ORIGINAL ARTICLE

A STUDY OF THE INCIDENCE OF CEREBELLOPONTINE ANGLE TUMORS AND THEIR MANAGEMENT IN A TERTIARY CARE HOSPITAL

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ABSTRACT: INTRODUCTION: Cerebellopontine angle tumors are a surgical challenge to many neurosurgeons who want to operate in this space. Although most of these tumors are benign, they are a challenge because of the complex anatomy and important neurovascular structures that traverse this space. Most common cerebellopontine angle tumor is vestibular schwannoma. The management of these cases is essentially surgical. There has been a change in the surgical strategy over the years from simple intratumoral decompression to complete microsurgical excision, to facial nerve preservation and hearing preservation. **AIMS AND OBJECTIVES:** To study the clinical and radiological characteristics, know the pathological types and determine the surgical resectability and outcome of cerebellopontine angle tumor. **MATERIALS AND METHOD:** It is a prospective study done in the department of Neurosurgery, King George Hospital, Visakhapatnam, Andhra Pradesh. It is a Tertiary Care Hospital. 50 patients diagnosed with cerebellopontine angle tumor were recruited into the study and were managed. **RESULTS:** 50 cases of cerebellopontine angle tumors accounting for 11% of all intracranial space occupying lesions, of which vestibular schwannoma alone constituted 10%. Most of the tumors were large or giant tumors. Total resection was done in 74% of vestibular schwannoma and 50% of meningiomas. Anatomical preservation of facial nerve was achieved in 67% of patients. **CONCLUSION:** Cerebellopontine angle tumors show high incidence from 3rd to 5th decade with common symptoms being hearing loss and ataxia. Most of the patients presented at a delayed stage with large to giant tumors with no useful hearing. Complete excision of tumor preserving facial and lower cranial nerve function is the goal. Postoperative cerebrospinal fluid leak can be managed effectively with conservative therapy.
KEYWORDS: Cerebellopontine angle tumors, vestibular schwannoma, meningiomas.

INTRODUCTION: Cerebellopontine angle is a triangular space bounded anteromedially by pons, posteromedially by cerebellum and laterally by petrous part of temporal bone. Although most of the cerebellopontine angle tumors are benign, the complex anatomy and important neurovascular structures traversing this space makes the management of these tumors, a surgical challenge to the neurosurgeon who would like to operate in this space. Most of the cerebellopontine angle tumors are vestibular schwannomas to the extent of 80%. The rest of the tumors are Meningiomas, Epidermoids and Arachnoid cysts, and the rare tumors are trigeminal schwannomas, facial nerve schwannomas, exophytic brainstem gliomas, secondaries and choroid plexus papillomas. The management of these cerebellopontine angle tumors is essentially surgical except for the smaller ones which can be managed by radiosurgery. The advancement in imaging

has resulted in the detection of smaller tumors at an earlier stage and has increased the ability to preserve hearing. Over the years the surgical strategy has changed from simple intratumoral decompression to complete microsurgical excision, to facial nerve preservation and hearing preservation.

AIMS AND OBJECTIVES: To study the cerebellopontine angle tumors with respect to,

- Clinical characteristics.
- Radiological characteristics.
- Pathological types.
- Surgical resectability and its outcome.

MATERIALS AND METHOD: The study was performed in the Department of Neurosurgery, King George Hospital, Visakhapatnam. It is a Tertiary Care Hospital. 50 patients of cerebellopontine angle tumors operated between January 2010 to January 2012 were included in the study. It is a prospective study.

