

(Visual Field Analysis and Examples)

Review:

See handout

Data Plots:	Total Deviation	versus	Pattern Deviation
Global Indices:	Mean Deviation	versus	Pattern Standard Deviation
Field Types:	Humphrey	versus	Octopus

Lesion locations:

See handout

- 1) Paracentral and nasal step - 50%
- 2) Paracentral - 25%
- 3) Nasal step - 25%
- 4) Temporal wedge - 2% (myopes)

Criteria for Abnormality / Progression

Anderson's criteria: *See handout*

NTG Study Group Criteria: Easiest to remember (Some details left out)

Collaborative Normal-Tension Glaucoma Study Group. Comparison of glaucomatous progression between untreated patients with normal-tension glaucoma and patients with therapeutically reduced intraocular pressures. *American Journal of Ophthalmology*. 1998; 126: 487-497.

- 1) Pupil > 2.5 mm
- 2) Reliable field (FP ≤ 15%, FN ≤ 30%, FL < 15% but if FL < 10% then FN rate between 30-50% acceptable)
- 3) Minimal defect: cluster of 3 adjacent points depressed by at least 5 dB from normal age values (Total Deviation Plot) with one of these values depressed by at least 10 dB.
- 4) These must coincide on one side of the horizontal midline and there had to be points elsewhere that were at least 10 dB higher than the densest point in the scotoma.
- 5) Progression:
 - Deepening of an existing scotoma
 - Expansion of an existing scotoma
 - These 2 progression criteria were met if 2 adjacent points in a baseline defect declined 10 dB from their initial average of the three baseline values
 - Points could not be peripheral or cross nasal meridian
 - The decline must be 3x the SF
 - A new or expanded threat to fixation
 - A fresh scotoma in a previously normal part of the field

Other Analyses:

See handout

- Change Analysis
- Change Probability
- Overview Analysis

Parvocellular (P) (X) pathway		Magnocellular (M) (Y) pathway	
80% of retinal fibers		20% of retinal fibers	
Small soma, axon size, receptive fields		Large soma, axon size, receptive field	
Midget cells		Parasol cells	

Properties	Results of lesion	Properties	Results of lesion
See color	Reduced color vision	Don't see color	Normal color vision
See fine detail	Reduced texture perception	Don't see fine detail	Normal texture perception
Sensitive to high contrast	Reduced pattern perception	Large receptive fields	Normal pattern perception
Slow, sustained response	Reduced acuity	Sensitive to low contrast	Normal acuity
Driven mostly by cones	Reduced contrast perception	Fast, transient response	Normal contrast perception
Function: color vision and visual acuity	Normal flicker perception	Driven mostly by rods, peripheral retina	Reduced flicker perception
Fovea		Function: movement and depth perception	My cells represent 25% of M cells and are important in flicker perception
LOW temporal frequency		HIGH temporal frequency	
HIGH spatial frequency		LOW spatial frequency	

Glaucoma Theories:

- Selective loss of M pathway only ("Selective loss hypothesis")
 - Need large and/or low contrast flickering target (test motion & flicker)
- Selective large fiber loss (includes M pathway and blue-cone pathway)
 - "Reduced redundancy or undersampling hypothesis"
 - Need large and/or low contrast flickering target and/or a blue target
 - Test cells with minimal receptive field overlap thus any absence is detected easier (less redundancy or masking of the loss)
- Diffuse loss of all fiber types ("Population response hypothesis")
 - Need complex stimulus as the combined connections of many cell types are needed or the transmission of information fails

Current Visual Field Limitations:

- Luminance threshold of static perimetry is not subserved by large fibers but rather the smallest fibers, which are least likely to be affected in glaucoma
- Kinetic perimetry (Goldmann) uses luminance threshold but at least motion is detected (yet limited sensitivity due to patient, instrument and operator factors)
- **SWAP: Short Wavelength Automated Perimetry** or "Blue-on-yellow" visual field: Undersampling hypothesis tested with a large (size V) blue stimulus (440 nm) on a yellow background but done with static perimetry, 15% longer than standard white-on-white perimetry, affected greatly by the blue filter of a cataract.
- **FDP: Frequency Doubling Perimetry:** Also undersampling hypothesis tested by flickering stimulus (My cells tested); very fast, less affected by media, pupil diameter less important, ambient illumination and optical blur less important, can detect defects missed with white-on-white perimetry, specificity as high as 99%