Visual Fields Glaucoma and Beyond

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Disclosure

- **Dr. McSoley has served as a paid consultant for Heru.**

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This course discusses test selection, recognition of artifact and indicators of reliability with the goal of enhancing visual field interpretation. Attention is directed to the anatomic basis, recognition and significance of nonglaucomatous visual field defects. Examples from the Humphrey Field Analyzer and the Heru device will be discussed.

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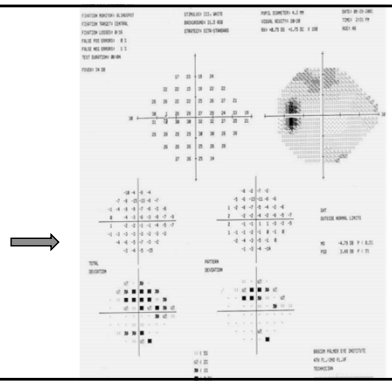

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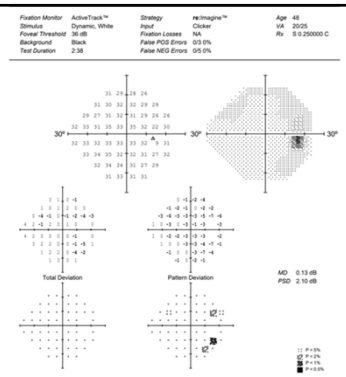

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Brief intro

- Why perform visual fields ?
- Identify abnormality
- Explore clinical findings
- Address symptoms
- Follow for change / confirm stability

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Brief intro

- Stimuli detected on background
- Kinetic Perimetry
  - isopter
- Static Perimetry (SAP, WoW)
  - dB
  - (attenuation of maximum stimulus intensity)

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- Selecting appropriate test
  - Test pattern and strategy
  - Stimulus size
- Recognizing the quality of information provided by the test (s)
  - Reliability
  - Artifact
- Interpreting the test
- Recognizing the significance of findings

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Somethings to keep in mind

- Importance of instruction and proper positioning
- Role of patient participation and attention
- Pattern and sequence of testing

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Somethings to keep in mind

- Foveal Threshold determined early
- “primary points” determined
- Central points determined
- Test “moves” peripherally
  - More peripheral points tested later

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Somethings to keep in mind

- Sensitivity tends to decrease with
  - Longer test time
  - Eccentricity
- Variability increases with
  - Eccentricity
  - Test duration
  - Moderate decreased sensitivity
  - Abnl points more variable until they are very poor

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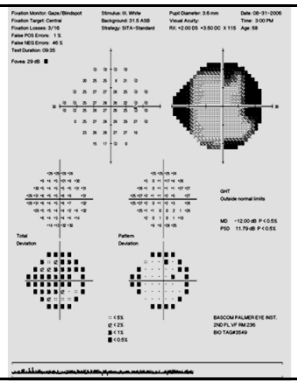

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Reliability Parameters

- Fixation
- False Positive
- False negative
- *Continuum not absolute cutoff*

- Clinical Picture

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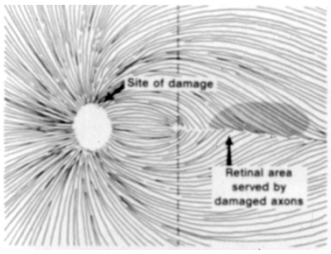

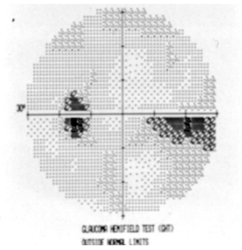

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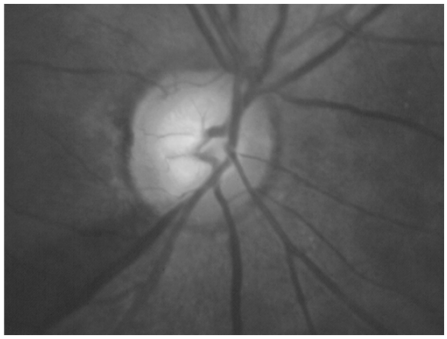

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Clinical Correlation

- Does this make sense?
  - May need to re-examine or repeat test
  - Consider pattern, sequence of testing
  - Other causes
- Test time
- Patient input
  - Comfort, understanding, instruction

