



MRI IN EVALUATION OF RING ENHANCING LESIONS OF THE BRAIN AND CORRELATION WITH MR SPECTROSCOPY.

Radiodiagnosis

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ABSTRACT

Ring-enhancing lesions are considered as routine imaging abnormality detected in neuroimaging . MRI and CT scans are used for diagnosing these pathologies. There can be various etiologies of such lesions in the brain. MR spectroscopy is a potential tool for creating a differential diagnosis between infectious conditions of the brain which present as ring enhancing lesions like tuberculomas, neurocysticercosis and pyogenic or fungal abscesses among each other and from the other mimicking conditions. This study was carried out on 38 patients referred to the radiodiagnosis department of dhiraj hospital with clinical suspicion of an infective CNS lesions. These patients underwent MRI brain (Plain and Contrast) and MR spectroscopy was carried out. Out of 38 patients, the commonest pathology encountered was tuberculoma (57%), neurocysticercosis (28.9%) and brain abscesses (13 %). On spectroscopy examination 17 out of 22 tuberculoma patients showed Lipid peak as the major metabolite. Raised choline and reduced NAA was found in Neurocysticercosis patients. Amino acid peak was seen characteristically in 2 cases of abscesses. All the 5 cases showed lactate peak. The present study concludes that MRI with contrast is the modality of choice for diagnosing ring enhancing lesions of the brain. MR spectroscopy is a recent development which aids MRI in differentiating various pathologies presenting as ring enhancing lesions. It is of great value in differentiating infective lesions like tuberculoma , NCC and brain abscesses from brain tumours and metastases.

KEYWORDS

Magnetic Resonance Imaging , Mr Spectroscopy, Ring Enhancing Lesions.

INTRODUCTION-

Ring-enhancing lesions are considered as routine imaging abnormality detected on brain scans. MRI and CT scans are used for their diagnosis. There can be various causes of such lesions in the brain. Usually , the grey matter white matter junction is the most common location where the lesions occur in the brain parenchyma , but they could be located in the sub cortical white matter, around the basal ganglia, in the cerebral cortex , in the cerebellum and virtually any site in the brain can be eventually involved. [1] Magnetic resonance imaging is the most superior imaging modality as it easily differentiates grey from white matter and conditions like hypoxic ischaemia, infarction, multiple sclerosis plaques, haemorrhage , infection, pyogenic abscesses. MR spectroscopy is a potential tool for creating a differential diagnosis between infectious conditions affecting the brain like tuberculomas, neurocysticercosis and pyogenic or fungal abscesses. This study is an attempt to evaluate the use of MRI and spectroscopy in differentiating various ring enhancing lesions affecting the central nervous system., in patients presented at our radiodiagnosis department.

AIMS AND OBJECTIVES-

This study aims to evaluate the use of MRI and MR spectroscopy in diagnosis and differentiation of various infective ring enhancing lesions affecting the brain.

MATERIALS AND METHODS-

The study used the data of patients presented in the radiology department in dhiraj general hospital piparia, waghodia from January 2018 to August 2019 . 38 patients were diagnosed with ring enhancing lesions , using a 1.5 TESLA PHILIPS MRI machine and using single and multi voxel spectroscopy. It is a prospective observational (non interventional) type of study.

DISCUSSION-

TABLE 1- INCIDENCE OF VARIOUS RING ENHANCING LESIONS-

Pathology	Incidence
Tuberculoma	22
Neurocysticercosis	11
Abscess	5
Total	38

Chart 1-

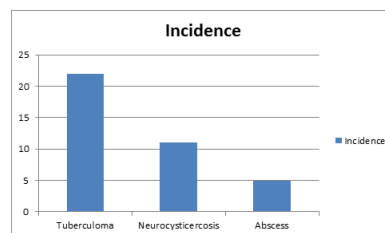
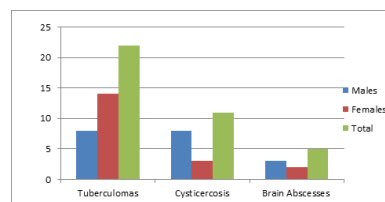


Table 2 - GENDER SPECIFIC INCIDENCE OF RING ENHANCING LESIONS

Pathology	Males	Females	Total
Tuberculomas	8	14	22
Cysticercosis	8	3	11
Brain Abscesses	3	2	5

Chart 2-



TUBERCULOMA-

Out of 38 patients evaluated, tuberculomas were seen in 22 (57.8%) of the cases. Among the 22 cases (males = 8 , females= 14). Single lesions were noted in 6 cases (27.2%) and multiple in 16 cases (72.7 %). They are seen usually as conglomerate lesions which are hypointense on both T1 and T2.

