What is Glaucoma?

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Overview

- Define Glaucoma
- Diagnosis that make-up glaucoma
- Patients that are pre-dispose to Glaucoma
- Discuss risk factors associate with Glaucoma
- Treatment
- Patient Education Opportunities

Normal

Glaucoma

Military Medical New 10 Jan11

- January is Glaucoma Awareness Month
- Nearly 3 million people have glaucoma
- Glaucoma comes without warning symptoms
- Glaucoma is the second leading cause of blindness in the U.S. and first leading cause of preventable blindness
- 120, 000 Americans are blind from glaucoma
- African Americans account for 9-12%, 6-8 times more likely than Caucasians…ages 45-65 more likely to go blind from the disease
- Other high risk groups are: diabetics, Fam Hx, people over 60, those severely nearsighted

Definitions

- Glaucoma is an optic neuropathy characterized by a loss of ganglion cells and their axons, in the RNFL. The loss of retinal ganglion cells in glaucoma is irreversible
- Neuropathy is any disease of the nervous system
- An eye disease in which the normal fluid pressure inside the eyes slowly rises, leading to vision loss– or even blindness.
- NEI: Glaucoma is a group of diseases that damage the eye's optic nerve and can result in vision loss and blindness

Glaucoma Research Foundation

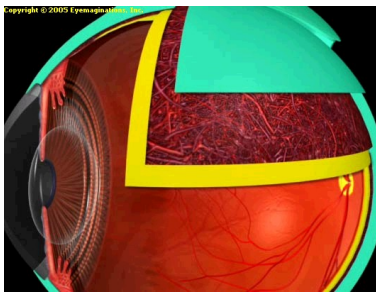
- Glaucoma is a group of diseases that can steal without warning or symptoms a persons vision. Over 3 million Americans have it, only half know it

http://www.glaucoma.org

Anatomy and Physiology of the Eyeball

3 Layers

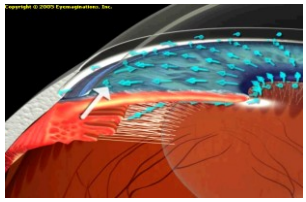
- Fibrous Layer
  - *Cornea
  - *Sclera
- Vascular Layer
  - *Choroid
  - *Ciliary body
  - *Iris
- Nerve Layer
  - *Retina
  - *Macula
  - *Optic nerve



What is the main function of each layer?

Aqueous Chamber

- Manufactured by ciliary body
- Characteristics:
  - Clear
  - Watery consistency (99% H_2O)
- Functions
  - Refraction of light
  - Intraocular Pressure (IOP)
  - Probably nourishes posterior surface of the cornea and the crystalline lens
- Flows from posterior chamber through the pupil into the anterior chamber

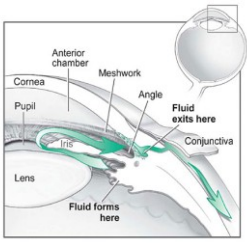


How does aqueous flow out of anterior chamber?

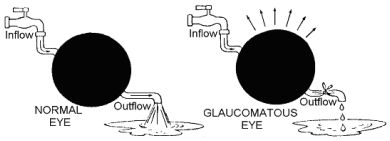
Types of Glaucoma

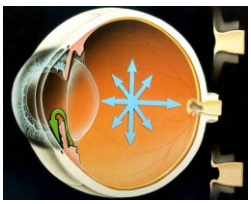
Not curable/but treatable in most cases

- Low-tension/ normal tension glaucoma
- Angle-closure glaucoma
- Congenital glaucoma
- Secondary glaucoma



IOP





Low Tension Glaucoma

- Optic nerrve damage and narrowed side vision occur in people with normal eye pressure. Lowering eye pressure at least 30 percent through medicines slows the disease in some people. Glaucoma may worsen in others despite low pressure.
- Potential risk factor: low blood pressure

Angle Closure Glaucoma

- The fluid at the front of the eye cannot reach the angle and drain from the eye. The angle gets blocked by the part of the iris. People with this type of glaucoma have a sudden increase in eye pressure. Symptoms include severe pain and nausea, as well as redness of the eye and blurred vision.
- Dilating a patient with narrow angles can induce an acute angle glaucoma attack
- This is a medical emergency, now is the time to act
- Explain the YAG-PI, why is it necessary

Dilation Hazards

- Cross Contamination
- Narrow anterior chamber angle
- Potential risk in dilating
- Plan for acute angle glaucoma attack

