

An Overview Of

CHRONIC EAR INFECTIONS

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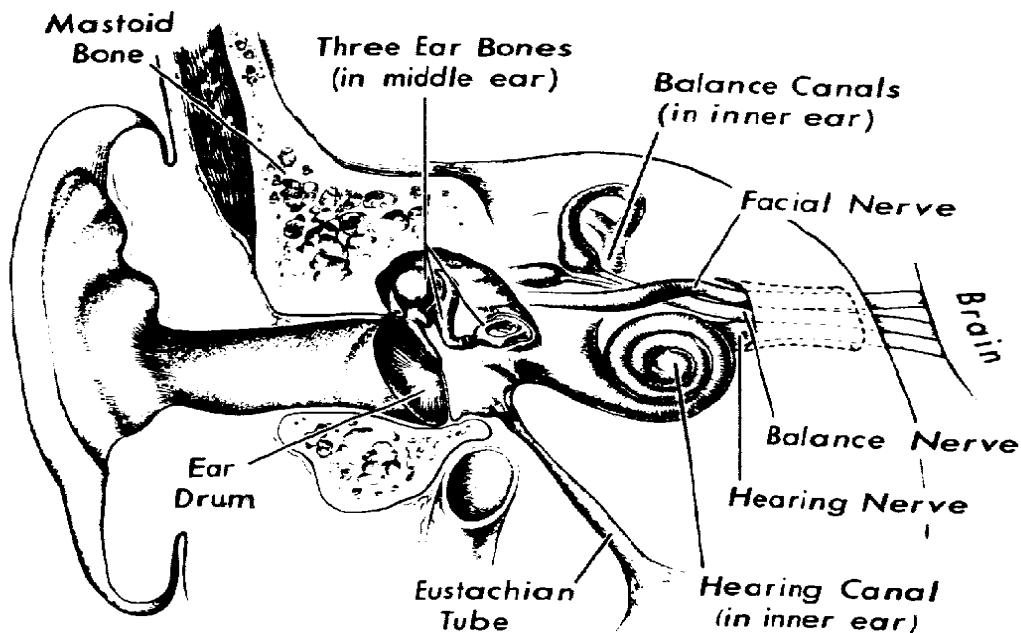
CHRONIC OTITIS MEDIA

Chronic otitis media is persistent infection *or* inflammation of the **middle** ear. Chronic ear “infections,” by definition, persist or recur despite standard medical treatment. Without more aggressive intervention, these conditions can persist for decades. Symptoms depend upon whether the condition is active or inactive, whether or not there is involvement of the mastoid bone and whether or not there is a hole in the eardrum. There may be drainage from the ear, hearing impairment, tinnitus (head noise), dizziness, pain or, rarely, weakness of the face.

FUNCTION OF THE NORMAL EAR

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

Sound waves pass through the external ear canal to vibrate the eardrum, which separates the external from the middle ear. The three small bones in the middle ear (hammer or malleus, anvil or incus, and stirrup or stapes) transmit the sound vibrations from the eardrum to the inner ear. Vibrations in the fluid of the inner ear stimulate delicate cells that convert the vibration energy into a nerve signal. The hearing nerve then transmits impulses to the brain where they are interpreted as understandable sound.



The middle ear chamber is lined by a membrane similar to the lining of the nose and contains secreting glands and blood vessels. This chamber is connected to the back of the nose by a small channel called the Eustachian tube. The Eustachian tube serves to ventilate the middle ear while protecting it from bacteria and nasal mucous. Normal function of the Eustachian tube is

perceived as a popping sensation in the ear. This occurs by way of contraction of the tensor veli palatini muscle during chewing, swallowing, or yawning. Periodic opening of the Eustachian tube is important, because oxygen and carbon dioxide in the air of the middle ear are absorbed by the lining of the middle ear. If the Eustachian tube is functioning properly, it will open to allow the air that has been absorbed to be replaced (or to compensate for changes in pressure with change of altitude).

DEVELOPMENT OF CHRONIC OTITIS MEDIA

A number of factors may contribute to the development of chronic ear infections. Most experts consider Eustachian tube dysfunction to be the primary cause for both acute and chronic ear infections. The Eustachian tube may be adversely affected by immunologic problems, environmental problems, and birth defects.

