Glaucoma Diagnosis
Fine Tune Your Skills

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4 main types of glaucoma and why it matters

Glaucoma used to be triad of…

- Increased IOP
- ONH damage
- Visual field defects

Now…

-
- ONH damage
-

The Optic Nerve = CNS

Table 1: The 12 Cranial Nerves

Nerve no.	Nerve name	Rhyme	Function
1	Olfactory	On	Smell (not usually tested)
2	Optic	Old	Visual acuity
3	Oculomotor	Olympus'	Opening of eyelids, eye movement (upward/medial, upward/lateral, medial, downward/lateral)
4	Trochlear	Towering	Eye movement (downward/medial)
5	Trigeminal	Top	Facial sensation, chewing movements
6	Abducens	A	Eye movement (lateral)
7	Facial	French	Facial muscle movement (except chewing muscles) and eyelid closing
8	Auditory (vestibulocochlear)	And	Hearing and balance
9	Glossopharyngeal	German	Taste on the posterior third of the tongue (not usually tested)
10	Vagus	Viewed	Uvula (palate muscles) and swallowing
11	Accessory	A	Shoulder shrug
12	Hypoglossal	Hop	Tongue movement

Risk Factors

Age

- Incidence of 0.25% at 20 years
- Incidence of 15% at 70-75 years

ADAGES

- African Americans have a 6X higher incidence of glaucoma
- Glaucoma progresses faster
- More severe damage and loss of visual function

LALES

- Population-based cross-sectional study involving 6,357 subjects 40 and older
- Designed to measure the prevalence of eye disease in Latinos
- Latino population has incidence of glaucoma slightly less than African Americans, but greater than the average person

What About Diabetes?

- **Studies Showing Positive Association**
  - **Klein BE et al. Beaver Dam Study Ophthalmology 1994**
  - **Dielemans I et al. Rotterdam Study, Ophthalmology 1996**
  - **Mitchell P et al. the Blue Mountains Eye Study, Ophthalmology 1997**
- **Studies Showing No Association**
  - **Tielsch JM et al. the Baltimore Eye Survey, Ophthalmology 1995**
  - **Weih LM et al. the Visual Impairment Project, Ophthalmology 2001**
  - **Leske MC et al. the Barbados Eye Study, Archives Ophthalmology 1995**
  - **Wormald RP et al. The African Caribbean Eye Survey. Eye 1994**
  - **Quigley HA et al. Proyecto VER, Archives Ophthalmology 2001**

Hypertension

- Perfusion Pressure =
  Diastolic Pressure – IOP

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

Normal Perfusion Pressure: 80 -20 = 60

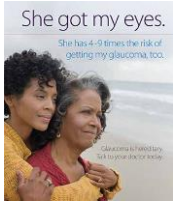
Perfusion Pressure

- Once it gets below 40, it is a problem

Other conditions

- Sleep apnea
- Migraines
- Chronic steroid use

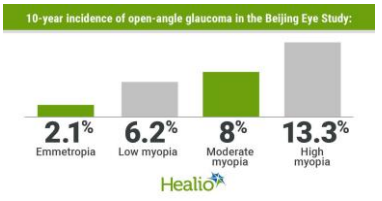
Family History



- **"First-degree relatives of identified OAG patients should be evaluated with optic disc and visual field testing."**

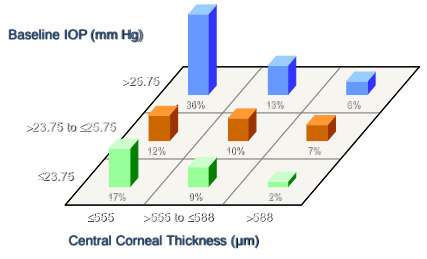
Harry A Quigley, MD *Arhives of Ophthalmology*, July 2006

Myopia and glaucoma

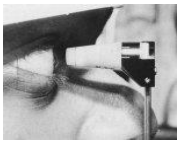


Low Myopia: 1-2 D High Myopia: Over 6D

Central Corneal Thickness and IOP



Ways we check IOP



Where does the 10 to 21 range come from?

