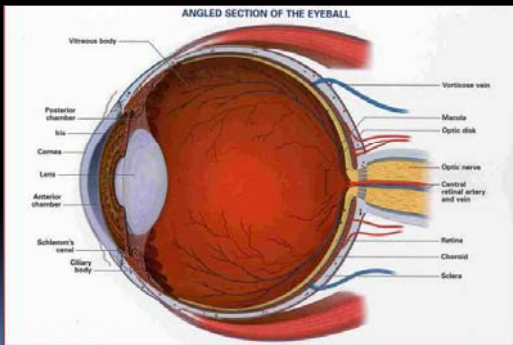


SLOW VISION LOSS

Robert Honkanen MD
Associate Clinical Professor
Department of Ophthalmology
Stony Brook University

Eye Anatomy



Slow Vision Loss

- Definition: Vision loss that occurs gradually over a period of weeks to years, often in a slow imperceptible manner.
- Causes
 - Glaucoma
 - Cataract
 - Macular Degeneration
 - Amblyopia/Strabismus

Glaucoma

- Four basic clinical presentations we will review
 - Primary Open Angle Glaucoma
 - Primary Angle Closure Glaucoma (Chronic or Acute)
 - Secondary Glaucoma
 - Congenital Glaucoma

Glaucoma

- Definition – a group of diseases that have in common a characteristic optic neuropathy with associated visual field loss for which elevated IOP is one of the primary risk factors.

Glaucoma

- Epidemiology
 - Second leading cause of irreversible blindness.
 - 60.5 million affected individuals in 2010 increasing to 79.6 million by 2020.
 - 14% of those affected will be blind bilaterally from the disease.
 - Number one cause of irreversible blindness in African Americans.

Glaucoma

- Epidemiology
 - Up to 50% of affected individuals may not know they have the disease.
 - Affects approximately 2-5% of the population over age forty; with prevalence doubling every decade.
 - By age 70, approximately 10% of individuals will have glaucoma.

Glaucoma

<u>Disease</u>	<u>Prevalence %</u>
Hypercholesterolemia	34
Hypertension	32
Obesity	31
Diabetes	8
Glaucoma (POAG)	2
Coronary Heart Disease Mortality	0.39

Glaucoma

- Pathophysiology
 - Anatomy
 - Aqueous production and outflow
 - Elevated IOP
 - A common, but not necessary feature of the disease (nl range = 10-21 mmHg)
 - Damage
 - Optic atrophy/excavation
 - Visual field defects



Images courtesy of WLM Alward MD

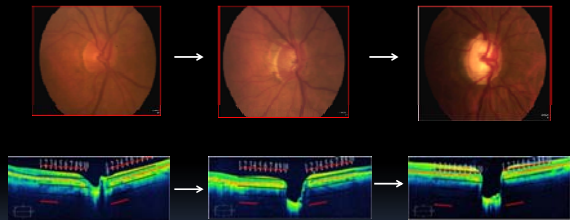
Glaucoma

- Pathophysiology

- Anatomy
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Glaucomatous ONH Progression

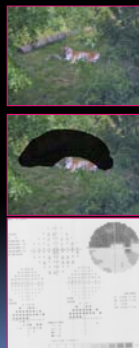


Excavation of the disc is due to loss/death of the retinal ganglion cells and their axons which pass through the optic nerve head. The site of damage is at the lamina cribosa of the optic nerve head.

Glaucoma

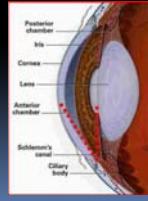
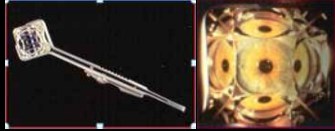
- Pathophysiology

