

Mesial Temporal Sclerosis: A pictorial essay

*Nagateja B¹, Venkat Kishan T², Murthy PVN³, Kusum Kumar⁴, Pavani B¹, Shri Puja K¹.

¹Post Graduate, ²Assistant Professor, ³Professor and HOD, ⁴Senior Resident, Department of Radiology, Kamineni Institute of Medical Sciences, Narketpally, Nalgonda district, Telangana state, India.

ABSTRACT

Mesial Temporal sclerosis (MTS) is one of the commonest cause of partial complex seizures. It is the most common lesion identified histologically in adults with temporal lobe epilepsy. The etiology is controversial and it may be congenital or developmental. Mesial temporal sclerosis is characterized by neuronal loss and gliosis which contribute to its two principal findings on conventional Magnetic Resonance Imaging (MRI) seen as hyperintensity and volume loss of the hippocampus. Conventional MR imaging is considered as a preferred imaging technique in the detection of abnormal hippocampus with a sensitivity of 85%- 98%. MR imaging findings along with EEG data strongly guide the work up of temporal lobe epilepsy patients. We present three cases of mesial temporal sclerosis. All the three cases showed unilateral hippocampal atrophy, one of the cases also showed added hippocampal hyperintensity. In this case series typical findings of MTS were seen in a paediatric age group patient (patient's age was 18 months) which is rare.

Key words: Magnetic resonance imaging, mesial temporal sclerosis

Introduction

Mesial Temporal sclerosis (MTS) is one of the commonest causes of partial complex seizures.¹ Before understanding the imaging findings in Mesial Temporal Sclerosis, the basic knowledge of Magnetic Resonance (MR) anatomy of hippocampal area is a prerequisite for recognition and accurate interpretation of MR findings in hippocampal sclerosis. The limbic structures, in particular the hippocampus and the parahippocampal gyrus are important sites for epilepsy development.

In the medial aspect of the temporal lobe, the hippocampus is a curved structure consisting of two U- shaped layers, one the dentate gyrus and the other the Cornu Ammonis (CA).

These are interlocked together. The cornu ammonis

is further divided into four portions CA1 to CA4. The cornu ammonis blends into the subiculum, which forms the transition to the neocortex of parahippocampal gyrus.

The hippocampus is superior to subiculum and parahippocampal gyrus and is about 4 to 4.5 cm curved structure.

The boundaries of hippocampus on MRI coronal images are as follows

- Laterally the temporal horn surrounds the hippocampus and also extends superiorly.
- Supero-medially is the choroid fissure and medially is the ambient cistern and the brainstem.
- Inferiorly is the parahippocampal gyrus, the subcortical white matter and the collateral sulcus.²

For further understanding, the hippocampus can be defined into three regions depending on its morphology and relationship to midbrain, that is,

*corresponding author :

Dr. Nagateja Bonala
Post Graduate,
Department of Radiology,
Kamineni Institute of Medical Sciences,
Narketpally, Nalgonda District, Telangana state, India -508254
nagatejabonala@gmail.com

- The hippocampal head is the most anterior expanded part.
- The hippocampal body is the cylindrical structure extending posteriorly where temporal horn of the lateral ventricle lies laterally.
- The hippocampal tail is the narrowest portion which extends beyond the brainstem.

Cases:

Case 1: A 29 year old male patient presented with recent history of seizures. MRI brain was performed.

