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ORIGINAL ARTICLE

CEREBELLOPONTINE ANGLE MASSES: RADIOLOGIC-PATHOLOGY CORRELATION AT TIKUR ANBESSA SPECIALIZED HOSPITAL AND MYUNGSUNG CHRISTIAN MEDICALCENTER

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ABSTRACT

Introduction*: Cerebellopontine angle (CPA) masses are the most common neoplasm in the posterior fossa, accounting for 5%-10% of intracranial tumors. The objective of this study was to describe the imaging feature, identify the prevalence of the various CPA masses, and determine the diagnostic accuracy of computedtomography and magnetic resonance imaging in the evaluation of CPA masses.*

Methods: *Five-years cross sectional descriptive study was done at Tikur Anbessa Specialized Hospital and Myungsung Christian MedicalCenter between January 2011 and December 2015. Thirty-Eight patients with CPA masses on computedtomography and/ormagnetic resonance imaging that were surgically treated and histopathological proven were selected. Patients' demographic data, diagnosis on admission, clinical manifestations, computedtomography/ magnetic resonance imaging features and diagnosis, and histologic diagnostic results were collected using structured questionnaire. Data entry and analysis were carried out using SPSS Version 20.0.*

Results: *A total of 58 patients underwent surgery for CPA masses, of which 38 had brain computedtomography/magnetic resonance imagingand biopsy proven diagnosis. The highest number of cerebellopontine anglemasses was found in the age group between 31 and 40 years. Equal sex distribution was observed. The most common clinical presentation was headache. Most masses were multiple and right-sided. Order of frequency of CPA mass was vestibular schwannoma followed by meningioma and epidermoid cyst.*

Conclusion: *The most common CPA mass was vestibular schwannoma followed by meningioma and epidermoid cyst. Magnetic resonance imaging is more sensitive and more specific in diagnosing cerebellopontine anglemass than computedtomography scan.*

Key words*: Cerebellopontine, Mass, Schwannoma, tomography, magnetic resonance, Ethiopia*

INTRODUCTION

Cerebellopontine angle (CSA) tumors are the most common neoplasm in the posterior fossa, accounting for 5%-10% of intracranial tumors (1-3). Most CPA tumors are benign, with over 85% being vestibular schwannoma. The most frequent non-acoustic CPA tumors are meningiomas, epidermoid and facial or lower cranial nerve schwannoma (1-4). Early in the 20th century, CPA lesions were difficult to diagnose and rarely completely excised. Indeed, the mortality rate for operative intervention in the posterior fossa approached 50% (5). However, revolutionary advances in neuroimaging and surgical techniques and approaches have made these lesions almost uniformly treatable with acceptable morbidity and very low rates of mortality (1,6). Both of these modalities image the lesion directly. Advanced neuroimaging modalities like computed tomography (CT) and magnetic resonance imaging (MRI) were introduced in Ethiopia some 16years back.

This study was done to assess the prevalence and differential diagnostic imaging features of those tumors depending on the site of origin, tumor size, shape and margin, CT attenuation, MRI signal, enhancement and extension pattern. These were done in addition to the histopathological diagnosis in patients operated for CPA tumors in in Tikur Anbessa Specialized Hospital (TASH) and Myungsung Christian Medical Center, Addis Ababa, Ethiopia.

PATIENTS AND METHODS

This was a hospital based cross-sectional descriptive study among patients operated for CPA masses and had cross-sectional imaging and patho-histology diagnosis at TASH and MCMC in Addis Ababa, Ethiopia between January, 2011 and December, 2015. Master registers of operation logbook, and patients' medical records were retrieved to complete sampling

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of all patients with CPA tumors, those patients who have CT and /or MRI and histopathology result were included and those lacking imaging or histopathology results were excluded.

Data concerning their socio- demographic status, diagnosis on admission, clinical manifestation, CT/MRI features: number, location, appearance & diagnosis, and histologic diagnostic results were collected using a structured questionnaire prepared for this purpose. Data entry and analysis was carried out using Statistical Package for Social Sciences (SPSS) version 20.0. Frequencies and means were computed for description of the various variables and presented in prose form and graphs. Ethical clearances for the conduct of this study were obtained from the radiology department ethical review committee, TASH, school of medicine, AAU.

RESULTS

During the study period there were 58 patients with CPA tumor had posterior fossa and had surgery performed. Among these, 38 (65.5%) had cross sectional imaging and histopathological diagnosis. Of the 38 patients, 36 (94.7%) had CT scan, 22 (57.9%) MRI and 20 (52.6%) had both CT and MRI. All age groups were included. Their mean (SD) age was 34.6 (±2.56) and their age at admission ranged from four to 70 years. Females and males were equally affected (Table 1).

Table 1: Socio-demographic Characteristics of Patients with Cerebellopontine angle tumors, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia,2010 -2015.