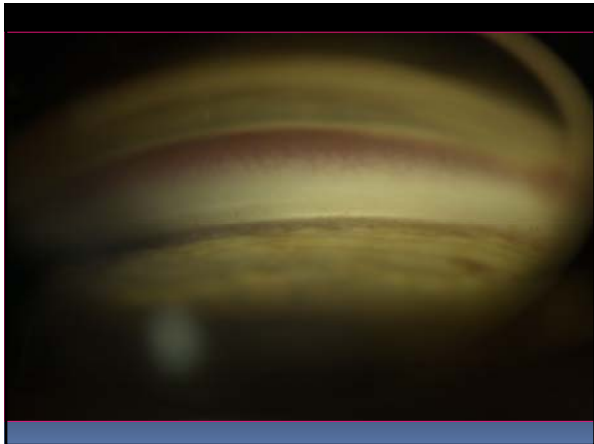
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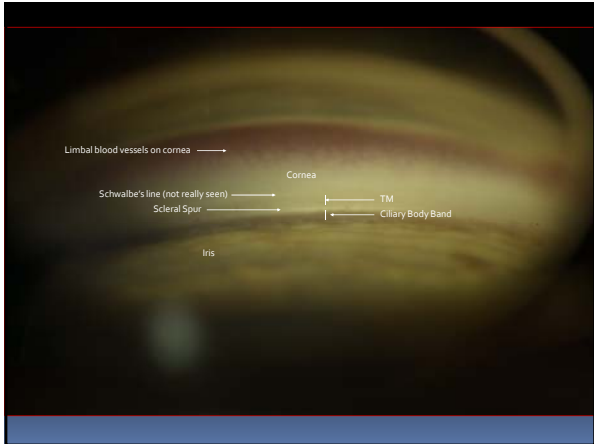


Glaucoma

- Pathophysiology
 - Open Angle
 - Closed Angle

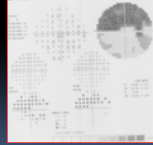
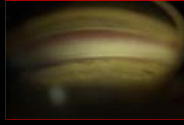






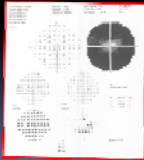
Glaucoma

- **Primary Open Angle Glaucoma**
 - Most common type (70% of all glaucoma cases)
 - Familial disease, hereditary
 - Bilateral
 - Caused by acquired impairment of aqueous drainage through the trabecular meshwork
 - Marked by progressive constriction of the field of vision, excavation of the optic nerve head and elevated IOP; painless. (Normal tension glaucoma would be the definition if the IOP was never elevated)



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Glaucoma

- **Primary Closed Angle Glaucoma** ("Narrow angle glaucoma")
 - **Acute**
 - Ophthalmologic Emergency
 - Covered in ocular emergency lecture (Dr. Haque)
 - **Chronic**
 - Often asymptomatic with same VF/ONH/IOP findings as POAG.
 - Differs from POAG because the angle is narrow with PAS (peripheral anterior synechiae).



Glaucoma

- Angle closure glaucoma ("Narrow angle")
 - Chronic
 - Often asymptomatic with same VF/ONH/IOP findings as POAG.
 - Differs from POAG because the angle is narrow with PAS (peripheral anterior synechiae).



Glaucoma

- Symptoms of POAG
 - No symptoms until the late phase of disease when advanced vision loss finally becomes symptomatic.
 - Occasional symptom of decreased vision in dark or at twilight when disease is more advanced.
- Symptoms of CACG
 - May be asymptomatic
 - May have occasional headache like symptoms especially when reading or in dimly lit rooms
 - Occasional symptom of decreased vision in dark or at twilight when disease is more advanced.

Glaucoma

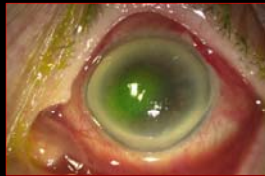
- Signs of POAG
 - Slowly progressive loss of vision, usually starting in the periphery
 - Increased cupping
 - Nerve fiber layer defects around the optic nerve
 - Increased IOP
 - (Not all forms of glaucoma need to have elevated IOP – however, by definition for POAG it does)
- Signs of CACG
 - Same as those listed for POAG
 - Will see peripheral anterior synechia in the angle.

Glaucoma

- Management of POAG and CACG
 - To be discussed after a few more slides.

Glaucoma

- Acute angle closure glaucoma ("Narrow angle")
 - Ophthalmic emergency
 - Rare form of disease
 - Occurs when root of iris blocks the drainage mechanism in patients with anatomically shallow anterior chambers



Treatments:
Press on center cornea,
Pressure lower drops, oral Diamox, IV
Mannitol, laser iridotomy, surgery if
attack can not be broken.

Glaucoma

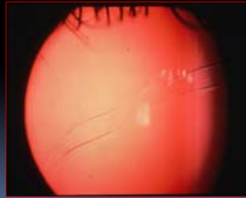
- Congenital Glaucoma
 - Relatively rare form
 - Caused by congenitally imperfect or maldeveloped aqueous humor drainage mechanism
 - Barkan membrane
 - Before the age of 2 or 3 years the eye will show additional findings due to the elevated IOP.



