

Volumetric assessment of hippocampus and cerebral white matter lesions in structural MRI

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Avhandlingen baseras på följande delarbeten:

- I. Olsson E, Eckerström C, Berg G, Borga M, Ekholm S, Johannsson G, Ribbelin S, Starck G, Wysocka A, Löfdahl E, Malmgren H: Hippocampal volumes in patients exposed to low-dose radiation to the basal brain. A case-control study in long-term survivors from cancer in the head and neck region. *Radiation Oncology* 2012, 7:202.
- II. Eckerström C, Olsson E, Borga M, Ekholm S, Ribbelin S, Rolstad S, Starck G, Edman A, Wallin A, Malmgren H: Small baseline volume of left hippocampus is associated with subsequent conversion of MCI into dementia: the Goteborg MCI study. *J Neurol Sci* 2008, 272:48-59.
- III. Olsson E, Klasson N, Berge J, Eckerström C, Edman Å, Malmgren H, Wallin A: White matter lesion assessment in patients with cognitive impairment and healthy controls: reliability comparisons between visual rating, a manual and an automatic volumetrical MRI method - the Gothenburg MCI Study. *J Aging Research*, in press.

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ABSTRACT

Assessment in structural MRI like hippocampal volumetry and white matter lesion (WML) assessment is receiving widespread attention and recommendation as important research and diagnostic tools. The aim in this thesis is to contribute to enhanced reliability and validity in structural MRI assessment.

The hypothesis in Paper I was that long-term survivors of head and neck cancer with lowered quality of life had radiation induced damage to the hippocampus. The main hypothesis in Paper II was that patients with mild cognitive impairment subsequently converting to Alzheimer's or vascular dementia had hippocampal atrophy. The main aim in Paper III was to explore reliability in three types of WML assessment methods. Manual hippocampal volumetry was used in Paper I and II. A visual assessment method, a manual segmentation with thresholding method, and an automatic volumetry method were used in Paper III.

Low dose radiation gave no volumetrically discernible damage to the hippocampus. Other possible effects of such radiation on the brain remain to be explored. Left hippocampal atrophy predicted conversion to dementia, which confirms its usefulness as a biomarker. Low reliability for low and medium volumes in WML assessment in clinical samples implies a need of refined methodology and reliability analysis.

Keywords: magnetic resonance imaging, hippocampal volumetry, white matter lesions, mild cognitive impairment, dementia, low dose radiation

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