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SPECTRUM OF LESIONS IN CEREBELLOPONTINE ANGLE REGION WITH COMPARATIVE STUDY OF SQUASH CYTOLOGY AND HISTOPATHOLOGY.

Oncopathology

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ABSTRACT

Introduction: Cerebellopontine angle tumors are the most common neoplasms in the posterior fossa, accounting for 10-15% of all intracranial tumors. Usually the lesions of the CP angle are vestibular schwannomas, meningiomas, epidermoid cysts, metastases, ependymomas, choroid plexus papillomas and vascular malformations. **Objectives:** To study the various lesions occurring in the cerebellopontine angle region with comparison between squash cytology and histopathological findings. **Materials And Methods:** The present study comprises of 18 cases from 2016 to 2017.Intraoperative squash smears were prepared,stained with toluidine blue, haematoxylin and Eosin and examined. Paraffin sections were stained by Haematoxylin and Eosin and IHC wherever necessary. Histopathological examination was done and correlated with smear cytology. **Results:** Out of 18 cases; 7 were schwannomas, 5 meningiomas, 4 Epidermoid cysts, one each of MPNST and Choroid plexus papilloma. **Conclusion:** Schwannomas, Meningiomas and Epidermoid cysts are most commonly found in cerebellopontine angle.

KEYWORDS

Cerebellopontine angle, Schwannoma, Meningioma, Epidermoid cysts.

INTRODUCTION

Cerebellopontine angle (CPA) is a triangular space bounded by the temporal bone anterolaterally, pons medially, cerebellar hemisphere anteriorly, tentorium cerebella superiorly and lower cranial nerve inferiorly.The cerebellopontine angle (CPA) tumors are the most common neoplasms and they usually account for 5-10% of all intracranial tumors.[1]Ususally the lesions of the CP angles are divided into those native to the angle (vestibular schwannoma, meningioma, epidermoid, arachnoid cyst, metastases, lipoma, etc.) and as those which are extending to the angle from adjacent structures (gliomas, ependymomas, choroid plexus papillomas, vascular malformations).[2]

They are mostly benign with low potential for malignancy(1%). These tumors are slow growing over a period of years and increase in size causes compression on surrounding structure resulting in hearing loss (95%), tinnitus (80%), vertigo (50-75%) , headache (25%) and facial hypoesthesia (35-50%).[1]The diagnosis of CPA tumors relies on history and physical examination, and confirmed by histopathological examination.

The intraoperative cytology preparation was first introduced by Eisenhardt and Cushing in early 1930 and by Badt in 1937. It is a rapid pathological diagnosis of lesions of the nervous system and it helps the neurosurgeon to plan the extent of surgery. This technique is simple, rapid, inexpensive, fairly accurate and dependable intraoperative diagnostic tool.[3]

AIM:

To study the various lesions occurring in the cerebellopontine angle region with comparison between the squash cytology and histopathological findings of the lesions.

MATERIALS AND METHODS:

The study comprises of 18 cases of cerebellopontine angle lesions from 2016 to 2017 which were collected from the departmental records. The biopsy samples obtained at the time of the surgery were transported in isotonic normal saline to the neuropathology laboratory for processing.

Smears were prepared by placing 1-2mm of biopsy material at one edge of clean,dry slide and crushing with another slide with enough pressure to spread the tissue into thin film.They were immediately put in 95% ethyl alcohol for 2 minutes for wet fixation and stained with rapid H&E and air dried smears with toluidene blue.Remaining tissue was preserved in formalin and processed in routine paraffin embedded sections for histopathological report and Immunohistochemistry was done wherever it was necessary.

RESULTS:

Total number of cases studied were 18 where maximum cases were female(11 i.e 61.1%) and 7 cases were male(7 ie 38.9%)(Table1).The age ranged from 4 years to 60years and maximum cases were seen in age range of 21 to 40years(10 cases, 55.56%) followed by 41 to 50years(7 cases,38.89%) (Table 2). Out of 18 cases,Seven cases were of Schwannoma, Five cases of Meningioma in which three were Meningothelial Meningioma , one was fibroblastic Meningioma and one was clear cell Meningioma.Four cases were of Epidermoid Cysts.One case each was of Malignant Peripheral Nerve Sheath Tumor and Choroid plexus Papilloma.(Table3).

