SPECTRUM OF ABNORMALITIES DETECTED ON MRI IN 250 CASES OF FOCAL EPILEPSY IN A TERTIARY CARE HOSPITAL

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ABSTRACT: BACKGROUND AND OBJECTIVES: The accurate diagnosis of the cause of the seizure is crucial for treatment and prognosis. MRI not only identifies specific epileptogenic substrates, but it has also increased substantially the ability to detect causes of seizure and to plan medical or surgical therapy. The aim of this study was to evaluate the role of MRI in detection, localization and characterization of the structural epileptogenic abnormalities in focal epilepsy. **MATERIALS AND METHODS:** This was a prospective study done on 250 patients (138 males and 112 females) of all the ages, with focal seizures presenting in OPD or IPD with exclusion of idiopathic generalized epilepsy, acute head trauma, febrile seizures, and acute infarct/haemorrhage cases. The study was done on 1.5 Tesla MRI using various protocols. Routine investigations [(Haemoglobin (HB), total leukocyte count (TLC) differential leukocyte count (DLC) and erythrocyte sedimentation rate (ESR)] were done in all the patients. Cerebrospinal fluid (CSF) and histopathological analysis were taken into account wherever available. **RESULTS:** MRI showed normal study in 108 cases (43.2%), 58 cases (23.2%) of neuroinfection, 39 cases (15.6%) of gliosis, 25 cases (10%) of neoplasms, 15 cases (6%) of developmental anomalies, two cases (0.8%) each of Rasmussen encephalitis and hypoxic ischaemic encephalopathy and one case (0.4%) of vascular anomaly. **CONCLUSION:**CNS granulomatous pathology (predominantly NCC) and gliosis / encephalomalacia were the two most common abnormalities detected on MRI. Majority of structural epileptogenic abnormalities are detected by MRI making it a superior neuroimaging modality with no radiation exposure and higher sensitivity but subtle abnormalities are missed giving false negative results therefore employing appropriate imaging protocols and performing dedicated pulse sequences is essential.
KEYWORDS: Epilepsy, Causes, MRI Spectrum.

INTRODUCTION: Epilepsy is a chronic neurological disorder characterized by spontaneous, recurrent seizures, caused by excessive and abnormal electrical discharge from cortical neurons. The incidence of epilepsy is approximately 0.3 to 0.5% and prevalence is approximately estimated to be five to tenpersons per 1000.[1] In clinical practice the assessment of patients presenting with seizures is a problem that the physician faces quite regularly. The evaluation and management of patients with seizure is essential for the patient's quality of life.With the recent advances in the neuroimaging, MRI has increased substantially not only the identification of the lesion but also determines specific treatment and predicts prognosis. It has been proven beyond doubts that MRI is the most meaningful procedure in the diagnosis.Rapid advances are being made in MRI techniques

so that patients who were previously regarded as being 'MRI negative' may have relevant abnormalities, which can be identified with contemporary optimal imaging.[2]

As compared with CT, MR imaging with its higher sensitivity, better spatial resolution, excellent soft tissue contrast, multiplanar imaging capability and lack of ionization emerged as primary modality of choice in evaluation of patients with epilepsy.[3]

This study was undertaken to evaluate the role of MRI in detection, localization and characterization of the structural epileptogenic abnormalities in focal epilepsy.

MATERIAL AND METHODS:Two hundred and fifty patients (138 males and 112 females) of all the ages, with focal seizure presenting in OPD or IPD were evaluated. Patients with idiopathic generalized epilepsy, acute head trauma, febrile seizures, and acute infarct/haemorrhage were excluded. The study was done on 1.5 Tesla MRI using various protocols (T1W axial, T2W axial, coronal and sagittal, T2W FLAIR axial, T2 FFE axialand T1 IR oblique coronal. Post contrast T1 and additional sequences were taken when required. Routine investigations [(Haemoglobin (HB), total leukocyte count (TLC) differential leukocyte count (DLC) and erythrocyte sedimentation rate (ESR)] were done in all the patients. Cerebrospinal fluid (CSF) and histopathological analysis were taken into account wherever available.

