Acknowledgements

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  • Eye IC Professional Advisory Committee
Glaucoma highlights...

- Function
- Structure
- Treatment
IOP Revealed!

Robert Weinreb, MD

- "The most disruptive event for glaucoma practitioners within the next 5 years...
- The most transformative event for glaucoma patients within the next 5 years..."*

Is it...
- A) Rock inhibitors?
- B) TSLT?
- C) 24hr IOP monitoring?
- D) Neuroprotection?

24 hour IOP Measurement

- Acoustic Technology
- Infrared Technology
Why does IOP increase nocturnally?

- Episceral venous pressure increase?
- Yes, but that only explains part of the story.
- If you put a 24 hr contact lens IOP monitoring device on someone who stays supine for 24 hrs, when will the IOP be the highest?
- Nocturnally*

According to Robert Weinreb, MD

Visual Fields?

Visual Fields - Function

* What is an excellent way to improve VF results? (That...
Ways to improve visual field accuracy

• Patients must have a clear idea of the nature of the visual field
• Explain that it will take several minutes, and there will be periods when they won’t see anything.
• They are not supposed to see all the lights!
• Give advice and encouragement.
• Allow patient to rest if necessary.
• Allow technician to make notes.
• Should be 1:1 tech/patient ratio.

VF Trends...
Are we doing more VF’s now or 10 years ago?

• a study of claims data of 169,917 individuals with open-angle glaucoma and 395,721 individuals suspected of having glaucoma aged 40 years and older enrolled in a national managed care network between 2001 and 2009.
• the odds of a patient undergoing visual field testing decreased by 44% from 2001 to 2009.

What about SWAP?

• “Swap is now considered less valuable for the detection, and monitoring, of glaucomatous progression.”
Matrix

- The procedure involves measuring contrast-detection thresholds for the FDT stimulus at key visual field locations
- Zippy Estimation of Sequential Thresholds (ZEST) is similar to SITA
- ZEST is computationally and procedurally simpler than SITA
- Test times are more consistent from one patient to another, irrespective of their visual field status.

Consensus

- "Studies comparing FDT against SAP find the diagnostic precision is similar to, or slightly better, than SAP."

But hold the phone! It is too early to tell about progression

- "There is only limited evidence guiding the use of FDT in the monitoring of glaucomatous progression."
How often should we be doing VF’s?

Scary VF Statistic

• More than 25% of patients with newly diagnosed suspected or established glaucoma have not undergone visual field testing within two years of diagnosis.


Advice from Harry Quigley, MD

• “Early on, optometrists should conduct visual field tests several times a year.”
• “After 4 or 5 field tests, you’re going to be able to tell who’s stable.”
• “There are some patients who worsen catastrophically, and you have to locate them. The only way we’ll know that is through field testing, and doing more field testing than we are now”

Optometry Times March, 2014
OHTS weighs in...

- 86% of initial abnormal and reliable fields were normal on retest
- needed 3 fields in a row to conclusively determine progression

Zeiss/Humphrey
Guided Progression Analysis (GPA2)

Trend-based analysis (useful in more advanced cases of glaucoma)
Rate of change

A Word About Octopus

OCTOPUS 900
The One in One Perimeter
- White/White Static
- SWAP – Blue/Yellow
- Red/White
- Flicker
- Low Vision
- True Goldmann Kinetic

EyeSuite Global Trend
1) Superposition of the G visual field grid to the best correlating nerve fibre bundle map.
2) Measuring of the fibre angle for every grid point at the place of the blind spot.
3) Polar coordinates for every point:
   - fibre angle
   - MD
4) TOP = tendency oriented perimetry. Approx 2 min/eye.

Octopus: Glaucoma Test Pattern

Octopus: Advanced Analysis

Polar Graph - combining structure and function

Simple, automated protocol guides technician through the test

Operator friendly - anyone in the office can be trained to run the test

Patient set-up to printable results in as little as 4.6 minutes
Oculus Easy Field

- screener and full threshold
- sophisticated progression analysis
- slightly slower than fdt, better sensitivity and specificity

VF Conclusions

- Zeiss/Humphrey still market leader but competition is increasing.
- Progression analysis is becoming more sophisticated and useful.
- SWAP no longer a player.
- FDT useful
- Consider 2 vF's/yr as new normal

Structure
Disc Photos

- What is the gold standard for structural progression?

