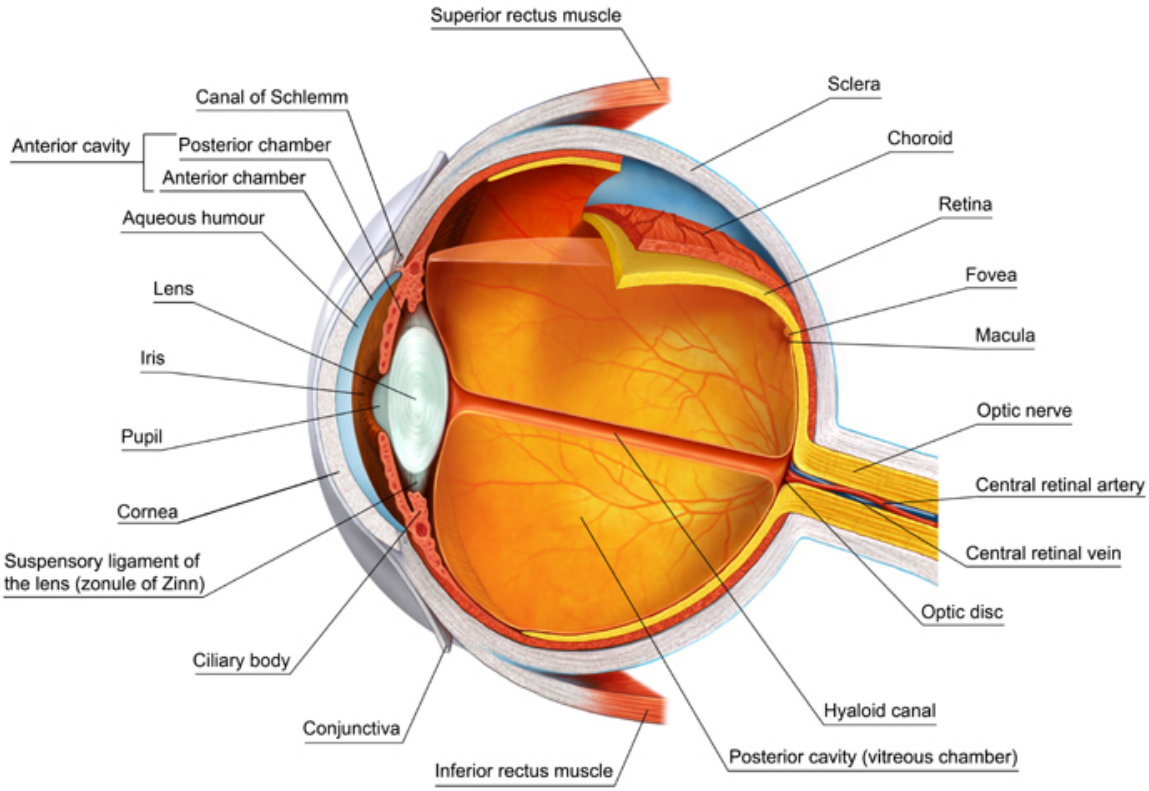
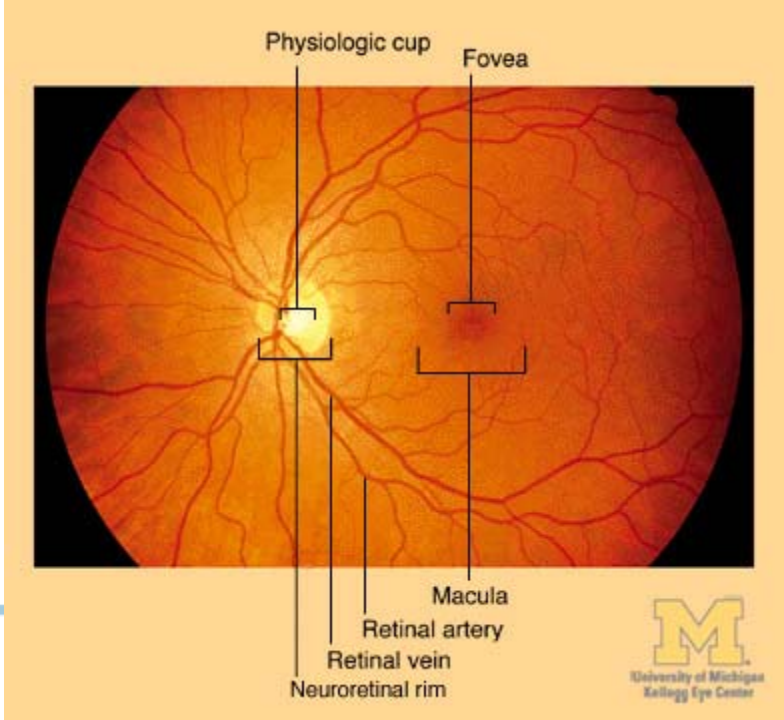
Eye