MRS showed a Lipid peak in 17 (77.2 %) cases and it plays an important role in identification of tuberculomas from other infective granulomas. The caseous and non caseous stages of tuberculoma can also be differentiated based on the T2 weighted images . Due to its excellent spatial resolution, post contrast images are of tremendous value to determine the size of the lesions and it helps to differentiate

the granuloma from its surrounding edema.

My findings were similar to the findings of Archana et al, who hypothesised that, tuberculomas are characterised by a hypointense T2 signal with complete or partial DWI restriction and lipid resonance on spectroscopy⁽²⁾

NEUROCYSTICERCOSIS-

Out of 38 patients evaluated neurocysticercosis was seen in 11 (males = 8 ; females = 3) cases. 6 patients presented with multiple lesions whereas 5 patients presented with single lesions.

All the cases were showing intraparenchymal forms of NCC , no subarachnoid or racemose forms of NCC were encountered in this study. Scolex was identified in 5 cases using FLAIR, T1 3D and post contrast sequences .

MRS shows Choline peak and reduced NAA peak . Calcified lesions which were seen in 4 cases (36.3 %). All the lesions were hypo to isointense on T1 weighted images and 7 cases were hyperintense on T2. Out of these 7 lesions , 4 lesions showed inversion on FLAIR suggesting that the contents are similar to that of CSF. Intense ring enhancement with surrounding perilesional edema was seen in all cases suggestive of active lesions.

In 2001 Kuruvilla A et al concluded seizure as the most common presenting feature in NCC. (100 %) cases. They reported multiple peripheral rim like enhancing lesions on cross sectional imaging. These findings are similar to my study.⁽³⁾

ABSCCESS-

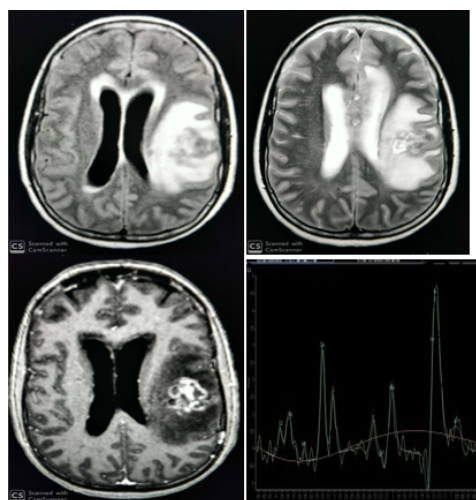
Only 5 patients were diagnosed with abscesses .Thus they constituted only 13 percent of the total. . They appeared as hyperintense on T2W1 with a smooth well defined hypointense peripheral surrounding rim like granulation tissue.

On gadolinium enhanced MRI scans these lesions presented a very smooth and regular peripheral enhancement with mild surrounding perilesional oedema

On MRS , Lactate peak was seen in all 5 cases which suggests anaerobic glycolysis. Amino acids peak like glutamine was seen in 2 cases.

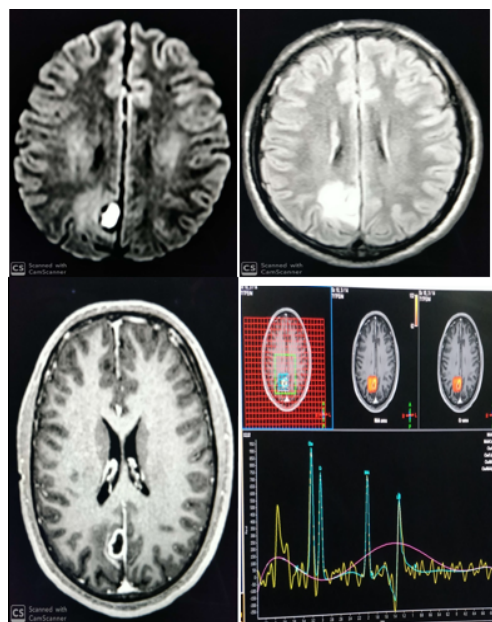
My findings were consistent with those of Zhou W et al , who studied 2 patients with brain abscesses in 2019. They reported that the necrotic centre of the abscesses showed reduced NAA, Cr , and Cho. But there is a raised level of amino acids like succinate , and lactate in the centre. These spectroscopy resonances are very sensitive for abscesses.⁽⁴⁾

