

# MICROSTRUCTURAL CHARACTERISTICS OF CEREBROVASCULAR LESIONS IN PATIENTS WITH DEMENTIA WITH LEWY BODIES

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## INTRODUCTION

White matter hyperintensities (WMHs) on MRI are thought to be associated with ischemic small vessel disease in the aging brain, and they are described in up to 80% of demented subjects.<sup>1</sup>

Beside being indicators of cerebrovascular disease (CVD) in patients with or without dementia,<sup>2</sup> WMHs on T2-weighted MRI could also be due to vascular amyloidosis.<sup>3</sup> The underlying pathophysiology of WMH is complex indeed,<sup>4</sup> with potential contribution from both vascular and neurodegenerative pathologies.<sup>5</sup> Patients with Alzheimer's disease dementia have more WMHs and a higher frequency of cerebral infarcts than cognitively normal (CN) subjects.<sup>6</sup> However, the prevalence and the clinical impact of CVD in dementia with Lewy bodies (DLB) is not established, with conflicting reports about the frequency of cerebrovascular lesions on MRI in patients with DLB compared to CN.<sup>7-8</sup>

## OBJECTIVE

Our aim is to characterize the WMHs by studying their microstructural proprieties in patients with DLB compared to CN subjects.

## METHODS

We recruited **15 patients with probable DLB** and **24 CN subjects**.

**Table 1.** Sociodemographic, clinical and MRI features

	DLB	CN	p
<b>Number</b>	15	24	---
<b>Age at MRI, years</b>	70.9 (5.4) [62-81]	69.7 (6.5) [59-82]	0.432
<b>Women, n (%)</b>	5 (33.3)	9 (37.5)	>0.99
<b>MMSE</b>	16.6 (5.7) [9-23]	29.22 (1) [27-30]	<0.001

Values are means (standard deviations) [range] or numbers of patients. P values refer to Fisher exact test, Mann-Whitney U-test or the Kruskal-Wallis, as appropriate. Abbreviations: MMSE= Mini Mental State Examination; CN = cognitively normal subjects; DLB = dementia with Lewy Bodies;

### MRI ACQUISITION :

Using a 3.0 T Philips Intera scanner, the following sequences of the brain were acquired:

- 1) T2-weighted spin echo (SE)
- 2) 3D T1-weighted fast field echo
- 3) pulsed-gradient SE echo planar with sensitivity encoding with diffusion gradients applied in 35 noncollinear directions using a gradient scheme which is standard on this system (gradient over-plus) and optimized to reduce echo time as much as possible.

### IMAGES ANALYSIS:

- WMH load was quantified on T2-weighted scans.
- T2 images were co-registered to diffusion tensor (DT) MRI using a standardized protocol in FSL.
- Fractional anisotropy (FA) and mean diffusivity (MD) values were obtained from **WMHs** and the **normal appearing WM (NAWM)**.

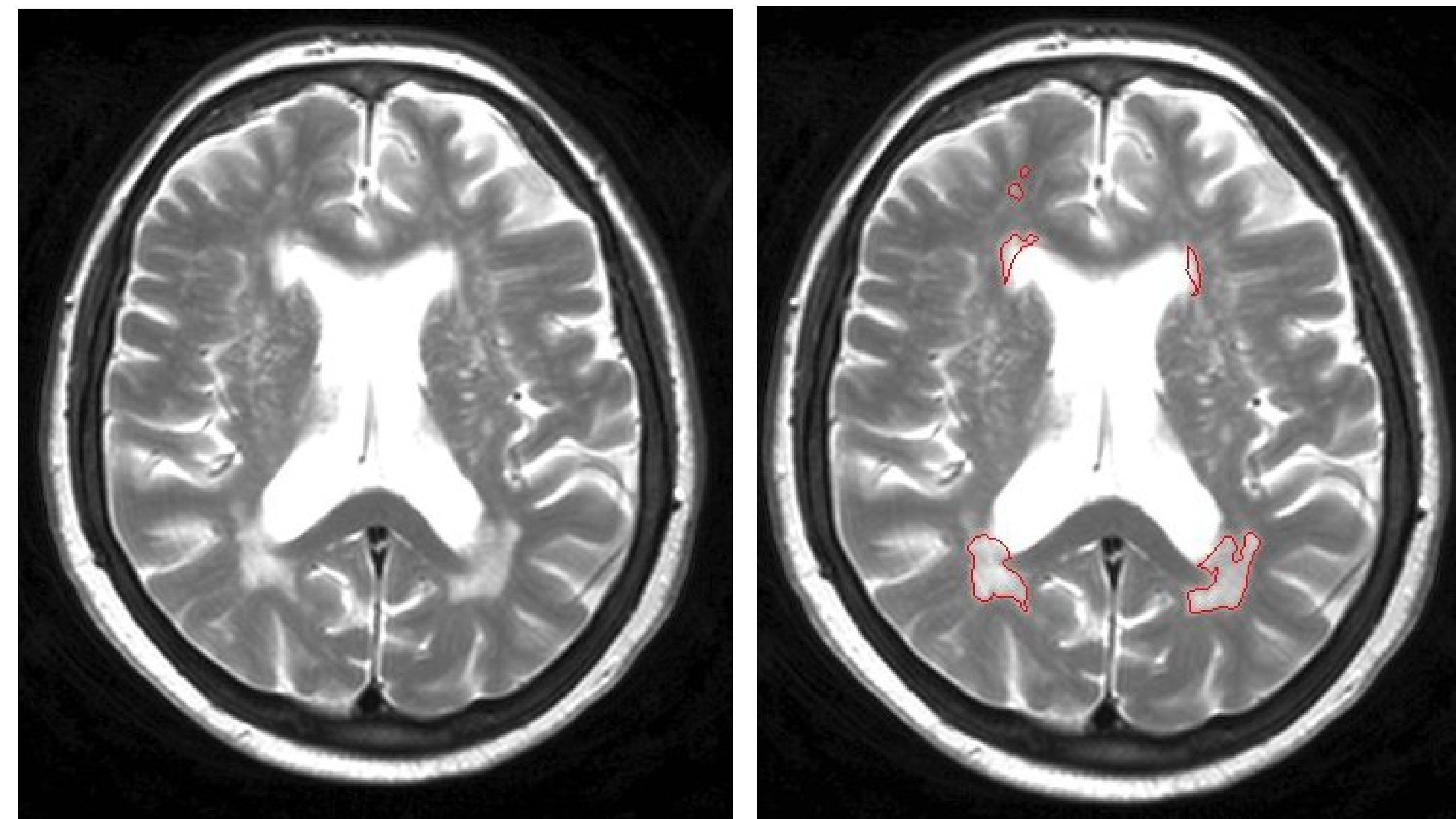
**Table 2.** Clinical features of patients with probable DLB.

