Diagnosing Glaucoma: Everything You Need to Know

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Webster's Definition of Glaucoma

- Condition of increased pressure within the eyeball, cauisng gradual loss of sight

Better way to define glaucoma

- The pressure inside the eye rises to a level higher than what is healthy for the eye
- Elevated IOP is not included in the definition of glaucoma

When does a patient have glaucoma?

- Any of the following:
- Repeatable VF defect
- Progressive deterioration of the ONH
- Progressive damage seen on OCT testing

IOP

- Inflow: production of aqueous by ciliary body
- Outflow: drainage of aqueous. 90% through trabecular meshwork, 10% through uveoscleral pathway

Glaucoma is the second leading cause of blindness in the world

- **2-3 million in US may have glaucoma**

Pathology of Glaucoma

- Increased resistance in trabecular meshwork
- The patient's rate of axonal loss exceeds the normal age-related rate of loss

What's your job in diagnosing glaucoma?

- Find out what kind of glaucoma your patient has
  - OAG
  - Pigmentary
  - Narrow Angle

What's your job in diagnosing glaucoma?

- Make sure your patient does not have glaucoma at the time of visit

What's your job in diagnosing glaucoma?

- Global Risk assessment – identifying those at greater risk and treating prophylactically

What's your job in diagnosing glaucoma?

- Establish a baseline

The Easy Ones

- People with elevated IOP
- People with increased C/D ratio
- People with pigment in trabecular meshwork and/or on corneal endothelium

The more variable

- Age
- Race
- Refractive error
- Systemic conditions
- Family history

Old People

Hispanic Population

- LALES study
- Two times greater risk for developing glaucoma than the average population

African-American Population

- African Americans have three times higher incidence of glaucoma
- Glaucoma progresses faster
- More severe damage and loss of visual function

Diabetes

BP and OAG

- Low BP
- Treatment of Hypertension

Hypertension

- Perfusion Pressure =
  Diastolic Pressure – IOP

Normal BP = 120/80
Normal max IOP = 20/21

Perfusion Pressure

- Perfusion Pressure =
  Diastolic Pressure – IOP

Normal: 80 -20 = 60

Once it gets below 40, it is a problem

Chronic steroid use

- Eye drops
- Inhalers
- Pills
- Creams

History of ocular/head trauma

Myopia & Glaucoma

Family History

- **"We must be more aggressive in recommending examinations for family members of OAG patients."**
- **"First-degree relatives of identified OAG patients should be evaluated with optic disc and visual field testing."**

Harry A Quigley, MD *Arhives of Ophthalmology*, July 2006

Typical Testing

- Gonio
- IOP
- Fundus Photography
- Corneal pachymetry
- Visual Field Analysis
- Nerve Fiber Layer Analysis
- ? Tonography

Gonioscopy: The Facts

92% of glaucomas are POAG

It is standard of care for work ups

You get paid for it!!!

3 most common things we see

- Potentially occludable angles (5%)
- Pigment in the trabecular meshwork (2%)
- Angle Recession (1%)

Potentially occludable angles

- Risk factors: female, Asian descent, having hyeropia

Potentially occludable angles

- Diagnosis:
  - Keep beam narrow as possible
  - Keep room dark as possible

Good resource for gonioscopy

www.gonioscopy.org

Gonioscopy Billing

- CPT code: 92020
- Reimbursable once a year
- Average reimbursement: $22

When is the cornea thin?

Patients with thin corneas at a greater risk for glaucoma

Pachymetry: Billing

- CPT code:76514
- Reimbursable once in patient's lifetime
- Average reimbursement: $14

What is Normal IOP?

- normal intraocular pressure is that pressure which does not lead to glaucomatous damage of the optic nerve head. It is the pressure at which the patient would not suffer from any optic atrophy at all over the course of time.

What is normal IOP?

- How do you calculate what is normal IOP for any given patient
- You can't!!!!

What is normal IOP fluctuation?

- 2 to 4 mm is considered normal
- Anything greater than 5.0mm is a red flag

How do we find this?

- Schedule patient appointments during different times of the day
- Serial tonometry

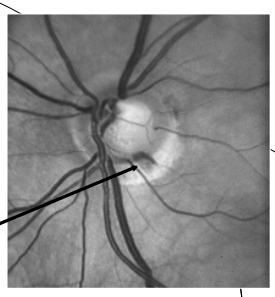
Serial tonometry (CPT code: 92100)

- At least 3 IOP readings during different time periods of the same day
- Option 1: Patient comes in at 8am, 9am, 10am, 11am, etc
- Option 2: Patient comes in at 8am, 11am, 2pm, 5pm, etc

In glaucoma…

The rate of axonal loss exceeds the normal age-related rate of loss

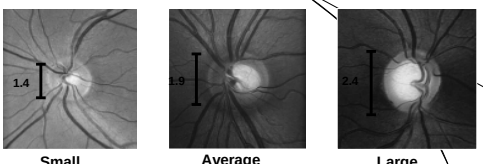
1. **Observe the scleral Ring to identify the limits of the optic disc and its size**
2. **Identify the size of the Rim**
3. **Examine the Retinal nerve fiber layer**
4. **Look for Retinal and optic disc hemes**



This section was developed by Robert N. Weinreb, MD, Felipe Medeiros, MD, and Remo Susanna Jr, MD.

