ORIGINAL ARTICLE

Surgical Outcome of Cerebellopontine Angle Tumors

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ABSTRACT

Objectives: *The purpose of this study was to evaluate the clinical features and surgical outcome of CP tumors with retractorless method.*

Material and Methods: *It is a retrospective study of 7 cases operated in Neurosurgery Unit 1, PINS/Lahore General Hospital, Lahore. Study span was 2 months and follow up duration was 15 days. Predominating symptoms were related to cranial nerves 5^{th}, 6^{th}, 7^{th}, 8^{th} and cerebellum.*

Results: *Age range was 25 – 45 years with an average age of 35 years. 4 patients were male and 3 patients were female. In all patients, surgery was performed. Clinical presentation was tinnitus, decrease hearing, hearing loss, abnormal balance, headache, facial numbness, buccal numbness, ataxia and trigeminal neuralgia in one case. All patients were operated through retrosigmoid sub-occipital approach with retractorless method. VP shunt was inserted in 3 cases and EVD was done in all other cases just before surgery. Histopathology report was 4 patients were of vestibular schwannoma, 2 were of meningioma and 1 was of epidermoid cyst. Five patients operated successfully with no new focal neurological deficit. One patient died intraoperatively and one patient was re-explored postoperatively due to intracranial hemorrhage.*

Conclusion: *It is concluded that surgery via the retrosigmoid approach with retractorless method is relatively safe corridor for the treatment of CP Angle Tumors.*

Abbreviations: *CPA: Cerebellopontine Angle. IAC: Internal Auditory Canal. EVD: Ventricular Drain.*

Keywords: *Cerebellopontine angle tumors, retrosigmoid sub-occipital approach, retractorless method.*

INTRODUCTION

The Cerebellopontine Angle (CPA) is the most common site for posterior fossa neoplasms. Tumors occupying this region account for approximately 10% of all intracranial neoplasms, with vestibular schwannoma accounting for 80% of these CPA tumors.[1,2] Other tumors involving this region include meningiomas, dermoid tumors, arachnoid cysts, lipomas, and metastases. The trigeminal, facial, and vestibulocochlear nerves arise between the superior and inferior limbs of the Cerebellopontine fissure, the sulcus between the pons, middle cerebellar peduncle and the cerebellum.

SURGICAL APPROACHES

1. Retrosigmoid Approach

Perhaps the most versatile of the available approaches, the retrosigmoid approach provides excellent visualization of the CP angle, brainstem, and IAC (Internal Auditory Canal).

2. **The middle fossa approach** to tumors of the CP angle is most useful when tumors isolated to the IAC, as the approach poorly visualizes the cistern of the CP angle and the brainstem.
3. **The Trans labyrinthine approach**, it is preferred by some neurosurgeons, is favored for early identification of the facial nerve and excellent visualization of the IAC. However removal of the contents of the inner ear makes it unsuitable for patients with serviceable hearing.[3]

The **differential diagnosis** of mass lesions in the CP angle is vestibular schwannoma, meningioma, epidermoid cyst, arachnoid cyst, metastasis, vascular malformations such as a thrombosed, saccular

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aneurysm, exophytic brainstem gliomas, ependymoma, trigeminal schwannoma, facial schwannoma, lipoma, neurosarcoidosis, endolymphatic sac tumor, choroid plexus papilloma, hemangioblastoma, chordoma with dural erosion, chondrosarcoma with dural erosion, and cholesterol granuloma.

Vestibular schwannoma (VSs) are benign, slow-growing neoplasms arising from Schwann cells that account for approximately 10% of all primary brain neoplasms. The incidence of symptomatic VSs is approximately 1.2 per 100,000 population, evenly divided among males and females. The incidence of vestibular schwannoma in patients with neurofibromatosis type 2 (NF2) is considerably higher than that of the general population. Up to 95% of NF2 patients will develop vestibular schwannoma, 90% being bilateral and 5% being unilateral.[4,5,6]

Meningiomas constitute the second most common tumor type in the CP angle, accounting for approximately 10% of CP-angle lesions in total. In addition to hearing loss, patients with CP angle meningiomas also frequently present with headache and ataxia from cerebellar compression. Due to their large size at the time of presentation, meningiomas frequently present with symptoms of cranial nerve V and X dysfunction (trigeminal neuralgia, facial dysesthesias, facial numbness, difficulty swallowing).[7-10]

Epidermoid cysts constitute the third most common cerebellopontine mass, accounting for 1% of all intracranial neoplasms with 50% of these lesions located in the cerebellopontineangle.[11,12]

Arachnoid cysts are benign, developmental collections of cerebrospinal fluid. Though they are common intracranial masses, they rarely occur in the CP angle and are most frequently asymptomatic.[13,14]

Metastatic involvement of the CP angle from primary tumors distant from the central nervous system, though rare, can lead to significant neurologic compromise.[15-18]

MATERIAL AND METHODS

Study Design

Prospective decompressive case study.

It was a study of 7 patients who were operated in Lahore General Hospital Lahore Neurosurgery Unit 1. Study span was 2 months and follow up period was 15 days.

Inclusion Criteria

All newly designed cases of CPA lesions.

Exclusion Criteria

Previous operated cases.

