CERTIFIED PARAOPTOMETRIC REVIEW COURSE

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AMERICAN OPTOMETRIC ASSOCIATION
PARAOPTOMETRIC RESOURCE CENTER

COMMISSION ON PARAOPTOMETRIC CERTIFICATION
CPC

FINANCIAL DISCLOSURES

- Eyevance Pharmaceuticals

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EYE CARE SPECIALISTS

- Optometrist
- Ophthalmologist
- Ophthalmic Medical Personnel
- Paraoptometric
- Optician

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TOPICS TO BE DISCUSSED

- Anatomy and Physiology of the Eye
- Clinical Principles and Procedures
- Ophthalmic Optics and Dispensing
- Contact Lenses
- Professional Issues

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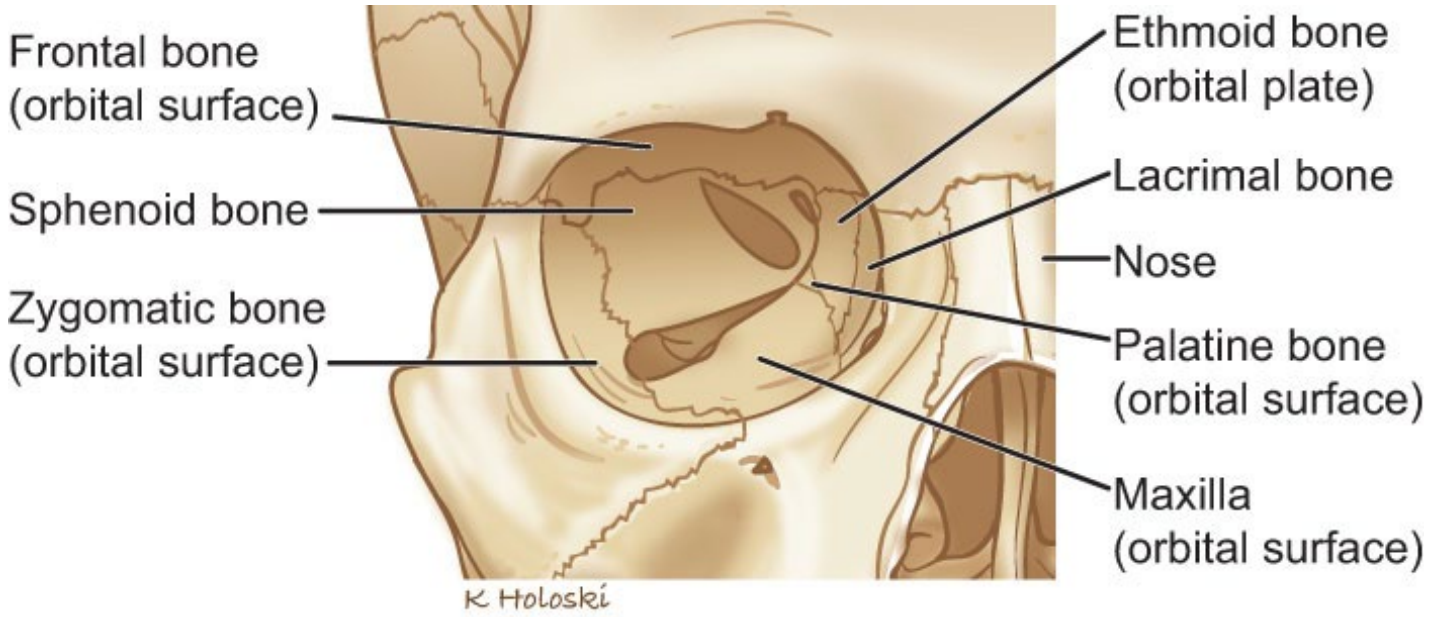
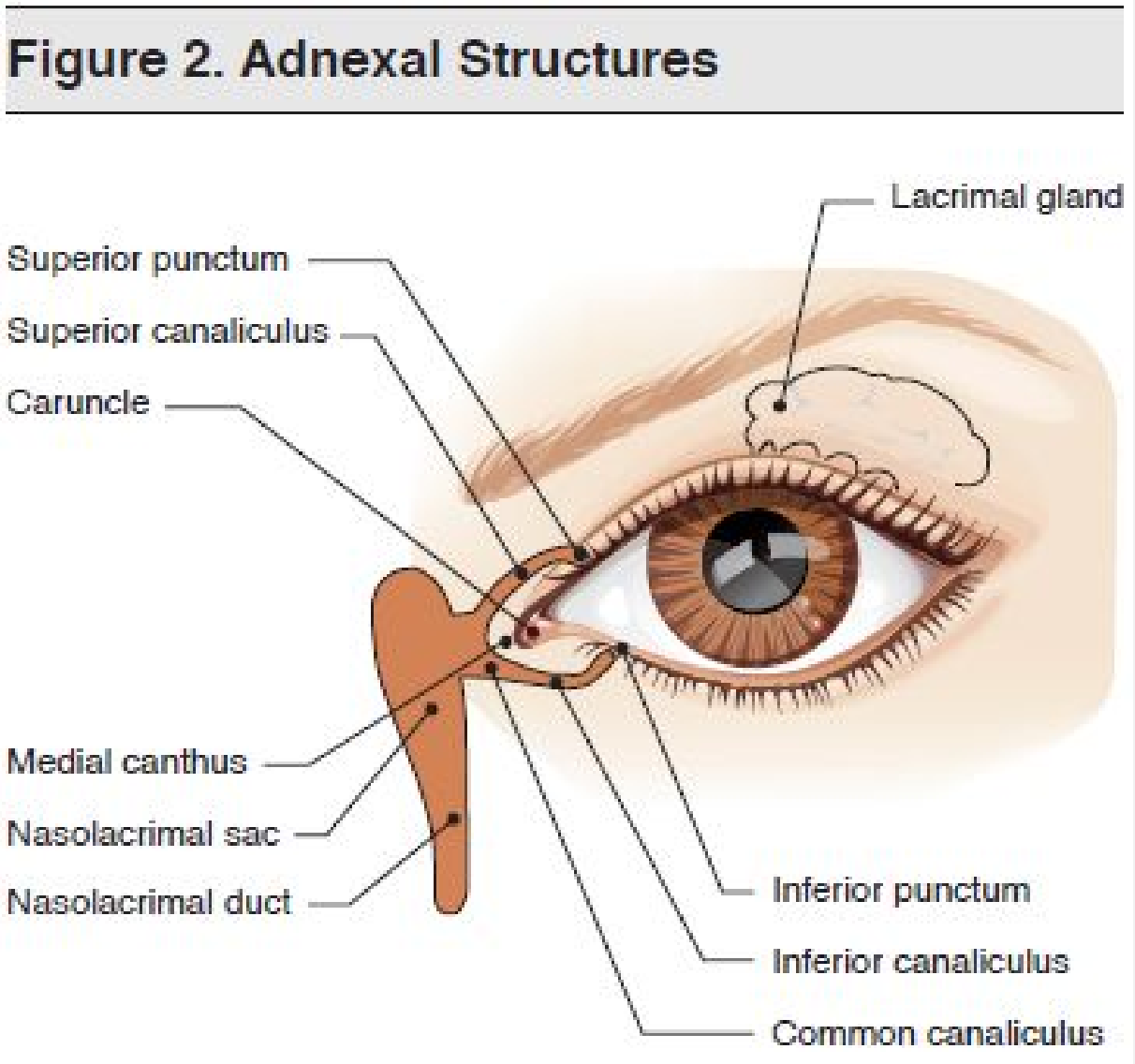
ANATOMY AND PHYSIOLOGY

ORBIT



ADNEXA OF THE EYE

- **Lacrimal Gland**- secrete aqueous layer of the tear film
  - Dacryoadenitis
- **Lacrimal Duct**- drainage system for tears
- **Nasolacrimal Duct**- carries tears from eye into nasal cavity
  - Dacryocystitis

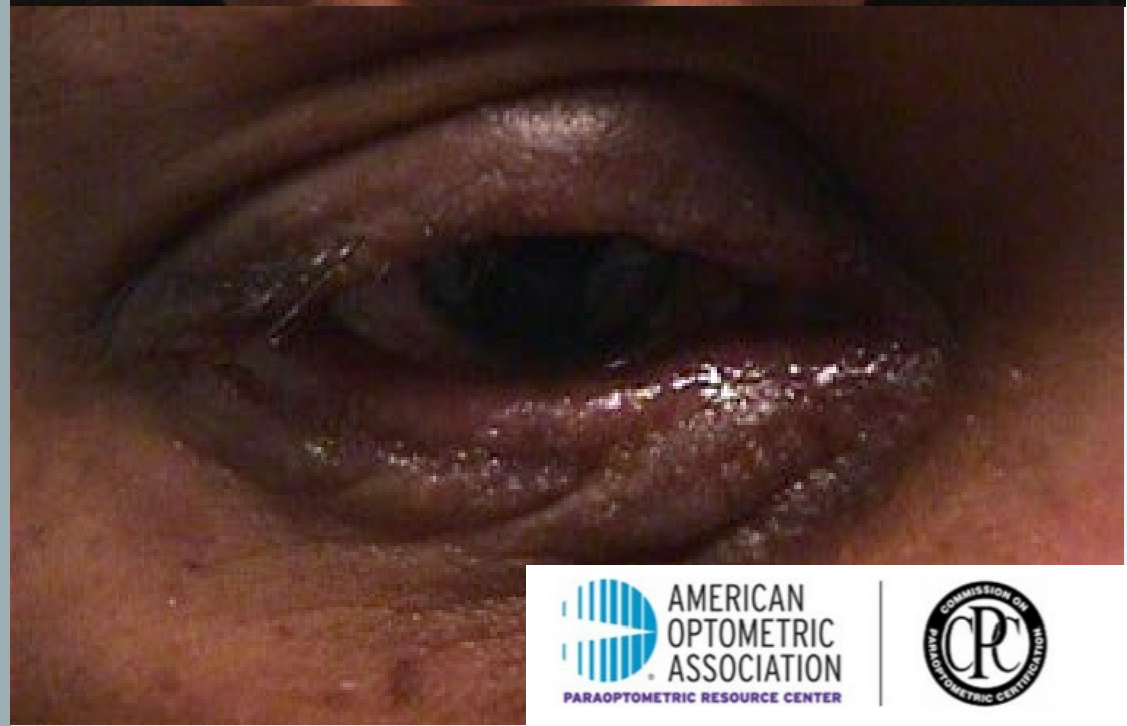


COMMON EYE DISORDERS

Blepharitis- chronic inflammation of lid margin

Redness, thickening of eyelid

Hordeolum- "stye," when one of the glands of the eyelids become inflamed and blocked



