Michigan Ear Institute

Facial Nerve Problems

www.michiganear.com

WELCOME

Welcome to the Michigan Ear Institute, one of the nation's leading surgical groups specializing in hearing, balance and facial nerve disorders. The Michigan Ear Institute is committed to providing you with the highest quality diagnostic and surgical treatment possible.

Our highly experienced team of physicians, audiologists and clinical physiologists have established international reputations for their innovative diagnostic and surgical capabilities, and our modern, attractive facility has been designed with patient care and convenience as the foremost criteria.

It is our privilege to be able to provide care for your medical problems and we will strive to make your visit to the Michigan Ear Institute a positive and rewarding experience.

A DISCUSSION OF FACIAL NERVE PROBLEMS

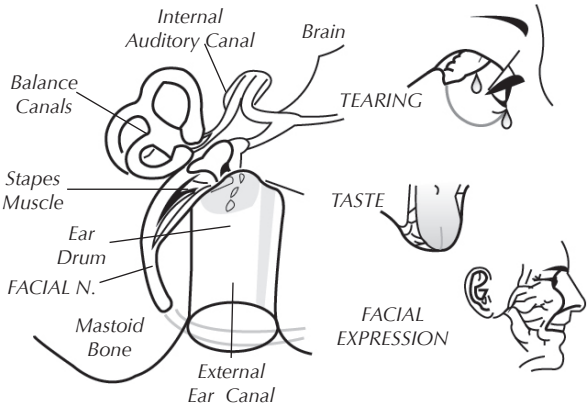
Twitching, weakness or paralysis of the face is a symptom of some disorders involving the facial nerve. It is not a disease in itself. The disorder may be caused by many different diseases, including circulatory disturbances, injury, infection or a tumor.

Facial nerve disorders are accompanied at times by a hearing impairment. This impairment may or may not be related to the facial nerve problems.

FUNCTION OF THE FACIAL NERVE

The facial nerve resembles a telephone cable and contains hundreds of individual nerve fibers. Each fiber carries electrical impulses to a specific facial muscle. Acting as a unit this nerve allows us to laugh, cry, smile or frown, hence the name, "the nerve of facial expression". Each of the two facial nerves not only carries nerve impulses to the muscles of one side of the face, but also carries nerve impulses to the tear glands, saliva glands, to the muscle of a small middle ear bone (the stapes) and transmits taste fibers from the front of the tongue and pain fibers from the ear canal. As such, a disorder of the facial nerve may result in twitching, weakness or paralysis of the face, dryness of the eye or the mouth, loss of taste, increased sensitivity to loud sound and pain in the ear.

An ear specialist is often called upon to manage facial nerve problems because of the close association of this nerve with the ear structures. After leaving the brain the facial nerve enters the temporal bone (ear bone) through a small bony tube (the internal auditory canal) in very close association with the hearing and balance nerves. Along its inch and a half course through a small bony canal in the temporal bone



the facial nerve winds around the three middle ear bones, in back of the eardrum, and then through the mastoid to exit below the ear. Here it divides into many branches to supply the facial muscles. During its course through the temporal bone the facial nerve gives off several branches: to the tear gland, to the stapes muscle, to the tongue and saliva glands and to the ear canal.

DIAGNOSIS OF A FACIAL NERVE DISORDER

Abnormality of facial nerve function may result from circulatory changes, infections, tumors, or injuries. An extensive evaluation is often necessary to determine the cause of the disorder and localize the area of nerve involvement.

Hearing Test

Tests of hearing are done to determine if the nerve disorder has involved the delicate hearing mechanism. When the face is totally paralyzed a special hearing test (stapedius reflex) helps to localize the problem area.

"X-Rays"

Scans are usually taken to determine if there is infection, tumor or bone fracture. (CT or MRI scans).

Tear Test

A test of eye's ability to tear may be helpful to determine the location of the facial nerve involvement.

Balance Test

An ENG (electronystagmography) test of the balance system is advised in some cases to clarify the cause or location of the facial nerve disorder.

Electrical Tests

There are three electrical tests of the facial nerve function that we may use: nerve excitability test, electroneurography and electromyography.

Nerve Excitability Test

The facial nerve excitability test helps us to determine the extent of nerve fiber damage in cases of total paralysis. The test may be normal despite the paralysis, indicating a better outlook for return of function. In such cases the excitability test may be repeated every day or so to detect any change which would indicate progressive deterioration.

Electroneurography (ENoG)

Electroneurography involves the use of a computer to measure the muscle response to electrical stimulation of the facial nerve. Recording electrodes are placed on the face and the facial nerve is stimulated with small electrical currents. Muscle contractions are recorded by the computer.

Electromyography

Electromyography may be indicated in cases of long standing paralysis. This test helps us to know if the nerve and muscles are recovering. Tiny needles are used to measure the responses.

EYE CARE

The most serious complication that may develop as the result of total facial nerve paralysis is an ulcer of the cornea of the eye. It is important that the eye on the involved side be protected from this complication by keeping the eye moist. Closing the eye with the finger is an effective way of keeping the eye moist. One should use the back of the finger rather that the tip in doing this to insure that the eye is not injured.

Glasses should be worn whenever you are outside. This will help prevent particles of dust from becoming lodged in the eye.

If the eye is dry, you may be advised to use artificial tears. The drops should be used as often as necessary to keep the eye moist. Ointment may be prescribed for use at bedtime.

At times it is necessary to tape the eyelid closed with tape. It is best for a family member to do this to insure that the eye is firmly closed and will not be injured by the tape.

If pain, redness or visual loss occurs despite lubrication, you should see an ophthalmologist (eye specialist) immediately.

In many cases where long standing paralysis is anticipated it may be necessary to insert a tiny gold weight into the eyelid or perform some other long standing procedure to help the eyelid close.

BELL'S PALSY AND HERPES ZOSTER

Bell's Palsy

The most common condition resulting in facial nerve weakness or paralysis is Bell's palsy, named after Sir Charles Bell who first described the condition. The underlying cause of Bell's palsy is not known, but it probably is due to a virus infection of the nerve. We know that the nerve swells in its tight bony canal. This swelling results in pressure on the nerve fibers and their blood vessels. Treatment is directed at decreasing the swelling and restoring the circulation so that the nerve fibers may again function normally.

Herpes Zoster Oticus

A condition similar to Bell's palsy is herpes zoster oticus, "shingles" of the facial nerve. In this condition there is not only facial weakness but often hearing loss, unsteadiness and painful ear blisters. These additional symptoms usually subside spontaneously but some hearing loss may be permanent.

Treatment

Treatment of the facial paralysis in these two conditions may be either medical or surgical.

Medical Treatment

Medical treatment, (with steroids or antiviral medications), may be instituted to decrease the swelling and stimulate the circulation.

Surgical Treatment

❒ *Mastoid decompression of the facial nerve.* Surgical decompression of the facial nerve is indicated in cases of paralysis when the electrical tests show that the nerve function is deteriorating. This operation is performed under general anesthesia and requires hospitalization for two to four days. Through an incision behind the ear the rigid mastoid bone around

the swollen nerve is removed, relieving pressure so that the circulation may be restored.

