IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 8 Ver. 8 (August. 2018), PP 01-06
www.iosrjournals.org

"Evaluation of Seizure by MRI in a Tertiary Care Hospital"

Dr. Kumar Ashok Charan1, Dr. Parthasarathy K R[2], Dr. Krishnarjun[3]
Dr. Veeresh U Purad[4.]

1. Joint Director, Department Of Radiology and Imaging, Bokaro General Hospital, Bokaro, Jharkhand.
2 .Prof and HOD, Department of radio diagnosis, SSIMS and RC, Davangere, Karnataka
3. And 4 - residents, Department of radio diagnosis, SSIMS and RC, Davangere, Karnataka
Corresponding Author: Dr. Kumar Ashok Charan

Abstract:
Introduction: *A seizure is a paroxysmal alteration in neurological function resulting from abnormal excessive neuronal electrical activity.[1] The pathophysiologic basis of seizures is loss of normal regulation of neuronal excitation and inhibition, resulting in a state of relative hyperexcitability.[2] Epilepsy is a chronic condition characterized by recurrent seizures unprovoked by an acute systemic or neurologic insult; the term itself does not indicate a specific underlying pathology.[2,3]*
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.
AIM:
To assess the spectrum of pathology of seizure disorders on MRI.
Materials and methods: *Hospital based cross-sectional study was conducted in the Department of Radiodiagnosis, SSIMS &RC, Davangere from January2017-January2018. 72 patients with Seizure disorder were selected which are evaluated by 1.5 Tesla MRI and this study also included the seizure patients who underwent MRI imaging in Department Of Radiology and Imaging, Bokaro General Hospital, Bokaro, Jharkhand.*
Observation And Results: *MR examination revealed pathological findings in 31 out of 72 patients which includes, mesial temporal sclerosis (22.5%), Stroke (22.5%), Infections*
(16.1%), Developmental disorders (12.9%), tumours/vascular abnormalities (19.3%)
and Phacomatosis (6.4%).
Conclusion: *MRI play a significant role in patients presenting with seizures and helps to identify the cause of the seizures. Common neuroimaging abnormalities associated with seizures were mesial temporal sclerosis, cerebrovascular diseases, neoplasms, vascular*
malformations, infections and developmental malformations.

Date of Submission: 06-08-2018 Date Of Acceptance: 20-08-2018

I. Introduction

A seizure is a paroxysmal alteration in neurologic function resulting from abnormal excessive neuronal electrical activity.[1] Epilepsy is a chronic condition characterized by recurrent seizures unprovoked by an acute systemic or neurologic insult; the term itself does not indicate a specific underlying pathology.[2,3]

The incidence of epilepsy is approximately 0.3 to 0.5% and prevalence of epilepsy estimated as 5 to 10 persons per 1000. It is age dependant and higher in children and elderly persons than in young adults. [5]Most of the patients suffering from this disease have good control of this disease with the use of antiepileptic drugs. However upto 20% of patients continue to have seizures despite the best medical treatment. [7]

In clinical practice in order to diagnose and find out the etiology of the lesion, there are many neuro radiological investigations that can be utilized, and most commonly used radiological investigation is Magnetic resonance imaging.

Pathophysiology: The Pathophysiology of epilepsy is incompletely understood. Seizures are result of a shift in the normal balance of excitation and inhibition within the central nervous system. These observations emphasize that the concept that the many cause of seizures and epilepsy result from a dynamic interplay between endogenous factors, epileptogenic factors and precipitating factors.[4]

Classification of Seizures

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 12-35 years :
- Trauma, Genetic disorders, Infection, Brain tumours, Illicit drug use, Idiopathic
  Older adults (> 35 years):
- Cerebrovascular disease, Brain tumor, Alcohol withdrawal, Metabolic disorders, Alzheimer and degenerative diseases, Idiopathic

Optimizing the lesion detection:

The MR imaging plays major role in the detection of causes of the seizure disorder. Improved lesion detection requires both a dedicated epilepsy protocol and the interpreting radiologist's familiarity with common causes of epilepsy[8] Examinations performed at 3 T have a better signal-to-noise ratio and better contrast resolution of the gray-white matter junction than do those performed at 1.5 T. Both lesion detection and characterization are improved with 3-T MRI [7]

Our study was conducted by performing by using 1.5 Tesla, GE MRI, and basic sequences used are: Axial T1 and T2, Axial / Coronal Flair, GRE, High resolution 3D FSPGR, STIR, DWI/ ADC, Hippocampal series, MRS and Post contrast T1, Perfusion study.