RESULTS: Out of the 250 patients included in the study, 138 patients (55.2%) were male and 112 patients (44.8%) were female, male to female ratio being 1.2:1. Maximum number of patients (72.8%) fall in the age group of 2-40 years.108 (43.2%) of the 250 patients in the study group had completely normal MRI findings whereas 142(56.8%) showed abnormalities.Of the rest of the 142 (56.8%) cases with abnormal MRI findings neuroinfection 58 (23.2%) and gliosis/encephalomalacia 39 (15.6%) were the two most common abnormalities seen in 38.8% cases Neurocysticercosiswas the most common granulomatous lesion detected on MRI. Granulomatous lesions were most frequently seen in 11-20 years of age group, while gliosis/ encephalomalacia wasmost frequently observed in older age group 51-60 years with second peak in 31-40 years age groups. Congenital/developmental disorders as name implies presented in age less than 40 years. Tumours were most commonly seen in age group older than 30 years whereas hypoxic ischemic encephalopathy manifested itself entirely in younger age (2-10 years). Similarly MTS predominantly presented in less than 40 years of age. Miscellaneous conditions like vascular anomalies were seen in 41-50 years.

DISCUSSION: Two hundred and fifty patients of focal epilepsy were studied, and it was found that majority of the cases (72.8%) belonged to 2-40 years of age group. Similar findings were reported by Sander et al [4] and Verma et al [5]but greater incidence was reported in older age group by Narayanan et al [6]. This could be explained by reflection of variation in etiological spectrum which differs from region to region.

Male predominance was noted, 138 patients (55.2%) were male and 112 patients (44.8%) were female, with male to female ratio being 1.2:1, which is in agreement with the other studies. [5, 7, 8]

We found positive MRI study in 56.8% of cases. Li et al [9] reported positive MRI in 74%, Rahimian et al [10]in 36% and koirala et al [11] in 55%. In contrast to our study, Li et al recorded abnormal MRI in 74% of the cases. Discordance was noted as majority lesions diagnosed were

developmental anomalies (44%) which are detected by high resolution dedicated MRI pulse sequences, used in their study. Rahimian et al reported increasednumber of normal MRI- 64% (127 out of 198) which can be attributed to infections, contributing good number of cases in our study resulting in increased percentage of abnormal MRI as compared to their where no such case was diagnosed.

In 43.2% cases no abnormality was detected on MRI. Most standard MR imaging protocols typically used to evaluate intracranial disease are suboptimal in the identification of subtleepileptogenic substrates, such as cortical dysplasia, hippocampal sclerosis and band heterotopias. Optimal imaging parameters (image orientation, slice thickness and pulse sequence) need to be employed to identify these substrates[12].

Neuroinfection was reported as the most predominant cause of focal epilepsy.Neurocysticercosis accounted for 36 cases (14.4%) followed by tuberculoma 19 cases (7.6%) and three cases of abscess. Following neuroinfection, gliosis formed second group accounting for 39 cases (15.6%). 25 cases (10%) were of neoplasms out of which 17 cases were of glioma, four cases each of meningioma and metastasis. Mesial temporal sclerosis accounted for nine (3.6%) cases, other developmental anomalies three cases, three cases (1.2%) of tuberous sclerosis, two (0.8%) cases each of Rasmussen encephalitis and hypoxic ischemic encephalopathy and one case of cavernous angioma were recorded.This correlates well the other Indian studies [5, 13, 14] where neuroinfections still predominates as a commonest cause of epilepsy.

Literature revealed haemorrhage/infarct as a commonest cause of focal epilepsy but in our study neuroinfection formed the bulk because cases of haemorrhage/infarct cases were excluded and variation in etiological spectrum differs from region to region.

The distribution of various MRI abnormalities differed among various age groups. In the younger age group developmental anomalies (6%) and ischemic insults (1.6%) predominated whereas gliosis (15.6%) and neoplasms (10%) were found in adult age group. Neuroinfections were noted in all the age groups with maximum cases in 11-20 years.

In a study by Solosrunggruanget al[15], young adults (15-34 years) and adult age groups (35-64 years) were made. It was observed that developmental anomalies were the most common aetiology in first group and vascular diseases for the latter group. Similar results on study of 160 patients were noted by koiralaet al[11]. In paediatric age group major abnormalities were hippocampal sclerosis and cortical atrophy whereas major abnormalities found in adults were space occupying lesions (27%), ischemia or infarcts (16.2%) and granulomatous lesions (11%). However in our study vascular diseases/ acute infarcts were placed in the exclusion criteria.

CONCLUSION: This study showed male predominance. CNS granulomatous pathology (predominantly NCC) and gliosis/encephalomalacia were the two most common abnormalities detected on MRI. Majority of abnormalities are detected making MRI a superior neuroimaging modality with no radiation exposure and more sensitivity but subtle abnormalities(developmental anomalies) are missedgiving false negative results therefore employing appropriate imaging protocols and performing dedicated pulse sequences are essential. MRI thus proves to be the best imaging modality for almost all pathologies, causing epilepsy.

