Volumetry of Insular Cortex in Diagnostics of AD

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Aim

Our goal was to prove that assessment of volume of insular operculum would be a step in creating a visual scoring system by semiquantitative analysis used in diagnosing Alzheimer's disease. Secondarily, we aimed to differentiate Alzheimer's disease from other dementias.

Methods

The analysis contained MRIs of 15 AD patients and 15 control persons. Patients repeatedly undertook psychological tests battery examined by a neurologist and were divided into groups according to their age. Using the software ImageJ, the approximate volume of insular operculum was measured and statistically compared by the programme Statistica6. Apart from total volume, average volume and partial volumes (of frontal and parietal part) were assessed. The measurements were performed on insular operculum on every slice of MRI from its first appearance (visible connection of temporal and frontal lobe) to the point of fusion of brain stem on both sides (disappearance of a canal in between the sides).

Results

After statistical comparison of measured volumes for both the right and the left hemisphere, T-test revealed significant results for both sides ($p(R) = 0.0003$ and $p(L) = 0.0006$). Not only the volume but also the average was statistically significant on both sides ($p(R) = 0.000005$ and $p(L) = 0.00002$). While measuring only the frontal or the parietal part of the insular operculum, the same trend was observed.

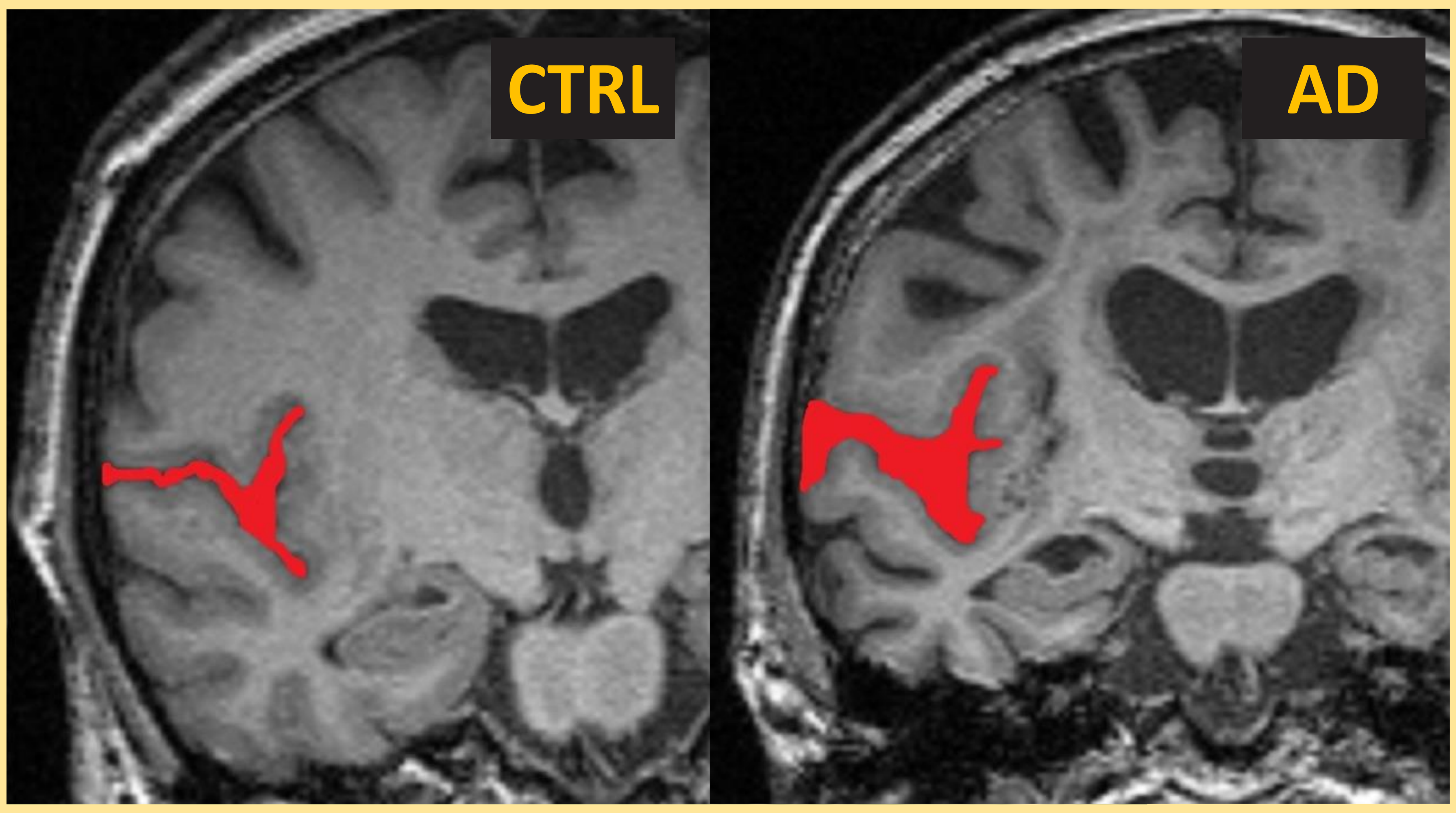

figure 5: measured area (control/AD)