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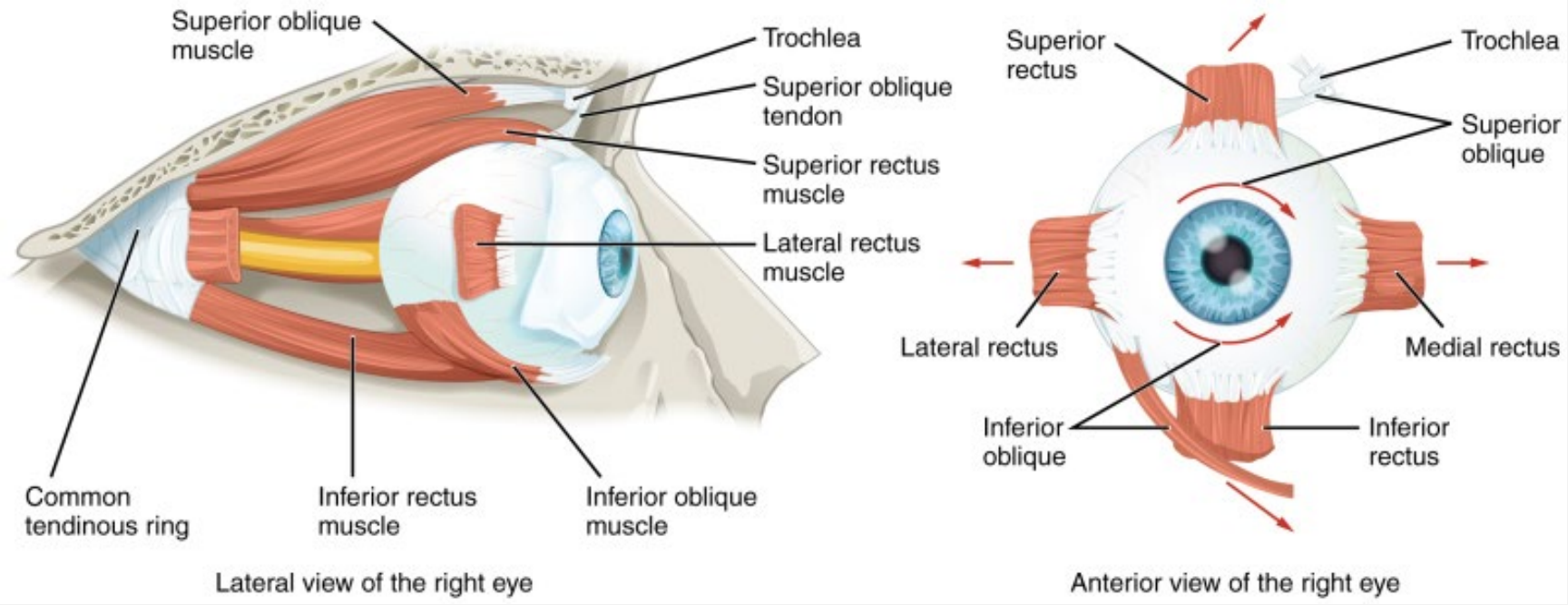
EXTRAOCULAR MUSCLES



Conditions of EOMs: Cranial Nerve Palsy, Strabismus, Exo-/Eso-/Hyper-/Hypo-Phoria or Tropia

FUNCTIONS OF THE EXTRAOCULAR MUSCLES

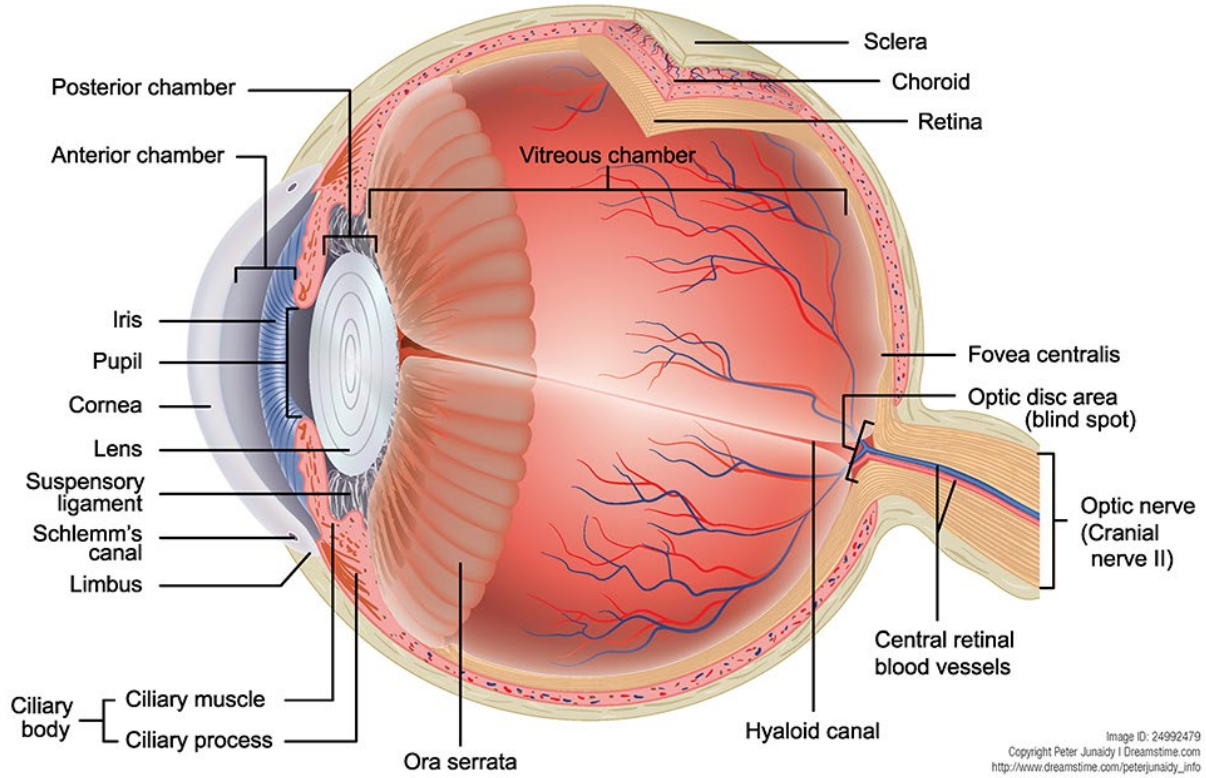
Muscle	Primary Action	Secondary Action
Superior Rectus (CNIII)	Elevation	Adduction, Intorsion
Inferior Rectus (CNIII)	Depression	Adduction, Extorsion
Medial Rectus (CNIII)	Adduction	None
Lateral Rectus (CNVI)	Abduction	None
Superior Oblique (CNIV)	Intorsion	Abduction, Depression
Inferior Oblique (CNIII)	Extorsion	Abduction, Elevation

Muscle	Primary Action
Levator Palpebrae Superioris (CNIII)	Raises upper eyelid

COMMON EYE DISORDERS

- **Amblyopia**- loss of vision in one or both eyes
  - Caused by refractive error or strabismus
  - Better treated while young
  - "lazy eye"
- **Esotropia**- form of strabismus which causes one or both eyes to turn inward
  - May be constant or intermittent
- **Nystagmus**- eyes make repetitive, uncontrolled movements that leads to reduced vision
  - can occur side-to-side, up and down, or circular

Schematic Section of the Human Eye



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STRUCTURES OF THE EYE

Anterior Segment

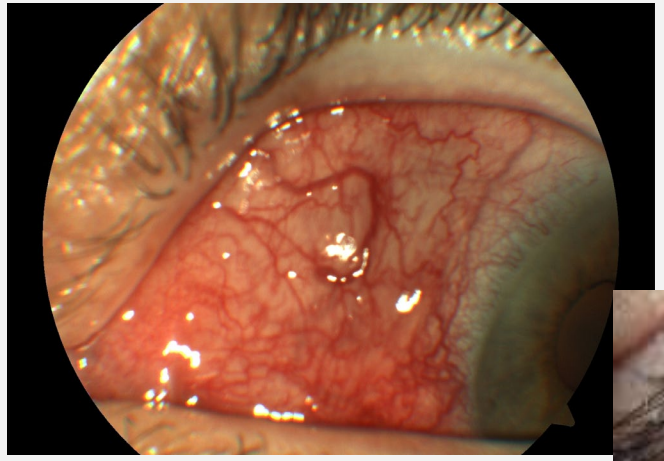
- Sclera
- Conjunctiva
- Cornea
- Limbus
- Ciliary Body
- Ciliary Muscles
- Ciliary Processes
- Iris
- Pupil
- Lens

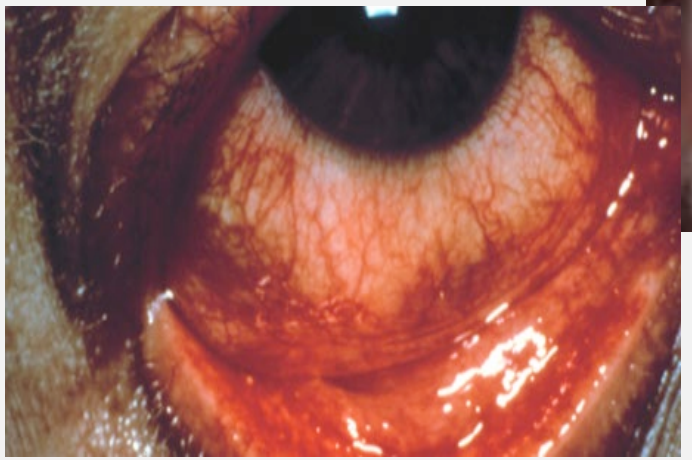
Posterior Segment

- Vitreous
- Optic Nerve
- Macula
- Retina
- Choroid

ANTERIOR SEGMENT

- **Sclera**- tough, white, fibrous outer protective layer of the eye, continuous with cornea and protective sheath covering optic nerve
  - Scleritis
  - Episcleritis
- **Conjunctiva**- loose connective tissue that lines eyelids and covers sclera, stabilizes tear film
  - Allergic/Bacterial/Viral Conjunctivitis
  - Conjunctival Laceration
  - Pinguecula
  - Pterygium
  - Subconjunctival Hemorrhage





COMMON EYE DISORDERS

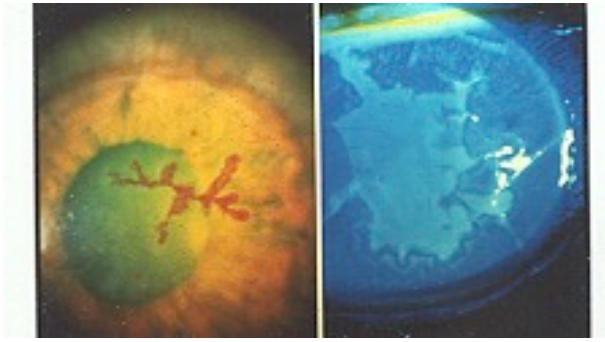
- **Subconjunctival Hemorrhage**- tiny blood vessels between sclera and conjunctiva rupture
  - May occur spontaneously, coughing, vomiting, sneezing, trauma
  - Looks worse than it is
- **Pinguecula**- thickening of connective tissue on sides of cornea
  - Benign, yellowish cast to sides of eye
- **Ptygerium**- abnormal growth of tissue that grows on cornea
  - may cause irritation or changes in vision

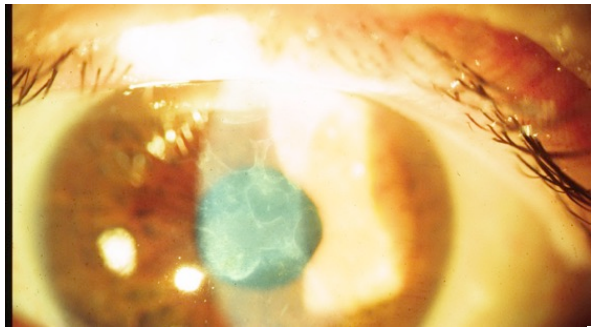
ANTERIOR SEGMENT

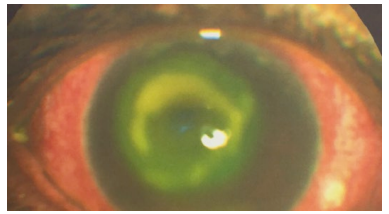
Cornea- front transparent part of outer protective layer of eye, bulging curvature is major refraction of the eye

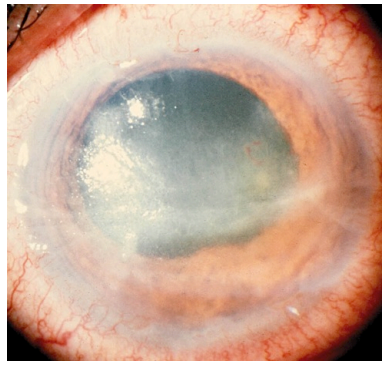
- Corneal Dystrophies
- Fuch's Dystrophy
- Keratic Precipitates
- Corneal Ulcer
- Corneal Abrasion
- Recurrent Corneal Erosion
- Foreign Body
- Herpetic Keratitis
- Keratoconus
- Bullous Keratopathy