II. Methodology

Source of data: The study included patients being referred to Department of Radiodiagnosis and Neurology, S. S. Institute of Medical Sciences & Research Centre, Davangere, Karnataka with seizure disorders. This study also includes the seizure patients who underwent MRI imaging in Department Of Radiology and Imaging, Bokaro General Hospital, Bokaro, Jharkhand.

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 GE HDXT 1.5 Tesla machine.

Inclusion criteria :

- Patients with seizure disorders. (First onset or otherwise)
- Patients of all age groups will be included in the study.

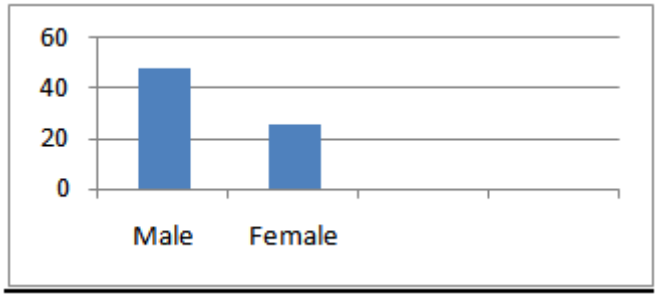
Exclusion criteria :

- Patients with recent trauma.
- Patients with absolute contraindication for MRI. (Patients with metallic implants, cochlear implants, cardiac pacemakers)
- Patients who are unwilling for imaging.

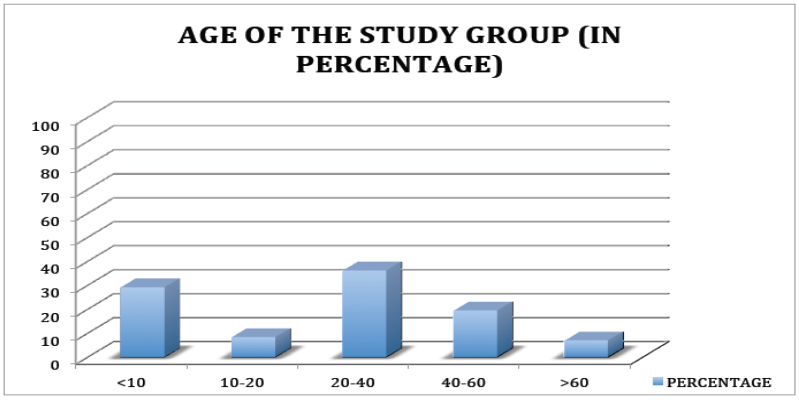
Duration of study - 1 years (including follow up)

III. Results

Gender	Number of patients	Percentage
Male	47	65.3
Female	25	34.7



Age group	Number of patients	Percentage
<10	21	29.1
10-20	06	8.3
20-40	26	36.1
40-60	14	19.4
>60	05	6.9



MRI Pathology	Number of patients	Percentage
Idiopathic	41	56.9
Mesial temporal sclerosis	7	9.7
Stroke / Gliosis	7	9.7
Tumors / Vascular malformations	6	8.3
Developmental disorders	4	5.5
Infections	5	6.9
Phacomatosis	2	2.7

IV. 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 72 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. 59.7% of the patients had an acute onset of seizures of less than 1 month duration. 29.1% 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 51.3% of patients followed by Simple/Complex partial seizures (16.6%). Absence, Atonic/Myoclonic and unclassified type of seizures were 12.5, 9.7 and 9.7% respectively. [9] It was also observed that MR positivity was more in myoclonic seizures, temporal lobe seizures, absence seizures and motor seizures than most commonly referred GTCS cases.

ROLE OF MRI:

The MR examination revealed pathological findings in 31 out of 72 patients (43.1%) which includes, mesial temporal sclerosis (22.5%), Stroke (22.5%), Infections (16.1%), Developmental disorders (12.9%), tumours/vascular abnormalities (19.3%) and Phacomatosis (6.4%).

Mesial temporal sclerosis:

7 patients were diagnosed with mesial temporal sclerosis on MRI. The most sensitive and specific MRI sequence was Coronal Oblique SPGR, which is the dedicated sequence for evaluating the hippocampus. The common findings on MRI were loss of undulations, volume loss and high T2/FLAIR/ SPGR signal on the affected side.[6]

Stroke/ Gliosis :

3 patients suffered from an acute non hemorrhagic infarct and 4 from gliosis secondary to a previous cerebrovascular accident. All the patients had pathology confining to the temporal or occipital lobes. On MRI, DWI and ADC were the sensitive sequences in non hemorrhagic infarcts and the GRE sequence was sensitive for hemorrhagic insults. MRA showed loss of flow voids on the affected territories.