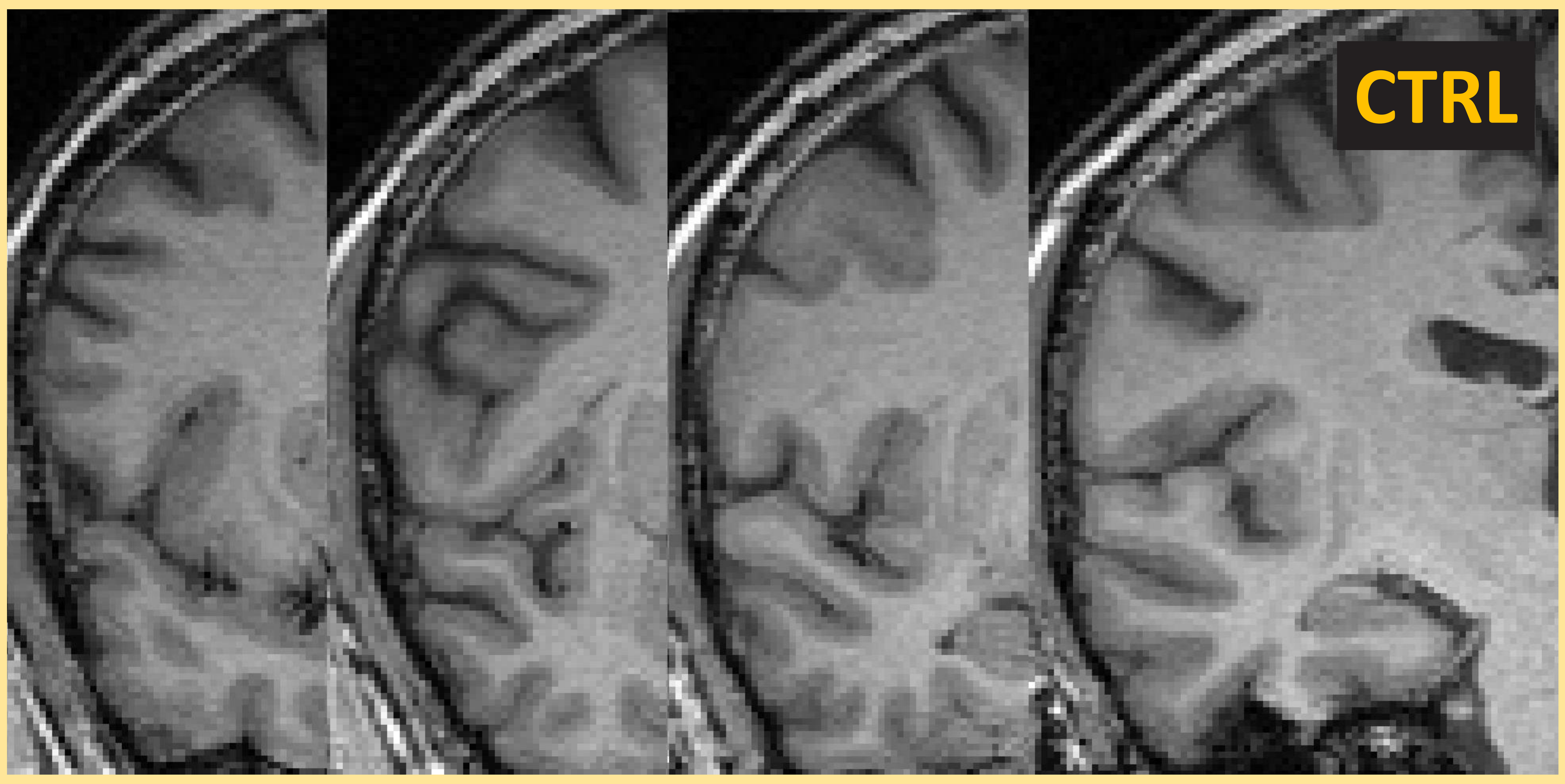

figure 6: insular cortex of a control person

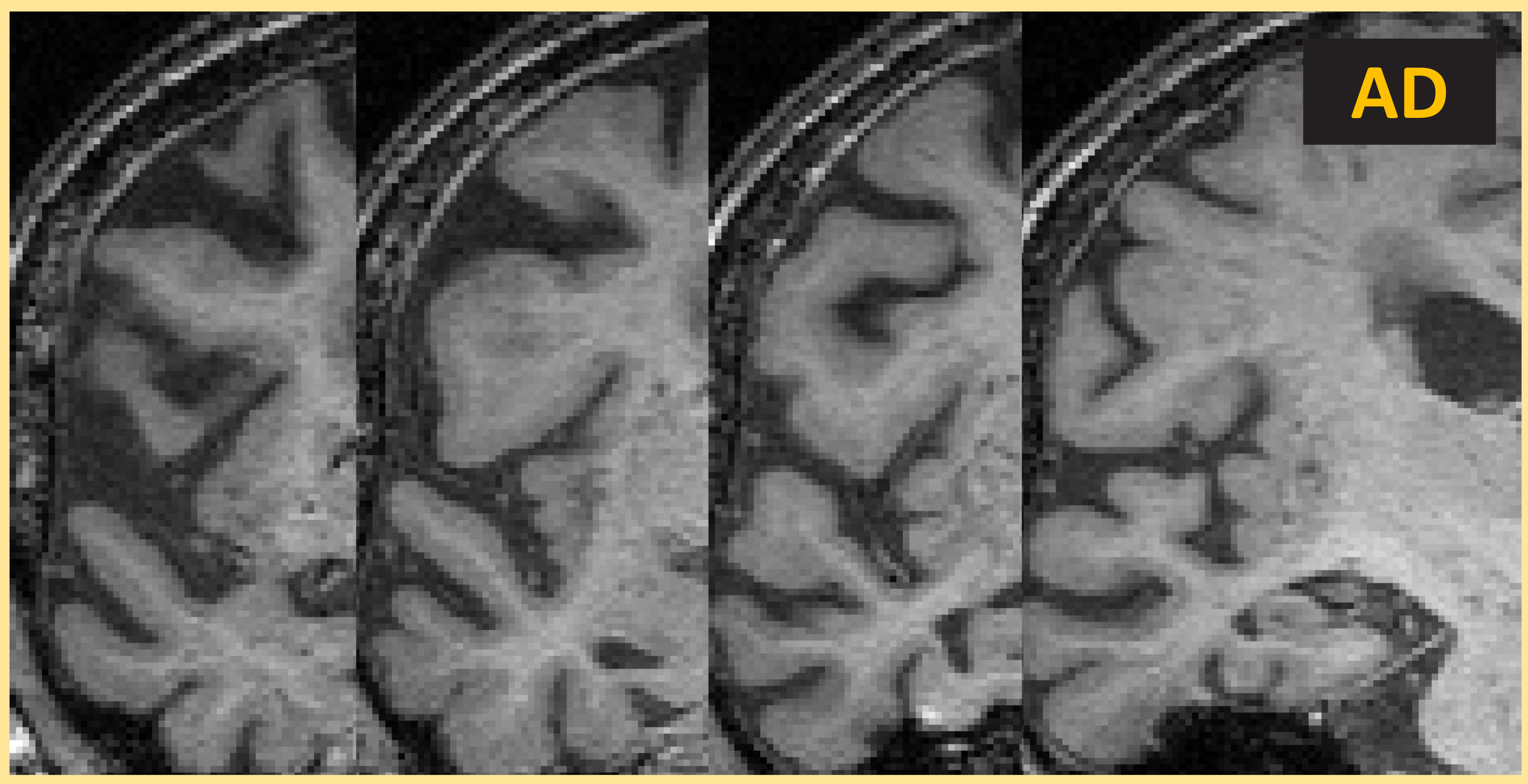

