

## Questions?

Your questions are important. Call your doctor or health care provider if you have questions or concerns. UWMC clinic staff are also available to help.

**Appointments:** Call Otolaryngology – Head & Neck Surgery Center, 206-598-4022.

### Established patients with questions about your treatment plan:

Weekdays from 8 a.m. to 5 p.m., call the Nurse Voice Mail Line, 206-598-7519.

After hours and on weekends and holidays, call 206-598-6190 and ask for the Otolaryngology resident on call to be paged.

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# Otosclerosis and Stapes Surgery

*What to expect*

**Otosclerosis** is a condition in your ear that causes hearing loss. It occurs when there is abnormal growth on the tiny bones (*ossicles*) in your middle ear. If you have otosclerosis, your hearing may be improved with hearing aids or with surgery on the *stapes* (stirrup) bone, the smallest bone in the body.

Stapes surgery has been used since the 1960s. This surgical technique continues to improve. Today, this surgery restores hearing in most cases without complications.

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## About Otosclerosis

Otosclerosis is the most common cause of *conductive hearing loss* in adults. Conductive hearing loss occurs when sound waves cannot move normally in the ear. See page 4 for more information about conductive hearing loss.

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.

The good news is that hearing loss occurs in only 10% of people (1 out of 10) with otosclerosis. Profound (severe) hearing loss and deafness are very rare.

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. Also, your children may inherit this tendency to develop otosclerosis. 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.

Hearing loss from otosclerosis may be corrected by surgery or with a hearing aid. In some cases, both surgery and a hearing aid are needed. It is very rare for otosclerosis to cause total deafness. If this happens, a *cochlear implant* is an option. Please see our handout, “Cochlear Implant” for more information.

In 1% to 2% of patients (1 to 2 out of 100), there may be major complications 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 – to preserve your better hearing in the other ear in case problems occur.

### *Ear Drum Perforation*

In less than 1% of patients (less than 1 out of 100), a hole in the eardrum 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 complication of stapes surgery is weakness in the face. This may occur due to swelling of the facial nerve located right next to the oval window, or due to some other abnormality.

### **Hearing Aids**

Whether or not your doctor recommends surgery, you may find that good hearing aids that fit well are helpful. Patients 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.

## **We Care About Your Hearing**

**If your doctor has recommended 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.**

After stapes surgery, tinnitus is likely to remain. But, it is usually less intense and patients are not as aware of it.

## Complications After Stapedectomy

### *Dizziness*

It is normal to feel dizzy for a few hours after your 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.

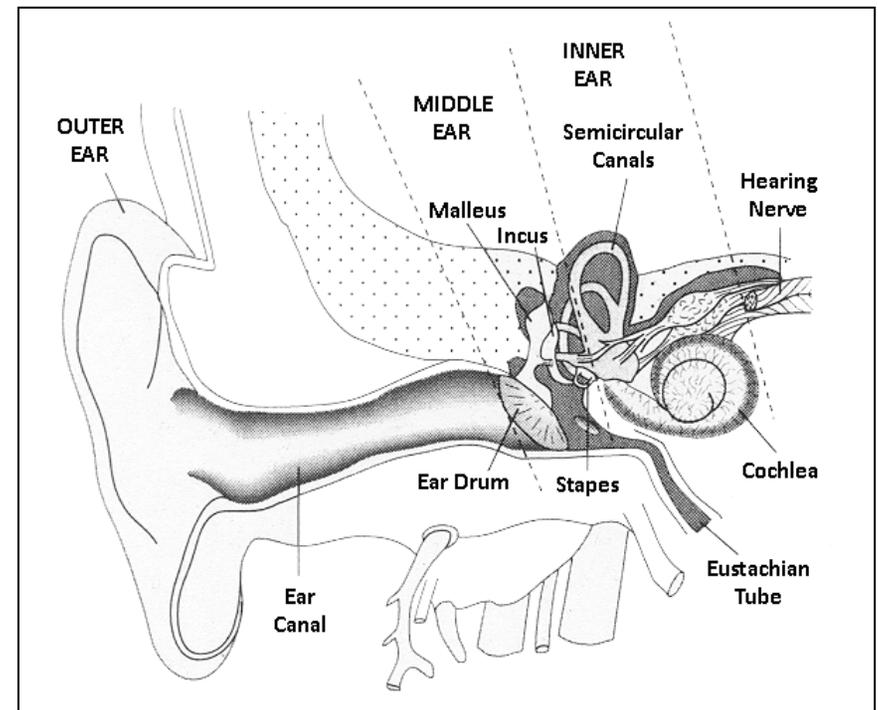
### *Taste Changes*

Most patients lose their ability to taste on the same side of their tongue for a few weeks after surgery. This loss of taste is rarely permanent. It occurs because the *chorda tympani* nerve, which passes through the middle ear as it goes from the mouth to the brain, is affected by the surgery. As this nerve returns to normal functioning, 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



Parts of the ear

## Normal Ear Function

The ear has 3 parts:

- The **outer ear** collects sound waves.
- The **middle ear** increases the sound energy and transmits the sound to the inner ear.
- The **inner ear** transforms 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 transmitted 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*. The vibration of the stapes against the oval window 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. These impulses are carried by the hearing nerve to the brain. The brain interprets these impulses as sound, and this allows you to hear.