Characteristic	Frequency (N=38)	Percent
Age		
≤ 19	8	21.1
20-30	9	23.7
31-40	11	28.9
41-50	1	2.6
51-60	8	21.1.
>60	1	2.6
Total	38	100
Sex		
Male	**19**	**50.0**
Female	**19**	**50.0**
Total	38	100

The most common presenting symptoms were headache, failure to keep balance, and visual loss, accounting for 52.6, 15.8%, and 10.5% of patients, respectively. Loss of hearing; abnormal body movement and body weakness were recorded in 5.3% each. Left side facial deviation, and loss of weight were reported in 2.6% each (Table 2).

***Radiological finding*:** 92.1% of the CPA tumors were single and 7.9% multiple. 47.4% of the tumors were on the right side, while 44.7% on the left and 7.9% had extension to the midline. (Table 2)

***Prevalence*:** Fourteen (36.8%) patients had vestibular schwannoma, 12(31.6%) meningiomas, 4(10.5%) hemangioblastoma, 3(7.9%) epidermoid cyst, and 2(5.3%) low-grade astrocytoma and the rest such as dermoid cyst, ependymoma, metastasis and tuberculosis (TB) granuloma, each accounted for 2.6% of the cases.

Table 2: Clinical and Radiological Features of Patients with Cerebellopontine angle Tumors, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2010-2015

Symptom	Frequency	Percent
Head ache	20	52.6
Failure to keep balance	6	15.8
Visual loss	4	10.5
Abnormal body movement	2	5.3
Body weakness	2	5.3
Loss of hearing	2	5.3
Left side Facial Deviation	1	2.6
Loss of weight	1	2.6
Total	38	100.0
Multiplicity		
Single	35	92.1
Multiple	3	7.9
Total	38	100.0
Location		
Right	18	47.4
Left	17	44.7
Extension to either side	3	7.9
Total	38	100.0

Table 3. Computed Tomographic features of Vestibular Schwannoma and Meningioma in among patient at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia,2010-2015.

Computed tomographic findings	Characteristics			Vestibular Schwannoma		Meningioma	
				f	%	*f*	%
CT density	Pre-Contrast	Isodense		8	61.5	2	18.1
		Heterogeneous		4	30.8	1	9
		Hyper dense		1	7.7	8	72.7
	Post Contrast	Heterogeneous		7	53.8	2	18.2
		Homogenous	Mild	1	7.7	9	81.8
			Moderate	2	15.4		
			Intense	3	23.1		
Mass effect				13	100	11	100
Perilesional edema				8	61.5	8	72.7
Dural tail				1	7.7	5	45.4
IAC extension				4	30.8	1	9
Calcification				1	7.7	4	36.3
Hemorrhage				1	7.7		
Cystic changes				7	53.8	-	-
Hyperostosis of Adjacent bone						4	36.3

CT Features of Vestibular Schwannoma and Meningioma: Vestibular schwannoma had heterogeneous density and heterogeneous enhancement on the pre contrast and post contrast studies in61.5% and 53.8%of cases, respectively. Six of 13(46.2%)had homogenous enhancement, of which three (23.1%) accounted for intense enhancement (Table 3).

All vestibular schwannoma cases had mass effect to the adjacent structure especially the 4th ventricle resulting in obstructive hydrocephalus. Extension to the Internal Auditory Meatus (IAC) was observed in 4/13(30.8%)of the cases and dural tail was observed in 7.7%. Seventy-three percent of meningioma had hyperdense appearance on pre contrast study, while 81.8% and 18.1% had homogenous and heterogeneous enhancements on post contrast study, respectively. Similar to vestibular schwannoma, all meningioma cases had mass effect on the fourthventricle. Dural tail was observed in 45.4%, hyperostosis of the adjacent bone and calcification was noted in 36.3% of the cases each.

***CT Finding and Histopathology result of Vestibular Schwannoma and Meningioma*:** Of 13 histopathologically confirmed vestibular schwannoma cases only 6 (46%) were diagnosed on CT scan imaging while meningiomas were diagnosed in 9/11(81.8%) of the patients, and hemangioblastoma in 2/4(50%).

MRI features of Vestibular Schwannoma: 37.5% of vestibular schwannoma cases were hypointense, 25% heterogeneous and 12.5% isointense on T1WI. On T2WI 50% of the cases were hyperintense and 50% heterogeneous.50% of the cases were enhancing moderately followed by intense enhancement, 37.5%. All cases of vestibular schwannoma had mass effect. Perilesional edema was observed in 62.5% and 3/8(37.5%) of patients had IAC extension (Table 4).

With regard to Meningiomas, hypointensity on T1WI was observed in 20% and isointensity in 80%. On T2WI, 80% were hyperintense and 20% heterogeneou (Table 4). Intense post contrast enhancement, dural tail and adjacent bone change were noted in all cases of meningioma. Out of 8 histopathologically diagnosed vestibular schwannoma, 5(62.5%) were diagnosed on MRI while all MRI diagnosed meningiomas were histopathologically reconfirmed and 1/3(33.3%)of epidermoid cysts had histopathological diagnosis.

