

Evaluation of the Unaffected Fellow Eye of Unilateral Exfoliation Syndrome and Exfoliative Glaucoma Eyes using Short Duration Transient Visual Evoked Potentials (SD-tVEP)

Lam Lu,¹ Peter H. Derr,² Jessica V. Jasien,¹ Alberto O. Gonzalez-Garcia,² Celso Tello,¹ Jeffrey M. Liebmann,^{1,3} Robert Ritch¹

¹Einhorn Clinical Research Center, New York Eye and Ear Infirmary of Mt. Sinai, New York, NY, ²Diopsys Inc., Pine Brook, NJ, ³NYU School of Medicine, New York, NY

Program Number: 3503 – D0103

Background

Exfoliation syndrome (XFS) is the most common identifiable cause of open-angle glaucoma worldwide.¹ It is characterized by the production and progressive accumulation of fibrillar extracellular material in ocular tissue.² XFS presents unilaterally in about two thirds of patients,³ and XFS eyes are more likely to have glaucomatous damage than eyes without XFS, independent of IOP.⁴ Diopsys NOVA VEP can normal subjects from glaucoma suspects and patients with visual field defects.⁵

Purpose

To evaluate the fellow eye of unilateral XFS and exfoliative glaucoma (XFG) patients using SD-tVEP in comparison to normal control eyes.

Methods

- The study population was divided into three age-matched groups:
 - 1) 15 randomly selected eyes of 15 normal control subjects (70.2±5.4 yr)
 - 2) 30 eyes of 15 unilateral XFS patients (73.9±6.0 yr)
 - 3) 30 eyes of 15 unilateral XFG patients (70.5±8.5 yr)

- Normal control subjects had corrected visual acuities of 20/30 or better with no clinical evidence of XFS nor XFG in both eyes.

- The non-exfoliative eye (fellow eye) of unilateral XFS and XFG patients had a corrected visual acuity of 20/30 or better with no clinical evidence of XFS or XFG.

- The fellow eye of the XFG patients did not have clinically evident XFS.

- SD-tVEP's were recorded using the Diopsys NOVA VEP Vision Testing System (Diopsys, Inc. Pine Brook, NJ).

- XFS/XFG eyes and healthy eyes were compared using an area under the curve (AUC) analysis of the SD-tVEP parameters.

- 1 way ANOVA was performed using the SD-tVEP parameters to determine if significant differences existed between the XFS/XFG eye, the non-exfoliative fellow eye and normal control eye.

Results

- Significant differences were found between both XFS and XFG eyes and the normal control eyes using SD-tVEP parameters (p=0.01, p=0.03 respectively).
- Differences were detected between both XFS and XFG eyes to normal control eyes using the AUC analysis in both amplitude and latency, (Figure 3).
- The differences between both XFS and XFG fellow eyes and the normal control eyes approached significance (p=0.054, p=0.06).
- No significant difference was found between the XFS and XFG eye and fellow eye (p=0.43, p=0.21) nor was one found between the XFS and XFG eyes (p=0.39).

