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MR EVALUATION OF SEIZURES: A STUDY DONE IN TERTIARY CARE RURAL INSTITUTE IN THE STATE OF TELANGANA

Radio-Diagnosis

Dr Vyankatesh Aironi* Professor and Head, Department of Radio-diagnosis, Dr Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Rangareddy district- 501503, Telangana, India. *Corresponding Author

Dr Preethi Kotha Reddy Department of Radio-diagnosis, Dr Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Rangareddy district- 501503, Telangana, India.

ABSTRACT

Introduction:- A seizure is a sudden, uncontrolled burst of electrical activity in the brain and can cause changes in behaviour, movements, feelings and levels of consciousness. Epilepsy is a chronic brain disorder that causes recurring episodes of seizures. The epilepsies are common seizure illness of brain matter with an age-adjusted prevalence of 4-8 per 1000 population. Magnetic resonance imaging (MRI) can identify the brain causative substrate or epileptogenic focus precisely and guides the clinician in the determination of treatment and prognosis. The current study is undertaken to identify the spectrum of causative factors leading to seizures and characterise the related MRI findings in such patients. **Materials & Methodology: -** The patients clinically presenting with suspected seizures were referred for MRI to the Department of Radio-diagnosis, Dr Patnam Mahender Reddy institute of medical sciences (DPMRIMS), Chevella (rural setup in Rangareddy district of Telangana state). Total 56 patients were studied on 1.5 Tesla Siemens Sempra MRI scanner over a period of six months from June 2023 to November 2023. **Results: -** The patients presenting with all age groups (from 1 year to 75 years of age) of both sexes were included in this retrospective study, including 38 adults and 18 children below 18 years age. Major causative substrates found in our study were: - mesial temporal sclerosis (10.9%), hypoxic insult in perinatal period (10.7%), brain tumours (7.1%), old calcified foci (granulomas) (7.1%), and rest of cases had miscellaneous and rare conditions like infantile cerebra hemiatrophy, Tuberous sclerosis, pituitary bleed, venous haemorrhagic infarct, focal gliosis, Parkinsonism, cerebral atrophy and chronic ischemic foci. Majority of subset of 35.7% cases had normal brain studies with normal hippocampi. **Conclusion: -** MRI brain evaluation in seizures is very helpful to detect the causative factor accurately due to its excellent inherent soft tissue contrast resolution and multiplanar capability as compared to CT scan. It demonstrates the relation of causative substrate in brain with eloquent cortex, which helps in planning surgery if surgery is curable like in cases of brain tumours. Hippocampal sclerosis is amenable to surgery and such cases with serious presentations not controlled by medications, can be referred for neurosurgical treatment. Medical management can be decided in other non-surgical cases on case-to-case basis by correlating imaging features with EEG and laboratory investigations e.g. granulomas or venous bleeds or idiopathic epilepsy.

KEYWORDS

Magnetic resonance imaging, Seizures, hypoxic insult, mesial temporal sclerosis, hippocampal volumetry

INTRODUCTION: -

Epilepsy is a chronic brain disorder with recurrent episodes of seizures resulting from a sudden uncontrolled burst of electrical activity in the brain, leading to changes in behavior, physical movements, feelings and levels of consciousness of an affected individual [1,2,3,4]. Epilepsy is a common serious neurological disorder of brain with global prevalence of 4- 8 cases per thousand population [1] with incidence of about 0.3 to 0.5 % [4]. Modern neuroimaging [1,2] including computed tomography (CT scan), magnetic resonance imaging (MRI), FDG-PET scan [1], SPECT scan [2], along with electro-encephalogram (EEG) [1, 2, 4] and laboratory tests like CSF analysis [4], form an important role in clinching diagnosis of causation of seizure activity and its subsequent clinical management.

An unprovoked first-time seizure is a life changing and quite dramatic serious situation in a patient's life and forms a cause of serious concern for affected close family members, and the treating clinician and also has a social stigma associated with it [3]. Life of individual and property can be potentially endangered in an event of seizures and loss of normal consciousness [3]. Though the condition of epilepsy is a clinical diagnosis, MRI evaluation of brain or otherwise any relevant neuroimaging plays a vital role in detection and localization of epileptogenic focus or causative brain substrate in brain, whereas electrical abnormal trigger is identified and localized by EEG[1, 2]. This imaging features along with laboratory and neurophysiological tests help the referring clinician in deciding treatment modality like medical line or surgical treatment or palliation or otherwise like symptomatic treatment, radiation or chemotherapy in case of malignant etiologies [4]. CT scanning too has preliminary role in identification of focal or diffuse brain disorder causing seizures [2]. But due to its inherent radiation issues, poor contrast and tissue resolution in brain despite giving contrast, there is poor sensitivity and specificity to diagnose especially subtle grey- white matter focal abnormalities like FCDs (cortical dysplasias), hippocampal sclerosis and anteromedial temporal lobe abnormalities, heterotopias, cortical tubers, etc [1,2]. However high-resolution MRI with 1.5 Tesla or 3 Tesla MRI scanner of modern days, with hippocampal high resolution epilepsy protocols [1, 2]; whether coupled with PET [1] or not can diagnose these subtle as well as gross brain substrates causing seizures along with excellent tissue contrast and tissue specificity inherent to MRI. Of course, the imaging findings need to be correlated with EEG findings, CSF analysis, blood parameters etc. to help in accurate precise clinical management of case [4].

