

## **Tympanic Membrane Perforation**

A hole in the eardrum (tympanic membrane perforation) is a common consequence of ear injury or infections. They can be repaired surgically to improve hearing and to prevent complications.

### **What causes a perforation in the eardrum?**

With recurrent ear infections, the eardrum (tympanic membrane) may become “scarred”. Scar tissue generally has less blood supply than normal tissue. As such, it is less resistant to infection and eventually, a point may come that the eardrum, when faced with the stress of an abscess, dissolves away, leaving a hole in the eardrum.

The eardrum may also become perforated by foreign objects (Q-tips, bobby pins) or by trauma, such as a slap to the ear. Although many traumatic perforations heal spontaneously, many require repair. Perforations may also occur following extrusion of pressure equalization tubes placed to prevent recurrent middle ear infections.

Chronic Eustachian tube problems cause negative middle ear pressures that can retract and thin the eardrum so much that it stops working as a sound collector and threatens to form cholesteatoma (see the sections titled “Otitis media” and “Cholesteatoma”). In these cases, the collapsed sections of eardrum are removed surgically and repaired using methods described below.

### **What are the consequences of a perforated eardrum?**

A hole in the eardrum leads to hearing loss because the eardrum no longer has the surface area to collect all of the sound coming into the ear. The size of the hearing loss is related to the size of the perforation. It is not unusual for a small perforation that causes little hearing loss to go unnoticed by the patient.

An ear with a hole in the eardrum is more likely to become infected because it is not protected from repeated water entry. Moisture evaporating from the exposed linings of the middle ear also tends to humidify the ear canal and creates a good environment for bacteria and fungi to grow. Excessive humidity in the ear canal with recurrent infection is a common problem for hearing aid users. The hearing aid acts as a plug that keeps the ear from drying out, and promotes an environment for infection.

In some cases, skin from the outer surface of the eardrum will migrate into the middle ear through a perforation and accumulate. This accumulation invariably results in infection which will not stop until the infected skin is removed. The skin can erode hearing bones and migrate deep into airspaces around the ear, requiring extensive surgery in some cases. See the section titled “Cholesteatoma” for more details.

## **Fixing a hole in the eardrum**

**Myringoplasty:** If a hole in the eardrum is small, it can sometimes be repaired by a procedure called myringoplasty. This is performed by irritating the margins of the perforation and then giving it some sort of template to grow across. This template may be as simple as a piece of cigarette paper placed over the roughened edges of the hole. More often, however, a small piece of tissue such as a piece of fat can be placed through the very small perforation and result in a successful closure.

**Tympanoplasty:** If a hole in the eardrum fails myringoplasty or is too large to repair with myringoplasty, then tympanoplasty is required. It is often performed by trimming the margins of the perforation and creating a patch out of the covering of the temporalis muscle above the ear. Feel the muscle above your ear by placing your fingers above the top of your ear and clenching your jaw. The covering of this muscle is called fascia, which is an excellent material for repairing an eardrum. The eardrum can also be repaired using the tough covering of the cartilage of the ear, called perichondrium. The toughest material used to repair the eardrum is cartilage taken from the outer ear. It behaves like a natural stiff plastic that resists retraction that many eardrums requiring tympanoplasty are prone to. Cartilage is the least frequently used of these materials because it is harder to work with.

In tympanoplasty, the graft material has to be held against the edges of the perforation until healing occurs. This generally takes a minimum of several weeks. Because the surgical area is too small to sew the graft into place, the graft and eardrum are sandwiched together between a mass of gelatin packing placed in the middle ear beneath the graft and in the ear canal over the graft. This gelatin is saturated with antibiotics to prevent infection from destroying the graft before blood vessels grow into the graft and make it resistant to infection.

The ear canal is shaped like a boot, and the round eardrum is the sole of the boot. It is hard to see the front half of the eardrum by looking through the ear canal. A perforation in the posterior (back) half of the eardrum can generally be repaired through the ear canal, but perforations in the anterior (front) half of the eardrum may require an incision behind the ear to allow easy vision and working access for a good repair. This is like looking through the back of the boot to see more easily into the toe area.

## **What to expect after surgery**

The success rate of operations to fix a hole in the eardrum is generally 90% or better. This operation is done under general anesthesia in a hospital or outpatient surgery center. Most patients are able to resume school or work within one week of surgery. The gelatin packing will all be removed from the ear canal within 3 weeks of surgery. Gelatin packing in the middle ear may take 4 to 6 weeks to dissolve. A hearing test will be obtained at that time. If an incision behind the ear was used, the top of the ear may become numb because nerves to the top of the ear go near the incision. The numbness generally resolves over

a period of months. Incisions behind the ear tend to heal very well and are generally difficult to find a year after surgery.

Most ears requiring tympanoplasty have chronic problems with Eustachian tube function. Although the perforation has been repaired, the new eardrum will be subject to the same stresses of chronic Eustachian tube dysfunction as the original eardrum. This may lead to accumulation of fluid, hearing loss, or retraction of the new drum. Cartilage is a good choice for tympanoplasty in patients who are at higher risk for recurrent problems, as it is stiffer and more resistant to retraction. Patients who have had tympanoplasty surgery are generally examined yearly until it is evident that chronic problems will not develop.