

Michigan Ear Institute

Acoustic  
Neuromas



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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 evaluation and treatment possible.*

*Our highly experienced team of physicians and audiologists has established international reputations for their innovative diagnostic and surgical capabilities, and our modern, attractive facility has been designed to provide the best patient care.*

*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 as valuable an experience as possible.*

# ACOUSTIC TUMOR

The diagnosis of an acoustic neuroma has been established as the most probable cause of your symptoms

## GENERAL COMMENTS

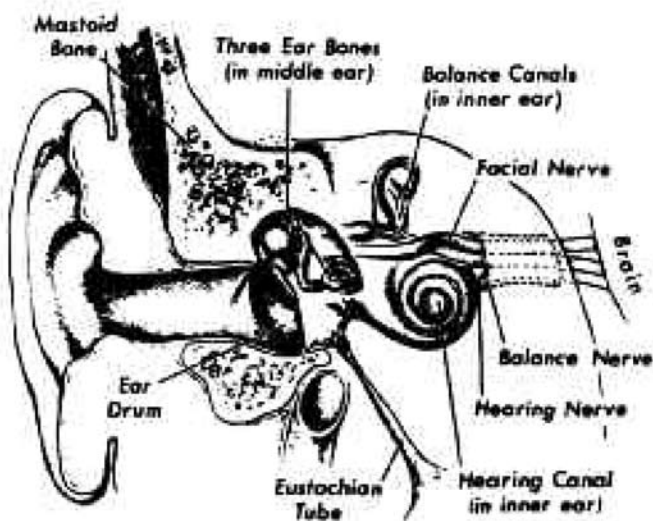
Acoustic neuromas (sometimes termed vestibular schwannomas) are benign fibrous growths originating from the balance or hearing nerve (8th cranial nerve), that do not spread (metastasize) to other parts of the body. They constitute six to ten percent of all brain tumors.

These growths are located deep inside the skull and are adjacent to vital brain centers. The first signs or symptoms one notices usually are related to ear function and include ear noise (tinnitus) and disturbances in hearing and balance. As the tumors enlarge, they involve other surrounding nerves having to do with more vital functions. Headaches may develop as a result of increased pressure on the brain. If allowed to continue over a long period of time, this pressure on the brain can be fatal.

In most cases these tumors grow slowly over a period of years. In others, the rate of growth is more rapid. In some the symptoms are mild, and in others, severe multiple symptoms develop rather rapidly.

The patient with an acoustic tumor has a serious problem, which sometimes involves life and death. Therefore, diagnostic procedures are frequently necessary to accurately assess the tumor and create an appropriate treatment plan.

The preservation of life is the most important objective of treatment of acoustic neuromas. Great care is exerted before, during and after treatment in these cases in order to preserve life. An important secondary objective of treatment is to preserve as many vital structures as possible. For most, a completely



normal life results following treatment. For others, various degrees of physical handicap may persist.

To accomplish the preservation of life with the least future physical disturbance, pre and postoperative care is performed using a team approach. This team includes an internist, a neuromonitoring specialist, an anesthesiologist, a specially trained surgical nurse, a neurosurgeon and an otologist (ear specialist). The neurosurgeon is co-surgeon with the otologist. Fortunately, great advances have been made in safety removing acoustic tumors including microsurgery, stereotactic radiosurgery, lasers, and nerve monitors.

## TREATMENT OF ACOUSTIC NEUROMAS

There are three treatment options for those affected by an acoustic neuroma: observation, stereotactic radiosurgery and surgery.

## **OBSERVATION**

The conservative approach of simple observation is an option for specific tumors and situations. In selected cases, tumors may be monitored for growth over a period of time since some of these benign tumors seem to stop growing. It is a consideration for those with smaller tumors or tumors that have been documented to not be enlarging. In the elderly and those with significant medical problems, observation may be recommended, at least initially. Larger tumors are rarely observed.