Epilepsy is classified into two categories [1]: - focal and generalized, out of which focal epilepsy forms a major subset wherein a specific cerebral lesion, most commonly temporal lobes are involved, due to which terms like temporal lobe epilepsy, mesial temporal sclerosis or hippocampal sclerosis [5] came into vogue in clinical field. Focal epilepsy form about important 40- 60 % subset of newly diagnosed cases of epilepsy[1]. Out of these cases, 30 % cases develop drug-resistant form of intractable epilepsy [1]. The other forms of epilepsy having focal brain substrate like FCDs, hamartomas, low grade tumors like gangliogliomas, DNET, including conditions like mesial temporal lobe epilepsy (MTLE) or ATLE (anterior temporal lobe epilepsy are amenable to surgical treatment and have seizure free life post-surgery in about 70- 80 % cases [1, 2]. Thus, anatomical localization of lesion, its relation to eloquent brain cortex, correlation with source of epilepsy from EEG studies, form important clinical pathway to diagnose, treat and prognosticate cases with epilepsy [1, 2]. Various neurosurgical treatments like amygdalo-hippocampectomy in case of hippocampal sclerosis, or more wider anterior temporal lobe resection in cases of MTLE, can be suggested to such patients [5].

So, MRI is advisable in two clinical scenarios [2]: - 1) long standing epilepsy especially intractable or refractory seizures which form subset requiring mostly surgical treatment 2) newly diagnosed cases of seizures (unprovoked seizures including). MRI also helps to categorize the disease process into either static disease like congenital brain malformations, ischemic foci, or progressive diseases like brain neoplasms, encephalitis, etc [2]. We can follow-up cases of seizures undertaking treatment and also having undergone surgical treatment by MRI apart from monitoring progression of focal brain lesions during course of treatment like tuberculomas, neurocysticercus granulomas, etc.

Hippocampal volumetry also aids in diagnosis of hippocampal sclerosis, though imaging details of hippocampal, size, signal abnormalities, delineation of details of dentate gyrus, subiculum, and parahippocampal gyrus along with assessment of mamillary body and

fornix on ipsilateral side of abnormal hippocampus play main role to diagnose this condition also called as mesial temporal sclerosis [1,5].

That being said, MRI also identifies focal lesions in neo-cortical epilepsy [2] which includes low grade brain tumors [1, 7], meningiomas, astrocytoma, cavernomas, gliotic scars (scar epilepsy), resulting from perinatal hypoxic-ischemic insult, trauma, infective etiologies [1], vascular malformations like AVM, developmental venous anomaly (DVA) [2] etc. In some selective cases, post-contrast evaluation after gadolinium injection, can help in lesion and tissue characterization apart from evaluation of eloquent cortex [4], extent of edema and actual size and location of lesion. This retrospective study of 56 cases presenting with seizures highlights the important role of diagnosing and localizing causative brain substrate and the diverse disease spectrum ranging from congenital, dysplastic or developmental abnormalities to infection to neoplasm to vascular disorders to hypoxic-ischemic insult to trauma or just normal MR morphology wherein cause is presumably focal abnormal electrical focus triggering epileptiform seizures, wherein clinical and neurophysiological as well as laboratory parameters help the decision making and treating clinician who actually plays a central role in all the clinical scenario of emergency room where such patients come to.

AIMS AND OBJECTIVES OF THE STUDY: -

1) To evaluate the causative brain substrate by high resolution MRI.
2) To assess the hippocampal volume in cases presenting with seizures.
3) To find the disease burden of focal or diffuse brain disorder causing seizures.
4) To assess the importance of MRI brain evaluation in decision making, planning treatment modality and prognosticate the case.

MATERIALS AND METHODOLOGY

This present retrospective study of MR evaluation of 56 cases presenting with history of seizures was performed in Department of Radio-diagnosis, Dr Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Rangareddy district, Telangana state (India) during the period of June 2023 to November 2023, on a state-of-the-art MRI 1.5 Tesla scanner of Siemens make, model Sempra (Siemens Healthcare system, Erlangen, Germany). The patients selected for the study were of all age groups, including both sexes from age of 1 year to 75 years of age; having clinical symptoms of seizures either in form of generalised tonic-clonic seizures or absent seizures or focal seizures, presenting complaints being epileptic seizures, generalised tonic clonic convulsions, absent seizures, choreiform movements, status epilepticus, headache, global developmental delay, growth retardation, mental retardation, spastic paraparesis, congenital squint, history of fall, recurrent seizures, new onset unprovoked seizures, febrile convulsions, cerebral palsy, but all had common history of seizure like activity.

