hearing aid may be needed for distance hearing. A powerful hearing aid may be needed if loss is severe.



Normal stapes with otosclerosis



Total stapedectomy



Stapedotomy with piston prosthesis

- **Total deafness due to cochlear otosclerosis:** Stapes surgery will not help. But, a cochlear implant may be helpful. Ask your doctor for more information.

Stapes Surgery

Stapes surgery is done through the ear canal. A small incision may be made in front of the ear to improve access and to get a small amount of tissue. This tissue will be used as a seal around the man-made stapes piston (*prosthesis*).

During surgery, the surgeon turns the eardrum forward and removes part (stapedotomy) or all (stapedectomy) of the stapes bone. This may be done with either a microdrill or a laser.

The wire loop of the piston (see drawing at bottom left) is attached to the *incus*, the second hearing bone next to the stapes. Then some tissue is placed around the opening to the inner ear to seal around the piston. The surgeon then returns the eardrum to its normal position and fills the ear canal with ointment or a dressing (bandage).

The stapes prosthesis lets sound waves pass from the eardrum to the inner ear. This lets you hear again. The hearing regained after surgery is usually permanent. It may take about 4 to 6 weeks after surgery for your hearing to improve.

Day of Surgery

Stapes surgery is usually done as outpatient surgery. You will arrive at the hospital the morning of the surgery, and you will stay in the recovery room until you are well enough to leave.

You may **not** drive yourself home from the hospital, or take a bus, taxi, or other transportation by yourself. Bring a family member or friend to drive you home.

After Surgery

Travel

You may travel by air up to 48 hours after surgery. After this, it is best to wait 4 to 6 weeks to travel by air.

Activities

- You should be able to return to a desk job about 1 week after surgery. If you must do heavy physical activity for your job, you will need to wait 4 to 6 weeks to return to your normal level of work.
- Avoid being around loud noises such as gunfire or machinery. These may damage your new hearing.

- We advise you **not** to dive or swim more than 6 feet under water. The pressure changes could damage your hearing. To protect your hearing, you will need to follow this advice **for the rest of your life**.

Hearing Improvement After Surgery

Your hearing will be worse right after surgery. This is from the ointment or dressing in your ear canal and the fluid that builds up behind your eardrum. Long-term improvements should begin about 3 weeks after surgery. In about 4 months, your hearing should be at its best.

The level of hearing improvement depends on how well your ear heals. For most patients, the ear heals very well and hearing improves as they had hoped. If your ear does not heal all the way, your surgeon may advise a 2nd surgery.

If needed, surgery on the 2nd ear may be done 1 year after the first ear.

Tinnitus

You may have some *tinnitus* (ringing in your ears) before your surgery. This often occurs when the nerve impulses from the ear to the brain are not working well.

The level of tinnitus is not always related to the extent or type of hearing loss. But, it is a common result of hearing loss. It is usually worse when you are tired, nervous, or in a quiet setting. When you are doing something that occupies your mind such as reading, listening to music, or doing other activities, you may not notice the ringing.

After stapes surgery, you will most likely still have tinnitus. But, it is usually less intense and patients are not as aware of it.

Problems After Stapedectomy

Feeling Dizzy

It is normal to feel dizzy for a few hours after a stapedectomy. This will slowly get better, but you may still feel unsteady for the first few days after surgery. For several weeks, you may feel dizzy if you move your head quickly. It is rare for dizziness to last longer than several weeks.

Taste Changes

For a few weeks after surgery, most patients lose their ability to taste on the side of their tongue, on the side of the operated ear. This occurs because the surgery affects the *chorda tympani* nerve, which passes through the middle ear as it goes from the mouth to the brain.

This loss of taste usually does not last. As this nerve starts to work again, the sense of taste returns in most people.

Hearing Loss

About 1% to 2% of patients (1 to 2 out of 100) have more hearing loss after the surgery. This is due to:

- Scar tissue
- Infection
- Blood vessel spasm
- Irritation of the inner ear
- Leaking of inner ear fluid

In 1% to 2% of patients (1 to 2 out of 100), there may be major problems during healing that cause severe hearing loss. In these cases, hearing aids will not work in the operated ear. This is why the ear with the poorest hearing before surgery is chosen for surgery. Your doctor wants to preserve your better hearing in the other ear in case problems occur.