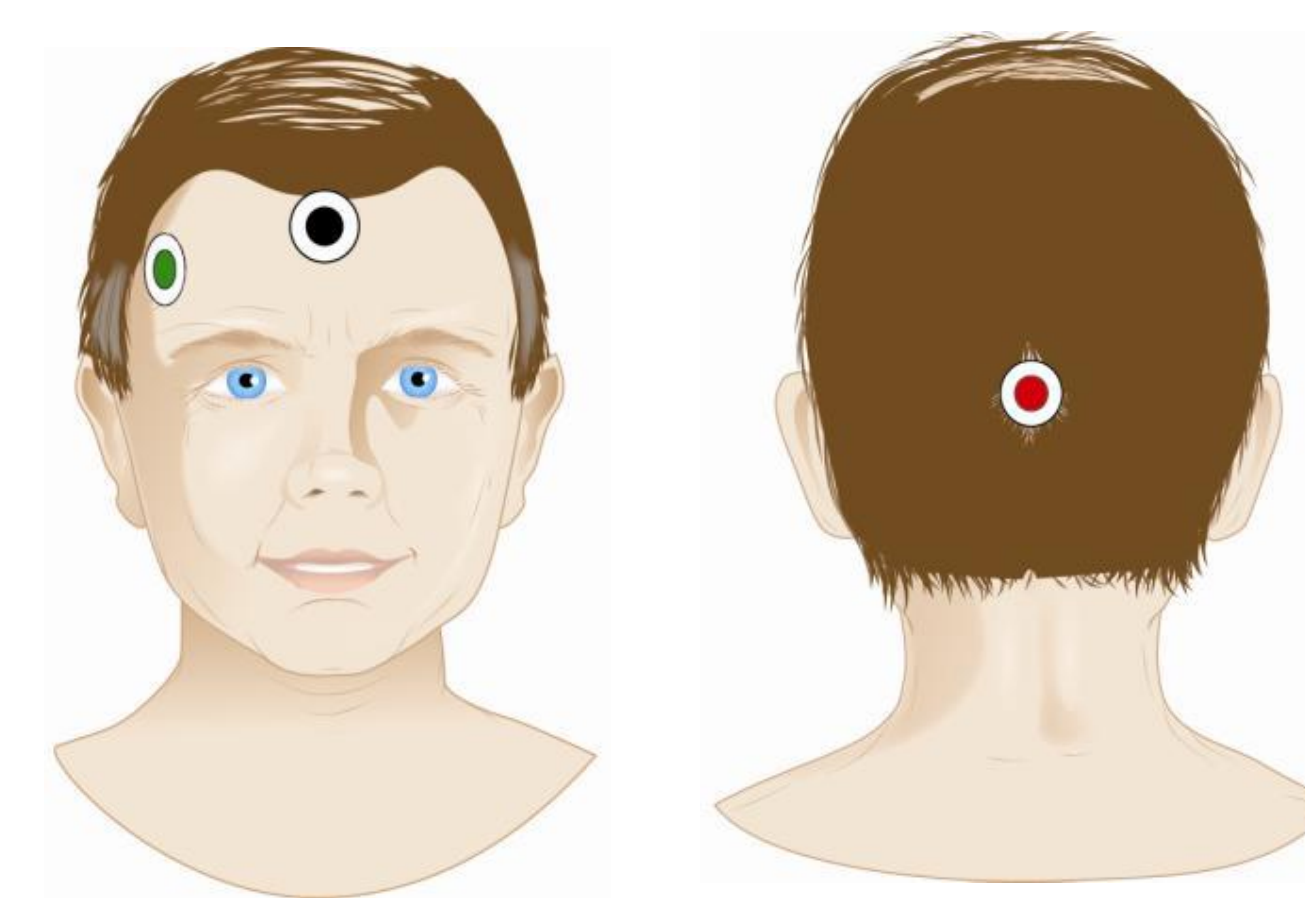
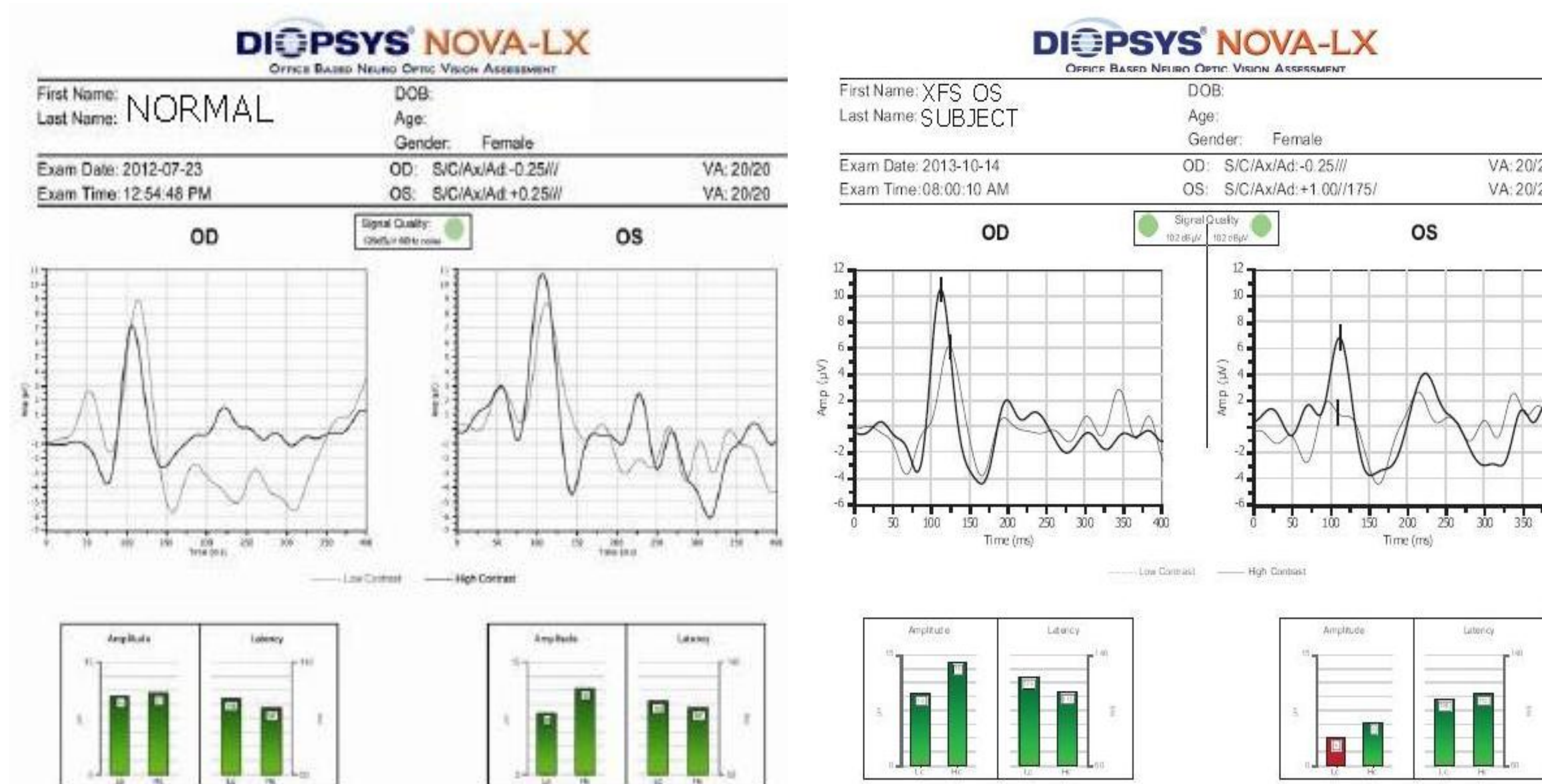