Eyelid → Conjuctiva → Cornea (clear/avascular) in line w/ Episclera/Sclera (white/vascular) → Ant Cavity w/ Aqueous Humor → Uvea (Iris + Ciliary Body in line w/ Choroid + Retina w/ Disk and Cap in Middle) → Lens → Post Cavity w/ Vitreous Humor

blood in vessel thru ciliary body → aqueous humor in posterior chamber thru pupil to anterior chamber → trabecular meshwork at angle b/t cornea/iris entering Schleman canal → venous blood



Normal: sharp rim, C:D 50%
Papilledema: blurred rim
Glaucoma: C:D >80%
Retinal Artery Occlusion: overall pale except for a cherry red spot
Retinal Vein Occlusion: retinal hemorrhage (very dirty appearance)
Retinal Detachment: blurred whitish area
Proliferative Retinopathy: new vessels over disk

	Yes Vision Loss (transient = amarousis fugax)	No Vision Loss
YES Pain	Acute • Scleritis • Anterior Uveitis • Keratitis • Acute Glaucoma • Temporal Arteritis • Optic Neuritis • Orbital/Periorbital Cellulitis • Cavernous Sinus Thrombosis	Acute • Eyelid Disease (blepharitis, Hordoleum, Dacrocystitis) • Episcleritis/Scleritis • Corneal Abrasion
NO Pain	Acute • Factious • Vitreous Hemorrhage • Retinal Detachment • Retain Vein Occlusion • Retinal Artery Occlusion • Ischemic Optic Neuropathy Chronic • Myopia (near sighted, young) vs Presbyopia (far-sighted, elderly) • Cataracts • Chronic Glaucoma • HTN/DM Retinopathy • ARMD	Acute • Infectious/Allergic Conjuctivitis • Subconjuctival Hemorrhage

Orbit (ptosis, exopthalmus, strabismus, pain during eye movement only)

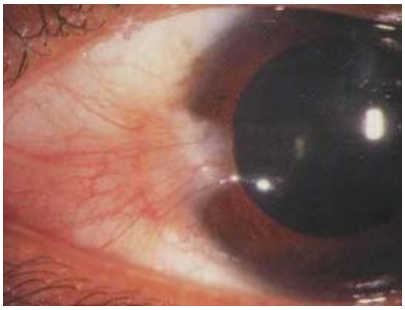
- **Graves Ophthalmopathy** (refer)
- **Psuedotumor**: idiopathic inflammation of muscle/nerves/glands w/ associated lymphoproliferative disorder
- **Tumor**: rhahbdomyosarcoma, gland cancer, carcinoma, metastatic (metastatic, breast, lung), direct extension (meningioma, sinus), etc
- **Periorbital Cellulitis**
- **Cavernous Sinus Thrombosis**

Eyelid

- **Blepharitis**
  - Mech: Inflammation of eyelid margin
  - S/S: burning, itching, erythema, scaling, ulceration
  - Etiology: *Staph* infection, seborrheic dermatitis, allergic
  - Tx: top abx, warm compress
- **Hordeolum**
  - Mech: External (Stye) / Internal (Chalazion): infection of Zeis/Meibomian gland resulting in inflammation of eyelid
  - Etiology: Staph aureus
  - Tx: (as above)
- **Dacryo-adenitis (gland) / cystitis (duct)**
  - Mech: inflammation of gland/duct that is acquired or congenital (nasolacrimal duct obstruction 2/2 failure of epithelial cells of tear duct to come apart and canalize occurring few wks after birth in 5% of infants)
  - S/S: chronic tearing and erythema 2/2 constant rubbing
  - Tx: digital massage of lacrimal sac and eyelid cleansing w/ most canalizing in <1yr if not then probe to canalize

