Retinal thickness evaluation in a cohort of ALS patients.


(1) Department of Neuroscience, Rehabilitation, Ophthalmology, Genetics and Maternal-Infantile Sciences; IRCCS AOU San Martino IST, Genoa, Italy.

INTRODUCTION
Amyotrophic Lateral Sclerosis (ALS) is no more considered as an exclusively motor dysfunction. The lack of a reliable quantitative marker of neurodegeneration represents one of the main unmet needs in ALS clinical research and care (1). Although visual disturbances are not typical of the clinical spectrum of ALS, the possibility that the anterior visual pathway (AVP) may be afflicted subclinically by ALS remains largely unexplored. Optical Coherence Tomography (OCT) is an interferometric method generating cross-sectional images of the retina in vivo. It allows to objectively and non-invasively quantify axonal and neuronal layers of the retina thus measuring different quantitative parameters, such as the thickness of the Retinal Nerve Fiber Layer (RNFL), which has been proposed as a proxy marker of neurodegeneration in different neuroinflammatory and neurodegenerative diseases (2). A recent study has not found OCT alterations in ALS (3). Our aim was to evaluate RNFL thickness in a group of subject with ALS and their correlation with clinical, cognitive and MRI parameters in order to confirm or confute prior results present in literature.

PATIENTS AND METHODS
Ten ALS patients (20 eyes) and 10 healthy controls (20 eyes; HCs) were enrolled in the study. ALS disease severity was determined with Seated Vital Capacity evaluation and the Amyotrophic Lateral Sclerosis Functional Rating Scale - Revised. Furthermore, the patients were classified according to their El Escorial level-of-certainty to one of three diagnostic categories (possible, probable and definite ALS). All OCT scans were carried out with a Spectralis optical coherence tomograph (Heidelberg Engineering, Heidelberg, Germany); OCT evaluations encompassed RNFL thickness, total macular volume, papillomacular bundle, optic nerve head. Ophthalmological assessment included examination of visual acuity (EDTRS table), contrast sensitivity (Pelli-Robson’s contrast sensitivity chart), colours sensitivity (Ishihara tables), ocular motility and fundus oculi evaluation. All the patients underwent a neuropsychological examination [Reading the mind in the eyes test (RMET), Frontal Assessment Battery (FAB), ALS Cognitive Behavioral Screen (ALS CBS) and the Neuropsychiatric Inventory (NPI)] in order to evaluate the presence of cognitive impairment. ALS patients and the healthy controls executed a brain MRI scan (1.5 Tesla equipment) with 3D-FSGPR and Diffusion Tensor imaging acquisitions. All these parameters and their changes over time were evaluated at baseline and at the follow-up visits with a prospective observation over a year.

RESULTS
Ten ALS patients (20 eyes) and 10 healthy controls (20 eyes; HCs) underwent OCT scanning. Study population is shown in Figure 1 and 2. There was no significant difference between ALS patients and HCs in any of the examined OCT measures (Figure 4 and Figure 5). Moreover, OCT parameters showed no correlation with clinical measures of disease severity and with paraclinical parameters. RNFL thickness did not present a correlation with MRI findings. Moreover we found differences between ALS patients and HCs in global cortical atrophy evaluated with MRI parenchymal fraction analysis.

CONCLUSIONS
These findings confirm that retina and anterior visual pathway do not appear to be involved in non-motor degeneration in ALS patients not allowing clinicians to use OCT as a reliable biomarker for this affection. In our study we included ophthalmological, neuropsychological and neuroradiological (MRI) assessment in order to correlate these parameters to RNFL thickness. Our study affirms the negative results of the only one previous research on OCT in ALS (3) and does not support the opinion of a subclinical more widespread involvement of extra motor pathways. Additionally whole brain cortical atrophy evaluated with MRI parenchymal fraction presented statistically significant differences between the two groups and correlated with disease severity encouraging future applications of this parameter as a possible disease biomarker.

REFERENCES