



Vestibular schwannoma between 1 and 3 cm: Importance of the tumor size in surgical and functional outcome



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ABSTRACT

Objective: The aim of the study was to compare the surgical and functional outcomes of the microsurgical osteoplastic retro-sigmoid approach in a semi-sitting position in two groups of patients with vestibular schwannomas (VSs) ranging from 1 to 3 cm in size.

Method: A 5-year retrospective evaluation was made of these two groups of patients with VS: Patients with VS sizes 1–<2 cm in maximal intra/extrameatal diameter ($n = 292$) were assigned to group “A” and a matched group of patients with VS between 2 and 3 cm in size ($n = 154$) were assigned to group “B”.

Results: Significant differences in postoperative outcomes ($p < 0.05$) were found for facial nerve function of House–Brackmann grade I (94% group A vs. 78% group B) and preservation of preoperative hearing (51% group B vs. 34% group A).

Patients with tumors sizes ranging between 1 and <2 cm exhibited total tumor removal with significantly higher facial nerve preservation and hearing function preservation rates compared with patients with tumors 2–3 cm in size.

Conclusion: Even a small increase in tumor size correlated with a significant reduction in good hearing and facial preservation postoperatively, which implies that tumor removal should be performed at the earliest stage possible. Furthermore, these results contradict recommending the wait-and-see approach for intra/extrameatal tumors.

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1. Introduction

The goal of every surgery should be to avoid life-threatening events and to find ways to preserve nerve function, and thus improve patient's quality of life [3]. Surgery for vestibular schwannoma (VS) remains one of the most demanding surgical procedures at the same time that microsurgery is trending as the primary tool for managing patients with VS. Consequently, there is a pressing need to better identify and measure factors influencing functional outcomes in microsurgery patients.

VS, often called acoustic neuroma [1–3], is currently the preferred name for a tumor that arises not from the acoustic nerve but from the schwann-cell sheath of the pars superior of the vestibular nerve (not the cochlear portion) [4]. These tumors are histologically benign [3] and diagnosis can often be made by

clinical history alone. The prevalence in adult males and females is about equal [5].

Symptoms are closely associated with tumor size and often start with a triad of unilateral sensorineural hearing loss, tinnitus, and balance difficulties (gait disturbances) [4,5]. Yet, large tumors can still be present but show surprisingly few symptoms and almost no signs except for hearing loss. Even 4- and 5-cm tumors may have virtually no physical findings and few associated symptoms. In addition, a subset of patients has central neurofibromatosis, bilateral VS, and multiple intracranial meningiomas as well as other neoplasms.

Time of diagnosis, clinical experience, and tumor size were identified as factors significantly influencing the postoperative outcomes regarding hearing and facial nerve function. Several authors report hearing preservation of about 50% after removal of small tumors and even better results have been reported for completely intracanalicular lesions [3,6].

Therefore, the philosophy of the senior author (A.S.) is that in all cases of VS, regardless of tumor size, complete surgical removal and preservation of facial nerve function should be the goal and the greatest effort to preserve functional hearing should always be made.

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Table 1

The distribution of patients in two different groups in our study depending on the tumor size. We have compared the surgical and complication results in these two groups of acoustic neuromas.

Group	A	B
Tumor size	1–< 2 cm	2–3 cm
Population	292	154
Mean size	1.7 cm	2.6 cm

There are many treatment options in management of acoustic neuromas including wait-and-see [10–18], microsurgery, fractionated stereotactic radiotherapy [7], gamma knife surgery [8], and radiosurgery [9]. The question remains as to which of these methods is the best option for management of acoustic neuromas. In this study, the focus is on microsurgery as a treatment method and the evaluation of tumor size as a postoperative functional determinant (groups A and B) (Table 1).

Because the results are presented in standardized form (House–Brackmann scale for facial function and Gardner and Robertson classification for hearing function), they can be used for comparisons between the various methods used to treat VS.

2. Methods

2.1. Study design

Between 1999 and 2010, the senior author (AS) excised more than 1000 VS via the suboccipital retrosigmoid approach and semi-sitting position for patients in two different clinics (Table 2). In addition, between 2002 and 2010, 627 cases of VS were surgically treated at the Clemens Hospital in Münster.