Limbus- border of cornea and sclera



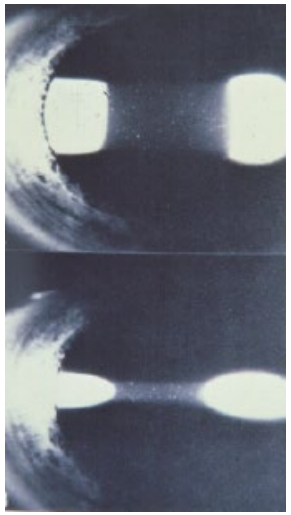


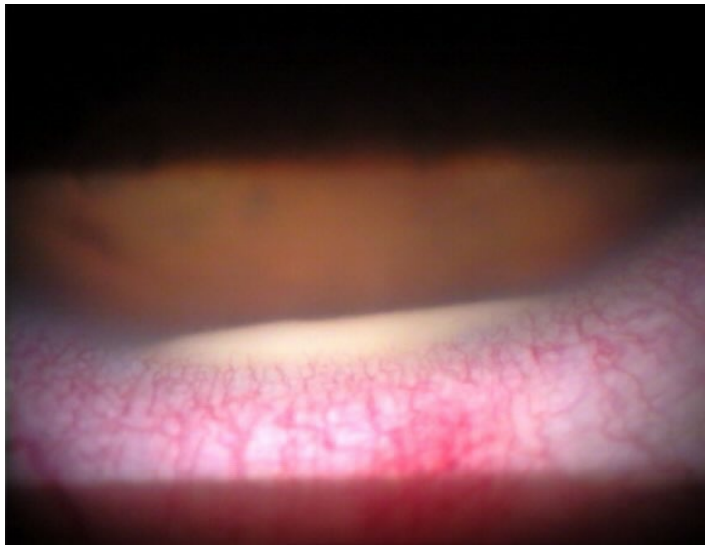




COMMON EYE DISORDERS

- **Keratoconus-** thinning of cornea, which causes it to bulge forward
  - Leads to vision changes
  - Treatment includes glasses, contact lenses, crosslinking, corneal transplant





ANTERIOR SEGMENT

Anterior Chamber- fluid filled space between iris and corneal endothelium, filled with aqueous (nourishes eye and gives eye its shape)

- Iritis/uveitis
- Hyphema
- Hypopyon

Schlemm's Canal- circular lymphatic-like vessel that collects aqueous from anterior chamber and delivers it into episcleral blood vessels

ANTERIOR SEGMENT

- **Pupil**- round hole in center of iris through which light passes
  - Anisocoria
  - Neurological Conditions
  - Correctopia
- **Iris**- colored portion of the eye that surrounds pupil, responsible for controlling amount of light entering the eye
  - Iris Nevus
  - Posterior Synechiae

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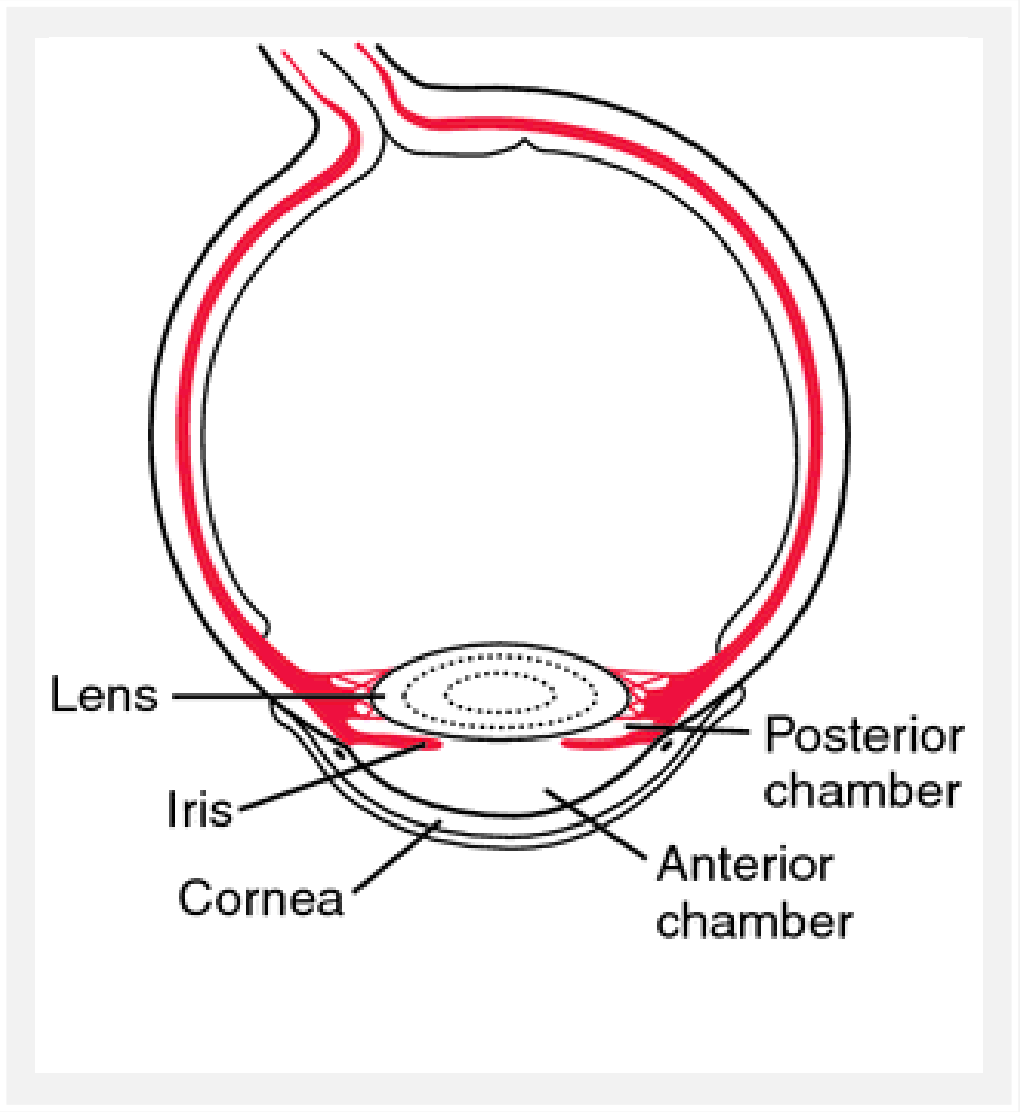
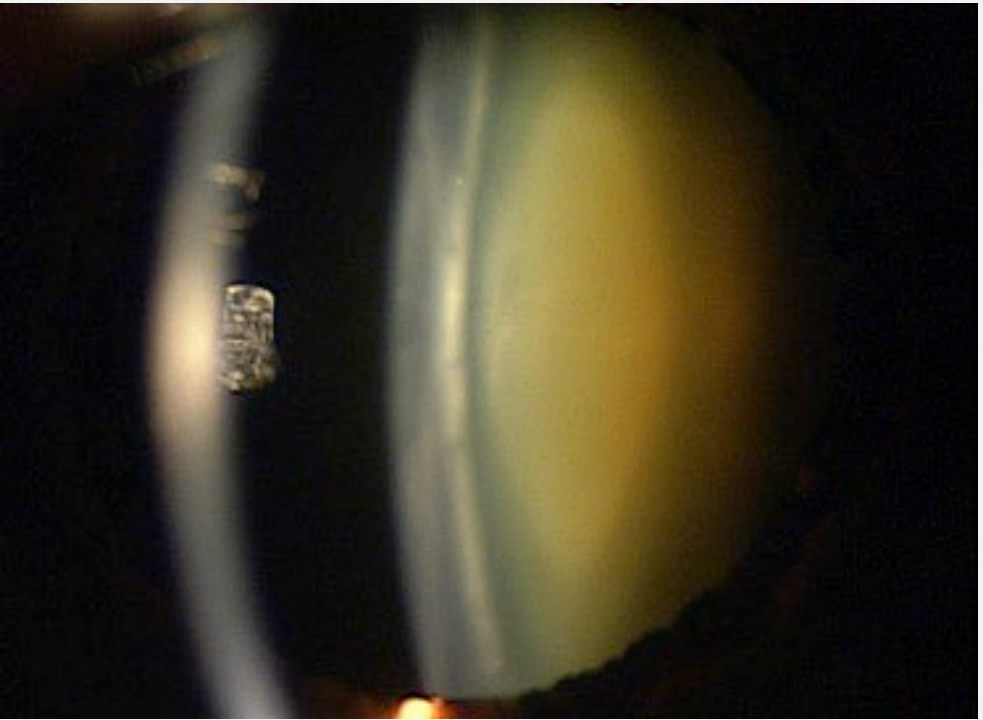


ANTERIOR SEGMENT

Posterior Chamber- narrow space behind peripheral part of iris and in front of suspensory ligament of lens and ciliary processes.

- Space between posterior iris and anterior to lens

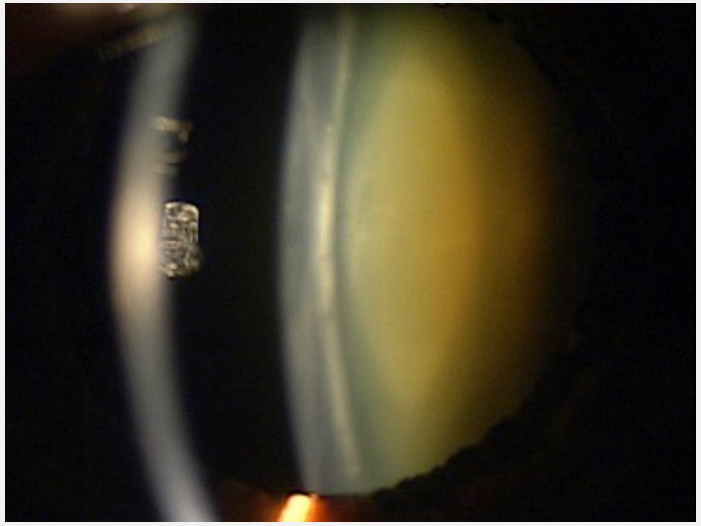


ANTERIOR SEGMENT

- **Ciliary Body:** part of uvea that delivers oxygen and nutrients to eye tissues
  - **Ciliary Muscles-** smooth muscle fibers that change shape of lens to achieve accommodation
  - **Ciliary Processes-** 80 projections on posterior surface of iris that forms frill around lens, secrete nutrient fluids to nourish structures
- **Lens**- resilient, transparent structure in the eye that focuses light by changes of curvature of its front surface
  - Cataract
- **Suspensory Ligaments**- long, thin fibers which connect lens to ring of ciliary muscles

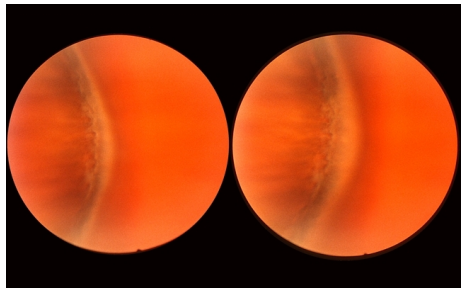
COMMON EYE DISORDERS

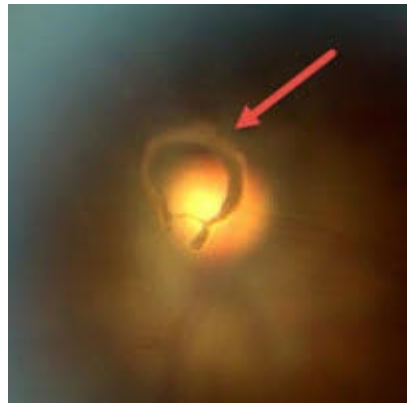
- **Aphakia**- absence of natural lens
  - Strong spectacles needed
  - *Pseudophakia*- presence of intraocular lens after cataract extraction
- **Cataract**- hardening and discoloration of the lens, cloudy or opaque area
  - Nuclear sclerosis
  - Cortical
  - Posterior subcapsular