The MRI brain study either plain and/or contrast study was performed after ruling out various contraindications for MRI and proper history taking in form of name, age, sex, past antecedent history, occupational history, social habits, substance abuse, any relevant past surgical history, present clinical signs and symptoms, past history of medications including antiepileptics, antitubercular or antihelminthic medications, previous and present EEG findings, any history of previous trauma, relevant birth history (forceps delivery or breech or caesarean section), address and contact details. Patients having aneurysm clips, cochlear implants, cardiac pacemaker, dental implants, fresh orthopaedic implants were excluded from study. Informed consent was taken from all patients or from guardians or relatives as per the condition and age of the patient. In case of paediatric patients unable to sleep in MR gantry triclofos was used to sedate the child with paediatric consultation. Basic MR sequences including Turbo spin echo T1 axial, sagittal, T2 axial, sagittal, FLAIR axial and coronal, DWI with ADC images, SWI sequences were taken after taking localizer in three planes. Sequences related to epilepsy protocol were taken in form of thin T2 coronal, T1 IR coronal, FLAIR coronal and volumetric T1WI 3-D acquisition with isotropic voxel size of 1 mm or 1.5 mm, to allow reconstruction in any plane were taken. 3D acquisition was for subtle grey white matter focal abnormalities like focal cortical dysplasia (FCD) and for hippocampal volumetric assessment. Patient is placed in supine position in MR gantry using 8 channel head coil and adequate FOV for brain acquisition.

Image Interpretation And Analysis By Radiologist:

Radiologist with experience more than five years in Neuroimaging Radiology viewed the MR images in DICOM format on Osirix software in iMac Apple systems. The interpreter recorded various findings in terms of focal lesion if any, including grey matter abnormalities like FCDs, heterotopias, cortical tubers, focal brain lesions or tumours, associated focal perilesional oedema, any mass effect on adjoining structures like ventricles, sulci, brainstem, any midline shift towards opposite side, any multiplicity of lesions, presence of diffuse cerebral oedema, any internal brain herniations, presence of any gliosis, anatomical and pathological features if any in hippocampi and parahippocampal regions. Hippocampal volumetry was done in majority (80%) of 56 cases. Pattern of myelination of brain was also evaluated children presenting with seizures especially below five years of age.

The data of patients was collected and put on Microsoft excel sheet, and the statistical analysis was done using percentage method to study disease burden and burden of individual lesions and their role in causing seizures was done referring to standard values in given literature.

RESULTS: -

In this retrospective cross-sectional imaging analysis of sample size of 56 patients presenting with seizures to our hospital situated inn rural settings of Telangana with basic work nature being farming and real estate businesses, conducted over period of six months on 1.5 Tesla state-of-the-art MRI scanner of Siemens Sempra make and model, we found following major contributory factors and minor associated non-contributory findings in MRI brain studies done.

Total 56 Cases Presenting With Seizures:

Normal MRI Brain study: - 20 (35.7%)
Mesial temporal sclerosis: - 10 (17.9%)
Hypoxic insult with sequelae: - 06 (10.7%)
Brain tumours: - 04 (7.1%)
Old calcified foci including granulomas: - 04 (7.1%)
Intracranial bleed including pituitary and CST: - 02 (3.6%)
Gliotic scar: - 01 (1.8%)
Tuberous sclerosis: - 01 (1.8%)
Left infantile cerebral hemiatrophy: - 01 (1.8%)
Miscellaneous conditions like ischemic foci, Parkinsonism etc.: - 08 (14.3%)

It is obvious from above mentioned chart, that in majority of cases almost 36 % had normal MRI brain findings, with no morphological cause, maybe electrical focal abnormal trigger or febrile convulsions or some metabolic underlying undetected cause might be contributing such cases.

Major focal causative brain substrate was mesial temporal sclerosis (17.9%) which had abnormal hippocampus either on one side or bilateral (bilateral in 05 cases, right sided hippocampal abnormality in 02 cases and rest 03 cases with left sided abnormality, on MR imaging assisted by hippocampal volumetry.

Six cases, all of them children below 18 years age had sequelae related to perinatal hypoxic insult with predominant involvement of peritrigonal as well as parieto-occipital regions of brain white matter (05) **[Figure 9, 13]** and basal ganglia on both sides (01 case). Associated corpus callosal dysgenesis was seen associated in one case of HIE (hypoxic ischemic encephalopathy) **[Figure 10]**. Cerebellar atrophy was seen in one of the six cases with HIE **[Figure 14]**.

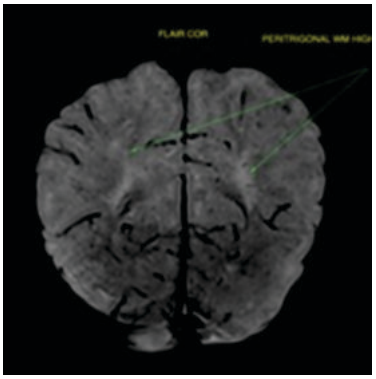

Figure 9:- Two-year old male child with developmental delay and

absent seizures- showing changes of PVL in peritrigonal regions on FLAIR coronal image.

