Acoustic Neuromas  
Two Case Reports and Short Literature Review

Authors: G. Vyas *, Sudhakar Vaidya ***, Ashish Sharma**
* Professor & Head Department of Medicine, ** Associate Professor, ***Associate Professor Department of ENT,

Institution: R.D. Gardi Medical College, Ujjain, India.

Corresponding Author: Dr. S. Vaidya, R.D. Gardi Medical College, Ujjain, India. E-Mail: drsvaidya@hotmail.com

Abstract

Acoustic neuromas are relatively uncommon benign tumors of the posterior fossa. Treatment options include surgery, radiosurgery and observation. Two patients with an acoustic neuroma are described, one of whom elected to have surgery the other radiosurgery. Both patients presented with an asymmetric hearing loss. The signs and symptoms and a short literature review are also presented.

Introduction

In 1917, Harvey Cushing reported 30 cases of acoustic neuromas who underwent a suboccipital intracapsular removal with a marked reduction in intraoperative mortality to 10 to 15%.1 In 1922, Walter Dandy, Cushing’s pupil, reported the first complete resection of an acoustic neuromas with a 11% mortality rate.1,2 Major improvements in outcomes occurred with the introduction of the operative microscope and surgical drill by Dr. William House.1 With the advent of meticulous microsurgical dissection, surgical clips and bone wax, the mortality for acoustic neuroma surgery dropped from 15% in 1917 to 1%.1

Acoustic neuromas occur at a frequency of approximately 1/100,000 per year.3 In the USA two to three thousand new cases are diagnosed each year and acoustic neuromas can be found in up to 1% of autopsies.3 They comprise 6% to 8% of all intracranial tumors and 80% to 90% of all CPA tumors.2 The vast majority occur in adulthood with no race or gender predilection.

Most acoustic neuromas are benign schwannomas arising in the internal auditory canal, most commonly from the the vestibular division not the auditory division of the VIIIth cranial nerve.2 They are, thus, more appropriately called vestibular schwannomas.2 Malignant degeneration is very rare. The following is a report of two patients with a cisternal acoustic neuroma.
Case Report #1: A 55-year-old male nonsmoker, nonalcoholic, nonhypertensive, nondiabetic, stenotypist by occupation presented with complaints of unilateral hearing loss right ear, tinnitus for the last three years. There is no history of headache, trauma, convulsions, or projectile vomiting. There is no history of tuberculosis, diabetes mellitus, hypertension or any other chronic illness in the past. He had been previously diagnosed and treated as a case of cardiomyopathy. For the complaints of hearing loss in right ear, tinnitus for last three years, he had been consulted by various ENT consultants and was subjected to all relevant investigations including audiometry which revealed unilateral deafness.

On April 3, when he was returning from his office work he lost consciousness which lasted for almost 10 minutes. There was no neurological deficit at that time except sustained injury on left side due to the fall. He was subjected to all routine investigations and MRI. MRI revealed acoustic neuroma with intracanalicular extension. All other routine investigations were found to be within normal limits.

Due to his medical condition, Gamma Knife Radiosurgery was advised as the primary treatment option to achieve tumor control and preserve facial nerve function.

Patient was shifted to Gamma Knife suite and Leksell stereotactic head frame was applied under sedation in supine position. The skull measurements were recorded and imaging of head [stereotactic MRI] was obtained. The radiological images were then network transferred to Gamma Plan and treatment planning was performed. Total five shots were delivered using two 18 mm collimator shots, and three 8 mm collimator shots. 100% of tumor volume [4.1 cubic cms] was delivered prescription dose greater than or equal to 12.0 Gy at 50% prescription isodose configuration. Maximum dose to the tumor was 24.0 Gy. Patient tolerated the procedure well. Below is a collection of MRI images of the patient's acoustic neuroma.
Case Report #2: The pictures below are MRI scans from a 47-year-old male patient (#2) with a left acoustic neuroma. The only symptom was a very small asymmetrical hearing loss. An ABR was performed which was abnormal, having a wave V intraaural latency of 0.71 ms. The patient initially declined surgery and was followed for three years. Tumor growth was detected and the neuroma was surgically excised through a left retromastoid craniectomy. Right hand picture - Patient’s audiogram. Middle Picture - T1 MRI Scan with Gadolinium Contrast. Left hand picture - T1 Weighted MRI Scan with Gadolinium Contrast. View Enlarged Pictures At End Of The Manuscript

Discussion

The etiology of most acoustic neuromas are idiopathic, rarely they are congenital. However, All patients should be screened for neurofibromatosis. Type 2 neurofibromatosis may present with bilateral acoustic neuromas. Other possible associations with acoustic neuroma formation which can be found in the literature are loud noises and cell phone usage.

