Influence of mental stress on intraocular pressure and visual field testing: is there a white coat syndrome in glaucoma?

Shay Keren[1], Michael Waisbourd[1], Nir Gomel[1], Yael Cohen[1], Shimon Kurtz[1]

[1]Department of Ophthalmology, Tel Aviv Sourasky Medical Center, affiliated to the Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

Background: To investigate the effects of mental stress stimulus on intraocular pressure (IOP) measurement and visual field (VF) testing.

Methods: Patients with open angle glaucoma underwent a baseline IOP measurement and VF testing. Afterwards, they completed a computerized mental stress test (Stroop test) which is a known standardized method to induce mental stress. After test completion, patients underwent a second IOP measurement and VF testing

Results: Seventy-two eyes of 36 patients were enrolled. Mean age was 67.0 ± 9.5 years (range 47-84 years). The mean baseline IOP was 15.0 mmHg, and after the Stroop mental stress test, IOP increased to 16.0 mm Hg (P < 0.001). There was a trend towards significant mean deviation decreased from -6.9 dB to -8.0 dB (P = 0.054, t-test) following the stress test. This difference became significant using the Wilcoxon nonparametric test (P = 0.008). Correlation was found between glaucoma severity and change in IOP (P = 0.02) and PSD (P < 0.01)

Change in intraocular pressure and visual field parameters before and after Stroop mental stress test

Parameter		Pre-Stroop (mean ± SD)	Post-Stroop (mean ± SD)	Difference (mean ± SD)	P value	Wilcoxon signed ranks test
IOP(mmHg)		15.0 ± 3.9	16.0 ± 3.5	1.0 ± 2.2	<0.01	
Visual Field*	Fixation losses (%)	8.1 ± 9.8	9.9 ± 9.3	1.8 ± 9.2	0.08	Z=-1.2 P=0.2
	False positive (%)	1.9 ± 2.8	1.8 ± 2.5	0.1 ± 3.5	0.9	
	False negative (%)	3.2 ± 4.8	3.9 ± 6.3	0.7 ± 7.5	0.6	
	MD(dB)	-6.9 ± -5.5	-8.0 ± -6.0	-1.0 ± -3.2	0.054	Z= -2.7 P<0.01
	PSD(dB)	5.6 ± 4.1	5.6 ± 3.8	0.0 ± 2.4	0.9	
	VFI (%)	78.9 ± 16.8	78.0 ± 15.9	0.9 ± 5.5	0.6	

IOP: intraocular pressure; MD: Mean Deviation; PSD: Pattern Standard Deviation; VFI: Visual Field Index

*Only patients with reliable VFs were included in the VF parameter analysis (n=21, 42 eyes).

correlations between changes in intraocular pressure / visual field indices and glaucoma severity based on visual field mean deviation and number of glaucoma medications

Parameter		Glaucoma Severity		Number of Glaucoma Medications	
		Correlation coefficient (r)	P value	Correlation coefficient (r)	P value
Change in IOP		0.3	**0.02**	0.03	0.8
Change in Visual field*	Fixation losses (%)	0.08	0.6	0.3	0.1
	False positive (%)	-0.3	0.07	-0.1	0.6
	False negative (%)	-0.2	0.2	-0.3	0.2
	VFI	-0.1	0.4	0.2	0.3
	MD	0.007	1	0.02	0.9
	PSD	-0.5	**<0.01**	-0.1	0.6

A screenshot of the computerized Stroop test

Conclusions: We found a small but statistically significant increase in IOP and a trend towards deterioration of visual field mean deviation, following a short mental stress test. Patients with more severe glaucoma showed more pronounced changes. Our results suggest that mental stress could affect IOP measurement in the clinic.