Pattern-reversal electroretinograms and visual evoked potentials in branch retinal vein occlusion

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Abstract. We recorded pattern electroretinograms and visual evoked potentials in a group of selected patients with unilateral uncomplicated branch retinal vein occlusion. To document the effects of preexisting risk factors, patients were divided into three groups: diabetes mellitus, hypertension with hyperlipidemia and no systemic disease. The transient and steady-state pattern electroretinogram and visual evoked potential amplitudes were significantly reduced and visual evoked potential peak times were delayed relative to the fellow eyes and age-matched normal subjects. There was a second amplitude reduction relative to the other patient groups in both the affected and fellow eyes of the diabetes mellitus group, which was indicative of an additive effect of diabetes mellitus.

Abbreviations: BRVO—branch retinal vein occlusion.

Introduction

Branch retinal vein occlusion (BRVO) is a frequent cause of retinal vascular disturbance in which vision-limiting complications, such as macular edema, macular nonperfusion and vitreous hemorrhage from neovascularization, may occur [1, 2].

As part of an ongoing investigation and laser treatment of retinal dysfunction in retinal disorders, pattern electroretinograms (PERGs) and visual evoked potentials (VEPs) were recorded from a group of selected patients with BRVO to document the effects of preexisting diabetes mellitus and hypertension with hyperlipidaemia.

Patients and methods

The patients were recruited from the retina and outpatient clinic of our ophthalmology department, and the diagnosis of BRVO was based on the funduscopic appearances as judged by two surgeons (K.G. and N.Z.). In a 4-year study period, a total of 164 patients with BRVO were evaluated. Three groups
of patients were selected: those with diabetes mellitus (N=14), hypertension with hyperlipidemia (N=12) and no systemic disease (N=9). Full informed consent was obtained from each patient.

Patients who had neovascular changes of the optic disc, previous laser treatment, intraocular pressure greater than 22 mm Hg or a history of glaucoma, intraocular surgery, vitreous traction, proliferative retinopathy in either the affected or fellow eyes, macular and minor branch occlusions, bilateral BRVO and dense cataracts at the time of examination were excluded. All patients had color photographs taken and fluorescein angiograms performed 1 week before PERG and VEP recording to support the abovementioned criteria. Cardiologic and neurologic examinations were performed by specialists. Routine biochemical investigations included full hemotologic profile, fasting lipid profile, plasma glucose profile, and plasma electrolytes. The definition of diabetes mellitus was a fasting plasma glucose level greater than 140 mg/dL on at least two occasions or a plasma glucose level greater than 200 mg/dL at any time of the day. Hypertension with hyperlipidemia was defined as a systolic blood pressure greater than 150 mm Hg and a diastolic blood pressure greater than 95 mm Hg on at least three occasions (or current treatment with an antihypertensive medication), and fasting plasma cholesterol level greater than 220 mg/dL, fasting plasma triglyceride level greater than 150 mg/dL or low-density lipoprotein level greater than 180 mg/dL. The criteria for the patients with no systemic disease was defined as no neurologic and cardiologic disease in the past and present and normal values for the routine blood tests and biochemical investigations.

PERGs and VEPs were recorded on each patient between 2 and 3 months after the incident. High-contrast (76%) black and white checks were used to elicit transient (each check subtending 23' at the eye and counterphasing at five reversals per second) and steady-state (each check subtending 46' at the eye and counterphasing at 20 reversals per second) responses. The entire screen subtended 13° at the eye. The mean luminance was 50 cd/m². Data collection time was 150 ms (the averager was retriggered each 300 ms), and 150–200 responses were averaged. The PERG recording used gold-foil corneal electrodes and silver-silver chloride disk electrodes referenced to the ipsilateral temple and grounded on the forehead; for the VEP recording, silver-silver chloride disk electrodes were placed on the Oz, Fz and Fpz points. PERGs were recorded bilaterally and VEPs monocularly. Bandpass settings were 1.6–30 Hz. The system employed artifact rejection, so that large voltages resulting from eye movements or blinks were discarded. The transient PERG and VEP and steady-state PERG amplitudes were determined by measuring the difference in voltage between the initial negative and major positive components of each response, and the steady-state VEP amplitude