The degree and rapidity of recovery of facial nerve function depends upon the amount of damage present in the nerve at the time of surgery. Recovery may take from 3 to 12 months and may not be complete. Fortunately, it is unusual to develop a hearing impairment following surgery but this depends on the extent of surgery needed in the individual case.

❒ *Middle fossa facial nerve decompression*. At times deeper portions of the facial nerve are affected. In that case surgery may also involve an incision above the ear, with removal of a small portion of the skull. The need for this procedure can usually be determined by tests before surgery.

❒ *Mastoid and middle cranial fossa facial nerve decompression*. This procedure is a combination of the previously described surgeries.

RISKS AND COMPLICATIONS OF FACIAL NERVE SURGERY

Hearing Loss

All patients notice some hearing impairment in the operated ear immediately following surgery. This is due to swelling and fluid collection in the mastoid and middle ear. This swelling usually subsides within 2 to 4 weeks and the hearing returns to its preoperative level. In an occasional case scar tissue forms and results in a permanent hearing impairment. It is rare to develop a severe impairment.

Dizziness

Dizziness is common following surgery due to swelling of the inner ear structures. Some unsteadiness may persist for a few days postoperatively. On rare occasions dizziness is prolonged.

Related to Middle Fossa Approach

The middle fossa approach to the facial nerve, necessary in some cases, is a more serious operation. Hearing and balance disturbances are more likely following this surgery. Permanent impairment is, nonetheless, uncommon.

A hematoma (collection of blood under the skin incision) develops in a small percentage of cases, prolonging hospitalization and healing. Reoperation to remove the clot may be necessary if this complication occurs.

A cerebrospinal fluid leak (leak of fluids surrounding the brain) – develops in an occasional case. Reoperation may be necessary to stop the leak.

Infection is a rare occurrence following facial nerve surgery. Should an infection develop after a middle fossa it could lead to meningitis, an infection in the fluid surrounding the brain. Fortunately, this complication is very rare.

Temporary paralysis of half of the body has occurred following middle fossa operation, due to brain swelling. This complication is extremely rare.

Related to Anesthesia

Operations on the facial nerve usually are performed under general anesthesia. There are risks involved with any anesthesia and you should discuss this with the anesthesiologist.

INJURIES OF THE FACIAL NERVE

A common cause of facial nerve injury is a skull fracture. This injury may occur immediately or may develop some days later due to nerve swelling. Injury to the facial nerve may occur in the course of operations on the ear. This complication, fortunately, is very uncommon. It may occur, however, when

the nerve is not in its normal anatomical position (congenital abnormality) or when the nerve is so distorted by the mastoid or middle ear disease that is not identifiable. In rare cases it may be necessary to remove a portion of the nerve in order to eradicate the disease.

Treatment

Treatment of an injured facial nerve may be medical or surgical, depending on the extent of the nerve damage.

Medical Treatment

Medical treatment is the same as described for Bell's palsy.

Surgical Treatment

☐ *Mastoid Decompression of the facial nerve.* *(Refer to page 8.)*

☐ *Middle fossa facial nerve decompression* *(Refer to page 9.)*

☐ *Facial nerve graft* A facial nerve graft is necessary at times if facial nerve damage is extensive. A skin sensation nerve is removed from the neck and transplanted into the ear bone to replace the diseased portion of the facial nerve. Total paralysis will be present until the nerve re-grows through the graft. This usually takes 6 to 15 months. Some facial weakness may be permanent.

TUMORS

Acoustic Tumors

The most common tumor to involve the facial nerve is a nonmalignant fibroid tumor of the hearing and balance nerve, the acoustic tumor. Although there is rarely any weakness of the face before surgery, tumor removal sometimes results in weakness or paralysis. This weakness usually subsides in several months without treatment, occasionally it will be permanent.

It may may be necessary to remove a portion of the facial nerve in order to remove the acoustic tumor. Rarely, it may be possible to sew the nerve ends together at the time of surgery or to insert a nerve graft. At times a nerve anastomosis procedure is necessary later, connecting a tongue nerve to the facial nerve (hypoglossal facial anastomosis page 13). In either case the face is totally paralyzed until the nerve regrows which takes from (6 to 15 months).

Facial Nerve Neuroma

A nonmalignant fibroid growth may grow in the facial nerve itself. This tumor may or may not produce a gradually progressive facial nerve paralysis. Removal of this facial nerve neuroma requires removing that portion of the facial nerve invaded by the tumor. Usually it is possible to graft it at the time with a skin sensation nerve from the neck. Total paralysis will last until the nerve regrows through the graft, usually requiring a period of 6 to 15 months. There will be some permanent facial weakness.

When the portion of the facial nerve nearest the brain is destroyed by the tumor, a facial reanimation procedure may be necessary (see below).

Removal of a facial nerve neuroma may necessitate removal of the inner ear structure. If this were necessary, it would result in a total loss of hearing in the operated ear and temporary severe dizziness. Persistent unsteadiness is uncommon.

FACIAL REANIMATION

There are a number of surgical procedures that are helpful with facial paralysis. In some cases, repairing or decompressing an injured nerve is an important consideration. There are variety of other procedures that may be helpful to prevent drying or injury of the eye and assist in improving symmetry or even movement of the face although none of these procedures can create a perfectly normal appearance of the face.

Eyelid Surgery

Implantation of gold into the upper eyelid can be helpful in counter balancing the lifting eyelid muscle. This helps to prevent dryness and irritation of the eye and helps to improve the appearance. Shortening of the lower lid or corners of the eyelid are sometimes performed at the same operation. Complications of these procedures are rare and may include bleeding, infection, droopy eyelid, extrusion of the implant and visual loss.

Hypoglossal-Facial Nerve Anastomosis

Connecting a portion or all of the tongue nerve to the facial nerve may provide good tone to the face. Facial movements can also be obtained by attempting to move the tongue to the involved side when a smile is desired. Some degree of tongue weakness is expected which may affect speech or swallowing.

Temporalis Muscle Transposition

Transferring one of the jaw muscles to the corner of the mouth can provide improvement of facial symmetry. Smiling is relearned by attempting to bite at the same time. Unlike hypoglossal-facial anastomosis, no tongue weakness is expected and chewing problems are rare. The surgeon always attempts to over correct the pull at the corner of the mouth. This over-correction and the significant face swelling usually resolve in 4-6 weeks. Rarely a very thick muscle may result in a bulge.

While facial reanimation surgery cannot provide a return to normal facial function, the improvement in eye protection and appearance is usually gratifying. Not infrequently, secondary procedures or revisions may be required to obtain the best results or modify results because of the passage of time.

Miscellaneous

There are a variety of other operations that are sometimes performed by themselves or in combination with the above procedures. Such procedures may include a face lift or removal of excess skin at the brow or cheek. For patients who have some faulty return of facial function, selective cutting of facial nerve branches or facial muscles may be of benefit and are sometimes combined with other procedures to correct some of the anticipated weakness.

