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Study Of Evaluation Of Role Of MRI In Detecting Brain Lesions Of Seizure Disorder Patients.

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ABSTRACT

MRI is much superior to X-ray CT in terms of its sensitivity and specificity for identifying lesional epilepsies, which commonly include hippocampal sclerosis and malformations of cortical development.This retrospective study included 120 patients with seizures who underwent MRI at a tertiary care hospital. Data on age, gender, neurological findings, duration of seizure disorder, clinical diagnosis, and MRI abnormalities were collected and analyzed. The majority of the patients were in the age group of 21-30 years (26.67%) followed by 11-20 years (19.17%). Male patients (56.67%) outnumbered female patients with a male-to-female ratio of 1.31:1. Most patients had normal neurological findings (76.67%). Generalized tonic-clonic seizures (77.50%) were the most common clinical diagnosis. Abnormal MRI findings were observed in 43.33% of the patients. Infarct (25.00%) and tuberculoma (19.23%) were the most common MRI abnormalities. In this study, the majority of the patients with seizures had normal neurological findings and generalized tonic-clonic seizures were the most common clinical diagnosis. Abnormal MRI findings were observed in almost half of the patients, with infarct and tuberculoma being the most common abnormalities. The results of this study emphasize the importance of considering MRI in the evaluation of patients with seizures, especially when there are atypical clinical features or when the seizures are refractory to medical therapy.

Keywords: seizure disorder, epilepsy, clinical diagnosis, MRI abnormalities

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INTRODUCTION

MRI is much superior to X-ray CT in terms of its sensitivity and specificity for identifying lesional epilepsies, which commonly include hippocampal sclerosis and malformations of cortical development [1]. Identification of a structural lesion is often but not always a reliable indicator of the site of seizure onset [2]. MRI can offer the prediction of surgical outcome and may hold promise in the future for dimensional localization of seizure focus [3]. MRI is widely available for clinical use; it has brought on revolutionary changes in the management of patients with seizure disorders [4]. With its higher sensitivity, better spatial resolution, excellent soft tissue contrast, multiplanar imaging capability and lack of ionizing radiation it has emerged as the primary modality of choice in the evaluation of seizure disorder [5, 6]. MRI is an excellent tool for detecting anatomic substrates that underlie regional brain epileptogenesis and aids in formulating a syndromic or etiological diagnosis so as to plan further management as surgery or pharmacotherapy [7-9].

Hence, revolutionary introduction of MRI for evaluation of seizures has been a great boon and a versatile tool, both for the diagnosis of cerebral lesions as well as clinical management of patients with neurologic disorders [10]. The role of MRI in seizure disorders in identifying the epileptogenic focus, also lies in its ability to depict topographic relationships between epileptogenic lesion and the eloquent regions of brain. MRI may detect reasons for failure such as inadequate resection and can monitor tumor recurrence on follow up imaging and useful for prognosticating postoperative seizure control also. [11] In this context of revolutionary role of MRI, we focused to evaluate its role in detecting degree and extent of brain lesions of seizure disorder patients as well as correlate with clinical status in this study.

MATERIAL AND METHODS

The present study was a prospective, cross-sectional study conducted over a period of two years from October 2020 to September 2022 in the Department of Radiodiagnosis of a tertiary care teaching hospital located in Central India. The study population consisted of all consecutive 120 patients with clinically diagnosed seizure disorder who were referred to the department for MRI brain during the study period.

Patients of all age groups and both genders with clinically diagnosed seizure disorder were included in the study. Patients with a history of claustrophobia, metallic implants insertion, cardiac pacemakers, metallic foreign body in-situ, chronic illness that would limit their activities of daily living such as cerebral palsy, pregnant women, and patients not willing to sign the informed consent form were excluded from the study.

At the time of enrolment, demographic characteristics such as age and gender were noted for all patients. Clinical characteristics such as neurological signs, associated symptoms, duration of seizure disorder, clinical diagnosis, and MRI diagnosis were also recorded.

All enrolled patients were initially screened for the study and were explained the study procedure, including the risks of contrast examination, in their native language. Those who were willing to participate and signed the informed consent document were included in the study.

