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Lateralization in Temporal Lobe Epilepsy Using Automatic Segmentation of Hippocampus

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Background & Objective: The hippocampus is a key component of the human brain's limbic system. It is believed that it has a key role in learning process and memory. The deviations in volume and architecture of the hippocampus have been observed with epilepsy. Estimation of volumetric asymmetries in the human brain from MRI provides significant information for the diagnosis of focal abnormality.

Experimental Approaches: Automatic brain segmentation method may be used for volumetry of hippocampus to overcome limitations (e.g. expense) of conventional method of evaluating an epileptic patient by long intracranial EEG studies for surgical candidacy. We have recently developed an automatic method based on entropy for segmentation of the brain structures. We extended our method using a new multiple atlas strategy and applied it on 21 patients with temporal epilepsy (TLE). To this end, we used 12 normal subjects for multiple atlas construction. In addition, we added free form deformation step to the segmentation to capture variability due to abnormalities. We compute the volume of the left and right hippocami segmented using our automatic method and use them for lateralization.

Results: About 80% of cases lateralization was consistent with intracranial EEG evaluation and the difference between left and right side hippocampi volumes was significant ($p < 0.01$). This is close to findings other investigations doing manual segmentation of the hippocampi.

Conclusion: Automatic segmentation can be used for lateralization in TLE.

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