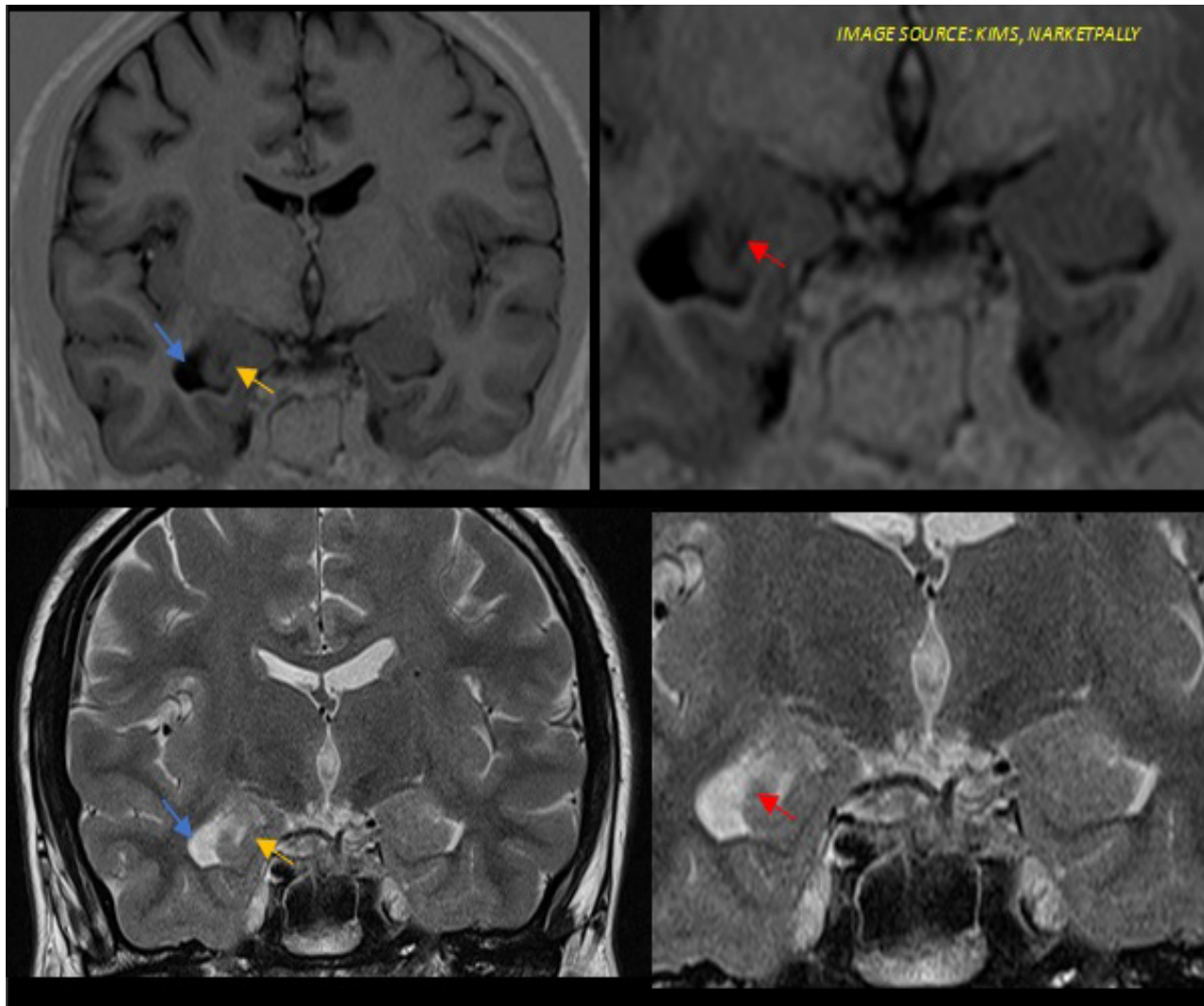


Fig. 1A: Coronal T1 TIRM (top) and axial T2W (bottom) images show atrophy of the right hippocampus (yellow arrow) with asymmetry of the temporal horns of the lateral ventricles (blue arrow). Loss of digitations of the hippocampus (red arrow) is seen on the right side.

Case 2: A 29 year old male patient came with long standing history of seizures. MRI Brain was carried out.