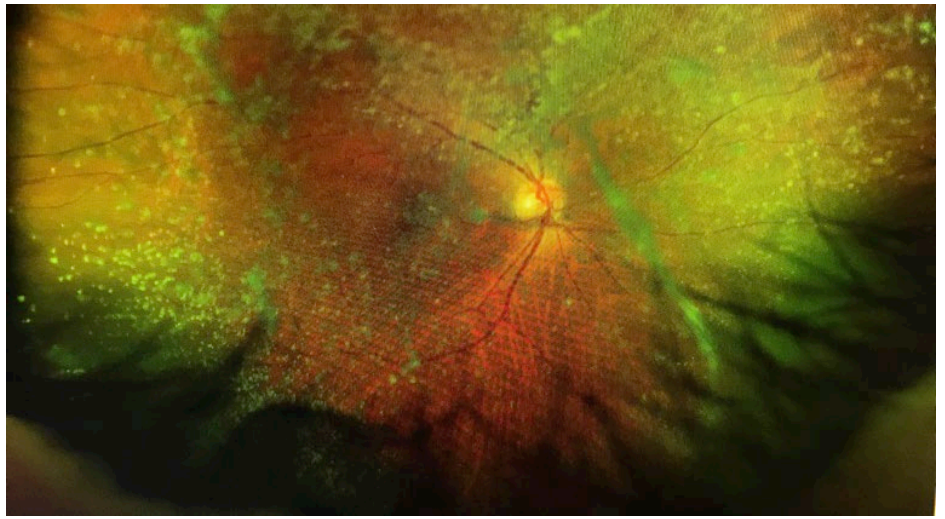


POSTERIOR SEGMENT

- **Ora Serrata**- serrated junction between retina and ciliary body
  - Transition from non-photosensitive area of retina to the complex, multi-layered photosensitive region
- **Vitreous Chamber**- space occupied by vitreous
  - Posterior vitreous detachment
  - Shaffer's Sign
  - Vitritis
  - Asteroid Hyalosis
- **Hyaloid Canal-** small transparent canal running through vitreous from optic nerve to lens

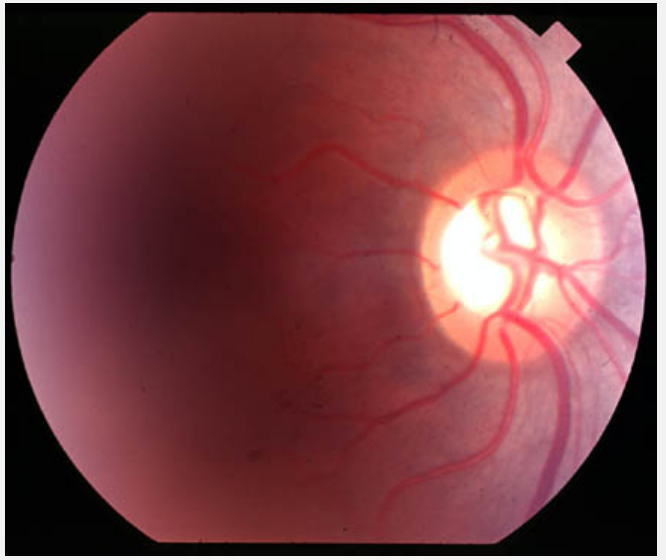


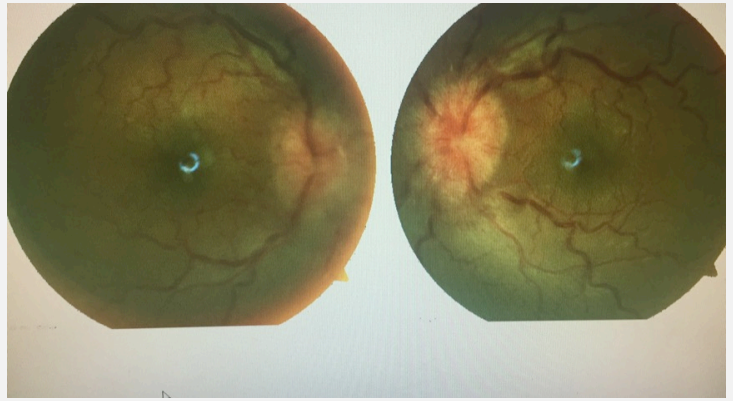




POSTERIOR SEGMENT

- **Optic Nerve (CNII)**- bundle of fibers that carries vision-related impulses from retina to brain
  - Glaucoma
  - Optic neuritis
  - Ischemic optic neuropathy
- **Optic Disc Area (Blind Spot)**- point of exit for ganglion cell axons leaving the eye, no rods or cones overlying optic disc



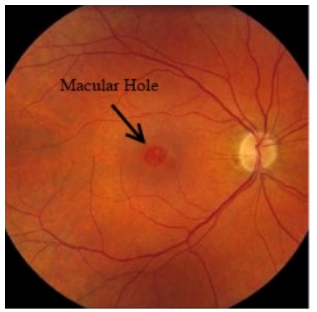


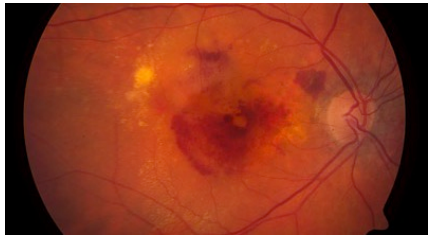
COMMON EYE DISORDERS

- **Glaucoma**- condition of optic nerve usually associated with increased ocular pressure
  - Different types including narrow angle and open angle
  - Signs of angle closure- pain, redness, blurry vision, nausea, vomiting

POSTERIOR SEGMENT

- **Fovea Centralis**- small, thinned out area of retina consists mostly of receptor cells, which provides visual acuity
  - Macular degeneration
  - Retinal dystrophies
  - Macular holes
  - Macular edema
- R**ods-** photoreceptors that provide black/white vision, most sensitive to night vision, motion detection, and peripheral vision, ~120 million
- **Cones**- photoreceptors that provide color vision and clear central vision, ~6-7 million



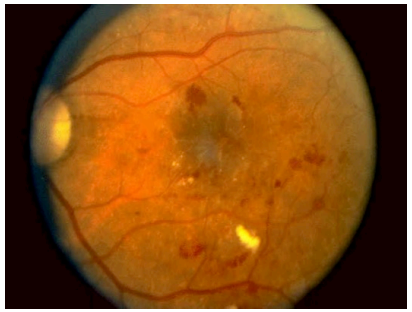


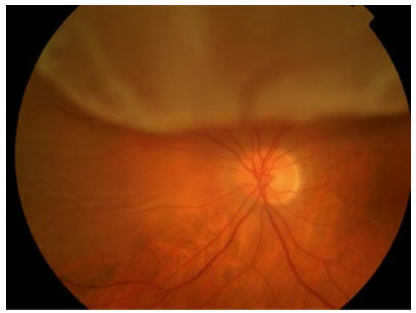
COMMON EYE DISORDERS

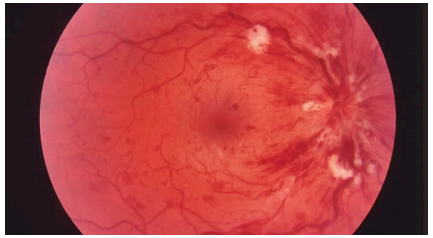
- **Macular Degeneration-** breakdown of macula
  - May lead to permanent loss of vision
  - Largest source of irreversible blindness

POSTERIOR SEGMENT

- **Retina-** inner lining of back chamber of eye that contains layers of nerve cells giving eye its sensitivity to light
  - Artery/Vein Occlusion
  - Diabetic/Hypertensive Retinopathy
  - Toxoplasmosis
  - Retinal Detachment
  - Retinitis Pigmentosa
- **Central Retinal Blood Vessels-** run through optic nerve, drains blood from retinal capillaries into superior ophthalmic vein or into cavernous sinus





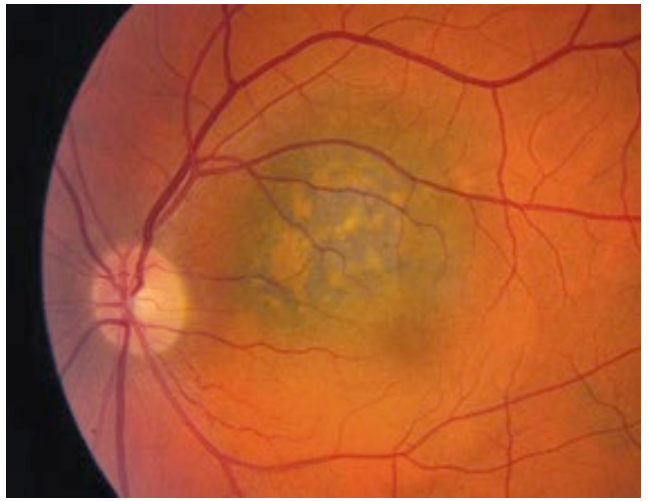


COMMON EYE DISORDERS

- **Diabetic Retinopathy-** due to poor blood circulation that occurs with diabetes
  - Possible new blood vessel growth that may leak or break
  - Can lead to scarring, hemorrhages, or retinal detachment
  - Leading cause for blindness
- **Flashes and Floaters-**
  - Flashes- mechanical stimulation of nerves in retina or tugging on the retina
  - Floaters- debris in the vitreous
- **Retinal Detachment-**
  - Retina pulls away from rest of the eye
  - May lead to permanent vision loss

POSTERIOR SEGMENT

- **Choroid**- layer between retina and sclera, consists primarily of blood vessels that provide nourishment to the retina
  - Choroidal nevus
  - Choroidal melanoma



REFRACTIVE STATUSES OF THE EYE

How light rays enter the eye are focused

Light travels through space in straight lines and as light rays are emitted from source, they converge or diverge

Further away light source = more parallel light rays become and the less eye has to accommodate

Cornea→Lens→ Retina

Accommodation- eye's ability to focus objects from distance to near by changing convexity of lens

REFRACTIVE STATUSES OF THE EYE

- Emmetropia- image will focus on retina when accommodation relaxed
  - No lenses needed
- Hyperopia ("Farsightedness)- image focused behind retina, cornea too flat or eyes too short
  - (+) lenses
- Myopia ("Nearsightedness)- image focused in front of retina, eyes too long
  - (-) lenses
- Presbyopia- loss of ability to see at near due to lens losing ability to accommodate
  - Usually beings in early 40s and requires readers
- Astigmatism- image focused at multiple points, cornea longer in one meridian than another
  - "football-shaped" cornea
  - Different power of lens to correct each meridian

PHARMACOLOGY

ANESTHETICS

- Abolishes corneal sensation
- Used for surgery, remove foreign bodies, and performing gonioscopy
- Examples: **Proparacaine**, **Tetracaine**, Cocaine, Benoxinate Hydrochloride, Butacaine
- More inflammation- more drops
- Side effects: corneal irregularities, restlessness, delirium, irregular respiration, convulsions, cardiovascular disorders

AUTONOMIC DRUGS

- Autonomic nervous system affected by emotional behavior
  - Sympathetic- "fight or flight" response
  - Parasympathetic- "rest and digest" response
- Divided into mydriatic, cycloplegic, and mitotic agents

	Structure	Action	Examples	Adverse Effects
Mydriatic	iris musculature	Dilates pupil, differentiates preganglionic from postganglionic lesions in Horner's Syndrome	**Phenylephrine**, Hydroxyamphetamine, Cocaine, Epinephrine	Cardiac arrest, tachycardia, reflex bradycardia
Cycloplegic	Iris musculature, ciliary body, paralyzes fine muscles	Dilates pupil, paralyzes accommodation, treatment of iritis to relieve ciliary muscle spasm, prevents posterior synechiae	**Atropine**, Homatropine, Scopolamine, **Cyclopentolate**, **Tropicamide**	Rapid pulse, fever, flushing, dry mouth, rash, conjunctival injection
Miotic	Stimulate iris sphincter muscle	Constricts pupil, improve aqueous outflow, withdraws congestion of iris tissue, reduces accommodative effect	**Pilocarpine**	Ciliary spasm, headache, decreased vision

PROPER MANAGEMENT OF SIDE EFFECTS

- Fainting- place head between knees, lean patient back in chair, loosen tight collar, remain in office for 20-30 minutes following
- Central nervous system stimulation (tremors or convulsions)- may be given Valium by physician, remove patient from dangerous environment
- Respiratory Emergency- know where Automated External Defibrillator and how to perform CPR
- Allergic Reaction- may need epinephrine, oxygen, corticosteroids

