Bedside digital videooculography could be a biomarker of neurodegenerescence in early multiple sclerosis patients

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Introduction:
We previously reported that video oculography (VOG) could highlight subclinical eye movement abnormalities (EMA) in patients with multiple sclerosis (MS) or radiologically isolated syndrome (RIS) without correlation to brain MRI T2 lesion load (LL).
We also demonstrated that eVOG, a home-developed iPad application, could be a reliable and mobile tool to detect eye movement abnormalities (EMA) compared to VOG.

Objectives:
To assess correlations between EMA and MRI parameters, particularly global and regional brain atrophy.

Methods:
We conducted a monocentric, prospective, transversal study including patients with MS or RIS. Each patient was assessed with eVOG to detect abnormalities regarding horizontal or vertical saccades, smooth pursuit or antisaccades. The presence of fixation abnormalities such as square wave jerks were also detected.
Each patient had a brain MRI including a 3D FLAIR sequence which was analyzed using volBrain software to obtain regional volumetric measures of 135 brain structures and T2 lesion load (LL) volume.

Results:
44 patients were included (24 MS/20 RIS, mean age 46.4 yrs (26-70); F/M 1.6, mean EDSS 1.9 (0-6)
Patients had an average of 2.5 EMA, and 35 patients had at least 2 EMA.
28 patients had smooth pursuit impairment (SPI). In comparison with patients without SPI, we found significant difference regarding global brain volume (1153 vs 1226cm3, $p = 0.04$), and particularly cerebellar vermis ($p=0.005$), thalamus ($p=0.03$), and supplementary motor cortex ($p=0.007$).
No other correlation was found regarding other brain structures, other EMA and global or regional T2-LL.

Conclusions:
Detection of SPI using eVOG was associated with increased regional brain atrophy in specific areas involved in the control of eye movements.
eVOG could be an easy to deploy bedside tool to detect RIS or MS patients with significant neurodegenerescence.