Figure 1. Illustration displaying placement of electrodes: center of forehead, slightly above temple and an inch above theinion.



Parameters (Normal)	OD	OS	Difference	Remarks
Amplitude Low Contrast (µV)	10.5	8.2	2.3	
Amplitude High Contrast (µV)	10.9	11.5	0.6	
Latency Low Contrast (ms)	114.3	112	2.0	
Latency High Contrast (ms)	107.4	107	0.0	

Parameters (XFS OS)	OD	OS	Difference	Remarks
Amplitude Low Contrast (µV)	9.8	3.8	6.0	Low
Amplitude High Contrast (µV)	14.0	5.9	8.1	
Latency Low Contrast (ms)	124	108.4	15.6	Significant Difference
Latency High Contrast (ms)	113	112.3	1.0	

Figure 2. Two examples of test results. First (left) is a healthy subject and shows no comparable difference in both amplitude (µV) and latency (ms). Second is a XFS patient which shows lower amplitude and lower latency in affected eye in both high and low contrast compared to a healthy subject.

AUC Analysis of XFS Eye vs. Healthy Eye

	Amplitude (µV)	Range	Latency (ms)	Range
HC P100	0.8	0.64-0.97	0.79	0.62-0.96
LC P100	0.84	0.67-1.00	0.71	0.59-0.95

AUC Analysis of XFG Eye vs. Healthy Eye

	Amplitude (µV)	Range	Latency (ms)	Range
HC P100	0.77	0.58-0.96	0.75	0.56-0.93
LC P100	0.71	0.50-0.91	0.74	0.56-0.93