All children are born with resistance to many bacterial infections, because they carry their mother's antibodies. These antibodies may be passed through breast milk. This is one reason why children that are breast-fed may have fewer ear infections than children raised on formula. As mother's antibodies are lost, children will be vulnerable to certain bacteria that cause ear infections. These bacteria are most likely to cause acute ear infections after a child develops a viral upper respiratory tract infection (which causes the Eustachian tube to remain congested). Young children that are in daycare, specifically those with play groups > 6 children, are at an increased risk of developing viral upper respiratory tract infections, as well as acute ear infections. With time, most children will develop a resistance to both the viruses that cause upper respiratory tract infections and the bacteria that cause acute ear infections. If repeated acute ear infections develop or a severe ear infection damages the middle ear, these infections may become recurrent or persistent. For example, an acute ear infection may cause the eardrum to rupture. Though most of these ruptures will heal on their own, some will remain open.

Environmental problems can contribute to the development of ear infections. Environmental and food allergies and tobacco smoke exposure (even if the smoking occurs in another room) can increase congestion in the Eustachian tube.

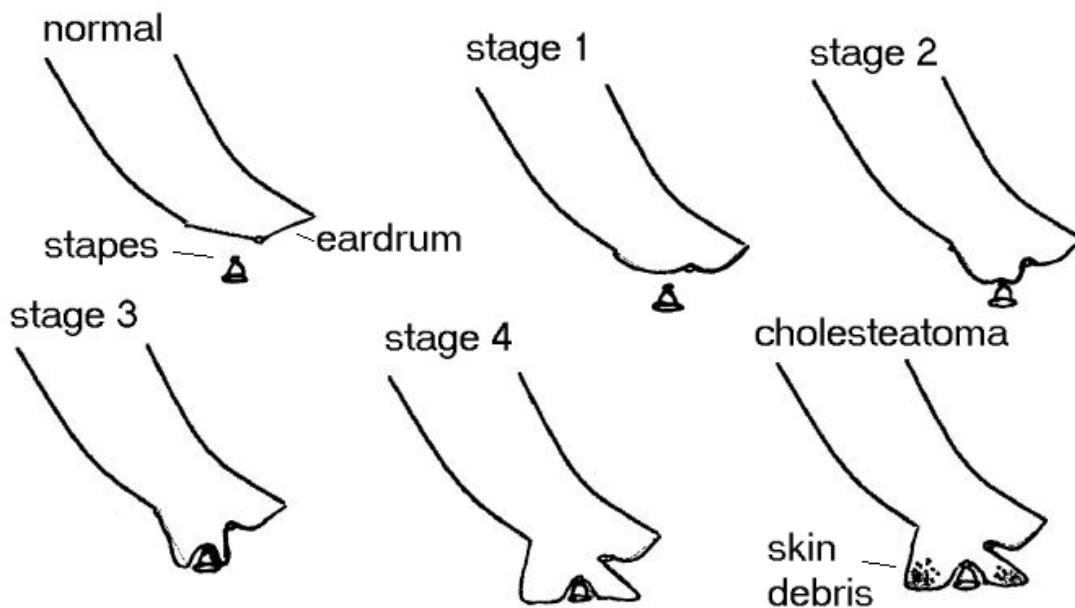
All children are born with relatively poorer functioning Eustachian tubes than their adult counterparts. The infant Eustachian tube is relatively more horizontal, narrow, and "S" shaped, leading to be more vulnerable to congestion. The anatomy of the Eustachian tube, like height or eye color, is determined by the genetic composition, so some people will have better tubes than others. Some children are born with more severe problems affecting the Eustachian tube.

The most severe of these is cleft palate. The tensor veli palatini muscle, which is responsible for opening the Eustachian tube during swallowing and yawning, is attached to the palate. If the palate has a cleft, contraction of this muscle will not open the Eustachian tube. Even after surgical repair of the cleft palate, the Eustachian tube commonly remains problematic.

If the Eustachian tube cannot open adequately, air cannot enter the middle ear space and a negative pressure is formed. This negative pressure feels like "stiffness" when it occurs slowly and is not severe. If it occurs rapidly or to greater degrees (eg, when diving under water), it will often cause pain. If the negative pressure continues for longer periods of time, the Eustachian

tube will be less effective at clearing bacteria that enter from the back of the nose.

