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ROLE OF MRI IN EVALUATION CEREBELLOPONTINE (CP) ANGLE SCHWANNOMA AND ITS HISTOPATHOLOGICAL CORRELATION

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Conflicts of Interest: Nil

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Abstract:

AIM: 1) To evaluate the role of Magnetic Resonance Imaging (MRI) to localize and characterize cerebellopontine angle Schwannomas

2) Correlation of MRI findings of CerebelloPontine angle schwannomas with histopathology.

Material & methods: This prospective observational study was carried out on consecutively selected 30 patients of all age group with CT scan findings suggestive of CP angle schwannoma referred for MRI of brain in the Department of Radio-diagnosis, SMS medical college Jaipur from July 2017 to July 2018. MRI was performed on PHILIPS INGENIA 3 TESLA MRI in all cases. All patients underwent surgery and the final diagnosis was made by histopathology. Statistical analysis was applied to find out the Sensitivity, Specificity, Accuracy, PPV and NPV of MRI. P-value < 0.05 was taken as significant.

Results: In the present study, 25 patients diagnosed as schwannoma and 5 patients diagnosed as other benign tumors. Maximum number of schwannoma patients were in the age group of 41-60 years (52%). Final diagnosis was made by histopathology. Sensitivity of MRI for diagnosis schwannoma was 100%, Specificity was 83.3% and Positive predictive value of 96%.

Conclusion: MRI is considered as an excellent noninvasive investigation for CP angle schwannoma. Signal intensity at MR imaging, enhancement, shape and margins, extent, mass effect, and adjacent bone reaction are also helpful in establishing the diagnosis.

Keywords: MRI, Schwannoma, Vestibulocochlear nerve.

Introduction:

A schwannoma is a tumor that arises from Schwann cells. Schwann cells are cells that are derived from a primitive structure known as the neural crest. Theoretically, Schwannomas can arise anywhere that a Schwann cell is found. However, in the brain and spinal cord, Schwannomas tend to arise mainly at the following sites: [1].

• The VIIIth (vestibulocochlear) cranial nerve–where they are referred to as vestibular Schwannomas (or acoustic ‘‘neuromas’’);

• The Vth (trigeminal) cranial nerve–where they are referred to as trigeminal Schwannomas;

• The lower cranial nerves (IX, X or XI–i.e., glossopharyngeal, vagus, or accessory) at the jugular foramen–where they are referred to as jugular foramen Schwannomas;

• The spinal cord’s spinal nerve roots (especially sensory or ‘‘dorsal’’ nerve roots)–where they are referred to as spinal Schwannomas. Lesions of the cerebellopontine angle (CPA) are frequent and represent 6–10 % of all intracranial tumors [2].

Acoustic neuromas, which are also called vestibular schwannomas and meningiomas are the two most frequent lesions and account for approximately 85–90 % of all CPA tumors. [3]

Knowledge about the anatomy, pathology, clinical presentations and merits of different imaging modalities can lead to adequate diagnosis and management of the different CPA lesions. [4] CT and MRI are widely used radiological methods for CPA imaging. The main radiological diagnostic goal is the description of the relation of the tumor to IAM, the brain stem and cerebellar hemispheres [5].

This is especially true for any lesions in the cerebellopontine angle, where the sensitivity and specificity of MR imaging with its multidimensional imaging capabilities are far superior to that of CT. 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 [6].

The MR imaging technique described is simple and noninvasive. Therefore we evaluate the role of MRI in evaluation of cerebellopontine angle schwannomas.

MATERIAL AND METHODS

This prospective observational study was carried out on consecutively selected 30 patients of all age group with CT scan findings suggestive of CP angle schwannoma referred for MRI of brain in the Department of Radio-diagnosis, SMS medical college Jaipur from July 2017 to July 2018. MRI was performed on PHILIPS INGENIA 3 TESLA MRI in all cases. All patients underwent surgery and the final diagnosis was made by histopathology.

INCLUSION CRITERIA:-

1) All Patients in whom MRI findings suggestive of CP angle Schwannoma.

2) All those patients who had CT findings suggestive of CP angle Schwannoma and which were later on confirmed on MRI.

EXCLUSION CRITERIA:-

1. Claustrophobic patients.
2. Patients with metallic implants, pacemakers.
3. Patients unfit for surgery or not willing to undergo surgery.

METHOD OF DATA COLLECTION

All patients underwent preoperative MRI examination. All patients underwent surgery and the final diagnosis was made by histopathology.

MRI PROTOCOL:-

MRI Machine – PHILIPS INGENIA 3 TESLA was used. Position of Patient – supine on the MRI table and head coil was applied. Routine T1WI (Axial and coronal spin echo T1W), T2WI (Axial, coronal and sagittal fast spin echo T2W), FLAIR Axial sequences followed by post contrast axial T1W sequences were taken.

