Does quantitative MRI of the deep brain grey matter structures offer diagnostic value for patients with Dementia with Lewy Bodies (DLB)?

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Introduction

- Dementia with Lewy bodies (DLB) is a neurodegenerative dementia, accounting for 10-15% of all people with dementia.
- The clinical symptoms of DLB and patients with Alzheimer's disease (AD) can overlap making differentiation difficult.
- This has led to neuroimaging being used to better understand the symptom profile and enhance diagnostic accuracy.
- DLB patients have loss of dopamine transporters in the putamen (AD patients don't show this) which can be measured by "DATscan" and assists in the diagnosis.
- The current study examined whether quantitative MRI techniques can be used to detects subtle changes in the putamen which may help to differentiate between the DLB and AD groups and controls, which would be useful in diagnosis.

Aim

• To determine whether there are changes in the tissue properties (MRI relaxation times T_1 and T_2) in the putamen in DLB patients which relate to neurotransmitter changes seen using DAT scanning, and which can differentiate between DLB and AD patients.

Methods

• MRI scans were analysed from 106 subjects enrolled in the previous comprehensive imaging study[1] (35 DLB, 36 AD and 35 age and sex matched healthy controls).

• The putamen was identified on the axial slices of the anatomical T_1 weighted scan collected in each patient (figure 1).

• Region of interests (ROIs) were defined in each hemisphere by manually outlining the left and right putamen on each slice where it was seen on the quantitative T_1 relaxation map (usually 4/5 slices) using ImageJ software (http://rsbweb.nih.gov/ij/)

• ROI was subsequently applied to quantitative MRI maps of T_1 and T_2 tissue relaxation times and the mean value for each structure was calculated.

• Group statistical analysis (ANOVA, t-test) was performed to look for differences between patient populations using SPSS software (version19, IBM).

• Regression analysis was performed in the patient groups against previously collected cognitive profiles to investigate any relationship between brain imaging changes and clinical features of the different dementia groups (data not shown).

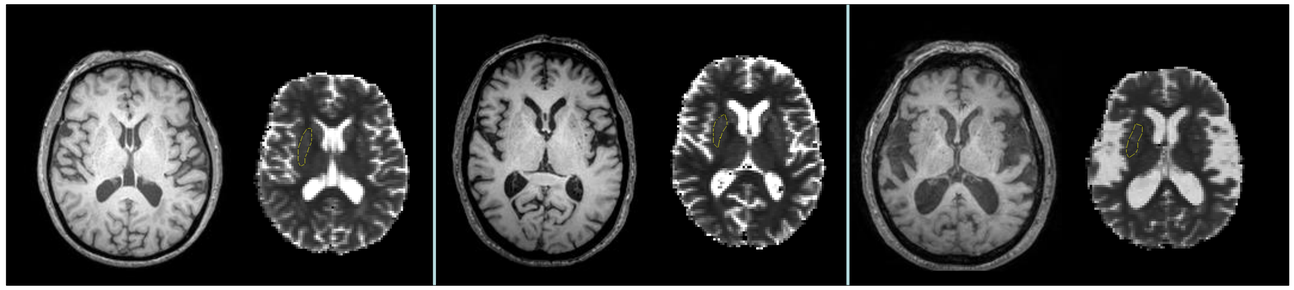

Figure 1: showing ROI (putamen) on left hemisphere of quantitative T_1 scan for a control (1); DLB (2); AD (3)

	Control	AD	DLB	ANOVA F (sig)
Quantitative T_1 ***Left***	1.087±0.082	1.080±0.062	1.117±0.111	1.691 (0.190)
Quantitative T_1 ***Right***	1.095±0.077	1.078±0.068	1.125±0.141	1.983 (0.143)
Quantitative T_2 *Left*	0.074±0.008	0.071±0.006	0.074±0.011	1.604 (0.206)
Quantitative T_2 *Right*	0.074±0.010	0.072±0.007	0.076±0.014	1.275 (0.284)

Table 1: showing the mean values for each structure on quantitative T_1 and T_2 scans (± standard deviation) and ANOVA comparison

Results

• There were no statistically significant differences between putamen relaxation times (T_1 or T_2) between patients and control subjects (Table 1)

• The quantitative ROI analysis was found to be insensitive to changes in dopaminergic transporters in the putamen. The finding was negative and MRI imaging was found to be unsatisfactory as a method for diagnosing DLB.

Conclusion

This is an important finding as it categorically demonstrates that quantitative MRI scans are not effective biomarkers for pathological changes in the putamen and therefore not helpful in assisting the diagnosis of DLB.

References

1) Watson R, et al. Neurology 2012; 79:906-14