

Dissertation Thesis Opponent's Report

Study Program: Neuroscience

Author: **Anasthasia Lahutsina**

Thesis Title: **Altered morphology of white and grey matter in patients with Alzheimer disease and schizophrenia on MRI**

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Results of work

Results show significantly longer right paracingulate sulcus in patients with schizophrenia than in controls and greater difference between the length of paracingulate sulcus on the right and left site (laterality) after adjustment for age and sex. The uninterrupted cingulate sulcus was more common in schizophrenia patients than in controls. It is mentioned that the practical classification of schizophrenia patients and controls based only on the length of left cingulate and right paracingulate sulcus is far of being perfect. Only the concurrent unilateral presence of the short paracingulate sulcus and nonparcellated cingulate sulcus in the left or the right hemisphere suggests a higher probability of schizophrenia. The absolute and normalized hippocampal area in the optimal slice is significantly higher in control group than those in the Alzheimer disease patients. In volumetric study of grey matter of basal ganglia and white matter surrounding them was found, that in Alzheimer disease loss of volume in putamen goes together with a surprising increase of its connectivity studied by DTI. Results were published in 4 publications, that's are included

Work structure

The work is divided in ten chapters and has 60 pages without literature a publications. It is mentioned history of volumetry (neuromorphometry) and MRI, the gold standard for imaging the brain in vivo. The author defined the goals and clearly described used methods. Results are presented in tables and ROC analysis in a graph. In the next chapter is discussed the practical use of cingulate and paracingulate sulcus length as a support tool for schizophrenia diagnosis. Hippocampal optimal slice on coronal section for the visualization of the atrophy in Alzheimer disease is explained. They are discussed the probably compensatory changes of white matter surrounding the basal ganglia in Alzheimer disease. Overview of the literature contains 115 citations. They are attached 4 publications in extenso, which are the basis of the dissertation.

The research problem

The thesis is concerned in three problems: 1) Fast evaluation of Alzheimer disease according the measurement of the optimal hippocampal section (caudally from amygdalar level). 2)

White matter changes found in DWI and fiber tractography in patients with Alzheimer disease and compared to age related adults with normal cognitive abilities. 3) Comparison of the cingulate and paracingulate sulcus length and arrangement (interrupted or uninterrupted) in schizophrenia and in controls.

Methodology (Research Methods, sample, data collection)

Routine MRI images were analysed through the Freesurfer (v6.0) and Image J software, for diffusion tensor images was used FSL Studio Program. For statistic was used Statistica software. Mini-Mental State Examination was used to detect mild cognitive impairment in Alzheimer disease. Clinical information about Early-Stage Schizophrenia Outcome study for the first episode of schizophrenia patients was received from the NUDZ in Klecany. In the paracingulate and cingulate sulcus study were participated 93 schizophrenia patients and 42 healthy controls. According the morphology of these 2 sulci in MRI were participants divided in 6 groups and there were studied the differences between patients with schizophrenia and controls. In the hippocampal volume study were examined 80 individuals, 40 with Alzheimer disease and 40 controls (recruited mostly from the University of Third Age) with normal Mini-Mental State Examination results. For the hippocampal volume comparison was used the area of hippocampus (Image J) on the most rostral slice of hippocampus on the coronal section in that is not present the amygdala. For the volume of basal ganglia was used the FreeSurfer program. For the DWI tractography and connectivity of basal ganglia were recruited 10 Alzheimer disease patients and 10 healthy controls. The last study had a small number of participants, so it would be useful to increase the number of participants to be sure, that the results are valid as well. All described methods are used in the top neuroscience, so it is good that the author is familiar with them.

Comments on the text, language and graphic level

The text is sufficient for the Dissertation Thesis, it contains tables, graphs, schemes and 4 publications of the author. An opponent did not find any remarks related to the stylistic part of the text. The English language used by a non-native is excellent.

Questions and commentaries for defense

- 1) There is some discrepancy in Table 3 and Table 7 in number of participants with cingulate sulcus – 2nd type. Please correct it before your defense.
- 2) The loss of hippocampal volume in Alzheimer disease is known fact for many years and it is known the different function and connections of anterior and posterior part of the hippocampus. Do you have some idea for the optimal posterior hippocampal section?
- 3) Can you increase the number of participants involved in study with white matter changes in Alzheimer disease?

Conclusions

The submitted doctoral dissertation **Altered morphology of white and grey matter in patients with Alzheimer disease and schizophrenia on MRI** reaches the high academic standard. Therefore an opponent concludes:

The author has demonstrated the ability of independent creative work in the given field. I recommend the thesis for defense and after the successful defense the receiving of the PhD. degree.

Prague 15.8. 2023



MUDr. Veronika Němcová, CSc.