Effects of Simulated Afferent Pupillary Defects on Automated Perimetry

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• No conflicts of interest to disclose

Background
• Glaucoma is a progressive optic neuropathy characterized by well known patterns of vision loss
• Progression of disease and response to treatment are monitored by multiple methods, including automated perimetry
• Swedish Interactive Threshold Algorithm (SITA) commonly employed to speed collection
• Multiple parameters developed to monitor progression
Project Goals and Aims

- Experimental interest in determining
  - Can presence of APD be predicted by visual fields alone?
  - Correlation between magnitudes of APD and shift in perimetry metrics
- Goal: assess the effects of a quantifiable visual obscuration on visual fields
  - Obscuration able to generate APD
  - In particular MD, PSD, and VFI of interest

Common Parameters

- Mean Deviation (MD): average sensitivity over all points compared to age-matched control field
- Pattern Standard Deviation (PSD): average sensitivity over all points from age-matched control field adjusted for overall depression (or elevation) in the field
- Visual Field Index (VFI): combined percentage, derived from PSD, weighted to favor central points
  - WNL points rated 100%, blind points 0%
  - Significantly depressed points rated by percent deviated from age-matched control

Previous Studies

- Johnson et al (1988): positive linear correlation between vision loss in central 30° and magnitude of APD
- Kardon et al (1993): larger APD associated with compressive ON and IIH than with NAION and optic neuritis
- Artes et al (2005): suggest MD more sensitive to disease progression than PSD
- Bengtsson and Heijl (2008): propose use of VFI, suggest overprediction of disease progression with MD compared to VFI in phacic eyes
- Schiefer et al (2012): magnitude of APD in glaucoma patients corresponds more with wider field loss (30° field) than with central field loss (10° field)
Experimental Design

- 19 otherwise healthy subjects between ages of 18-40, 9 male & 10 female
- No hx of ocular problems beyond need for corrective lenses
- SITA fast 24-2 on dominant eye with and without 0.9 log_{10} ND filter (transmits 12.5% of light)
- Order of test randomized, tests done in series with short break between
Statistical Analysis

- Average change and p-values calculated with Student 2 sample paired t-test using Microsoft Excel
- Mean Deviation: loss of 3.2dB average between trials (p<<0.01)
- Pattern Standard Deviation: gain of 0.12dB average between trials (p<0.05)
- Visual Field Index: loss of 1.1% average between trials (p<0.05)
- 2 fields excluded (1 for high false positive, 1 for high fixation losses) with 17 remaining in analysis

Conclusions and Discussion

- Statistically significant decrease in MD, likely clinically observable, less than predicted (3.2 vs 9dB), may allow prediction of APD
- Statistically significant increase in PSD and decrease in VFI, less likely clinically observable
- Considerations
  - ND filter vs damage to optic nerve
  - Secondary effects of ND filter beyond attenuation
  - Subjects testing beyond upper limits of machine

Questions?

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References

- Mansuri, Gohda, et al. “Relationship of a new visual field index, the VFI, with Mean deviation (MD) in 20 and 24 field threshold tests examined by Humphrey field analyser in POAG patients.”