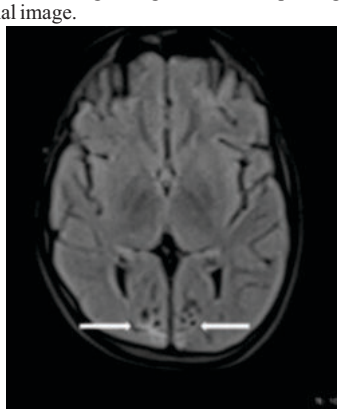

Figure 13:- Flair Axial Image In A Male Child With Gliotic Changes In Bilateral Occipital Lobes Shown By Long White Arrows (Periventricular leucomalacia/ HIE)

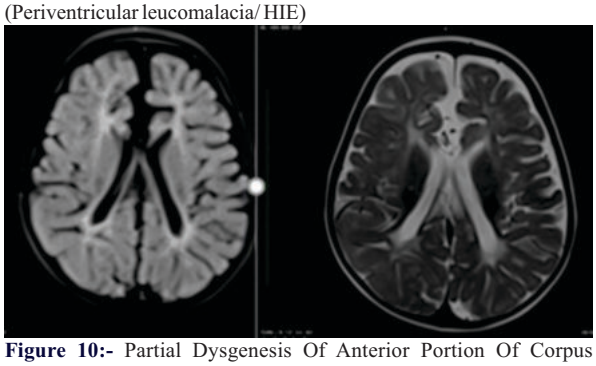

Figure 10:- Partial Dysgenesis Of Anterior Portion Of Corpus Callosum With Periventricular Leucomalacia, Dilated Lateral Ventricles As Seen On Axial FLAIR (Right Image) As Well As T2 Axial Left Sided Image.

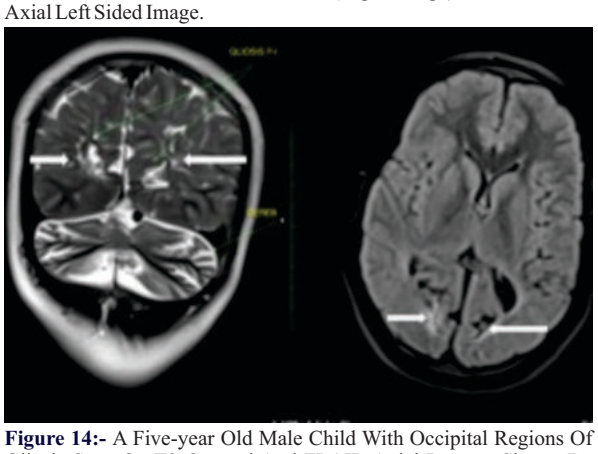

Figure 14:- A Five-year Old Male Child With Occipital Regions Of Gliosis Seen On T2 Coronal And FLAIR Axial Images, Shown By Arrows.

The brain tumours which we detected on MR brain study along with contrast in two of them had: - meningiomas (02 cases) **[Figure 18]**, residual/ recurrent epidermoid in cerebellopontine angle and lipoma in quadrigeminal plate cistern **[Figure 15]**. All were adults except the child of five years having lipoma.

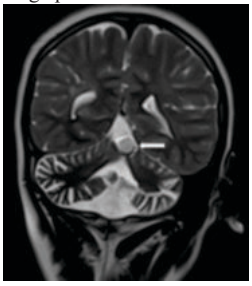

Figure 15:- Another male child showing significant cerebellar atrophy with small lipoma along straight sinus (quadrigeminal plate cisternal lipoma). Cerebrum does not show atrophy as in cerebellum.

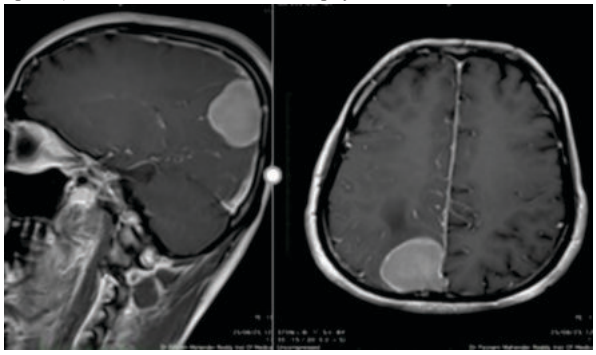

Figure 18:- A Sixty-year-old Male Patient With History Of Severe Headache And Seizures With Right Parieto-occipital Intensely Enhancing Parafalcine Meningioma With Enhancing Dural Tail.

Miscellaneous conditions with non-contributory findings in brain were: - chronic ischemic foci in deep cerebral white matter (04 cases), Parkinsonism with typical SWI features in 75-year-old man, partial empty sella in 02 cases, and cerebral atrophy changes disproportionate to the age of patient being 30 years **[Figure 16]**- suggesting either alcohol abuse predominant in tis rural setup.