CORTICOSTEROIDS

- Hormones derived from adrenal gland or synthetically produced reduce inflammation and exudative reaction of diseased tissue
- Reduce swelling, redness, cellular reaction, and scarring
- Important to know medical history (cautious in diabetics, hypertensives)
- Ocular conditions: blepharitis, contact dermatitis, conjunctivitis, acne rosacea, interstitial keratitis, chemical burns, marginal corneal ulcers, iritis, Herpes Zoster, scleritis, episcleritis, temporal arteritis
- Examples: Prednisolone, Dexamethasone, Kenalog, Ozurdex, Difluprednate, Loteprednol
- Side effects: delayed healing, proliferation of virus, cataracts, increased IOP, overgrowth of fungi

NONSTEROIDAL ANTI-INFLAMMATORIES

- Blocks prostaglandin synthesis
- Treats inflammation, prevents intraoperative miosis, treats and prevents cystoid macular edema, reduces pain
- Decreases ocular symptoms of allergy
- Examples: Bromfenac, Nepafenac, Ketorolac, Diclofenac
- Side Effects: burning, stinging, corneal toxicity

ANTIALLERGIC AGENTS

- Mast Cell Stabilizers:
  - Reduces itching, redness, and swelling
  - Degranulate mast cells
  - Examples: cromolyn sodium, lodoxamide tromethamine, olopatadine, hydrochloride

- Antihistamines:
  - Block histamine receptors
  - Examples: levocabastine, olopatadine
- Antihistamine/Mast Cell Stabilizers:
  - Examples: ketotifen, epinastine, nedocromil, olopatadine

ANTIBIOTICS

- Use for blepharitis, conjunctivitis, corneal ulcers, keratitis, meibomitis, dacryocystitis, endophthalmitis
- *Bacteriostatic*- inhibits bacterial growth
  - Examples: tetracycline, chloramphenicol, erythromycin, sulfonamides, amphotericin B
- *Bactericidal*- kill bacteria
  - Examples: streptomycin, polymyxin B, penicillin, bacitracin, neomycin, vancomycin, ampicillin, tobramycin, gentamicin, ofloxacin, ciprofloxacin

ANTIBIOTICS

- Fluoroquinolone examples: moxifloxacin, levofloxacin, ofloxacin, gatifloxacin
  - Affect both gram positive and gram negative bacteria
  - Reduce bacterial resistance
- Continuous use of antibiotics may lead to resistant strains of bacteria
- Systemic antibiotics are necessary for deeper structures of eye
  - Endophthalmitis, cellulitis, chorioretinitis
  - Side effects: muscular weakness, bone marrow depression, aplastic anemia, skin rashes

ANTIVIRALS

- Interfere with DNA synthesis of virus to produce a virus that cannot function as an infective agent
- Used for herpes simplex and herpes zoster
- Examples: acyclovir, valacyclovir, ganciclovir, trifluridine, famciclovir

GLAUCOMA MEDICATIONS

- Prostaglandins (teal)- increase uveoscleral outflow
  - Examples: latanoprost, latanoprostene bunod, bimatoprost, travoprost, tafluprost
- Beta Blockers (yellow)- decrease aqueous production
  - Examples: Timolol, Betimol
- Alpha Agonists (purple)-decrease aqueous production and increase uveoscleral outflow
  - Examples- brimonidine, apraclonidine
- Carbonic Anhydrase Inhibitors (orange)- decrease aqueous production
  - Examples: dorzolamide, brinzolamide, acetazolamide, methazolamide
- Rho kinase inhibitors (white)-increase outflow through trabecular meshwork
  - Examples- netarsudil
- Mitotic Agents (green)- increases outflow through trabecular meshwork by causing tension on scleral spur
  - Examples: Pilocarpine
- Combination Agents (blue)
  - Examples: Cosopt (dorzolamide-timolol), Combigan

CONTACT LENS SOLUTIONS

- Consider safety, efficacy, and cost
- Most contain 95% water
- Formation depends on preservatives, wetting agents, buffers, surfactants, cleaners, and disinfectants
- Must cover disinfection but *not* sterilization
  - Disinfection- destruction of all vegetative bacterial cells but does not include spores
  - Sterilization- complete destruction of all forms of microbial activity
- Can cause toxicity or hypersensitivity such as redness, punctate keratitis, and infiltrates

STAINS

Fluorescein

- Shows defects or abrasions in corneal epithelium
- Best seen with ultraviolet or cobalt blue light
- *Pseudomonas* flourish in fluorescein
- Paper strips or in Fluress

Rose Bengal

- Affinity for degenerating epithelium
- Stain areas of sloughed off epithelium
- Stains damaged or unprotected cells
- Paper strips

HOW TO WRITE A PRESCRIPTION

- Patient's Name
- Name of the Drug and Percentage of Concentration or Dosage of Each Unit
- Amount of Drug to be Supplied
- "Sig"- directions
- Signature of physician with "dispense as written" or "substitution permitted"
- Number of Refills

CLINICAL PRINCIPLES AND PROCEDURES

PREPARE PATIENTS CHART FOR WORKUP

- Confirm patient's identity
- Obtain identification
- Obtain insurance card
- HIPAA form
- COVID screening

RECORDING CASE HISTORY

Chief Complaint

FOLDAR

Frequency- How Often Does it Happen?

Onset- When Did It Start?

Location- Where is it happening/which eye?

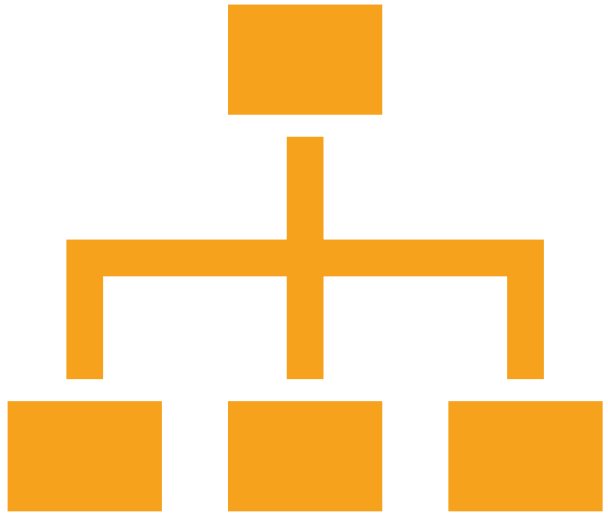
Duration- When it happens, how long does it last?

Associations- What do you associate with it happening?

Remedies- What do you do to improve the symptoms?

Medical vs. Visual Compliant

Make diagnosis based on chief complaint



RECORDING CASE HISTORY

- Ocular History
- Ocular Medications
- Systemic Medications
- Allergies
- Family (Ocular & Systemic) History
- Smoking History
- Height/Weight/BMI

CLINICAL PROCEDURES

BLOOD PRESSURE MEASUREMENT

Manual vs. Automated

- Wrap cuff around upper arm (80% of circumference of upper arm)
- Lightly press stethoscope's bell over brachial artery just below cuff's edge
- Rapidly inflate cuff to 180mmHg or higher
- 1st knocking sound (Korotkoff)= systolic pressure
- When knocking sound disappears= diastolic pressure

BLOOD PRESSURE MEASUREMENT

- Normal Blood Pressure: <120 and <80
- Elevated Blood Pressure: 120-129 and <80
- Hypertension: 130-180 or 80-120
- *Hypertensive Crisis*: >180 and/or >120

VISUAL ACUITY TESTING

- Equipment: Occluder, Lamp, Projector, Near Card
- VA with correction (cc) vs. VA without correction (sc)
- Dim Lighting
- Patient holds occluder, test each eye separately, ask patient to read lowest line
- Recording examples: VAcc OD: 20/40+1; VAsc OS: CF@5ft

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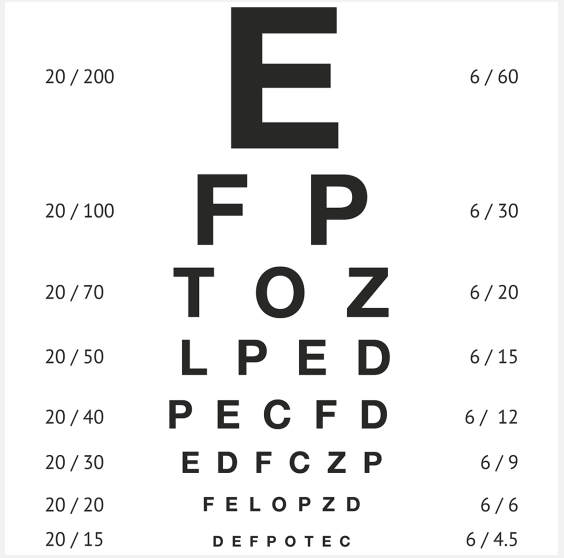
PINHOLE VISUAL ACUITY

- Determines if vision is correctable by lenses
- Increases depth of focus and decreases retinal blur
- Visual acuity will increase if patient's retina and visual pathway are free of abnormalities
- Taken when VA is worse than 20/30



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STEREOACUITY TESTING

Measures patient's fine depth perception through his ability to fuse stereoscopic targets

Equipment: polaroid glasses or red-green glasses, test booklet (Randot, Stereo Fly, etc.)

Patient wears glasses and holds stereo target @ 40 cm w/lamp directed towards target

Randot Stereotest- identify which circle appears to be floating above the page or appears closest; stop when two consecutive incorrect answers

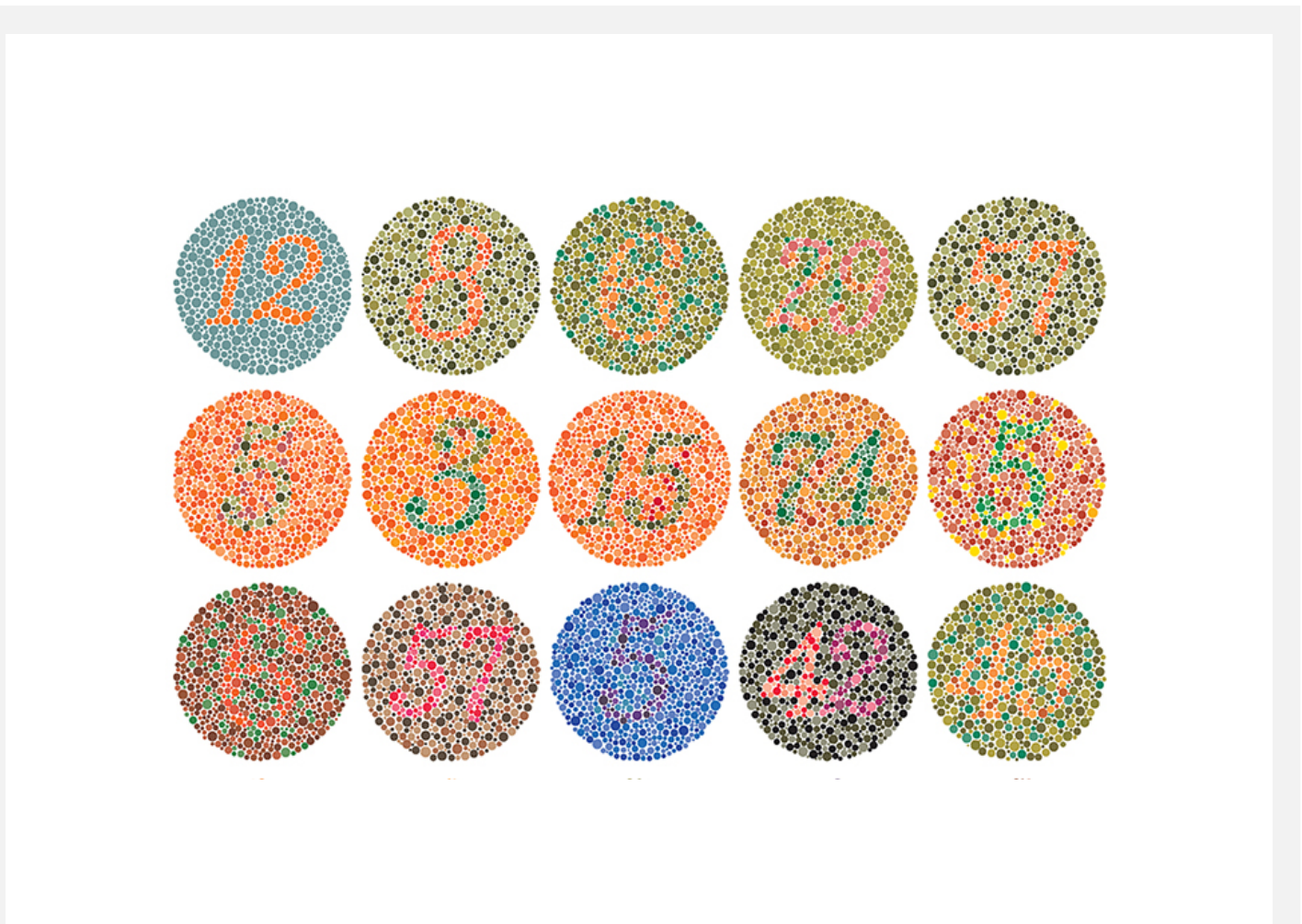
Stereo Fly- pinch wings of fly

Recording Examples: Stereo at N sc 40sec, Randot

STEREOACUITY TESTING

COLOR VISION ASSESSMENT

- Screen for acquired or hereditary color vision defects
- Equipment: occluder, lamp, test book
- Test each eye separately
- Ask patient to identify number or figure on page
- Recording: Color OD: 12/13, OS: 11/13 Ishihara



