

ROLE OF MAGNETIC RESONANCE IMAGING IN THE EVALUATION OF PATIENTS PRESENTING WITH SEIZURES.

Radio-Diagnosis

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ABSTRACT

Aims and Objectives: To study the common and uncommon structural abnormality/ lesions causing the seizures in adults and paediatric age groups. **Material and Methods:** A retrospective study of 394 patients presenting with seizures referred to Department of Radiodiagnosis and Imaging in Vydehi institute of Medical Sciences and research centre, Bangalore from 2019 to 2022. MRI brain was performed using 1.5 Tesla MRI scanner. **Results:** Out of the 394 patients (218 patients were of adult age group and 176 patients were of paediatric age group) who presented with seizures and had undergone magnetic resonance imaging, 243 patients (61.6 %) had no abnormal neuroimaging findings. Most of the patients presented with generalised seizures. Among the pediatric age group periventricular leucomalacia and disorders of cortical malformation are the predominant causes. Among the adults commonest findings were gliosis due to vascular insult and infectious granulomas(possibilities of neurocysticercosis and tuberculoma). The other common findings were intracranial neoplasms, developmental vascular malformations and venous thrombosis. **Conclusion:** The multiplanar imaging and excellent gray-white matter resolution of MRI helps in the better delineation and characterization of the lesions/abnormalities. MRI is a non-invasive modality with no radiation hazard and can reliably identify and localize intracranial abnormalities that cause seizures and hence useful in further management of the patient.

KEYWORDS

INTRODUCTION

Seizure is a most common medical disorder and neuroimaging plays a valuable role in the evaluation of etiological factors for seizures. Epilepsy is a disorder of the brain characterized by two or more seizures unprovoked by any immediately identifiable cause. It is the most common neurological disorder in developing countries.[1]

An epileptic seizure is a result of abnormal, excessive neuronal activity arising in the grey matter of the cerebral cortex.[2]Magnetic resonance imaging plays an important role in the diagnosis of any neurological conditions that lead to epilepsy.MR imaging because of its excellent soft-tissue contrast, acts as a most valuable tool for preoperative evaluation, allowing for a detailed evaluation of anatomy to localize epileptogenic focus. When compared to CT, MRI is free from beam hardening artifacts.[3]MRI protocol routinely includes T1 and T2 weighted images, fluid-attenuated inversion recovery sequence (FLAIR). MR Images should be obtained in at least two orthogonal planes covering the whole brain with minimum slice thickness not exceeding 3mm. In suspected cases of temporal lobe epilepsy, oblique coronal plane images obtained perpendicular to the long axis of the hippocampus are the best.[4]

METHODS AND MATERIALS

A retrospective analysis of patients presenting with seizures referred to the Department of Radio diagnosis and imaging in Vydehi institute of medical sciences and research centre, Bangalore from august 2019 to august 2022. MRI brain was performed using 1.5 Tesla MRI scanner.T1W Axial, T2W Axial, FLAIR Axial, T1W Sagittal/ T2W Coronal, Gradient echo sequence Axial, DWI Axial & MR Angiogram sequences are employed. Additional sequences used are T2W Coronal, FLAIR Coronal and Coronal T1 inversion recovery, T1W contrast & MR Spectroscopy.

Inclusion Criteria

- All the patients who presented clinically with seizures and referred to the department of Radio diagnosis.
- Patients of all age groups and both sexes are included in the study.

Exclusion Criteria

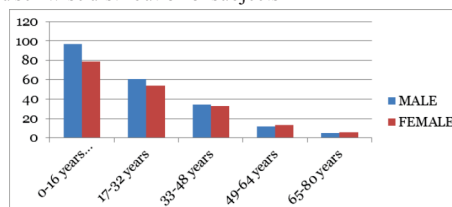
- Patients with history of insertion of metallic implants or placement of cardiac pacemakers and aneurysmal clips.
- Patients with history of claustrophobia.
- Patients with history of anxiety disorders who are reluctant to give consent.

