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MAGNETIC RESONANCE IMAGING SPECTRUM IN EPILEPSY IN PEDIATRIC AGE GROUP.

Radio-Diagnosis

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ABSTRACT

A seizure is a paroxysmal alteration in neurological function resulting from abnormal excessive neuronal electrical activity(1) Electroencephalograph and neurosonogram are often the initial diagnostic workup for seizure activity. They have the benefits of being non-invasive and avoiding radiation exposure. Computed tomography is helpful in detection of calcific foci; however, it has the risk of radiation exposure. Magnetic resonance imaging (MRI) is the imaging modality of choice due to its ability to depict neuroanatomy, excellent gray white matter differentiation, status of myelination and detection of focal structural brain lesions(2).

KEYWORDS

Epilepsy, pediatrics age group.

INTRODUCTION

A seizure is a paroxysmal alteration in neurological function resulting from abnormal excessive neuronal electrical activity[1]. Seizures are caused by abnormal regulation of neuronal excitation and inhibition, resulting in a relative hyperexcitability.

About 5% children are at risk of experiencing a seizure and half of them encounter the first seizure in infancy. Prevalence is greater in the neonatal period (almost 1% in term and 20% in preterm)[2]. Seizures are most likely associated with temporal lobe lesions[3], but various spectrum of etiology ranging from infections to tumours results in seizures[4].

Paediatric epilepsy presents with various diagnostic challenges. Recent advances in neuroimaging have aided in the diagnosis, management, and treatment of paediatric epilepsy[5].

MRI is the imaging modality of choice for the evaluation of patients with epilepsy and has been shown to be superior to CT for the detection of cerebral lesions.

Classification of Seizures[6]

1. Partial seizures

a. Simple partial seizures (with motor, sensory, autonomic, or psychic signs) b. Complex partial seizures c. Partial seizures with secondary generalization

2. Primarily generalized seizures

a. Absence (petit mal) b. Tonic-clonic (grand mal) c. Tonic d. Atonic e. Myoclonic

3. Unclassified seizures

a. Neonatal seizures b. Infantile spasms

Causes of seizures :

Neonates (< 1 month) :

- Perinatal hypoxia and ischemia, Intracranial haemorrhage and trauma, Acute CNS infections, Metabolic disturbances, Drug withdrawal, Developmental disorders, Genetic disorders.

Infants and children (> 1 month to < 12 years):

- Febrile seizures, Genetic disorders, CNS infections, Developmental disorders, Trauma, Idiopathic

Age group of more than 12 years :

- Trauma, Genetic disorders, Infection, Brain tumours, Idiopathic

AIM

To study the imaging spectrum of etiology of epilepsy in pediatric age group.

OBJECTIVES

The objectives of our study was to study the cross sectional MR imaging profile in children and to analyze the etiology of early onset epilepsy.

METHODOLOGY

The study was performed from January 2021 to October 2021 on 50 children who presented with epilepsy to Gadag institute of medical sciences Gadag. They were evaluated clinically and underwent MRI of the brain using a 1.5 Tesla MRI scanner PHILIPS using head coil. IV gadolinium contrast was used wherever indicated. Children with any known contraindication to MRI were excluded.

Study Design

- Time bound clinical study.
- All patients who were referred to Department of Radio-Diagnosis with clinical symptoms and signs of seizures. MRI was performed with the 1.5 Tesla MRI scanner PHILIPS.

Duration of study – 10 months

Results

Table 1: Gender distribution of study population.

	No. of patients	Percentage
Male	24	48%
Female	26	52%

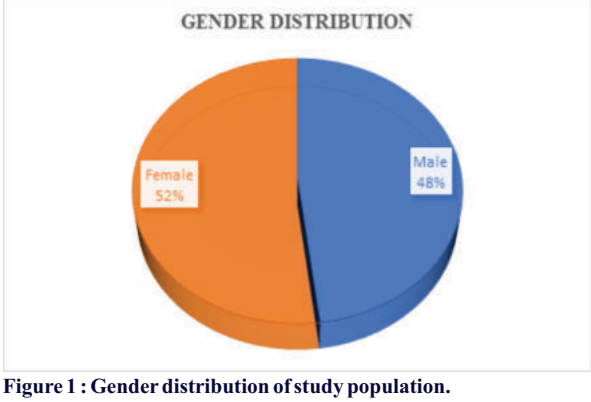

Figure 1 : Gender distribution of study population.

Table 2 : Type of seizures

Type of seizure	Number of patients	Percentage
GTCS	29	58%
Simple/complex partial	11	22%
Absence	5	10%
Myoclonic	2	4%
unclassified	3	6%

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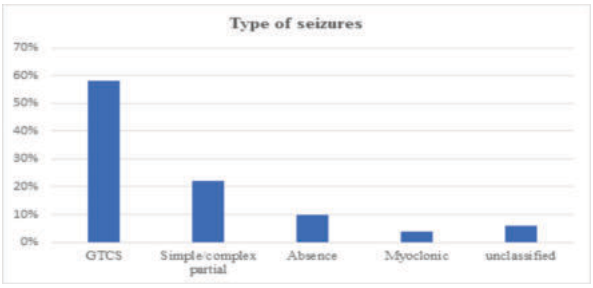

Figure 2 : Type of seizures

Table 3 : Distribution Of Seizure Based On Onset.