METHODOLOGY:

- All patients with cerebellopontine angle tumors were assessed with respect to age, sex, clinical presentation, imaging characteristics and resectability.
- Facial nerve function was graded according to House – Brackmann score[1] pre-operatively and at the time of discharge and follow up.
- Pre-operative pure tone audiometry was done in all patients to assess the degree of hearing loss. A criterion for useful hearing was taken as hearing loss <50 decibel (Gardener – Robertson modification[2] of the Silverstein and Norell system[3]). Postoperative hearing assessment was done only in those patients who had useful hearing pre-operatively. Speech discrimination test was not done.
- The tumor size was measured in CT or MRI in three axes, i.e. diameter parallel to the petrous ridge, perpendicular to the petrous ridge or the vertical diameter in the coronal slices. The size of the tumor was taken as the largest vertical diameter in any one of the these three axes. The tumors were then categorized according to the classification proposed by Jackler et al.[4]
- All patients were operated via the retro-mastoid retro sigmoid sub-occipital craniectomy using standard microsurgical techniques.[5, 6]

RESULTS: A total of 50 patients with cerebellopontine angle tumors among 430 cases of all intracranial tumors operated between the study period from January 2010 to January 2012 were assessed. These constituted 11% of all intracranial space occupying lesions. Of the 50 cases of cerebellopontine angle tumors, 43 were vestibular schwannomas, meningiomas constituted for four cases, epidermoids two, and one case of melanoma.

ANALYSIS: In this study vestibular schwannomas constituted 86% of cerebellopontine angle tumors. The rest comprised of meningiomas (8%), epidermoids (4%) and melanoma (2%). There

was predominance of these tumors in females, accounting for 56% of cases. About 80% of vestibular schwannomas presented between third and fourth decades, meningiomas occurred between third and fourth decade and epidermoids were seen in fifth decade. The most common presenting complaint was sensorineural hearing loss, cerebellar signs, headache and sensory trigeminal dysfunction. Pre-operatively, 88% of cerebellopontine angle tumor patients had no useful hearing (<50 decibels). Out of the six patients who had useful hearing pre-operatively (2 vestibular schwannomas, 2 meningiomas, 1 epidermoid, 1 tuberculoma) five patients retained it post operatively also. Most of the tumors are either large or giant (96%). Anatomical facial nerve preservation was possible in 68% of large and 58% of giant cell tumor cases. Most of the patients showed a worsening of the facial grade in the immediate postoperative period which improved by the time of discharge and follow-up. Preoperative V-P shunt was required in 36% of cases of cerebellopontine angle tumors which were giant causing severe hydrocephalus. Total resection was possible in 74% cases of vestibular schwannomas and 50% in meningiomas. Brainstem adherence and adherence to facial nerve was responsible for lesser resection in remaining cases. CSF leak occurred in 16% of cases. All of them were from the wound site. All were managed conservatively with lumbar drain and medication. Meningitis occurred in 10% cases. All of them recovered with appropriate antibiotics. Lower cranial nerve paresis developed in 18% of patients. They were managed with nasogastric tube feeding. Two patients required temporary tracheostomy for the management of secretions and they recovered in four weeks' time. Mortality in this study was 5.6%.

DISCUSSION: There has been a considerable evolution in the management of cerebellopontine angle tumors especially vestibular schwannoma. Initially it was Cushing who was the first to reduce mortality from 50% to 11%.[7] Later complete excision without mortality was reported by Walter Dandy in his study. With the advent of the era of operating microscope by the efforts of House,[1] Rand and Kurze[8] in 1964 and 1965 and safe modern anesthesia and refinements in microsurgical techniques the goal of vestibular schwannoma surgery shifted from complete excision to preservation of facial nerve function and cochlear nerve function. In the present study 96% of patients had either large or giant sized tumors. Pre-operative V-P shunt was required in 36% of patients. The incidence of pre-operative shunt was as high as 66% in the study reported by Rama Murthi et al.[9] In the study published by VK Jain et al[10] 8.5% of patients required V-P shunt. Complete tumor excision was done in 62% of patients in this study. VK Jain et al[10] reported complete tumor excision in 96.5% of patients. Anatomical preservation of facial nerve was achieved in 67% patients in the present study. For medium sized tumors it is 100 percent and for large size tumors it is 76% and for giant size tumors it is 58%. In a study by Samii and Matthias[6] preservation rate was reported to be 93% independent of tumor size. In Jain VK et al.[10] study, the preservation of facial nerve was 84.3%. This shows that there is a learning curve for preservation of facial nerve. In the present study 12% (6 patients) had useful hearing preoperatively. Post-operative hearing could be preserved in 4 patients (66%). Samii et al[11] reported hearing preservation in 23.6% with large tumors. VK Jain et al reported hearing preservation in 29.6% of their patients who had useful pre-operative hearing. The reported incidence of cerebrospinal fluid leak ranges between 0-30% with the average approximately