Furthermore, the negative pressure may irreversibly damage the eardrum. The negative middle ear pressure leads to a process, known as atelectasis, which is the progressive collapse of the eardrum against the middle ear bones and the inner ear. Skin that is normally shed from the skin of the eardrum can no longer be expelled out the ear canal. This dead skin debris then builds up in small pockets, known as **cholesteatoma**. As the debris accumulates, the pockets expand, destroying surrounding bone. The skin debris, along with moisture and body heat, provide for excellent growth material for bacteria and fungus; hence, chronic ear infections are common with cholesteatoma. These skin pockets can become extensive, growing into small spaces throughout the bone that houses the ear, potentially involving surrounding structures (eg, the brain and the nerve that controls facial movements). If surrounding structures become involved, **more serious complications may develop**. Extension of the skin pockets into small spaces also makes the risk of **residual disease** considerable, even with the most expert of treatment.



In some cases, the eardrum will weaken and rupture before a skin pocket develops. The hole in the eardrum (known as tympanic membrane perforation) will allow bacteria to infect the middle ear by way of the ear canal. The hole in the eardrum also allows for mucous to reflux (pass) up the Eustachian tube, leading to persistent ear drainage.

HEARING IMPAIRMENT WITH CHRONIC OTITIS MEDIA

Any disease affecting the ear canal, eardrum, or the three small ear bones may cause a **conductive** hearing loss by interfering with transmission of sound to the inner ear. Conductive hearing impairment is commonly encountered in chronic ear infection as a result of a perforation

(hole) in the eardrum, partial or total destruction of one or all of the three little ear bones, or scar tissue. If the trouble lies in the inner ear, a **sensorineural** or nerve hearing loss is the result. When there is difficulty in both the middle and inner ear, a combination of conductive and sensorineural impairment exists (mixed hearing loss). The hearing loss associated with chronic ear infection may also be sensorineural, and deafness may occur. Conductive hearing loss is more likely to be treatable. Sensorineural hearing loss is generally permanent.

EVALUATION

In many cases, an ear specialist can determine the cause and treatment needed by simple inspection of the ear. Frequently, the ear will need to be cleaned and examined with a microscope. As hearing loss is a nearly universal problem with chronic otitis media, a hearing test is usually performed before treatment is started. X-rays (usually CT scans) may be needed to determine the extent of the problem. The need for such studies is dependent on symptoms, findings from the ear exam and the hearing test, prior treatment to the ear, and your physician's personal experience.

GENERAL CARE OF THE EAR

If a hole in the eardrum or a cholesteatoma is present, you should not allow water to get into your ear canal. This may be avoided when showering or washing the hair by placing cotton or lambs wool in the external ear canal and covering it with a layer of vaseline. Swimming is permissible if you use a small ear plug. Your otologist (ear surgeon) can advise you in regard to this.

You should avoid blowing your nose in order to prevent any infection in your nose from spreading to the ear through the Eustachian tube. Any nasal secretions preferably should be drawn backward and expectorated. If it is absolutely necessary to blow your nose, do not occlude or 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 discharge occurs. Cotton is placed in the outer ear to catch any discharge but should not be allowed to block the ear canal.

MEDICAL TREATMENT

Medical treatment frequently will stop flare-ups of ear drainage. Treatment consists of careful cleaning of the ear and, at times, the application of antibiotic ear drops or powder. Antibiotics by mouth may be helpful in certain cases. Treatment with intravenous antibiotics may lead to control of chronic ear infections in certain individuals.

SURGICAL TREATMENT

As a rule, chronic otitis media is a surgically-treated disease. For many years surgical treatment was instituted in primarily to control infection and prevent serious complications. **These remain the primary goals of surgery.** Changes in surgical techniques have now made it possible to reconstruct the diseased hearing mechanism in most cases. **Reconstruction of the hearing**

mechanism is the secondary goal of surgery.

Various tissue grafts may be used to replace or repair the ear drum. These include a covering of muscle from above the ear (fascia) and a covering of ear cartilage (perichondrium). A diseased ear bone may be replaced by an artificial bone (prosthesis). Bone or cartilage from other parts of the ear may be repositioned to rebuild the hearing mechanism.

