

Acoustic Neuroma

Overview

An acoustic neuroma is a benign (non-malignant tumor) that originates on the hearing or balance nerve. These nerves are located deep in the skull and are near important structures. Because the tumor involves the nerves of balance and hearing, patients will usually present with hearing loss, ringing in the ear, or problems with balance. Larger tumors will cause facial numbness, headaches, and the accumulation of fluid around the brain that can be fatal if left untreated.

Tumor Size

Tumors can be roughly divided into small, medium, or large. Larger tumors make treatment more difficult and result in increased complications.

- Small tumors involve the internal auditory canal. This is the bony canal where the hearing, facial, and balance nerve pass from the brainstem to the inner ear. If hearing is normal or near normal, hearing preservation in the form of surgery or radiosurgery may be considered. Sometimes small tumors are observed with serial MRI scans.
- Medium tumors involve the internal auditory canal and extend into the brain cavity, but they do not place pressure on the brainstem.
- Large tumors extend into the brain cavity and place pressure on the brainstem.

Treatment Options

- **Observation** is an option for treating small and medium tumors. These tumors can safely be monitored with scheduled MRI scans. If no tumor growth is seen, an annual MRI is required to make sure the tumor does not show growth. If the tumor has grown, further treatment is indicated. Observation is not recommended for young patients or in patients with large tumors. Hearing loss is possible during the observation period and can be sudden in some cases.
- **Radiosurgery** is the use of radiation in a very precise manner. The goal of treatment is to stop tumor growth. Generally, the tumor should show signs of growth by repeat MRI before the tumor is treated with radiosurgery. The procedure is performed as an outpatient and is well tolerated with some patients experiencing temporary headache and nausea. The risks of radiosurgery include continued tumor growth, facial numbness, hearing loss, dizziness, ringing in the ear, facial paralysis or twitching (rare), and fluid buildup around the brain. If the tumor needs to be removed after radiosurgery because of continued tumor growth, complications (including facial weakness) tend to be more common. Also, there is a small risk of the tumor turning malignant (cancer) that is estimated to be 1 in 1,000 cases over a 30-year period.
- **Surgery** is a complex procedure and involves many people in a team to help decide what surgery and team is recommended to treat tumors. Because of the complex anatomy involved with the surgical removal of an acoustic neuroma a neurotologist, neurosurgeon, and an audiologist are utilized. Hearing preservation may be attempted in patients with normal or near-normal hearing and small tumors. The choice of surgical approaches is determined by multiple factors including tumor size, tumor location, and hearing status. Facial nerve monitoring is performed during surgery as well as hearing nerve monitoring if hearing preservation is an option.

- **Translabrynthine approach** is the most common approach utilized to remove an acoustic neuroma. An incision is made behind the ear and the bone behind the ear is removed. Next, the labyrinth is removed allowing a wide view of the tumor. Because the labyrinth is removed, total hearing loss is expected. On the other hand, the brain does not require retraction and the largest tumors can be removed through this approach. Fat from the abdomen is used to fill in the surgical defect.

- **Middle fossa approach** is used with small tumors with good hearing. An incision is made above the ear and a small piece of the skull is removed that will be placed back with small titanium plates. The temporal lobe of the brain is retracted and the bone over the internal auditory canal is removed. This allows access to the tumor that is then removed. The goal of the middle fossa approach is hearing preservation which is achieved in approximately 60% of cases.

- **Retrosigmoid approach** is also used for small to medium tumor where most of the tumor is in the brain cavity rather than in the internal auditory canal. An incision is made behind the ear and a small piece of the skull is removed. This allows a wide view of the brain cavity. The tumor is then removed. Hearing preservation is sometimes possible with the retrosigmoid approach.

- **Total versus partial removal** is sometimes a necessary choice. Total removal of tumor is always the goal of surgery. If the tumor is very stuck to the facial nerve or other vital structures, a small piece of tumor will be left behind to prevent complications. These small pieces of tumor rarely grow, however, it is important to get an annual MRI scan to make sure this small remnant does not grow.