Glaucoma

▪ Congenital Glaucoma

- Clinical findings seen in congenital glaucoma:
 - Cloudy / hazy corneas
 - Breaks in Descemet's membrane on the cornea – Haab's striae
 - Increased axial length – or buphthalmos
 - Increased corneal diameter
 - Increased IOP



Glaucoma

▪ Symptoms for Congenital Glaucoma

- Tearing (epiphora)
- Photophobia (light sensitivity or pain to light)
- Blepharospasm (forceful closure of eyelids)

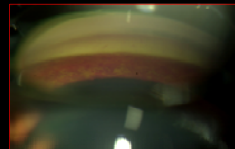
▪ Treatment

- Surgical for primary cases of congenital glaucoma
 - Goniotomy or trabeculotomy surgery
 - "angle surgery"
 - Video 01 – f4v

Glaucoma

▪ Secondary Glaucoma

- Result of damage to drainage mechanism by other intraocular disorders, e.g. inflammation, after surgery, traumatic, diabetes.
 - Open or closed angle mechanisms



Glaucoma

▪ Secondary Glaucoma

- Result of damage to drainage mechanism by other intraocular disorders, e.g. inflammation, after surgery, traumatic, diabetes.
- Open or closed angle mechanisms



Glaucoma

▪ Symptoms for Secondary Glaucoma

- May have more acute onset
- May have a painful, red eye
- May have peri-orbital pain

▪ Signs for Secondary Glaucoma

- Identifiable pathology known to contribute to glaucoma – often but not limited to abnormalities in corneal endothelium, angle structures, iris architecture, or lens.

Glaucoma

▪ Examination for Glaucoma

- Anterior segment exam / posterior segment exam to r/o secondary causes
- Intraocular pressure
- Ophthalmoscopy (clinical optic nerve head evaluation)
- Visual field testing
- Optic Nerve Head Imaging (OCT, HRT, GDx)

Glaucoma

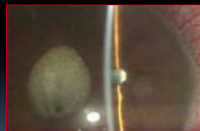
- Management (adult onset)
 - All forms of treatment are currently aimed at lowering the IOP
 - Modalities Include:
 - Medication
 - Laser
 - Surgery

Glaucoma

- Medications
 - Cholinergics / parasympathomimetics
 - Beta adrenergic blockers
 - Carbonic anhydrase inhibitors
 - Alpha-adrenergic agonists
 - Prostaglandins
 - Combination drops
- Bottle cap colors
 - Green
 - Light blue or yellow
 - Orange
 - Green / purple bottle
 - Tiel

Glaucoma

- Laser Treatments
 - Laser trabeculoplasty
 - ALT
 - SLT
 - Laser Iridotomy
 - For angle closure



Glaucoma

- Surgical Treatments
 - Minimally invasive glaucoma surgery
 - Filtering procedures
 - Penetrating procedures
 - Non-penetrating procedures
 - Seton Implants
 - Ciliary Body Destructive procedures



Glaucoma

- Surgical Treatments
 - Minimally invasive glaucoma surgery
 - Filtering procedures
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 - Non-penetrating procedures
 - Seton Implants
 - Ciliary Body Destructive procedures
- Video 02

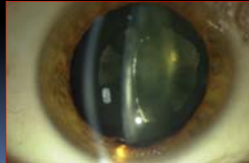
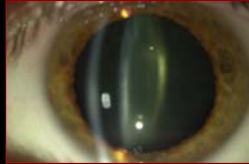
Glaucoma

- Postoperative appearance after trabeculectomy.



Cataract

- Definition
 - An opacity in the normally transparent focusing lens of the eye that as it becomes denser interferes with clear vision.
- Causes
 - Aging (most common)
 - Trauma, medications, intraocular surgery, metabolic endocrine or other congenital abnormalities.