Read This Article


Are disc photos better than clinical exam?


• “(84%) were detected only by review of photographs”
Problems with diagnosis...

- European Optic Disc Assessment Trial
- Designed to determine the accuracy and repeatability of European ophthalmologists in classifying stereoscopic disc photos as healthy or glaucomatous vs GDx and HRT
- 48 patients with glaucoma, 40 without
- 207 ophthalmologists

European Optic Disc Assessment Trial

- MD’s accuracy = 80.8%
- GDxVCC = 93.2%
- HRT = 89.8%
- “Imaging techniques appear to be better than ophthalmologists in the diagnosis of glaucoma”

...and progression

  Test-retest reproducibility of optic disk deterioration detected from stereophotographs by masked graders
- Follow-up photographs were compared with baseline by two masked graders; disagreement between the graders was adjudicated by a third grader.
- Specificity ranged from 98% to 100% (no change)
- The problem area was the confirmation of discs suspected to show deterioration (change). A measure of this ability to consistently define change, sensitivity, was only 64% to 81%
The Gold Standard

Isn’t so golden… *

But are you using photographs?

Optic Nerve Head Photo or Drawing:
documented in only ¼ of initial glaucoma evaluations
(395 patients in managed care setting)

Table 2: Performance of Specified Processes of Care
During Initial Evaluations for Primary
Open-angle Glaucoma (POAG)

<table>
<thead>
<tr>
<th>Process of Care</th>
<th>% of Initial Evaluations (N = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual acuity examination</td>
<td>66.0</td>
</tr>
<tr>
<td>Pupil examination</td>
<td>74.2</td>
</tr>
<tr>
<td>Intraocular pressure check</td>
<td>96.0</td>
</tr>
<tr>
<td>Slitlamp examination</td>
<td>92.4</td>
</tr>
<tr>
<td>Gonioscopy*</td>
<td>43.8</td>
</tr>
<tr>
<td>Temporal subtraction*</td>
<td>53.9</td>
</tr>
<tr>
<td>Optic nerve head (photograph or drawing)</td>
<td>53.0</td>
</tr>
<tr>
<td>Field evaluation*</td>
<td>69.7</td>
</tr>
<tr>
<td>Visual field test*</td>
<td>68.2</td>
</tr>
<tr>
<td>Target intraocular pressure level specified</td>
<td>1.3</td>
</tr>
</tbody>
</table>

*Process of care performed at or up to 12 months before or 6 months after the first visit for POAG.

How can we improve it?

• www.eyeic.com
POAG: Cup Expansion/Drance Heme

New Code 0380T Effective Jan 1, 2015

Description: Computer-aided animation and analysis of time series retinal images for the monitoring of disease progression, unilateral or bilateral, with interpretation and report

- 0380T intended as an add-on code to existing 92250 (fundus photography) and not to replace 92250
- The code has support from AAO and optometry AOA
- 0380T will initially be considered ‘experimental’, listed as ‘non-covered’ by many payers in new coverage determinations
- Nevertheless, providers can still submit claims (often requiring additional supporting material) for payment consideration. Payers consider paying claims based upon the circumstances and support provided.
Imaging to identify patients at risk.

Determine the rate of progression to identify patients at risk.

Rate of Change (microns/yr) 01-20-2001 -3.9 ± 1.1 P<0.1%

HRT 3
Optical Coherence Tomography

We know OCT can help us identify NFL damage, but should we be looking anywhere else?
A problem with time domain OCT

<table>
<thead>
<tr>
<th>Scan Type</th>
<th>Fast RNFL Thickness (2.4)</th>
<th>Scan Type</th>
<th>Fast RNFL Thickness (2.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scan Date:</td>
<td>4/02/2006</td>
<td>Scan Date:</td>
<td>10/5/2006</td>
</tr>
<tr>
<td>Scan Length:</td>
<td>10.37 mm</td>
<td>Scan Length:</td>
<td>10.37 mm</td>
</tr>
</tbody>
</table>

OD

OD

Signal Strength (Max %) 0

Signal Strength (Max %) 0

Another problem

OCT Trends

• The odds of undergoing testing using the newer ocular imaging devices increased by 147% from 2001 to 2009.