Congenital Glaucoma

- Children are born with a defect in the angle of the eye that slows drainage of aqueous. The children usually have obvious symptoms such as cloudy eyes, sensitivity to light, and excessive tearing.
- Early intervention could lead to a great outcome

Secondary Glaucoma

- These can develop as complications from other medical conditions. These types of glaucomas are associated with eye surgery or advanced cataracts, eye injuries, certain eye tumors, or uveitis
- Pigmentary glaucoma occurs when pigment from the iris flakes off and blocks the meshwork, slowing fluid drainage
- Neovascular glaucoma is linked to diabetes

Major Risk Factors

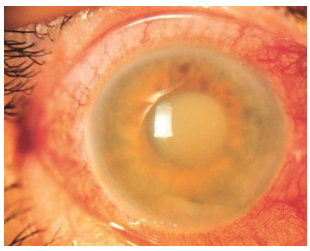
- Inter-ocular pressure
- Age
- Race
  - African Americans 6 x
- Family Hx
- Myopia
- Corneal thickness
- Medical conditions
  - Trauma
- Everyone can get it!
- 1 out of 10K babies born in the U.S.

At Risks

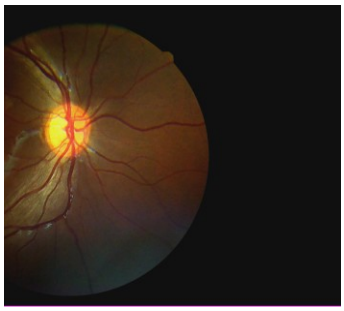
- Everyone over 65
- African Americans ages 20-39 should have eye exams every 3-5 years
- People with diabetes
- Family Hx of glaucoma
- Corticosteroid patients
- African Americans are five times more likely
- 15 times more likely to have blindness in 45-64
- Pt with RP

- + Hypertension
- Diabetes
- B-12 Deficiency
- Auto-immune disorders
- Playing wind instruments (trumpet)
- Tobacco use
- Sleep Apnea
- Lupus
- Rheumatoid Arthritis
- Tuberculosis
- Females
- Lyme Disease

At Risk



11 year old girl



Assessment of Glaucoma

- Case Hx
- Optic Nerve Head (ONH)
- Visual function…field testing
- Retinal Nerve Fiber Layer
- Expert interpretation of results
- Corneal thickness… pachymetry avg 500 microns
- Gonioscopy POAG vs CAG
- Trauma
- IOP (asymmetric pressure)
  - Goldmann (industry std)
  - POAG
  - Low Tension
  - Closed or narrow angle

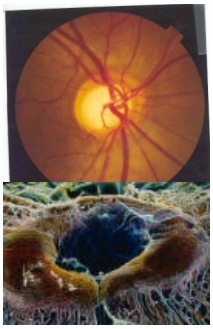
There must be a change in a retinal condition to Dx glaucoma

Glaucoma Assessment

- . Identify testing procedures associated with POAG
- - IOP Measurements
- - OCT
- -Pachymetry
- -Visual Fields

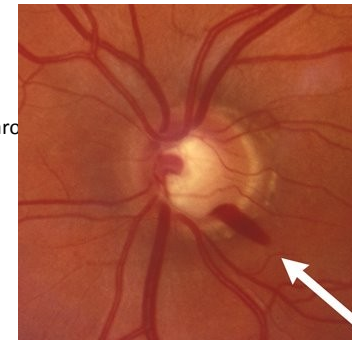
Optic Nerve Head

- Ophthalmoscope exam
- C/D ratio (middle divot)
- Rim thinning
- Notching
- Excavation
- Requires clear media
- Dilation
- Fundus photography
- Imaging (HRT, OCT, GDx for early detecting!
- Drance hemms on edge of disk



ONH Inspection

- C/D Ratio
- ONH Color
- Dranz –bleeding arc the optic nerve



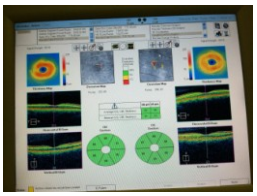
5 Rules for ONH Evaluations

- Observe the scleral ring to identify the limits and size of disc
- Examine the RNFL
- Look for retinal and optic disc hemorrhages
- Identify size of the neuroretinal rim
- Examine the region of parapapillary atrophy (PPA)

