Visual Field Basics

African Glaucoma Summit
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Bascom Palmer Eye Institute
University of Miami School of Medicine
Visual Fields in Glaucoma

- Why bother?
- What visual field test should I get?
- How do I interpret the results?
Visual Fields: Why Bother?

- Glaucoma affects the peripheral vision well before central vision.
- Central visual acuity is a poor test for glaucoma in the field or in the clinic.
- Gives you the functional status of the visual system.
- Assists in DIAGNOSIS and FOLLOWING of glaucoma.
What’s Wrong with IOP and the Optic Nerve?

- IOP is a risk factor for glaucoma and what we treat once it’s diagnosed
- IOP > 21 mmHg is NOT synonymous with glaucoma
- Optic nerve has a lot of physiologic variation...a 0.4 can be cupped from glaucoma and a 0.9 can be physiologic
- Visual fields allow you to tell the difference between pathologic and physiologic cupping
What VF Test for Glaucoma?

- Frequency Doubling Technology works well for SCREENING in the office or field
- 90 seconds per eye, portable, easy to train
- Automated static perimetry has become the gold standard visual field for OFFICE diagnosis of glaucoma
SAP in Diagnosis of Glaucoma

- Cluster of 3 depressed points on pattern deviation plot, at least 1 at $P < 1\%$ level
- OR
- Abnormal Glaucoma Hemifield Test
- OR
- Pattern Standard Deviation $P < 5\%$
- IF
- Repeatable on confirmatory test
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  - OR
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  - IF
- Repeatable on confirmatory test
RIGHT

AGE  51
FIXATION LOSSES  0/20
FALSE POS ERRORS  0/17
FALSE NEG ERRORS  1/11
QUESTIONS ASKED  363
FIELD: 35 DB
TEST TIME 11:49
HFA S/N  638-3151

-5  0  -5  0
-6  3  -2  -1  -1
-13 -6  -4  -2  1  -1
-21 -1 -2  -1  0  0  0
-1 -1 -1  0  0  0  0
-3 -2 -1 -1  0  0  0
-5 -3 -7  1  -3  0
-4 -10 -6 -1

TOTAL DEVIATION

PATTERN DEVIATION

PROBABILITY SYMBOLS

:: P < 5%
:: P < 2%
:: P < 1%
■ P < 0.5%

GLAUCOMA HENKFIELD TEST (GHT)
OUTSIDE NORMAL LIMITS

MD  1.94 DB
PSD  3.38 DB P < 5%
SF  1.84 DB
CPSD  3.38 DB P < 1%
Visual Field in Glaucoma: Severity

- Visual field can be used to judge the severity of functional damage to the optic nerve
- Visual field severity can be used to set target IOP once the diagnosis is made
Although optic nerve visualization is important for future comparison to detect change, the large differences between individual makes grading of the severity of glaucoma impossible based on optic nerve cupping.
H.A.P. Visual Field Severity Scale

- Arbitrary criteria for grading visual field damage in glaucoma based on clinical experience
- Adopted by Prevent Blindness America and recently compared to Frequency Doubling Perimetry
- Practical, easy to use
Early Defects

- Mean deviation up to -6 dB
- Fewer than 25% (one quadrant’s worth) of points depressed below 5% level and fewer than 15% (8) depressed below 1% level on pattern deviation plot
- No point adjacent to fixation with sensitivity < 15 dB
CENTRAL 24 - 2 THRESHOLD TEST

NAME
STIMULUS III, WHITE, BACKG 31.5 RGB, BLIND SPOT CHECK SIZE III
STRATEGY FULL THRESHOLD

BIRTHDATE
FIXATION TARGET CENTRAL
ID
DATE 07-07-95
TIME 11:20:35 AM
RX USED +4.75 DS
DCX
DEG PUPIL DIAMETER VA 20/20

LOW PATIENT RELIABILITY

RIGHT
AGE 70
FIXATION LOSSES 4/16 xx
FALSE POS ERRORS 2/16
FALSE NEG ERRORS 6/11
QUESTIONS ASKED 379
FIXE 34 DB
TEST TIME 12:29

FAR S/M 638-7462

-4 2 -2 2
-2 0 -2 -2
1 2 -2 -2
1 1 1 1
-4 -4 -2 2
2 2 2
1 0 -2 2

TOTAL DEVIATION

-4 -2 -2 2
-2 0 2 0
1 1 1 1
-4 -4 -2 2
2 2 2
1 0 -2 2

PATTERN DEVIATION

MD + 0.00 DB
PSD 2.79 DB P < 1%
SF 2.58 DB P < 5%
CPSD 0.82 DB

PROBABILITY SYMBOLS
:: P < 5%
:: P < 2%
:: P < 1%
:: P < 0.5%
Figure 5-8. Early nasal step. Visual field of a 72-year-old patient with glaucoma (contralateral eye of
### Right Eye Analysis