Next Gen OCT can evaluate?

- A. Pachs
- B. Macula/GCC in glaucoma
- C. Glaucomatous progression
- D. Angle
- E. All of the above.

3 Areas of Structural Change in Glaucoma

Glaucoma affects 3 areas in the posterior segment of the eye

- Cupping
- Nerve fiber thinning

* Ganglion cell loss

RNFL rate of change (2 yr. data): -3.86μm/Yr.
OCT Trend Analysis is great but...

- It only picked up 62% of NFL thinning as determined by serial red-free photographs

Structure/Function Combined

- Optic nerve photos are still considered gold standard but are under-utilized, cumbersome, and sometimes difficult to interpret. Animation programs may help.
- The most studied (non-photographic) method of determining glaucomatous progression is the HRT, but OCT is gaining ground.
- GCC is considered an excellent way to monitor glaucoma.
We have reached our cruising altitude

Ocular Blood Flow

Glaucoma Treatment Options

- Topical
- Laser
- Surgical
The topical tx problem...

Compliance

• "All things considered, our patients are probably taking their drops 50% of the time."

Harry Quigley, MD at Optometric Glaucoma Society, New Orleans 2015

Glaucoma treatment

• 1st Line
• Topical
  • Prostaglandins
  • B Blockers
  • CAI
  • Alpha Agonists

What is your choice for additive therapy to a prostaglandin?
Zioptan

- ZIOPTAN (tafluprost) 0.0015%
- the first preservative-free prostaglandin
- lowered IOP at 3 and 6 months by 6-8 mmHg and 5-8 mmHg respectively, from a baseline pressure of 23-26 mmHg
- Most frequently reported changes have been increased pigmentation of the iris, periorbital tissue and eyelashes
- conjunctival hyperemia which was reported in a range of 4 to 20 percent of patients

Carbonic Anhydrase Inhibitors

- Topical carbonic anhydrase inhibitors appear to work approximately equally well during the day and night, both with monotherapeutic use, as well as adjunctively with prostaglandins.

Alpha Agonists

- 0.2% Brimonidine bid prevents glaucomatous visual field progression better than 0.5% timolol bid in NTG
- 9.1% vs. 28.3%
- Neuroprotection vs. lowering heart rate

*Results from Low Pressure Glaucoma Treatment Group

Krupin, Liebman, Greenfield et al. JAO, reported in Summer 2011 Glaucoma Today
B Blockers???

• “I am avoiding B blockers more and more...”
• Johnathan Myers, MD
• Wills Eye
• At Optometric Glaucoma Society Meeting
• New Orleans, 2015

But...does Alphagan lower nocturnal IOP?

• “The hypothesis that brimonidine, like prostaglandin analogs, would reduce nighttime IOP because of its effects on uveoscleral pathway was not proven true,”

Monocular Trial???

• Still doing it?
• Should we be?
Marijuana tx????

- 1970s studies that reported lowered intraocular pressure for three to four hours after marijuana was administered.
- AAO: “no scientific evidence that marijuana is an effective long-term treatment for glaucoma, particularly when compared to the wide variety of prescription medication and surgical treatments available.”

Rock Inhibitor

- Aerie Pharmaceuticals
  - Travoprost combined with Rho kinase inhibitor
  - Improves outflow of trabecular pathway
  - 45% reduction of IOP in phase 2!
Laser Therapy

- ALT
- SLT
- MLT
- TSLT

SLT as initial therapy and monotherapy

St. Lucia Glaucoma Study Group

- The study enrolled 62 patients whose mean IOP was 17.5 mm Hg on one medication before washout and 21.4 mm Hg after washout.
- One, 3, 6, and 9 months after laser treatment, mean IOP measured 13.5, 14.1, 14.1, and 14.2 mm Hg.
- "SLT has the potential to bend the blindness curve in this population."

