European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 10, Issue 1, Winter 2023

Original Research

Analysis Of Outcomes Of Microsurgical Removal Of Vestibular Schwannoma Via Retrosigmoid Approach: An Institutional Based Study

[1]Dr. Kumar Abhinav, [2]Dr. Ankita Agrawal, [3]Dr. Chandralekha S Tampi

[1]Senior Resident, Department of Neurosurgery, Lilavati Hospital & Research Centre, Mumbai, Maharashtra, India
[2]Senior Lecturer, Department of Conservative and Endodontics, Buddha Institute of Dental Sciences and Hospital, Patna, Bihar, India
[3]HOD, Department of Histopathology, Lilavati Hospital & Research Centre, Mumbai, Maharashtra, India

Corresponding author
Dr. Kumar Abhinav
Senior Resident, Department of Neurosurgery, Lilavati Hospital & Research Centre, Mumbai, Maharashtra, India
Email: drabhinav11789@gmail.com

Received: 18 November, 2022 Accepted: 29 December, 2022

ABSTRACT

Background: Evaluation of the outcome of microsurgical removal of vestibular schwannoma via retrosigmoid approach.

Materials &Methods: 50 patients with presence of unilateral VSs were enrolled in the present study. Evaluation of facial nerve function was done immediately after surgery and during follow-up. Facial nerve function was categorised as good, fair and poor. Evaluation of the hearing function was done by audiology examinations including pure tone audiometry (PTA) and speech discrimination score (SDS). All the patients were managed by sub-occipital retrosigmoid approach. Following the surgical treatment, MRI evaluation of all the patients was done. Postoperative complications were evaluated. All the results were recorded and analysed using SPSS software.

Results: Gross total resection was done in 90 percent of the patients while near total resection was done in 8 percent of the patients. Partial resection was done only in 1 patient. Electrophysiological monitoring during surgery was done in 92 percent of the patients while external ventricular drainage was done in 4 percent of the patients. Overall mortality was seen in 1 patient (2 percent). Deafness, facial paralysis, tinnitus, disequilibrium and facial paralysis was seen in 30 percent, 42 percent, 40 percent, 32 percent and 22 percent of the patients respectively.

Conclusion: A nicely planned surgery with the help of microsurgical techniques for managing vestibular schwannoma patients helps in achieving good functional outcome and tumor control.

Key words: Schwannoma, Retrosigmoid, Microsurgical.

INTRODUCTION

Schwannomas (also known as neuromas, neurinomas "of Verocay" and neurilemmomas) are benign, well-encapsulated, slow-growing nerve sheath tumors composed exclusively of

Schwann cells derived from the neural crest.[1, 2] Of all nerve sheath tumors, schwannoma is the most common in approximately 89% of the cases. About 60% of the benign schwannomas are vestibular schwannomas (VS).[3]

Although benign, VS represents a risk to various intracranial structures due to mass effect. The most common symptoms include progressive hearing loss and tinnitus which are reported in over 60% of patients. Larger tumours can cause hydrocephalus and brainstem compression leading to symptoms such as facial paraesthesia, vertigo, and headache. VS accounts for approximately 8% of all intracranial tumours with an incidence of 10.4 per million per year.[4, 5]Lasers proved to be well-established instruments in different surgical fields for over 40 years. Laser surgery in general showed various advantages, such as reduction of mechanical trauma and of intraoperative bleeding. A major advance in making lasers more useful in neurosurgical practice came with the introduction of continuous-wave lasers with flexible hand-held fiber.[6, 7] The retrosigmoid approach remains the gold standard technique for excision of medium-to-large-sized vestibular schwannomas. The retrolabyrinthine and middle fossa approaches are suited for small-sized schwannomas. The goal of modern management is to improve the quality of life by preserving the functional status of the patient and minimizing the morbidity by all possible means.[8]Hence; the present study was conducted for evaluating the outcome of microsurgical removal of vestibular schwannoma via retrosigmoid approach.

MATERIALS & METHODS

The present study was conducted for evaluating the outcome of microsurgical removal of vestibular schwannoma via retrosigmoid approach. A total of 50 patients with presence of unilateral VSs were enrolled in the present study. Only those patients were enrolled which were scheduled to undergo surgical treatment through via suboccipital retrosigmoid approach. Complete demographic and clinical details of all the patients was obtained. Categorization of the tumour was done according to tumour size on MRI. Evaluation of facial nerve function was done immediately after surgery and during follow-up. Facial nerve function was categorised as good, fair and poor. Evaluation of the hearing function was done by audiology examinations including pure tone audiometry (PTA) and speech discrimination score (SDS). All the patients were managed by sub-occipital retrosigmoid approach. Following the surgical treatment, MRI evaluation of all the patients was done. Postoperative complications were evaluated. All the results were recorded and analysed using SPSS software.