12%. In the present study, 15% of the patients had cerebrospinal fluid leak which was managed conservatively with diamox and lumbar drain. Although injury to facial and vestibulocochlear nerve are the two major cranial nerve injuries that can occur during the surgery, there are risks of injury to lower cranial nerves in large and giant sized tumors, which can complicate the post-operative course. Judicious use of nasogastric tube feeding and planned tracheostomy can avoid major respiratory complications post operatively. The reported incidence of lower cranial nerve paresis in the literature ranges from 1.5% to 5.5%,[11, 12, 13] as against 16% in the present study. In the present study, all the cases were operated by retro-mastoid retro-sigmoid approach in supine position. This concludes the fact that this approach in experienced hands is a good option, with good results compared to other series irrespective of tumor size. This is an extension to the view put forward by Samii et al that from any of the available approaches, surgeons can develop expertise to high standards by training and experience with respect to the optimum patients' safety, mortality and morbidity.[11]

REFERENCES:

1. House JW, Brackman DE, Facial Nerve Grading System Otolaryngol. Head Neck Surg. 1985; 93: 146-7.
2. Gardner G, Robertson JH: Hearing preservation in unilateral acoustic neuroma surgery. Ann Otol Rhinol Laryngol 97: 55-66, 1988.
3. Silverstein H, Mc Daniel A, Norrell H et al: Hearing preservation after acoustic neuroma surgery with intraoperative direct eighth cranial nerve monitoring: Part II. A Classification of results Otolarngol Head Neck Surg 95, 1986.
4. Jackler RK, Pitts LH. Acoustic neuroma. Neurosurg clin N Am 1990; 1: 199-233.
5. Brackmann DE: Acoustic neuroma: Surgical approaches and complication. Ann Acad med. Singapore 20: 674-679, 1991.
6. Harner SG, Ebersold MI. Management of acoustic neuromas, 1978 – 1983. J Neurosurg. 1985; 63(2): 175-9.
7. Cushing H: Tumors of the nervus acousticus and the syndrome of cerebellopontine angle. Philedelphia: Saunders, 1917.
8. Rand RW, Kurze T. Facial nerve preservation by posterior fossa transmeatal microdissection in total removal of acoustic neuroma. J Neurol Neurosurgery Psychiatry 1965; 28: 311-6.
9. Ramamurthi B. The continuing challenge of acoustic neurinomas (1949-1993). Br J. Neurosurgery 1995; 9: 361-6. Review
10. Vijendra K. Jain, Naveen Mehrotra. Surgery of Vestibular Schwannomas: an institutional experience. Neurology India 2005: 53: 41-7.
11. Samii M, Matthias C. Management of 1000 Vestibular Schwannomas: Clinical presentation. Neurosurgery 1997; 40: 1-10.
12. Ebersold MI, Harner SG et al. Current results of the retromastoid approach to acoustic neurinoma. J Neurosurg. 1992; 76: 901- 9.
13. Lanman TH, Brackmann DE, Histelberger WE, Subin B. Report of 190 consecutive cases of large acoustic tumors removed via the translabyrinthe approach. J Neurosurg. 1999; 90; 617 – 23.