Approach to Structural Change vs Functional Change

"I will treat structural change only, with medicines and lasers all day. I reserve true surgery for significant functional change."

- Johnathan Myers, MD
  - Wills Eye
  - At Optometric Glaucoma Society Meeting
  - New Orleans, 2015
Minimally Invasive Glaucoma Surgery (MIGS)

- ECP
- Canaloplasty
- Trabecutome
- Istent
- Express Shunt
- AqueSys
- Hydrus

Which is the best MIGS???

Cataract Surgery!

- "What makes cyclophotocoagulation unique is that it is one of the few glaucoma procedures that can be repeated and titrated without leaving any conjunctival scars, nor does it alter the outflow pathway anatomy in any way that would preclude any future glaucoma surgical options."
- Having adopted endoscopic cyclophotocoagulation several years ago, I've been pleased with the results.
Glaucoma Treatment Conclusions

• Topical CAI’s are best to decrease nocturnal IOP (in addition to PG’s)
• We should be moving away from B Blockers when possible.
• We should prescribe preservative free options when possible

My approach to glaucoma: New Patient

• Grand Rounds Format
• Structure – Function – Structure

EHR Glaucoma Report

56 Y/O WM, cc: last exam 2 years ago elsewhere, no visual complaints
Does the OCT match the field?
My approach to glaucoma: Established Patient

- Grand Rounds Format
- Structure – Function – Structure

Case

- 2004
- 61 Y/O WM
- IOP 23mmHg OD and 25mmHg OS
- Pachs 502 OD and 518 OS
2004-2011

- Peak IOP 25 mmHg OD and 29 mmHg OS
- Mean IOP 19.8 mmHg OD and 21.6 mmHg OS
2012

- Start Lumigan

- 2004-2011
  - Peak IOP 25 mmHg OD and 29 mmHg OS
  - Mean IOP 19.8 mmHg OD and 21.6 mmHg OS

- 2012-2013
  - Mean IOP 15.9 mmHg OD and 16.0 mmHg OS
2014 Add Combigan
Case

2/16/99  45 YO/WM
cc:  "Trouble with progressives on the computer", "Floaters in right eye for six months"
OcHx: Followed in past for ocular hypertension - last seen 3 years ago.
Fam OcHx: negative
SHx: occasional sinus problems, avid biker
Vf 20/20 OD and OS
PERRL-APD
Biomicroscopy: next slide
Tn 18mmHg OD, 18mmHg OS
DFE C/D .15/.15 OD and OS
PVD OD

Glaucoma Flow Sheet
Lifestyle/Dietary modifications in ARMD and Dry eye are common, but how about glaucoma?

- POAG was significantly associated with:
  - more frequent use of pesticides during the professional life
  - low consumption of fatty fish and walnuts
  - higher frequency of heavy smoking

Dietary modifications in ARMD and Dry eye are common, but how about glaucoma?

- "It is remarkable how few studies have been done on potentially modifiable risk factors like smoking, diet, obesity, and exercise," he noted. "Just like cardiologists do today, I predict that in the future, we will discuss with our patients smoking cessation, altering diet, losing weight, and increasing physical activity."

Robert Weinreb, MD, Ophthalmology Times, June 2014

The Future of Glaucoma tx?

Sleeping With Head Elevated Reduces IOP

- 9.3 percent reduction of IOP in the glaucoma group and an 8.7 percent reduction of IOP in the non-glaucoma group, compared with measurements taken when subjects slept on their backs without the pillow.

Researchers at State University of New York Downstate Medical Center in Brooklyn, N.Y. conducted the study; a report of the study appeared in July 2014's issue of Journal of Glaucoma.
Oral Contraceptives and Glaucoma?

- Women who have taken oral contraceptives for three or more years are twice as likely to suffer from glaucoma.
- Previous studies in the field have shown that estrogen may play a significant role in the pathogenesis of glaucoma.

The study was conducted by researchers at University of California, San Francisco, Duke University School of Medicine and Third Affiliated Hospital of Nanchang University, Nanchang, China. Nov. 2013.

Thank You

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