

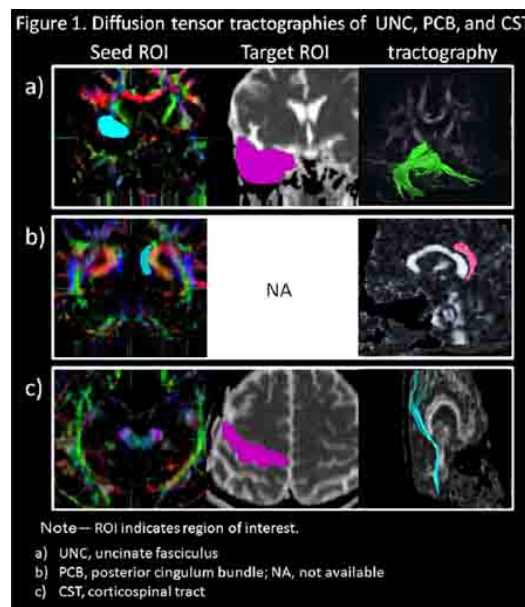
White matter abnormality in dementia with lewy bodies: A diffusion tensor imaging study.

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Introduction Alzheimer's disease (AD) is the most common cause of dementia manifested by cognitive and memory deterioration and progressive impairment of activities of daily living. Also dementia with lewy bodies (DLB) is the second most common cause of dementia and its clinical feature includes visual hallucinations, cognitive fluctuations, parkinsonism, and dementia. In grey matter volume, several studies comparing AD and DLB showed that atrophic change of DLB exhibited smaller relative to AD. Few studies using diffusion tensor imaging have reported the differences in white matter of AD and DLB. In the present study, we investigate nerve bundles of white matter using diffusion tensor tractography, and compare the parameters (e.g., FA, fractional anisotropy; ADC, apparent diffusion coefficient) between subjects with AD, DLB, and normal controls (NC).

Method Subjects with fifteen AD, 15 DLB, and 16 NC underwent 1.5T magnetic resonance DTI and neuropsychological assessment (mini mental state examination, Alzheimer's disease assessment scale-cognitive component). Probable AD was diagnosed according to the NINCDS-ADRDA criteria. All probable DLB subjects met the criteria for DLB of McKeith et al.. Diffusion tensors were computed and fiber-tract maps were created using a PC workstation with "dTV II" diffusion tensor imaging software developed by Masutani et al.. We measured mean fractional anisotropy (FA) and apparent diffusion coefficient (ADC) values along the uncinate fasciculus (UNC), posterior cingulum bundle (PCB), and corticospinal tract (CST) (Fig 1). Informed consent for the imaging study was obtained from all patients or their families after the nature of the procedures had been fully explained.



	Group			P value		
	NC	AD	DLB	NC vs AD	NC vs DLB	AD vs DLB
gender (F/M)	8/8	10/5	10/5			
Age, mean±SD, y	71.9 ± 7.2	73.6 ± 6.4	72.9 ± 9.1	NS	NS	NS
UNC						
FA, (R+L)/2, mean±SD	0.380±0.017	0.357±0.020	0.370±0.020	<0.001	NS	<0.05
R, mean±SD	0.383±0.02	0.357±0.019	0.375±0.023	<0.01	NS	<0.05
L, mean±SD	0.378±0.02	0.351±0.028	0.365±0.021	<0.01	NS	NS
ADC, (R+L)/2, mean±SD	0.422±0.019	0.446±0.016	0.432±0.020	<0.001	NS	<0.05
R, mean±SD	0.421±0.017	0.444±0.016	0.431±0.021	<0.001	NS	<0.05
L, mean±SD	0.422±0.02	0.447±0.021	0.433±0.021	<0.01	NS	NS
PCB						
FA, (R+L)/2, mean±SD	0.397±0.028	0.357±0.028	0.374±0.026	<0.001	<0.05	NS
R, mean±SD	0.402±0.033	0.364±0.032	0.377±0.027	<0.001	<0.05	NS
L, mean±SD	0.392±0.024	0.350±0.028	0.371±0.032	<0.001	<0.05	<0.05
ADC, (R+L)/2, mean±SD	0.397±0.018	0.425±0.019	0.415±0.019	<0.001	<0.01	NS
R, mean±SD	0.393±0.017	0.423±0.024	0.411±0.018	<0.001	<0.05	NS
L, mean±SD	0.400±0.021	0.427±0.018	0.419±0.023	<0.001	<0.05	NS
CST						
FA, (R+L)/2, mean±SD	0.505±0.024	0.506±0.028	0.511±0.030	NS	NS	NS
R, mean±SD	0.511±0.031	0.495±0.040	0.507±0.028	NS	NS	NS
L, mean±SD	0.500±0.021	0.510±0.032	0.515±0.036	NS	NS	NS
ADC, (R+L)/2, mean±SD	0.415±0.014	0.430±0.018	0.428±0.020	NS	NS	NS
R, mean±SD	0.413±0.013	0.430±0.019	0.431±0.025	NS	NS	NS
L, mean±SD	0.416±0.018	0.429±0.022	0.426±0.021	NS	NS	NS
MMSE, mean±SD	27.4 ± 2.0	18.5 ± 4.2	18.5 ± 4.3			
ADAS-Cog, mean±SD	7.34 ± 3.86	21.45 ± 8.48	21.02 ± 7.57			

Note—NC indicates normal control subjects; AD, Alzheimer's Disease; DLB, Dementia with Lewy Bodies; FA, fractional anisotropy; ADC, apparent diffusion coefficient; UNC, uncinate fasciculus; PCB, posterior cingulum bundle; CST, corticospinal tract; MMSE, Mini-Mental State Examination; ADAS-Cog, Alzheimer's Disease Assessment Scale-cognitive component

Result In the FA and ADC values of UNC and PCB, significant differences were observed between subjects with AD and NC. Those values in the right UNC, statistically significant differences were exhibited between subjects with AD and DLB (Table 1). Subjects with DLB exhibited significantly lower FA and higher ADC values in the both sides of PCB relative to subjects with NC. There are no statistical significant differences in the CST among all groups.

Discussion FA and ADC are imaging markers commonly used to study microstructural white matter abnormalities in various pathologic states. Decreasing of FA and increasing of ADC is thought to be lower integrity of brain tissues. This result means subjects with AD have more severe abnormality in the white matter of

UNC and PCB than subjects with DLB. Subjects with DLB exhibit white matter abnormality in the PCB relative to NC subjects. This result is consistent with reduced regional cerebral blood flow of posterior cingulate cortex in previous SPECT studies.

Conclusion Subjects with AD have more severe abnormality relative to subjects with DLB in the white matter. Subjects with DLB exhibit white matter abnormality relative to NC subjects.