OTHER FACIAL NERVE DISORDERS

Facial Spasm

Surgery to correct this problem may involve **1)** intentional weakening of the nerve through an incision on the face which may also require a gold weight eyelid implant, or **2)** relieving pressure on the nerve adjacent to the brain. This operation includes risks of facial paralysis, hearing loss, dizziness, spinal fluid leak and stroke. **3)** An injection of Botox can give temporary relief. As always, you should discuss your proposed surgery in detail with your doctor.

Mastoid Infection

Acute or chronic middle ear infections occasionally cause a weakness of the face due to swelling or direct pressure on the nerve. In acute infections the weakness usually subsides as the infection is controlled and the swelling around the nerve subsides.

Facial nerve weakness occurring in chronically infected ears is usually due to pressure from a cholesteatoma (skin-lined cyst). Mastoid surgery is performed to eradicate the infection and relieve nerve pressure. Some permanent facial weakness may remain.

Postoperative Facial Nerve Weakness

Delayed weakness or paralysis of the face following reconstructive middle ear surgery (myringoplasty, tympanoplasty, stapedectomy) is uncommon, but occurs at times due to swelling of the nerve during the healing period.

Fortunately this type of facial nerve weakness usually subsides spontaneously in several weeks and rarely requires further surgery.

Hemifacial Spasm

Hemifacial spasm is an uncommon disease of unknown cause which results in spasmodic contractions of one side of the face. Extensive investigation is necessary at times to establish the diagnosis correctly. In some cases, a hemifacial spasm is caused by irritation of the facial nerve near the brain. Examination of the nerve and correction of the irritation, if present, is possible by the retrolabryrinthine or retrosigmoid surgical approach. Facial nerve decompression (see Bell's palsy) may be beneficial.

In this operation the area between the brain and the inner ear is exposed by removing the mastoid bone behind the inner ear. The complications related to this surgery are the same as those for the middle fossa approach (Pages 9 and 10) .

Brain Disease

Tumors and circulatory disturbances of the nervous system may cause facial nerve paralysis. The most common example of this is a stroke.

As opposed to other conditions listed in this booklet, in brain diseases there are usually many other symptoms which indicate the cause of the problem. Treatment is managed by the internist, neurologist or neurosurgeon.

GENERAL COMMENTS

During the period of recovery of facial function, exercises may be recommended. Exercising the muscles by wrinkling the forehead, closing the eyes tightly and smiling forcefully may be beneficial.

Electrical stimulation of the facial muscles may be of some benefit.

As recovery of facial nerve function begins exercises may be recommended by your otologist.

Excerpt from materials prepared by the
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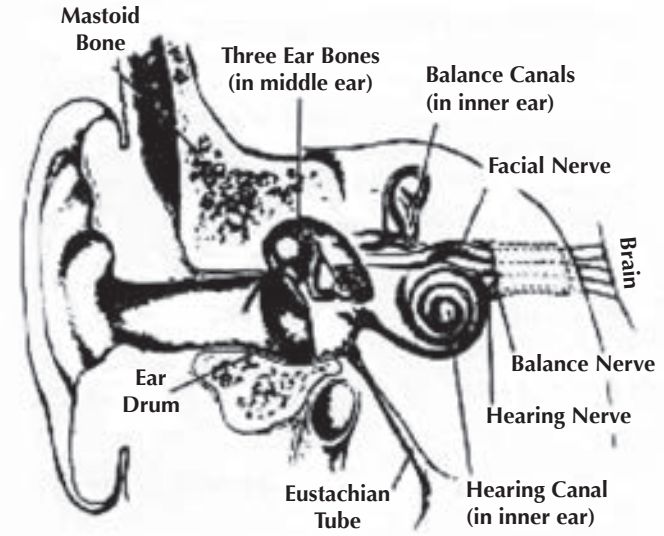

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Facial Nerve Problems

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Patient Signature

Date

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WELCOME

Welcome to the Michigan Ear Institute, one of the nation's leading surgical groups specializing in hearing, balance and facial nerve disorders. The Michigan Ear Institute is committed to providing you with the highest quality diagnostic and surgical treatment possible.

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MECHANISM OF HEARING

The ear is divided into three parts: an external ear, a middle ear and an inner ear. Each part performs an important function in the process of hearing.

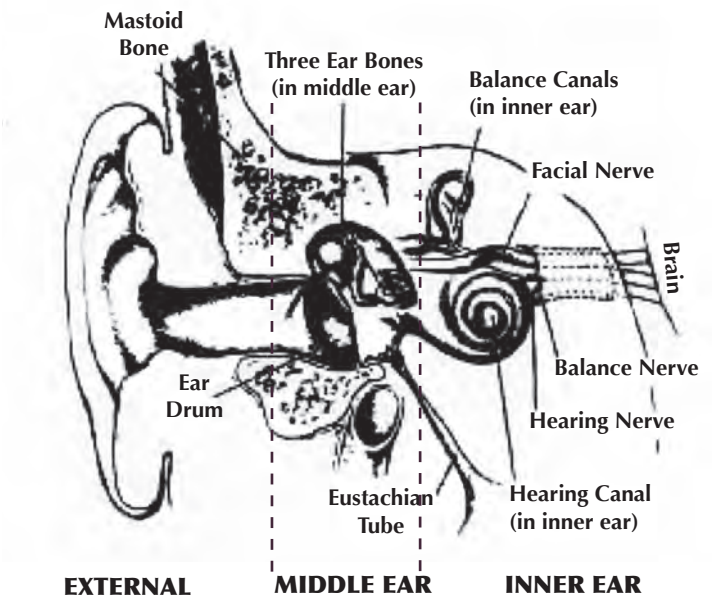
The external ear consists of an auricle and ear canal. These structures gather the sound and direct it toward the eardrum membrane.

The middle ear chamber lies between the external and inner ear. This air filled space is connected to the back of the throat by the Eustachian tube, which serves as a pressure equalizing valve. The middle ear contains three small ear bones (ossicles): the malleus (hammer), incus (anvil), and stapes (stirrup). These bones transmit sound vibrations to the inner ear. They act as a transformer, converting sound vibrations in the external ear canal into fluid waves in the inner ear. A disturbance of the Eustachian tube, eardrum or the bones may result in a conductive hearing loss. This type of impairment is usually correctable medically or surgically.

The inner ear chamber contains the hair cells bathed in fluid. Inner ear fluid waves stimulate the hair cells. The information generated in these cells is transmitted to the brain through the hearing nerve where it is interpreted. A disturbance in the inner ear fluids or nerve endings may result in a sensorineural (nerve) hearing impairment. This type of impairment is usually not correctable.

FUNCTION OF THE EUSTACHIAN TUBE

The Eustachian tube is a narrow, one and a half inch long channel that connects the middle ear with the nasopharynx- the upper throat area just above the palate.