RESULTS

Mean age of the patients was 51.3 years. 56 percent of the patients were males while the remaining were females. Gross total resection was done in 90 percent of the patients while near total resection was done in 8 percent of the patients. Partial resection was done only in 1 patient. Electrophysiological monitoring during surgery was done in 92 percent of the patients while external ventricular drainage was done in 4 percent of the patients. Overall mortality was seen in 1 patient (2 percent). Deafness, facial paralysis, tinnitus, disequilibrium and facial paralysis was seen in 30 percent, 42 percent, 40 percent, 32 percent and 22 percent of the patients respectively. Hematoma, meningitis, CSF leak, labial herpes and chronic headache were seen in 2 percent, 6 percent, 2 percent, 4 percent and 4 percent of the patients respectively.

Table 1: Demographic and clinical variables

Variable		Number	Percentage
Gender	**Males**	28	56
	Females	22	44

Mean age (years)		51.3	
Extent of resection	**Partial resection**	1	2
	Near total resection	4	8
	Gross total resection	45	90

Table 2: Managements during surgery

Management during surgery	Number	Percentage
Electrophysiological monitoring	46	92
External ventricular drainage	2	4
One third lateral cerebellum resection	2	4

Table 3: Overall mortality rate

Mortality	Number	Percentage
Present	**1**	**2**
Absent	**49**	**98**
Total	**50**	**100**

Table 4: Immediate post-surgery manifestations

Manifestations	Number	Percentage
Deafness	15	30
Facial paraesthesia	21	42
Tinnitus	20	40
Disequilibrium	16	32
Facial paralysis	11	22

Table 5: Post-surgery complications

Complications	Number	Percentage
Hematoma	1	2
Meningitis	3	6
CSF leak	1	2
Labial herpes	2	4
Chronic headache	2	4

DISCUSSION

Vestibular schwannomas, commonly termed acoustic neuromas, arise from the vestibular branch of the eighth cranial nerve (acoustic nerve) and are benign, slow-growing brain tumors that negatively impact patient quality of life. They are thought to account for the majority of intracranial nerve sheath tumors. These are tumors that evolve from the Schwann cell sheath and can be either intracranial or extra-axial. They usually occur adjacent to the cochlear and vestibular nerves and most often arise from the inferior division of the latter. Anatomically, acoustic neuroma tends to occupy the cerebellopontine angle. About 5-10% of cerebellopontine angle (CPA) tumors are meningiomas and may occur elsewhere in the brain. Bilateral acoustic neuromas tend to be exclusively found in individuals with type 2 neurofibromatosis.[9- 11] Removal of vestibular schwannomas may be performed using several approaches: the translabyrinthine, the retrosigmoid, or the middle fossa approach. Prerequisites for the translabyrinthine approach include mainly the preoperative lack of serviceable hearing and the presence of larger tumors. The retrosigmoid (suboccipital) approach allows the removal of tumors of any size with the potential for hearing preservation; its main disadvantage is the need for cerebellar retraction. [11- 13] Hence; the present study was

conducted for evaluating the outcome of microsurgical removal of vestibular schwannoma via retrosigmoid approach.

Mean age of the patients was 51.3 years. 56 percent of the patients were males while the remaining were females. Gross total resection was done in 90 percent of the patients while near total resection was done in 8 percent of the patients. Partial resection was done only in 1 patient. Electrophysiological monitoring during surgery was done in 92 percent of the patients while external ventricular drainage was done in 4 percent of the patients. Overall mortality was seen in 1 patient (2 percent). Our results were in concordance with the results obtained by previous authors who also reported similar findings. Huang X et al consecutively enrolled 657 unilateral giant (>4 cm diameter) vestibular schwannoma patients treated via the suboccipital retrosigmoid approach. Gross total resection was performed in 556 patients (84.6%); near-total resection was achieved in 99 patients (15.1%). The mortality rate is 0.6%.[14] In another study conducted by Betka et al, authors analysed complications of vestibular schwannoma (VS) microsurgery. The main neurological complication was facial nerve dysfunction. The intermediate and poor function (HB III–VI) was observed in 124 cases (45%) immediately after surgery and in 104 cases (33%) on the last followup. They encountered disordered vestibular compensation in 13%, permanent trigeminal nerve dysfunction in 1%, and transient lower cranial nerves (IX–XI) deficit in 6%. Nonneurological complications included CSF leakage in 63% (lateral/medial variant: 99/1%), headache in 9%, and intracerebral hemorrhage in 5%.[15]

