ORIGINAL ARTICLE

Surgical Outcomes of Cerebellopontine Angle Tumors in 34 Cases

Joarder MA[1], Karim AKMB[2], Sujon SI[3], Akhter N[4], Waheeduzzaman M[5], Joseph V[6], Jahangir SM[7], Chandy MJ[8]

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 radical excision with facial nerve and hearing preservation. **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 Methods:** It is a retrospective study done in the department of Neurosurgery, Apollo Hospitals Dhaka. 34 patients diagnosed with cerebellopontine angle tumor were recruited into the study. **Results:** Among 34 cases of cerebellopontine angle tumors vestibular schwannoma alone constituted 79%. Most of the tumors were large or giant tumors. Total resection was done in 25% of vestibular schwannoma and 50% of meningiomas. Anatomical preservation of facial nerve was achieved in 73% of patients. Facial nerve function as measured by the House Brackmann system. Postoperatively 61% had a score of 1 or 2; 29% had a score of 3 or 4; and 8% had a score of 5 or 6. Other complications included 2 cases of CSF leak, 3 cases of meningitis, 2 cases of lower cranial nerve palsy and 1 patient died. **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. Sub total excision with keeping anterior part of tumor for preserving facial nerve function is the goal.

Key words
Cerebellopontine angle tumors, vestibular schwannoma, meningioma

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

1. Associate Consultant, Dept. of Neurosurgery, Apollo Hospitals Dhaka 2. Registrar, Dept. of Neurosurgery, Apollo Hospitals Dhaka 3. Clinical Associate. Dept. of Neurosurgery, Apollo Hospitals Dhaka 4. SMO, Dept. of Neurosurgery, Apollo Hospitals Dhaka.5. Senior Consultant, Dept. of Neurosurgery, Apollo Hospitals Dhaka 6. Senior Consultant, Dept. of Neurosurgery, Apollo Hospitals Dhaka 7. Senior Consultant and Coordinator Neuro anesthesia and neuro ICU 8. Senior Consultant and Coordinator, Dept. of Neurosurgery, Apollo Hospitals Dhaka.

this space. Most (80%) of the cerebellopontine angle tumors are vestibular schwannomas. The rest of the tumors are meningiomas, epidermoids, arachnoid cysts, other 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 (<2.5 cm) which can be managed by radiosurgery. The advancement in imaging has resulted in the detection of smaller tumors at an earlier stage, and therefore increased the ability to preserve hearing. Over the years the surgical strategy has changed from simple intratumoral decompression to complete or near 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, pathological types, surgical respectability and its outcome.

Materials and Method

This retrospective study was performed in the Department of Neurosurgery, Apollo Hospitals Dhaka. 34 patients of cerebellopontine angle tumors operated between January 2009 to January 2015 were included in this study. It is a retrospective 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 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. The tumor size was measured in MRI in two axes, i.e. diameter parallel to the petrous ridge, vertical diameter in the coronal slices. The size of the tumor was taken as the largest vertical diameter in any one of the axes. The tumors were then categorized according to the classification proposed by Jackler et al.[4] All patients were operated via the sub-occipital retro-mastoid craniectomy using standard microsurgical techniques.[5, 6]

Results

A total of 34 patients with cerebellopontine angle tumors operated between January 2009 to January 2015 were assessed. Of the 34 cases of cerebellopontine angle tumors, 27 were vestibular schwannomas, meningiomas constituted 6 cases, one case of epidermoid.

Table 1: Distribution of tumors according to age

Age	Vestibular schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
0 – 20	1	0	0	1	3
21 – 30	2	0	1	3	9
31 – 40	8	1	0	9	26
41 – 50	8	1	0	9	26
51 – 60	5	3	0	8	24
61 – 70	3	1	0	4	12

Table 2: Distribution of Cases according to Sex

Sex	Vestibular schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
Female	14	5	0	19	55
Male	13	1	1	15	45

Table 3: Distribution of cases according to clinical presentation

Clinical findings	Vestibular Schwannoma	Meningioma	Epidermoid	Total No. of Patients	(%)
Sensorineural hearing loss	24	4	1	29	85
Cerebellar signs	16	2	0	18	53
Headache	14	3	1	17	50
Trigeminal dysfunction	14	2	0	16	47
Facial nerve dysfunction	16	2	0	18	53
Papilloedema	9	1	0	10	29
Tinnitus	12	2	0	14	44
Pyramidal signs	8	1	0	9	26
Nerve dysfunction	1	1	0	2	6

Table 4: Distribution of cases according to size of tumor

Size	No. of Patients	(%)
Medium (10-25mm)	5	15
Large (26-40mm)	20	58
Giant (> 40mm)	9	27

Table 5: Distribution of cases according to pure tone audiometry

Class	No. of Patients	(%)
I & II (Serviceable)	5	15
III & IV (Non Serviceable)	29	85