The Eustachian tube functions as a pressure-equalizing valve for the middle ear that is normally filled with air. When functioning properly, the Eustachian tube opens for a fraction of a second periodically (about once every three minutes) in response to swallowing or yawning. It allows air into the middle ear to replace air that has been absorbed by the middle ear lining (mucous membrane) or to equalize pressure changes occurring during altitude changes. Anything that interferes with this periodic opening and closing of the Eustachian tube may result in hearing impairment or other ear symptoms.

Obstruction or blockage of the Eustachian tube results in a negative middle ear pressure, with retraction (sucking in) of the eardrum membrane. In the adult, this is usually accompanied by some ear discomfort (a fullness or pressure feeling) and may result in a mild hearing impairment and head noise (tinnitus). There may be no symptoms in children. If the obstruction is prolonged, fluid may be drawn from the mucous membrane of the middle ear creating a condition called serous otitis media (fluid in the middle ear).

This occurs frequently in children in connection with upper respiratory infections and accounts for the hearing impairment associated with this condition.

EUSTACHIAN TUBE PROBLEMS RELATED TO FLYING

Individuals with a Eustachian tube problem may experience difficulty equalizing middle ear pressure when flying.

When an aircraft ascends, outside pressure decreases, resulting in outward pressure on the eardrum. When the aircraft descends, just the opposite occurs: atmospheric pressure increases and there is a relative decrease in the middle ear pressure and inward pressure on the eardrum. Either situation may result in discomfort in the ear due to abnormal middle ear pressure if the Eustachian tube is not functioning properly. This discomfort more likely to occur upon aircraft descent.

To avoid middle ear problems associated with flying, you should not fly if you have an upper respiratory problem such as a common cold, allergy attack, or sinus infection. Should you have such a problem, or should you have a chronic Eustachian tube problem and must fly, it may help to avoid ear difficulty by observing the following recommendations:

1. Begin taking an oral decongestant, such as Sudafed tablets, the day before your air flight. Continue the medication for twenty-four (24) hours after the flight if you have experienced any ear difficulty.

2. Following the container directions, begin the use of a nasal decongestant spray, such as Neosynephrine, shortly before boarding the aircraft. Should your ears "plug up" upon ascent, hold your nose and swallow. This will help suck excess air pressure out of the middle ear.

3. Thirty minutes before the aircraft is due to land again use the nasal spray. Chew gum to stimulate swallowing. Should your ears “plug up” despite this, hold your nose and blow forcibly to try to blow air up the Eustachian tube into the middle ear (Valsalva maneuver).

4. Drinking adequate amounts of fluid (ideally water) before and during the flight allow the lining of the Eustachian tube to function more efficiently.

5. **Remember it is unwise to fly if you have an acute upper respiratory infection. Should flying be necessary under these circumstances DO NOT perform the Valsalva maneuver mentioned above.**

None of these recommendations or precautions need be followed if you have middle ear ventilation tube in your eardrum membrane.

FINDINGS IN YOUR CASE

- ☐ Normal eustachian tube function
- ☐ Eustachian tube blockage
- ☐ Acute suppurative otitis media
- ☐ Serous otitis media - Acute
- ☐ Serous otitis media - Chronic
- ☐ Chronic serous mastoiditis or idiopathic hemotympanum
- ☐ An abnormally patent eustachian tube
- ☐ Palatal Myoclonus

Hearing is measured in decibels (dB). The hearing level of 0-25 dB is considered normal hearing for conventional purposes.

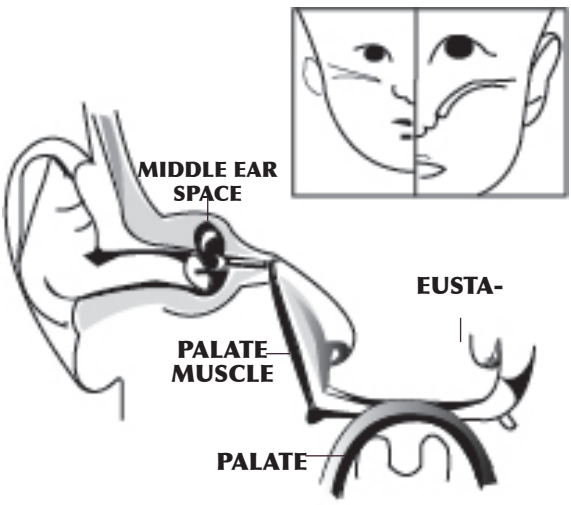
Our test reveal your hearing level to be:

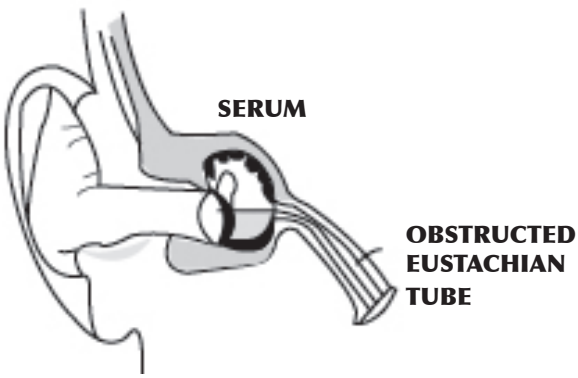
Right Ear _____ Decibels

Left Ear _____ Decibels

Conversion to degree of handicap

25 dB	0%	55 dB (Moderate)	45%
30 dB (Mild)	8%	65 dB (Severe)	60%
35 dB (Mild)	15%	75 dB (Severe)	75%
45 dB (Moderate)	30%	85 dB (Severe)	90%



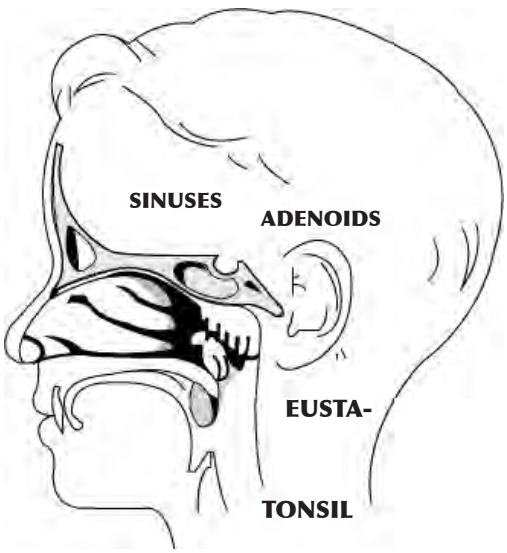


SEROUS OTITIS MEDIA

Serous otitis media is the term we use to describe a collection of fluid in the middle ear. This may be acute or chronic.

Acute serous otitis media is usually the result of block- age of the Eustachian tube from an upper respiratory infection or an attack of nasal allergy. In the presence of bacteria, this fluid may be come infected leading to an acute suppurative otitis media (infected or abscessed middle ear). When infection does not develop, the fluid remains until the Eustachian tube again begins to function normally, at which time the fluid is absorbed or drains down the tube into the throat.