MRI examination of the brain was performed on all patients using a 1.5 Tesla MRI scanner with a standard head coil. The imaging protocol included T1-weighted sagittal, axial, and coronal planes, T2-weighted sagittal, axial, and coronal planes, fluid-attenuated inversion recovery (FLAIR) axial plane, T2-weighted gradient-echo (GRE) axial plane, T2-weighted fluid-attenuated inversion recovery (FLAIR) axial plane, T2-weighted coronal plane, and contrast-enhanced T1-weighted axial and coronal planes. The contrast agent used was gadolinium-diethylenetriaminepentaacetic acid (Gd-DTPA), with a dose of 0.1 mmol/kg of body weight, administered intravenously.

All MRI images were reviewed by two experienced radiologists independently who were blinded to the patients' clinical details. The MRI findings were classified as normal or abnormal based on the presence of any structural lesion such as cyst, hemorrhage, infarct, or neoplasm. Any discrepancies between the two radiologists were resolved by consensus.

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RESULTS

Majority of the patients were in age group of 21 – 30 years (26.67%) followed by 11 – 20 years (19.17%), 31 – 40 years (16.67%), and ≤ 10 years (14.17%). The age of the patients ranged from 3 months to 75 years with a mean 28.67 ± 16.98 years.

Majority of the patients were males (56.67%) with a male-to-female ratio of 1.31:1.

Majority of the patients had normal neurological findings (76.67%). However, 15.83% patients had motor system abnormality, 5.83% had papilledema, and 1.67% had altered sensorium.

Majority of the patients had seizuredisorderfor 30 – 90 days (73.33%) followed by > 90 days (22.50%). While, 5 (4.17%) patients had seizuredisorderfor < 30 days. The duration of seizuredisorder ranged from 20 to 150 days with a mean 70.94 ± 31.07 days.

Table 1: Distribution of patients according to clinical diagnosis

Clinical diagnosis	N (=120)	%
GTCS	93	77.50
Simple partial seizure	9	7.50
Complex partial seizure	7	5.83
Myoclonic seizure	5	4.17
Febrile seizure	3	2.50
Absence seizure	2	1.67
Temporal lobe seizure	1	0.83

Majority of the patients had GTCS (77.50%) followed by simple partial seizure (7.50%), complex partial seizure (5.83%), and myoclonic seizure (4.17%). While, least number of patients had temporal lobe seizure (0.83%).

Table 2: Distribution of patients according to presence of MRI abnormalities

MRI abnormalities	N (=120)	%
Present	52	43.33
Absent	68	56.67

Majority of the patients had normal MRI findings (56.67%), while remaining had MRI abnormalities (43.33%).

Table 3: Distribution of patients according to MRI findings

MRI abnormalities	N (=52)	%
Infarct	13	25.00
Tuberculoma	10	19.23
Neurocysticercosis	9	17.31
Mesial temporal sclerosis	6	11.54
Meningioma	4	7.69
Sinus thrombosis	4	7.69
Cavernoma	3	5.77
IP bleed	2	3.85
Developmental malformation	1	1.92

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Table 4: Correlation of clinical diagnosis with MRI findings

Clinical diagnosis		MRI positivity	
	N	N	%
GTCS	93	49	52.69
Simple partial seizure	9	5	55.56
Complex partial seizure	7	7	100
Myoclonic seizure	5	4	80
Febrile seizure	3	3	100
Absence seizure	2	2	100
Temporal lobe seizure	1	0	0

Of 93 patients with GTCS, MRI abnormality was detected in 49 (52.69%) patients. Similarly, 55.56% of simple partial seizure, 80% of myoclonic seizure, and 100% of complex partial seizure,febrile seizure, and absence seizure were identified on MRI. However, one patient of temporal lobe seizure was not detected on MRI.

Majority of the patients of infarct were present in 31 – 40 and 21 – 30 years age group. Tuberculoma, neurocysticercosis, MTS, and meningioma were mainly present in patients belonging to age group of 21 – 30, 51 – 60, 41 – 50, and 41 – 50 years, respectively. Moreover, normal MRI findings were mainly seen in patients belonging to age group of 11 – 20 years.