figure 7: insular cortex of an AD patient

Charts

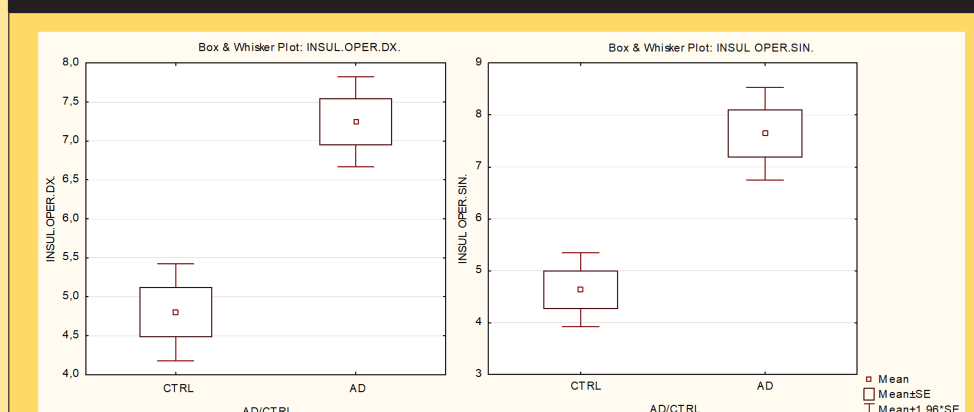
figure 1: average volume (rights/left)

