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AUTHORS

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Study Group:

ABSTRACT

TITLE: Visual and Auditory Induced Event-Related Brain Dynamics in Glaucoma

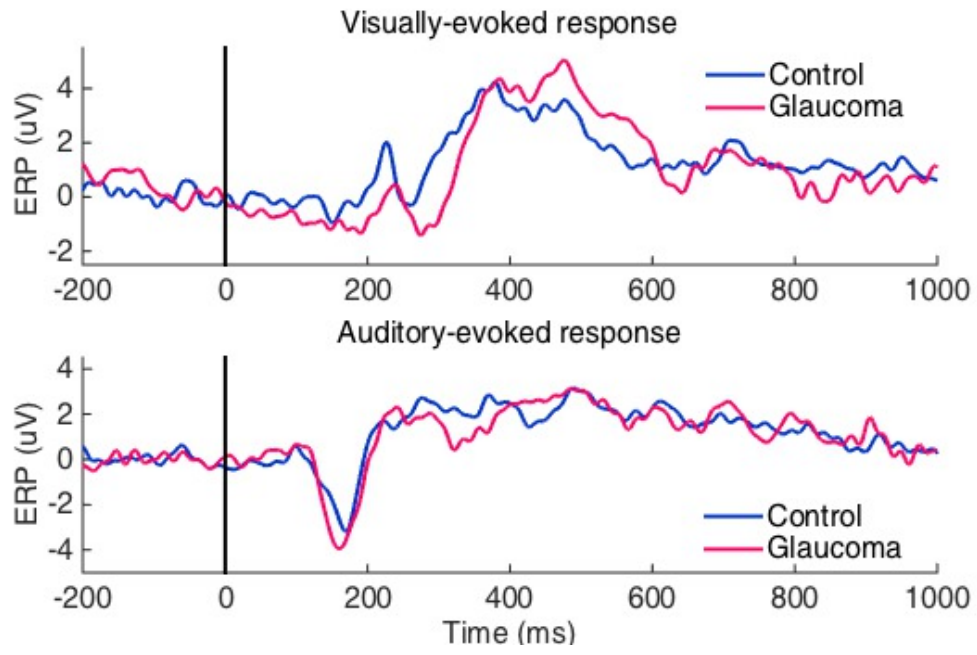
ABSTRACT BODY:

Purpose: This study aims to develop biological markers to evaluate perceptual and cognitive states in glaucoma patients while performing daily activities. Here we report the results of the analyses of brain's electrical responses to visual and auditory stimuli using electroencephalography (EEG).

Methods: The investigation consisted of assessing event related potentials (ERPs) in response to visual and auditory stimuli in a group of glaucomatous subjects with visual field loss and control subjects. The task was to respond to stimuli by pressing a button. A white square (5×5 cm each) was presented on an LCD monitor and chirp signals with an initial and target frequencies of 900 Hz and 1100 Hz, respectively, were presented through an earphone. Each stimulus was presented for 100 ms, followed by a random interval of time before next stimulus presentation. Subjects had their scalp EEG signals recorded with a sampling rate of 500 Hz while performing the tasks with 19 active dry electrodes using a Quick-20 Headset (Cognionics, Inc.). We studied ERPs obtained by averaging single channel EEG signals time-locked to the stimulus onsets. Reaction times to pressing the button were also recorded.

Results: The investigation consisted of around 1500 trials performed in 5 glaucoma and 5 control subjects. Mean age was 69.2±13.1 years in the glaucoma group and 65.0±11.6 years in the healthy group (p=0.61). There were significant differences in reaction times to visual and auditory stimuli between two groups (Glaucoma vs. Control; Visual: 389.54±48.50 ms vs. 377.37±67.89 ms, p<0.01, Auditory: 340.14±89.99 ms and 317.66±85.43 ms, p<0.01). Empirical results showed the latencies of P2 and N2 components in visually induced ERPs in the glaucoma group were larger than those in the control group (Figure). In addition, the amplitude of the P2 and N2 components showed significant differences between groups (Glaucoma vs. Control; P2: 0.44±18.67 μV vs. 1.97±13.81 μV, p<0.01, N2: -1.38±19.02 μV vs. -0.30±13.56 μV, p<0.01), while the amplitude of N1 components in auditory induced ERPs did not show significant difference (Glaucoma vs. Control; -3.92±18.44 μV vs. -3.17±14.01 μV, p=0.19).

Conclusions: Glaucoma patients show slower reaction times to both visual and auditory tasks. ERP analyses show increased amplitudes and latencies for visually induced ERPs, but not for auditory-induced ERPs.



Averaged event-related potentials recorded at Pz across all subjects.

DETAILS

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