Table 1: Age Distribution

Age group (year)	Frequency	Percentage %
<20	**2**	**8**
21-40	**5**	**20**
41-60	**13**	**52**
>60	**5**	**20**

Table 2: Distribution of lesion according to type of lesion

Lesions	Solid	Cystic	Mixed	Total
Vestibular Schwannoma	18	0	4	22
Trigeminal Schwannoma	2	0	1	3
Total	20	0	25	25
Percentage %	80		20	

Table 3: Sex incidence

Sex	No. of patients	Percentage %
Male	11	44
Female	14	56
Total	25	

Table 4: Distribution of lesion on T2WI

Lesions	Hyperintense	Isointense	Mixed	Total
Vestibular Schwannoma	20	0	2	22
Trigeminal Schwannoma	2	0	1	3

Table 5: MRI finding and histopathological findings of schwannoma

	True state of patients histological diagnosis		
Test result MRI diagnosis	True Schwannoma	Other lesion	Total
Positive	True Positive 24	False Positive 1	Patients with positive test 25
Negative	True Negative 0	False Negative 5	Patients with negative test 5
Total	All Patients with Schwannoma 24	Other lesion 6	All patient studied 30

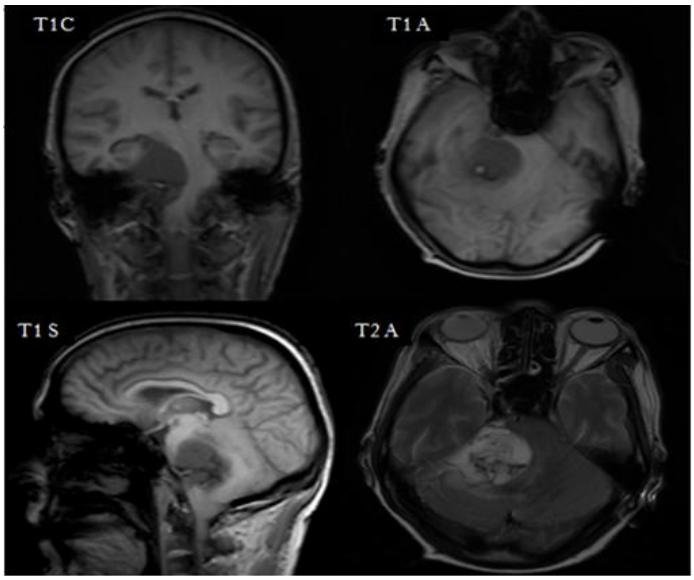

Figure 1: MRI T1W and T2W images showing heterogeneous intensity lesion at right CP angle suggestive of CP angle schwannoma

STATISTICAL ANALYSIS

Statistical analysis was applied to find out the Sensitivity, Specificity, Accuracy, PPV and NPV of MRI. P-value < 0.05 was taken as significant.

RESULTS

In the present study, 25 patients were diagnosed as Schwannoma and 5 patients were diagnosed as other benign tumors, maximum number of Schwannoma patients were in the age group of 41-60 years (52%).(**Table 1)**

(Table 2) shows the distribution of the type of lesions whether solid, cystic or mixed. 80 % of the lesions were solid and rest 20 % of the lesions show mixed (solid-cystic) characteristics. Out of 25 Schwannoma patients 14 were female and 11 were male. **(Table 3)**

Vestibulocochlear nerve was involved in 88% of the cases of CP angle Schwannoma and trigeminal nerve was involved in 12% of patients. **(Table 4)**

Final diagnosis was made by histopathology in all cases. MRI was erroneous in giving provisional diagnosis of Schwannoma in one case, which on subsequent surgery and histopathology was found to be a meningioma.

Sensitivity of MRI diagnosis for Schwannoma was 100%, Specificity 83.3%, Positive predicative value 96%.

DISCUSSION

Schwannoma is a benign (World Health Organization [WHO] Grade I) encapsulated tumor that arise from the Schwann cells of the nerve sheaths of cranial and spinal nerves. It accounts for 5-10% of primary intracranial neoplasms and for nearly 30% of intraspinal tumors. Vestibular Schwannomas represent 80-85% of the CPA tumors. Intracranial Schwannomas occur in all the age groups, but the peak incidence is in the fourth to seventh decades of life. The symptom of vestibular Schwannomas depends upon the size and location of the tumor. The growth rate of Schwannoma is variable, but usually it is slow, 1-2 mm/year. When it is in the intracanalicular stage it may present as a unilateral sensorineural hearing loss, tinnitus or vertigo.

MRI is a very good modality to detect small tumors, especially within the IAC, because of the lack of bone-induced artifact and the multidimensional capability of this modality. On axial images, the tumor often has a comma-like shape with a globular cisternal mass medially and a short tapered fusiform extension laterally into the IAC. Homogeneous contrast-enhancement is seen in the most of the cases. Schwannoma appear as homogeneously mildly hypo- or isointense (to adjacent brain) ovoid or tubular intracanalicular masses, hypointense on T1WI with intense homogeneous contrast-enhancement. On T2W sequences, they appear mildly to markedly hyperintense and may be obscured by the similarity in signal intensity to that of the surrounding cerebrospinal fluid (CSF).

Hence, in the present study, MRI had a sensitivity of 100 % and specificity of 83.3 % with a positive predictive value of 96 % in the diagnosis of vestibular Schwannoma. Haque S et al. [8] in their study of role of MRI in the evaluation of acoustic Schwannoma and its comparison to Histopathological findings in 2011 found that the overall sensitivity of MRI to diagnose Acoustic Schwannoma was 96 % with specificity of 88.2 % and positive predictive value which is consistent with the above study.

CONCLUSION

MRI is considered as an excellent noninvasive investigation for CP angle Schwannoma. Signal intensity at MR imaging, enhancement, shape and margins, extent, mass effect, and adjacent bone reaction are also helpful in establishing the diagnosis.

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