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MRI Evaluation of Extra Axial Cerebello Pontine Angle Tumours

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ABSTRACT

In our investigation of magnetic resonance (MR) imaging pertaining to extra-axial Cerebello Pontine (CP) angle tumors, we analyzed a total of 30 cases. Extra-axial CP angle tumors represent approximately 7-10% of all brain tumors. Among the 30 patients assessed, schwannomas were identified as the predominant pathology, constituting 60% of the cases, followed by Meningioma at 26.7%, epidermoid tumors at 6.7% and arachnoid cysts also at 6.7%. The age group most frequently affected was between 51 and 60 years, accounting for 28% of the cases. Schwannomas, the most prevalent extra-axial CP angle tumors, typically present as enhancing round masses that originate from the vestibular nerve near the porus acoustic us, often leading to the enlargement of the internal auditory canal. This tumor type predominantly affects individuals in their fifth to sixth decades of life, with a notable female predominance. On T1-weighted imaging, schwannomas are generally iso-to hypointense, while they appear hyper intense on T2-weighted images, exhibiting heterogeneous enhancement following contrast administration. Meningiomas, the second most common extra-axial CP angle tumors, are characterized by oval or hemispheric lesions that have a broad attachment to the tentorium or the petrous dura mater. Similar to schwannomas, the most affected demographic is also in the fifth to sixth decades, with a female predominance. Meningiomas typically show iso-intensity to gray matter on T1-weighted images and hyper intensity on T2-weighted images, with homogeneous enhancement observed on contrast imaging. Epidermoid and arachnoid cysts display cerebrospinal fluid (CSF) signal intensity across all imaging sequences., however, epidermoid cysts demonstrate diffusion restriction on diffusion-weighted imaging (DWI), whereas arachnoid cysts do not exhibit restriction on DWI and are completely suppressed on fluid-attenuated inversion recovery (FLAIR) sequences. MR imaging is recognized as the most sensitive non-invasive technique for characterizing extra-axial CP angle tumors, effectively delineating the location and extent of lesions, as well as their distinctive signal characteristics and enhancement patterns following contrast administration.

OPEN ACCESS

Key Words

Epidermoid cysts and arachnoid cysts, meningioma, MR imaging, extra axial cp angle tumours

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INTRODUCTION

The Cerebello Pontine angle (CPA) cistern is a subarachanoid space containing cranial nerves and vessels bathed in cerebrospinal fluid (CSF). The CPA is bounded by the pons, the anterior aspect of the cerebellum and the petrous temporal bone covered by dura mater. It is centered by the internal auditory canal (IAC) and extends caudally from the Vth cranial nerve to the IX-X-XIth cranial nerve complex. Tumours of the Cerebello Pontine angle (CPA) comprise 10% of all intra cranial tumours[1,2]. Vestibular schwannomas account for 70%-80% of all CPA lesions, meningiomas 5-12% and epidermoid cysts 2-6%[1-3] the few remaining lesions, which account for <1% each, are derived from an extraordinarily wide spectrum of unusual lesions that are challenging to diagnose. Diagnosis may be difficult because of the wide variety of cell types and origins of tumours. The tumours can derive from many anatomical structures, including primary origin from internal auditory meatus, ponto-cerebellar cistern and the lateral recess of the fourth ventricle, temporal bone, brain stem, or cerebellar nervous tissue[4-6]. CPA tumours, although uniform in location, are diverse pathologically and present clinically depending upon the site of tumour origin and displacement of the neurovascular structures. Clinical presentation of the CPA tumours is variable and it depends upon the size and location of the tumour. It can be asymptomatic in early stage or it can give vertigo, tinnitus, or hearing loss. Vascular compression of the vestibule cochlear nerve also causes vertigo and tinnitus. Large CPA lesions may compress the pons, the ipsilateral cerebellar hemisphere, the trigeminal nerve anteriorly and superiorly and the IX, X and XI nerves posteriorly. CPA lesions are clinically non-specific and the presenting symptoms are not related to the nature of the lesion itself, but to the nerves or cerebral structures involved with the lesions. Therefore, preoperative diagnosis of a CPA region tumour is mainly based on imaging. Computerized tomography (CT) and magnetic resonance imaging (MRI) are the primary modalities for diagnosis of cerebellopotine lesions. MRI is considered superior in differentiating the different types of CPA masses. The MR imaging technique described is simple and non-invasive. The high contrast resolution and multi planar capabilities of MR helps to delineate shape and margins, extent, mass effect, intensity at MR imaging, enhancement and adjacent bone reaction. The main radiological diagnostic goal is the description of the relation of the tumour to IAM, the brain stem and cerebellar hemispheres. The second line basic information is if the lesion is extra-or intra cerebral. Knowledge of typical signal characteristics and more specific features such as a hemispheric or ice-cream cone shape, adjacent hyperostosis, a dural tail, extension into one or more skull base foramina and enlargement of the internal auditory canal (IAC) helps in limiting the differentials considered. In addition to the computed tomography (CT) and conventional magnetic resonance (MR) imaging characteristics of the different CPA lesions (including anatomic site of origin, shape, density, signal and behaviour after contrast media injection), MR advanced techniques such as diffusion-weighted imaging (DWI) and perfusion imaging, as well as MR spectroscopy, when available, as they may bring crucial new data that allow accurate preoperative diagnosis.