## **STEREOTACTIC RADIOSURGERY**

Stereotactic radiosurgery is a recognized treatment option for selected tumors. It involves the delivery of a single dose of focused radiation. The growth of small and medium tumors may be arrested by this single dose of radiation. Large tumors cannot be treated by this technique. Although no incisions are required, the risks include: loss of part or all remaining hearing in the treated ear, dizziness that may be permanent, brain swelling and facial nerve weakness or paralysis. There is a slight chance, as with any radiation, that a benign tumor could become malignant. Your otologic surgeon using a team approach with other specialists coordinates this therapy. Treatment is completed as an outpatient over a several hour period.

## **SURGERY**

For most of those affected by an acoustic neuroma, surgery is the likely treatment option. There are three surgery variations (approaches) depending on the tumor size, location and the amount of hearing present. Acoustic neuroma surgery requires many hours to complete and involves an overnight observation period in a neurological intensive care unit. Vital

signs and nerve functions are monitored during these surgeries. Hospitalization after surgery varies from three to seven days.

The removal of an acoustic tumor is a major surgical procedure, with possibilities of serious complications, including death. Risks and complications of acoustic tumor treatment vary with the size of the tumor. Larger tumors are associated with more severe and frequent complications.

The risk involved with acoustic neuromas and their treatment must never be minimized.

## **Middle Fossa Approach**

For those with good hearing and small tumors that are mainly inside the bony canal, the middle fossa approach will likely be recommended. Through this canal pass the hearing, balance and facial nerves along the blood vessels that supply the inner ear.

The operation for removal of a small tumor is performed under general anesthesia using the operating microscope. The surgical approach is through an incision in front of and above the ear.

The tumor is totally removed in most cases. On rare occasions only partial removal can be accomplished. Every effort is made to preserve the hearing and still remove the tumor. In about 50% of cases the tumor involves the hearing nerve or the artery leading to the inner ear and total loss of hearing results in the operated ear.

## **Retrosigmoid (Posterior Fossa) Approach**

For tumors that have extended outside of the internal auditory canal into the cranial cavity and have maintained good hearing, the retrosigmoid approach may be recommended. The surgical approach is through an incision behind the ear. Hearing can usually be preserved in 50% of cases.



## **Translabyrinthine Approach**

For patients with larger tumors or with hearing loss, the translabyrinthine approach is typically recommended. This approach is performed through an incision immediately behind the ear. The bone of the mastoid and inner ear are removed during this procedure. Visualization of important structures is generally better and less retraction of the brain is required through this approach although any remaining hearing will be lost after surgery. The mastoid bone defect is closed with fat taken from the abdomen.

## **Partial vs. Total Removal**

Total removal of an acoustic tumor, without complications, is the goal of the management of these tumors. If large, the tumor may be removed in two planned stages. Regardless of its size, partial removal of the tumor may be necessary if the patient's responses during surgery indicate disturbance of the vital brain centers that control respiration, blood pressure, or heart function. This will often allow these vital functions to be restored. Once they are disturbed, however, they sometimes do not recover. If premature termination of the operation is necessary in the judgment of the operating surgeons, the remaining portion of the tumor may gradually enlarge to again produce symptoms. In this event, a subsequent operation might be necessary. This subsequent operation can often be accomplished without significant changes in vital signs.

In the event your tumor is partially removed, you will be so informed. Usually the first operation reduces the size of the tumor sufficiently so that it has a chance to separate away from the vital brain centers. It can, therefore, be successfully removed at a later date. In most cases we wait four to six months and then electively operate again for tumor removal.

In other cases, a course of continued observation is recommended. In this instance the tumor will be evaluated from time to time for possible regrowth and accordingly a decision made regarding its removal or treatment with stereotactic radiotherapy.

## **HEARING IMPAIRMENT FOLLOWING SURGERY**

Hearing may be lost in the operated ear following acoustic tumor surgery. When the hearing has deteriorated prior to surgery the patient already has become aware of problems: locating the direction of sound, hearing a person on the deaf side and, the major problem, understanding speech in difficult situations like background noise.