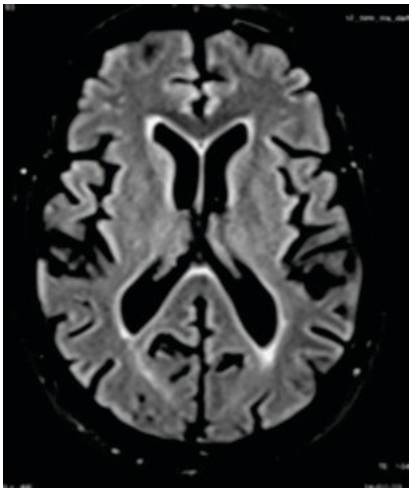

Figure 16:- Fazeka's grade 1 chronic ischemic changes with atrophy in an adult female patient with history of seizures. No other significant findings were seen. These were incidental findings.

The four cases (all adult patients females) presenting with calcific foci had old healed calcified parenchymal few granulomas in three cases **[Figures 6, 7]** whereas the one remaining case had old hemosiderin deposit in right frontal region **[Figure 8]** as a result of previous venous haemorrhagic infarct eight months back.

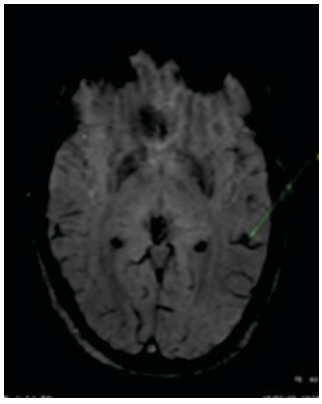

Figure 6:- Small calcified old granuloma (shown by arrow) in left temporal region of brain seen on axial SWI image in a middle-aged adult female with h/o seizures. She had another old granuloma in left high parietal region (not shown here)

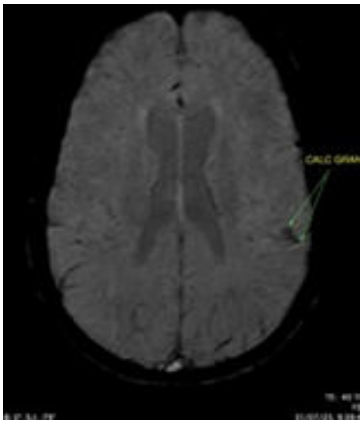

Figure7:- Two old calcified granulomas in left temporal region of brain seen on axial SWI sequence in a female patient.

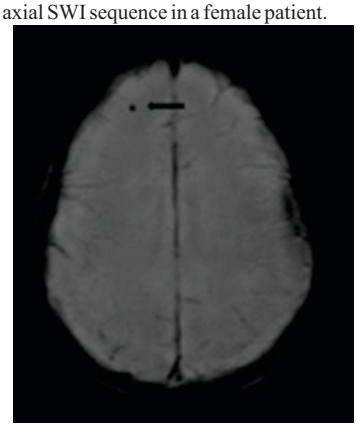

Figure8:- Tiny hemosiderin deposit on follow-up MRI on axial SWI image – a sequelae of right frontal venous infarct in a young female patient presenting with seizures and headache (diagnosed eight months back in outside hospital)

Rare conditions like: - pituitary bleed were found in young male individual **[Figure 17]**, right frontal venous haemorrhagic infarct in young male farmer due to heat stress, tuberous sclerosis in 56-year-old woman with facial abrasions, and Dyke-Davidoff-Mason syndrome (left infantile cerebral hemiatrophy) in 26-year male with alleged history of assault. This last condition was accidental finding.

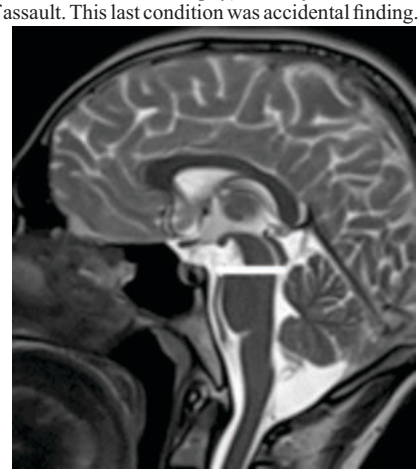

Figure17:- Small pituitary early subacute T2 hypointense (T1 hyperintense) bleed in a young male patient measuring 5 x 3 mm in size.

DISCUSSION: -

To recapitulate, the major causative brain substrates were hippocampal sclerosis, gliotic sequelae of hypoxic insult (periventricular leukomalacia) [2], old calcified granulomas, and brain tumours. Rest cases had single causative factor each: scar epilepsy, venous sinus thrombosis with venous bleed, pituitary bleed, tuberous sclerosis, infantile cerebral hemiatrophy. Other miscellaneous non-contributory MRI brain findings were chronic ischemic foci, partial empty sella, Parkinson's disease and chronic alcohol-induced cerebral atrophy.