Aims:

- To evaluate the incidence of extra axial Cerebello Pontine angle tumours in our study.
- To assess the role of Magnetic resonance imaging in the diagnosis of extra axial Cerebello Pontine angle tumours.
- To study MRI features of these tumours with and without contrast.

MATERIALS AND METHODS

The main source of data for the study will be patients attending the department of Radio-diagnosis. All patients referred to the department of Radiology with clinical suspicion of CP angle tumours subjected for study.

Inclusion Criteria:

- All Patients from all age groups who are clinically suspected to have ICSOL.
- Patients without a clinical suspicion but showing an cp angle lesion/ ICSOL on CT scan.

Exclusion Criteria:

- Patient having history of claustrophobia.
- Patient having history of metallic implants insertion, cardiac pacemakers.
- Metallic foreign body in situ.
- Patient clinically unstable.
- Trauma.
- Infectious pathology.
- Those with intra axial tumors within the brain.

Equipment: The MR examinations were performed on all patients who met inclusion criteria at a 3T whole-body MR system using a 32-channel phased array head coil. Conventional spin echo sequences, Axial T1, T2, Coronal FLAIR, Sag T2, FSPGR and Post-contrast T1+C. Special sequences such as DWI and MR spectroscopy was performed as and when required.

RESULTS AND DISCUSSIONS

The most common extra axial CP angle tumour is schwannoma with 18 cases (60%). This was followed by meningioma with 8 cases (26.7%), followed by

epidermoid and arachnoid cysts with 2 cases each (6.7%). Extra axial CP angle tumours are more common above 4th-5th decade. Peak age incidence noted in 5th-6th decade with 8 cases (26.7%).Out of 18 cases of Schwannoma 4 cases in 5th-6th decade followed by 3 cases each in 4th, 6th and 7th decades. Out of 8 cases Meninigioma 3 cases in 5th to 6th decade. Out of 30 cases of extra axial cp angle tumours 21 cases are female (70%), males 9 cases (30%) with female preponderance, female: male ratio being 2.3:1. Out of 18 cases of Schwannoma 12 cases of females, 6 cases of males, out of 8 cases of Meningioma 6 cases of females, 2 cases of males, 2 cases of arachnoid cysts of females, 1 case of epidermoid cyst is male and another case is female. So, there is female preponderance in extra axial CP angle tumours. Out of 18 cases of schwannomas 9 cases were Iso-intense (50%), 5 cases hypo- intense (27.7%), 4 cases mixed intensity (22.3%) on T1, out of 8 cases of Meningioma 5 cases were Iso-intense (62.5%), 2 cases hypo-intense (25%), 1 case mixed intensity (12.5%) on T1. Out of 18 cases of Schwannoma 1 case were Iso-intense (6%), 11 cases hyper- intense (61 %), 6 cases mixed intensity (33%) on T2W. Out of 8 cases of Meningioma 1 case were Iso-intense (12%), 6 cases hyper- intense (75%), 1 case mixed intensity (13%) on T1. Out of 18 cases of Schwannoma 7 case shows homogenous enhancement (39%), 11 cases shows heterogenous enhancement (61%) on contrast. Out of 8 cases of Meningioma 7 case shows homogenous enhancement (87%), 1 cases shows heterogenous enhancement (13%) on contrast. Out of 2 cases of each arachnoid cyst and epidermoid cyst follows CSF signal intensity on T1, T2 and FLAIR. Diffusion restriction in 2 cases (100%) of epidermoid cyst, no restriction in 2 cases of arachnoid cysts.