ISN'T IT Helpful

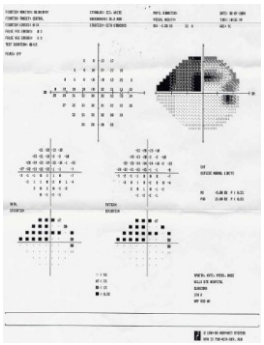
- Inferior rim thickest
- Superior rim slightly less thick
- Nasal rim even less thick
- Temporal rim should be the thinnest

These apply when you have a fairly round or slightly vertically oblong disc



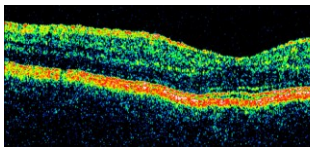
Peripheral Field Loss

- Visual field assessment
- Standard automated perimetry
- Moderate –to-advanced stages



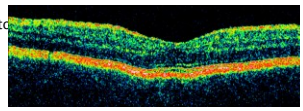
Retinal Nerve Fiber Layer

- Changes are more common than ONH changes
- Quigley Study
  - RNFL atrophy in 49%
  - ONH changes in 19%
- Airaksinen Study
  - RNFL defects in 83%
  - ONH C/D changes in 42%
- Red-free photography



Imaging cont…

- provides high-resolution imaging
- of the retina layers, with detail and precision.
- A range of scan patterns is available to fit the
- imaging needs for retina pathology. These
- patterns are designed to take advantage of the
- speed and resolution offered by Fourier-domain
- OCT technology.



Corneal Thickness

- ⊡ Thicker corneas over estimate IOP
- ⊡ Thinner corneas under estimate IOP
- ⊡ Average 555nm
- ⊡ African Americans average corneal thickness (520-540nm)
- ⊡ White Americans average corneal thickness (580-600nm)
- ⊡ False reading due to

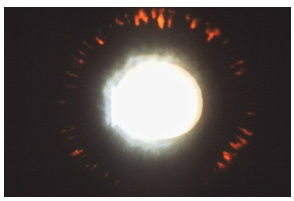
Corneal Thickness Correction Value

[um] [mmHg] 445 +7

455	+6	555	-1
465	+6	565	-1
475	+5	575	-2
485	+4	585	-3
495	+4	595	-4
505	+3	605	-4
515	+2	615	-5
525	+1	625	-6
535	+1	635	-6
545	0	645	-7

Inter-Ocular Pressure

- One risk factor for glaucoma
- Tonometry is used to assess IOP
- The damage thresh hole varies from person to person
- Ocular Hypertensive- vs –glaucoma
- Corneal thickness and IOP
- A.M. vs P.M.



What condition is this?

Clinical Examination

- BVA
- Pupillary function
- Anterior Seg eval
- Gonioscopy
- IOP (careful)
- Pachymetry
- NFL Eval
- Visual Field

Checking Blood Pressure

- Ocular Perfusion Pressure (OPP) diastolic
- OPP Formula= (BP 120/80) OPP = 80 – IOP
- Theory: OPP
- Check BP on all glaucoma patients (especially those with low IOP)

Testing

- DFE
- FDT
- Heidelberg (new technology)
- OCT

HVF (reduces operator error

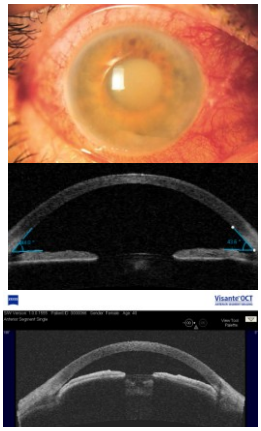
- Threshold testing
- FastPac Testing
- Rx is important
- Pupil Diameter ($3mm_{min}$)
- Fixation Losses (gaze not on target)
- False-positive (trigger happy)
- False-negative (missed brighter stimulus)
- Numeric data
- Gray scale
- Total deviation
- Pattern deviation
- Global Hemifield Test (GHT)
- Global indices (standards)
- Pattern Standard Deviation (PSD)
- Mean Deviation (MD)