Chronic serous otitis media may result from long-standing Eustachian tube blockage, or from thickening of the fluids so that it cannot be absorbed or drained down the tube. This chronic condition is usually associated with hearing impairment. There may be recurrent ear pain, especially when the individual catches a cold. Serous otitis media may persist for many years without producing any permanent damage to the middle ear mechanism. The presence of fluid in the middle ear, however, makes it very susceptible to recurrent acute infections. These recurrent infections may result in middle ear damage.



CAUSES OF SEROUS OTITIS MEDIA

Serous otitis media may result from any condition that interferes with the periodic opening and closing of the Eustachian tube. The causes may be congenital (present at birth), may be due to infection or allergy, or may be due to blockage of the tube by adenoids.

The Immature Eustachian Tube

The size and shape of the Eustachian tube is different in children than in adults. This accounts for the fact that serous otitis media is more common in young children. Some children inherit small Eustachian tubes from their parents; this accounts in part for the familial tendency to middle ear infection. As the child matures, the Eustachian tube usually assumes a more adult shape.

Cleft Palate

Serous otitis media is more common in the child with a cleft palate. This is due to the fact that the muscles that move the palate also open the Eustachian tube. These muscles are deficient or abnormal in the cleft palate child.

Infection

The lining membrane (mucous membrane) of the middle ear and Eustachian tube is connected with, and is the same as, the membrane of the nose, sinuses, and throat. Infection of these areas results in mucous membrane swelling which in turn may result in Eustachian tube obstruction.

Allergy

Allergic reactions in the nose and throat result in mucous membrane swelling, and this swelling may also affect the Eustachian tube. This reaction may be acute, as in a hay fever type reaction, or may be chronic, as in many varieties of “chronic sinusitis”.

Adenoids

The adenoids are located in the nasopharynx, in the area around and between the Eustachian tube openings. When enlarged, the adenoids may block the Eustachian tube opening.

ACUTE SEROUS OTITIS MEDIA

Treatment of acute serous otitis media is medical, and is directed towards treatment of the upper respiratory infection or allergy attacks. This may include antibiotics, antihistamines (anti-allergy drugs), decongestants (drugs to decrease mucous membrane swelling) and nasal sprays.

ACUTE SUPPURATIVE OTITIS MEDIA

In the presence of an upper respiratory infection, such as a cold, tonsillitis or sinusitis, fluid in the middle ear may become infected. This results in what is commonly called an abscessed ear or an infected ear.

This infected fluid (pus) in the middle ear may cause severe pain. If examination reveals that there is considerable ear pressure, a myringotomy (incision of the eardrum membrane) may be necessary to relieve the abscess and the pain. In many cases, antibiotic treatment will suffice.

Should myringotomy be necessary, the ear may drain pus and blood for up to a week. The eardrum then heals and the hearing usually returns to normal within three to four weeks.

Antibiotic treatment, with or without myringotomy, usually results in normal middle ear function within three to four weeks. During this healing period there are varying degrees of ear pressure, popping, clicking and fluctuation of hearing, occasionally with shooting pains in the ear.

Resolution of the acute infection occasionally leaves the patient with uninfected fluid in the middle ear. This is called chronic serous otitis media.°

CHRONIC SEROUS OTITIS MEDIA

Treatment of chronic serous otitis may be either medical or surgical.

Medical Treatment

As the acute upper respiratory infection subsides it may leave the patient with chronic sinus infection. Pus from the sinuses and nose drains over the eustachian tube opening in the nasopharynx resulting in persistent eustachian tube blockage. Antibiotic treatment may be indicated.

General health factors are particularly important in regard to one's resistance to infection. A deficiency in some of the blood proteins may predispose an individual to recurrent infections and prolonged colds. Periodic injections of gamma globulin may be indicated.

Allergy is often a major factor in the development or persistence of serous otitis media. Mild cases may be treated with antihistamine drugs. More persistent cases may require allergic evaluation and treatment, including injection treatment.

In connection with medical treatment, we may recommend eustachian tube inflation, the blowing of air through the nose into the obstructed eustachian tube and middle ear to help relieve the congestion and reestablish middle ear ventilation.

The Valsalva maneuver is accomplished by forcibly blowing air into the middle ear while holding the nose, often called "popping the ear". This should not be done, however, if there is a cold and nasal congestion.

Some patients suffer from acid reflux so that the stomach acid irriates the opening of the Eustachian tube resulting in inflammation of the tube. Medical treatment for acid reflux may be initiated in order to control this condition.

Surgical Treatment

The primary objective of surgical treatment of chronic serous otitis media is to reestablish ventilation of the middle ear, keeping the hearing at a normal level and preventing recurrent infection that might damage the eardrum membrane and middle ear bones. This involves myringotomy with insertion of a ventilation tube and occasionally adenoidectomy. In an occasional patient, there is a procedure to widen the Eustachian tube opening in the back of the nose.

Myringotomy

Myringotomy (an incision in the eardrum membrane) is performed to remove middle ear fluid. A hollow plastic or metal tube (ventilation tube) is inserted to prevent the incision from healing and to insure middle ear ventilation. The ventilation tube temporarily takes the place of the Eustachian tube in equalizing middle ear pressure. This tube remains in place for variable lengths of time, depending on its design. When the tube dislodges, the eardrum heals and the Eustachian tube then again becomes necessary for middle ear aeration.

In adults, myringotomy and insertion of a ventilation tube is usually performed in the office under local anesthesia. In children, general anesthesia is required. The adenoids can be removed at the same time if enlarged.

More often than not, when the ventilation tube dislodges, there is no further middle ear ventilation problem. Should serous otitis media recur, reinsertion of a tube may be necessary. In some difficult cases, it is necessary to insert a more permanent type of tube. This tube is inserted via an operation and will remain in place until removed.

At times a permanent eardrum membrane perforation (hole in the eardrum) develops when the tube is dislodged or removed. If this perforation persists, it

can be repaired at a later date when the Eustachian tube blockage has subsided.

When a ventilation tube is in place, the patient may carry on normal activities, with the exception that he must not allow water to enter the ear canal. Your doctor will recommend an ear plug for use when showering, washing the hair or swimming.

EUSTACHIAN TUBE SURGERY

Certain patients who are treated with various medications and myringotomy with tubes continue to suffer from Eustachian tube dysfunction. These patients may be candidates for a procedure to widen the opening of the Eustachian tube (called Eustachian tuboplasty). This procedure is done under general anesthesia in the operating room. Special scopes are used through the nose to visualize the opening of the Eustachian tube in the back of the nose. Instruments including a laser and shavers are used through the mouth. An incision is made near the opening of the Eustachian tube and deeper tissue is removed with the laser. This may allow wider and easier opening of the Eustachian tube and improve its function.

