T2* Relaxometry for Quantitative 3.0 T MR imaging of Iron Deposits in Alzheimer's Disease Brain

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Introduction

To diagnose Alzheimer's disease (AD) and to differentiate from other dementias, the detection of at least one hallmark, i.e., amyloid plaques or neurofibrillary tangles, is essential. However, to date, amyloid plaques in AD patients have been observed only by postmortem and biopsy (1). Since there is a link between amyloid deposits and iron accumulation, visualization of iron deposits in the brain definitely provides a potential basis for the detection of amyloid deposits in vivo. There have been a number of efforts to quantitatively measure the iron concentrations in the brain using MRI (2,3). Although the iron deposits in the brain causes decreased signal intensity on T_2 weighted images, the exact estimation of the iron content relies on T_2* values (4). In this study, we measured ΔB_0 corrected T_2* maps to estimate T_2* values in the hippocampus and the temporal cortex of AD patients to see whether the T_2* values can be a direct reflection of the iron deposits. The result of the study may suggest a potential T_2* mapping as a diagnostic imaging method for AD.

Materials and Methods

9 AD patients (M: F=4:5) and 10 aged-matched ((M: F=5:5) healthy control subjects were prospectively performed at a 3.0 T whole body MRI scanner (Achieva, Philips Medical system). All the patients had mild to moderate cognitive impairment. The T_2* maps with ΔB_0 correction were calculated using a multishot EPI gradient echo sequence with EPI factor =51, TR/TE =1200/44ms, FA =30°, slice thickness =4mm, 10slices, FOV =230×230mm^2, Matrix =256×256. The T_2* values were read from region of interest (ROI) drawn at bilateral hippocampi and temporal cortexes on the calculated T_2* maps using IDL 6.1 (Interactive Data Language).

Results and discussion

As shown in table 1, the mean T_2* values of the hippocampus and the temporal cortex in patients with alzheimer's disease were shorter than those in control subjects. And statistically significantly difference between AD patients and control subjects was observed. The T_2* maps demonstrate shortening of T_2* values in the hippocampus and the temporal cortex in AD patient (Fig.1).

Conclusion

The result of this study suggests a potential of T_2* relaxometry to estimate the iron content in the brain in vivo accumulated by pathologic condition. In the study, the T_2* relaxometry seems to adequately reflect the iron content in the hippocampus of AD, which will have an added value for diagnosis of AD.

Figure 1. The T_2* maps of an AD patient (left) and a control (right) . The arrows indicate the ROIs we measured.

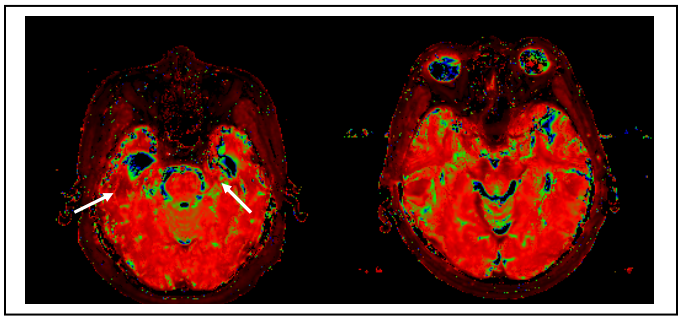

Table 1. The mean calculated T_2* values of bilateral hippocampi (HF) and temporal cortexes (TC)

	Mean age(range)	T_2*relaxation times(mean±SD, ms)	
		HF	TC
AD	**70(65-78)**	**28.2**±4.1 (p=0.04)	**26.8**±4.3 (P=0.02)
Control	**71(66-80)**	**33.4**±4.7	**33.9**±5.1

References

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