Onset of seizures	number of cases	percentage
Acute	31	62%
Chronic	19	38%

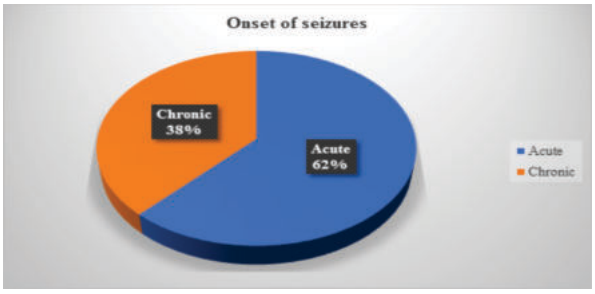

Figure 3 : Distribution of seizure based on onset.

Table 4 : MRI findings in study population.

MRI pathology	No. of patients	Percentage
Idiopathic	20	40%
Sequalae of old vascular insult	18	36%
Mesial temporal sclerosis	7	14%
Arachnoid cyst	2	4%
Neuroglial cyst	1	2%
Occipital meningocele	1	2%
Posterior reversible encephalopathy syndrome	1	2%

DISCUSSION

Patients presenting with seizures can have wide range of MR imaging abnormalities depending upon the etiology. MRI can reliably identify and localize the intracranial abnormality so that further management can be planned accordingly. In our study 50 patients were studied by MRI.

Seizure Type And Duration

Patients presented with seizures of varying duration ranging from few days to few months and even sometimes in years. 62% of the patients had an acute onset of seizures of less than 1 month duration. 38 % of patients had a chronic history of seizures (of more than 3 months) and were known epileptics on medication. With regard to the seizure type, GTCS was the most common constituting about 58% of patients followed by Simple/Complex partial seizures (22%). Absence, Myoclonic and unclassified type of seizures were 10, 4 and 6% respectively.

- Gliosis : 18 patients suffered from old infarct with gliosis , sequalae of old vascular insult.

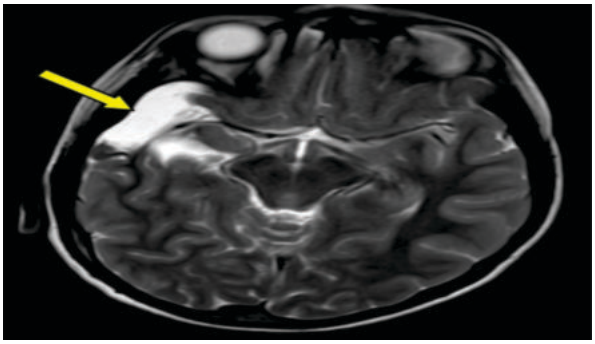

Figure 4 : 8 year old patient with k/c/o seizure disorder since birth. T2 and FLAIR image showing old infarct with cystic encephalomalacia and adjacent gliosis in right anterior temporal lobe.

- Mesial temporal sclerosis: 7 patients were diagnosed with mesial temporal sclerosis on MRI. The common findings on MRI were loss of undulations, volume loss and high FLAIR signal on the affected side.

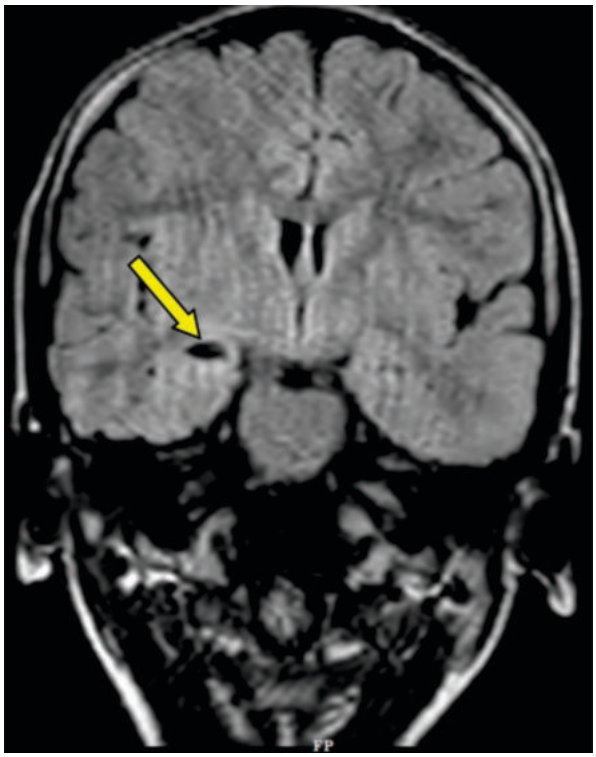

Figure 5 : 8 year old patient with k/c/o seizure disorder since 4 year. MRI shows volume loss with FLAIR hyper intensity in right hippocampus- Mesial temporal sclerosis.