CHRONIC SEROUS MASTOIDITIS AND IDIOPATHIC HEMOTYMPANUM

Chronic serous mastoiditis and idiopathic hemotympanum are uncommon conditions that have the same symptoms as chronic serous otitis media. They differ in that the middle ear fluid continues to form, either drainage out the ventilation tube or blocking it completely so that the tube dislodges shortly after surgery. This persistent fluid formation is due to changes in the mucous membrane of the middle ear and mastoid.

In both of the above conditions mastoid surgery may be necessary to control the problem and reestablish a normal middle ear mechanism.

PATULOUS (ABNORMALLY PATENT EUSTACHIAN TUBE

Abnormal patency of the Eustachian tube is a condition occurring primarily in adults, in which the Eustachian tube remains "open" for prolonged periods. This abnormality may produce many distressing symptoms: ear fullness and blockage, a hollow feeling, hearing one's own breathing, and voice reverberation. It does not produce hearing impairment. Other tests may be necessary to determine the cause of these symptoms.

The exact cause of an abnormal patent Eustachian tube is often difficult to determine. At times, it develops during pregnancy, or while taking oral contraceptives or other hormones. Weight loss or radiation therapy may be causes as well.

Treatment of this harmless condition is often difficult. A number of different medications are at times successful in alleviating the symptoms. Myringotomy and insertion of ventilation tube (as described under the surgical treatment of serous otitis media) can be effective.

Surgical correction of abnormally patent Eustachian tube can be preformed and has been developed at the Michigan Ear Institute. Certain materials may be injected into the opening of the Eustachian tube in order to close the tube. Cartilage may also be placed into a pocket in the Eustachian tube, which will also close it. Success varies in patients with this procedure and symptoms can continue despite intervention.

PALATAL MYOCLONUS

Palatal myoclonus is a rare condition in which muscles of the palate (back of the mouth) twitch rhythmically many times a minute. The cause of this muscle spasm is unknown.

A person may experience a rhythmic clicking or snapping sound in the ear as the Eustachian tube opens and closes. Sedatives or tranquilizers often are effective in controlling the symptoms. No treatment is needed in many cases.

Occasionally, the snapping sound in the ear is caused by simultaneous spasm of the two muscles attached to the middle ear bones. This also usually responds to medication. A small surgery to cut one or both of these muscles can be done to relieve the symptoms.

Michigan Ear Institute

Eustachian Tube Problems

Received by

Patient Signature

Date

For more information on the services and staff of the Michigan Ear Institute, call us at (248) 865-4444 or visit our web site at **www.michiganear. com**

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WELCOME

Welcome to the Michigan Ear Institute, one of the nation's leading surgical groups specializing in hearing, balance and facial nerve disorders. The Michigan Ear Institute is committed to providing you with the highest quality diagnostic and surgical treatment possible.

Our highly experienced team of physicians, audiologists and clinical physiologists have established international reputations for their innovative diagnostic and surgical capabilities, and our modern, attractive facility has been designed with patient care and convenience as the foremost criteria.

It is our privilege to be able to provide care for your medical problems and we will strive to make your visit to the Michigan Ear Institute a positive and rewarding experience.

CHRONIC EAR INFECTIONS

The diagnosis of chronic otitis media (long standing infection of the middle ear) has been determined as the cause of your ear problem. The reason that you have come to your doctor may be drainage from the ear, hearing impairment, tinnitus (head noise), dizziness, pain, or weakness of the face. What symptoms that you may have depends on the extent of disease and its location.

TYPES OF HEARING IMPAIRMENT

1 Conductive hearing impairment is caused by either external ear or middle ear disease.

2 Nerve or sensorineural hearing impairment is due to inner ear disease or hearing nerve problems.

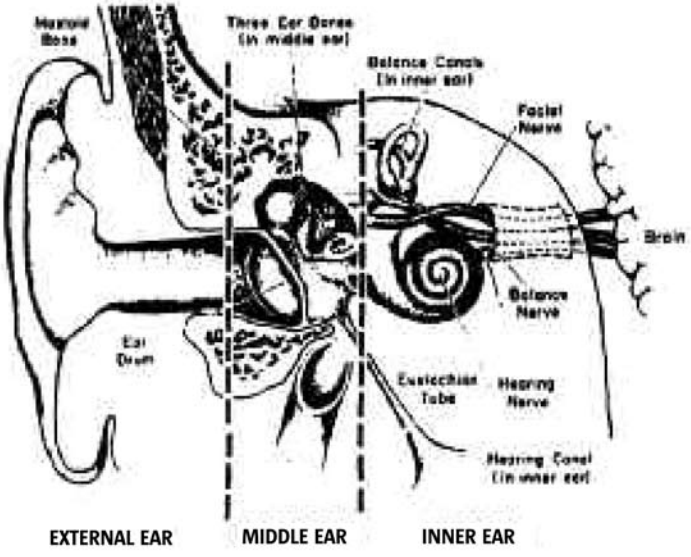
3 Mixed hearing loss is a combination of conductive and nerve hearing loss.

NORMAL ANATOMY AND FUNCTION

To facilitate an understanding of the normal function of the ear, we will divide it into three parts: an external ear, a middle ear and an inner ear. Each part performs an important function in the process of hearing.

The external ear is made up of an auricle (the part visible on the head) and the ear canal. These structures gather the sound and direct it towards the ear drum membrane.

The middle ear chamber lies between the external ear and the inner ear. This air filled chamber is connected to the back of the throat by the Eustachian



tube which serves as a pressure equalizing valve. The middle ear consists of the tympanic membrane (ear drum) and three small ear bones; malleus (hammer), incus (anvil) and stapes (stirrup). These structures transmit sound vibrations in the inner ear. The middle ear is normally filled with air when the eustachian tube is functioning properly.

Immediately behind and continuous with the middle ear space is a bony honeycomb of air pockets called the mastoid.

The inner ear has two interconnected chambers, the cochlea (hearing chamber) and the labyrinth (balance chamber). These are encased in bone and contain two separate fluids (endolymph and perilymph). The fluid bathes the delicate hair cells of hearing and of balance. Fluid waves in the hearing chamber stimulate the hair cells which generate electrical impulses, which are transmitted via the hearing nerve to the brain for interpretation as sound. Movement of fluid in any of the balance chambers will result in electrical impulses which are interpreted in the brain as motion or movement.

CAUSES OF HEARING IMPAIRMENT

Problems affecting the external ear may be due to an infection, presence of too much ear wax, or an abnormal growth in the ear canal. The middle ear problem may be due to a hole in the eardrum, destruction of one or all of the three ear bones, a skin cyst (cholesteatoma) or scar tissue. These problems can usually be corrected with surgery.

A nerve hearing loss may be caused by disturbances of the inner ear, or from a breakdown in the hearing nerve transmission.

CARE OF THE EAR

If a hole in the ear drum is present, you should not allow water to get in your ear canal. This may be avoided by placing a Vaseline coated cotton ball in the ear when showering or washing your hair. Swimming may be possible in certain cases if you use a small earplug and a swim cap pulled over the ears and precautions are used. Talk to your doctor.