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Age in years	Female	Male	Total	Percentage
<1	4	5	9	3.6
2-10	9	23	32	12.8
11-20	22	28	50	20.0
21-30	28	31	59	23.6
31-40	24	17	41	16.4
41-50	18	10	28	11.2
51-60	5	15	20	8.0
>60	2	9	11	4.4
Total	112(44.8%)	138(55.2%)	250	100.0

Table 1:Age and sex wise distribution

	Age group wise distribution								Total
MRI abnormality	<1	2-10	11-20	21-30	31-40	41-50	51-60	>60	
Normal	3	15	20	37	19	11	3	0	108
Mesial Temporal Sclerosis (MTS)	0	1	3	0	4	0	1	0	9
Neurocysticercosis	0	5	10	11	4	3	0	3	36
Gliosis	3	3	4	5	6	5	10	3	39
Tuberculoma	0	3	8	5	2	0	0	1	19
Meningioma	0	0	0	0	0	2	1	1	4
Metastasis	0	0	0	1	1	1	0	1	4
Glioma	1	0	1	0	5	4	4	2	17
Tuberous Sclerosis	1	1	1	0	0	0	0	0	3
Abscess	0	1	0	0	0	1	1	0	3
RasmussenEncephalitis	0	0	2	0	0	0	0	0	2
Cavernous angioma	0	0	0	0	0	1	0	0	1
Developmental Disorders	1	1	1	0	0	0	0	0	3
Hypoxic Ischemic Encephalopathy	0	2	0	0	0	0	0	0	2
Total	9	32	50	59	41	28	20	11	250