With hearing loss, one must learn to watch a speaker carefully in difficult listening situations, using his eyes to help the brain understand words which may sound very much the same, but appear different on the lips (example: pope, coke, soap, dope, cope).

Considerable help may be obtained with a CROS aid. The CROS aid (Contralateral Routing Of Sound) is an instrument that receives sound on the deaf side, amplifies it, and then routes it to the good hearing ear. A small aid is worn on each ear. Although not everyone will find this type of amplification system helpful, with sufficient need, and motivation, the patient usually will realize improved hearing performance with a CROS aid.

Another option is a temporal bone osseointegrated implant. This implant is a partially implanted hearing device that uses a titanium screw placed in the skull behind the deafened ear to anchor a sound processor. It is similar to dental implants used to anchor dentures in the mouth. The sound processor sends sound waves through the skull from the deafened side to the hearing ear.

# **RISKS AND COMPLICATIONS OF ACOUSTIC TUMOR SURGERY**

It is not possible to list every complication that might occur before, during or following a surgical procedure. The following discussion is included to indicate some of the risks and complications peculiar to acoustic neuroma surgery.

In general, the smaller the tumor at the time of surgery, the less the chance for complications. As the tumor enlarges, the incidence of complication becomes increasingly greater.

## **Hearing Loss**

In small tumors it is sometimes possible to save the hearing by removing the tumor. Many tumors are larger, however, and the hearing is lost in the involved ear as a result of the surgical procedure. Therefore, following surgery (and in many cases prior to surgery) these patients hear only with the remaining good ear. However, there are now new techniques to help cross the sound over from the deaf ear to the “good ear” such as a CROS hearing aid and an osseointegrated bone conduction device, which are discussed in detail above.

## **Tinnitus**

Tinnitus (ear noise) remains the same as before surgery in most cases. In 10% of cases, the tinnitus may be more or less noticeable.

## **Taste Disturbance and Mouth Dryness**

Taste disturbance and mouth dryness are not uncommon for a few weeks following surgery.

In 5% of patients this disturbance is prolonged.

## **Dizziness and Balance Disturbance**

In acoustic tumor surgery it is necessary to remove part or all of the balance nerve and, in most cases, to remove the inner ear balance mechanism. Because the balance nerve usually has been damaged by the tumor, its removal frequently results ultimately in improvement in any preoperative unsteadiness. Dizziness may occur, nonetheless, following surgery and may be severe for days or a few weeks. Therapy is initiated immediately after surgery to reduce the post surgery dizziness and increase the chances of complete balance recovery. Imbalance is prolonged in 30% of the patients until the normal balance mechanism in the opposite ear compensates for the loss in the operated ear. Some patients may notice unsteadiness for several years, particularly when fatigued.

At times the blood supply to the portion of the brain responsible for coordination (cerebellum) is decreased by the tumor or the removal of the tumor. Difficulty in coordination with arm and leg movements (ataxia) may result.

## **Facial Paralysis**

Acoustic tumors are in intimate contact with the facial nerve, the nerve that controls movement of the muscles, which close the eyelids, as well as the muscles of facial expression. Temporary paralysis of the face and muscles, which close the eyelids, can occur following removal of an acoustic tumor. If weakness occurs it can take many months to recover and rarely may be permanent.

Facial nerve monitors pioneered here at the Michigan Ear Institute have dramatically improved our ability to preserve the facial nerve.

Facial paralysis may result from nerve swelling or nerve damage. The facial nerve is usually compressed and distorted by the tumor in the internal auditory canal. Careful tumor removal, with the

help of an operating microscope, usually results in preservation of the nerve but nerve stretching may result in swelling of the nerve with subsequent temporary paralysis. In these instances facial function is observed for a period of months following surgery. If it becomes certain that facial nerve function will not recover, a second operation may be performed to connect the facial nerve to a nerve in the neck (facial hypoglossal anastomosis).

In 5% of cases the facial nerve passes through the interior of the acoustic tumor. On occasions the tumor may even originate from the facial nerve (facial neuroma). In either instance, it is necessary to remove all or a portion of the nerve to accomplish tumor removal. When this is necessary it may be possible to immediately reconnect the facial nerve or to remove a skin sensation nerve from the upper part of the neck to replace the missing portion of the facial nerve. If this is not possible a second operation may be performed to help reanimate the face.