Conjuctiva

- **Conjuctivitis**
  - Etiology
    - Allergies (+itching, seasonal, watery discharge, initially bilateral, NO LAD, other allergy Sx)
    - Infection
      - Viral (+itching, +prior hx, begins at one eye and then spreads to other eye w/in 2d and pt is contagious for 2wks, + peri-auricular LAD, Adeno, usually self-limited, HSV dendritic lesions on fluorescein stain)
      - Bacterial (+purulence w/ early morning "glued" eyes, no LAD, if very acute then consider Gonococcal/Chlamydia (trachoma = scarred conjunctiva) if sexually active and Psuedomonas if contact lens user then referral)
    - Irritative (topical meds, wind, UV, smoke)
    - Keratoconjuctivitis Sicca aka Dry Eye
      - Lipid (meibomian gland at eyelid) + Water (lacrimal gland at lateral corner) + Mucus (goblet cells on conjunctiva)
        - Etiology: VitA deficiency, aging, CTD esp Sjogren's, anticholinergics, smoke, etc
        - S/S: dry gritty eyes w/ foreign body sensation
        - Complications: ulcers, infection
        - Dx: Schirmer Test (+ if >5mm of filter paper is wet at 5min when placed at lower eyelid w/ eye closed), Flourescin (exposes loss of conjunctiva) vs Rose Bengal (exposes damage of conjunctiva)
        - Tx: artificial tears, methylcellulose ointment, muscarinic agonists (cevimeline, pilocarpine) which stimulates glands, if acute on chronic then Tx for infection
  - Tx: cool compresses, eyelid cleaning w/ saline cloth, stop contact lens use for awhile, NB do NOT patch eye, avoid irritants, eye drops (refer, while eye is closed, head tipped back, drop several drops in a lake in nasal margin , open eyes to allow liquid to enter, head upright), eye ointment (apply to edge of lower lid)
- **Pterygium**
  - Mech: benign growth of conjuctiva typically on the nasal side of the sclera
  - S/S: soft yellow mass that slowly grows w/ surrounding red eye
  - RFs: UV exposure, humidity, dust (often seen in manual labor workers)
  - Prevention: wear sunglasses and use artificial tears
  - Tx: artificial tears, as they are benign no treatment is necessary unless it grows across pupil affecting vision or if cosmetically unsightly then surgical removal can be done



- **Subconjuctival Hemorrhage** (unilateral localized sharply circumscribed hemorrhage, 2/2 trauma, bleeding diathesis, AC use, HTN, prolonged coughing/vomiting, resolves spontaneously in a few weeks w/o Tx)

Cornea

- **Keratitis**
  - Mech: inflammation of cornea
  - Etiology
    - Trauma: rubbing ,sand, contact lens, etc
    - Infection
      - Bacterial: Pseudomonas (contact lens), Gonorrhea (sexually active)
      - Fungal: Candida (contact lens)
      - Viral: HSV (dendritic ulceration)
    - dry eyes, topical meds, infections
  - S/S: red eye, pain, photophobia, tearing, reduced vision, foreign body, night pain during REM
  - Complication: abrasion/ulcer (corneal haze, pain, photophobia, tearing possibly leading to perforation, scarring, blindness)
  - Dx: Slit-Lamp Exam w/ slit lamp w/ cobalt blue filter & Scrape Cornea for Culture/Staining
  - Tx: ophtho consult, abx ointment not gtts b/c also soothes, topical NSAIDs (Ketorolac), no topical steroids

Episclera/Sclera

- **Episcleritis/Scleritis** (more systemic affecting other organs)
  - Mech: inflammation of sclera presenting w/ eye pain, photophobia, erythema possibly resulting in perforation
  - Etiology: 1° Idiopathic, 2° CTD (RA, SLE), Vasculitis (PAN, Wegener's), Infections
  - S/S: red eye, pain
  - Dx: Test (numb cornea then use Q-tip and touch cornea and move it, if the inflammation moves then conjunctivitis if it doesn't then deeper which scleritis, this important b/c scleritis or topical phenylephrine does not constrict vessels b/c dilated in sclera, this more serious and requires more intensive treatment)
  - Tx: treat underlying cause, Topical/Systemic Steroids (urgent care needed) and Systemic NSAIDs
  - NB episcleritis (self-limited w/ no permanent damage) vs scleritis (prolonged w/ permanent damage)