Table1:Gender wise distribution of tumors

Gender	Number	Percentage
Female	11	61.1%
Male	7	38.9%
Total	18	100%

Our study showed maximum female(11 i.e 61.1%) and 7 cases were male(7 ie 38.9%).

Table 2:Age wise distribution of tumors

Age	Schwannoma	Meningioma	Epidermoid cyst	Malignant Peripheral nerve sheath tumor	Choroid plexus papilloma	Total	Percentage
1-20years	-	1	-	-	-	1	5.55%
21-40years	5	-	3	1	1	10	55.56%
41-60years	2	4	1	-	-	7	38.89%
Total	7	5	4	1	1	18	100

Our study showed maximum age range of 21- 40 years.

Table 3: Spectrum of tumors in CP angle

Schwannoma	7	38.89%
Meningioma	5	27.78%
Epidermoid cyst	4	22.21%
Malignant peripheral Nerve Sheath Tumor	1	5.56%
Choroid plexus papilloma	1	5.56%
Total	18	100%

In the present study,the most common lesion was found to be

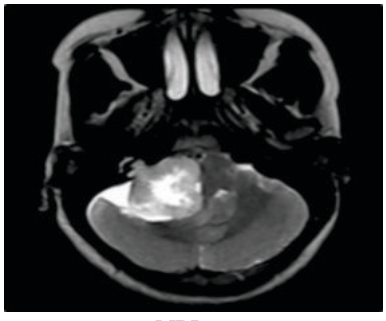
schwannoma (38.89%).

(A) Schwannoma:

Vestibular schwannomas constitute 6–8% of all intracranial tumors, 25–33% of posterior cranial fossa tumors and 75–86% of CPA tumors[4] .In our study,we had 7 cases of schwannoma with the most common clinical presentation of hearing loss(Table4).On intraoperative cytology,the cells were arranged in tight ropy fashion(Figure 1(A)) .On histopathological examination,both Antony A and Antony B areas, Verrocay bodies were seen (Figure1(B)).All the squash findings were concordant with the histopathological findings.

Table 4: Clinical presentations of schwannoma cases

Sl no	Age	Sex	Clinical features	Squash	Histopathology
1	45y	F	Sensorineural hearing loss, Tinnitus	Schwannoma	Schwannoma
2	36y	M	Sensorineural hearing loss	Schwannoma	Schwannoma
3	30y	F	Headache and Hearing Loss	Schwannoma	Schwannoma
4	36y	M	Hearing loss, dizziness	Schwannoma	Schwannoma
5	50y	F	Hearing loss	Schwannoma	Schwannoma
6	35y	F	Headache, Dizziness and hearing loss	Schwannoma	Schwannoma
7	30y	M	Hearing loss, Tinnitus	Schwannoma	Schwannoma



MRI

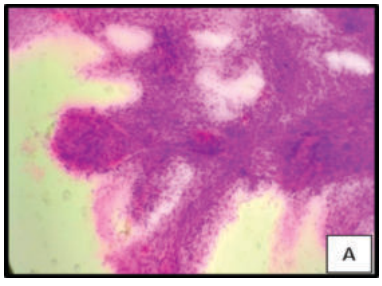


Figure1: (A) Squash smear studied shows tight ropy cohesive clusters of spindle shaped cells (H &E –Low power view;10X)

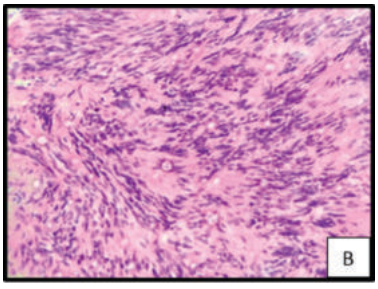


Figure 1: (B) Verrocay bodies are seen; (H&E-High power view;40x)

(B) Meningioma: '

CPA meningiomas' account for 5–15% of all CPA tumors and are the second most common tumor. They are slow growing benign lesions that occur most frequently in women in their fifth to sixth decade of life. On radiology,the 'dural tail' sign is visible in 60–72% of meningiomas.[5]In our study,(Table 5)we got 3 cases of meningiothelial meningioma,1 case each of clear cell meningioma and fibroblastic meningioma.On squash study,cohesive clusters of polygonal and spindled shaped cells are seen arranged in whorling pattern in all the cases(Figure2(A)).On histopathological examination,the cells showed lobulated to whorled pattern of polygonal or epithelioid cells with intranuclear inclusions. The nuclei are round to oval, with delicate chromatin and was reported as Meningiothelial meningioma.1case of clear cell meningioma was seen which was composed of sheets of polygonal cells with clear cytoplasm in histopathological examination (Figure 2(B)).IHC for EMA was done which had shown positivity (Figure2(C)). Another case showed monomorphic elongated cells and spindle shaped nuclei arranged in fascicles and was reported as fibroblastic meningioma in histopathology (Figure2(D)).