RESULTS:

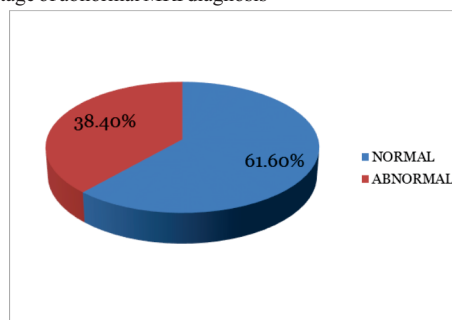
Age and sex wise distribution of subjects

Age in years	Male	Female	Total	Percentage
0-16	97	79	176	44.6%
17-32	61	54	115	29.2%
33-48	34	33	67	17.0%
49-64	12	13	25	6.3%
65-80	5	6	11	2.8%
TOTAL	209	185	394	100%

Age and sex wise distribution of subjects

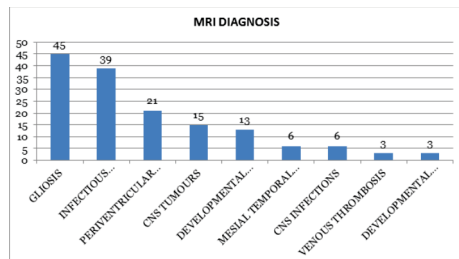


Percentage of abnormal MRI diagnosis



MRI DIAGNOSIS	NUMBER OF PATIENTS	PERCENTAGE
NORMAL PATIENTS	243	69%
GLIOSIS DUE TO VASCULAR INSULT	45	11.4%
INFECTIOUS GRANULOMAS	39	9.8%
PERVENTRICULAR LEUKOMALACIA	21	5.3%
CNS TUMOURS	15	3.8%
DEVELOPMENTAL CORTICAL MALFORMATIONS	13	3.2%

MESIAL TEMPORAL SCLEROSIS	6	1.5%
CNS INFECTIONS (MENINGITIS, ENCEPHALITIS, CEREBRAL ABSCESS)	6	1.5%
VENOUS THROMBOSIS	3	0.8%
DEVELOPMENTAL VASCULAR MALFORMATIONS	3	0.8%



DISCUSSION

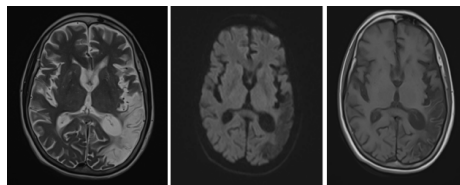
In this study we included a large subset of population in a tertiary care hospital who presented with seizures. Patients who presented clinically with seizures had a wide range of abnormalities on MR imaging based on the etiology. The MR imaging revealed abnormalities in 151 out of 394 patients (38.7%). The MR examination revealed normal study in 243 (61.3%) patients. That indicate most common cause of seizure disorder is idiopathic. Pannag KN et al, conducted a study in 2015 where it was seen that 45.7% of the patients had normal MRI brain findings in patients who presented with seizures.

In this study, we categorized the patients into paediatric and adult age groups. Out of 394 subjects 176 (44.7%) were of paediatric age group. 69 subjects had a positive MRI findings in the paediatric age group. The predominant causes were periventricular leukomalacia, developmental cortical malformations and gliosis.

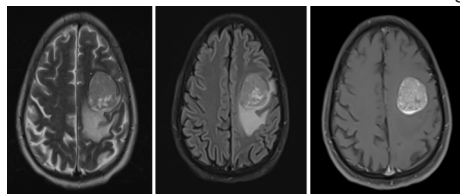
A total of 281 subjects were included in the study done by Kalnin et al., At least one MRI abnormality was identified in 87 of the 281 (31%) of children. The most common abnormalities were ventricular enlargement (51%), leukomalacia/gliosis (23%), gray matter lesions such as heterotopias and cortical dysplasia (12%), volume loss (12%), various other white matter lesions (9%), and encephalomalacia (6%). Among the developmental cortical malformations (13), there were 5 cases of lissencephaly - agyria - pachygyria spectrum, 4 cases of schizencephaly, 3 cases of focal cortical dysplasia and 1 case of polymicrogyria.