Ant Cavity w/ Aqueous Humor

- **Hypopion** (pus collecting at bottom of anterior chamber) vs **Hyphema** (blood collecting at bottom of anterior chamber)
- **Glaucoma** (increase IOP resulting in retinal damage)
  - **Acute Closed Angle** (rare)
    - Mech: acute closure of an already narrow anterior chamber angle resulting in acute increase in intraocular pressure
    - RFs: age, Asian, mydriasis, stress, meds, anterior uveitis
    - S/S: unilateral, extreme pain, blurring, halos around lights, steamy appearing cornea, dilated nonreactive pupils, tender "hard" eyes, N/V
    - Dx: clinical
    - Tx: emergent care needed therefore acutely decrease intraocular pressure w/ systemic IV acetazolamide and oral PO glyecerol then topical pilocarpine/timolol and subsequently laser iridotomy or surgical iridectomy in order to fix the anatomic anomalous narrow chamber angle
  - **Chronic Open Angle** (common)
    - Mech: a diseased trabecular meshwork that obstructs proper drainage of the eye resulting in gradual increase in pressure
    - Epidemiology: 0.5% of all adults

        - RFs: ocular HTN, FHx age, Hispanics/AA, DM, myopia, uvea changes, steroid use, retinopathy
        - S/S: initially asymptomatic and found incidentally but suspect in pts who need frequent lens changes as they get older, mild headaches, impaired dark adaptation, vision loss esp at peripheral nasal fields, halos around lights
        - Dx: tonometry (increased intraocular pressure – IOP w/ ULN 21mm of Hg, but not all pts with glaucoma have constant increased IOP sometimes when you measure IOP it is normal (25%!!!) but there are retinal changes, also not all pts w/ increased IOP aka ocular HTN have glaucoma aka retinal changes), fundoscopic exam (thinning of optic disk, increased cup to disk ratio aka >1/3, abnl retinal nerve fibers, etc)
        - Tx: decreased aqueous humor production w/ topical AB (apraclonidine, brimonidine), topical BB (timolol, betaxolol, carteolol, levobunolol, metipropranolol), systemic CAI (acetazolamide, dorzolamide, brinzolamide) or decreased aqueous humor outflow w/ topical Muscarinic Agonists (pilocarpine, carbachol) or topical Prostaglandin Antagonists (latanoprost, travoprost, anoprostone) and if medicines fails then laser trabeculoplasty
        - Px: eye exam Q3-5yrs for all pts >40yo and ocular HTN then Tx