Table 2: Agegroup wise distribution of MRI abnormalities

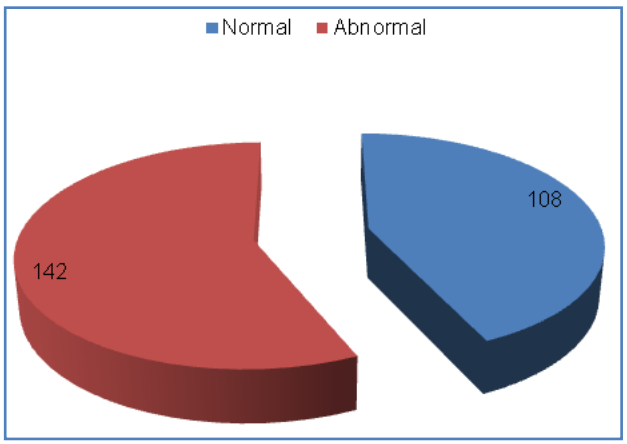

Fig. 1: Pie chart showing no. of abnormal and normal cases

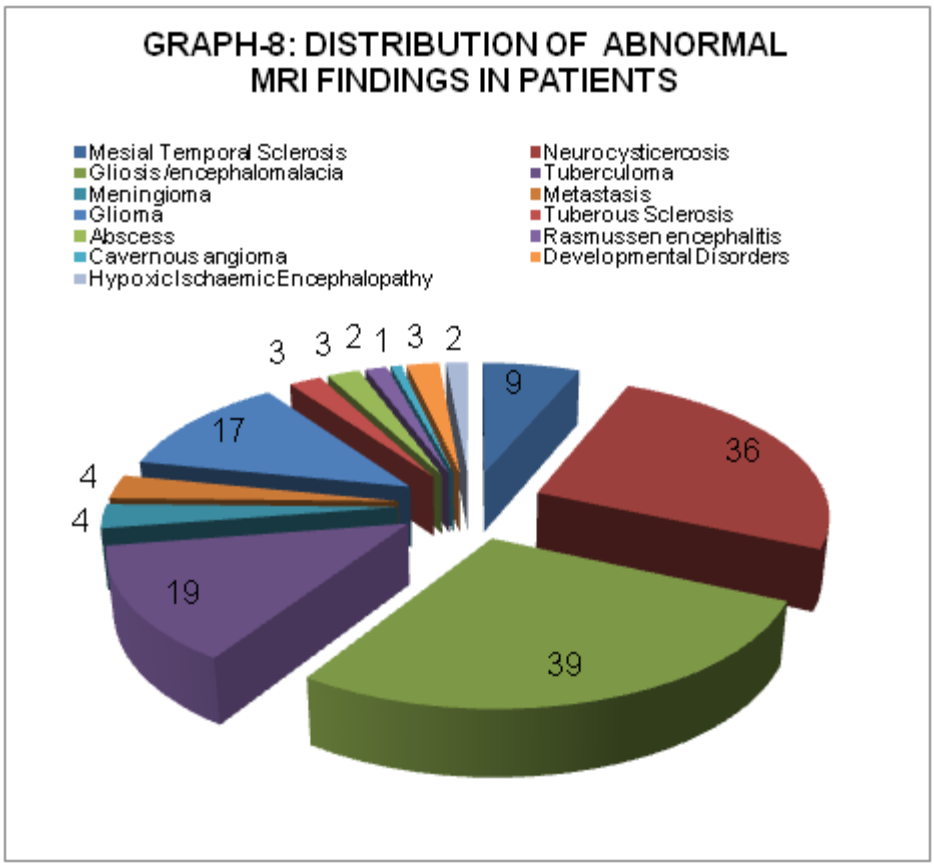

Fig. 2: Pie chart showing no. of cases of abnormal MRI findings

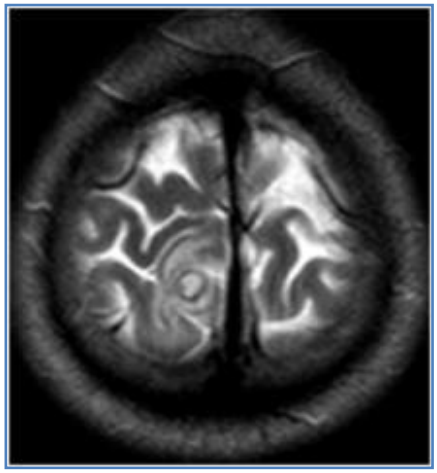

Fig. 3

Neurocysticercosis: Axial T2W image of the brain demonstrates well defined cystic lesion with mild surrounding edemain right high parietal region appearing as hyperintense with hypointense rim on T2W image. Small eccentric hypointense focus is seen within lesions/o – scolex

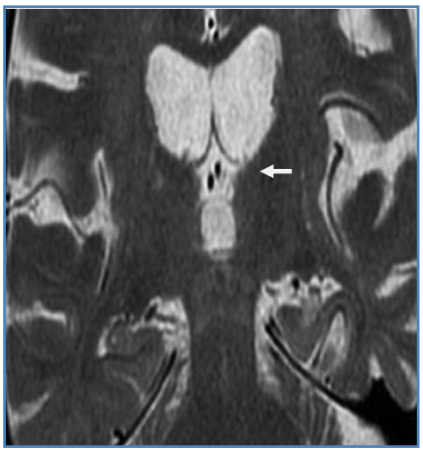

Fig. 4

Mesial Temporal Sclerosis :Coronal T2W image demonstrates reduced volume and hyperintense signalin left hippocampus

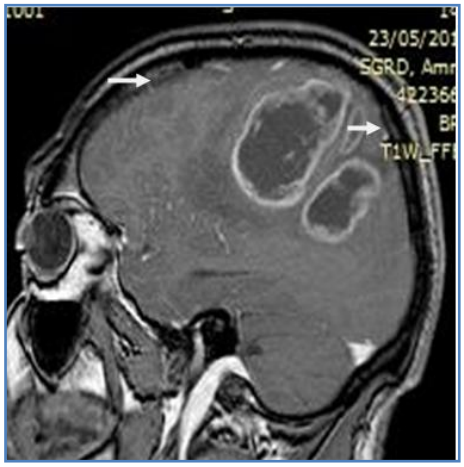

Fig. 5

GlioblastomaMultiforme: Sagittal T1W Post contrast image demonstratedtwo thick walled cystic lesions showingirregularrimenhancement and enhancement of the internalseptationsin right parietal lobe. Moderate surrounding oedema is seen.

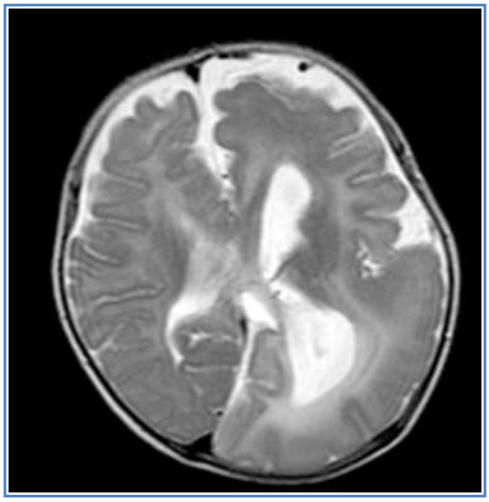

Fig. 6

Hemimegalencephaly: Axial T2W image shows left cerebral hemisphere and ipsilateral lateral ventricle enlargement with dysplastic left cerebral cortex and polymicrogyria. A band of hypointensity is seen in the white matter in periventricular region -band heterotopias.

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