### Types of Hearing Loss

- If there is a problem in the outer or middle ear, a **conductive** hearing loss occurs because the flow of sound vibration to the inner ear is lessened. 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).
- If the problem is in the inner ear, a **sensory** hearing loss occurs.

In otosclerosis, conductive hearing loss usually occurs, but sometimes it 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 patients (1 out of 10) with 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), which causes conductive hearing loss.

- Avoid being around loud noises such as gunfire or machinery. These may damage your new hearing.
- Diving or swimming more than 6 feet under water is **not** recommended. The pressure changes could damage your hearing. You will need to follow these precautions for the rest of your life to protect your hearing.

### 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. You should begin to notice lasting improvements 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 perfectly and hearing improves as they had hoped. If your ear does not heal completely, your surgeon may consider a second surgery. Surgery on the second 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 tinnitus.

This may be done with either a microdrill or a laser. The wire loop of the piston (see picture on page 7) 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 allows you to hear again. The hearing regained after surgery is usually permanent. It may take about 4 to 6 weeks after surgery to notice improved hearing.

### ***The 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. Do **not** plan to drive yourself home from the hospital. 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 your job requires heavy physical activity, you will need to wait 4 to 6 weeks to return to your normal level of work.

### ***Cochlear Otosclerosis***

About 1% to 2% of people (1 to 2 out of 100) with 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. Sodium fluoride has been used to try to stop the bone growth, but there is disagreement about how effective it is.

The 2 ways to help your hearing loss are by using a hearing aid or 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 effective. 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* and *stapedotomy*. The operation may be done under local 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, which means you do not have to stay overnight in the hospital. But, you may need to stay overnight if you feel dizzy after the operation.

Recovery after stapes surgery is usually short. Over 90% (9 out of 10) of these operations improve or fully restore hearing. In 1% to 2% (1 to 2 out of 100) of patients, there is total hearing loss in the operated ear and short-term severe dizziness.

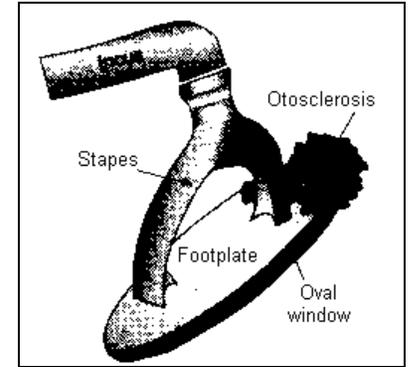
The choice between removing the entire stapes (**stapedectomy**) or removing only part of the stapes (**stapedotomy**) depends on how severe the otosclerosis is. After total removal, the patient has better low-frequency hearing and poorer high-frequency hearing than with a partial removal. A partial removal may be done with a laser or a microdrill to help lessen the effects of the surgery on the inner ear.

### Surgery Options

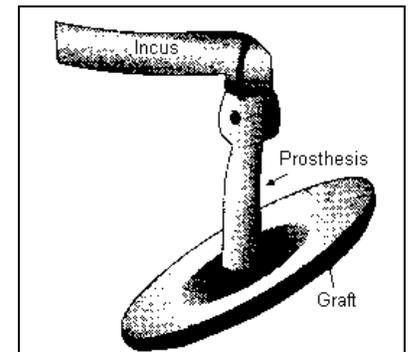
Your doctor will consider the level of hearing loss in both of your ears and the level of inner ear function when advising you on what kind of surgery to have. If you have:

- **A small amount of stapedial otosclerosis:** Surgery is not advised until it gets worse. A hearing aid will help if your hearing is affected.
- **Unilateral (one-ear) otosclerosis:** A stapes operation will improve hearing in the affected ear, make it easier for you to know where sound is coming from, and should improve your ability to hear in a noisy setting.

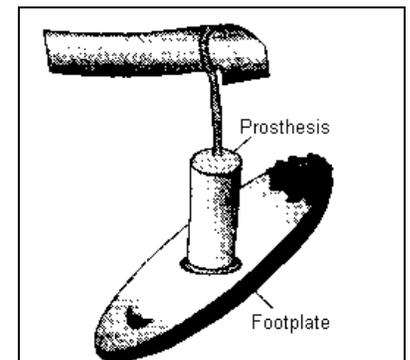
- **Good inner ear function and poor hearing in both ears:** A stapes operation in the poorer ear has a 90% (9 out of 10) chance of resulting in normal hearing after surgery, without the need for hearing aids.
- **Some inner ear damage:** The success of surgery depends on how much hearing loss there is. Sometimes, the inner ear function also improves so that a hearing aid is not needed. But, a mild-gain hearing aid may be needed for distance hearing, or a powerful aid may be needed if loss is severe.
- **Total deafness due to cochlear otosclerosis:** Stapes surgery will not help. But, a cochlear implant may be successful. Ask your doctor for more information.



Normal stapes with otosclerosis



Total stapedectomy



Stapedotomy with piston prosthesis

### The Stapes Operation

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

The surgeon turns the eardrum forward and removes part (stapedotomy) or all (stapedectomy) of the stapes bone.