A thin piece of plastic may be placed behind the ear drum to prevent scar tissue from forming and to promote normal function of the middle ear and motion of the ear drum. 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 disease is removed and the ear drum is reconstructed. At the second operation, the ear is explored to minimize the risk of residual disease and to attempt hearing restoration. A decision in regard to staging the operation is often made at the time of the first surgery.

MYRINGOPLASTY

In some cases, a permanent hole in the ear drum is the main problem leading to the chronic ear infection. This may be treated with this relatively simple procedure. This operation is performed for the purpose of repairing a perforation in the ear drum when there is no active middle ear infection or disease of the ear bones. This procedure seals the middle ear and may improve hearing.

Surgery is usually performed through the ear canal. Ear tissue is used to repair the defect in the ear drum. Surgery is usually done on an out-patient basis. The patient may be hospitalized for one night and may return to work in a week. Healing is complete in most cases in six to eight weeks. Hearing improvement is usually noticeable after 8 to 12 weeks.

TYMPANOPLASTY

This operation is performed to eliminate persistent middle ear infection and repair both the sound transmitting bones and any perforation of the eardrum. This procedure seals the middle ear and improves the hearing in many cases.

Most tympanoplasties are performed through an incision behind the ear, with local anesthesia of the ear canal and intravenous sedation or under general anesthesia. The perforation is repaired with tissue such as ear cartilage or the lining of the jaw muscle. Sound transmission across the middle ear is established by repositioning or replacing the diseased ear bones. 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. Then six months or more later, the sound transmitting mechanism is reconstructed. (See planned second stage.)

Surgery is usually done on an out-patient basis. Most people return to school or work within a week. Healing is usually complete in 8 to 12 weeks. A hearing improvement may not be noted for a few months.

TYMPANOPLASTY WITH MASTOIDECTOMY

When the destruction by cholesteatoma or infection is widespread in the mastoid, surgical

elimination of this may be difficult. Surgery is performed through an incision behind the ear. In many patients with cholesteatoma or chronic otitis media it is not possible to eliminate infection and restore hearing in one operation. The infection is eliminated and the eardrum rebuilt in the first operation. This usually requires a general anesthetic. Though most procedures are done as out-patients, over-night hospitalization is necessary for certain less healthy people or longer procedures. Most patients may usually return to work in one week. Healing is usually complete in 8 to 12 weeks. A hearing improvement, if reconstruction was performed, may not be noted for a few months.

When a second operation is necessary it will be performed six to twenty-four months later, to restore the hearing mechanism and to reinspect the ear spaces for any residual (remaining) disease. (See below). On rare occasions a radical mastoid operation (see below) may be necessary to control infection in a case thought originally to be suitable for tympanoplasty.

TYMPANOPLASTY: PLANNED SECOND STAGE

The purpose of this operation is to reinspect the ear spaces for disease and to improve the hearing. Surgery may be performed through the ear canal or from behind the ear, under a local or general anesthesia. The ear is inspected for any residual (remaining) disease. Sound transmission to the inner ear is accomplished by replacing missing ear bones and reinforcing any weak areas of the eardrum.

Surgery is usually done as an out-patient. Healing is usually complete in 8 to 12 weeks. A hearing improvement may not be noted for a few months.

TYMPANOPLASTY WITH REVISION MASTOIDECTOMY

The purpose of this operation is to eliminate discharge from a previously created mastoid cavity defect and to improve the hearing. The operation is performed under general anesthesia through an incision behind the ear. The mastoid cavity may be obliterated (see below) with fat from behind the ear or with bone. 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, however, a second operation is necessary to obtain hearing improvement (see Tympanoplasty: Planned Second Stage).

Surgery is usually done as an outpatient. The patient may return to work after one week. Complete healing of the inside of the ear may take three months. A hearing improvement may not be noted for a few months.

RADICAL MASTOIDECTOMY

The purpose of this operation is to eradicate the infection without consideration of hearing improvement. It is usually performed in those patients who may have very resistant infections or have infection in an only hearing ear. Occasionally it may be necessary to perform a radical mastoid operation in cases that originally appeared suitable for a tympanoplasty. This decision is made at the time of surgery. A fat 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 is usually done as an

outpatient. The patient may usually return to work in one week. Complete healing may require up to four months.

