Hearing Preservation in 2.7 cm Vestibular Schwannoma

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ABSTRACT

Hearing preservation is exceedingly difficult in vestibular schwannoma surgery, especially with increasing tumor size. We herein report a case of hearing preservation in a 2.7 cm vestibular schwannoma, where the patient maintained her pre-operative hearing threshold of 55 dB till a year after surgery. Hence, it appears that an attempt at hearing preservation is worth pursuing.

Key Words: *hearing preservation, tumor size, vestibular schwannoma*

INTRODUCTION

Hearing preservation in vestibular schwannoma surgery has been a matter of significant debate. There are ample reports ranging from hearing preservation to hearing improvement.[1-7] The prognostic factors and the measures of preservation need further elucidation. Here we report a case where we were able to preserve hearing at the preoperative threshold, despite the tumor being of considerable size; 2.7 cm at its maximum vertical dimension.

CASE REPORT

A 29 years female presented with a history of headache, and tinnitus for three years on June 18, 2007. She also had occasional episodes of vomiting and dizziness. She had no other complaints. Her neurological examination was normal, except for Weber's test that was lateralized to the right ear. Pre-operative pure tone audiogram showed a high frequency sensorineural hearing loss of 55 dB in the left ear (Figure 1). MRI showed 2.7 x 2.5 x 2.4 cm^3 left cerebellopontine angle vestibular schwannoma (Figure 2, 3). On June 20, she underwent an uncomplicated tumor removal via a retro-sigmoid approach. Left internal acoustic meatus was free from tumor. At the end of the surgery, facial nerve stimulation was done and found intact. Clinically, her facial function was preserved at the level of House-Brackmann grade I.[8] Immediate post-operative contrast enhanced Computed Tomography (CT) scan and a Magnetic Resonance Imaging (MRI) at 12 months showed no residual tumor (Figure 4).

She had no deterioration in her hearing ability in post-operative period and after a year of surgery, she still maintains her pre-operative level of 55 dB of high frequency sensorineural hearing loss (Figure 5).

The tumor was histologically proven a schwannoma WHO grade I.

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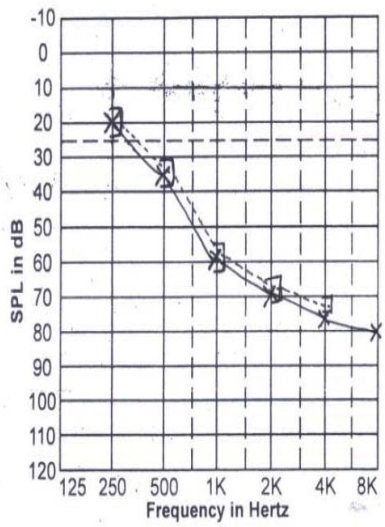

Figure 1. Pre-operative Pure Tone Audiogram; unmasked (x) and masked (])

Figure 2. Contrast enhanced axial T1 weighted MRI scan displaying left cerebellopontine angle vestibular schwanomma

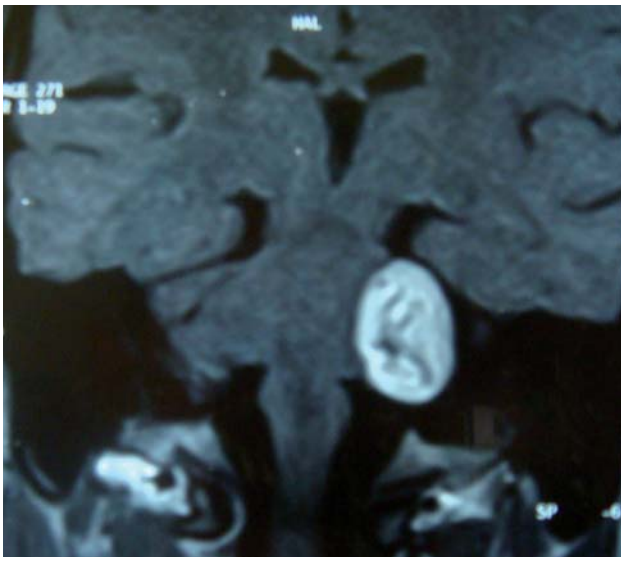

Figure 3. Contrast enhanced coronal T1 weighted MRI scan displaying left cerebellopontine angle vestibular schwanomma

Figure 4. Contrast enhanced axial T1 weighted MRI scan at 12 months follow up shows no residual tumor