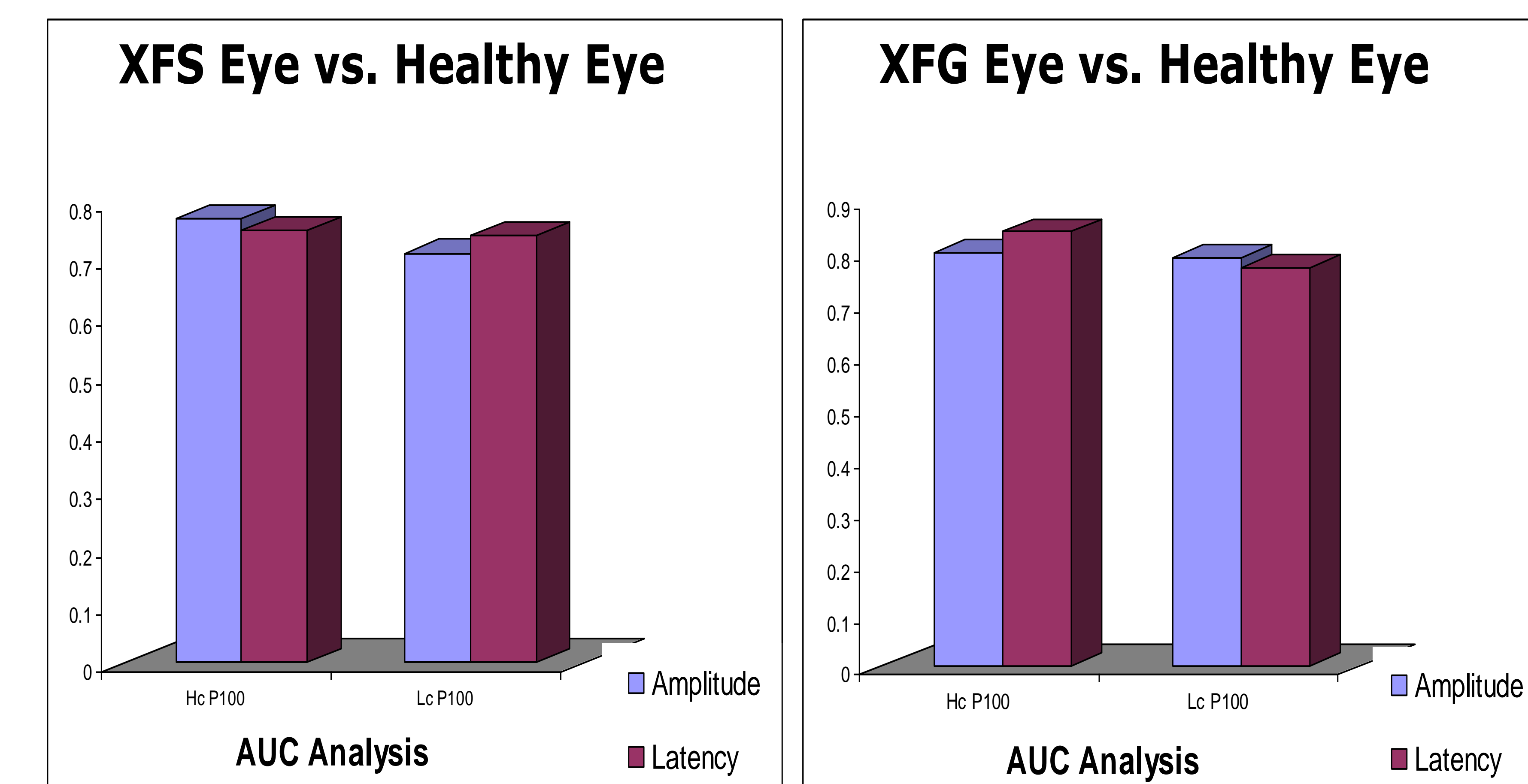


Figure 3. A tabulated and graphical representation of the under the curve analysis using SD-tVEP parameters showing differences detected in amplitude and latency between XFS/XFG patients and normal controls.

Conclusions

Short-duration transient VEP was able to detect differences between both XFG/XFS eyes and normal control eyes. We also found differences between the fellow eye of XFS/XFG and normal eyes, however the difference was not statistically significant. Further study with a larger number of patients is needed to confirm these preliminary findings.

References

- Ritch R. Exfoliation syndrome: the most common identifiable cause of open-angle glaucoma. *J Glaucoma* 1994; 3: 176-178
- Schlötzer-Schrehardt UM, Koca MR, Naumann GOH, et al. Pseudoexfoliation syndrome. Ocular manifestation of a systemic disorder? *Arch Ophthalmol.* 1992; 110(12): 1752-1756.
- Rouhiainen H, Teräsvirta M. Presence of pseudoexfoliation on clear and opacified lenses in aged population. *Ophthalmologica*, 1992; 204:67-70.
- Davanger M, Ringvold A, Blika S. The frequency distribution of the glaucoma tolerance limit. *Acta Ophthalmologica*, 1991;69-6: 782-785
- Pillai C, Ritch R, Derr PH, et al. Sensitivity and specificity of short-duration transient visual evoked potentials (SD-tVEP) in discriminating normal from glaucomatous eyes. *IOVS*. 2013;54, No.4: 2847-2852

Contact Information

Lam Lu, BS llu@nyee.edu
Jessica V. Jasien, M. En jjasien.ganyresearch@gmail.com

Disclosures

L. Lu, None; P. H. Derr, Diopsys, E; J. V. Jasien, None; A. Gonzalez-Garcia, Diopsys, E; C. Tello, Diopsys, C; J. Liebmann, Diopsys, C; R. Ritch, Diopsys, C.