Uvea

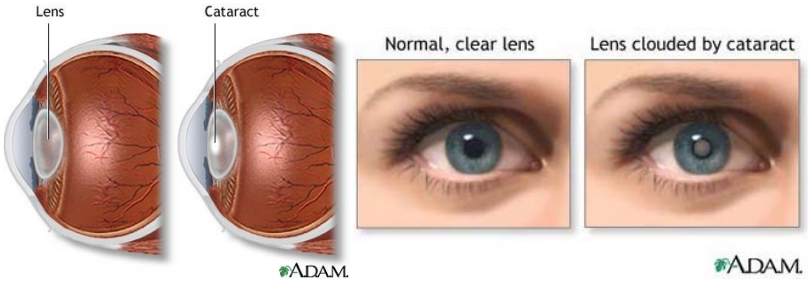
- **Uveitis** (Anterior (Iritis/Cyclitis) vs Posterior (Chorioditis/Retinitis))
    - Etiology: 1° idiopathic 2° systemic inflammatory dz (UC>Crohn's, Sarcoid, etc)
    - S/S: acute red eye, pain, photophobia, blurred vision, constricted/irregular/sluggish pupil, hypopyon/hyphema (inflammatory/RBC cells collect at bottom of chamber)
    - Dx: free cells in aqueous humor on slit lamp
    - Tx: urgent ophtho referral, systemic/local steroid
    - Complications: glaucoma, cataracts, macular degeneration
- **Optic Neuropathy**
    - Def: acute-to-chronic damage to optic nerve
    - S/S: monocular vision loss, variable pain with EOM, Relative Afferent Pupillary Defect (RAPD) aka Marcus-Gunn Pupil , color deficits esp red/green desaturation
    - Fundoscopic Exam: papillitis
    - Dx: MRI w/ Gadolinium and CSF can help differentiate the types below
    - Tx: IV steroids if not infectious
    - Types (vary in terms of pt age, presence of pain, onset/duration, uni/bilateral, fundoscopic exam)
        - Local Inflammatory ON aka Optic Neuritis (Multiple Sclerosis)
            - S/S: dyschromatopsia (color desaturation) + loss of visual acuity ± eye pain (other: scotoma, brief light flashes triggered by eye movement , etc)
                - Retrobulbar Optic Neuritis = inflammation behind globe (Normal Fundoscopic Exam) 70% EARLY "the pts sees nothing and the doctor sees nothing" , usually no pain
                - Bulbar Optic Neuritis = inflammation at globe (Optic Disk Swelling/Atrophy on Fundoscopic Exam) 30% LATE, usually pain w/ EOM
        - Ischemic ON (Vascular RFs, Vasculitis esp GCA)
        - Infectious ON (Any Meningo-encephalitis, West Nile, Toxo, Cat Scratch, HIV, Syphilis, Lyme, Aspergillus)
        - Systemic Inflammatory ON (Sarcoidosis, CTD esp SLE, Sjogrens, Behcets)
        - Compressive ON (malignancy, aneurysm, sinus dz, bone dz, etc)
        - Metabolic/Toxic/Medication ON (nutritional deficiencies esp VitB12, VitB1/6, Folate, Toxins esp Alcohol, Medications esp Ethambutol, Infliximab, Sildenafil, Amio, Isoniazide, Streptomycin, Chloroquin, Digitalis, Vincristine, Chloramphenicol, Glue, Heavy Metals
        - Trauma/Radiation ON
        - Genetic ON (Leber's, etc)
- **Retinal Detachment**
    - Unilateral painless loss of vision
    - Dx: grey retina floating w/in vitrous humor
- **Central/Branched Retinal Artery/Vein Occlusion**
    - Arterial
        - Etiology: thrombotic (yellow/white plaques at first branch), embolic, increased ICP, vasculitis esp GCA
        - S/S: sudden painless unilateral blindness, pupil accommodates but is sluggishly reactive to direct light, cherry red spot on fovea (nl retina is red but w/ ischemia it turns white except at fovea where blood is supplied from choroid), retinal swelling, "bloodless" retinal arteries aka pale fundus
        - Tx: thrombolysis of ophthalmic artery w/in 8hrs, decrease intraocular pressure (similar to acute closed angle glaucoma), if embolic you can manually dislodge by placing intermittent pressure on globe w/ heel of hand

- Venous
    - Etiology: hypercoagulable state
    - S/S: dilated tortuous veins, rapid painless unilateral blindness, hemorrhage, cotton wool spots, fundal edema
    - Tx: laser photocoagulation