Glaucoma vs Ocular Hypertension

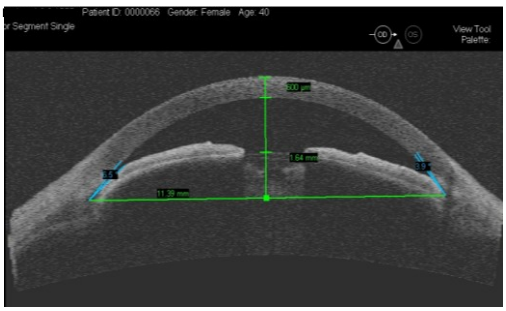
- Glaucoma
  - High or low pressure
  - Large C/D
- Ocular Hypertension (OHT)
  - Elevated pressure but no other signs

Acute Angle-Closure Glaucoma

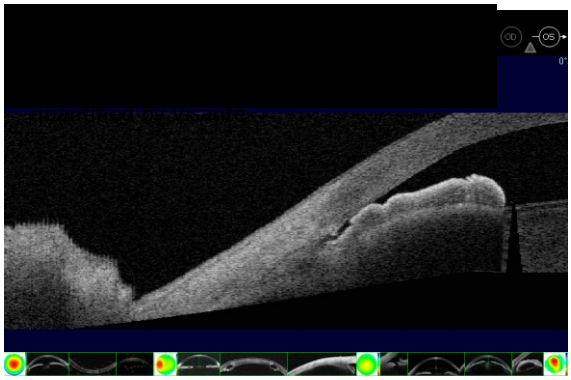
- Rapid onset
- Painful
- Very serious
- Can lead to permanent blindness



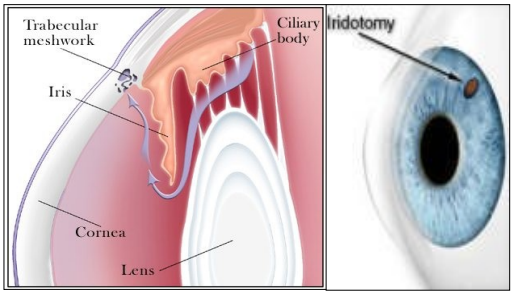
Narrow Angles / Shallow Chamber



Glaucoma Applications

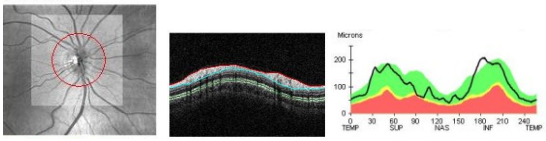


Peripheral Iridotomy = YAG PI



Glaucoma – RNFL Thickness Analysis

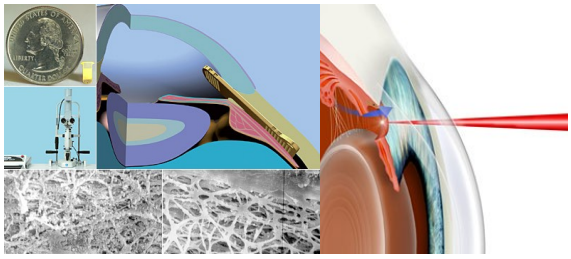
- Center of disc is automatically identified for precise registration and repeatability
- RNFL thickness display is of a 1.73mm radius circle around the disc
- TSNIT graph is compared to normative database of about 300 patients



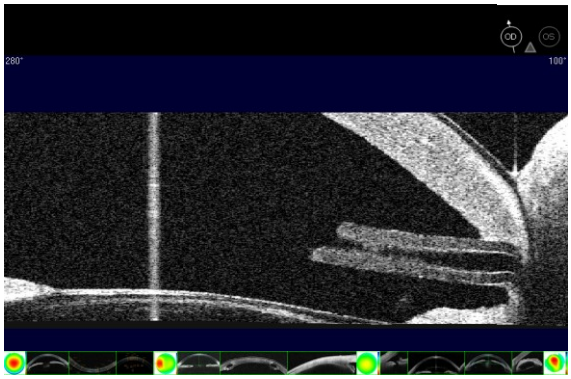
Treatment of Glaucoma

- Education
- Medication
- Surgery
  - YAG PI (PCAG)
  - SLT
  - Trabectulectomy
  - Tube Shunt
  - Laser ciliary body
  - Enucleation
  - Combinations

Shunt / Trabeculectomy



Glaucoma - Shunt



Trabeculectomy

- The SOLX laser system, which received FDA approval in September 2008, is similar to selective laser trabeculoplasty (SLT), in that only pigmented cells are targeted, sparing adjacent tissue from potential heat damage. The DeepLight Gold Micro-Shunt operates differently from other types of glaucoma implants, because drainage is confined to the eye's interior with the idea of reducing surgical complications.