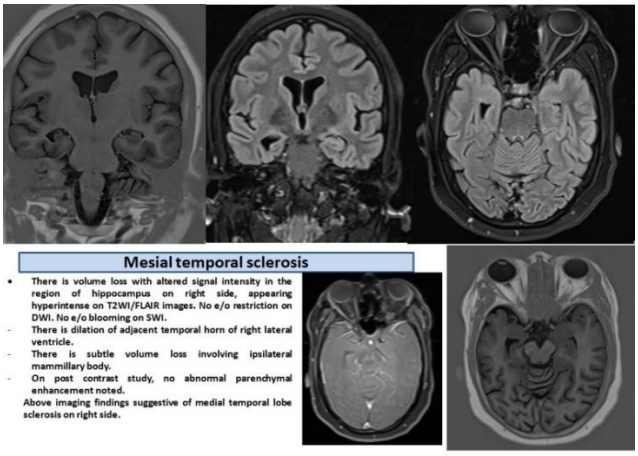

Figure 1: Mesial temporal Sclerosis

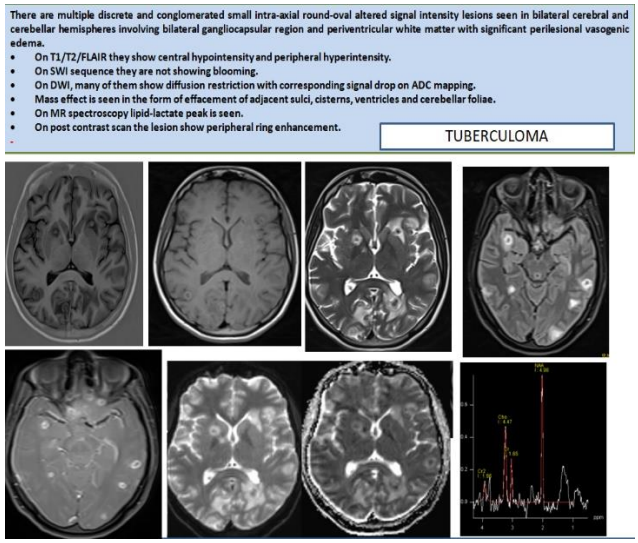

Figure 2: Tuberculoma

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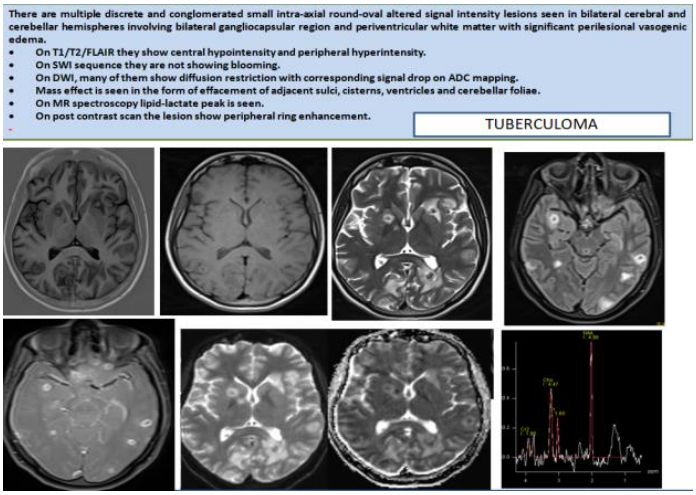