OCULAR MOTILITY TESTING- EXTRAOCULAR MOTILITIES (EOM)

- Assess patient's ability to perform conjugate eye movements
- No glasses
- Examiner holds penlight and asks patient to follow light with eyes only
- Examiner observes smoothness of movement, accuracy of following penlight, and extent of movement
- Ask if pain or diplopia
- Recording: EOM: SAFE (S- smooth, A- accurate, F- full, E- extensive)

ASSESS CONVERGENCE, SACCADES, AND PURSUITS

- Near Point of Convergence:
  - Equipment- penlight, red glass, near accommodative target, overhead lamp
  - Patient looks at light, single target first then move target closer to eyes until double or until one eye loses fixation, move target away until eye regains fixation
  - Recording Examples: NPCcc lite-TTN, NPCsc lite 10 cm/12 cm OS out, suppression
  - Expected Findings: break= 5 cm, recovery= 7 cm
- Pursuits: eye movement that allows one to follow or track a target
  - Test- follow target without moving eyes
- Saccades: quick, simultaneous movement of both eyes between two or more phases of fixation
  - Test- look back and forth between two targets

OCULAR MOTILITY TESTING

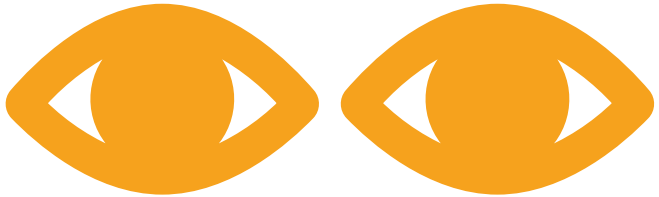
- To assess presence and magnitude of phoria or tropia
- Equipment: VA chart, near test target, occluder, prism bars
- Cover-Uncover Test:
  - Cover portion tests for phoria vs. tropia
    - If one eye moves= tropia
  - Uncover portion tests for unilateral vs. alternating tropias
- Alternating Cover Test:
  - Move occluder from one eye to other
  - Magnitude of deviation can be measured using prism bar
- Recording Examples: CT cc ortho at distance and near, CT sc 20 prism diopters RXT; 10 XP'

Direction of Eye Movement as Eye is Uncovered	Direction of Deviation	Direction of Prism Base for Neutralization
In	Exo	Base In
Out	Eso	Base Out
Up	Hypo	Base Up
Down	Hyper	Base Down

OCULAR MOTILITY TESTING

PUPILLARY RESPONSE TEST

- Assess afferent and efferent neurological pathways responsible for pupillary function
- Equipment: penlight, distant fixation target
- Observe size and speed of pupil constriction in both eyes
- *Swinging flashlight test*- move light between eyes rapidly, if either or both pupils fail to respond directly or consensually then investigate deeper
  - Pupil escape= (+) RAPD (P= positive R= relative A= afferent P= pupillary D= defect)
  - PERRL, (P= pupils, E= equal, R= round, R= responsive, to L= light)
- Recording Examples: PERRL, (+) RAPD OS

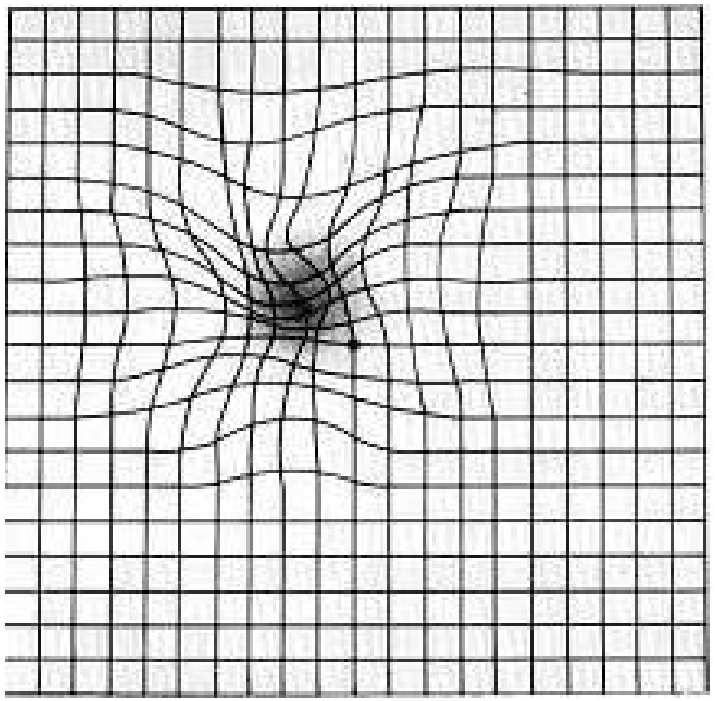


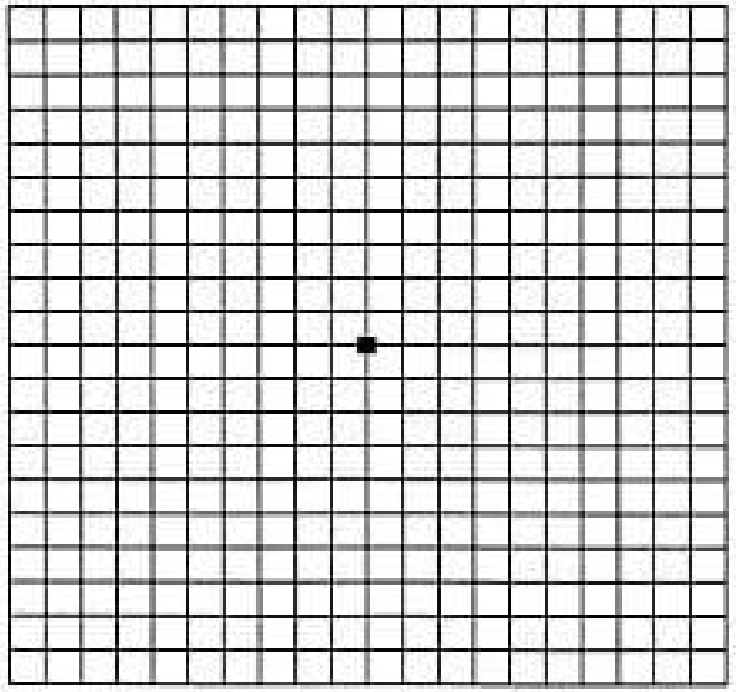
CONFRONTATION VISUAL FIELD SCREENING

- Screen for unnoted visual field defects (Finger Counting Fields)
- Equipment: lamp, occluder
- No glasses, bright light between patient & examiner
- Each eye tested separately, hold finger in front of eye tested about 40 to 60cm
- Expose one, two, or four fingers that you can easily see as well
- Recording Examples: FCF: OD: Full, OS: Full; FCF: OD: Full, OS: restricted temporally

AMSLER GRID TESTING

- Assess integrity of visual field corresponding to macular region of retina
- Performed when macular disease is possible diagnosis
- Near vision correction worn & ask patient to look at grid at 30 cm
- Patient to answer following questions: "Can you see all four corners?, Any of the lines missing or wavy?, Are any of the little squares missing or larger/smaller?" while staring at black dot in center
- Recording Examples: OD: WNL, OS: WNL; OD: WNL, OS: upper left corner not seen, (+) metamorphopsia in lower right quadrant



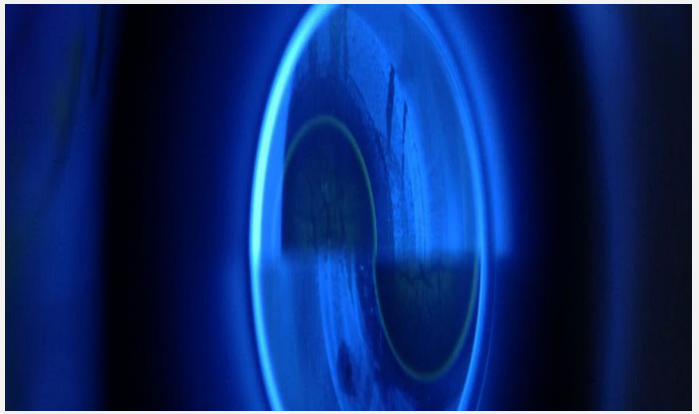


AMSLER GRID TESTING

TONOMETRY (CONTACT OR NON-CONTACT)

Contact

- Goldmann Applanation Tonometry
  - Instill anesthetic
  - Move tonometer towards cornea & then move joystick forward until prism comes in contact with cornea
  - Limbus will glow, center prism & should see set of semi-circle mires (make sure to center)
  - Align mires by turning dials so that they are properly aligned



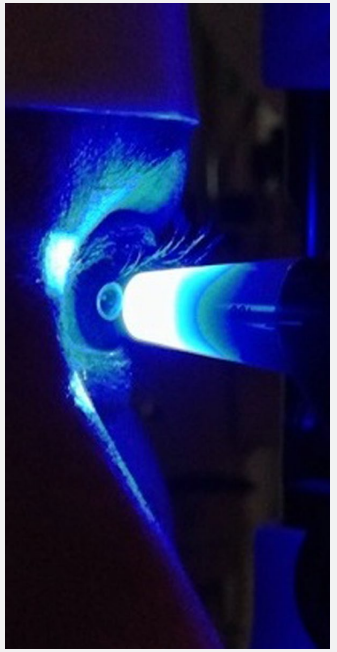
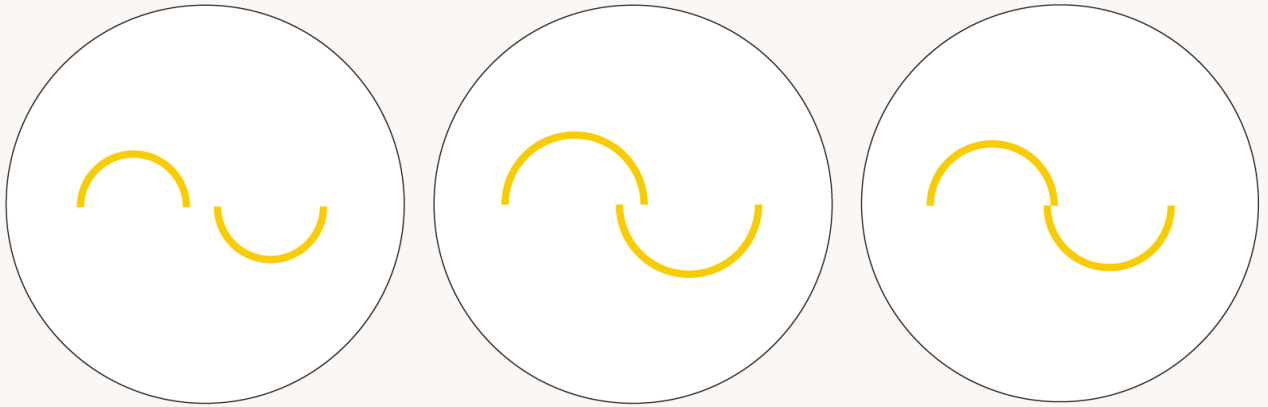


Figure 1. Applanation tonometry semi-circles viewed through the Goldmann prism



ICEH

High intraocular pressure will result in this image. Turn the calibrated dial on the tonometer backwards to reach the accurate end point.