- Study by Leydhecker and associates in the early 1960's done using Schiotz tonometry
- Mean IOP 15.5 +/- SD of 2.5
- Therefore 95% of normal population is IOP of 10.5 to 20.5

A patient having an IOP in the normal range really has very little to do with whether they have glaucoma

High IOP == work up

"Normal" IOP == ocular health exam

IOP Assymetry

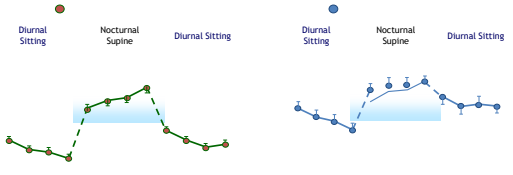
- 3mm difference: 6% increased risk of glaucoma
- 6mm difference: 57% increased risk of glaucoma

IOP Fluctuation

- 2 to 4 mm Hg is normal
- Anything over 5 mm Hg is a risk factor for glaucoma

Most of us learned that IOP is highest in the morning

Both healthy eyes and eyes with glaucomatous changes have higher nocturnal supine IOP than diurnal sitting IOP



Liu, Zhang, Kripke, Weinreb. *Invest Ophthalmol Vis Sci.* 2003;44:1586-1590.

How do we find this?

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

Serial tonometry

- 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

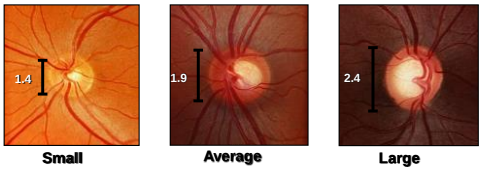
Serial tonometry (CPT code: 92100)

- CPT code 92100
- ICD 10 codes: Any of the glaucoma suspect, OHTN, glaucoma codes
- Reimbursement roughly $90-$100
- Should do yearly

At home IOP monitoring

Testing of the patient suspected of having glaucoma

Optic Disc Size

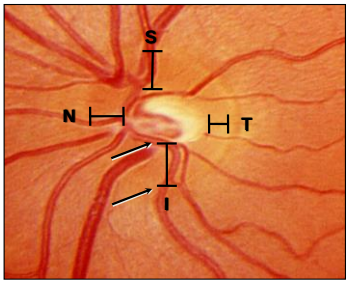


Small discs can have small cups in glaucomatous eyes
Large discs have large cups in healthy eyes

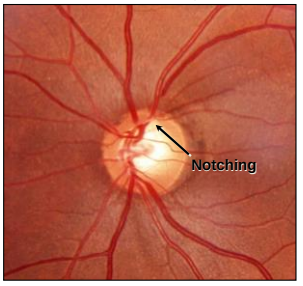
ISNT RULE

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

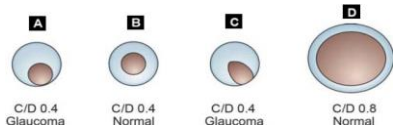
ISNT rule
Inferior >
Superior >
Nasal >
Temporal



Localized Rim Thinning/Notching



Notching



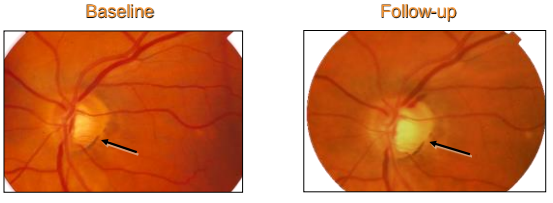
What is normal C/D ratio?

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

Stereo Optic Disc Photography

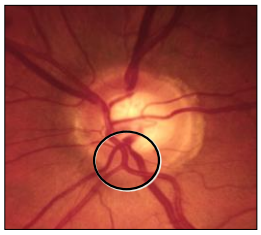
Is the gold standard for structural assessment

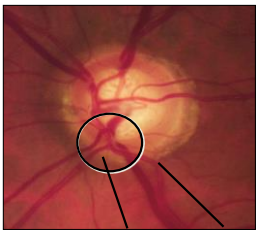
Focal Neuroretinal Rim Narrowing



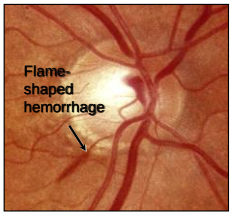
Rim and Vessel Change

Change in the RNFL





Drance Hemorrhage



Why take Fundus Photos?

- Show patient
- Establish a baseline
- Because it is the standard of care
- You get paid to do it

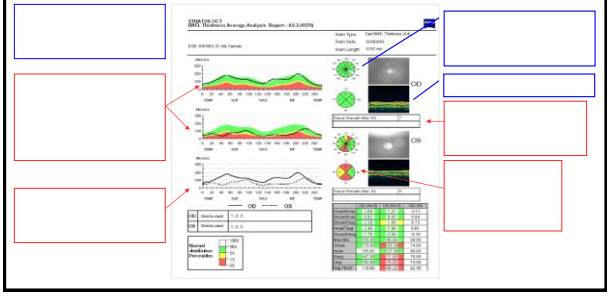
Fundus Photos: Billing

- CPT code: 92250
- Average reimbursement: $78

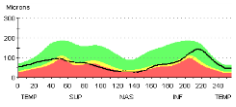
Fundus Photography

- How often can you do it?
- Once a year and every year

RNFL Thickness Analysis



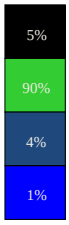
RNFL Thickness



95% of normal population falls in or below green band; 90% falls within green band

