I. Glaucoma Diagnosis

A. Basic principles of disease detection
   1. Glaucoma continuum
   2. Optic disc evaluation, IOP, OCT, VF, etc

B. Case example

C. Visual field analysis – focus of this talk
   1. How does the Humphrey Visual Field operate?
   2. What defines a glaucomatous visual field?
   3. What are the stages of glaucoma in terms of visual field?
   4. How is glaucoma progression determined?
   5. How often are visual fields necessary?
   6. Are there any good alternatives to Humphrey 24-2/30-2?

II. Understanding the Humphrey Visual Field Analyzer

A. Testing Strategies
   1. Threshold vs. SITA vs. SITA-FAST
      a) Step-wise threshold approach
   2. Central 30-2 vs. 24-2
      a) Points tested, time per test

B. Reliability
   1. Fixation Losses
   2. False Positives – "Trigger Happy"
   3. False Negatives – Status of eye vs status of patient?
   4. Acceptable standards for each category

C. Visual Field Indices
   1. Mean Deviation (MD)
      a) Average amount of change from age matched normals for entire VF; height of the hill of vision
      b) 0 is normal, more negative is worse VF loss
   2. Pattern Deviation (PD)
      a) Amount of non-uniformity, indicator of variability; shape of the hill of vision
      b) 0 is normal, more positive is more irregular VF
      c) Formerly called Pattern Standard Deviation (PSD)

D. Glaucoma Hemifield Test
   1. Compares local defects in 5 zones
   2. Good for early VF loss

E. Total and Pattern Deviation
   1. Numeric and Probability Plots
   2. Total deviation – corrected for age, includes all depressed points
   3. Pattern deviation – corrects for generalized depressions (cataracts)
      a) 7^{th} most sensitive point on total is baseline for pattern
   4. Judging reliability

a) When pattern is worse than total

III. Visual Field Rules in Glaucoma

A. Basic glaucoma VF rules
   1. Asymmetric across horizontal midline (early or moderate disease)
   2. Mid-peripheral (early or moderate disease)
   3. Clustered points
   4. Reproducible 2x or more
   5. Not expected by other concurrent disease
   6. Consistent with patient's functional status

B. Common glaucoma visual field patterns
   1. Arcuate scotoma; Bjerrum
   2. Nasal step
   3. Paracentral
   4. Temporal wedge
   5. Overall depression
   6. Transient changes

C. Other confounding visual fields
   1. Stroke
   2. Pt inattention

D. Definitions of glaucoma according to visual fields
   1. Hodapp-Anderson-Parrish (HAP)
      a) Only need 1 of the following:
      - GHT: Outside normal limits on 2 VFs
      - Cluster of 3+ contiguous non-edge points p<5% and 1 point p<1%
   2. Clinical Trials
      a) Both of the following required:
      - GHT: Outside normal limits
      - Cluster of 3+ contiguous non-edge points at 5% on pattern deviation
   3. Other authors have slight variations
   4. Case example

E. Staging glaucoma based on visual field results
   1. Hodapp-Anderson-Parrish
      a) Early (<-6dB), moderate (-6 to -12dB), severe (> -12dB)
      b) Based on MD and number/depth of reduced points
   2. Glaucoma staging system (GSS)
      a) Adapted from HAP scale, Stage 0 to Stage 5
      b) More for research than clinical practice
   3. AGIS, CIGTS, other trials, etc
      a) Not standardized

F. Case example

IV. Judging Visual Field Progression

A. No widely accepted standard, but can be:
   1. Deepening or expansion of an existing scotoma

2. New defect in normal area
3. Entire VF decreases in sensitivity

B. Major challenges
   1. Variations between clinical trials
   2. Individual patient fluctuations

C. Short-term vs. long-term fluctuations, trend analysis, etc
   1. Considerations for treatment
      a) Need to differentiate progression from fluctuations
      b) Effect of cataracts
   2. Visual Field Index (VFI)
      a) How is VFI calculated?
      b) Resistant to cataract
      c) Used to judge rate of progression
   3. Guided (or Glaucoma) Progression Analysis (GPA)
      a) Newer software to help calculate rate of progression from VFI
      b) Oldest 2 exams are baseline, current exam at bottom
      c) 1 page summary report
   4. How many VFs are needed?
      a) OHTS vs. HAP vs. clinical trials
      b) Confirming progression
      c) Repeatability, reliability, clinical trials data

D. Definitions for glaucomatous visual field progression
   1. AGIS
      a) Score of 0-20 based on depth of defects
      b) Progression = 4+ increase from baseline
      c) Confirmed on 3 straight exams at 6 month intervals
      d) Visual fields can recover, need 1-2 re-tests
   2. CIGTS
      a) Based on probability of 3+ points within lowest 5%
      b) Progression = 3+ increase from baseline
      c) 2 Baseline HVFs, confirmed on 2 HVFs
      d) Identifies 2x more progression than AGIS
   3. Other clinical trials: EMGTS, NTGS
   4. Early loss and progression
      a) Worse if defects are in both hemifields

E. Progression rates
   1. CNTGS vs. EMGT vs. OHTS
   2. OHTS examples of re-test variability

V. Other Visual Field Methods

A. FDT and FDT Matrix
   1. How does FDT detect glaucoma?
      a) Spacial/temporal frequencies
   2. Magnocellular (M), Parvocellular (P), Koniocellular (K) ganglion cells
      a) Magnocellular pathway affected first
      b) Transient response, fast conduction
      c) High temporal & low spatial freqs, motion

B. Does FDT work? Screening vs. progression monitoring

C. FDT vs. HVF 24-2

VI. Exam guidelines and data collection

A. Hodapp-Anderson-Parrish recommendations for Initial glaucoma suspect evaluation
   1. 3 IOPs
   2. 2 VFs
   3. Gonioscopy
   4. Optic nerve photos
   5. Pachymetry*
   6. OCT*
   7. Risk factors*
   8. Clinical reality?

B. Follow-up guidelines
   1. Establish a good baseline IOP
   2. Set a reasonable goal for IOP
   3. Lower the pressure
   4. Monitor IOP and check for progression
   5. Modify IOP goal and treatment as indicated
   6. Give medications time to work or fail

C. Summary points
   1. Visual fields are highly variable
   2. Need separate normal from glaucomatous VFs
      a) Get confirmation of defects (1-2x)
   3. No standard for progression exists
   4. Glaucoma is usually slow, get good data

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