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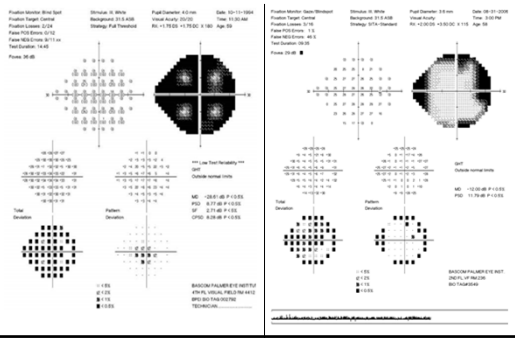
Artifacts



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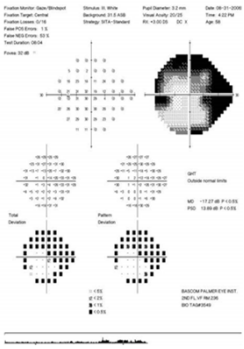
- Peripheral points tested later in test
- "clover-leaf" pattern
- Often high FN
- Sometimes longer test times



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- Quality of VF impacts diagnostic value
  - Introduction of artifact
  - Reliability
  - Patient input
  - Alignment
    - Incorrect head or body position may not be identified by fixation
  - Media fundus Refractive error
    - Wrong Rx

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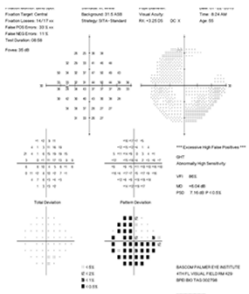
artifacts



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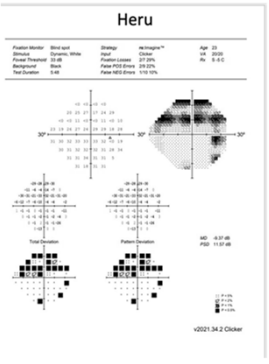

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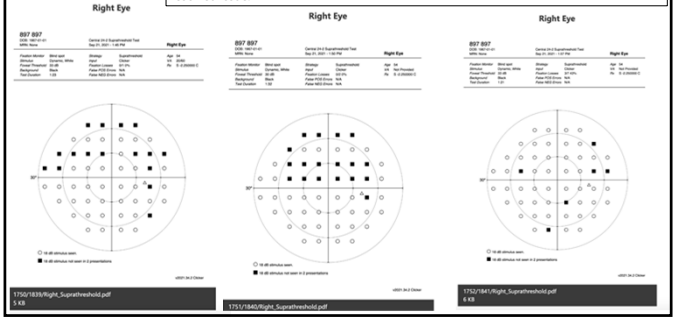
For first two tests, linear artifact appeared due to headset not being positioned properly (back part was resting too low on patient's head). Patient also stated that she would lose fixation circle at the top. Readjusted headset so back was positioned higher up which resolved issue.



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- Visual field testing is vital to management of glaucoma patients
  - Diagnosis
  - Staging of damage
  - In course of follow up
- Role of visual fields in non glaucomatous conditions
  - Addressing symptoms
  - Exploring clinical findings

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Visual Fields – why / when

- Symptoms
  - Subjective visual problems
  - Headaches in some settings
- Signs
  - Unexplained levels of vision, acquired color vision deficit
  - VF defects reported or uncovered w/ confrontation techniques
  - Some fundus findings
- History
  - Known or suspected lesions affecting the visual pathway
  - Drug toxicities

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Review of visual pathway

- Axons of ganglion cells of retina comprise retinal nerve fiber layer
- Nerve fiber layer gathers and proceeds posteriorly as optic nerve
- Optic nerve proceeds posteriorly to optic chiasm with nasal fibers crossing and temporal fibers remaining ipsilateral

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Review of visual pathway

- Temporal fibers of one eye and nasal fibers of fellow eye proceed posteriorly from the optic chiasm as optic tracts
- Optic tracts proceed to lateral geniculate body and synapse in the lateral geniculate nucleus
- Neurons proceed posteriorly as optic radiations, inferior fibers passing through temporal lobe, superior fibers passing through parietal lobe toward occipital lobe reaching the primary visual cortex