Ear Drum Damage

In less than 1% of patients (fewer than 1 out of 100), a hole in the eardrum (*perforation*) occurs, usually due to an infection. The membrane may heal itself after the infection is cleared. If it does not heal, a surgery called *myringoplasty* may be needed to repair the eardrum.

Face Weakness

A very rare problem of stapes surgery is weakness in the face. This may happen because of swelling of the facial nerve next to the oval window, or due to some other abnormality.

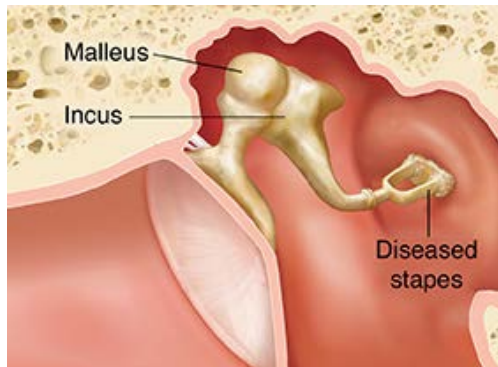
Hearing Aids

People with otosclerosis rarely lose all of their hearing. They often benefit from either a hearing aid alone or a hearing aid and surgery. The older you are, the less likely you are to have more hearing loss after surgery. You may find that good hearing aids that fit well are helpful, whether or not you have surgery.

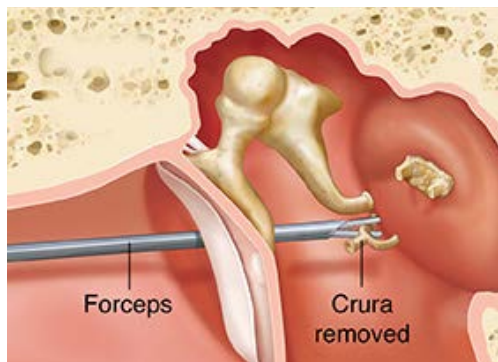
We Care About Your Hearing

If your doctor has advised stapes surgery but you have not yet had your operation, we advise you to have hearing tests every year. You may choose to have the surgery at any time with good results. Please call or write us with any questions you have.

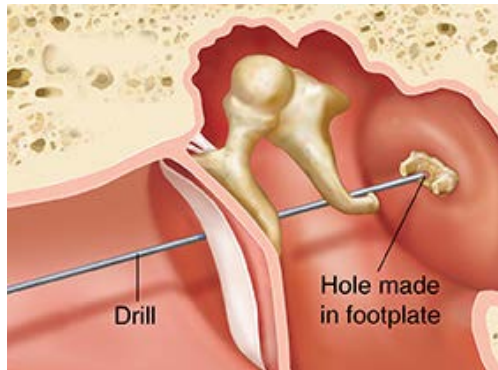
Stapes Surgery



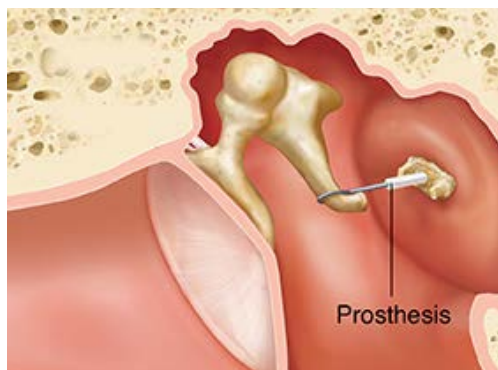
There are 3 bones in the middle ear: the malleus, incus, and stapes.



Your surgeon will use forceps to remove the crura, the damaged part of the stapes.



Your surgeon will use a drill to create a hole in the footplate of the stapes for the prosthesis.



Once the prosthesis is in place, your ear can begin to heal.

Questions?

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

For appointments: Call Otolaryngology – Head and Neck Surgery Center at 206.598.4022.

If you are already a patient and have questions about your treatment plan:

- Weekdays from 8 a.m. to 5 p.m., call the Otology Voice Mail Line at 206.598.7519.
- After hours and on weekends and holidays, call 206.598.4022 and press 5 when you hear the recording. You will talk with a Community Care Line nurse.