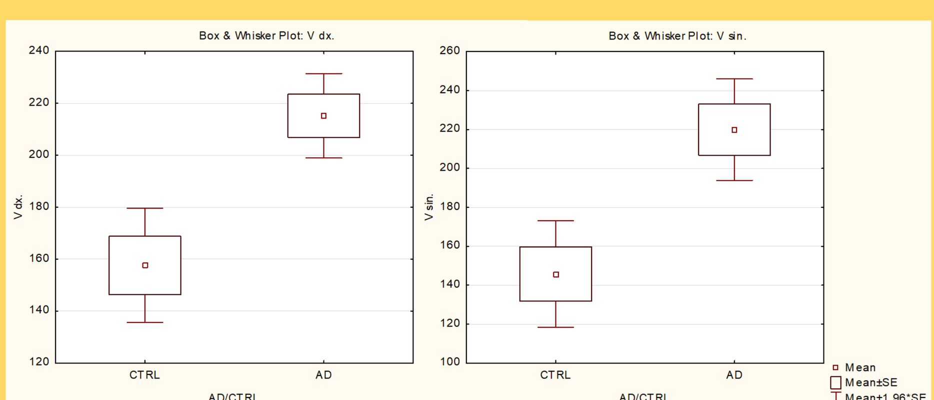
figure 2: total volume (rights/left)

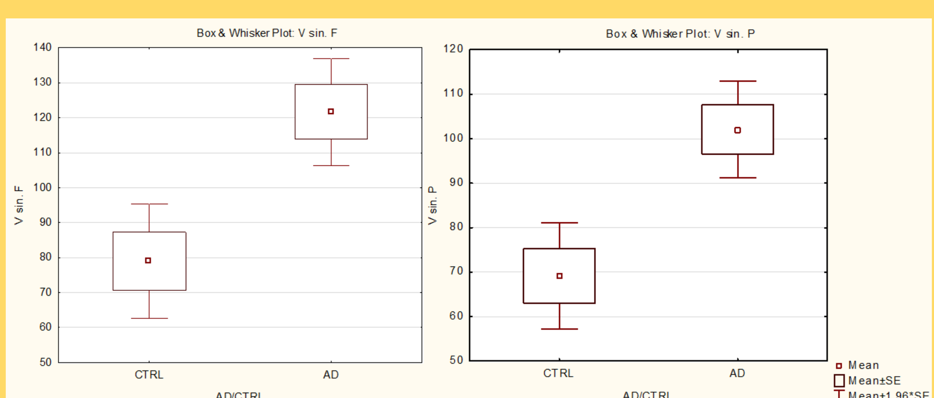
figure 3: partial volume – left insula (frontal/parietal)

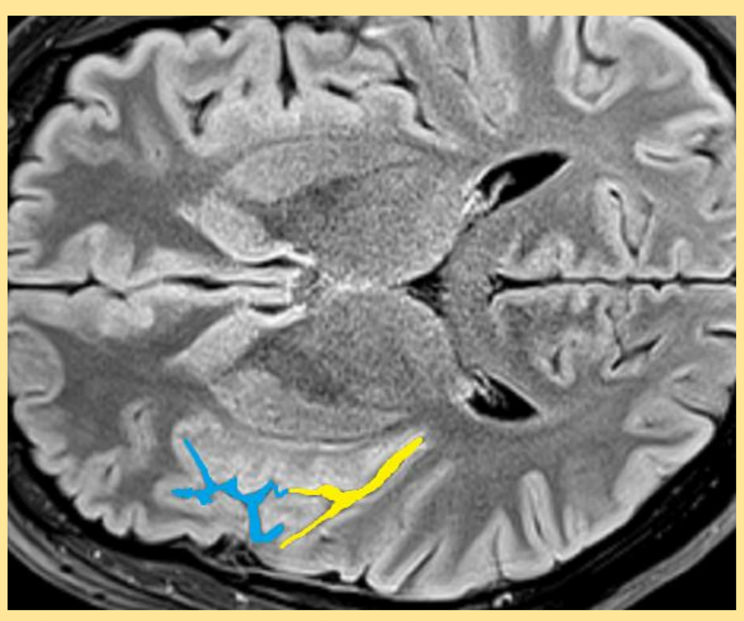
figure 4: parts of insular cortex

Conclusion

The statistically significant results support the idea of using insular atrophy as a feature of Alzheimer's disease and its potential diagnostic marker. A bit weaker significance on the left side offers a possible connection with the lateralised atrophy of the temporal lobe in hippocampal area – also right-sided. The difference in atrophy of the frontal and parietal parts of insular operculum could potentially lead to easier differential diagnosis of AD and other kinds of dementia.

Acknowledgement

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