Hearing impairment

Hearing impairment is the natural course of an untreated acoustic neuroma in the affected ear. Surgery or radiosurgery can also result in hearing loss. Many patients adjust well to hearing in only one ear. Other patients are more bothered with hearing loss and can consider a few options.

- One option is to wear a CROS (contralateral routing of sound) hearing aid which consists of a hearing aid in the poor ear that will transmit sounds to a hearing aid in the better ear.
- A bone anchored hearing device is an option as well. An abutment is surgically implanted. An external sound processor can be attached to the abutment to aid in hearing. The sound is routed through the bones of the skull into the good ear. The surgical procedure takes about 45 minutes and is performed as a day surgery.

Risks and complications of surgery

Facial weakness or facial paralysis can occur following surgery. The facial nerve, which controls the movement of the face, is intimately involved with the tumor and may be stretched very thin over larger tumors. IN addition, swelling may occur around the nerve resulting in a temporary weakness. Because of this, there is potential for facial weakness or permanent paralysis after the removal of an acoustic neuroma. The use of intra-operative monitoring of the facial nerve has decreased the incidence of facial nerve problems.

Most cases of facial weakness are temporary and resolve in 6-12 months. If facial nerve function does not return during this time, additional procedures can be used to improve facial movement.

Rarely, the facial nerve may be going through the tumor or the tumor may be coming from the facial nerve and the nerve is removed with the tumor. In this case, the nerve can be reattached or if a gap in the nerve exists, a small sensory nerve from the upper neck can be used to connect the two nerve endings. This

will leave the patient with permanent weakness but some movement usually returns over the next 6-12 months.

Spinal fluid leak is a possible risk with removal of acoustic tumors. The bone around the tumor and ear is removed to gain access to the tumor. This bone is connected by small air-containing chambers into the middle ear and out the nose. Rarely, spinal fluid can drain out of the surgical incision or ear canal. Fat from the abdomen is used to fill-in the surgical defect to decrease the chance of a spinal fluid leak. If a spinal fluid leak still occurs, a leak usually stops with a spinal drain. Rarely, the wound may need to be reopened to stop a spinal fluid leak.

Infection is always a possibility with surgery, despite of sterile technique and antibiotics. Since the surgery involves areas around the brain, an infection may lead to meningitis. This can be a serious and even fatal infection if not identified and treated promptly. Treatment consists of prolonged intravenous antibiotics.

Hearing loss in the operative ear is an expected outcome following translabyrinthine approach. With the middle fossa and retrosigmoid approaches, hearing loss (including total hearing loss) is a risk.

Ringin in the ear, or tinnitus, may result after surgery.

Change in taste occurs in a small percentage of patients. This is usually temporary.

Dizziness is experienced by most patients for 2 to 3 days after the tumor is removed. Dizziness and problems with balance may persist for a few months. Rarely, a patient may have long-term problems with balance. A very unusual problem is decreased blood supply to the part of the brain that controls coordination (the cerebellum). This may result in dizziness in the form of ataxia where coordination of the arms and legs is difficult. Vestibular rehabilitation is sometimes required to hasten the recovery of balance.

Eye care

If facial weakness occurs after surgery, closing the eye may be difficult. It is important to keep the eye moist and lubricated until facial function returns. Without eye closure, serious infection may occur that could rarely lead to blindness. If return of facial function is expected to take quite some time, a procedure may be needed to help the eye close. Patients are encouraged to call immediately if they experience any eye symptoms after surgery.

Other nerve problems

Rarely, the nerves controlling eye movement, facial feeling, the vocal cords, and swallowing may be injured. These deficits are usually temporary but can be permanent.

Postoperative headache

Postoperative headache is most common with the retrosigmoid approach, but may occur with any approach and can be prolonged.

Brain swelling and bleeding

The patient is observed in the intensive care unit for 1 to 2 nights to monitor for signs of brain swelling or bleeding. These complications can be life-threatening and may require additional surgery to remove blood or relieve swelling.