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Visual pathway and visual field

- Monocular or binocular defects
- Respecting vertical
- Respecting horizontal (especially nasal defects)
- If binocular,
  - Bitemporal
  - Homonymous
- Location
- congruity

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Monocular

Understood clinician recognizes some VF defects will be present in binocular conditions (e.g. glaucoma, ARMD)

- Conditions anterior to retina
  - Defects may be more diffuse
  - Media opacities, refractive error
- Retinal vascular, nerve fiber layer and some optic nerve defects tend to respect horizontal, likely more apparent nasally
- Some optic nerve and macular condition show central field defects
- Other fundus lesions (RPE / Choroid, retinoschisis) should correlate anatomically

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Binocular

- Bitemporal defects respecting the vertical localizable to crossing of nasal fibers at the optic chiasm
- A temporal defect respecting the vertical in one eye and defect involving temporal crossing the vertical, often involving visual acuity in the fellow eye suggests a junctional scotoma
- Defects on the same side of each eye (homonymous) suggest lesion posterior to the chiasm on the side contralateral to the VF defect
- Lesions of temporal lobe affect superior field
- Lesions of parietal lobe affect inferior field
- The more similar in shape (congruous) the defect the more posterior
- Occipital lobe lesions tend to be highly congruous

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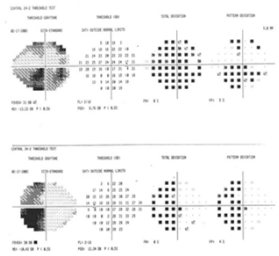
A patient with more than one problem



- Patient with known h/o early glaucoma R>L
- This VF represents new defect
- Non glaucomatous
- Interval h/o CVA

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- Will review and discuss visual field examples reflecting non glaucomatous defects

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Follow up

- Can have real decline within normal range
- Can have progressive decline of abnormal points
- Can have artifacts that simulate change

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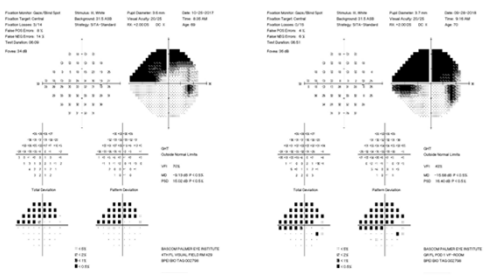
alignment



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Follow up

- Once statistically abnl need to follow sensitivity values- not rely on patterns or p value symbols
- Need range to detect decline
  - Floor / pedestal

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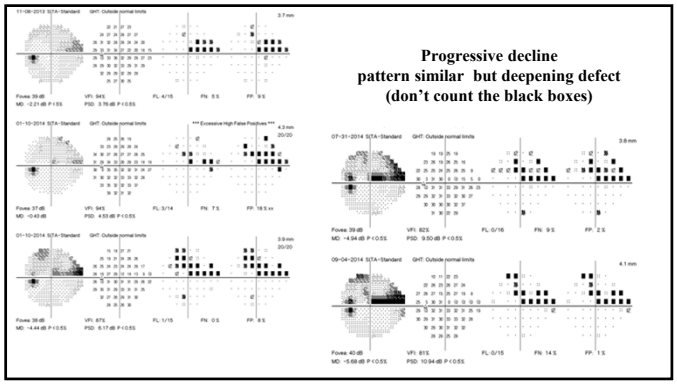

Progressive decline pattern similar but deepening defect (don't count the black boxes)

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Determining Progression
In general

- How good your baseline is
  - Accurately reflects status
  - Ideally more than one test to constitute baseline
- How variable the patient is
  - Can they reliably perform test
  - Are they consistent

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Determining Progression
In general

- How reproducible the specific test is
  - Does it vary across the spectrum of disease?
- What the magnitude of change is
- What is the dynamic range
  - Do you have the ability to detect change?
- How often the patient is tested

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Role of Visual Field Testing

- Exploring suspicion
- Diagnosis
- Staging of condition
- Monitoring for change
  - Identifying progression
  - Confirming stability

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- Thank you
  - All attendees
  - Meeting planners and sponsors
  - All scientists, clinicians, staff, patients and those who think and work to improve our ability to care for patients and assess visual function

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