You should not blow your nose as any infection in your nose may spread to your ear through the eustachian tube. Any nasal secretions should be drawn backward through the nose into the back of the throat and then expectorated. If it is absolutely necessary to blow your nose, compress one nostril while blowing the other.

In the event of ear drainage, the ear canal should be kept clean by means of a small cotton tipped applicator. Medication, as prescribed, should be used if discharge is present or when it occurs. Cotton is placed in the outer ear to catch any discharge but should not be allowed to block the ear canal.

EXPLANATION OF DISEASE PROCESS

Your disease may be caused by a perforation (hole) in the eardrum or a cholesteatoma (skin cyst). If a perforation is present, chronic drainage and infection may occur. This alone will put the ossicles (bone of hearing), mastoid bone, inner ear, or facial nerve at a great risk. Surgery to close the hole is strongly recommended. Occasionally, it will be necessary; to stage the operation in order to clear the infection and then rebuild the hearing mechanism.

A cholesteatoma (skin cyst) is an abnormality that usually arises from a collapsed portion of the eardrum. The cyst continues to grow slowly causing destruction of the ossicles (bones of hearing), mastoid bone, inner ear canals, or facial nerve. Because of this cholesteatoma, chronic infection may occur. Usually it is necessary to stage the operation. The first stage is done to remove the cholesteatoma and any infection, and to reconstruct the eardrum. Your hearing may occasionally be somewhat worse after the first operation. The second stage is to check for recurrent or residual cholesteatoma or infection (found in 5-15% of the operations) and then to attempt to rebuild the hearing mechanism. If your operation has been staged, it is imperative to have the second operation in 6-12 months following the first operation.

MEDICAL TREATMENT

Medical treatment will often control ear drainage. The ear is usually cleaned by your physician in the office. Ear drops or cream may be used to correct the infection. Antibiotics by mouth may be helpful in certain cases.

Examination Reveals:

Left		Right
☐	Severe scarring of the ear drum and middle ear	☐
☐	A hole in the ear drum	☐
☐	A cholesteatoma (skin cyst) in the external ear, middle ear or mastoid	☐
☐	Partial or total destruction of one or more of the middle ear bones	☐
☐	A mastoid cavity	☐

Your surgeon believes that you are a satisfactory surgical candidate at this time for:

Left		Right
☐	A myringotomy operation	☐
☐	A tympanoplasty operation	☐
☐	A tympanoplasty with mastoidectomy	☐
☐	A tympanoplasty planned second stage	☐

☐	A tympanoplasty with revision mastoidectomy	☐
☐	Modified radical mastoidectomy	☐
☐	Mastoid obliteration operation	☐

If you do not have surgery, it is important to have frequent hearing exams, especially if your ear is draining. If you have pain in or around the ear, increased drainage or dizziness, twitching or numbness in your face, call us immediately.

YOUR OUTLOOK WITH SURGERY

1 If this is your first operation, eardrum grafting is successful in over ninety percent (90%) of the patients resulting in a healed and dry ear.

2 Hearing improvement following surgery depends on many factors discussed in the text.

3 In your case, two operations may be necessary in all likelihood in order to improve the hearing. In this case, your hearing may be worse in the operated ear between operations. It is imperative that the second stage operation be performed to rule out the possibility of recurrent or residual disease in the ear in addition to an attempt at hearing improvement.

SURGICAL TREATMENT

For many years, surgical treatment was used for chronic otitis media exclusively to control infection and prevent serious complications. Advancements of surgical techniques have now made it possible to rebuild the diseased hearing mechanism in most cases.

Various tissue grafts may be used to replace the eardrum. These include the covering of the muscle from above the ear (fascia) and covering of ear cartilage (perichondrium), or covering from the skull (pericranium). A diseased ear bone may be replaced by a plastic part, cartilage, transplant or the diseased bone may actually be reshaped or repositioned.

A thin piece of plastic frequently is used behind the eardrum to prevent scar tissue from forming and to promote normal function of the middle ear and motion of the eardrum. When the ear is filled with scar tissue or when all ear bones have been destroyed, it may be necessary to perform the operation in two stages. At the first stage, a piece of stiff plastic is inserted to allow more normal healing without scar tissue. At the second operation, this plastic may be removed, recurrent or residual disease is looked for, and an attempt for restoring hearing is performed. A decision in regards to staging the operation is made at the time of the first surgery.

MYRINGOPLASTY

This operation is performed to repair a hole in the eardrum when there is no middle ear infection or disease of the ear bones. This procedure closes the middle ear in a natural way and may improve hearing. Surgery is performed under local or general anesthesia. Tissue grafts are used to repair the defect in the ear drum. The patient may be hospitalized for one night and may return to work within a week. Healing is complete, in most cases, in eight weeks at which time any hearing improvement is usually noticed.

TYMPANOPLASTY

The purpose of a tympanoplasty is to inspect the ear spaces for disease and to attempt to improve the hearing loss. The operation is performed to elimi-

nate any infection and repair both the sound transmitting mechanism and the eardrum. This surgery may improve the hearing loss. The surgery may be done in one or two phases.

The Surgery

A tympanoplasty is an outpatient procedure with some patients going home the same day and some being hospitalized for one night following surgery

Most tympanoplasties are performed through an incision behind the ear, under a local or general anesthetic. The surgery may also be performed through the ear canal. The perforation is repaired with fascia or perichondrium. Sound transmission is accomplished by repositioning or replacing diseased ear bones. Occasionally, a piece of cartilage is used to stiffen the eardrum and attempt to stop recurrent retraction pockets or cholesteatoma.

In some cases it is not possible to repair the sound transmitting mechanism and the eardrum at the same time. In these cases the eardrum is repaired first and six to twelve months later the sound transmitting mechanism is reconstructed. If a second surgery is necessary the ear will be inspected for any remaining or recurrent disease. Sound transmission to the inner ear is accomplished by replacing missing ear bones.

Post Surgery

In most cases you may return to work in a week to ten days. Healing is usually complete in eight weeks. Hearing improvement may not be noted for a few weeks.

MASTOIDECTOMY

The mastoid space connects directly with the middle ear space. There are important structures in and adjacent to the mastoid including the brain, inner ear and facial nerve. This makes infections risky

and surgery delicate. Almost any active process like infection or cholesteatoma will involve both spaces. Therefore, mastoid surgery is frequently necessary, in conjunction with tympanoplasty, to adequately treat the existing problem.

The mastoidectomy is the name of the procedure to clean out the mastoid. This is generally done through an incision behind the outer ear. The outer layer of bone is then removed and the abnormal contents are cleaned out. At the completion, the incision is either glued back together or closed with dissolvable sutures and requires little care.

The mastoidectomy, with or without a tympanoplasty, is an outpatient procedure. One can expect to be discharged after surgery or the following morning. Three weeks of restricted activity are advised. If your regular activities involve heavy lifting expect three weeks off, although most can return to near normal activity much sooner.