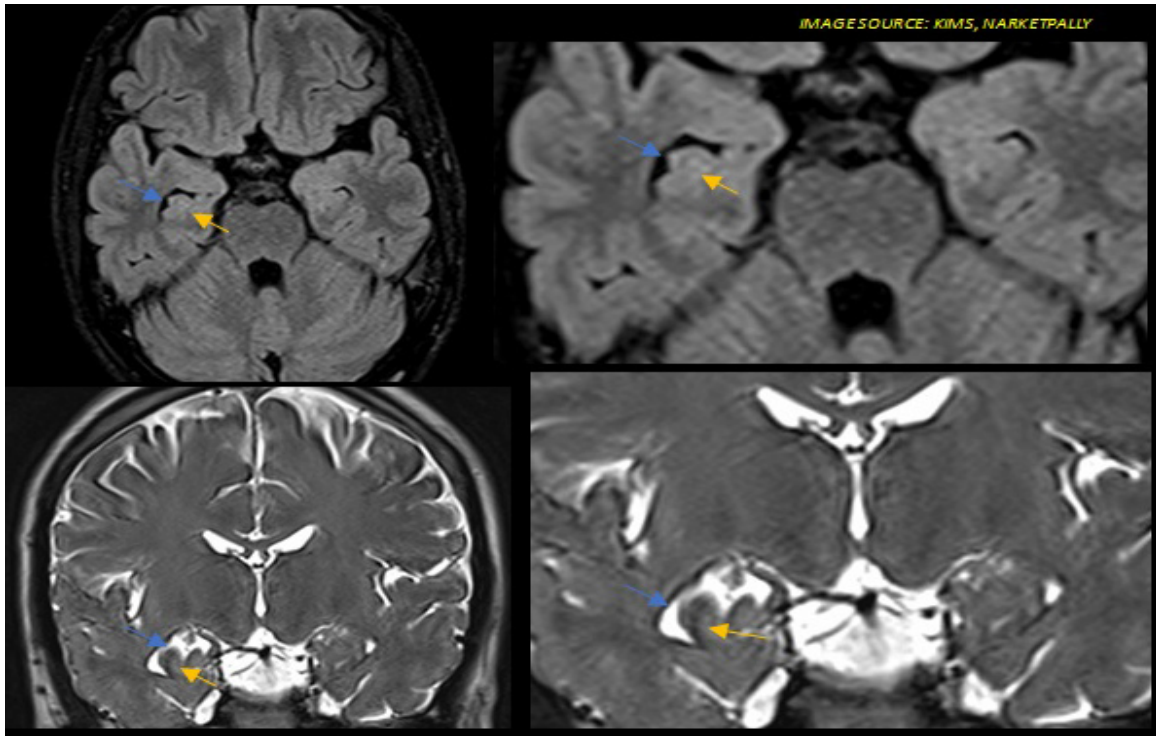


Fig. 2A: Axial T2 TIRM (top) and Coronal T2 space (bottom) images show mild atrophy of the right hippocampus (yellow arrow) with asymmetry of the temporal horns of the lateral ventricles (blue arrow).

