



Karolinska Institutet

**Institutionen för klinisk vetenskap, intervention och teknik
(CLINTEC), Enheten för medicinsk bild, funktion och
teknologi**

RELIABILITY OF VISUAL ASSESSMENT OF MEDIAL TEMPORAL LOBE ATROPHY

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Karolinska
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Abstract

Background: Medial temporal lobe atrophy (MTA) has been found to be an early sign of Alzheimer's disease (AD). Visual assessment of MTA (vaMTA) is a rapid, cost-efficient and clinically adaptable visual interpretation method for rating MTA, based on coronal magnetic resonance imaging (MRI) scans. The method was developed by Scheltens et al in the 1990s.

Purpose: The aim of this thesis was to investigate the reliability of vaMTA using the Scheltens rating scale: on a long-term basis, compared with volumetric calculation, compared with multivariate analyses and, finally, tested in a clinical situation

In **Study I**, MRI scans of 100 patients were visually assessed six times over a 1-year period. Two radiologists, with different backgrounds, performed the assessments independently of each other. The results showed a high degree of reproducibility when performed by an experienced investigator. The reproducibility drops when assessment is rarely performed.

Study II was a comparison between vaMTA and measurement of hippocampal volume in 544 non-demented elderly individuals from the Swedish National Study of Ageing and Care in Kungsholmen (SNAC-K). A significant correlation was found between the two methods. Cut-off values for MTA scores in normal ageing were also suggested.

In **Study III** the reliability of Scheltens' visual assessment rating scale for assessing MTA was compared with that of a multivariate MRI classification method, orthogonal projections to latent structures (OPLS), and manually measured hippocampal volumes to distinguish between subjects with AD and healthy elderly controls (CTL). A comparison between the different techniques was also performed in predicting future developments from mild cognitive impairment (MCI) to AD. The prediction accuracies in distinguishing between AD patients and CTL were high for all three modalities. All three methods were also highly accurate in identifying subjects who converted from MCI to AD at 1-year follow-up.

Finally, in **Study IV**, vaMTA scores were used in a validation study of the proposed new "Dubois criteria" in Alzheimer's disease, in which MTA is one of four important biomarkers. A retrospective study of 150 patients was carried out to compare the traditional diagnostic criteria for dementia with the new criteria suggested by Dubois et al. The results showed a lack of accuracy for the new AD criteria, as they were valid for only 55% of the clinically diagnosed patients with full-blown AD in this study.

Conclusion: Visual assessment of MTA using the MTA scale is reliable when performed on a daily basis. Medial temporal lobe atrophy scores have a significant correlation to hippocampal volume measurements, can predict conversion from MCI to AD with similar accuracy as can volumetric calculations and multivariate analysis, and can be used as supportive biomarker in the work-up of AD.