



Relationship between gray matter, retinal nerve fiber layer thickness and cognitive performances in multiple sclerosis: a cross sectional study.

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Background

Retinal nerve fiber layer (RNFL), as measured by ocular coherence tomography (OCT), may have a relationship between cognitive performances and brain structural changes in MS. The published data suggest correlations between RNFL thickness and measures of brain atrophy on MRI with grey matter (GM) atrophy remaining a hot topic.

Aims

The purpose of this study was to assess in a cross sectional design the relationship between RNFL, cognitive performances and MRI findings.

Materials and methods.

Patients were enrolled at MS Center of Cagliari. An MS expert neurologist performed the EDSS, the BICAMS assessment and the OCT. Eyes with previous optic neuritis (either clinical or subclinical) were excluded. All subject underwent brain MRI with a 1.5 Tesla Siemens scanner. Normalized Brain Volume (BV), Normalized Grey matter Volume (GM) and Normalized White Matter Volume (WM) were estimated with SIENAX. Relationship between peripapillary RNFL (pRNFL), symbol digit modality test, California verbal learning test II and brief visual memory test (corrected for age and education) and MRI data were assessed by means of the Spearman product moment correlation analysis also after correcting for age and disease duration.

Results

Out of 43 patients (16 male, 27 female) 84 eyes met the inclusion criteria. The study population characteristics were: mean EDSS 2.27 (SD \pm 1.57), age 43.98 (SD \pm 10.85), disease duration 11.63 (SD \pm 8.07). 16 patients (32 eyes) showed cognitive impairment (CI) while 27 patient (52 eyes) were not impaired. pRNFL showed a significant but mild relationship with disease duration ($r=-0.26$ $p=0.02$), WB ($r=0.27$ $p=0.02$) and GM($r=0.27$ $p=0.01$). After correcting for age and disease duration GM and pRNFL remained significantly associated ($r=0.26$ $p=0.02$). When considering separated groups, the relationship between GM and pRNFL became 40% ($r=0.40$ $p=0.02$) in cognitive impaired patients and not significant in not impaired patients ($r=0.18$ $p= 0.15$). None of the cognitive tests showed significant relationship in the whole population and in the sub-groups.



			Disease duration	Year Onset	EDSS	SDMT	CVLT	BVMT	GM	WM	BV
All patient	RNFL	Rho	-0.265	0.265	0.015	0.164	0.130	0.004	0.270	0.086	0.271
	84 eyes	p value	0.016	0.016	0.894	0.138	0.243	0.970	0.014	0.438	0.013
Cognitive impaired patients	RNFL	Rho	-0.325	0.325	0.097	-0.024	0.282	0.217	0.403	0.051	0.381
	31 eyes	p value	0.073	0,073	0.602	0.896	0.123	0.240	0.024	0.784	0.034
Not cognitive impaired patients	RNFL	Rho	-0.170	0.170	-0.031	0.271	0.105	-0.098	0.198	0.084	0.231
	52 eyes	p value	0.227	0.227	0.826	0.051	0.455	0.485	0.158	0.551	0.098

Conclusions

Our data confirm the strong relationship between pRNFL and GM impairment while white matter appear completely disjointed. We didn't confirm the relationship between pRNFL and cognitive performances found by other groups. Indeed it is relevant that the more is the cognitive impairment, the strongest is the correlation between pRNFL and GM.