Figure 3: Tuberculoma

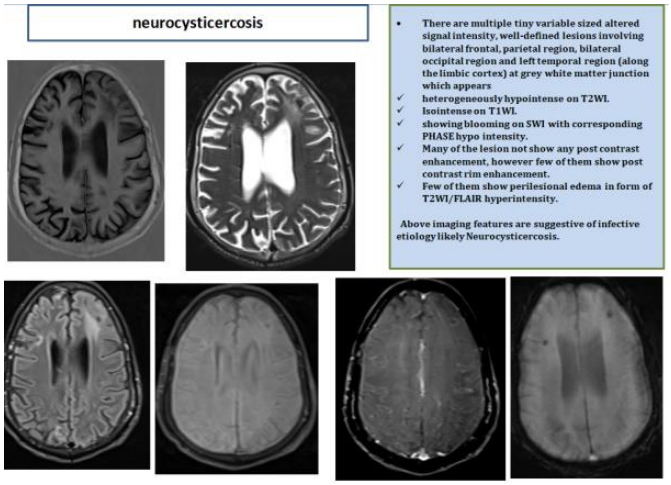

Figure 3: Neurocysticercosis

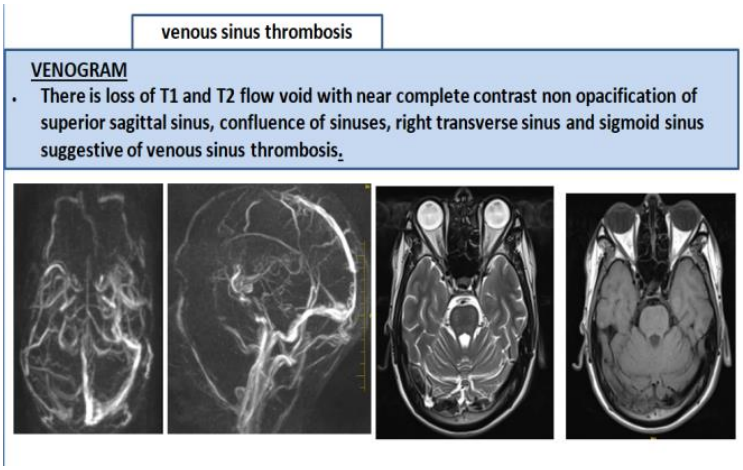

Figure 4: Venous sinus thrombosis

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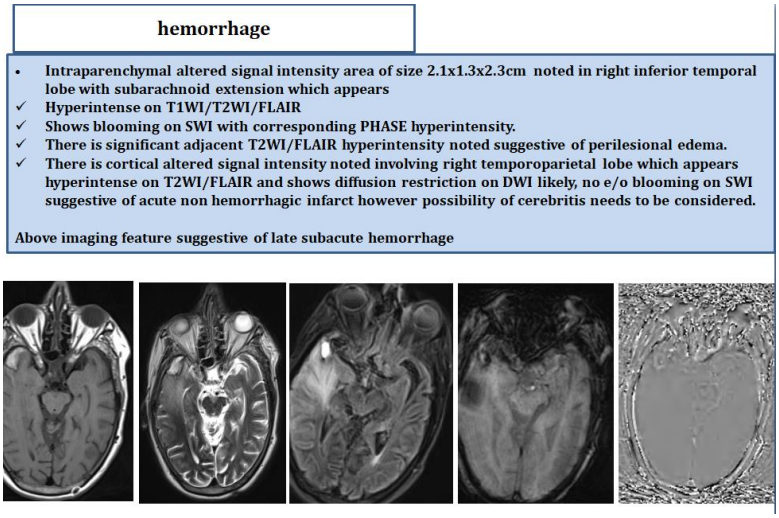