Table 5: Clinical presentations of meningioma cases

Sl no	Age	Sex	Clinical features	Squash	Histopathology
1	47y	F	Headache and giddiness, diminished hearing	Meningioma	Fibroblastic Meningioma
2	60y	M	Giddiness, headache, Tinnitus	Meningioma	Meningothelial Meningioma.
3	4y	F	Tinnitus, Hearing loss	Meningioma	Clear cell Meningioma
4	48y	F	Headache and Dizziness	Meningioma	Meningothelial Meningioma
5	56y	M	Tinnitus	Meningioma	Meningothelial Meningioma

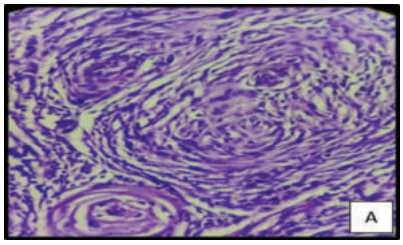


Figure2: (A) Smear shows few clusters of polygonal and spindled shaped cells are seen arranged in whorling pattern;(High power;40x)

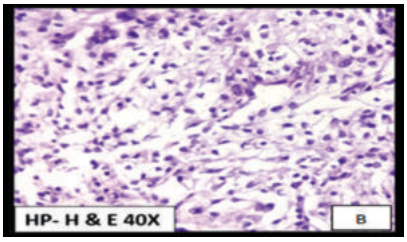


Figure2:(B) Clear cell Meningioma; Section studied shows sheets of polygonal cells with clear cytoplasm(H&E-High power;40x)

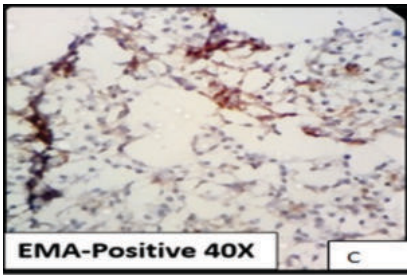


Figure2: C EMA is seen positive.

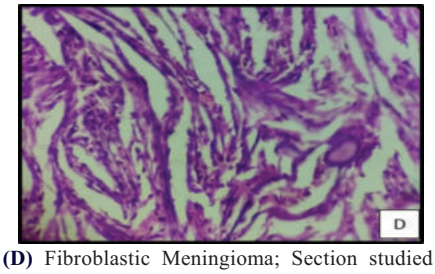


Figure2: (D) Fibroblastic Meningioma; Section studied shows monomorphic elongated cells and spindle shaped nuclei arranged in fascicle (H&E-High power;40x)

most common CPA tumor and they are congenital lesions that comprises 4.6–6.3% of all lesions.[4]In our study ,4 cases of epidermoid cyst were seen of which the patients presented with headache the most in the cases (Table 6).On squash cytology, anucleate squames were seen along with keratin material (Figure3(A)) .On histopathological examination, fibrocollagenous tissue along with lamellated keratin was seen (Figure3(B)).All the squash findings were in concordance with the histopathological findings.

Table 6: Clinical presentations of epidermoid cyst cases

Sl no	Age	Sex	Clinical features	Histopathology
1	30y	F	Dizziness, headache	Epidermoid Cyst
2	35y	F	Dizziness,loss of hearing	Epidermoid Cyst
3	45y	M	Headache	Epidermoid Cyst
4	40y	F	Headache and Dizziness	Epidermoid Cyst

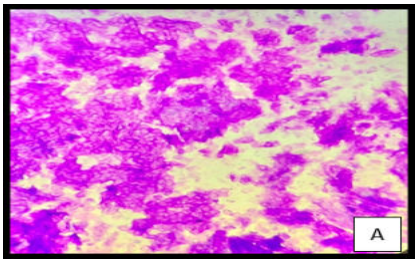


Figure3: (A) Squash smear shows clusters of clusters of anucleate squames.(High power view;40X)