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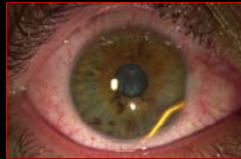
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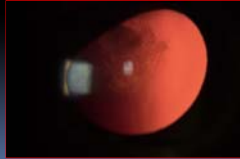
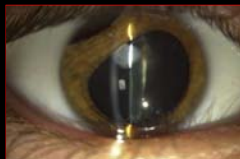
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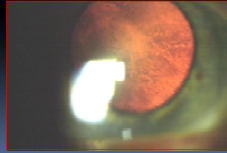
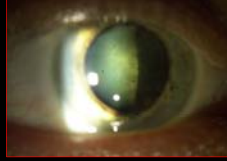
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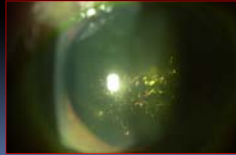
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Cataract

- Epidemiology
 - Most common cause of visual loss in the adult population
 - By age 65, greater than 90% of all people have cataracts
 - May develop at any age (essential to detect in neonatal period to prevent amblyopia)



Cataract

- Treatment is surgical removal
 - Couching
 - ICCE
 - ECCE
 - Phacoemulsification
 - Multifocal / pseudo-accomodating lenses
 - Astigmatism correcting lenses



Image taken from www.medrxiv.com/lookup/doi/10.1101/2017.04.14.17111111

Cataract

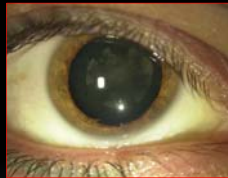
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 - Astigmatism correcting lenses
- Video ECCE
 - Quicktime #03

Cataract

- Treatment is surgical removal
 - Couching
 - ICCE
 - ECCE
 - Phacoemulsification
 - Multifocal / pseudo-accomodating lenses
 - Astigmatism correcting lenses
- Video Phaco
 - Quicktime #04

Cataract

- Cataract Surgery
 - Often deferred until vision is decreased and interferes with ADLs.
 - Surgery is medically indicated:
 - Neonates
 - When cataract interferes with diagnosis or management of other eye diseases (eg DM or tumor)
 - When cataract causes other eye problems such as uveitis or glaucoma



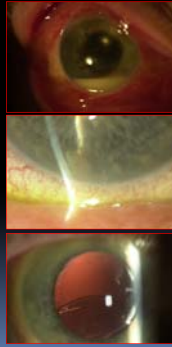
Cataract

- Cataract Surgery
 - Most commonly done on outpatient basis
 - Only inner lens and portion of anterior capsule are removed
 - After cataract removed eye is aphakic and optical power is restored with a lens implant, glasses or contact lens
 - Visual acuity restored to precataract levels in more than 99% of uncomplicated cases



Cataract

- Surgical Complications (rare)
 - Endophthalmitis
 - Retained lens fragments
 - Macular edema
 - Retinal Detachment
 - IOL dislocation
 - Corneal decompensation
 - Ptosis
 - Diplopia
 - Bleeding
 - Uveitis



Slow Vision Loss

- Definition:
- Causes
 - Glaucoma
 - Cataract
 - Macular Degeneration
 - Amblyopia/Strabismus

Age Related Macular Degeneration

- Epidemiology
 - Number one cause of irreversible vision loss in people over the age of 50.
 - Estimated that 15 million people in North America currently have the disease.
 - Estimates predict a 60% increase in numbers by 2020.
 - Risk increases with age.
 - Framingham data showed:
 - 6.4% with signs of AMD age<75
 - 19.7% with signs of AMD age>75
 - Occurs as dry form (about 86%) or wet form (about 15%).



Age Related Macular Degeneration

▪ Risk Factors

- Older age, positive family history, cigarette smoking, hyperopia, light iris color, hypertension, hypercholesterolemia, female gender, and cardiovascular disease



▪ Etiology

- Complex, but may involve genetic mutations in the complement pathway.
 - Tyr402His, and Ala69Ser genes may account for up to 75% of the genetic risk of AMD.

Age Related Macular Degeneration

▪ Exam

- Drusen – small, round, yellow lesions located at level of RPE within the macula. Include:
 - Laminar deposits (granular lipid rich material and collagen)
 - Linear deposits (phospholipid vesicles and electron dense granules within inner aspect of Bruch's membrane.
 - Typically do not cause symptoms.
- Drusen can be described as:
 - Small, Intermediate, or Large
 - Soft, Hard, Confluent
- Large, Soft and Confluent drusen more likely to have vision loss.



Age Related Macular Degeneration

▪ Exam

- RPE changes
 - Focal hyperpigmentation
 - RPE detachments
 - RPE loss / attenuation (geographic atrophy)
- Neovascularization
 - Subretinal fluid, lipid or blood.
 - RPE detachments



Age Related Macular Degeneration

- Symptoms
 - Gradual / rapid loss of vision
 - Metamorphopsia
 - Scotomata
 - No RAPD



Age Related Macular Degeneration

- Clinical exam findings
 - Decreased central vision/Snellen acuity
 - Amsler grid abnormalities.
 - Fluorescein angiography /Optical coherence tomography (FA/OCT) abnormalities.



