

## Treatment of the Perforated Eardrum

The benefits of closing a perforation include prevention of water entering the ear while showering, bathing, or swimming (which could cause ear infection), improved hearing, and diminished tinnitus. It also may prevent the development of cholesteatoma (skin cyst in the middle ear), which can cause chronic infection and destruction of ear structures.

There are a variety of surgical techniques, but all basically place tissue across the perforation allowing healing. The name of this procedure is called tympanoplasty. Surgery is typically quite successful in closing the perforation permanently, and improving hearing.

Your doctor will advise you regarding the proper management of a perforated eardrum.

### How is it treated?

A small hole in the eardrum often heals itself, sometimes within a couple weeks. During this time your ear needs to be protected from water (for example, in the bath, shower, or pool). Your ear will feel better if you protect it also from cold air.

Large holes or unhealed small holes are repaired by surgery. The surgical repair is usually a simple procedure and does not require staying overnight in the hospital.

Sometimes artificial eardrums are created for children or adults who have frequent ear infections and infected drainage.

### How long do the effects last?

A tiny rupture in your eardrum usually heals within 3 weeks.

### How can I help prevent a ruptured eardrum?

If you have symptoms of an ear infection, such as an earache or feeling of blockage in the ear, see your health care provider promptly.

## Indications

To restore the original mechanics of the middle ear so that mechanical energy can be transmitted in order to generate electrical impulses within the cochlea.

To secure the integrity of the tympanic membrane preventing infection. This helps avoid formation of scar tissue or tympanosclerotic fixation, which immobilises the ossicular chain and reduces middle ear efficiency. Such pathology leads to a greater conductive hearing loss and the spread of toxins into the inner ear, causing sensori neural hearing loss.

To prevent thermal stimulation of the labyrinthine mechanism, which leads to vertigo.

## Anesthesia

The operation may be performed under local or general anesthesia. Local anesthesia has some advantages including avoiding the risks of general anesthetic. When performed in combination with a vasoconstrictor it provides a near bloodless operating field in most cases.

Most experienced anesthetists adopt hypotensive anesthetic technique. In a ventilated patient who is otherwise fit and well and has no significant cardiovascular history, systolic pressure can safely be dropped to the resting diastolic pressure during anesthesia. This usually provides an excellent operating field.

Suction in the middle ear and manipulation of the ossicular complex stimulates the labyrinth and can lead to post-operative vertigo. Appropriate anti-emetics should be given during surgery with drugs such as Ondansetron being extremely effective in the prevention of postoperative nausea and vomiting.

## Technique

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Surgical technique is dictated by the site and size of the perforation. Good surgical access is paramount. Small perforations can be approached by a perimeatal approach using a speculum held in the ear canal by a rigid, table mounted speculum holder.

Graft material is usually fat, tragal perichondrium or preferably temporalis fascia. This can be harvested via a small separate incision. For larger perforations an endaural (vertical excision extending through a variable distance from within the external auditory meatus vertically above the ear and anterior to the pinna) or a post auricular (approximately 1 cm behind the pinna) incision should be employed. Both of these incisions allow excellent access to all parts of the tympanum. For antero-marginal perforations further exposure can be obtained by raising anteriorly or posteriorly based flaps and performing a bony meatoplasty. These techniques can also be employed with perforations elsewhere in the tympanic membrane, where there is a narrow external auditory canal.

A small margin of tissue around the whole of the circumference of the perforation is removed using a sharp middle ear needle or sickle knife. This removes the healing that has taken place between the anterior and posterior surface of the tympanic membrane. This leaves the three layers, as described in the middle ear anatomy section, bared and facing each other across the defect.

The size of the perforation is then estimated in order to harvest an appropriately sized piece of temporalis fascia. This is harvested from the deep layer of the temporalis fascia. This is much tougher tissue than the superficial layer and thus far more appropriate for performing the repair. For small perforations, the graft material can be laid under the perforation on a bed of suitable material such as Gelfoam™. This helps keep the graft in contact with the underside of the tympanic membrane.

For larger perforations, a circumferential incision is made from 1 o'clock around to 5 o'clock in the skin of the external auditory canal just lateral to the tympanic annulus. A combination of sharp and blunt dissection is used to lift the skin of the canal, along with the tympanic annulus and reflect the tympanic membrane forward. Care is taken to avoid damaging the delicate ossicular chain.

For central and anteriorly based perforations, it may be necessary to raise the tympanic membrane off the malleus. It is essential that all squamous epithelium is removed to prevent any implantation cholesteatoma forming. Mobility of the ossicular chain is confirmed. The

temporalis fascia is taken and laid under the defect, making sure there is a good overlap in all areas around the margins of the defect. Where the perforation has very narrow anterior margin, this may necessitate tucking the graft down towards the eustachian tube orifice, or raising an anterior flap to secure its anterior margin.

Grafts interposed between the ossicular complex and the under surface of the tympanic membrane will usually stay in place without the need for positioning of supporting material in the middle ear. Depending on the skills and preferences of the surgeon, however, adjuncts such as a bed of Gelfoam™ or securing with fibrin tissue glue can be employed to further stabilize the graft. The drum and flaps are returned to the normal positions, with particular attention being paid to maintaining the anterior angle of the drum and correct apposition of the posterior and inferior part of the drum to the level of the tympanic annulus. The whole assembly is stabilized from the lateral surface using appropriate packing material like Gelfoam™ and gauze impregnated with antibiotic ointment. Following packing for larger perforations where a temporalis fascia graft has been harvested, a light mastoid dressing dressing/bandage is applied.

#### Length of Operation

Depending on the experience of the surgeon and the size of the perforation, a typical myringoplasty will take between one to two hours.

#### Time in Hospital

Where the operation has been performed under local anaesthesia, many patients may opt to go home within a few hours. If general anaesthesia has been employed, particularly when combined with hypotension, the patient should be watched for at least 6 hours post operatively and practically this means that most will need to spend one night in hospital. This is not as great a disadvantage as one might consider, as the pressure dressing can be removed the following morning prior to discharge, rather than the patient having to revisit the hospital for this.

#### Time off Work (Limitations)

Time off work would depend on the magnitude of the procedure and the nature of employment. Since the operated ear is packed, there is little usable hearing during this period and the patient's safety at work with this disability must be taken into account.

For patients who have sedentary occupations, they can return to work within 2-3 days. Where a patient is involved in heavy manual work, such as lifting, or working in the proximity of heavy machinery, a period of up to 1-3 weeks off work, or time of pack removal is advisable.

### Risks and Complications

The risks of anesthetic and surgical risks for this type of surgery are extremely low. If hypotensive anesthesia is employed, assisted ventilation is advisable because of the risk of loss of central control mechanisms as the systemic blood pressure falls.

Complications are the same as for all surgery within the middle ear. In experienced hands the risk of an acute sensorineural hearing loss as a result of surgical intervention should be no greater than 0.5%.

The chorda tympani can be damaged during raising of the tympanic membrane leading to disturbances of taste sensation post operatively. Most authorities believe that if the chorda is stretched to any great degree, it is better to cut the nerve and leave it. A recent paper, however, has questioned the advisability of doing this. The inco-stapedial joint and stapes can easily be damaged by the over zealous surgeon and particular care should be taken to avoid instrumenting these structures.

As with all middle ear cases, the bony covering of the facial nerve may be dehiscant and any dissection to remove adhesions/granulations in this vicinity should be performed with great care. Where local anesthesia is employed, particularly when combined with vasoconstrictors, such as Adrenaline, there may be a transient facial weakness lasting for an hour or so, which can be distressing for both the patient and the surgeon!