Optical Coherence Tomography and Multifocal Visual Evoked Potentials usefulness to assess visual pathway alterations: evidence from clinical practice.

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Introduction

Full-field visual evoked potentials (ff-VEP) are fundamental in neurological practice to define the nature of visual disturbances. We explored whether, in case of normal ff-VEP and suspected organic visual pathway involvement, multifocal visual evoked potentials (mf-VEP) and optical coherence tomography (OCT) can be useful in the diagnostic workup. mf-VEP allows to infer the electrophysiological assessment of conduction along the central visual pathways for separate portions of the visual field [1]; this technique has proven to be useful in the investigation of glaucoma [2] and interesting findings are becoming available also in the assessment of patients with other optic neuropathies [3, 4]. OCT instead allows to assess neurodegeneration in vivo and in a non-invasive way; data published in the last years suggest its usefulness in an increasing number of neurological conditions [5-7].

Methods

Observational case reports. Neurophysiological assessment: ff-VEP were performed using a pattern reversal stimulation (checkerboard, size 60’, 30’, 15’) and one recording channel (Oz-Cz, according to 10/20 international system). mf-VEP were performed using a 56-segments dartboard pattern on LCD monitor and 2 recording occipital channels (1 horizontal: 2 electrodes at 4 cm on each side of the inion, left-right; 1 midline vertical: 1 electrode 2.5 cm above vs 1 at 4.5 cm below the inion, upper-lower) [Figure 1]. OCT was performed using standard RNFL 12° peripapillary circle scan allowing to measure RNFL global and sectoral thickness.

Results

We describe here the cases of 3 patients arrived at our department complaining for visual disturbances. Two young women (29 and 30 year-old respectively) arrived at our attention with a suspect of optic neuritis (ON) characterized by unilateral visual acuity (VA) loss, pain at eye movements and dyschromatopsia. In both cases ff-VEP in the acute phase were not diagnostic or conclusive; OCT and mf-VEP allowed to clearly identify the involvement of the visual pathway [Figures 2 and Figures 3]. The third patient, a 69 year-old woman affected by a left frontal basal meningioma involving the left optic nerve, complained for blurred vision in the nasal visual field of the left eye as confirmed by computed geometry (CP). While ff-VEP showed normal latency and non-significant amplitude reduction in the left eye, mf-VEP showed important amplitude reduction in the whole lower hemifield in the left eye. OCT scan confirmed axonal damage showing left RNFL thinning [Figure 4].

Conclusions

Sometimes ff-VEP fails in identifying abnormalities in patients with processes involving the visual pathway, particularly in cases with axonal or sectoral optic nerve involvement. In the presence of a patient complaining for visual disturbances with normal ff-VEP examination we suggest the importance of a multimodal evaluation, including OCT and mf-VEP. This integrated approach is likely to increase specificity and sensitivity of the diagnostic workup, potentially giving useful information in the differential diagnosis of neurological and neurophthalmological conditions affecting vision.

Bibliography and Acknowledgments


Key Points

- ff-VEP sometimes fail in identifying visual pathway involvement.
- mf-VEP can identify partial damages of the visual pathway.
- OCT can demonstrate axonal degeneration of the optic nerve.
- Usefulness of a multimodal neuroophthalmological evaluation to assess visual pathway abnormalities.