Table 6: Distribution of cases according to Facial Nerve Functional Grading (n=20)

Grade	Pre OP (n=20)	Post OP Grade (n=20)			Follow up Grade (n=10)		
		I & II	III & IV	V & VI	I & II	III & IV	V & VI
I & II	16	11	4	1	8	1	1
III & IV	4	0	3	1	0	0	0
V & VI	0	0	0	0	0	0	0

Table 7: Distribution of cases according to Facial Nerve Functional Grading (n = 9)

Grade	Pre OP (n=9)	Post OP Grade (n=9)			Follow up Grade (n=5)		
		I & II	III & IV	V & VI	I & II	III & IV	V & VI
I & II	7	6	1	0	0	4	1
III & IV	2	0	2	0	0	0	0
V & VI	0	0	0	0	0	0	0

Table 8: Distribution of cases according to findings on Imaging

Imaging Findings (n=34)	Vestibular Schwannoma (n=27)	Meningioma (n=6)
Homogenous enhancement	21	4
Heterogenous enhancement	6	1
Cystic component	5	0
Centered on IAM	22	3
Hyperostosis, Broad dural base, dural tail	0	5

Table 9: Distribution of cases according to surgical procedure

Surgical procedure (n=34)	No. of patients	(%)
VP Shunt + Tumor surgery	8	24
Direct Tumor surgery	26	76

Table 10: Distribution of cases according to resectability

Tumor	Excision	
	Sub total	Total
Vestibular Schwannoma (n=27)	24 (89 %)	3 (11 %)
Meningioma (n=6)	4 (66%)	2 (33 %)
Epidermoid (n=1)	1 (100%)	0

Table 11: Distribution of cases according to Histopathology

Histopathology (n=27)	No. of patients	(%)
Vestibular schwannoma	27	79
Meningioma	6	18
Epidermoid	1	3

Table 12: Distribution of cases according to anatomical preservation of facial nerve in entire group

Tumour size	No. of patients	(%)
Medium	3	60
Large	15	75
Giant	5	55

Table 13: Distribution of cases according to complications

Complication	Vestibular Schwannoma (n=27)	Meningioma (n=6)	Epidermoid (n=1)	Total No. of Patients (n=34)	(%)
CSF Leak	2	0	0	2	6
Meningitis	3	0	0	3	9
Hematoma	0	0	0	0	0
Nerve palsy	2	0	0	2	6
Mortality	1	0	0	1	3

Analysis

In this study vestibular schwannomas constituted 79% of cerebellopontine angle tumors. The rest comprised of meningiomas (17%), epidermoids (3%). There was predominance of these tumors in females accounting for 55% of cases. About 76% of vestibular schwannomas presented between third, fourth and fifth decades. The most common presenting complaint was sensorineural hearing loss, cerebellar dysfunction, headache and sensory trigeminal dysfunction. Pre-operatively, 85% of cerebellopontine angle tumor patients had no useful hearing (<50 decibels). Out of the five patients who had useful hearing pre-operatively (3 vestibular schwannomas, 2 meningiomas) three patients retained it post operatively also. Most of the tumors are either large or giant (85%). Few 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 24% of cases of cerebellopontine angle tumors for hydrocephalus. Total resection was possible in 26% cases of vestibular schwannomas and 66% in meningiomas. Adherence of tumour with brainstem and facial nerve were responsible for subtotal resection in remaining cases. CSF leak from wound site occurred in 6% of cases. All were managed conservatively with lumbar drain and medication. Meningitis occurred in 9% cases. All of them recovered with appropriate antibiotics. Lower cranial nerve paresis developed in 6% of patients. They were managed with nasogastric tube feeding. Two patients required temporary tracheostomy for the management of secretions and low conscious level. Mortality in this study was 3%.

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 85% of patients had either large or giant sized tumors. Pre-operative V-P shunt was required in 24% 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 32% 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 the present study for large size tumors in 74% of the cases and for giant size tumors in 62%. In a study by Samii and Matthias preservation rate was reported to be 93% independent of tumour size. In Jain VK et al study, the preservation of facial nerve was 84.3%. In the present study 15% (5 patients) had useful hearing preoperatively. Post-operative hearing could be preserved in 3 of these patients (60%). 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, 6% of the patients had cerebrospinal fluid leak which was managed conservatively. 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] It is 6% in the present study. In the present study, all the cases were operated by sub-occipital retromastoid approach in lateral position.

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. 1988;97:55-66.
3. Silverstein H, Mc Daniel A, Norrell H. Hearing preservation after acoustic neuroma surgery with intraoperative direct eighth cranial nerve monitoring: Part II. A Classification of results. Otolarngol Head Neck Surg. 1986;95.
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.1991;20:674-79.
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.
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. 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.