The most predictive symptoms are an asymmetric hearing loss at 3000 Hz of 15 dB or greater, asymmetrical discrimination and asymmetrical vestibular testing without vertigo. The second reported case is a patient with a minor asymmetric hearing loss that was found on MRI scan to have an acoustic neuroma. Even patients with a history of noise induced hearing loss should have an MRI if their hearing loss is asymmetrical. Baker et al has shown such patients have a 2.5% incidence of an acoustic neuromas on MRI scan.

All patients with a significant asymmetrical hearing loss should undergo MRI scanning. Daniels et al. reported finding 56 acoustic neuroma out of 1070 patients who underwent MRI testing for asymmetrical...
hearing loss. In addition he found another 70 intra intracranial and inner ear lesions, including 27 cerebellopontine angle lesions and one case of multiple sclerosis.

Poor balance is a common presenting complaint\(^1\), but since the growth of an acoustic neuroma is slow, the patient usually compensates for the loss of vestibular function and true vertigo is usually seen. If the vascular supply to the inner ear is suddenly compromised by the tumor, vertigo and a sudden hearing loss may result.

Treatment modalities can be divided into three types: Surgery, Radiosurgery, and Conservative. Which modality that is recommended depends upon the size of the tumor, age of the patient and patient preference.

**Radiosurgery (Case Report #1):** Gamma knife radio surgery has become an accepted treatment modality for acoustic neuromas. Reports of hearing preservation in patients with serviceable hearing, have ranged from 57%\(^9\) to 68%\(^10\) to 71%\(^11\). Over 96% of patients have preservation of facial nerve function after treatment.\(^12\) An increase in hearing and facial nerve function preservation is found in patients treated with 13 Gy or less at the tumor margin.\(^9\),\(^11\),\(^12\). Long term complications from treatment with the gamma knife can rarely occur such as rupture of intracranial artery aneurysms.\(^13\) and hydrocephalus.\(^14\) The University of Pittsburg reported on 162 patients followed for 10 years only 4 required operation for tumor growth.\(^14\)

**Surgery (Case Report #2):** Many patients with an acoustic neuroma have a profound hearing loss upon presentation. However, if diagnosed early, auditory function may be good. Noudel et al.\(^15\) reports that hearing can be preserved in 45% of patients, regardless of the surgical approach used. Chin et al.\(^16\) reported that overall facial nerve function was normal or near normal in 83.5% of patients. Those patients with small or medium sized tumors had 100% preservation. The use of intraoperative monitoring has been shown to decrease the incidence of facial paralysis.\(^17\) Facial nerve function can be preserved in the majority of surgical cases. The incidence of recurrence after transtemporal or translabyrinthine approach has been reported by Brors et al.\(^18\) to be 7%.

**Conservative:** A number of studies have studied the utility of following acoustic neuromas conservatively.\(^19\),\(^21\) Shin, et al.\(^21\) reported that of 97 patients 62% were successfully treated conservatively with a mean follow-up of 31 months. Martin et al.\(^22\) reported that of 276 patients who had at least one follow-up MRI scan 22% had observed growth. Some patients had rapidly growing tumors and follow-up scans starting at 6 months after treatment, yearly for two years and every five years after that were recommended. Patients with cystic acoustic nueromas appeared to have a propensity for tumor growth\(^10\) and are often not considered good candidates for conservative treatment.

In general, small tumors in older patients are best treated conservatively. Patient in poor health are often better candidates for radiosurgery as opposed to surgery. Large tumors, greater than 50 cc, and those associated with neurofibromatosis are better surgical candidates. Regardless of the type of treatment all patients need to be followed by serial MRI scans the first of which should be 6 months to one year after treatment. Long term complications and recurrences can result, thus requiring long term follow-up of patients.

**Conclusions**

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Acoustic neuromas are slow growing benign tumors which most commonly present with an asymmetrical hearing loss. Asymmetry as little as 15 dB may be the only symptom of the tumor. Treatment recommendations will vary depending upon the health and age of the patient along with the size of the tumor.

References