In addition, we find that epilepsy has a bimodal age presentation in literature, one in childhood and other in late adulthood. Such is the case with our study, wherein about 38 out of 56 cases with seizures are adults; majority (80%) above the age of 35 years, 18 cases were children below 18 years.

So, MRI is useful in focal epilepsy, neo-cortical epilepsy and in intractable epilepsy cases presenting with recurrent epileptic seizures or status epilepticus to emergency room [2]. Literature mentions that apart from temporal lobe lesions, neocortical non-temporal focal lesions like low grade brain tumours, like gangliogliomas, DNET, oligodendrogliomas, low grade astrocytoma including pilocytic variant, cortical dysplasias, malformations including phacomatoses, vascular malformations like cavernomas, arteriovenous malformations, developmental anomalies (DVA), meningiomas, gliotic scars resulting from trauma, perinatal hypoxic insult, infective lesions, ischemic events, etc can be diagnosed with great degree of confidence on MRI [1,2]. We found mainly sequelae of HIE (PVL) in total six cases in children, and four brain tumours from the list mentioned above. Gliosis from old trauma was seen in one adult male with history of trauma in remote past.

The brain tumours [7] found in our study (four cases) are as follows: -

1) **Meningioma** in right parafalcine parieto-occipital brain parenchyma with mild perifocal edema and local mass effect in 50-year-old male presenting with headache and focal seizures. Case was referred to neurosurgeon.

2) **Quadrigeminal plate lipoma** in a 8 year old male child with associated HIE sequelae, and severe cerebellar atrophy and presenting with global developmental delay and absent seizures.

3) **Meningioma** again along right tentorial leaf, with associated right mesial temporal sclerosis and old calcified granuloma in a 40-year female with seizures.

4) **Residual/ recurrent epidermoid in** right cerebello-pontine cistern in old operated case of 28 years old male individual who has fits of anger in which he behaves abnormally, throws objects and has amnesia after such a complex fit. He had post-operative gliotic changes with secondary hippocampal atrophy on right side in temporal lobe and this was the+ causative substrate.

In our study of hippocampal sclerosis, total of 10 cases had myriad of abnormalities in brain along with typical reduction in hippocampal volumes and morphological changes in parahippocampal gyrus, poor discernment of dentate gyrus and subiculum, ipsilateral mamillary body and fornix atrophy [2,5,6]. **[Figures 1, 2]** There is definite role of T2 relaxometry [2, 5, 6] as well along with hippocampal volumetric assessment, but we did not use it in our study. Overall simple qualitative visual analysis of hippocampus, temporal lobe, temporal horn and related structures like amygdala, entorhinal cortex, thalamus, uncus, fornix, mamillary body, parahippocampal gyrus is equally sensitive rather than too much reliance on quantitative cumbersome assessment of hippocampi and signal abnormality on T2WI [2, 5, 6]. **[Figures 3, 4, 5]** One case has associated isilateral uncal hypoplasia (anteromedial temporal lobe epilepsy) [6].

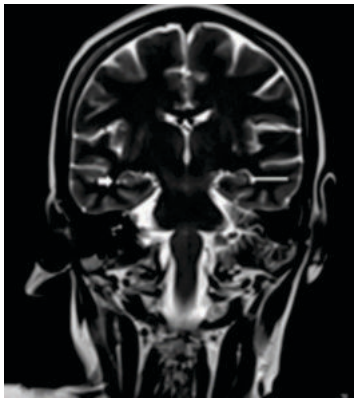

Figure 1:- Normal appearing hippocampi on both sides on T2 coronal

in a patient with seizures, showing hippocampal sulcal remnant tiny cyst[6] in right hippocampus (a normal variant).

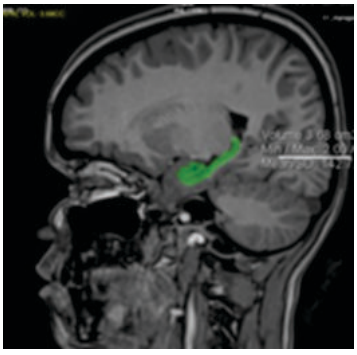

Figure2:- Normal Hippocampal Volumetric Assessment Done On Either Side On 3D-T1 WI With Volumetric Acquisition.

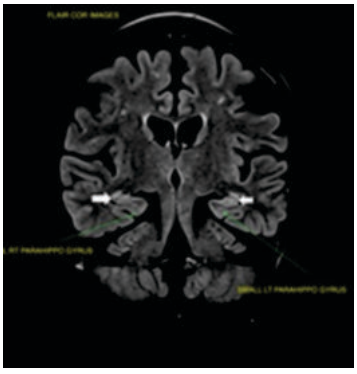

Figure 3:- Bilateral small FLAIR hyperintense hippocampi (shown by short white arrows) in a middle aged adult male with few ischemic foci and history of unprovoked GTCS (bilateral mesial temporal sclerosis)