For the candidate patients, re- and postoperative neuro-radiological data, operative reports, and follow-up data for up to 8 years were reviewed. Demographics recorded for each patient included age, gender, initial symptoms or signs, neurological status before and after surgery, tumor size, surgical complications, and neurological status at discharge and at follow-up.

The completeness of tumor removal was assessed intraoperatively by visual observation at the end of surgery and early after surgery with imaging studies (MRI with contrast) 1 day after surgery (Fig. 2). Facial nerve function was assessed according to the House–Brackmann scale and hearing level was classified according to the Gardner Robertson classification. Matching criteria (Table 3) were then used to stratify patient characteristics. All surgeries were performed by the same surgeon at the same institution using identical standards to further reduce statistical bias. After applying matching criteria, the pool of candidates ($n = 424$) was then apportioned into two groups. Patients with tumor size 1–<2 cm were

Table 2

The distribution of surgically treated patients with vestibular schwannomas in two different centers.

Group 1	1997–2002	420
Group 2	2002–2010	572 + 54 ^a
		1046

^a54 patients were excluded from the study (see Table 3).

Table 3

Our exclusion criteria and the distribution of our excluded patients.

The patients with NF I	1
The patients with NF II	6
Recurrent tumor after Gamma knife surgery	7
Recurrent tumor after radiotherapy	12
Recurrent tumor after microsurgery	27

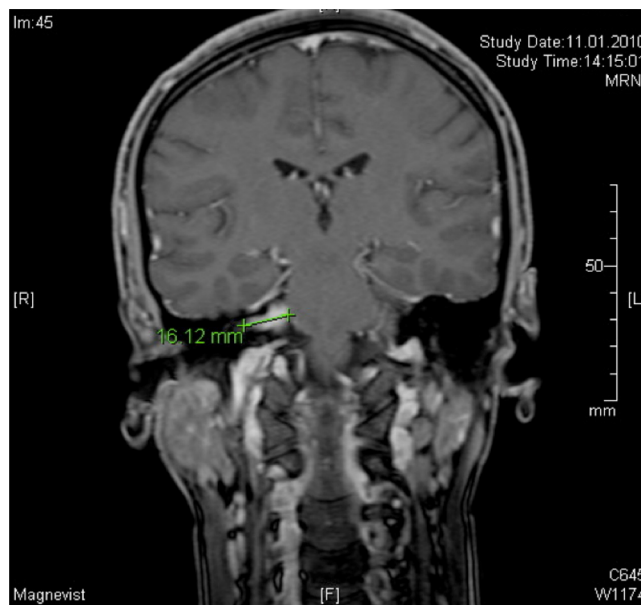


Fig. 1. The definition tumor size in our study is based on maximal intra/extrameatal diameter.

assigned to group “A” ($n = 292$) and patients with tumor size of 2–3 cm were assigned to group “B” ($n = 154$) (Table 1) (Figs. 1 and 2).

In the literature, the use of grade III Gardner–Robertson as a measure of functional hearing is controversial. Various reports as well as experts consider using grade I–III as a measure of good hearing function. Based on expert opinion and such reports, we also considered Grade I–III as a measure of good hearing function [10].

To confirm the grading, we asked all of our grade III patients about their ability to hear stereo sound and answer the telephone with their problem ear. As a result, all could answer the telephone and hear stereo sound. We did not use the Speech Discrimination Test because our patient data was not complete enough for meaningful statistical analysis.

2.2. Patient demographics

The average age for patients in group A was 50.2 years (range 28–65 years); there were more men (54%) than women (46%). The left side was involved in 40% of the cases and the right side in 60% of the cases. The mean follow-up duration was 63 months (range 9–88 months). The mean age of patients in group B was 53.7 years, 57% were male and 43% female. The left side was involved in 44% of the cases and the right side in 56% of the cases. The mean follow-up duration was 67 months (range 12–70 months) (Table 4). The chi-square and Fisher exact tests were applied to determine if the proportion of surgical and functional outcomes between the two groups were equal. A p -value < 0.05 indicated a statistically significant difference.

Table 4

The comparison of group A and B in our study.

Group	A	B
Tumor size	1–< 2 cm	2–3 cm
Number	292	154
Mean age	50.2 year	53.7 year
Mean F/A	63 month	67 month
Male	54%	57%
Female	46%	43%

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