Abstract

Cortical folding of the anterior cingulate cortex (ACC), particularly the cingulate (CS) and the paracingulate (PCS) sulci, represents a neurodevelopmental marker. Deviations in in utero development in schizophrenia can be traced using CS and PCS morphometry. In the present study, we measured the length of CS, PCS, and their segments on T1 MRI scans in 93 patients with first episode schizophrenia and 42 healthy controls. Besides the length, the frequency and the left-right asymmetry of CS/PCS were compared in patients and controls. Distribution of the CS and PCS morphotypes in patients was different from controls. Parcellated sulcal pattern CS3a in the left hemisphere was longer in patients (53.8 ± 25.7 mm vs. 32.7 ± 19.4 mm in controls, $p < 0.05$), while in CS3c it was reversed—longer in controls (52.5 ± 22.5 mm as opposed to 36.2 ± 12.9 mm, n.s. in patients). Non parcellated PCS in the right hemisphere were longer in patients compared to controls (19.4 ± 10.2 mm vs. 12.1 ± 12.4 mm, $p < 0.001$). Therefore, concurrent presence of PCS1 and CS1 in the left hemisphere and to some extent in the right hemisphere may be suggestive of a higher probability of schizophrenia.

Measurement of an hippocampal area or volume is useful in clinical practice as a supportive aid for diagnosis of Alzheimer's disease. Since it is time consuming and not simple, it is not being used very often. We present a simplified protocol for hippocampal atrophy evaluation based on a single optimal slice in Alzheimer's disease. We defined a single optimal slice for hippocampal measurement on brain magnetic resonance imaging (MRI) at the plane where the amygdala disappears and only the hippocampus is present. We compared an absolute area and volume of the hippocampus on this optimal slice between 40 patients with Alzheimer disease and 40 age-, education- and gender-matched elderly controls. Furthermore, we compared these results with those relative to the size of the brain or the skull: the area of the optimal slice normalized to the area of the brain at anterior commissure and the volume of the hippocampus normalized to the total intracranial volume. Hippocampal areas on the single optimal slice and hippocampal volumes on the left and right in the control group were significantly higher than those in the AD group. Normalized hippocampal areas and volumes on the left and right in the control group were significantly higher compared to the AD group. Absolute hippocampal areas and volumes did not significantly differ from corresponding normalized hippocampal areas as well as normalized hippocampal volumes using comparisons of areas under the receiver operating characteristic curves. The hippocampal area on the well-defined optimal slice of brain MRI can reliably substitute a

complicated measurement of the hippocampal volume. Surprisingly, brain or skull normalization of these variables does not add any incremental differentiation between Alzheimer disease patients and controls or give better results.

The volume reduction of the gray matter structures in patients with Alzheimer's disease is often accompanied by an asymmetric increase in the number of white matter fibers located close to these structures. The present study aims to investigate the white matter structure changes in the motor basal ganglia in Alzheimer's disease patients compared to healthy controls using diffusion tensor imaging. The amounts of tracts, tract length, tract volume, quantitative anisotropy, and general fractional anisotropy were measured in ten patients with Alzheimer's disease and ten healthy controls. A significant decrease in the number of tracts and general fractional anisotropy was found in patients with Alzheimer's disease compared to controls in the right caudate nucleus, while an increase was found in the left and the right putamen. Further, a significant decrease in the structural volume of the left and the right putamen was observed. An increase in the white matter diffusion tensor imaging parameters in patients with Alzheimer's disease was observed only in the putamen bilaterally. The right caudate showed a decrease in both the diffusion tensor imaging parameters and the volume in Alzheimer's disease patients. The right pallidum showed an increase in the diffusion tensor imaging parameters but a decrease in volume in Alzheimer's disease patients.

Keywords: Alzheimer's disease, schizophrenia, morphometry, FreeSurfer, ImageJ, sulcus cinguli, sulcus paracingularis, hippocampus, basal ganglia, white matter, gray matter, tractography, atrophy, parcellation, cortex