Mesial Temporal Sclerosis MRI

The incidence of temporal lobe epilepsy (TLE) due to mesial temporal sclerosis (MTS) can be high in developing countries. Current diagnosis of MTS relies on structural MRI, which is generally unavailable in developing world settings.

The study of Mandell et al.shows strong evidence that temporal lobe and brain volume can be predictive of seizure outcome following temporal lobe resection, and that volumetric CT analysis of the temporal lobe may be feasible in lieu of structural MRI when the latter is unavailable. Furthermore, since the authors' methods are modality independent, these findings suggest that temporal lobe and normative brain volumes may further be useful in the selection of patients for temporal lobe resection when structural MRI is available [1)].

MRI is the modality of choice to evaluate the hippocampus, however dedicated TLE protocol needs to be performed if good sensitivity and specificity is to be achieved.

Thin section angled coronal sequences at right angles to the longitudinal axis of the hippocampus are required, to minimize volume averaging.

Coronal volume and coronal high resolution T2 weighted image/FLAIR are best to diagnose MTS.

Findings include:

reduced hippocampal volume: hippocampal atrophy

increased T2 signal

abnormal morphology: loss of internal architecture (interdigitations of hippocampus)

Although comparing left to right side is easiest, it must be remembered that up to 10% of cases are bilateral, and thus if symmetry is the only feature being evaluated, many cases may be misinterpreted as normal.

Often mentioned, but probably one of the least specific findings, is enlargement of the temporal horn of the lateral ventricle.

If anything, care must be taken to not allow an enlarged horn to trick you into thinking the hippocampus is reduced in size.

When severe and long standing, additional associated findings include:

atrophy of the ipsilateral fornix and mamillary body

increased signal and or atrophy of the anterior thalamic nucleus

atrophy of the cingulate gyrus

increased signal and/or reduction in volume of the amygdala

reduction in volume of the subiculum

dilatation of temporal horn and temporal lobe atrophy

collateral white matter and entorhinal cortex atrophy

thalamic and caudate atrophy

ipsilateral cerebral hypertrophy

contralateral cerebellar hemiatrophy

loss of grey-white matter interface in the anterior temporal lobe

reduced white matter volume in the parahippocampal gyrus

Additional 3D volumetric studies can be performed, and although time consuming to post-process may be more sensitive to subtle hippocampal volume loss. Gadolinium is not required.

T2 relaxometry

T2 relaxometry may also be useful in detecting cases of hippocampal sclerosis.

https://radiopaedia.org/articles/mesial-temporal-sclerosis

Diffusion MRI

Mesial Temporal Sclerosis Diffusion MRI.

MR spectroscopy

Mesial Temporal Sclerosis MR spectroscopy.

MR perfusion

MR perfusion demonstrates similar changes to SPECT (see below) with blood perfusion depending on when the scan is obtained.

During the peri-ictal phases, perfusion is increased, not only in the mesial temporal lobe but often in large parts of temporal lobe and hemisphere. In interictal periods, in contrast, perfusion is reduced [2].

1)
Mandell JG, Hill KL, Nguyen DT, Moser KW, Harbaugh RE, McInerney J, Nsubuga BK, Mugamba JK, Johnson D, Warf BC, Boling W, Webb AG, Schiff SJ. Volumetric brain analysis in neurosurgery: Part 3. Volumetric CT analysis as a predictor of seizure outcome following temporal lobectomy. J Neurosurg Pediatr. 2015 Feb;15(2):133-43. doi: 10.3171/2014.9.PEDS12428. Epub 2014 Nov 28. PubMed PMID: 25431899.
2)
Camacho DL, Castillo M. MR imaging of temporal lobe epilepsy. Semin. Ultrasound CT MR. 2007;28

(6): 424-36.