

Acoustic neuromas are benign tumors arising from the vestibular nerve in the base of the skull. These tumors grow slowly, expanding into the cranial cavity, compressing the brainstem, and causing cranial nerve dysfunction. Affected individuals develop progressive hearing loss in one ear, ringing in the ear, a sense of imbalance, loss of sensation in the face, and weakness of facial muscles. Very large tumors cause headaches, double vision and hydrocephalus. Interestingly, the surgical treatment of acoustic neuromas parallels the history of the development of neurosurgery.

Acoustic neuromas

are rare. The incidence is 10 per million population per year or about 2,800 new cases in the US each year. These tumors are only rarely associated with genetic errors which are passed to succeeding generations.

In Neurofibromatosis², a genetic error is passed as an autosomal dominant trait (one half of children maybe affected) and this error results in acoustic neuromas on both sides.

Microsurgical removal and radiosurgery are effective methods of treating AN. Detailed information regarding the effects of treatment, risks and complications, long-term effects, and natural history of untreated tumors form an important basis for every patient's informed decision regarding treatment.

Natural History

Several studies have detailed the growth pattern of untreated AN. About 50% of tumors grow slowly (1 to 2 millimeters per year). For each patient, the growth rate is constant and can be predicted after 1 to 2 years of observation with serial MR scans. In about 20% of patients, the growth rate is more rapid (more than 2 mm per year). Finally, tumors seem not grow in more than 30% of patients (some even become smaller). Malignancy is extremely rare.

Microsurgical Removal

The success of surgical removal of these tumors is a testament to the skills and resourcefulness of neurosurgeons and otologists. At the turn of the century, open

operation was a risky proposition. The mortality rate was 80%. Now the operative mortality rate is 1% and the likelihood of surgical cure greater than 95%. In recent years, surgeons have turned the emphasis from reduction of the mortality rate to reduction in complication rates and preservation of cranial nerve function. Today, patients can expect to have near normal facial movement, sensation, and sometimes even hearing preservation following microsurgical removal.

A meta-analysis of the results of various microsurgical series is difficult as it is difficult to control for the many risk factors which influence the outcome of surgery. For example, the preservation of facial movement and hearing is highly influenced by tumor size.

Gamma Knife Radiosurgery

Gamma Knife radiosurgery has been used to treat acoustic neuromas for the past quarter century. Focused, high dose radiation was conceived by Professor Lars Leksell as a means of non-invasive treatment of movement disorders and pain. Shortly after its introduction as a surgical instrument in 1968, it was used to treat brain tumors and vascular malformations. The first report of GK treatment of AN was in 1971, and by the end of 1997, more than 8,000 patients have been treated worldwide. Modern computer graphics and brain imaging technology have resulted in a very effective and safe method of treating acoustic neuromas on an outpatient basis.

Unlike microsurgery, GK radiosurgical results are less dependent on the individual skills of the surgeon since the conformal treatment planning software, dose schedules and even the machine are virtually identical among the 112 units worldwide. The results in San Diego, Pittsburgh, Guadalajara, Stockholm, Beijing, Tokyo, New Delhi and Singapore will be the same.

The series reported by Pollock from the University of Pittsburgh is interesting because they had a similar group of 47 patients treated by microsurgery for comparison. After 3 years the control rate was 94% for radiosurgery and 98% for microsurgery. There were no deaths. Complications occurred in 38% of operated patients, and 33% required further surgery. Complications occurred in 28% of radiosurgery patients, and 13% needed more surgery. Radiosurgery compared favorably with microsurgery in terms of preservation of useful hearing and facial movement. After 3 years 63% of surgical and 83% of radiosurgical patients had normal facial movement. Among those with useful hearing before operation, 14% of operated and 75% of radiosurgical patients had serviceable hearing. Hospital stay and charges were lower for radiosurgery patients, while patient acceptance was greater.

Finally, long-term results have been reported for Gamma Knife radiosurgery in the treatment of acoustic neuromas. Kondziolka and others reported the results of 162 consecutive patients who underwent radiosurgery between 1987 and 1992 (NEJM 1998;339:1426-1433) yielding a 5 to 10 year follow-up. Control rate was 98%. Two-thirds of the tumors became smaller. Four patients were operated within four years, and the surgeon described the resection as no more difficult than unradiated tumors in three of the four. No further growth was noted after 4 years. Normal facial movement was found in 79%, and no patient with normal facial movement before radiation developed complete paralysis. There was no change in hearing in 51%, and 47% of those with useful hearing before treatment preserved useful hearing.

There are no reports of radiosurgery causing malignancy, and anecdotal reports of the difficulty of operated individuals previously treated by radiosurgery are unsubstantiated. Needless to say, the unusual complications of open surgery, i.e., infection, cerebrospinal fluid leak, hemorrhage, etc., can be avoided. In the rare case of recurrent growth radiosurgery can be repeated.

Dr. Leary has extensive experience in both the microsurgery and Gamma Knife radiosurgery of acoustic neuromas. We welcome your inquiries regarding your care.