Manual Hippocampal Volumetry Is a Better Detector of Hippocampal Sclerosis than Current Automated Hippocampal Volumetric Methods

H.R. Pardoe and G.D. Jackson

doi: https://doi.org/10.3174/ajnr.A3750
http://www.ajnr.org/content/34/10/E114
We read with interest “3T MRI Quantification of Hippocampal Volume and Signal in Mesial Temporal Lobe Epilepsy Improves Detection of Hippocampal Sclerosis,” in which Coan et al presented convincing evidence that quantitative assessment of hippocampal volume and T2 improves detection of hippocampal sclerosis vs visual inspection. Although we agree with the principal findings of the study, we disagree with the statement “whether manual or automatic analysis [of hippocampal volume] has higher sensitivity and specificity is still debatable” (text in square brackets added for clarity). We assert that current methods of automated hippocampal segmentation have poorer sensitivity and specificity than manual hippocampal segmentation for the detection of hippocampal sclerosis.

To provide evidence supporting this assertion, we measured left hippocampal volumes in 22 patients with epilepsy with left-lateralized hippocampal sclerosis and 22 age-matched healthy control participants 1) manually and 2) automatically (using FreeSurfer version 5.0; http://surfer.nmr.mgh.harvard.edu), and compared the sensitivity and specificity of the 2 techniques. A subset of the MR imaging scans used for this analysis were used in a prior study.

The sensitivity and specificity are both dependent on the hippocampal volume threshold used to classify participants. The commonly used method of measuring the area under the receiver operating characteristic (ROC) curve was used to assess which method (manual or automated) is a superior detector of hippocampal sclerosis. The ROC curves for manual and automated hippocampal segmentation are provided in the Figure. The area under the ROC curve for manual hippocampal segmentation is higher than automated hippocampal segmentation, indicating that manual segmentation is a superior method for the discrimination of hippocampal sclerosis.

The most important caveat to attach to this analysis is that the discriminative ability of automated, manual, and visual-based methods is likely to improve as MR imaging acquisitions improve. Nevertheless, we believe that manual hippocampal segmentation would likely improve the ability of quantitative methods to detect hippocampal sclerosis above the 28% improvement presented by Coan et al.1

http://dx.doi.org/10.3174/ajnr.A3750
In summary, we have presented evidence that manual hippocampal segmentation has higher sensitivity and specificity and is a better detector of hippocampal sclerosis than current automated hippocampal segmentation methods.

REFERENCES


H.R. Pardoe
New York University School of Medicine
New York, New York

G.D. Jackson
The Florey Institute of Neuroscience and Mental Health
Heidelberg, Victoria, Australia