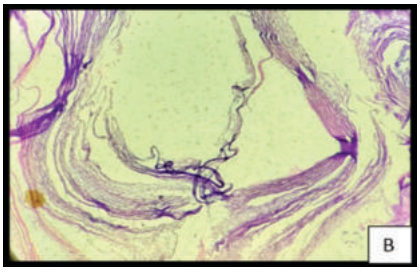


Figure 3: (B) HP section studied shows lamellated keratin flakes (H & E; Low power view; 10x)

(D) Malignant peripheral nerve sheath tumor(MPNST):

These are malignant tumor with, commonly arising in a peripheral nerve or in extraneural soft tissue. Malignant peripheral nerve sheath tumors (MPNSTs) primarily affect young to middle-aged adults, but also affect adolescents. Headache,dizziness and breathlessness were the clinical presentations in the patients of our study(Table7(a)). In this case, on squash cytology, the smear studied showed spindle cells with scant cytoplasm and round to oval nuclei in an inflammatory cell background and it was reported as spindle cell lesion (Figure4(A)). On histopathological examination,asymmetric spindle cells are arranged in storiform pattern and hyperchromatic nuclei is seen.Few mitotic figures were also noted and it favored a diagnosis of malignant peripheral nerve sheath tumor (Figure4(B)).It was a discordant case in our study.

Table 7(a): Clinical presentations of miscellaneous cases

Slno	Age	Sex	Clinical features	Squash	Histopathology
1	35y	M	Headache , Dizziness, breathlessness	Spindle cell lesion	Malignant peripheral Nerve Sheath Tumor

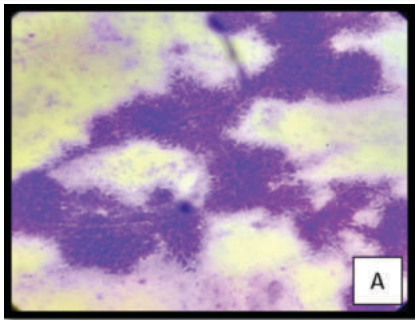


Figure4 :(A) Squash smear studied shows cohesive clusters of spindle cells; (Low power view; 10X)

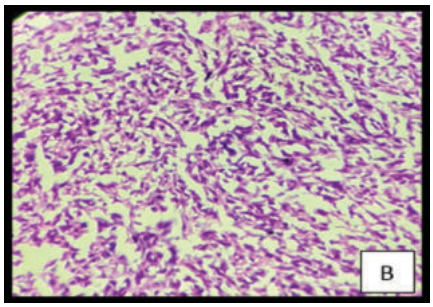


Figure4: (B) Section studied shows Spindle shaped cells with mitotic figures;(H&E-High power;40x)

(E) Choroid plexus Papilloma:

Choroid plexus tumors constitute 0.3-0.8% of all brain tumors. Headache, nausea and vomiting are common symptoms of increased intracranial pressure; however, findings vary with age at presentation.[6]We had one such case where the patient had headache and dizziness(Table 7(b)).In squash smear, low power view showed serpentine pattern of arrangement of cells are seen with fibrillary strands in centre (Figure5(A)). In high power,round to oval cells were seen arranged in loose clusters.In oil immersion view, the cells are round to oval with oval nuclei with slightly coarse chromatin were seen and it was reported as ependymoma. In histopathological study, the cells are arranged in delicate papillary patterns of fibrovascular tissue lined by a single layer of cuboidal to columnar epithelium along with round to oval nuclei within clear cytoplasm and it favored diagnosis of choroid plexus papilloma (Figure5(B)) .It was the another discordant case.

Table 7(b): Clinical presentations of miscellaneous cases

Sl no	Age	Sex	Clinical features	Squash	Histopathology
1	32y	F	Headache,Dizziness	Ependymoma	Choroid plexus papilloma

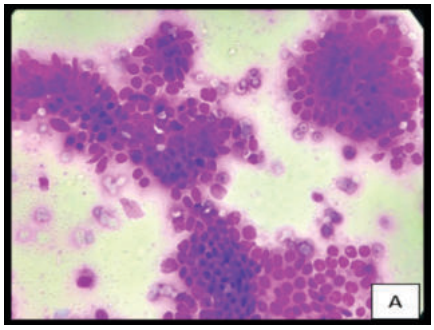


Figure5 :(A) Squash smear shows round to oval cells are seen arranged in loose clusters(H&E; High power view; 40X)