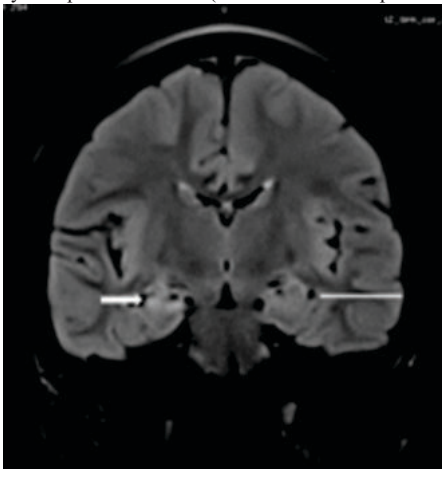

Figure 4:- Small deformed FLAIR hyperintense right hippocampal formation (shown by white broad shorter arrow) with relative widening of temporal horn of right lateral ventricle on FLAIR coronal image in young teenager male with epileptiform seizures- Right mesial temporal sclerosis. Left normal hippocampus is shown by long white arrow.

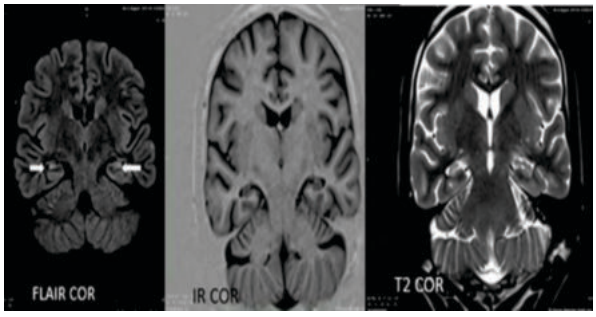

Figure 5:- Another case of bilateral mesial temporal sclerosis in young teenager female patient with h/o unprovoked seizures on Coronal FLAIR, IR and T2WI.

The Other Associated Findings In Temporal Lobe Epilepsy Seen With Hippocampal Volumes Are As Follows: -

Sr No	Age in years/ sex	Abnormal side	Rt hippocampal volume in cc	Left hippocampal volume in cc	Ass. Brain MRI findings
1	14 / M	Bilateral	2.1	2.4	Empty sella
2	24 /M	Bilateral	2.8	2.8	Empty sella
3	23/ F	Bilateral	2.0	2.1	Empty sella
4	66/M	Bilateral	2.2	2.2	Rt frontal gliosis, old lacunar infarcts
5	30/M	Bilateral	1.5	1.6	PVL (HIE) sequelae
6	10/M	Left	2.4	2.1	PVL, Raised ICT
7	60/F	Left	2.8	1.4	Raised ICT
8	42/M	Left	3.3	2.9	Cerebral atrophy
9	40/F	Right	1.9	2.9	Partial empty sella
10	12/F	Right	2,2	2.7	Partial empty sella

So, children of age group of 10- 14 years were affected with seizures, rest were adult cases of 23 to 60 years age group. The average volumes of abnormal hippocampus in these 10 cases had ranging from 1.5 to 2.8 cc. The average reduction of hippocampal volumes as compared to volume of normal side or age matched control was about 11.4% minimum to about 53% maximum. Normal hippocampi might show 10% difference in volumes due to seizures with hippocampi being intrinsically normal, that is one drawback of hippocampal volumetry [5]. These were also corroborated with morphological abnormalities in hippocampi, associated structures in parahippocampal region in anteromedial temporal lobe as mentioned above.

The Rare Conditions Which We Found In Our Study Were: -

1) **Parkinson's disease** [8] in a 70- year male individual with clinical history of pill rolling tremors, rigidity and gait disturbance. MR showed typical T2 WI and SWI features of rarefaction of substantia nigra (lateral portions) and red nuclei in midbrain with 'loss of swallow-tail sign' of substantia nigra on SWI sequence. **[Figures 11, 12]**

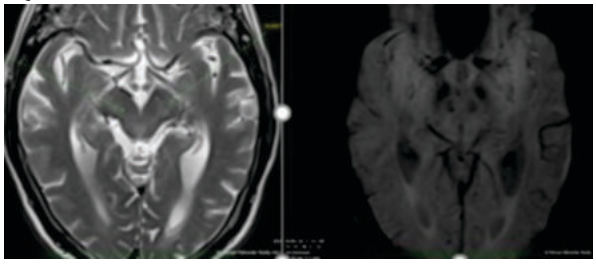

Figure 11:- A 75-year-old male with Parkinsonism and h/o seizures, psychosis- showing rarefaction of lateral portions of substantia nigra as well as red nuclei in midbrain with 'loss of Swallow –tail sign' of substantia nigra on SWI axial images through midbrain.

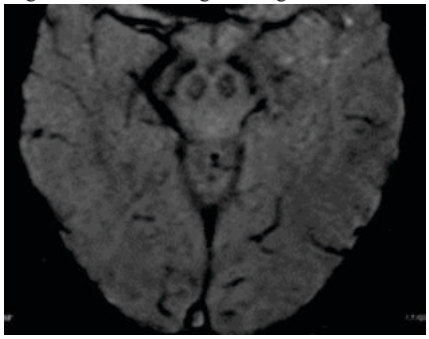

Figure 12:- Normal Swallow tail sign in substantia nigra in midbrain on axial SWI image in normal adult male for comparison.

