A Case of Functional (Psychogenic) Monocular Hemianopia Analyzed by Measurement of Hemifield Visual Evoked Potentials

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Key Words

Monocular hemianopia · Hemifield visual evoked potentials · Latency · Amplitude · Visual field

Abstract

Purpose: Functional monocular hemianopia is an extremely rare condition, for which measurement of hemifield visual evoked potentials (VEPs) has not been previously described.

Methods: A 14-year-old boy with functional monocular hemianopia was followed up with Goldmann perimetry and measurement of hemifield and full-field VEPs. **Results:** The patient had a history of monocular temporal hemianopia of the right eye following headache, nausea and ague. There was no relative afferent pupillary defect, and a color perception test was normal. Goldmann perimetry revealed a vertical monocular temporal hemianopia of the right eye; the hemianopia on the right was also detected with a binocular visual field test. Computed tomography, magnetic resonance imaging (MRI) and MR angiography of the brain including the optic chiasm as well as orbital MRI revealed no abnormalities. On the basis of these results, we diagnosed the patient's condition as functional monocular hemianopia. Pattern VEPs according to the International Society for Clinical Electrophysiology of Vision (ISCEV) standard were within the normal range. The hemifield pattern VEPs for the right eye showed a symmetrical latency and amplitude for nasal and temporal hemifield stimulation. One month later, the visual field defect of the patient spontaneously disappeared. **Conclusions:** The latency and amplitude of hemifield VEPs for a patient with functional monocular hemianopia were normal. Measurement of hemifield VEPs may thus provide an objective tool for distinguishing functional hemianopia from hemifield loss caused by an organic lesion.

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Introduction

Monocular hemianopia is a rare disorder, caused in most cases by an organic juxtasellar lesion such as a pituitary adenoma [1, 2]. It can also be a functional disorder; however, affected individuals then experience a monocular defect without objective evidence of visual pathway damage [3–5]. The measurement of visual evoked potentials (VEPs) is a valuable tool for the evaluation of sensory activity in the visual pathway from the retina to the occipital cortex. A hemifield VEP, which is measured during hemifield stimulation, is more useful than a standard full-field VEP for the diagnosis of hemianopia. It has been found that patients with an organic hemianopic visual field defect display an amplitude asymmetry of $>4 \mu\text{V}$ in hemifield VEPs in response to right- and left-hemifield stimulation [6]. However, as far as we are aware, the measurement of hemifield VEPs in a patient with functional monocular hemianopia has not yet been reported. We describe here the potential contribution of measurement of full-field and hemifield pattern-reversal VEPs to the diagnosis of functional monocular hemianopia.

Case Report

A 14-year-old boy who was born deaf was referred to the emergency room at Kochi University Hospital on 30 January 2013 with a history of monocular temporal hemianopia of the right eye following headache, nausea and ague. He visited our department for the first time the next day. His visual acuity was 1.2 and 1.5 in the right and left eye, respectively. His intraocular pressure was normal, as were the anterior segment and macular as revealed by optical coherence tomography. No relative afferent pupillary defect was apparent, and a color perception test (Ishihara color test) was normal. Goldmann perimetry revealed a vertical monocular temporal hemianopia of the right eye (fig. 1); this was also detected with a binocular visual field test. Computed tomography, magnetic resonance imaging (MRI) and MR angiography of the brain including the optic chiasm as well as orbital MRI revealed no apparent abnormality. On the basis of these findings, we diagnosed the patient's condition as functional monocular hemianopia.

At a follow-up 1 week later, the patient still manifested monocular temporal hemianopia of the right eye as revealed by Goldmann perimetry as well as a hemifield defect as revealed by the binocular field test. Pattern VEPs were then measured with a VikingSelect instrument (Natus Medical Inc., San Carlos, Calif., USA). The stimuli were checkerboard patterns with an individual check size of 1.5 degrees. The stimulus monitor was a cathode-ray tube of 14.3×18.5 degrees and the hemifield was of half size. The measurement distance was 100 cm and the reversal frequency was 0.7 Hz (transient VEP). Pattern VEPs according to the International Society for Clinical Electrophysiology of Vision (ISCEV) standard were within the normal range [7]. The latency and amplitude were 111.5 ms and $13.4 \mu\text{V}$ for the right eye and 107.5 ms and $11.9 \mu\text{V}$ for the left eye, respectively (fig. 2a). The hemifield pattern VEPs for the right eye were symmetrical, with a latency and amplitude of 114.0 ms and $9.1 \mu\text{V}$ for stimulation of the temporal field and 109.5 ms and $8.9 \mu\text{V}$ for stimulation of the nasal field, respectively (fig. 2b).

One month later, the visual field defect of the patient spontaneously disappeared.

Discussion

As far as we know, our report represents the first demonstration of a normal amplitude and latency for hemifield VEPs in a patient with functional monocular hemianopia. Hershenfeld and Sharpe [8] reported 24 cases of monocular hemianopia; field loss was functional in 2 of these, with the rest being attributed to tumors, dysversion of the optic disc or optic neuritis. Brooks and Subramanian [9] reported a case of monocular temporal hemianopia caused by septo-optic dysplasia. Organic monocular temporal hemianopia may result from optic nerve damage immediately anterior to the optic chiasm. An amplitude asymmetry of $>4 \mu\text{V}$ between responses evoked by right- and left-hemifield stimulation and recorded ipsilaterally to the stimulated hemifield is clinically relevant to hemianopic visual field defects caused by retrochiasmal organic lesions [6].

Functional monocular hemianopia is an extremely rare disease and we are aware of only 26 cases having been reported to date. The persistence of the hemianopia in a binocular field test and the absence of a relative afferent pupillary defect readily distinguish functional hemianopia from hemifield loss due to an organic lesion. Gittinger [4] also reported the lack of an abnormality on full-field VEP testing in a patient with functional hemianopia. We did not detect an amplitude asymmetry of $>4 \mu\text{V}$ between responses evoked by nasal and temporal hemifield stimulation in our patient. Hemifield VEP testing may thus provide an objective tool for distinguishing functional hemianopia from hemifield loss caused by an organic lesion.

The term ‘functional’ visual loss is used to describe symptomatic visual changes that cannot be explained by any physiologic findings [5]. Other terms, i.e. nonorganic or nonphysiologic visual loss, have also been used and are essentially the same as functional visual loss. As Thompson [10] described, the impaired function is presumably fully restorable because the impairment is a matter of function rather than of structure. Patients with functional visual loss, therefore, may have many different underlying conditions, and many terms have been used in the literature to attribute functional visual loss to an underlying motive or cause such as hysteria, psychogenic disorder, conversion disorder, Münchausen syndrome, hypochondria, somatization disorder or malingering [10–12]. In our case, a true underlying condition was not clear. Although the visual field abnormality of our patient was not similar to the abnormalities associated with psychogenic visual impairment such as tube, spiral or afferent tunnel vision, psychogenic visual impairment could not be excluded.

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Fig. 1. Visual fields of the patient determined by Goldmann perimetry. The monocular visual fields of the left (a) and right (b) eyes revealed temporal hemianopia in the right eye. c The binocular visual field showed right hemianopia.