MYRINGOTOMY WITH TUBES

Sometimes at the time of surgery for chronic ear infections ventilation is needed to allow equalization of pressure in the middle ear space and allow healing. This will be decided at the time of the operation if this is necessary. A myringotomy (an incision in the eardrum membrane) is performed to remove the middle ear fluid and allow aeration. A hollow plastic tube (a ventilation tube) is inserted to prevent the incision from healing and to assure middle ear ventilation. This plastic tube usually remains in place for six to nine months which allows adequate healing. When the tube dislodges the eardrum heals and the Eustachian tube hopefully will resume its normal pressure equalizing function.

Sometimes a more permanent tube may be placed through the eardrum. This may last several years at

a time. Sometimes the tube may be placed through a portion of cartilage in order to secure it in place against the eardrum and allow it to stay even longer.

TYMPANOPLASTY: PLANNED SECOND STAGE

The purpose of this operation is to inspect the ear spaces for disease and to attempt to improve the hearing. Surgery may be performed through the ear canal or from behind the ear, under a local or general anesthetic. The ear is inspected for any remaining or recurrent disease. Sound transmission to the inner ear is accomplished by replacing missing ear bones.

The patient may be hospitalized for one night and may return to work in about one week. Healing is usually complete in six to eight weeks. Hearing improvement is frequently noted at that time.

TYMPANOPLASTY WITH REVISION MASTOIDECTOMY

The purpose of this operation is to eliminate discharge from a previously created mastoid cavity defect and if possible to improve the hearing. The operation is performed under general anesthesia through an incision behind the ear. At times, the ear canal is rebuilt with cartilage or bone. The eardrum is repaired and, if possible, the hearing mechanism is restored. In most cases, a second operation is necessary to obtain hearing improvement.

The patient may be hospitalized for one night and may return to work after one or two weeks. The healing of the inside of the ear may take three or four months.

(MODIFIED) RADICAL MASTOIDECTOMY

The purpose of this operation is to eliminate the infection without consideration of hearing improvement. It is usually performed on those patients who have very resistant infection. Occasionally, it may be necessary to perform a radical mastoid operation in some cases that originally appeared suitable for a tympanoplasty. The decision is made at the time of surgery. A fat, muscle or bone graft to the ear is necessary, at times, to help the ear heal properly.

The radical mastoid operation is performed under general anesthesia and may require one night of hospitalization. The patient may usually return to work in one to two weeks. Complete healing may require up to four months.

MEATOPLASTY

If a modified radical or a radical mastoid is performed the opening to the ear canal sometimes needs to be enlarged. This is called a meatoplasty. This is performed by removing a portion of the cartilage and perhaps some of the skin of the ear canal so that it can be widened. This allows easy access for cleaning and removal of any debris or cholesteatoma that may develop in the future. This can then allow cleaning in the office setting.

After this operation you will need to use drops in the ears to keep the packing that is in the ear in place and moist. The packing allows the opening to stay widened and scar into position.

MASTOID OBLITERATION OPERATION

The purpose of this operation is to eliminate any mastoid infection and to obliterate or fill any previously created mastoid cavity. Hearing improvement is usually not considered.

The operation is performed under general anesthesia through an incision behind the ear. The mastoid space is filled with fat, muscle or bone. The patient may be hospitalized for one night and may return to work in one to two weeks. Complete healing may require three or four months.

WHAT TO EXPECT FOLLOWING SURGERY

There may be some symptoms that may follow any ear operation.

Taste disturbance and mouth dryness

It is not uncommon for there to be taste disturbance and mouth dryness following ear surgery. In some cases the disturbance is prolonged and permanent. This is due to involvement of a nerve that goes through the middle ear with the disease process. It supplies taste sensation to only one part of the tongue.

Tinnitus

Tinnitus (head noise) frequently is present before the surgery and most often is present temporarily after the surgery. It may persist for one to two months and then decrease in proportion to the improvement of your hearing. It may also persist especially if the hearing loss does not improve or worsens. The tinnitus may persist and may become worse.

Ear numbness

Temporary loss of skin sensation in and around the ear is common following surgery. This numbness may involve the entire outer ear an may persist for six months or may be permanent.

Jaw Symptoms

The joint where the jaw is located is located at the front of the ear canal. Some soreness or stiffness in the jaw movement is very common after ear surgery. This soreness or stiffness will decrease and usually go away within one to two months.

Drainage behind the Ear

On occasion the surgeon will need to insert drain tube behind the ear. The need to insert a drain after surgery is usually not apparent before the surgery. Should a drainage tube be needed it will be removed during the post operative phase of healing.

Ear Pressure

Ear pressure or a "popping" sensation or mild equilibrium disturbance may occur from the packing in the middle ear. When the packing is removed postoperatively this sensation will disappear.

RISKS AND COMPLICATIONS OF SURGERY

Fortunately complications are uncommon following surgery for correction of chronic ear infections. Rarely there may be a complication that occurs.

Ear Infection

Ear infection with drainage, swelling and pain may persist following surgery or on a rare occasion may develop following surgery. This in part is due to poor healing of the diseased ear tissue. When this is the case additional surgery may be necessary to control the infection.

Loss of Hearing

In three percent (3%) of the ears operated the hearing is further impaired permanently due to the extent of the disease present or due to complications in the healing process. On very rare occasions there is total loss of hearing in the operated ear. In some cases a two stage operation is necessary to obtain satisfactory hearing and to eliminate the disease. The hearing is usually worse after the first operation in these instances.

Dizziness

Dizziness may occur immediately following surgery due to swelling in the ear and irritation of the inner ear structures. Some unsteadiness may persist for a week postoperatively. On rare occasions dizziness is prolonged. Some patients with chronic ear infection due to cholesteatoma have a labyrinth fistula (abnormal opening into the balance canal). When this problem is encountered dizziness may last for six months or more.

Facial Paralysis

The facial nerve travels through the ear bone and is in close association with the middle ear bones, eardrum and the mastoid. A rare post-operative complication of ear surgery is paralysis of one side of the face. This may occur as a result of an abnormality or a swelling of the nerve and usually improves spontaneously. On rare occasions, the nerve may be injured at the time of surgery or it may be necessary to remove it in order to eliminate the disease.

When this takes place a skin sensation nerve is removed from the upper part of the neck to replace the nerve. Paralysis of the face under these circumstances might last six months to a year and there would be a permanent residual weakness. Eye complications may require treatment by a specialist.

Hematoma

A hematoma (collection of blood under the skin) develops in a small percentage of cases. This hematoma may prolong the healing process and require longer hospitalization. Re-operation to remove the clot may be necessary if this complication occurs.

Cerebral Spinal Fluid Leak

A cerebral spinal fluid leak (leak of fluid surrounding the brain) is a very rare complication. Re-operation may be necessary to stop the leak.

Brain Complications

Intracranial complications such as meningitis or brain abscess and sometimes even paralysis were common prior to treatment with antibiotics were available. Fortunately these are now extremely rare complications of surgery.

Anesthetic Complications

Rarely are there complications associated with anesthesia. These will be discussed with you by the anesthesiologist.

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Chronic Ear Infections

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