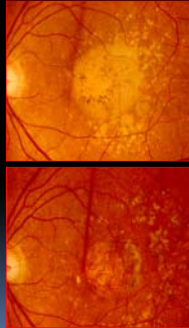
Age Related Macular Degeneration

- Treatments for Dry ARMD



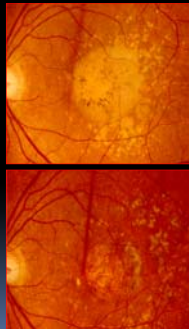
Age Related Macular Degeneration

- Micronutrients
 - Antioxidants
 - Vitamins
 - 500 mg Vitamin C
 - 400 IU Vitamin E
 - 15 mg beta carotene
 - Zinc
 - (80 mg zinc oxide, 2 mg cupric oxide)
- May reduce risk of progression to advanced AMD by up to 25%.



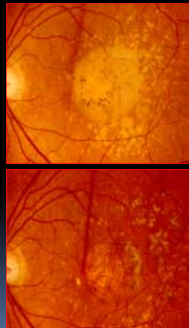
Age Related Macular Degeneration

- Other behavior modifications
 - Avoiding UV light might be beneficial.
 - Smoking cessation.
 - Obesity reduction.



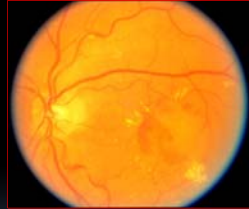
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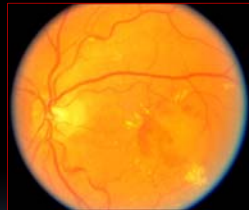
Age Related Macular Degeneration

- Treatments for Wet ARMD



Age Related Macular Degeneration

- Anti-angiogenesis
 - Macugen
 - Lucentis
 - Avastin
 - Eyelea
 - Trap VEGF
- Photodynamic therapy
- Laser photocoagulation



Age Related Macular Degeneration

- Keys
 - Will not go totally blind
 - 20/400 endpoint
 - Use of low vision aids



Slow Vision Loss

- Definition:
- Causes
 - Glaucoma
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 - Amblyopia/Strabismus

Amblyopia

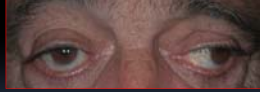
- Amblyopia
 - Reduced visual acuity (best-corrected) not attributable to structural abnormality of eye or posterior visual pathway
 - "Lazy eye"
 - Prevalence: 2-4% in North America
 - Onset prior to age 7
 - Preventable or reversible

Amblyopia

- Block in normal visual development
 - Strabismus
 - Refractive error
 - Anisometropia
 - High isometropia
 - Visual deprivation
 - Cataract
 - Ptosis
- Lack of binocular mapping of the environment
- Decrease synapses within lateral geniculate body (even atrophy)
- Lack of fusion, decreased stereovision

Amblyopia

- Strabismus
 - Misaligned eyes, "crossed, wandering eyes"
 - Affects 4% of children
 - Esotropia: inward turning
 - Exotropia: outward turning



Amblyopia

- Reduced visual acuity (best-corrected) not attributable to structural abnormality of eye or posterior visual pathway
 - Unilateral (or bilateral)
 - Defect of central vision (peripheral vision intact)
- Etiology:
 - Strabismus
 - Refractive error
 - Anisometropia
 - Hemangioma, Ptosis → induce astigmatism
 - High isometropia
 - Visual deprivation
 - Cataract
 - Ptosis (occlusion +/- induced astigmatism)
- Prevalence: 2-4% in North America
- Preventable or reversible
 - Detection and appropriate intervention

Amblyopia

- Signs
 - Decreased vision, usually since birth
 - Strabismus (misalignment of eyes)
 - Visual preference, head tilt

Amblyopia

- Treatment
 - Correct refractive errors / eyeglasses
 - Treat ocular disease – cataracts / ptosis / glaucoma
 - Occlusion therapy (patching/penalization of the GOOD eye)
 - Surgery – move the eye muscle insertions



Amblyopia

- Preventable cause of blindness
- Critical period
- Risk until age 10

THE END

Questions