Size Matters! Bigger is Better

Size discs can have small cups in glaucomatous eyes
Large discs have large cups in healthy eyes



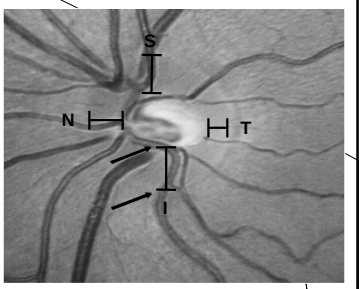
Small **Average** **Large**

Small discs: avg vertical diameter <1.5 mm
Large discs: avg vertical diameter >2.2 mm

ISNT RULE

Rim width
Distance between border of disc and position of blood vessel bending

ISNT rule
Inferior >
Superior >
Nasal >
Temporal



RNFL Examination

- Best performed using red-free light (red-free photographs or green light)
- Look at
  - Striations
  - Brightness
  - Visibility of parapapillary retinal vessels
- Look **diffuse** and **localized** RNFL loss

Where do you find these disc hemorrhages?

On your ONH photographs

Fundus Photos: Billing

- CPT code: 92250
- Can do once a year
- Average reimbursement: $78

Fundus Photos

- Establish a baseline
- Always compare to previous year's photo AND always compare to initial baseline photo

What is normal C/D ratio?

- .30
- 95% of the normal population falls between 0.2 to 0.4

Only 5% of the normal population has a C/D of .50 and greater

My recommendation is to work these patients up for glaucoma

If C/D .50 or greater

- Does this patient get a full work up?
- How often does the patient get this work up?

What testing strategy do we use?

- Standard?
- SITA – Standard?
- SITA – Fast?

What Stimulus Size?

- Size III is standard
- Size V used for advanced glaucoma and decreased visual acuity

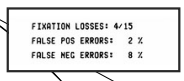
What field size do we use?

- Right field size?
  - 30-2 used to be the standard
  - 24-2 is the standard size
  - 10-2 can be used with visual field loss within the central 10º of fixation

Reliability

False Positive Rate (FP)

- Percentage of time the patient responded in the absence of a stimulus
- >25% – use caution
- >33% FP rate – unreliable
- Ideal rate is <10%

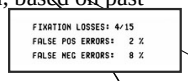


How do elevated FPs impact the appearance of the field

Will cause you to miss cases of glaucoma

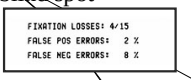
Reliability
False Negative Rate (FN)

- Percentage of time the patient failed to respond to a stimulus that should have been seen, based on past responses
- >25% FN rate – use caution
- >33% FN rate – unreliable



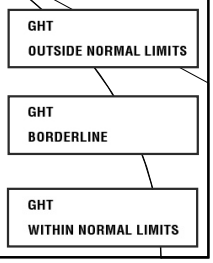
Reliability
Fixation Losses (FL)

- Percentage of times the patient responded to a stimulus presented at the plotted blind spot
- FL increases if:
  - The patient does not maintain fixation
  - The blind spot was incorrectly located
  - The patient's head moves



Review Probability Plots
Glaucoma Hemifield Test (GHT)

- Printout
  - GHT Outside Normal Limits
    - Upper and lower fields differ in <1% of normals, or differ from normal
  - GHT Borderline
    - Upper and lower fields different to extent found in <3% of normals, or both different from normal
  - Within normal limits

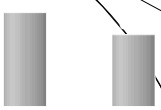


Asman P, Heijl A. *Arch Ophthalmol*. 1992;110:812-819.

- Repeat test if needed
- Accuracy is more important than speed

VF are Highly Variable

- **After *one* abnormal visual field test:**
  - **86% of patients test within normal limits on next exam**
- **After *two* consecutive abnormal test results:**
  - **66% of patient test within normal limits on next exam[3]**



Their conclusion:

You need three consecutive, reliable tests before making any decisions

VF: Billing

- CPT code: 92083
- Can do once a year if stable
- Can do twice or sometimes even three times a year for progressive glaucoma
- Average reimbursement: $59

rNFL

- More objective than VF
- Does that mean more accurate?

Other conditions which impact rNFL

- AION
- Optic Neuritis
- Optic Drusen

Optic Neuritis and AION

- Differentiating feature will be optic disc pallor instead of optic nerve cupping

Optic drusen

- Differentiating feature will be careful examination with 78 or 90 D lens
- May need Bscan, OCT, and/or CT scan

Beware of False Positives

- 40% based on ganglion cell analysis
- 30% based on rNFL maps

Worst in eyes with long axial length and small optic disc size

OCT and race

OCT and cataracts

OCT and floor effect

Normal rate of decay of rNFL

- Normal: .48 microns per year after age 40
- Glaucoma: .98 microns per year after age 40

OCT: Billing

- CPT code: 92133
- Can do once a year on stable patients
- Can do twice a year on progressive patients
- Can't do at all on advanced glaucoma
- Average reimbursement: $45

Standard Glaucoma Suspect work up protocol

- Visit 1: Dilated exam, gonio, pach, photos
- Visit 2: IOP check and GDx/OCT
- Visit 3: IOP check and VF

Truncated Glaucoma Suspect work up protocol

- Visit 1: Dilated exam, gonio, pach, photos
- Visit 2: IOP check and GDx/OCT and VF same day

Truncated Glaucoma Suspect work up protocol

- BENEFIT: You save your patient one trip to your office

Truncated Glaucoma Suspect work up protocol

- You lose:
  - Practice: revenue from an intermediate exam
  - Practice: 20% reimbursement for multiple procedure

Truncated Glaucoma Suspect work up protocol

- You lose:
  - Clinically: another IOP measurement
  - The Intangible: The more often a patient has to come see you, it underscores the seriousness of this disease