In the present study, deafness, facial paralysis, tinnitus, disequilibrium and facial paralysis was seen in 30 percent, 42 percent, 40 percent, 32 percent and 22 percent of the patients respectively. Hematoma, meningitis, CSF leak, labial herpes and chronic headache were seen in 2 percent, 6 percent, 2 percent, 4 percent and 4 percent of the patients respectively. In their study, Huang X et al reported presence of 'new' deafness (47.6%), intracranial infection (7.6%), lower cranial nerve defects (7.5%) and pneumonia (6.2%) as short-term complications. The facial nerve was preserved anatomically in 589 cases (89.7%). Good facial nerve functional outcome postoperatively was achieved in 216 patients (32.9%). The common long-term complications were hearing loss (85.2%), facial paralysis (HB grade IV–VI, 24.4%) and facial numbness (15.7%).[14]Rajput M et al, in another previous study, assessed hearing and facial nerve status before and after the surgery via the retrosigmoid approach among VS patients. The audiogram confirmed the presence of sensorineural hearing loss (SNHL) in all patients. Twelve patients out of 27 had Class II hearing with the threshold between 31 and 50 decibels and a Speech Discrimination Score (SDS) of 50% to 69%. Ten patients had non-serviceable hearing and the remaining five had poor hearing. The audiogram was repeated after surgery for those 12 patients who had Class II hearing and showed that seven out of 12 patients maintained a hearing threshold within the range of Class II at the one-year follow-up (hearing preservation 58%). The facial nerve preservation rate was 56% considering House-Brackmann Grade III or less as acceptable facial nerve function.[15] In another similar study conducted by Taha I et al, authors assessed facial nerve function and hearing after microsurgical removal of sporadic vestibular schwannomas. The rate of good outcome was 90% if no facial nerve damage was observed during intraoperative monitoring, the size of the tumor was under 30 mm and no hydrocephalus was present. During the study period, the treatment strategy changed from total to near-total resection after the introduction of CK radiosurgery, which could be used as a second-line treatment in case of residual tumor regrowth. This resulted in an improvement of outcomes (0% HB 5–6) despite the larger tumor sizes.[16]

CONCLUSION

A nicely planned surgery with the help of microsurgical techniques for managing vestibular schwannoma patients helps in achieving good functional outcome and tumor control.

REFERENCES

1. Joshi R. Learning from eponyms: Jose Verocay and Verocay bodies, Antoni A and B areas, Nils Antoni and Schwannomas. Indian Dermatol Online J. 2012 Sep;3(3):215-9.
2. Kondo RN, Pontello R, Taguti PDS. Cutaneous schwannoma: an atypical presentation. An Bras Dermatol. 2017 May-Jun;92(3):441-442.
3. Propp JM, McCarthy BJ, Davis FG, Preston-Martin S. Descriptive epidemiology of vestibular schwannomas. Neuro Oncol. 2006 Jan;8(1):1-11.
4. Matthies C, Samii M. Management of 1000 vestibular schwannomas (acoustic neuromas): clinical presentation. Neurosurgery. 1997;40(1):1–9.
5. Evans DG, Moran A, King A, Saeed S, Gurusinghe N, Ramsden R. Incidence of vestibular schwannoma and neurofibromatosis 2 in the Northwest of England over a 10-year period: higher incidence than previously thought. Otol Neurotol. 2005;26(1):93–97.
6. R.W. Ryan, R.F. Spetzler, S.W. Coons, M.C. Preul. Returning an important tool to neurosurgery: application of a novel flexible CO2 laser fiber. Paper Presented at the AANS Annual Meeting, San Diego, USA 2009; 2-6.
7. R.W. Ryan, R.F. Spetzler, M.C. Preul. Aura of technology and the cutting edge: a history of lasers in neurosurgery. Neurosurg. Focus., 2009; 27 (3): p. E6
8. Roopesh Kumar V R, Karthikayan A, Sanjeevi V, Saranyan R. Microsurgical Excision of Vestibular Schwannoma with Facial Nerve Preservation: A Retrosigmoid Approach. Neurol India 2022;70:872-5
9. West N, Sass H, Møller MN, Cayé-Thomasen P. Facial nerve schwannomas presenting with vestibular dysfunction: a case series. Acta Neurochir (Wien). 2018 Dec;160(12):2315-2319.
10. Meola A, Chang SD. Bilateral Vestibular Schwannomas in Neurofibromatosis Type 2. N Engl J Med. 2018 Oct 11;379(15):1463.
11. Braunstein S, Ma L. Stereotactic radiosurgery for vestibular schwannomas. Cancer Manag Res. 2018;10:3733-3740.
12. Ebner FH, Roser F, Shiozawa T. Petrosal vein occlusion in cerebello-pontine angle tumour surgery: an anatomical study of alternative draining pathways. European Journal of Surgical Oncology. 2009; 35(5): 552–556
13. Lalwani AK, Butt FYS, Jackler RK, Pitts LH, Yingling CD. Facial nerve outcome after acoustic neuroma surgery: a study from the era of cranial nerve monitoring. Otolaryngology-Head and Neck Surgery. 1994; 111(5): 561–570.
14. Huang X, Xu J, Xu M, Chen M, Ji K, Ren J, Zhong P. Functional outcome and complications after the microsurgical removal of giant vestibular schwannomas via the retrosigmoid approach: a retrospective review of 16-year experience in a single hospital. BMC Neurol. 2017 Jan 31;17(1):18.
15. Rajput M, Ahmad A, Arain A. Preservation of Hearing and Facial Nerve Function with the Microsurgical Excision of Large Vestibular Schwannomas: Experience with the Retrosigmoid Approach. Cureus 10(12): e3684.
16. Taha I, Hyvärinen A, Ranta A et al. Facial nerve function and hearing after microsurgical removal of sporadic vestibular schwannomas in a population-based cohort. Acta Neurochirurgica volume 162, pages. 2020; 43–54