## **Eye Complications**

Should facial paralysis develop, the eye may become dry and unprotected. Care by an eye specialist may be indicated. It may be necessary to apply artificial tears or to tape the eye shut. When prolonged facial nerve paralysis is expected, implantation of a gold weight or spring into the eyelid helps keep the eye moistened as well as providing comfort and improved appearance.

## **Other Nerve Weaknesses**

Acoustic tumors may contact the nerves, which supply the eye muscles, the face, the mouth and throat. These areas may be injured with resultant double vision, numbness of the throat, weakness of the face and tongue, weakness of the shoulder, weakness of the voice and difficulty swallowing. These problems may be permanent.

## **Brain Complications and Death**

Acoustic tumors are located adjacent to vital brain centers that control breathing, blood pressure, and heart function. As the tumor enlarges it may become attached to these brain centers and intertwined with the blood vessels supplying these areas of the brain.

Careful tumor dissection, with the help of an operating microscope, usually avoids complications. If the blood supply to vital brain centers is disturbed, serious complications may result: loss of muscle control, paralysis, or even death. In our experience death occurs rarely as the result of the removal of small acoustic tumors and occurs in less than 1% of the larger tumors.

## **Postoperative Spinal Fluid Leak**

Acoustic tumor surgery results in a temporary leak of cerebrospinal fluid (fluid surrounding the brain). This leak is closed prior to the completion of the surgery with fat removed from the abdomen. Occasionally this leak reopens and further surgery may be necessary to close it.

## **Postoperative Bleeding and Brain Swelling**

Bleeding and brain swelling may develop after acoustic tumor surgery. If this occurs a subsequent operation may be necessary to reopen the wound to arrest bleeding and allow the brain to expand. This complication can result in paralysis or death.

## **Postoperative Infection**

Infection occurs in less than 5% of patients following surgery. This infection is usually in the form of meningitis, an infection of the fluid and tissue surrounding the brain.

When the complication occurs, hospitalization is prolonged. Treatment with high doses of antibiotics is often indicated. These antibiotics can cause allergic reactions, may suppress the body's blood-forming tissues or may produce hearing loss in the good ear. Fortunately these antibiotic complications are rare.

## **Transfusion Reaction**

Although extremely rare, it may be necessary to administer blood transfusions during acoustic tumor surgery. Immediate adverse reactions to transfusions are uncommon. A late complication of a transfusion is viral infection of the liver (hepatitis). This occurs in less than 5% of transfused patients. When this complication occurs, medical treatment is necessary, at times requiring re-hospitalization. Many patients will consider banking their own blood in advance of surgery. Please ask your doctor for details of such "auto-donations".

## CONCLUDING REMARKS

The earlier acoustic tumors are diagnosed and treated, the less likely the possibility of serious complications.

Overall many patients have hearing loss, head noise, and balance difficulties. Rarely are these symptoms due to an acoustic neuroma. Appropriate evaluations of individuals with these symptoms are necessary to determine if further testing is indicated. This will allow earlier detection of these rare tumors. The size of the tumor at the time of discovery is extremely variable. In some cases, the tumor is relatively large before a definite diagnosis can be established. The problem must be faced as it exists at the time of diagnosis and acceptance made of whatever risks are necessary to remove these tumors. The risks of treatment options must be thoroughly discussed to give an individual the best potential outcome.

The statements made in this booklet are based on our personal experiences in managing a large series of acoustic tumor cases.

If you have any questions about yourself and a possible acoustic tumor, please discuss them with your otologist.

Feel free to consult a second otologist or neurotologist regarding your situation. Your medical records can be sent to any consultant you desire.









**Michigan Ear Institute**



## Acoustic Neuromas

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Received by

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Patient Signature

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Date



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and staff of the Michigan Ear Institute,  
call us at (248) 865-4444 or visit our  
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