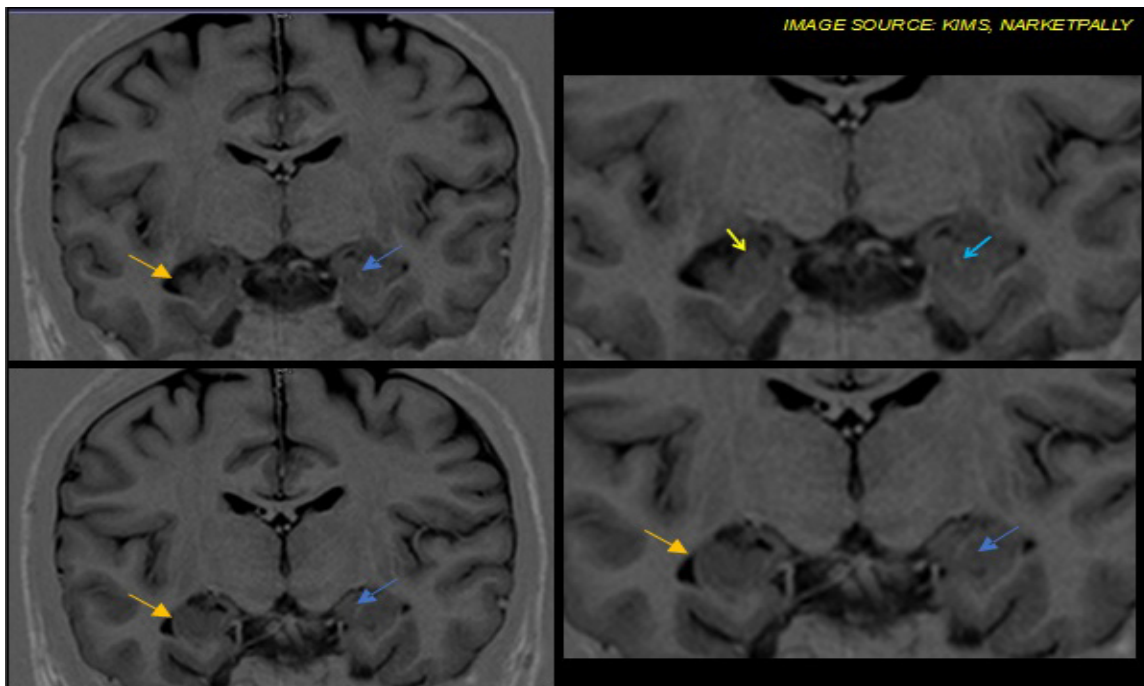


Fig. 2B: Coronal T1 TIRM images show atrophy of right hippocampus. There is evidence of loss of internal architecture of the right hippocampus (yellow arrow). The normal preserved internal architecture of left hippocampus is seen by visualization of the alveus (blue arrow).

Case 3: An eighteen months old child presented with a recent episode of seizures and gave history of seizures since birth. MRI brain was carried out.

