Clinical utility of new visual field modalities in Glaucoma

Pinakin Davey OD, PhD, FAAO
Professor
Western University of Health Sciences
College of Optometry

Disclosure

Has a relevant financial relationship with Haag Streit, Genzyme, Optovue and Bausch and Lomb as a speaker and ZeaVision, Vector Vision, Topcon as a consultant

The content and format of this course is presented without commercial bias and does not claim superiority and commercial product or service.

Definitions

- "Ocular tissue damage at least partially related to intraocular pressure"

Goals

- Document status of optic nerve structure and function
- Target pressure - so damage is unlikely to happen
- Maintain IOP below target pressure
- Monitor status of the optic nerve and reset target pressure if deterioration occurs.
- Monitor Visual fields

Goals cont...

- Minimize side effects of management and impact on vision and general health and quality of life.
- Educate and engage the patient in management
Gold standard
- Simultaneous stereo photography!
- Problems?

If damage occurs throughout the retina, how does visual acuity remain stable?

What about other visual tasks?

Axonal facts
- 700,000 to 1.2 million
- Large variation
- Count of axons increase with increase in area.
- Large number of axons central macula

Visual fields

Which test shall I select?
Threshold tests - standard of care in glaucoma

- Central threshold tests are standard of care in glaucoma
- Central 30 degrees
- Tests like 24-2, 30-2, G- Protocol, 32

Is Glaucoma a peripheral disease?

- Yes
- So why don’t we measure visual fields from 30-60 degrees from center?

Is central retina and visual field more protected?

- Yes there is some truth to that
- But not as much as once considered...
- Lots of OCT studies identify macular damage early in glaucoma!

What strategy should I use?

- New strategies in Humphrey
  - SITA Faster
  - No Fixation losses measured
  - No False negatives measured
  - No False positives measured (SITA Standard did not measure as well.)
  - The thresholds are begun at much more difficult levels
  - Saves time...
  - But what's the cost ...?

Visual fields – don’t like them; can’t live without them.
Some problems with HFA

- Points spread evenly
- Data not representative of RNFL

Opportunities for Improvement in Central 10 Degrees

- Glaucomatous damage of the macula is common and can occur early in the disease
- Can be missed and/or underestimated with standard 24-2 VF tests that use a 6° grid

Glaucomatous damage of the macula

Donald C. Hood, M.B., B.S.  
Allison M. McKendrick, M.D.  
Jeffrey M. Liebmann, M.D.  
Robert R. Hyland, M.D.

The Prevalence and Nature of Early Glaucomatous Defects in the Central 10° of the Visual Field

Donald C. Hood, M.B., B.S., Allison M. McKendrick, M.D., Jeffrey M. Liebmann, M.D., Robert R. Hyland, M.D.

24-2 and 10-2 VF Examples

- Blue cross region on the 24-2 VF = central 10-2 VF
- A) Both are abnormal
- B) 24-2 VF normal; 10-2 VF abnormal
- C) 24-2 VF abnormal; 10-2 VF normal

Highest Importance Locations Chosen from 10-2 Pattern

- Expert group selected specific 10-2 test point locations
- Prevalence and depth of glaucomatous macular defects were systematically evaluated to select optimum test points
- Pattern covers areas known to be susceptible to glaucomatous defects both from structural and functional studies

Minimize Time and Maximize Information in VF Testing with HFA3

- SITA Faster 24-2
  - Test in 2 minutes or less
  - ~50% faster than SITA Standard; ~30% faster than SITA Fast

- SITA Faster 24-2C
  - More information in central field
  - ~20% faster than SITA Fast 24-2

Add new tests to patient progression

- Mixed SITA GPA
- Includes SITA Faster, Fast, Standard, 24-2, 30-2, and 24-2C in progression analysis
New 24-2C SITA Faster protocol
- Free upgrade if you have HFA III
- Gives more macula points.
- Results comparable to 24-2 SITA FAST
- Thresholds are +3 dB
- Gives you some macula information
- You may need 10-2 if damage is noticed in macula region