Figure 5: Hemorrhage

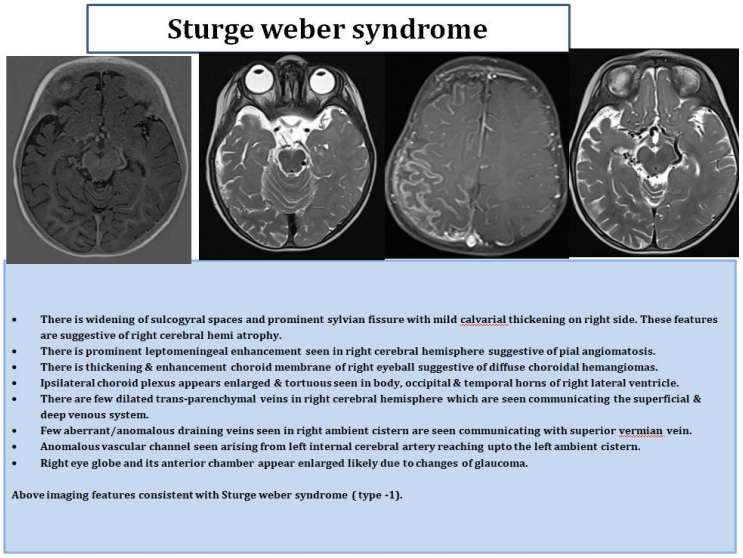

Figure 6: Sturge weber syndrome

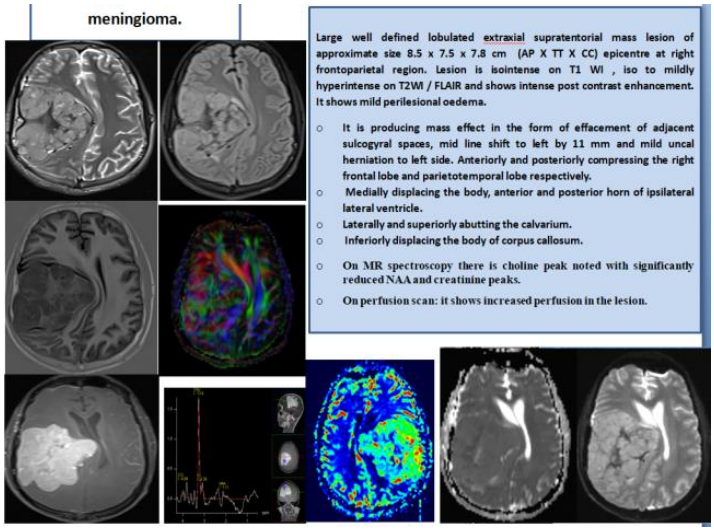

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Figure 7: Meningioma

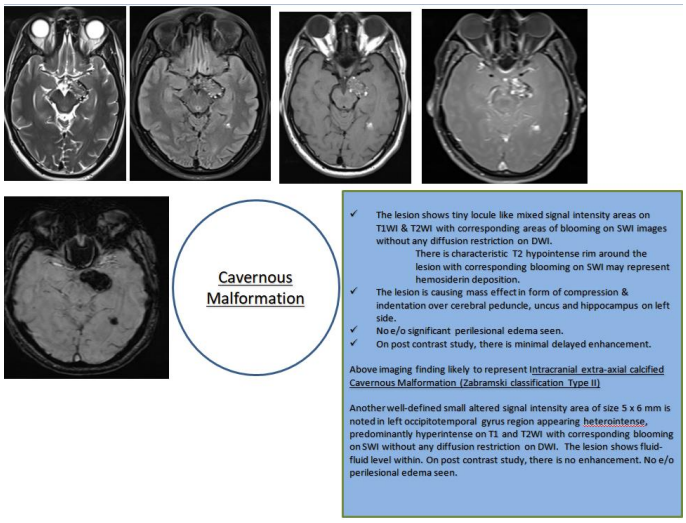

Figure 8: Cavernous Malformation.

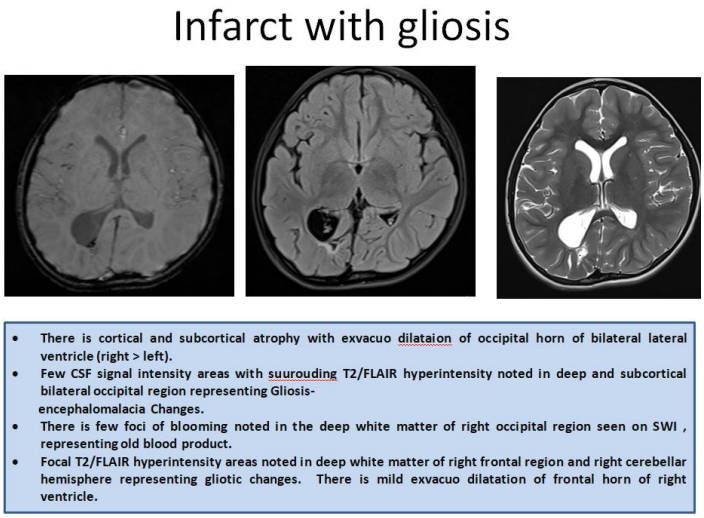

Figure 9: Infarct with gliosis.