Data Collection Procedure

All data collected on special designed proforma along with concent.

Surgical Procedures

In all patients surgery was offered retrosigmoid suboccipital approach with retractorless method. In all patients diagnostic tool was MRI before and CT scan after surgery. Post-op CT scan was performed 72 hours after surgery to see and residual tumor and brain edema due to surgery.

Data Analysis

Percentages were calculated of the available data.

RESULTS

Sex Incidence

4 patients were male and 3patients were female (Table 1).

Table 1: *Sex Incidence.*

Sex	No of patients	Percentage
Male	4	57.15
Female	3	42.85
Total	7	100

Age Range

Age range was 25-45 years and average age was 35 years.

Outcome

Gross total resection was achieved in 6 patients and sub-total resection was achieved in 1 patient (See Tables 2, 3, 4).

Table 2: *Clinical summary of 7 CP angle tumor patients.*

Cases	Age (years)	Sex	Duration	Side	Neurological Deficit	Location	Extent of Resection	Type of involvement	Outcome	Complication	Follow up
1	45	F	3 m	Rt	Tinnitus, decrease hearing	CPA meningioma	Total	8th	Good	Nil	15 days
2	36	M	4 m	left	Facial numbness Decrease hearing	CPA schwannoma	Total	5th, 7th, 8th	Intra-operative bleed	Yes	15 days
3	37	M	2 m	Left	Hearing loss	CPA schwannoma	Total	8th	Good	Nil	15 days
4	45	M	3 m	Right	Right facial numbness	CPA Epidermoid	Sub total	5th	Good	Nil	15 days
5	42	M	4 m	Right	Decreased vision, decrease hearing, facial pain	CPA schwannoma	Total	Nil	Intra-operative death	Death	15 days
6	39	F	2 m	Right	Unsteady gait, decrease hearing	CPA schwannoma	Total	8th and Cerebellum	Good	Nil	15 days
7	30	F	5 m	Right	Facial pain right side	CPA meningioma	Total	Nil	Good	Nil	15 days

Table 3: *Extent of tumor resection.*

Extent	No	Percentage
Total	6	85.72
Subtotal	1	14.28

Table 4: *Outcome.*

Outcome	No of patients	Percentage
Good	5	71.42
Complications	1	14.28
Mortality	1	14.28

Histopathology

Operative findings in 4 patients were vestibular schwannoma, 2 were of meningioma and 1 was of epidermoid cyst (Table 5).

Table 5: *Histopathology.*

Type	No	Percentage
Vestibular Schwannoma	4	57.15
Meningioma	2	28.57
Epidermoid cyst	1	14.28

DISCUSSION

We presented a series of 7 patients who underwent for surgery for CP angle tumors via the retrosigmoid approach with facial nerve preservation in all cases presenting with tinnitus, abnormal gait, loss of co-ordination, hearing loss, confirmed from audiology

clinic. 2 patients were with facial numbness and buccal numbness and 2 was with trigeminal neuralgia and also 1 was with decreased vision in left eye, 1 patient was with tinnitus 1 was unsteady gait and 1 was with decreased vision.

Cushing first described the syndrome of the cerebellopontine syndrome as the progression of the symptoms 1-auditory and vestibular changes 2-headache 3-ataxia 4- involvement of adjacent cranial nerves 5-hydrocephalus 6- dysarthria 7- cerebellar and brainstem crises.

EVD was placed in 4 cases just before the operation and VP shunt was placed in 3 patients.

Radiosurgery was first utilized for the treatment of CPA masses in 1969 when Lars Leksell employed radiosurgery for the treatment of an acoustic neuroma. The timeline for treatment efficacy for radiosurgery depends on tumor type; slow-growing pathologies such as vascular malformations and schwannoma respond more slowly, whereas fast-growing pathologies such as metastatic lesions respond more quickly.

In our cases preoperative hearing loss was associated with tumors located inferior to internal acoustic meatus or involving the internal acoustic meatus. In our group of patients, facial and vestibular nerves were upward displaced in 80% of cases and displaced forward in 20% cases. The retrosigmoid suboccipital approach with retractorless method avoids destroying the labyrinth. The intervention must be conducted under facial nerve monitoring to preserve it. The tumor is removed, starting with the coagulation and holding of arachnoid layer in one hand, which can save the outer vascular structures from damage. In case of meningioma, located close to the jugular foramen, there is increased risk of perioperative vagitation disorders and post-operative swallowing disorders.

In case of epidermoid, I the incidence is 5%. The incidence of trigeminal neuralgia is 0.5%. MRI is the diagnostic tool for CP angle tumors. If the tumor is firmly adherent to the neurovascular structures, then we leave it to minimize the risk.

CONCLUSION

It is concluded that surgery via the retrosigmoid approach with retractorless method is relatively safe corridor for the treatment of CP Angle Tumors.

ROLE OF AUTHORS

Dr. Ali Zunair: Literature review.
Dr. Muhammad Imran Bajwa: Paper Editing and Results Writing.
Dr. Zubair Ahmed khan: Data Collection, Paper writing.
Dr. Rizwan Masood Butt: Study Design and overall supervision.

Additional Information
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Authors report no conflict of interest.
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