DISCUSSION

Vestibular schwannoma, conventionally known as acoustic neuroma, is a non-malignant tumor of the VIII[th] cranial nerve, commonly the inferior vestibular branch.[9,10] They comprise about 6% of all intracranial tumors, about 30% of brainstem tumors, and about 85% of tumors in the region of the cerebellopontine angle.[11] Slowly progressive one-sided hearing impairment is the most frequent symptom, occurring in more than 95% of patients. Nearly two-thirds of patients have a high-frequency sensorineural pattern of hearing loss.[12]

Hearing loss is a major problem after the surgical treatment of vestibular schwannoma. This has been variously attributed to scarring, fibrosis, or micro-hemorrhages during operation. Over the long term, very few patients retain serviceable hearing.[13] It is inevitable after translabyrinthine approach. Retrosigmoid and middle fossa approach result in 60% and 40% hearing loss, respectively.[6] Although not precisely a complication, hearing in the operated ear often deteriorates over time to a greater extent than the unoperated ear, even without recurrent tumor.[3] In

few patients with serviceable hearing, it may further deteriorate by 25% in the late post-operative period. Some authors have suggested that given the modest hearing that is salvaged in the very few patients who are candidates for hearing sparing surgery, hearing preservation as an objective of vestibular schwannoma surgery is not worthwhile.[14]

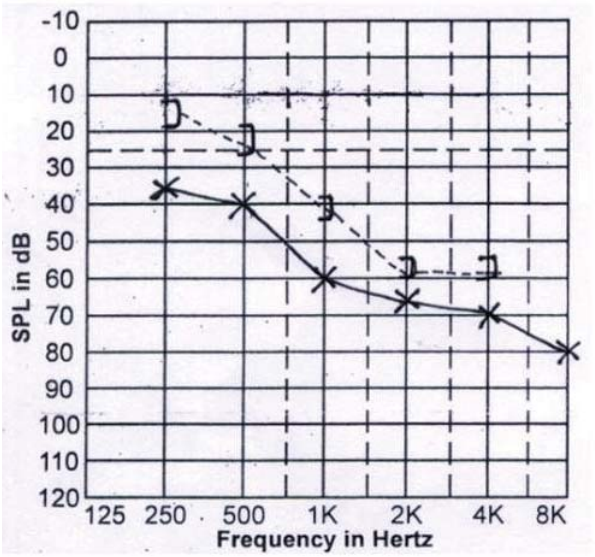

Figure 5. Post-operative Pure Tone Audiogram; unmasked (x) and masked ( ])

With the increasing frequency at which vestibular schwannomas are diagnosed at an earlier stage, hearing preservation has become an important consideration. Hearing preservation surgery is usually performed for patients with useful hearing (less than 50 dB for the average hearing level and more than 50% speech discrimination score), corresponding to Gardener-Robertson grade I and II.[15,16] These criteria are based on the fact that the deteriorated hearing hardly recovers after tumor removal. Yet, hearing improvement has been achieved in vestibular schwannoma patients after tumor removal even in those with severe pre-operative hearing loss.[4]

A short period from the onset of hearing loss, better pre-operative hearing, small tumor size, superior vestibular nerve origin, shorter intraaural wave V latency, shorter absolute wave V latency and a good otoacoustic emission have been associated with higher rates of hearing preservation.[4,15] Tumour filling the fundus of the internal auditory canal was found to be a significant adverse prognostic factor as regards successful hearing preservation.[2]

Preservation of hearing is critically dependent upon the tumor size. Hearing preservation of 35-71% can be achieved with tumors of less than 1.5 cm size.[1] With tumors upto 2.5 cm, hearing can be saved in about 50% patients. Above 2.5 cm, this drops off precipitously. In large tumors above 3 cm, hearing preservation is achieved in only 10%.[17] With stereotactic radiosurgery, hearing preservation upto 26% has been achieved for the tumors less than or equal to 3 cm.[18] In one study, postoperative hearing near preoperative levels were attained in 167 patients (50%). Though there was no significant difference in mean tumor size between the hearing preservation groups and the no measurable hearing group, the mean preoperative tumor size in patients from the preserved hearing group was 1.14 cm.[15]

Hearing preservation and improvement have been documented after vestibular schwannoma surgery. What portends a bad prognosis in terms of hearing is yet to be known. Though the size of the tumor has been considered to be of critical importance, it is still not significantly proven. Even with large sized tumors, hearing preservation has been achieved. Till there is further elucidation as to where a hearing preservation surgery may not be worthwhile, it appears that an attempt at hearing preservation is worth pursuing.

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