In our study of MR imaging of extra axial cp angle tumours, we evaluated 30 cases. 30 patients were evaluated, whose age group ranged from 10-90 years. The highest incidence of extra axial cp angle tumours were found in 51-60 years age group accounting for 29% of cases and least was seen in age group of 11-20 years constituting 4%. Thirty patients were evaluated of which 9 (30%) were males and 21 (70%) were females. Out of the 30 patients who were evaluated, schwannoma (60%) is the most common pathology followed by meningioma (26.7%), epidermoid (6.7%), arachnoid cysts (6.7%). Out of Thirty patients evaluated schwannoma diagnosed in 18 cases (60%). Among the 18 cases, Males=6 and Females=12 with female to male ratio 2.3:1 Maximum no of patients in the age group of 50-60yrs constituting 40% of patients. Unilateral involvement is seen in 17 cases and bilateral involvement is noted in 1 case, which is a case of Neurofibromatosis type II with multiple vestibular schwannoma in cp angle, meckel's cave, lateral walls of cavernous sinuses and Neurofibromas in spinal canal. Most commonly involved is vestibular component of VIII nerve, followed by facial and trigeminal nerves . In our study we evaluated 17 cases of vestibular schwannoma (89.4%) and 1 case of trigeminal schwannoma. Most of them are solid lesions (68%), 4 cases are mixed type (solid+cystic)-(32%). On imaging, most of the tumours are isointense on T1W and hyper intense on T2W imaging. On contrast administration there is intense enhancement noted heterogeneously if tumour is large. All cases shows hyper intensity on FLAIR and no Diffusion restriction was noted in all cases. In the present study most of the vestibular schwannoma's were hypointense relative to pons on T1-weighted images and hyper intense to pons on T2-weighted images. In the present study, one lesion was showed both solid and cystic components. On MR imaging, the lesions appeared hypointense on T1-weighted images and showed hyper intense to mixed signal intensity on T2-weighted and FLAIR images with no restriction on DWI. Both the lesions showed marked enhancement on post contrast sequences. Similar findings were described by Valavanis[7] and Goldberg[8]. Meningiomas are second most common CP angle tumours, comprises of 5- 12% of CP angle tumours. Most of the meningiomas are benign (WHO Grade I)-Meningothilial subtype. Out of 30 patients evaluated 8 cases are Meningioma, 6 are females and 2 are males. 51-60 yrs age group are commonly involved with 3 cases. Most of the cp angle Meningioma are tentorium based (4 cases). There are several studies discussing the signal characteristics of the meningiomas at the MR imaging. The signal intensity of the tumour mass may be rather variable on both T1-, T2-weighted and FLAIR images[9-11]. On T1, most tumours are isointense to the cortical grey matter (from 56-94%). Hypointense meningiomas account from 20-48% and hyper intense tumours on T1-weighted images are rare. On T2-weighted images, about 50% of the tumours remain isointense with the brain cortex. Hypointense tumours are less common, from 4-18%. In the present series, on T1-weighted images, Out of 8 cases of Meningioma 5 cases were Iso-intense (62.5%), 2 cases hypo- intense (25%), 1 case show mixed intensity (12.5%). On the T2-weighted images, Out of 8 cases of Meningioma 6 cases were hyper- intense (75%), 1 case was iso intense (12.5%) 1 case show mixed intensity (12,5%) to the cortical grey matter. In our present study we evaluated 2 cases of arachnoid cysts. Both cases are females, In both cases there is involvement on right side as arachnoid cyst more common on right side. Epidermoid tumours represent 0.2-1.4% of all primary intra cranial tumours[12]. CPA epidermoids constitute 40% of all intracranial epidermoids and the incidence of epidermoids among all CPA tumours is approximately 5%[12]. In our experience, a CISS image is the best sequence for detecting epidermoids. Although most epidermoid tumors are slightly hyperintense relative

to CSF on T1-weighted image, CISS sequences demonstrate these lesions more clearly. Because a CISS sequence provides high spatial resolution with very thin section, it is possible to detect the exact tumour extension, even for a small lesion in Meckel's cave.

CONCLUSION

- A spectrum of usual and unusual lesions exists in the CP angle.
- Among Extra axial CP angle tumours acoustic schwannomas are most common tumours at CP angle followed by meningiomas.
- Signal intensity on MR imaging, enhancement, shape and margins, extent, mass effect and adjacent bone reaction are also helpful in establishing diagnosis.
- MRI is the most sensitive non-invasive modality in the characterization of extra axial cp angle tumours.
- It can identify the site and extension of the lesions as well as the characteristic signal and enhancement pattern on contrast.
- Apart from diagnosing, MR imaging plays an important role in stratifying patients into appropriate treatment options.

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