New IStent

- **iStent Trabecular Micro-Bypass.** is available in Europe for the treatment of open-angle glaucoma. The device also is commercially available in the United States and Canada for use in conjunction with cataract surgery for the reduction of IOP in patients with mild to moderate open-angle glaucoma.

Durasert

- **Durasert.** In June 2011, pSividia Corp. announced an early stage clinical trial of its Durasert glaucoma implant is underway in the United States. The bioerodible implant is inserted under the scleral conjunctiva and is designed to provide long-term sustained release of the glaucoma medicine latanoprost, reducing or eliminating the need for daily medicated eye drops to treat glaucoma.

Education

- Document well the pt medical charts
- Tell patient to keep a chart of progress
- Monitor progress
- The importance of following the doctors instruction/compliance
- Document non-compliance
- Encourage honesty
- Explain the diagnosis
- Suspected cause of condition
- Planned treatment
- Possible affects on vision now and in the future
- Watch for any particular symptoms and contact us if they occur
- Suggested lifestyle changes
- Changes in iris color

Medications to lower IOP

- Prostagladins
- Betablockers…slows the heart rate
- Alpha-agonists
- Carbonic anhydrase inhibitors
- Miotic or cholinergic agents…Pilocarpine
- Epinephrine Compounds

#1 reason for IOP not going down…not taking meds

Nonpenetrating Glaucoma Surgery (NPGS)

- A **deep sclerectomy** involves a minimally invasive incision into the white of the eye (sclera), a portion of which is removed to create a drainage space for relief of eye pressure
- A new surgical method known as **viscocanalostomy** creates an opening for insertion of a highly pliable, gel-like material known as viscoelastic, which helps provide enough space for adequate drainage and eye pressure relief.

Viscocanalostomy

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ED and Glaucoma

- Several studies in the 1980s found that ED was a side effect of systemic and topical beta-blocker therapy.[1-4]
- "It has been postulated that the sexual dysfunction accompanying β-blockade may be due to a number of mechanisms including: increased α-sympathetic tone causing shunting of blood away from the penis, depression and sedation mediated by the central nervous system, and overall decreased activity of the central nervous sympathetic system," the study's authors write.

https://col125.mail.live.com/?tid=cm6CTmIwPp5BGZMwAIZMIC0A2&fid=flinbox

No Need For Weed (Cannabis)

- The smoke contains THC
- No research supports the benefits of smoking medical marijuana
- Marijuana can lower IOP but the benefits have not been substantiated therefore it is not recommended for patients
- Rosanne Barr

http://optometrytimes.modernmedicine.com/optometrytimes/news/marijuana-and-optometry-practicing-post-legalization

ED and Glaucoma Meds

- **Vancouver, British Columbia**—A recent study found an association between erectile dysfunction (ED) and glaucoma that is not attributed to the use of beta-blocker therapy.
- **History of beta-blockers and ED**
- Several studies in the 1980s found that ED was a side effect of systemic and topical beta-blocker therapy.[1-4]
- "It has been postulated that the sexual dysfunction accompanying β-blockade may be due to a number of mechanisms including: increased α-sympathetic tone causing shunting of blood away from the penis, depression and sedation mediated by the central nervous system, and overall decreased activity of the central nervous sympathetic system," the study's authors write.

http://optometrytimes.modernmedicine.com/optometrytimes/news/rise-erectile-dysfunction-association-glaucoma

The Next slides are for Reference Only

Caffeine Effects

- Studies are showing that caffeine raises IOP in patients

Medications

- IOP Lowering Medications
  - Azopt
  - Betimol
  - Betoptic S
  - Combigan
  - Iopodine
  - Istalol
  - Lumigan
  - Timolol
  - Travatan
  - Xalatan

- Dosages vary
- Insurances may not pay for brand names
- Some medications work on some pts but not on others
- Pt should run out of their medications
- Compliance is a big issue with many patients

References

- **Quigley HA, Katz J, Derick RJ, GD Sommer**: 1992 An Evaluation of Optic Disc and Nerve Fiber Layer
- **Airaksinen PJ, Alnako HI**: 1983 Effect of Nerve Fiber Loss on Optic Nerve Configuration in Early Glaucoma
- **University of Illinois Eye Digest 2006**: Corneal Thickness and Glaucoma
- http://www.allaboutvision.com/conditions/glaucoma-surgery.htm

Thank you

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