	DLB (n=15)
Disease duration, years	2.4 (1.16) [1-5]
Visual Hallucinations, n (%)	11 (73.3)
Fluctuations, n (%)	10 (66.7)
Parkinsonism, n (%)	14 (93.3)
REM Sleep Behavior Disorder, n (%)	13 (86.6)
Hypertension, n (%)	9 (60)
Diabetes, n (%)	3 (20)
Treatment with AChEI, n (%)	13 (86.7)
Treatment with dopaminergic agents, n (%)	2 (13)
Treatment with antipsychotics, n (%)	13 (86.7)

Values are means ± standard deviations [range] or numbers (percentage) of patients. AChEI= acetylcholinesterase inhibitor.

## RESULTS

**Figure 1.** Example of WMHs on T2-weighted scans.



**Table 3.** WMH microstructural characteristics of patients with DLB and CN subjects.

	DLB (n=15)	CN (n=24)	p
<b>NAWM FA</b>	0.39 (0.02)	0.41 (0.02)	<b>0.001</b>
<b>NAWM MD</b>	0.76 (0.03)	0.74 (0.02)	<b>0.016</b>
<b>WMH FA</b>	0.27 (0.04)	0.3 (0.04)	<b>0.030</b>
<b>WMH MD</b>	1.1 (0.15)	0.96 (0.14)	<b>0.006</b>
<b>WMHs, ml</b>	4920 (5.7)	4244.4 (10.9)	<b>0.035</b>

Values are means (standard deviations) [range] or numbers of patients. P values refer to Mann-Whitney U-test or the Kruskal-Wallis, as appropriate. Abbreviations: MD=mean diffusivity; FA=fractional anisotropy; WM = white matter; NAWM= normal appearing white matter; WMHs= white matter hyperintensities

**Table 4.** DT MRI metrics of NAWM and WMHs in patients with DLB and CN subjects.

	NAWM FA	WMH FA	p
<b>DLB (n=15)</b>	0.39 (0.02)	0.27 (0.04)	<b>0.001</b>
<b>CN (n=24)</b>	0.41 (0.02)	0.3 (0.04)	<b>0.001</b>
	<b>NAWM MD</b>	<b>WMH MD</b>	
<b>DLB (n=15)</b>	0.76 (0.03)	1.1 (0.15)	<b>&lt;0.001</b>
<b>CN (n=24)</b>	0.74 (0.02)	0.96 (0.14)	<b>&lt;0.001</b>

Values are means (standard deviations) [range] or numbers of patients. P values are assessed using Wilcoxon Test. Abbreviations: MD=mean diffusivity; FA=fractional anisotropy; NAWM= normal appearing white matter; WMHs= white matter hyperintensities.

## CONCLUSIONS

- In agreement with other studies,<sup>9, 10</sup> our results support the evidence that WMHs volume is greater in patients with DLB compared to CN subjects.
- In patients with DLB, WMHs and NAWM FA values were lower and WMHs and NAWM MD values were higher compared to CN subjects, probably reflecting a diffuse microstructural WM damage in the patients group.
- Furthermore, within each clinical group, WMHs DT MRI metrics were altered compared to those of NAWM.

## REFERENCES

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