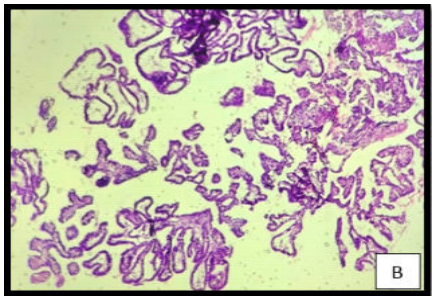


Figure5: (B) HP section studied shows cells are arranged in delicate papillary patterns of fibrovascular tissue round to oval nuclei.(H&E-Low power;10X)

DISCUSSION:

Cerebellopontine angle tumors, although uniform in location, are diverse pathologically and with regard to the site of tumor origin and displacement of the neurovascular structures and they are the most common neoplasm in the posterior fossa accounting 5-10% of all intracranial tumors. Most CPA tumors are benign, with over 85% being vestibular schwannoma. Other tumors involving this region include meningiomas, dermoid cysts, arachnoid cysts, lipomas, and metastases. [7]The cerebellopontine angle is densely inhabited by vital

neurologic tissue and so growth of any tumor growth in this region leads to significant neurologic dysfunction and if left undiagnosed or untreated it can ultimately lead to death. We had 18 patients(11 female and 7male) where female was predominant and showed similarity to other studies done by Ravi Shankar and Sohail Amir et al. Our study had maximum cases of schwannomas(7);In similar studies done by Ravi Shankar Prasad[2],they had found maximum number of Schwannomas(29) and Sohail Amir et al[1](36), followed by Meningiomas and epidermoid cysts in all the three studies(Table 8).The maximum age range in our study was found to be 21 to 40 years and it was not corresponding to the other two studies which showed maximum age range of 41 to 60 years.

In the clinical presentation of symptoms, our study had showed maximum cases of hearing loss, headache and dizziness/giddiness followed by tinnitus which is very closely similar to studies done by Sohail Amir and Ravi Shankar Prasad (Table 9).In the comparative study of squash cytology and histopathology, our study showed concordance in 16 cases out of 18cases (88.89%) and 2 were discordant cases where one case reported as Spindle cell lesion but histopathologically it was reported as Malignant nerve sheath tumor and the other case reported as Ependymoma was found to be choroid plexus papilloma on histopathology.The diagnostic accuracy is found to be quite high in squash cytology as seen in our study (88.89%) and also in many other literatures. This technique is simple, rapid, inexpensive, fairly accurate, and dependable intraoperative diagnostic tool. The soft consistency of the central nervous system (CNS) tissue is best suited for squash cytology to give an intraoperative diagnosis so as to help the surgeons to decide the treatment and give the patient a quality life.[3]

Table 8:Comparison of spectrum of cerebellopontine tumors

	Study by Ravi Shankar Prasad(2018)[2]; 38 patients	Study by Sohail Amir et al(2019)[1], 45 patients	Present study 18 cases
Schwannoma	29(76.31%)	36 (80%)	7(38.89%)
Meningioma	5(13.15%)	5(11.11%)	5(27.78%)
Epidermoid cyst	3(7.90%)	4(8.89%)	4(22.22%)
Malignant peripheral nerve sheath tumor	-	-	1(5.56%)
Choroid plexus pailloma	-	-	1(5.56%)
Arachnoid cyst	1(2.6%)	-	-
Total cases	38(100%)	45(100%)	18(100%)

Table 9:Clinical Features of the cerebellopontine tumors

	Study by Ravi Shankar Prasad [2] (2018);38 patients	Study by Sohail Amir et al[1](2019),45 patients	Present study (18 patients)
Hearing loss	78%	82.2%	55.56%
Headache	29%	75.5%	55.56%
Tinnitus	65.8%	48.8%	27.78%
Cerebellar symptoms	-	71.1%	-
Dizziness/Giddiness	77%	-	55.56%
Nerve involvement/ Facial numbness	7%	73.3%	-
Mastoid pain	28%	-	-
Papilledema	-	55.56%	-

CONCLUSION:

In the Cerebellopontine angle, Schwannomas are most commonly seen followed by meningiomas and epidermoid cyst then malignant peripheral nerve sheath tumor and choroid plexus papilloma. These intraoperative diagnosis of the cases can be further confirmed by the histopathological studies which is the gold standard and help the surgeons to give the patients a tailormade treatment and a good quality of life.[8]

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