Low intraocular pressure will result in this image. Turn the calibrated dial on the tonometer forwards to reach the accurate end point.

This is the correct end point – the inner edges of the semi-circles are just touching. This will give an accurate reading of intraocular pressure.

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TONOMETRY (CONTACT OR NON-CONTACT)

Non-Contact

- iCare
- Tonopen
- Non-contact Tonometer

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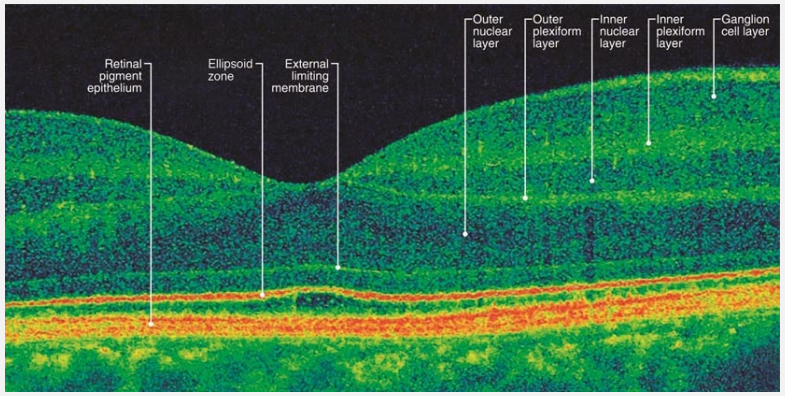
TESTS TO EVALUATE RETINAL AND OPTIC NERVE DISEASES AND DISORDERS

Optical Coherence Tomography (OCT)- uses light waves to obtain cross sections of the retina

- Able to see all layers of retina
- Used frequently for glaucoma, macular degeneration, diabetic retinopathy and macular edema



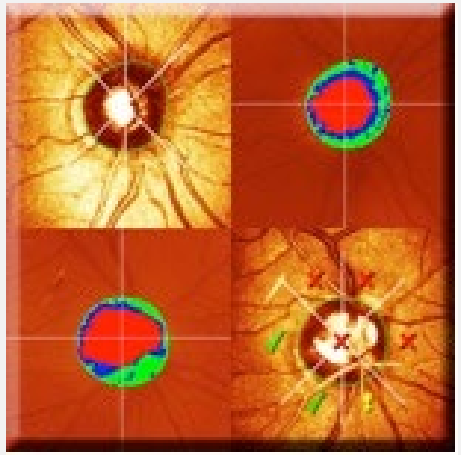
Fundus Photography- takes pictures of retina

- Optos
- Fundus Camera
- Wide field imaging

TESTS TO EVALUATE RETINAL AND OPTIC NERVE DISEASES AND DISORDERS

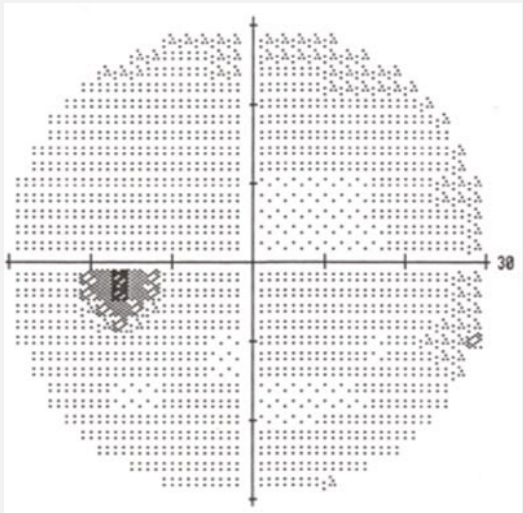
Heidelberg Retinal Tomography (HRT)- observation and documentation of optic nerve

- With a laser, takes images of deeper layers
- Helpful in managing glaucoma



Visual Field Testing- determine blind spots in vision

- Helps diagnose different conditions such as glaucoma, optic neuritis, tumors/lesions, stroke



TESTS TO EVALUATE RETINAL AND OPTIC NERVE DISEASES AND DISORDERS

- Diopsys- visual electrophysiology
  - Measures electrical response of light-sensitive cells in retina known as rods and cones
  - Helps diagnose both rare and common retinal conditions
- Macular Pigment Optical Density (MPOD) Testing- measures macular pigment known as lutein and zeaxanthin
  - More lutein and zeaxanthin= more blockage of wavelengths from sunlight and blue lights

SLIT LAMP EXAMINATION

Evaluates health of anterior segment of eye

Used in conjunction with lenses to view anterior chamber angle and ocular fundus

Used in evaluation of contact lenses on the eye

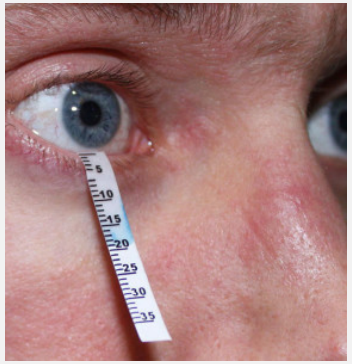
Used for Goldmann Applanation Tonometry

DRY EYE TESTING

- SPEED Questionnaire- evaluates frequency and severity of dry eye symptoms


SPEED™ QUESTIONNAIRE

- Schrimer's Test- evaluates integrity of lacrimal secretion system
  - Measures amount of total secretion within 5 minutes
    - <5mm in 5 minutes= lacrimal insufficiency
    - >25mm in 5 minutes= excessive reflex tearing



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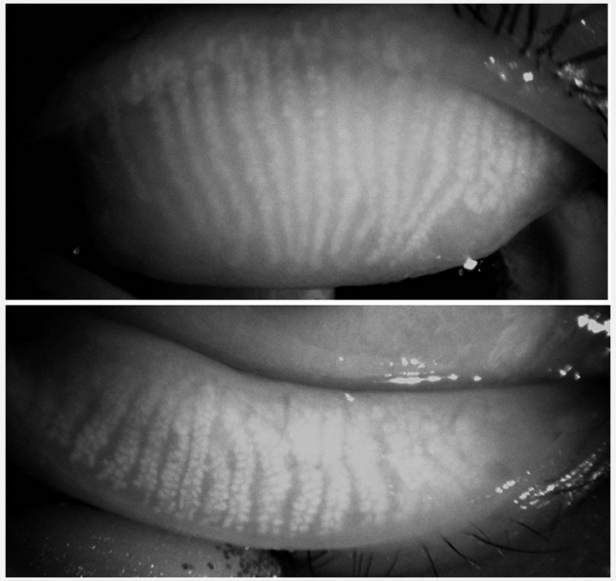
DRY EYE TESTING

Tear Break-Up Time (TBUT)- measures stability of tear film

- Place fluorescein on eye
- Patient blinks several times and then holds eyes open
- Count seconds until there are dark spots/streaks on cornea= dry spots
- <10 seconds= unstable tear film

Tear Osmolarity- objective & quantitative test that assesses tear film

- Measures particles in solution
  - >308= hyperosmolarity
    - More salt than water in tears



DRY EYE TESTING

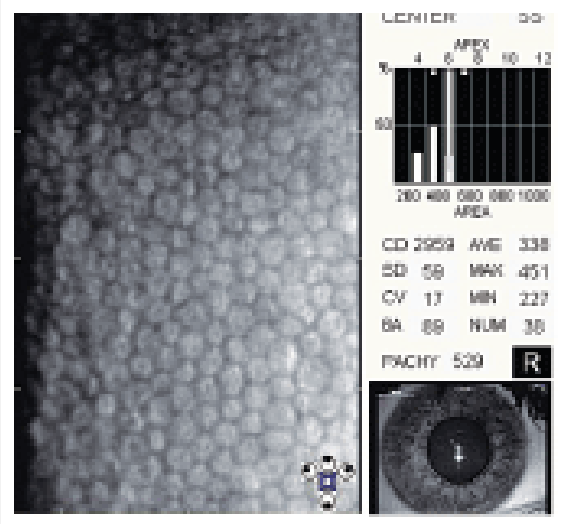
Meibography- images meibomian glands

- Responsible for oil portion of tear film
- Dysfunction of meibomian glands leads to dry eyes

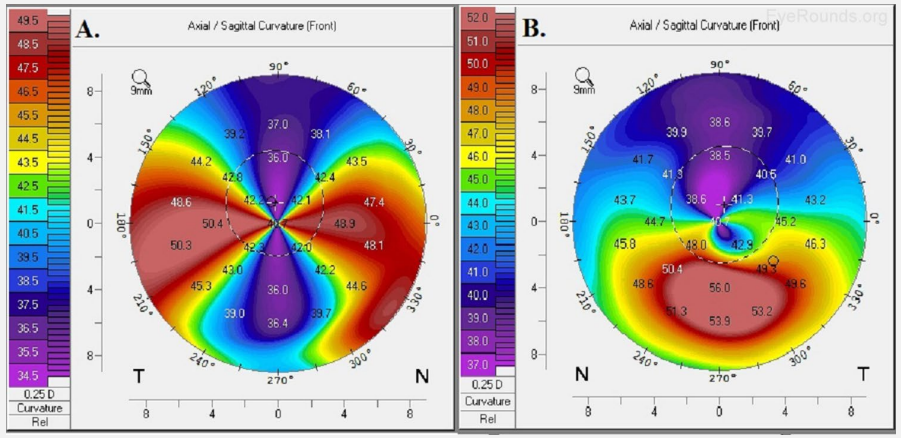
Lipiflow, iLux, TearCare

TESTS TO EVALUATE CORNEA

- Specular Microscopy- evaluates corneal endothelium
  - Helps diagnose endothelial disorders/infections
  - Counts number of cells and cell density



- Corneal Topography- imaging technology that maps surface curvature of cornea
- Keratometry- assesses curvature, power, and toricity of cornea
  - May also be used to assess integrity of corneal/tear surface

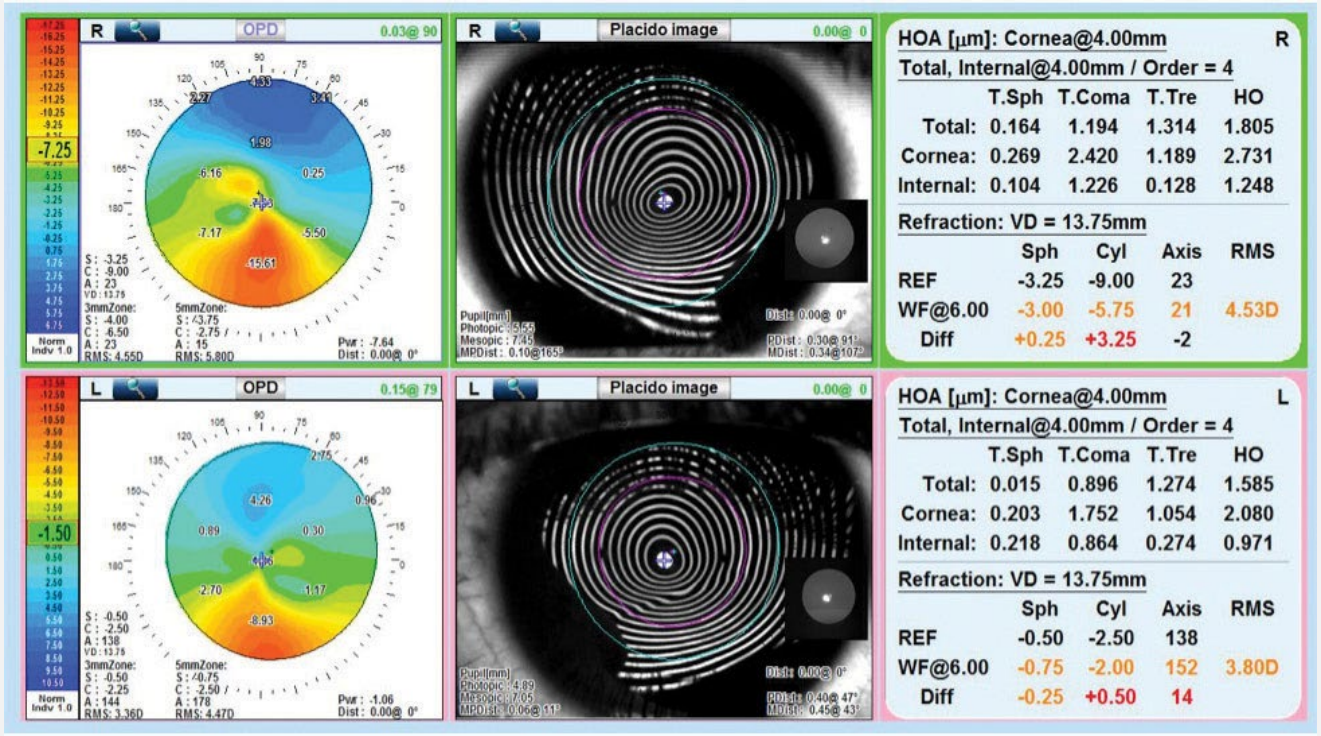


TESTS TO EVALUATE CORNEA

- Pachymetry- measures thickness of cornea
  - Used for glaucoma, refractive procedures, and corneal conditions
  - Average corneal thickness= 555 microns