2) **Dyke-Davidoff-Mason syndrome (Infantile cerebral atrophy on left)** in a twenty-year-old ale with history of assault having previous history of seizures having thick cranial vault in left half, with chronic Wallerian degeneration of corticospinal tracts seen in form of small left cerebral peduncle.

3) **Tuberous sclerosis** [2] in 56-year female presenting with facial abrasive injury, accidentally found to have calcified subependymal nodules along lateral ventricles with subtle multiple cerebral tubers.**[Figure 19]**

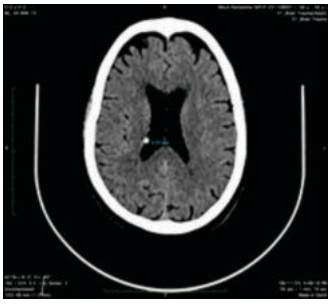

Figure 19:- 56-year-old female with history of facial trauma and abrasions, showing calcified subependymal tubers on CT Brain (a case of Tuberous sclerosis)

4) **Anteromedial temporal lobe epilepsy (AMLE/ MTLE)** [2,5,6] in 12-year child with left mesial temporal sclerosis with atrophy of left hippocampus, parahippocampal gyrus, left mamillary body, left fornix, left uncal dysplasia/ hypoplasia and significant dilatation of temporal horn of right lateral ventricle. There was antecedent history of neonatal seizures (PVL) with gliotic scar in right caudate nucleus.

In our study, majority i.e., 80% cases underwent plain study as lesion could be picked up on detailed brain MRI with epilepsy protocol and hippocampal sequences, and so also FLAIR, Diffusion and SWI (susceptibility weighted imaging) sequences [8] did not reveal any additional abnormality wherein focal lesions were found and also in those 20 cases (36% cases) where the brain MR study was normal beyond doubt. Post-contrast assessment was done in two cases of meningiomas which showed intense enhancement with enhancing dural tails on which they were base upon. Rest two cases, we did as there were known cases of cerebral tuberculomas completed antibiotic full course, which on post contrast brain study had no residual evidence of tubercular granulomas nor any abnormal meningeal enhancement was seen. Brain tumours cases were referred to neurosurgeon and rest were managed by neurophysician on case-to-case basis as per EEG findings, laboratory investigations and clinical condition & severity of seizures.

SUMMARY AND CONCLUSION: -

Epilepsy is a serious brain disorder with large socio-economic impact, and is cause of serious concern for family members of such a patient and treating physician with epilepsy; especially in new-onset unprovoked seizures in any age group due to its potential life threatening and endangering nature for patient as well as people around, property (like vehicle, accidental injury to pedestrians etc). Thus, evaluation by EEG (electro-encephalogram), clinical and laboratory evaluation, CSF analysis, followed by neuroimaging with CT, MRI, PET-CT, PET-MRI form important pathway in clinical diagnosis and to find out causative brain substrate (epileptogenic focus) to arrive at accurate diagnosis, plan treatment modality and prognosticate the case depending upon collective findings from neurophysiological tests and imaging findings.

High resolution brain MRI on 1.5 Tesla or 3 Tesla scanners help to locate the epileptogenic focus and also to rule out organic brain lesion in cases of idiopathic epilepsy where presumably abnormal electrical activity triggers the event of seizures. Hippocampal assessment with volumetry, detection of focal brain lesions like gliosis due to perinatal hypoxic insult, previous trauma or infarction (ischemic origin), focal neoplasms either benign or malignant, granulomas either active or healed/ healing, cerebral hemiatrophy, phacomatoses like Sturge Weber's syndrome, tuberous sclerosis, parasitic infestations, infective aetiologies like tuberculomas, neurocysticercosis, venous bleeds from venous sinus thrombosis, intracranial bleeds etc- all forms of cranial, cerebral, vascular lesions can be assessed by MRI in contrast to CT which has poor soft tissue resolution and cannot help in tissue characterisation as in MRI, nature of tissue substrate like blood, calcium, nature of tumorous cells, fat, CSF, ischemic tissue, infarcted tissue, etc is possible by MRI. Localisation with identification of eloquent cortex adjoining focal brain lesion is another major benefit to treating and operating clinician colleague.

We found also rare causes (apart from usual causes of seizures like mesial temporal sclerosis, sequelae of perinatal hypoxic insult, brain tumours, cortical subcortical granulomas, bleeds, gliotic scars), like Parkinsonism with typical imaging features on SWI, tuberous sclerosis, Dyke-Davidoff-Mason syndrome, pituitary bleed as causative brain substrate for seizure presentation. Miscellaneous conditions though not causative for seizures were also found on MRI like partial empty sella, chronic ischemic foci in cerebral white matter, cerebral atrophy disproportionate to age of patient (cause could be alcohol abuse or medications), etc.

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