Quantitative brain MRI at 7T in healthy subjects and in metabolic diseases

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PROPOSITIONS BELONGING TO THE THESIS:

QUANTITATIVE BRAIN MRI AT 7T

in

HEALTHY SUBJECTS AND IN METABOLIC DISEASES

1. At 7 Tesla, cortical thickness can be determined more accurately using MP2RAGE data if B_1^+ inhomogeneities are accounted for.

2. After taking into account B_1^+-related biases, the change in cortical thickness estimates correlates inversely with the change in apparent T_1. These differences are largest in regions where B_1^+ is too low, apparent T_1 too high and the contrast between gray matter and cerebral spinal fluid worse.

3. At 7 Tesla, quantitative T_1 (or R_1) mapping using the MP2RAGE sequence is more reproducible compared to other (predominantly) myelin-content dependent parameters, such as those based on T_2^* using ME-GRE and/or their weighted variants.

4. Areal parcellation of highly myelinated regions in surface space, defined either by a MRI parameter threshold or by strong intensity gradients, both require manual input to provide unambiguous borders.

5. Patients affected by the mitochondrial m.3243A>G mutation show a widely varying clinical phenotype.

6. The m.3243A>G mutation load, especially when defined by that measured in blood, correlates significantly with the observed morphological brain changes: patients with a higher mutation load show lower gray matter brain volumes.

7. Cortical gray matter changes in thickness, T_1, T_2^* and CBF concur especially in regions that can be linked to specific neurocognitive and -biological processes.

8. The combined analysis of MRI, genetic and metabolomic data may provide more detailed insights in the progression of Type 2 Diabetes Mellitus, as well as related changes in cognitive performance.

9. Large, high resolution, quantitative MRI datasets require an optimized analysis strategy that preserves the spatial specificity and quantitative nature of the data, preferably with minimal manual intervention as possible.

10. The definition of "big" in the term "big data" varies across scientific fields and type of data, and does not solely depend on the sample size.

11. "Sport is de belangrijkste bijzaak in het leven" *(Kees Jansma)*

Roy A.M. Haast, Maastricht, June 27, 2018