MASTOID OBLITERATION OPERATION

The purpose of this operation is to eradicate any mastoid infection and to obliterate (fill-in) a previously created mastoid cavity. Hearing improvement is not considered. The operation is performed under general anesthesia through an incision behind the ear. The mastoid space is filled with muscle or fat (from the ear or abdomen) or bone or both of these. Surgery is generally done as an outpatient. The patient may return to work in one week. Complete healing may require up to three months.

TYMPANOSTOMY TUBE PLACEMENT

In unusual circumstances, it may be necessary to place a ventilation tube in or under the eardrum. This may not always be anticipated before surgery. This does not affect the healing immediately after surgery, and it may allow for more rapid ventilation of the middle ear (earlier hearing improvement).

CRANIOTOMY

In rare circumstances, cholesteatoma may erode the bony covering around the brain and spread up next to the brain. In some cases, the brain may drop down into the mastoid. In these cases, a small window of bone may be removed from over the brain to allow removal of the diseased tissue and repair the covering over the brain.

SURGICAL OUTLOOK

Drainage: Eardrum grafting is successful in over 90% of patients, resulting in a healed dry ear.

Hearing: Hearing improvement following surgery depends upon many factors, among which are the extent of the ear bone damage, Eustachian tube function, and the ability of the ear to heal properly. It is uncommon to have **total** restoration of hearing. If two operations on your ear are necessary, your hearing may be worse in the operated ear between surgeries. If you have had prior unsuccessful surgery, chances for successful eardrum healing or hearing restoration are less than those for previously untreated ears.

Eradication of Disease: Residual cholesteatoma may be present in approximately 30% of cases. Staged procedures or close follow-up are necessary to address this problem.

WHAT TO EXPECT FOLLOWING SURGERY

There are some symptoms that may follow any ear operation. However, please call the ENT clinic if you experience:

- clear, watery drainage from your incision or nose;
- redness, swelling or infected drainage from your incision;
- pain, cramping or swelling in the legs;
- fevers (>101°F);

- *severe headache or neck stiffness.*

PAIN: Some degree of pain and tenderness is expected after surgery. This usually originates in spasm of the jaw and neck muscles that are moved during the surgery. Movement of any of these muscles will aggravate the pain. Pain should be controlled with oral acetaminophen, alone or combined with a prescribed narcotic medication. Significant pain should decrease over the first few days following surgery, sometimes longer for modified radical or radical mastoid operations. If the pain improves, then worsens, you should contact your surgeon's office. Worsening pain may be a sign of a wound infection that may need to be drained. Episodes of pain that occur later in the course of healing are commonly due to spasm in the neck and jaw muscles. These may be treated with anti-inflammatory agents. If this is not effective, you should contact your surgeon's office.

DRAINAGE FROM THE EAR CANAL: This is expected for many weeks after surgery. Cotton balls are placed in the bowl of the outer ear to catch the drainage. If the drainage saturates more than a dozen cotton balls per day or becomes foul or pus-like, please contact your surgeon's office.

DRAINAGE BEHIND THE EAR: At times the surgeon may insert a drain tube behind the ear. The necessity for this is usually not apparent before surgery. Should a drain tube be necessary, it will protrude through the skin behind the ear about 1/4 of an inch and may be left in place for up to a week. Once the drain is removed, drainage from behind the ear should resolve. If drainage from behind the ear persists or worsens, you should contact your surgeon.

TASTE DISTURBANCES AND MOUTH DRYNESS: Taste disturbances and mouth dryness are not uncommon for a few weeks following surgery. In some patients this disturbance is prolonged.

TINNITUS: Tinnitus (head noise), frequently present before surgery, is almost always present temporarily after surgery. It may persist for one to two months and then decrease in proportion to the hearing improvement. Should the hearing be unimproved or worse, the tinnitus may persist or be worse.

NUMBNESS OF EAR: Temporary loss of skin sensation in and about the ear is common following surgery. This numbness may involve the entire outer ear and may last for six months or more.

JAW SYMPTOMS: The jaw joint is in intimate contact with the ear canal. Tissue from the jaw muscle is commonly used to repair the eardrum. Some soreness or stiffness in the jaw movement is very common after ear surgery. It usually subsides within one to two months.

