

Diagnostic Ability of Fast Transient Visual Evoked Potential for Glaucoma Assessment



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Introduction

- Despite recent technological advances, glaucoma diagnosis and management is still based primarily on clinical assessment of the visual field and the optic nerve.
- However, in order to evaluate early damage and its progression over time, different technologies for objective and quantitative measurement of structural and functional changes have emerged.
- The conventional pattern reversal visual evoked potential technique is an objective method of evaluating the integrity of the visual pathway.

Purpose

- We investigated the the diagnostic ability of a fast transient visual evoked potential (ftVEP) device to discriminate between healthy and glaucomatous eyes.

Methods

- Seventy-one glaucoma patients (glaucomatous optic neuropathy and reproducible visual field loss) and 20 healthy subjects were enrolled.
- Subjects with neurological disease, ocular diseases other than glaucoma or best corrected visual acuity <20/30 were excluded.
- Among glaucoma patients, 31 had early visual field damage (MD > -6dB), 22 had moderate visual field damage (MD from -6dB to -12dB) and 18 had advanced visual field damage (MD < -12dB).
- All patients underwent ftVEP with 10% and 85% Michelson of contrast in both eyes (acquisition time, 20s).
- If both eyes were eligible, one was selected randomly.
- Receiver operating characteristic (ROC) curves and sensitivities at fixed specificities were generated for the following ftVEP parameters:
 - ftVEP amplitude-10% of contrast
 - ftVEP amplitude-85% of contrast
 - ftVEP latency-10% of contrast
 - ftVEP latency-85% of contrast

Results

- Areas under the ROC curves for ftVEP amplitude-10% and 85% were 0.82 and 0.71, respectively.
- For ftVEP latency-10% and 85%, areas under the ROC curves were 0.58 and 0.61, respectively.
- Areas under the ROC curves for ftVEP amplitude were significantly larger than those for latency ($p < 0.05$).
- ftVEP amplitude-85% had the highest sensitivity at 80% specificity (70.4%, cut-off 3.15 mV).
- ftVEP latency-85% had the lowest sensitivity at 80% specificity (33.8%, cut-off 113.3 ms).
- When only patients with early glaucoma (MD up to -6 dB) were considered ($n=31$), amplitude-10% (AUC, 0.75) had the best diagnostic performance.

Table 1. Demographic and Clinical Characteristics of Study Patients*

Variable	Study Group (n=71)	Control Group (n=20)
Age (years)	60.1 ± 16.5	56.5 ± 11.3
Gender (male/female)	36/35	8/12
Visual Field Mean Deviation (dB)	-8.2 ± 7.3	-0.3 ± 1.1

*Data are given as mean ± standard deviation whenever indicated.

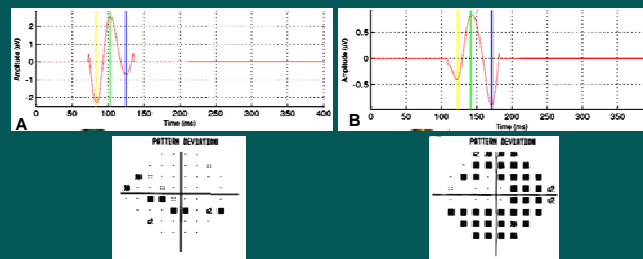


Figure 1: Test results of a patient with early (A) and a patient with advanced (B) glaucoma. Patient A has less functional damage than patient B based on standard automated perimetry results (MD, -3.90 dB vs -19.69 dB). Fast transient visual evoked potential results (10% contrast) show latency delay and amplitude reduction in patient B compared with patient A.

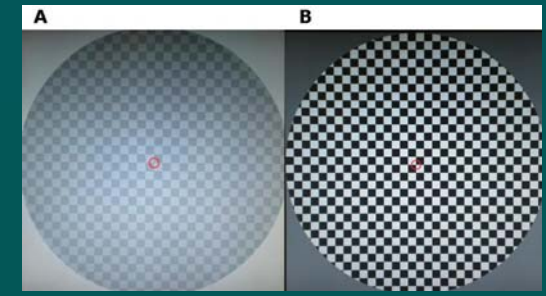


Figure 2: A) Checkboard with 10% Michelson contrast stimuli. B) Checkboard with 85% Michelson contrast stimuli.

Discussion

- Previous studies have evaluated the use of VEP devices in glaucoma.¹⁻⁵
- Most studies found abnormal *amplitude* values in glaucomatous patients compared to controls.
- There is little agreement regarding glaucomatous damage and *latency* delay.^{1,2,5}
- Investigating the diagnostic performance of a new, rapid, and objective electrophysiological test of functional damage, we found that *amplitude* was the best parameter to discriminate between healthy and glaucomatous eyes.

Conclusion

Our findings suggest that ftVEP technique can discriminate between healthy and glaucomatous eyes. Among the parameters tested, amplitude values have the best performance. These preliminary results suggest that ftVEP warrants further investigation as a fast and objective method to assess functional damage in glaucomatous eyes.

References

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