FIGURE 1 - 40 year old female with fever and headache diagnosed as- TUBERCULOMA



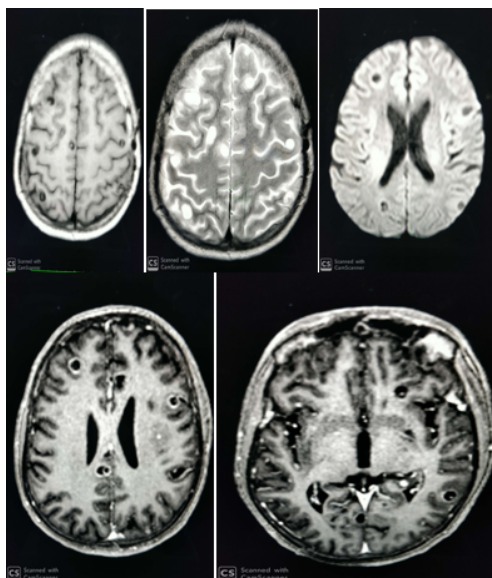
Multiple conglomerated T2 hypointense lesions in left parietal lobe with surrounding perilesional edema showing partial diffusion restriction and peripheral rim enhancement show elevated lipid, lactate and choline levels suggestive of tuberculomas.

FIGURE 2 –21 year old male with headache and ataxia diagnosed as -ABSCCESS



A well defined oval ring enhancing lesion noted in right parietal lobe in parafalcine location showing strong diffusion restriction with choline, lipid and lactate peak suggestive of abscess.

FIGURE 3- 30 year old male with vomiting diagnosed as - NEUROCYSTICERCOSIS



Select axial sections show multiple ring enhancing lesions in both cerebral hemispheres , appearing as hyperintense on T2W1 and show complete attenuation on flair images, with no diffusion restriction and there is a central hyperintense scolex seen within. Neurocysticercosis was diagnosed.

CONCLUSION-

The most sensitive modality for the characterization and diagnosis of intracranial ring enhancing lesions – Magnetic Resonance Imaging. The most common feature noted in most of the lesions is irregular type of ring enhancement.

Incidence wise the most common lesions encountered in our study were Tuberculoma (57.8%) followed by Neurocysticercosis (28.9%), Abscess (13.1%)

Single lesions or multiple conglomerated lesions showing hypointense signal intensity on T2 weighted images , and show raised

lipid spectra, with an elevated Cho/Cr ratio >1 , and markedly reduced NAA/Cr ratio, and slight reduction of NAA/Cho ratio on MRS is more in favour of tuberculoma. Neurocysticercosis cases showed ring enhancing lesions which appear as Hyperintense on T2 with no diffusion restriction, and a presence of scolex on 3D FAIR, and T1 post contrast images. On MR Spectroscopy most of the lesions showed mildly raised choline, reduced NAA and the Cho/Cr ratio was normal in all these cases. Brain Abscesses have a characteristic imaging finding as they appear as hyperintense on T2 with a hypointense rim, and show complete diffusion restriction. On post contrast images abscesses show a smooth regular and complete ring enhancement. MRS may show Lactate and Amino Acid peaks. Currently MRI is the gold standard in early detection of ring enhancing lesions and thus helps in patient management by suggesting the correct diagnosis based on characteristic imaging findings.

MR Spectroscopy usually complements MRI, in characterization of various ring enhancing lesions based on elevation of multiple metabolites specific to various conditions. However MRS findings cannot be used as a sole criteria for diagnosing these ring enhancing lesions.

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