- Arachnoid cyst : 2 patients had arachnoid cyst. One involving retrocerebellar region causing mild mass effect over cerebellar parenchyma and mild scalloping of occipital bone. Another patient in right sylvian fissure, causing mass effect over adjacent temporal lobe. On MR it appears as well-defined extra axial fluid signal intensity lesion .

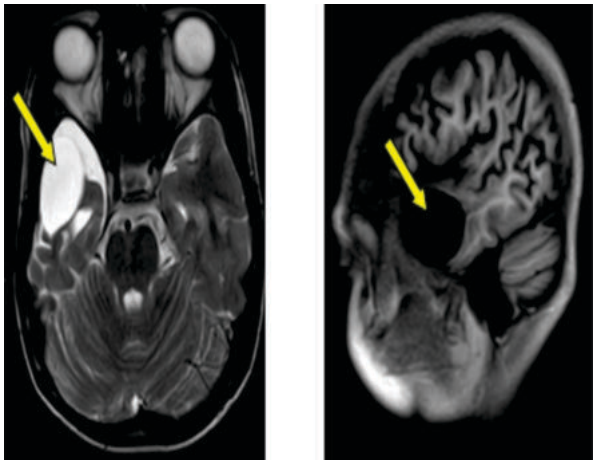

Figure 6 : 14 years old patients with 2 episodes of seizures. MRI shows well-defined extra axial fluid signal intensity lesion m/s 3.6x2.3cm in the right temporal region causing mass effect over adjacent temporal lobe - arachnoid cyst.

- Neuroglial cyst : one patients had Small neuroglial cyst noted in the medial temporal lobe on the right side. On MR it follow CSF signal, hypointense on T1 and hyperintense on T2.

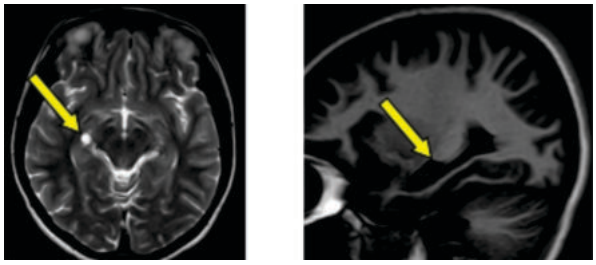

Figure 7 : 16 year old patient with 3 months history of GTCS. MRI shows hypointense on T1 and hyperintense on T2 lesion in the right medial temporal lobe - Neuroglial cyst

- Occipital meningocoele : one patient had protrusion of occipital meninges through defect in the skull at the level of foramen. No herniation of neuroparenchyma.

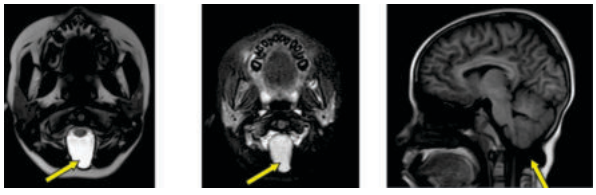

Figure 8 : 10 year old patient with h/o seizure 5 days back. T1, T2, FLAIR shows protrusion of occipital meninges at the level of foramen magnum - Occipital meningocele

- Posterior reversible encephalopathy syndrome: One patient showesT2/FLAIR hyperintensity is seen in the subcortical white matter of bilateral high frontal, temporal and parieto-occipital lobes.

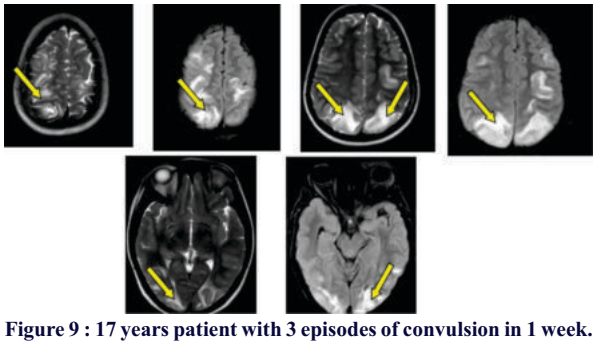

Figure 9 : 17 years patient with 3 episodes of convulsion in 1 week. MRI showsT2/FLAIR hyperintensity is seen in the subcortical white matter of bilateral high frontal and parieto -occipital lobes - Posterior reversible encephalopathy syndrome

CONCLUSION

MRI plays a vital role in early diagnosis of the cause of epilepsy thus helping in planning early and appropriate treatment in pediatric age group. MR imaging not only identifies specific epileptogenic substrates, but also determines specific treatment and predicts prognosis. In the evaluation of pediatric patients with seizure disorder, it is important to arrive at an accurate diagnosis of the cause of seizure for treatment decision. As a versatile imaging tool for pediatric patients with seizures, MRI has emerged as a popular choice because of its high spatial resolution, excellent inherent soft tissue contrast, multiplanar imaging capability, and lack of ionizing radiation[5,7].

Hence we conclude that MRI play a significant role in patients presenting with seizures and diagnostic modality must be performed to confirm or rule out any organic or developmental lesions.

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