The predominant MRI findings in the adults were gliosis due to vascular insult and infectious granulomas. Similar findings were seen in the study conducted by chabarwal et al., where pathological findings were seen in 65 out of 110 patients (59%) which included, cerebral infarct with gliosis (20%), NCC (7.27%), atrophy (5.45%) as the predominant findings.

Illustrated Cases:

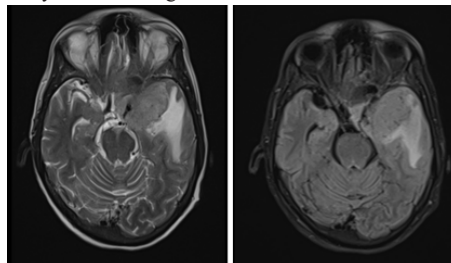


Case 1: Areas of altered signal intensities appearing T1W hypointense, T2W hyperintensities and FLAIR peripheral hyperintensities showing no diffusion restriction on DWI noted in left parietal, temporal and occipital gray and white matter with mild ex vacuo dilatation of the occipital horn of the left lateral ventricle - s/o old infarct with gliosis.

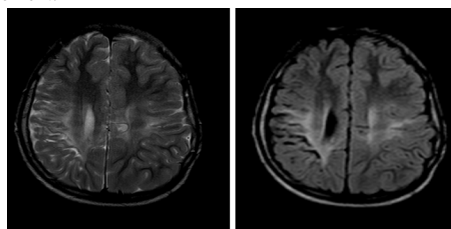


Case 2: Well defined, circumscribed, intra-axial lesion noted in the left frontal lobe appearing isointense T2W/FLAIR images. The lesion

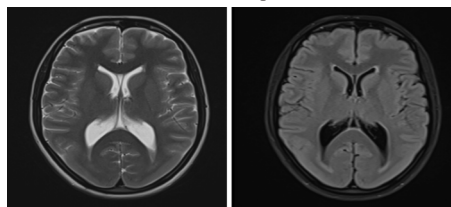
shows heterogeneous enhancement in post contrast images. Significant perilesional vasogenic edema in the left frontal and parietal lobes noted - likely intermediate glioma.



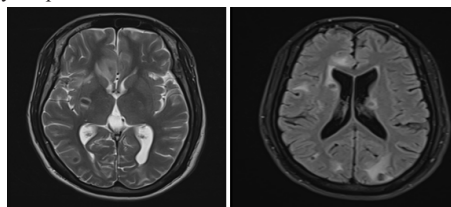
Case 3: Fairly well defined, extra-axial heterogeneous lesion showing T2W/FLAIR- hyper intensity, T1W isointense signal noted broad based to sphenoid wing dura on left side compressing the adjacent temporal and basi-frontal brain parenchyma. Significant surrounding T2/FLAIR hyperintensities noted. Post contrast images showing avid enhancement.



Case 4: T2W/FLAIR hyperintensities in the bilateral fronto-parietal lobes with no diffusion restriction - s/o periventricular leukomalacia.



Case 5: Reduction in the number and shallow sulcations involving the occipital lobe on both sides with dilated occipital horns of bilateral lateral ventricles - imaging features in favour of lissencephaly - pachygyria spectrum.



Case 6: Multiple well-defined ring-enhancing lesions noted in the bilateral cerebral hemispheres. Significant perilesional vasogenic edema noted. No hydrocephalus noted. The lesion is T1W iso-

hypointense, T2W central hypointense with peripheral hyperintensity with FLAIR hypointense. No diffusion restriction.

CONCLUSION

Accurate detection of the underlying cause in seizure is very important for planning appropriate management. The multiplanar imaging and excellent gray-white matter resolution of MRI helps in the better delineation and characterization of the lesions/abnormalities. MRI is a non invasive modality with no radiation hazard and can reliably identify and localize intracranial abnormalities that cause seizures and hence useful in further management of the patient.

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