RISKS AND COMPLICATIONS OF SURGERY

Fortunately complications are uncommon following surgery for correction of chronic ear infection. These

INFECTION: Ear infection, with drainage, swelling and pain, may persist following surgery or, in 5% of cases, may flare up following surgery. If this develops, different antibiotic therapy, opening a portion of the incision, or additional surgery might be necessary to control the infection.

LOSS OF HEARING: In 3% of the ears operated on, the hearing is further impaired permanently due to the extent of the disease present or due to the complications in the healing process; nothing further can be done in these instances. On occasion there is a 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, and this should improve after the second operation.

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. Up to ten percent of the patients with chronic ear infection due to cholesteatoma have a labyrinthine 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 in close association with the middle ear bones, eardrum and the mastoid. A rare postoperative complication of ear surgery is temporary paralysis of one side of the face. This may occur as the result of an abnormality or a swelling of the nerve and usually subsides spontaneously. On very rare occasions the nerve may be injured at the time of surgery or it may be necessary to excise it in order to eradicate disease. When this happens a skin sensation nerve is removed from the upper part of the neck to replace the facial 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, requiring treatment by a specialist, could develop.

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

RARE COMPLICATIONS: A cerebrospinal fluid leak (leak of fluid surrounding the brain) is a very rare complication. Reoperation may be necessary to stop the leak. Intracranial (brain) complications such as meningitis, brain abscess, or even paralysis were common in cases of chronic otitis media prior to the development of antibiotics. Fortunately these now are extremely rare complications.

CARE INSTRUCTIONS FOLLOWING SURGERY

MEDICATIONS: Your surgeon will commonly prescribe antibiotic ear-drops to keep the

packing of the ear canal soft and reduce the chance of infection and a medicine to relieve pain for the first few days after surgery. Antibiotics to be taken by mouth are not routinely used, but may be indicated in certain circumstances.

EAR DRESSING: A cotton or a plastic and cotton pressure dressing is commonly used to protect the ear after surgery. This may be removed after one to two days. A cotton ball is kept in the bowl of the outer ear to catch drainage from the ear canal. This should be changed with fresh cotton as it becomes saturated. Under the cotton ball, foam packing can be seen. This should not be disturbed. It is normal for some of this packing to fall out with cotton ball changes. This packing will be removed by your surgeon during your postoperative visits.

BATHING & SWIMMING: Washing the hair may be resumed 2 or 3 days following surgery. The incision behind the ear may get wet at this time. Avoid scrubbing the incision. If a small area of the incision behind the ear opens or bleeds after bathing, simply clean it daily with hydrogen peroxide on a cotton ball. It is important to avoid contamination of the ear canal with water until the canal is healed (usually 4 – 12 weeks). As earplugs are far from perfect, submersing the head, such as with swimming, is not recommended until the ear canal is healed.

NOSE BLOWING & SNEEZING: Raising pressure in the back of the nose by nose blowing or sneezing with the nostrils obstructed and mouth closed can lead to build-up of pressure in the middle ear and displacement of the middle ear grafts. Avoid nose blowing and sneeze with your mouth open until cleared by your surgeon.

ACTIVITIES: Most daily activities will not affect your outcome with surgery. Light activities, such as walking, are encouraged. Activities that lead to jarring of the head (eg, boxing or jumping on a trampoline) should be avoided for 4 – 6 weeks after surgery.

TRAVEL RESTRICTIONS

You should have someone drive you from the hospital. Driving is permissible the day after surgery if there is no difficulty with head movements (eg, dizziness). Air travel is permissible 48 hours after surgery but should be avoided, if possible, for four weeks after surgery.

POSTOPERATIVE CLINIC VISITS

The first visit to your surgeon will generally be between 1 and 4 weeks after surgery. Keeping these scheduled visits is important to ensure optimal healing and prompt treatment of any problems. Subsequent visits are commonly scheduled at 4 – 8 week intervals until healing is complete.

DEFERRING SURGERY

If you do not have surgery performed at this time, it is advisable to have frequent examinations, especially if the ear is draining. Serious complications can develop. Should you develop dull pain in or about the ear, increased discharge, dizziness or twitching or weakness of the face, you should immediately consult your physician.