Table 4: Magnetic resonance imaging features of Vestibular Schwannoma& Meningioma in patients with cerebellopontine angletumors, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia,2010-2015

MRI Findings	Characteristics		Meningioma		Vestibular Schwannoma	
			No of cases	%	No of cases	%
Signal Intensity	T1WI	Hypointense	3	37.5	1	20
		Isointense	1	12.5	4	80
		Hyperintense	1	12.5	-	-
		Heterogeneous	2	25	-	-
	T2WI	Hyperintense	4	50	4	80
		Heterogeneous	4	50	1	20
Contrast Enhancement	Intense		3	37.5	5	100
	Moderate		4	50	-	-
	Heterogeneous		1	12.5	-	-
Mass effect			8	100	4	80
Perilesional Edema			5	62.5	4	80
Dural Tail			1	12.5	5	100
Involvement of IAC			3	37.5	-	-
Bone Change					5	100
Hemorrhage			1	12.5	-	-

MRI Finding and Histopathology result of Vestibular Schwannoma and Meningioma:

DISCUSSION

In the present study, the occurrence of CPA tumors in young patients with peak incidence of 20-40 years was similar to patients reported by Kunwarpal Singhet.al (8), but younger than patients studied by Haque S, *et al,* peak incidence of 41-50 years (9), and older than the patients reported by Hari PS et. al., majority were between 1 and 20 years (7,10). Kabashi S *et al.* in their study showed no significant gender difference (10), this agrees well to our finding, but equal gender distribution was neither similar to Hari PS *et. al*. and others who reported slight male preponderance (7,9) nor to Kunwarpal Singh who came up with female predominance (8). This mismatch might be due to small sample size of the current study, further study might be needed to make sound conclusion.

In agreement to most cited literatures, signs of increased intracranial pressure, sensorineural hearing loss, tinnitus, and disequilibrium were the most common clinical presentations of patients with CPA tumors (7,8).During the Scientific exhibit at the 1999 RSNA scientific assembly revealed that, vestibular schwannoma and meningioma are the two most frequent lesions, accounting for approximately 85-90% of all CPA tumors and epidermoid cyst is the 3rd most common tumor (1,2,4,10,11). Our observation agrees well with the findings regarding the first two most frequent lesions but the third commonest lesion being hemangioblastoma is not in agreement with the above authors. This could be explained by the fact that hemangioblastoma is intraxial tumor with impingement of the CPA mimicking a mass lesion that originate from CPA.

CT features of Vestibular Schwannoma and Meningioma: On CT scan imaging, majority of meningioma were hyperdense on the pre contrast and show homogeneous enhancement on post contrast study. The above findings along with presence of dural tail, hyperostosis and perilesional edema in the majority of the cases agrees well with study done by A. Vincent Thamburaj in Apollo hospital, India, where 75% were hyper dense on the pre contrast and had uniform and bright enhancement on post contrast study also show atypical features such as necrosis, cyst formation or hemorrhage (15%)and tumoral calcification (13). CT scan appearance of vestibular schwannoma is usually isodense to hyperdense (14,15). But on the current study most cases had heterogeneous pre contrast density and post contrast enhancement; this may be due to the presence of cystic change and difference in tumor size.

MRI features of Vestibular Schwannoma and Meningioma: The fact that vestibular schwannomas were hypo intense on T1WI, 50% hyper intense and another 50% heterogeneous on T2WI and majority were enhancing moderately followed by intense enhancement agrees well with a study done by Haque S et al, who reported that vestibular schwannomas were hypointense on T1 WI in all cases, hyper intense on T2WI in 22(84%) cases, contrast enhancement was homogeneous in 15(57%) cases and heterogeneous in 11(43%) cases (9). On the same study majority cases of meningioma were isointense on T1WI and had intense enhancement along with presence of dural tail in all cases and perilesional edema, this finding was reproducible in the present study.

TB granuloma as a CPA region mass was found in this study which is not reported by many authors (1,3,7,15-18). This can be partly explained by the epidemiology of TBin our country.

***Limitations*:** Our study would have the drawbacks of studies with data collected retrospectively such as poor documentation of patients' medical records, non-standardized reporting format: not mentioning related positive or negative statements, poor recording of intra operative findings and histopathology results. The results would therefore need to be interpreted with this limitation in perspective.

Conclusions: PA tumors occur in all age groups, more frequently in the young and adults with equal sex distribution. The most common CPA tumor is vestibular schwannoma followed by meningioma. Attenuation on CT, signal intensity on MRI, enhancement, shape, margin, extent, mass effect and adjacent bone reaction all are help full in establishing the diagnosis. RI findings of the present study correlated well to histopathological results. Considering the epidemiology, TB mass lesion as a possible rare differential diagnosis should be considered depending on the imaging characteristic feature.

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