Age	Vestibular schwannoma	Meningioma	Epidermoid	Total No. of Patients
0 – 20	3	0	0	3 (6%)
21 – 30	7	1	0	8 (16%)
31 – 40	16	2	1	19 (38%)
41 – 50	8	1	0	9 (18%)
51 – 60	7	0	1	8 (16%)
61 – 70	2	0	0	2 (4%)

Table 1: Distribution of tumors according to age

Sex	Vestibular schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
Female	24	3	1	28	56%
Male	19	1	1	21	42%

Table 2: Distribution of Cases according to Sex

Clinical findings	Vestibular Schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
Sensorineural Hearing Loss	40	2	1	43	89
Cerebellar signs	38	4	2	44	81
Headache	34	4	1	40	74
Trigeminal Dysfunction	33	3	2	37	69
Facial nerve dysfunction	29	3	3	35	65
Papilloedema	25	2	0	27	50
Tinnitus	20	2	0	22	41
Lower Cranial Nerve Dysfunction	8	1	2	11	20

Table 3: Distribution of cases according to clinical presentation

Size	No. of Patients	(%)
Medium (10-25mm)	2	4
Large (26-40mm)	19	38
Giant (> 40mm)	29	58

Table 4: Distribution of cases according to size of tumor

Class	No. of Patients	(%)
I & II (Serviceable)	6	12
III & IV (Non Serviceable)	44	88

Table 5: Distribution of cases according to pure tone audiometry

Grade	Pre OP	Post OP Grade			Follow up Grade (n=8)		
		I & II	III & IV	V & VI	I & II	III & IV	V & VI
I & II	13	6	5	2	4	1	0
III & IV	6	0	4	2	1	0	2
V & VI	0	0	0	0	0	0	0

Table 6: Distribution of cases according to Facial Nerve Functional Grading (Large Tumors n = 19)

Grade	Pre OP	Post OP Grade			Follow up Grade (n=10)		
		I & II	III & IV	V & VI	I & II	III & IV	V & VI
I & II	20	7	12	1	4	1	1
III & IV	12	0	8	4	3	0	1
V & VI	1	0	0	1	0	0	0

Table 7: Distribution of cases according to Facial Nerve Functional Grading (Large Tumors n = 33)

Imaging Findings	Vestibular Schwannoma (n=43)	Meningioma (n=4)
Homogenous enhancement	28 (65%)	3 (75%)
Heterogenous enhancement	18 (41%)	2 (50%)
Centered on IAM	34 (79%)	3 (75%)
Eccentric to IAM	11 (25%)	2 (50%)
Acute Angle	33 (76%)	0 (0%)
Obtuse angle	12 (27%)	4 (100%)
Enlargement of IAM	25 (58%)	0 (0%)
Hyperostosis, Broad dural base, dural tail	0 (0%)	3 (75%)

Table 8: Distribution of cases according to findings on Imaging

Surgical procedure	No. of patients	%
VP Shunt + Tumor surgery	18	36%
Direct Tumor surgery	32	64%

Table 9: Distribution of cases according to surgical procedure

Tumor	Excision	
	Sub total	Total
Vestibular Schwannoma	11 (25.5%)	.32 (74.4%)
Meningioma	2 (50%)	2 (50%)
Epidermoid	1 (50%)	1 (50%)
Melanoma	1 (100%)	-

Table 10: Distribution of cases according to resectability

Histopathology	No. of patients	%
Vestibular schwannoma	43	86%
Meningioma	4	8%
Epidermoid	2	4%
Melanoma	1	2%

Table 11: Distribution of cases according to Histopathology

Tumor size	Anatomical Preservation	%
Medium	2	100%
Large	13	68%
Giant	17	58%

Table 12: Distribution of cases according to Anatomical preservation of facial nerve

Complication	Vestibular Schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
CSF Leak	7	1	0	8	16
Meningitis	3	2	0	5	10
Hematoma	1	0	0	1	2
Lower cranial nerve palsy	9	0	0	9	18
Mortality	2	1	0	3	6

Table 13: Distribution of cases according to complications

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