Infections:

5 patients had CNS infections presenting with seizures, 3 had Neurocysticercosis and 2 had bacterial meningitis.

Neurocysticercosis :

The 3 patients with NCC had multiple ring enhancing lesions in the bilateral cerebral hemispheres. Lesions shows T1 hypointense and T2 hyper intense contents. Some lesions showed cystic signals with eccentric speck within the lesion with perilesional edema while some showed blooming on SWAN which denotes the calcified nodular stage. All patients had multiple intra parenchymal lesions of different stages.

Meningitis:

2 out of the 5 patients with history of fever and seizures were diagnosed as meningitis on CSF analysis. In both patients there was post contrast leptomeningeal enhancement seen in the sulcal spaces of brain parenchyma. One of the patients also had enhancing basal exudates.

Developmental disorders:

4 patients showed the features of developmental disorders. One patient was diagnosed with polymicrogyria of fronto-parietal lobe. Two patients developed HIE where one had progressed to cystic Encephalomalacia. One patient had corpus callosal agenesis.

Neoplasms:

4 patients (12.9%) were diagnosed as neoplasms of which 2 patients were gliomas, 1 meningioma and one patient was diagnosed with DNET (dysembryonic neuroepithelial tumour)

Glioma :

Two patient revealed low grade glioma on MRI. MRI features included lesions hypointense on T1WI andhyperintense on both T2WI and FLAIR sequences. Mild perilesional restriction with mild mass effect was seen. MRS showed elevated choline peak in both cases and the lesions showed no contrast enhancement. The above features suggestive of low grade glioma.

Meningioma :

One patient revealed the features of meningioma in frontal convexity. Well defined extra axial, enhancing SOL noted in left anterior frontal convexity, measuring 5x4 cm. It was dural based lesion with dural tail at its margin revealed subtle cortical hyperostosis of the roof of the left orbit. Perilesional edema extending into adjacent white matter compressing the lateral ventricle. The lesion was compressing the underlying cerebral parenchyma and causing midline shift.

DNET:

One patient, who is a known case of epilepsy since 4 years underwent

MRI, which revealed an abnormal high signal lesion on T1, T2 and FLAIR images with blooming on GRE images was seen at the right temporal lobe. The lesion shows post contrast 114 enhancement with choline-creatinine peak on MRS. Histopathology revealed neuroepithelial cells with increased nuclear: cytoplasmic ratio and the diagnosis of DNET was made.

Cavernoma :
2 patients revealed well defined focal non enhancing lesion showing blooming on GRE in the sub cortical white matter of left frontal lobe in one patient and the left cerebellar hemisphere in another patient with complete hypointense rim. One patient also had an associated non hemorrhagic infarct of the left temporoparietal region on MRI

Phacomatosis :
Two patients with clinical diagnosis of phacomatosis had undergone MR neuroimaging. One was diagnosed to have tuberous sclerosis and the other sturge weber syndrome.

Tuberous sclerosis:
On MRI, one patient showed left frontal lobe subependymal nodules and bilateral frontal, right temporal, bilateral occipital and left parietal multifocal small white matter linear and patchy hyperintense lesions on T1WI. No mass effect or perilesional edema. Bilateral parietal periventricular cystic changes were noted.

Sturge Weber syndrome:
One patient revealed MR features of Sturge-weber syndrome showing linear gyriform cortical/subcortical calcifications on GRE with high signal on FLAIR are seen in bilateral parieto-occipital lobes linear gyriform cortical/subcortical calcifications on GRE with high signal on FLAIR are seen in bilateral parieto-occipital lobes.

V. Conclusion

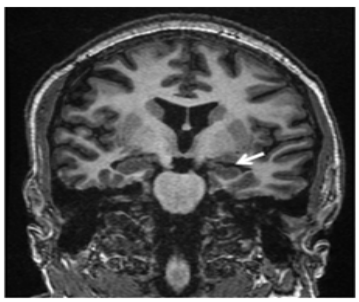
Accurate diagnosis of the cause of seizure is crucial for finding an effective treatment. MRI has been shown to be highly sensitive and specific in identifying the underlying pathology in seizures. With its high spatial resolution, excellent inherent soft tissue contrast, multiplanar imaging capability and lack of ionizing radiation, MR imaging has emerged as a versatile tool in the evaluation of patients with seizures. MR imaging not only identifies specific epileptogenic substrates, but also determines specific treatment and predicts prognosis. Employing appropriate imaging protocols and reviewing the images in a systemic manner helps in the identification of subtle epileptogenic structural abnormalities. This study was carried out in 72 patients with clinical impression of seizures by

subjecting them to magnetic resonance imaging and revealed pathological findings in 31 out of 72 patients (43.1%) which includes, mesial temporal sclerosis (22.5%), Stroke (22.5%), Infections (16.1%), Developmental disorders (12.9%), tumours/vascular abnormalities (19.3%) and Phacomatosis (6.4%).