**Age:** 54

**Fixation Losses:** 3/21

**False Pos Errors:** 3/19

**False Neg Errors:** 8/11

**Questions Asked:** 366

**Fix Time:** 33 sec

**Test Time:** 00:11:18

**HFA S/N:** 638-6983

### Results

#### Total Deviation

<table>
<thead>
<tr>
<th>Location</th>
<th>Deviation</th>
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<tr>
<td>27</td>
<td>-3 -2</td>
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<td>29</td>
<td>-3 -2</td>
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<tr>
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<td>-3 -2</td>
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<td>33</td>
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<tr>
<td>35</td>
<td>-3 -2</td>
</tr>
<tr>
<td>37</td>
<td>-3 -2</td>
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#### Pattern Deviation

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<tr>
<td>27</td>
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<tr>
<td>35</td>
<td>-3 -2</td>
</tr>
<tr>
<td>37</td>
<td>-3 -2</td>
</tr>
</tbody>
</table>

#### Glaucoma Hemifield Test (GHT)

- **MD:** -2.44 dB, P < 10%
- **PSD:** 2.35 dB
- **SF:** 1.28 dB
- **CPSD:** 1.91 dB, P < 10%

#### Probability Symbols

- \( P < 5\% \)
- \( P < 2\% \)
- \( P < 1\% \)
- \( P < 0.5\% \)
**Glaucous Hemifield Test (GHT)**

**Outside Normal Limits**

<table>
<thead>
<tr>
<th>Probability Symbols</th>
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</thead>
<tbody>
<tr>
<td>: : P &lt; 5%</td>
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<tr>
<td>: : P &lt; 2%</td>
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<tr>
<td>: : P &lt; 1%</td>
</tr>
<tr>
<td>: : P &lt; 0.5%</td>
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</tbody>
</table>

**GHT Parameters**

- **Right Eye**
  - **Age:** 78
  - **Fixation Losses:** 1/25
  - **False Pos Errors:** 0/17
  - **False Neg Errors:** 0/11
  - **Questions Asked:** 494
  - **Fovea:** 34 DB
  - **Test Time:** 15:29
  - **HFA S/N:** 639-2392

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<tr>
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<th>-22 -16</th>
<th>-10 -14</th>
<th>-14 -7 -11 -13 -8 -11</th>
<th>-23 25</th>
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<tbody>
<tr>
<td>Right</td>
<td>23 24 29 26 28 26</td>
<td>23 25</td>
<td>-14 -7 -12 -13 -8 -11</td>
<td>-14 -7 -12 -13 -8 -11</td>
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<td>0 0 0 0 0 0</td>
<td>-4 -5 -4 -5 -2 -3</td>
<td>-4 -5 -4 -5 -2 -3</td>
</tr>
</tbody>
</table>

**GHT Results**

- **Right Eye:**
  - **ND:** 4.14 DB
  - **PSD:** 4.54 DB
  - **SF:** 1.93 DB
  - **CPSD:** 4.16 DB

*Note: The table and diagram contain detailed measurements and symbols that are not fully transcribed.*
Moderate Defects

- Mean deviation -6 to -12 dB
- Fewer than 50% (one hemifield’s worth) of points depressed below 5% level and fewer than 25% (one quadrant’s worth) depressed below 1% level on pattern deviation plot
- No point adjacent to fixation with sensitivity \( \leq 0 \) dB
- Only 1 hemifield with a point adjacent to fixation \( < 15 \) dB
Severe Defects

- Mean deviation worse than -12 dB
- More than 50% (one hemifield’s worth) of points depressed below 5% level and more than 25% depressed below 1% level on pattern deviation plot
- Any point adjacent to fixation $\leq 0$ dB
- Both hemifield contain point(s) $<15$ dB adjacent to fixation
<table>
<thead>
<tr>
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<th>31</th>
<th>25</th>
<th>31</th>
<th>25</th>
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<td>AGE</td>
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<td></td>
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<tr>
<td>FIXATION LOSSES</td>
<td>3/23</td>
<td>28</td>
<td>30</td>
<td>33</td>
<td>(31)</td>
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<tr>
<td>FALSE POS ERRORS</td>
<td>1/14</td>
<td>31</td>
<td>29</td>
<td>28</td>
<td>(34)</td>
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<tr>
<td>FALSE NEG ERRORS</td>
<td>1/18</td>
<td>28</td>
<td>30</td>
<td>27</td>
<td>(27)</td>
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<tr>
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<td>31</td>
<td>32</td>
<td>33</td>
<td>(31)</td>
</tr>
<tr>
<td>FEVER</td>
<td>37 DB</td>
<td>8</td>
<td>24</td>
<td>(17)</td>
<td>(8)</td>
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<td>(28)</td>
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**Glaucoma Hemifield Test (GHT)**

OUTSIDE NORMAL LIMITS

**Total Deviation**

**Pattern Deviation**

**Probability Symbols**

- : P < 5%
- : P < 2%
- : P < 1%
- : P < 0.5%

- MD: -7.86 DB P < 0.5%
- PSD: 10.92 DB P < 0.5%
- SF: 2.21 DB P < 18%
- CPSD: 10.86 DB P < 0.5%
Visual Field Summary

- VF assessment critical in early diagnosis of glaucoma
- Also used for judging severity of functional damage to optic nerve
- Most common method used to diagnose worsening glaucoma