5% of normal population falls within or below yellow band; 4% falls outside the yellow band

1% falls within red band; considered outside normal limits



100%
95%
5%
1%
0%

OCT: Billing

- CPT code: 92133
- Average reimbursement: $45

OCT

- How often can you do it?
  - Can do once a year on stable patients
  - Can do twice a year on progressive patients
  - Can't do at all on advanced glaucoma

VF: What Stimulus Size?

Size III is standard

Size V used for advanced glaucoma and decreased visual acuity

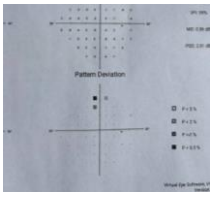
What field size do we use?

Right field size?

24-2 is the standard size

10-2 can be used with visual field loss within the central 10º of fixation

What do you look for on a VF?



Never make decisions on just one VF

Repeat test if needed in 2-3 weeks

In most cases waiting that long is not going to change the clinical outcome

Their conclusion:

You need three consecutive, reliable tests before making any decisions

What do most of us do?

- TWO – as long as test is consistent with previous and reliable.

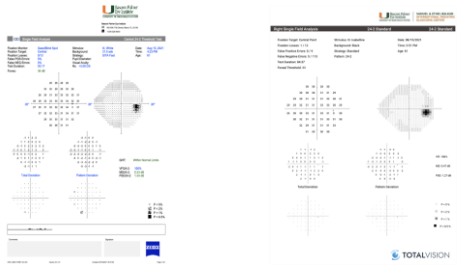
VF: Billing

- CPT code: 92083
- Average reimbursement: $59

Visual Field testing

- How often can you do it?
  - Can do once a year on stable patients
  - Can do twice a year on progressive patients or high risk patients

What's New in VF?



Where Virtual VF are useful

- When you are tight on space and want to free up a room
- When you are tight on tech hours and want to free up your tech
- When you travel between multiple offices
- When you want the latest in medical technology

A couple of little things to fine tune the diagnosis

Gonioscopy: Why do it?

Identify the type of glaucoma

It is standard of care for work

You get paid for it!!!

Improving Your Gonioscopy Skills

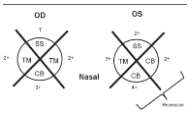
- Use dark room
- Start with 1mm, narrow beam of light
  - Keep beam away from pupil
- Minimize lens tilt
  - Only minor movements permitted to see over convexity of iris
  - Otherwise narrow open will appear open

Gonioscopy Billing

- CPT code: 92020
- ICD 10 codes: Any OHTN, Glaucoma suspect, or glaucoma
- Average reimbursement: $22

Gonioscopy

- How often can you do it?
- Documentation:
  - A note in the chart is usually sufficient



Ocular Hypertension Treatment Study

- Patients with thin corneas were three times greater risk for developing glaucoma even after adjusting IOP for corneal thickness
- Each 40 microns = 1.7 greater risk of progression over 10 year time period

Pachymetry: Billing

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

Putting it All Together

Who do you work up?

- Anyone with C/D .50 or greater
- Anyone with IOP 21 or greater
- Anyone with + FH and at least 2 other risk factors
- Anyone with a bunch of little risk factors

What do you need for a glaucoma practice?

- OCT
- VF
- Fundus camera
- Gonioscope
- Corneal pachymeter

Money makers for glaucoma

- Fundus Camera
- VF
- OCT
- Gonioscope
- Corneal pachymeter

Standard Glaucoma Suspect work up protocol

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

Pick Your Poison

- Option A:
  - Visit 1: initial evaluation
  - 1 month later: IOP check and OCT
  - 1 month later: IOP check and VF
- Option B
  - Visit 1: initial evaluation
  - 3-4 months later: IOP check and OCT
  - 3-4 months later: IOP check and VF

What's your job in diagnosing glaucoma?

- Make sure your patient does not have glaucoma at the time of visit
- Identify risk factors for glaucoma and recommend work up for appropriate patients
- Establish a baseline and then track for changes

Most common 2 reasons why glaucoma goes undiagnosed

- Patients don't come for regular eye exams
- Doctor fails to work up a patient who has sufficient risk factors

Optometry and Glaucoma

- Average Optometrist sees 20 to 30 patients a day.
- Glaucoma 2-3%, Glaucoma Suspect 5-6%
- Therefore, on average, an OD should see at least one patient a day related to this condition