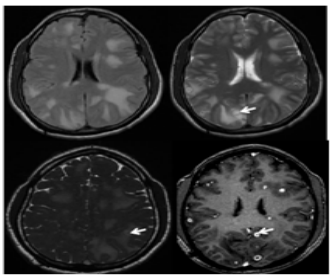
MR imaging is superior neuroimaging with no radiation exposure and It's ability in identifying subtle lesions, location, extent of the lesions and amount of findings are excellent. This could be the first investigation of choice in different CNS disorders.

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

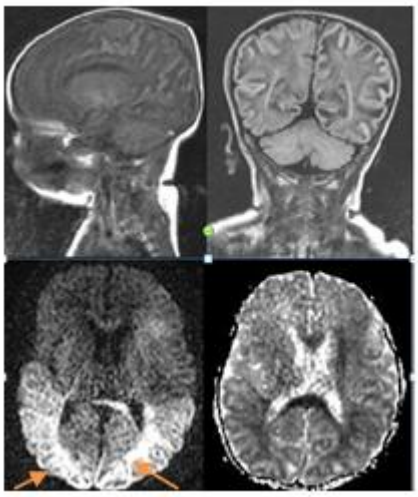
CASES



33 year old male patient who is a known case of epilepsy since 7 years.
MRI of this patient showed loss of undulations and volume of the left hippocampus (White arrow) with prominence of the left temporal horn indicative of left mesial temporal sclerosis.



35 year old patient with history of GCTS since 15 days. MRI of this patient showed disseminated NCC in various stages (white arrows).



8 day old infant with h/o seizures, MRI showed hypoxic ischemic encephalopathy

References

[1]. Scott N. Atlas. Magnetic Resonance Imaging of the brain and spine. 4th edn., .p. 2-14, 307-339.
[2]. Gupta V, Ronen RA. Epilepsy. In: Atlas SW. ed. Magnetic resonance imaging in brain and spine. 4th edition. Philadelphia. Lippincott Williams & Wilkins;2009. Fauci SA, Kasper DL, Longo DL, Braunwald E, Hauser SL, Jameson JL et al editors. In Harrison's principles of internal medicine.17th edition, Newyork.:McGraw- Hill;2008. Chapter 363,Seizures and epilepsy.
[3]. Goodridge DMG, Shorvon Sd. Epileptic seizures in a population of 6000 demography, diagnosis and classification and role of the hospital services. Br Med J
[4]. 1983; 287:641-647.
[5]. Seizures and epilepsoy, Lowertein DH in section 2 diseases of the central nervous system, Chapter-348, Harrison's principles of internal medicine, Kasper DL, Fauci AS, Longo LD, Braunwald E, Houser SL, Jameson JL (edt), 16th edn., Vol. II, New York : McGraw Hill; .p.2357-2372.
[6]. Jagruti P Sanghvi, Surekha B Rajadhyaksha, Meher Ursekar. Spectrum of congenital CNS malformations in pediatric epilepsy. Indian Pediatr 2004 Aug;41(8):831-8.
[7]. Yamamoto Junichi et al, Low-frequency electric cortical stimulation has an inhibitory effect on epileptic focus in mesial temporal lobe epilepsy. Epilepsia 2002 May;43(5):491-5
[8]. Duncan J. The current status of neuroimaging for epilepsy. Curr Opin Neurol. 2009;22(2):179-84.
[9]. E Rahimian, M Tahsini, R Abolfazli. Evaluation of MRI findings in 198 cases of focal seizure. The Internet Journal of Neurology. 2006 Volume 8 Number 2.
[10]. Wieshmann UC. Clinical Application of Neuroimaging in Epilepsy. J Neurol Neurosurg Psychiatry 2003; 74: 466-70.

Manisha Bhagat "Safety Comparison of Cisatracurium And Atracurium In Patients Undergoing General Anaesthesia."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 8, 2018, pp 01-06