Problems continued
- No real blind spot monitoring

Octopus Features: Fixation Control
- No stimuli during fixation loss
- Automatic repetition of stimuli after blinking or darting
- Most accurate test possible

Octopus Features: Auto Eye Tracking
- The perimeter centers the patient automatically to the optical axis
- Less interrupts, less time to finish
HFA II versus HFA 3
- Larger touch screen
- Liquid crystal lens -8 to +8 only sph correction

Visual Field Index
- Percentage of normal age adjusted field
- Greater the number more normal
- Trend over time is given with a probability values as well
- Should work in theory; in reality does not!

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Cluster analysis
Why cluster analysis?
- Individual points may vary
- Overall clusters are more stable
- Also close representation to various bundles of RNFL
- So in some respect better structure function relationship.
**Globa trend of progression**

- **Color codes**
  - Worsening at the 5% level
  - Improvement at the 5% level
  - Fluctuation at the 5% level

**Scale**
- Grey: Normality
- 15dB: Seriously impaired vision
- 25dB: Considered legally blind

**Trend analysis**

- Numbers: Progression rate dB/year
- Green: Worsening at 1% probability
- Orange: Improvement at 1% probability
- Cyan: Recovery at 1% probability
- Yellow: Fluctuation at 1% probability
- Brown: Fluctuation at 5% probability

**Global trends**

- **Progression rate**
  - Scale: Grey for Normality, 15dB for Seriously impaired vision, 25dB for Considered legally blind

**OCTOPUS**

- **Polar Diagram Principle**
  - OCTOPUS: The bridge from function to structure
The 4-in-1 screen

Bebie curve

Bebie curve examples

Octopus

Criteria for glaucomatous damage

1) GHT outside normal limits
2) PSD < 5% of normal individuals
3) A cluster of three or more non-edge points (pattern deviation plot) all of which are depressed at a p<5% and one of which is depressed at a p<1% on two occasions (respecting horizontal meridian)
   • This criterion was written for 30-2, if 24-2 field is analyzed edge points are included.
   • Criteria should be met on 2/3 issues mentioned above
   • Confirmed on two occasions!
**Why is staging important?**

- Treatment issues
- Management issues
- Prognosis
- Research

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**Staging of disease**

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**Glaucoma staging system - Brusini**

GSS -2

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**Clear text analysis**

**Stages**
- normal VF
- borderline VF
- early VF defects (Brusini stage 1)
- moderate VF defects (Brusini stage 2)
- advanced VF defects (Brusini stage 3)
- severe VF defects (Brusini stage 4)
- most severe VF defects (Brusini stage 5)

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**Octopus -600**
Why does it help targeting specific ganglion cells?

Sensitivity thresholds with PULSAR perimetry

Example of SAP and function-specific perimetry in the same eye
Principle of using stimulus V for low vision patients

- Visual field parameters improved after cataract surgery
- MD, PSD and VFI - less influenced in nuclear sclerosis
- MD, PSD and VFI – greater effect in cortical cataract, particularly for early glaucoma

Effect of Cataract Opacity Type and Glaucoma Severity on Visual Field Index

Hye Jin Chung¹, Jeong Hoon Choi², Young-Chun Lee², and Su-Young Kim²

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Sources of error

- Miosis: decreases threshold peripherally, increases variability centrally
- Lens opacities
- Uncorrected refractive error –decrease in contrast sensitivity
- Spectacles
- Ptosis

Patient has cataract what do I do with Visual fields?

- Dilate as much as possible
- Depend on PSD plot more than total deviation
- Use imaging modalities more.

Cataract in glaucoma patient

Summary

- Time for change is here.
- Doing what we have always done is unlikely to yield progress.
- Great programs that make a lot of sense clinically
- New technology may identify glaucoma early and easier to follow