- **Diabetic Retinopathy**
    - usually asymptomatic and thus found incidentally until late in course
    - 2/2 MIcrovascular Disease (ischemic insult, really no other disease can cause these specific problems, more closely related to degree of hyperglycemia w/ less effect from lipids/BP, seen mainly in T1DM)
    - leading cause of blindness in adults, uniquely much more common in T1 than T2, seen in 90% of T1 pts after 15yrs of Dx, Tx: laser photocoagulation)
    - Background/Non-Proliferative Retinopathy (no vision changes): **Microaneurysms** (small, round red dots) that then leak (1) lipoprotein forming **Hard Exudates** (irregular in shape and size, but sharply defined yellow markings) (2) fluid forming **Macular Edema** (?) (3) **retinal hemorrhage** (red dots)
    - Preproliferative Retinopathy (some vision changes): retinal ischemia/infarcts forming **Soft Exudates aka Cotton-Wool Spots** (whitish/gray areas)
    - Proliferative Retinopathy (dramatic vision changes): **Neovascularization** (abnormal vessels) w/ surrounding **Fibrous Tissue** which can contract and cause **Retinal Detachment / Vitreous Hemorrhage**
- **Hypertensive Retinopathy**
    - usually asymptomatic and thus found incidentally until late in course
    - arterial narrowing (nl A:V is 2:3 therefore <2:3) → vessel wall thickening (copper/silver wiring) w/ AV nicking → vessel damage w/ microaneurysms → hemorrhage, lipid deposits, edema, cotton wool spots
    - vessel damage leading to hemorrhage vs eye tries to protect itself from HTN by arterial constriction w/ arterial narrowing then copper narrowing then AV nicking then exudates flaming hemorrhage then papilledema
- **Age Related Macular Degeneration (ARMD)**
    - Def: degeneration of macula (central portion) of retina usually of one or both eyes resulting in loss of central vision with inability to do functions that require high acuity like driving, fading colors, line distortion, need for more light, etc
    - RFs: older age, F>M, Caucasian, smoking, FHx, higher BMI, *Chlamydia pneumoniae* infection, cataract surgery
    - increases with age such that 1% of 65-75yo have ARMD and 15% of 85-95yo have ARMD
    - leading cause of blindness in elderly
    - Dx: fundal exam w/ findings shown below
    - Two types of late ARMD (early ARMD is classified as just ARMD)
        - Dry Atrophic ARMD 85% (slow loss of vision) characterized by focal retinal thinning, Drusen (pale yellow deposits), and pigment epithelial mottling, pathogenesis (unknown)
            - Tx: no specific Tx just antioxidative therapy w/ VitC, VitE, beta-carotene, zinc is advocated as progression is slow over many years and overall disease is not life threatening but pts do eventually lose most of their central vision but w/ peripheral sparing so pts are not completely blind, NB some dry ARMD develop wet ARMD (~3%/yr) no treatment has been found to prevent this conversion
        - Wet Exudative ARMD 15% (fast loss of vision sometimes sudden 2/2 hemorrhaging, etc) characterized by neovascularization similar to the proliferative stage seen in diabetic nephropathy, pathogenesis (increased VGEF 2/2 genetic polymorphism)
            - Tx
            - antioxidants as above
            - intravitreous injections of steroids
            - intravitreous injection of VEGF inhibitors (Ranibizumab, Bevacizumab, Pegaptanib)
            - thermal laser photocoagulation of neovasculature only outside of macula is used to slow progression but does not restore vision rather actually generating a permanent blind spot
            - photodynamic therapy w/ intravitreous injection of dyes (Verteporfin) followed by activation by a laser which releases radicals which damage neovasculature
            - macular translocation surgery in which the macula is detached and moved to a less diseased area (experimental)
- **Retinoblastoma**
    - 1/3 bilateral, 6% genetic (AD), 90% b/f3yo
    - Def: Malignant Retinal Cancer resulting in leukoria (white pupillary reflex), strabismus, orbital inflammation, hyphema (blood layering anterior to iris)
    - Dx: Pupillary Reflex Test and CT
    - Tx: Chemo, Laser Photocoagulation, Cryo, Enucleation if unresponsive

Lens

- **Cataracts**
  - RFs: age, white, sun exposure, DM, smoking, EtOH, steroids
  - Lens opacity (usually global) producing painless gradual loss of vision w/ blurry vision, leukoria (pupil appears white), glare w/ bright sunlight, fading colors, difficulty with night vision, etc
  - Congenital: rubella infection
  - Acquired: trauma, radiation, corticosteroid use, metabolic (DM, hypocalcemia, Wilson - copper, Chlorpromazine - brown, muscle dystrophies – red/green/blue)
  - Idiopathic: familial (most cataracts are idiopathic)
  - Tx: surgical lens replacement w/ local anesthesia



Post Cavity w/ Vitreous Humor

- **Endophthalmitis**
  - Etiology: bacterial (after trauma or bacteremia), fungal esp Candida (after fungemia, NB any eye Sx in a pt w/ Candidemia warrants an emergent eye exam)
  - S/S: acute decreased visual acuity, eye pain, floaters w/ fundoscopic exam very hazy and confirming floaters
  - Dx: clinical but confirm w/ vitreous aspiration
  - Tx: vitreous drainage, intravitreous/topical/systemic antibiotics/antifungals, intravitreal steroids
- **Hemorrhage**
  - Etiology: trauma, HTN, DM
  - S/S: abnormal red reflex, blurred retina

Other

- **Ambylopia**
  - Def: decrease in visual acuity in child caused by blurred retinal image leading to failure of visual cortex to develop
  - Etiology: strabismus (eye misalignment), refractive errors, opacities (eg. cataracts, retinoblastoma)
  - Test: Corneal Light Reflex (have child look directly into light source and observe the location of the light reflection
  - Test: Cover-Uncover Test (have child stare at distant object and cover one eye and see if there is movement of the uncovered eye)
  - Eso (inward), Exo (outward), Hypo (downward), Hyper (upward)
  - Tx: b/f 4yo
  - strabismus (patch good eye, eye muscle surgery)
  - refractive errors (glasses)
  - opacity (surgery)