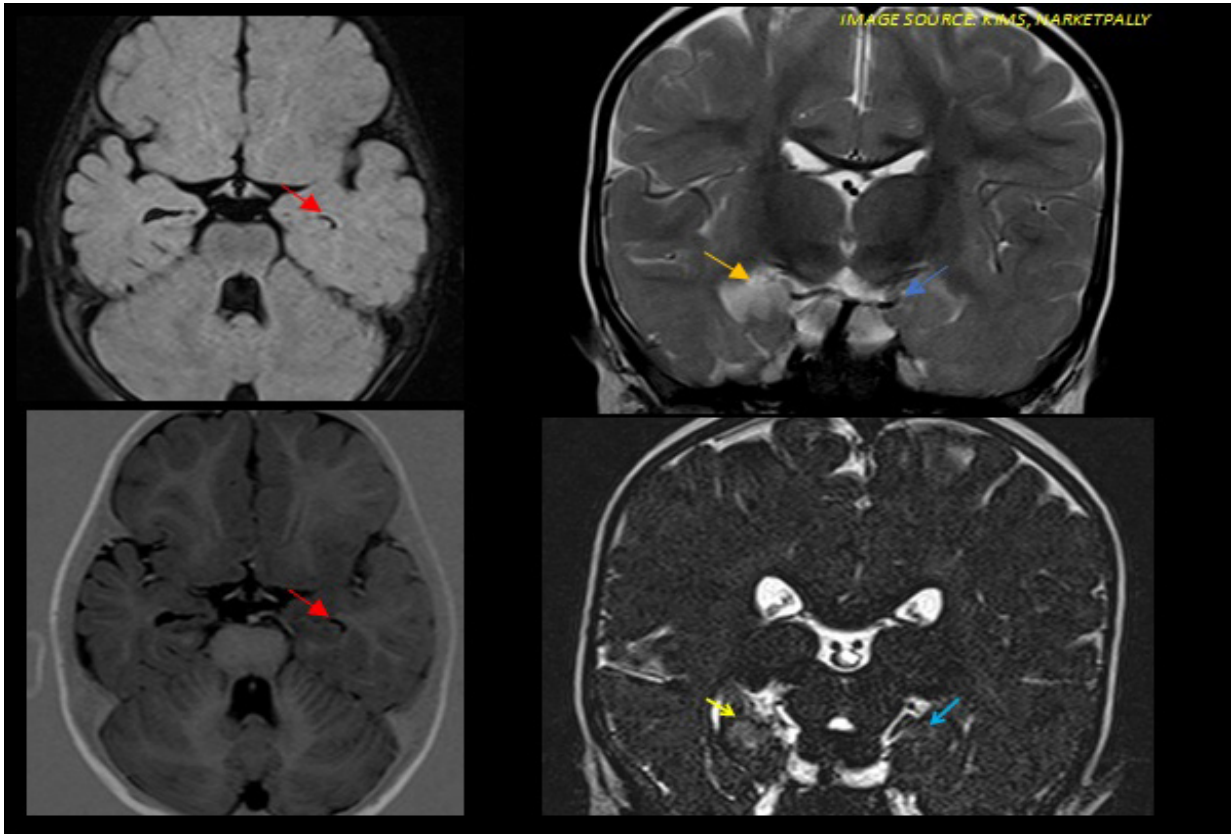


Fig. 3A: Axial T2 TIRM image and T1 TIRM image on left side shows asymmetry to temporal horn of the lateral ventricles (red arrow) Coronal T2W and Coronal T2 space images on right side show loss of digitations of hippocampus with volume loss and hyperintensity across the right hippocampus (yellow arrow). On left side it appears normal (blue arrow).

Discussion

The hippocampus is isointense to grey matter on all MR pulse sequences. The principal MR abnormalities in hippocampal sclerosis are hyperintense signals on the T2 Weighted images and hippocampal atrophy. Loss of internal architecture is another frequent feature. Other MR findings associated with hippocampal sclerosis can be divided as temporal lobe and extratemporal lobe findings. The temporal lobe findings are ipsilateral loss of hippocampal head digitations, dilation of temporal horn of lateral ventricle, temporal lobe atrophy, atrophy of the collateral white matter. Extratemporal findings include atrophy of the fornix, mammillary body, thalamus and Caudate.

MRI features of MTS can be assessed qualitatively and quantitatively. The qualitative assessment is mainly dependent on morphological abnormality and signal changes which are carried out through conventional MR sequences. Qualitative methods are about 80% – 90% sensitive. The quantitative methods of evaluation include volumetry and T2 relaxometry. The normal volume of right and left hippocampus is 2.90 cm³ and 2.78 cm³, respectively³. The normal mean T2 relaxometry value is 98 ± 2.8 ms.⁴ Quantitative assessment gives a sensitivity of 90%- 95%. The spectroscopy also helps in evaluation by showing decreased N Acetyl Aspartate (NAA), decrease NAA: creatine and decreased NAA: (creatinine + choline) ratios.

Decreased NAA, decrease NAA: creatine and decreased NAA: (creatinine + choline) ratio are shown to lateralize epilepsy in 65%- 96% cases in bilateral temporal lobe structural abnormalities on MR. Mean Apparent Diffusion Coefficient (ADC) values measured at the hippocampus have been found to be significantly higher on the lesion side than on the contralateral side. Enhancement with intravenous gadolinium has shown to be of no value in hippocampal sclerosis.²

The basic principle of imaging in MTS is for the lateralization of the epileptic focus. Qualitative methods are useful in case of unilateral findings. Quantitative methods are helpful in further lateralization in case of bilateral temporal lobe atrophy/ changes.

In our cases, as there was only unilateral involvement, qualitative methods were sufficient in evaluation.

References

1. Stephen Chan, Joel Erickson, Sydney S Yoon; Limbic system Abnormalities Associated with Mesial Temporal Sclerosis: A model of Chronic cerebral changes due to seizures; *Radiographics* 1997; 17:1095-110.
2. Scott W. Atlas; *Magnetic Resonance Imaging of the Brain and Spine*; Fourth Edition Vol 1: 315-24.
3. Honeycutt NA, Smith CD.; Hippocampal volume measurements using magnetic resonance imaging in normal young adults; *J Neuroimaging*. 1995 Apr;5(2):95-100.
4. Regula S. Briellmanna,b, Ari Syngeniotisa, Steve Fleminga, Renate M. Kalnins et al., Increased Anterior Temporal Lobe T2 Times in Cases of Hippocampal Sclerosis: A Multi-Echo T2 Relaxometry Study At 3 T; *AJNR* 2004 :25: 389-94.