DISCUSSION

The present study aimed to assess the clinical profile and MRI findings of patients with seizure disorder. The study included 120 patients with a mean age of 28.67 years. The majority of the patients were males (56.67%) with a male-to-female ratio of 1.31:1. Majority of the patients had normal neurological findings (76.67%) while a significant proportion of patients had motor system abnormality (15.83%), papilledema (5.83%), and altered sensorium (1.67%).

The most common clinical diagnosis in the present study was GTCS (77.50%), followed by simple partial seizure (7.50%), complex partial seizure (5.83%), and myoclonic seizure (4.17%). These findings are consistent with the existing literature, which suggests that GTCS is the most common type of seizure disorder.

In the present study, MRI abnormalities were detected in 43.33% of the patients, while 56.67% of the patients had normal MRI findings. The most common MRI abnormalities were infarct (25.00%), tuberculoma (19.23%), and neurocysticercosis (17.31%). These findings suggest that MRI is an important

diagnostic tool for patients with seizure disorder, as it can detect underlying structural abnormalities that may be responsible for the seizure disorder.

The correlation analysis between clinical diagnosis and MRI findings revealed that MRI abnormalities were detected in a significant proportion of patients with all types of seizure disorder. However, the proportion of patients with MRI abnormalities varied between different types of seizure disorder. For example, MRI abnormalities were detected in 52.69% of patients with GTCS, while all patients with febrile seizure and absence seizure had MRI abnormalities. These findings suggest that MRI should be considered as a routine investigation in patients with seizure disorder, irrespective of the clinical diagnosis.

The age distribution of the patients with different types of MRI abnormalities also provides interesting insights. For example, patients with infarct were mainly present in the age group of 31 – 40 and 21 – 30 years, while patients with tuberculoma, neurocysticercosis, MTS, and meningioma were mainly present in patients belonging to the age group of 21 – 30, 51 – 60, 41 – 50, and 41 – 50 years, respectively. These findings suggest that the age of the patient may be an important factor in determining the underlying etiology of seizure disorder.

In conclusion, the present study provides important insights into the clinical profile and MRI findings of patients with seizure disorder. The study highlights the importance of MRI as a diagnostic tool for patients with seizure disorder and suggests that MRI should be considered as a routine investigation in all patients with seizure disorder. The age distribution of the patients with different types of MRI abnormalities also provides interesting insights and may help in determining the underlying etiology of seizure disorder.

In the present study, most of the patients had normal MRI findings (56.67%), while remaining had MRI abnormalities (43.33%). Majority of the patients had infarct (25%) followed by tuberculoma (19.23%), neurocysticercosis (17.31%), and mesial temporal sclerosis (11.54%). In agreement with the present study, **Kushwah et al.** found that normal MRI findings were observed in 35% patients. While, 16% patients had infarct with gliosis, 17% had infective granuloma, 9% had glioma, 3% had meningioma, 2% had developmental malformation, 1% had atrophy, and 17% had miscellaneous findings. [12]In their study, **Patel et al.** observed that abnormal MRI findings were noted in 62% patients, rest of patients showed normal findings. Out of abnormal findings, the most common findings were chronic ischemic small vessels disease (16.7%), atrophy (13.3%), cystic encephalomalacia with gliosis (10%), neoplasms (8.7%), edema (7.3%) and acute infarct (7.3%) [13].

CONCLUSION

MRI because of its excellent inherent soft tissue contrast, multiplanner ability, and high spatial resolution has emerged as versatile tool in evaluation of all seizure disorder patients. MRI helps in evaluation of seizure disorder in terms of detection of underlying cause and find epileptogenic focus. With advent of newer sequence in MR technology it is helping clinicians for prognostication, management and follow up.

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