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.

Because of the complexity of the anatomy and patients' individual circumstances, a team approach involving a neurotologist (ear specialist) and a neurosurgeon are used to remove tumors. By combining the expertise of both specialties, surgical outcomes are greatly improved. Postoperative care involves a team of audiologists and physical therapists as needed.

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
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
Medium tumors involve the internal auditory canal and extend into the brain cavity, but they do not place pressure on the brainstem.

Large tumors
Large tumors extend into the brain cavity and place pressure on the brainstem.

Treatment options:
Observation
Small tumors and some medium tumors can be observed with serial MRIs. 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
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 1000 cases over a 30-year period.

**Surgery**

Because of the complex anatomy involved with the surgical removal of an acoustic neuroma, a team approach is used consisting of a neurotologist, neurosurgeon, and an audiologist. 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 and, in hearing preservation surgery, hearing nerve monitoring is used during the surgery.

**Translabyrinthine approach**

This 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**

The 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**

The 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**

Total removal of tumor is always the initial 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 to make sure this small remnant of tumor does not grow.

**Hearing impairment**

The natural course of an untreated acoustic neuroma is hearing loss 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 options 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 a surgically implanted abutment that attaches to an external sound processor. The sound is then 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 complication of surgery

**Facial weakness or paralysis**

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**

The bone around the tumor and ear are removed to gain access to the acoustic neuroma. This bone is connected by small air-containing chambers. With removal of the tumor, the spinal fluid can flow through these 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**

Despite sterile technique and antibiotics, infection is always a possibility with surgery. 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**

The translabyrinthine approach always results in total hearing loss in the operated ear. With the middle fossa and retrosigmoid approaches, hearing loss (including total hearing loss) is a risk.

**Ringing in the ear**

Ringing in the ear, or tinnitus, may results after surgery.

**Change in taste**

A small percentage of patients may notice a change of taste. This is usually temporary.

**Dizziness**

Most patients experience significant vertigo for 2 to 3 days after the acoustic neuroma 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 removed blood or relieve swelling.

Making an Appointment
Primary care physicians typically refer new patients to UT Southwestern Medical Center. If an individual does not need a referral, they may make an appointment through the following options:

- Complete an online Request an Appointment Form.
- Call 214-645-6455 or 866-645-6455 (toll free).

Physicians referring a patient may use the above options or the following:

- Complete an online Physician Referral Form.
- Call our Comprehensive Skull Base Program Physician referral line 214-645-3400
- Call 866-645-5455 (toll free).

After-Hours Care
Current UT Southwestern patients who need urgent care outside of normal business hours may call 214-648-3111 to leave a page for our on-call physician.

Emergency Care
If an individual is experiencing a life-threatening problem, they should call 911 immediately or go to the nearest emergency room. UT Southwestern’s emergency room is located at University Hospital–St Paul, 5909 Harry Hines Blvd. (corner of Harry Hines Boulevard and Inwood Road).

Website: www.utsouthwestern.edu/skullbase