



Clinical and Radiographic Factors Predicting Hearing Preservation in Large Vestibular Schwannomas

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Introduction

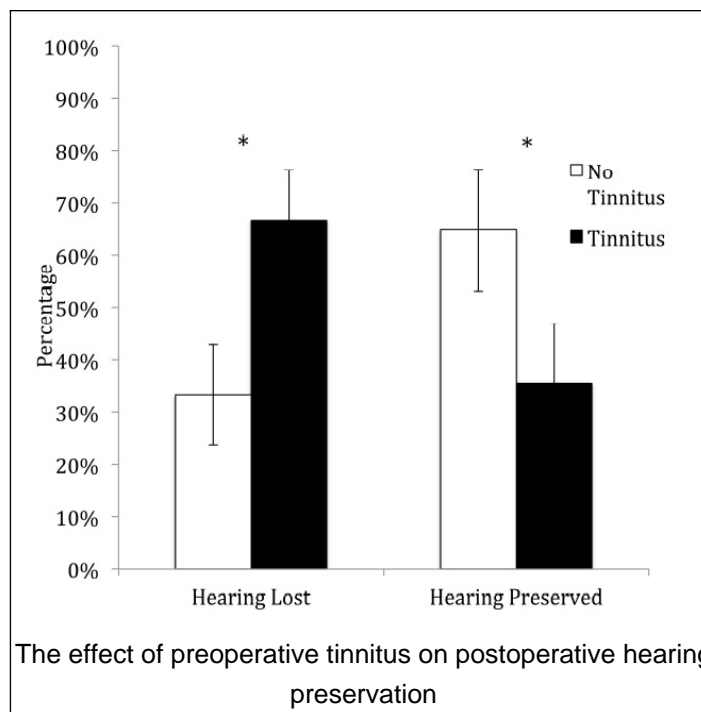
A significant proportion of patients with vestibular schwannomas greater than 3 cm have serviceable hearing preoperatively. Postoperative hearing preservation rates reported in the literature for these patients with large tumors are relatively low ranging from 0-33%. The clinical and radiographic factors predicting hearing preservation in smaller vestibular schwannomas are well described; however, the impact of these factors in larger tumors are less known. We investigated clinical and radiographic factors predicting hearing preservation in large vestibular schwannomas.

Methods

The clinical and radiographic data of 85 patients who underwent retrosigmoid craniotomies for unilateral vestibular schwannomas larger than 3 cm were retrospectively reviewed. Preoperative and postoperative audiograms, preoperative symptoms, preoperative MRI features and postoperative facial weakness were analyzed. Preoperative imaging features included tumor size, internal auditory canal length and width, degree of internal auditory canal filling, cystic or solid appearance, the presence of a CSF cleft surrounding the tumor, fourth ventricular width, cerebellar edema, brainstem edema and hydrocephalus.

Results

Hearing was preserved in 41% of patients. The presence of hypertension and diabetes increased the likelihood of preoperative hearing loss. Preoperative tinnitus was associated with a lower likelihood of hearing preservation. No radiographic factors were found to be predictive of hearing preservation; however, larger tumor size, smaller fourth ventricular width and the presence of a CSF cleft surrounding the tumor were predictive of postoperative facial weakness.



The effect of preoperative tinnitus on postoperative hearing preservation

Learning Objectives:

1. By the end of this session, participants should recognize that hearing preservation in larger vestibular schwannomas is possible.
2. Describe the clinical and radiographic factors associated with hearing preservation in large vestibular schwannomas.

Conclusions

Systemic comorbidities may influence hearing loss preoperatively in patients with large vestibular schwannomas. Tinnitus may be an indicator of hearing reserve and potential for hearing preservation. Preoperative radiographic features were not found to predict hearing preservation despite some features being associated with postoperative facial weakness.

	Preoperative Hearing Present	Preoperative Hearing Absent
Clinical Factors		
Age (mean, SD)	43.8 (10.9) *	53.6 (11.4)
Gender (N, % male)	19, 46.3%	24, 54.5%
Hypertension (N, %)	5, 12.2% *	16, 36.4%
Diabetes mellitus (N, %)	0, 0% *	5, 11.4%
Active smoker (N, %)	2, 4.9%	3, 6.8%
Frequent alcohol consumption (N, %)	13, 31.7%	10, 22.7%
Radiographic factors		
Maximum extrameatal tumor diameter (mean mm, SD)	36.0 (5.2)	36.5 (6.1)
Extrameatal tumor volume (cm ³ , SD)	17.2 (7.9)	20.0 (10.9)
Intrameatal length (mm, SD)	7.9 (3.4) *	10.7 (4.3)
Intrameatal width (mm, SD)	7.4 (2.2) *	9.4 (3.2)
Percentage of IAC filling (% ,SD)	65.0% (27.5%) *	78.6% (26.0%)
Tumor cyst present (N, %)	27 (67.5%)	25 (56.8%)
Tumor heterogeneity (N, %)	28 (71.8%)	29 (65.9%)
CSF cleft within IAC (N, %)	32 (80.0%) *	19 (50.0%)
CSF cleft surrounding tumor (N, %)	15 (40.5%)	15 (42.9%)
Narrowest width of ipsilateral MCP (mm, SD)	7.2 (2.9)	7.2 (2.3)
Narrowest width of 4 th ventricle (mm, SD)	8.7 (3.3)	9.6 (4.0)
Brainstem edema present (N, %)	5 (12.2%)	5 (11.9%)
Cerebellar edema present (N, %)	18 (43.9%)	17 (40.5%)
Hydrocephalus present (N, %)	3 (7.3%)	9 (20.9%)

Clinical and radiographic factors associated with preoperative hearing

References

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- Baguley DM et al. 2006. The clinical characteristics of tinnitus in patients with vestibular schwannoma. *Skull base* 16:49-58.

	Preoperative		Postoperative	
	Hearing Lost	Hearing Preserved	Hearing Lost	Hearing Preserved
SDS % (mean, SD)	83 (15)	84 (24)	N/A	88 (14)
PTA dB (mean, SD)	32.9 (16.2)	28.7 (12.5)	69.8 (12.0)	40.1 (15.6)

Preoperative and postoperative audiometry in patients with hearing preservation and loss

	Mean (SD)	Range
Age	48.9 (12.2)	24-75
Maximum tumor dimension (mm)	36.3 (5.7)	29-58
Extrameatal volume (cm ³)	18.7 (9.6)	6.7-52.2
IAC length (mm)	9.4 (4.2)	1.9-25.5
IAC width (mm)	8.5 (3.1)	2.0-18.8
Percentage filling of IAC (%)	71.5 (27.3)	13-100

Demographic characteristics and quantitative tumor parameters