ABERROMETRY

- Measures the way a wavefront of light passes through cornea and lens
  - Analyzed three different ways: outgoing wavefront aberrometers, ingoing retinal imaging aberrometers, and ingoing feedback aberrometers
  - Helps diagnose refractive error, distorted images, blurring, ghosting, starburst, poor night vision



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RETINOSCOPY

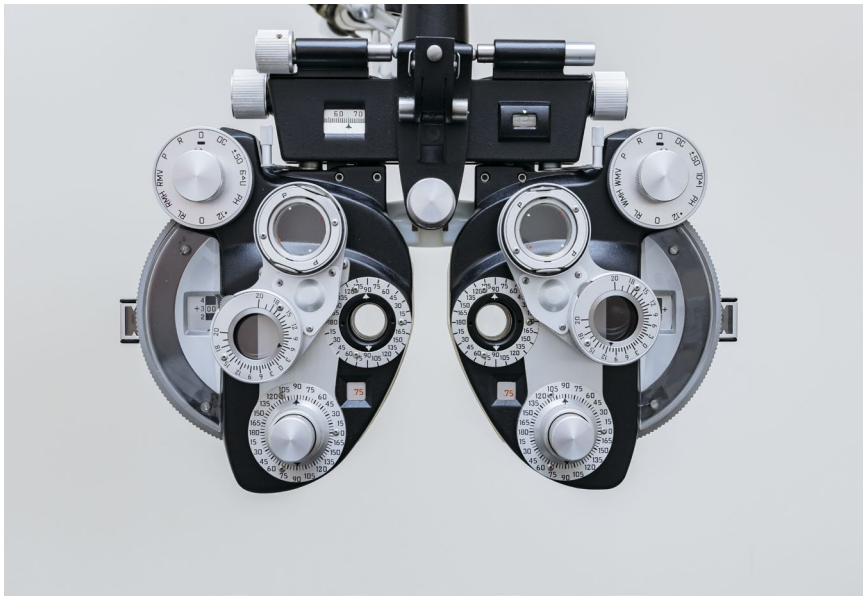
- Objective measure of refractive power of the eye
  - Use a hand-held instrument
  - Examiner shines light into eye and observes reflex seen
  - By analyzing reflex, examiner will neutralize prescription
  - “with”= (+) lens, “against”= (-) lens

REFRACTION

Autorefraction- obtains a starting point for a patient's prescription

Lensometry- measures the prescription of a patient's glasses

Manual- performed with phoropter



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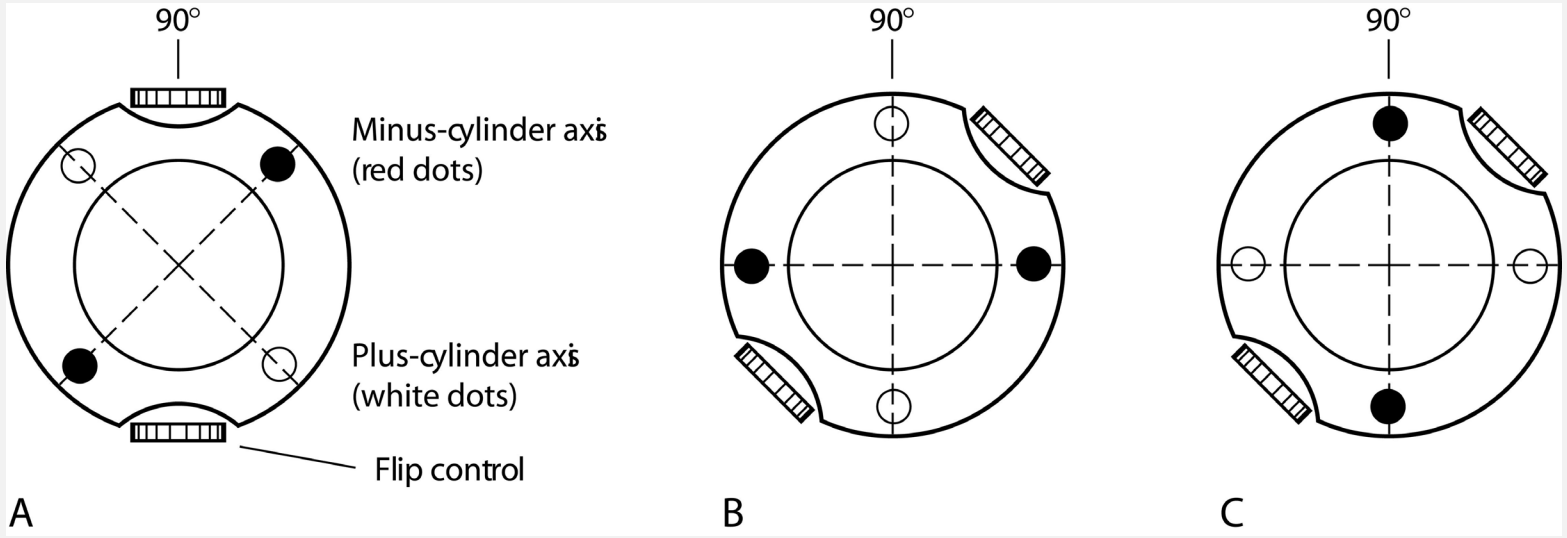


REFRACTION

- Use starting point (retinoscopy, autorefraction, patient's last Rx/glasses)
- Find working sphere
- Refine cylinder- JCC axis check, JCC power check
- Refine the sphere- fog patient to 20/40 to 20/60

CONTRAST SENSITIVITY TESTS

- Measures ability to distinguish between different increments of light (i.e. light vs. dark)
- Pelli—Robson Test- consists of letters that gradually become less contrasted

LOW VISION TESTS

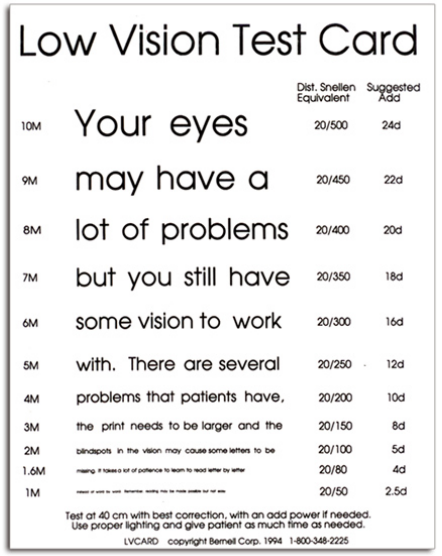
Focus on patient's visual difficulties

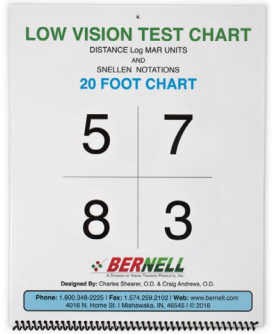
Lighthouse Near Visual Acuity

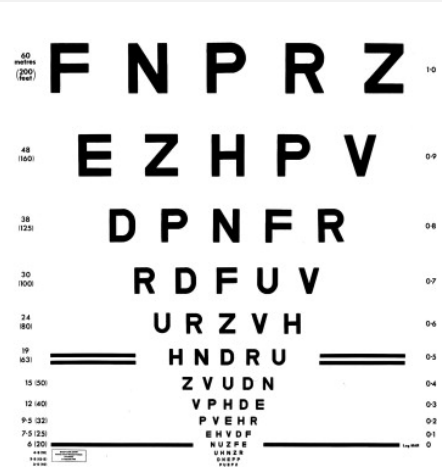
Bailey-Lovie Acuity Chart

Bernell Chart

Magnifiers







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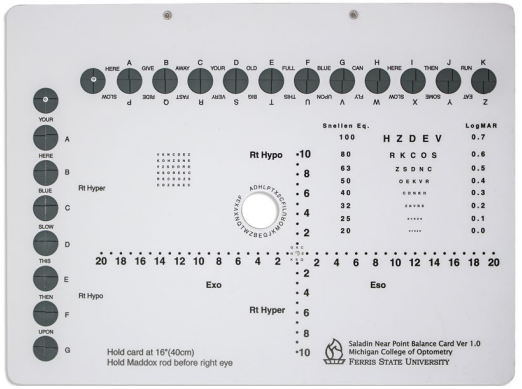
SPORTS VISION TESTS

- Visual Acuity (Snellen Eye Chart)
- Contrast Sensitivity Tests
- Eye Tracking Devices
- Ocular Alignment Tests
- Eye Dominance Test
- Depth Perception Measurements
  - Howard-Dolman Apparatus- measures amount of error at any distance by judging distance of two rods
- Visual Processing Speed and Hand-Eye Coordination
- Eye Teaming Tests
  - Saladin Near Point Balance Card- measures nearpoint, vergences, accommodation, and cyclophoria



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VISION THERAPY TESTS

- Visual Acuity
- Stereopsis
- Ocular Motilities- Pursuits, Saccades, and Cover Test
- Visual Field
- Accommodative Tests
- Visual Perception- Motor Free Visual Perception Test includes spatial relationships, visual discrimination, figure-ground, visual closure, visual memory
- Visual Processing – usually diagnosed when a child is learning, may be acquired from brain injury
  - Concerns about ability to learn from visually-presented information

CHAIR-SIDE SCRIBING

- Observe patient
- Updating patient's medical record
- Writing down results of tests
- Helping identify correct diagnosis and treatment/plan

TRAUMATIC BRAIN INJURY TESTS

- Visual Acuity
- Pupils
- Ocular Motilities
- Binocular Testing- convergence, accommodation, cover test
- Visual Field
- Visual Processing
- Many require Vision Therapy

CLINICAL PRINCIPLES AND PROCEDURES

- Administer, Record, and Transmit Prescribed Medications
  - E-Prescribe- allows doctor to communicate directly with a patient's pharmacy
  - Brand vs. generic, amount, sig, refills
- Eyeglass and Contact Lens Prescriptions
  - Expiration date
  - Specification of eye
  - Brand/diameter/base curve for contact lenses
- Maintain Inventory of Diagnostic/Therapeutic Medications
  - Anesthetics, dilation drops, glaucoma medications, oral carbonic anhydrase inhibitors, fluorescein strips, rose bengal strips

CLINICAL PRINCIPLES AND PROCEDURES

Provide patient education for relevant concern, diagnosis, or surgery

- Answering questions
- Identifying reason for exam
- Educational material

Assist with Surgical Procedures

- Safety procedures
- Patient education
- Patient preparation

CLINICAL PRINCIPLES AND PROCEDURES

- Maintain ophthalmic equipment
  - Clean and calibrate equipment
  - Sterilize instruments and tools
  - Perform aseptic procedures
    - Prevent contamination from pathogens

OPHTHALMIC OPTICS AND DISPENSING

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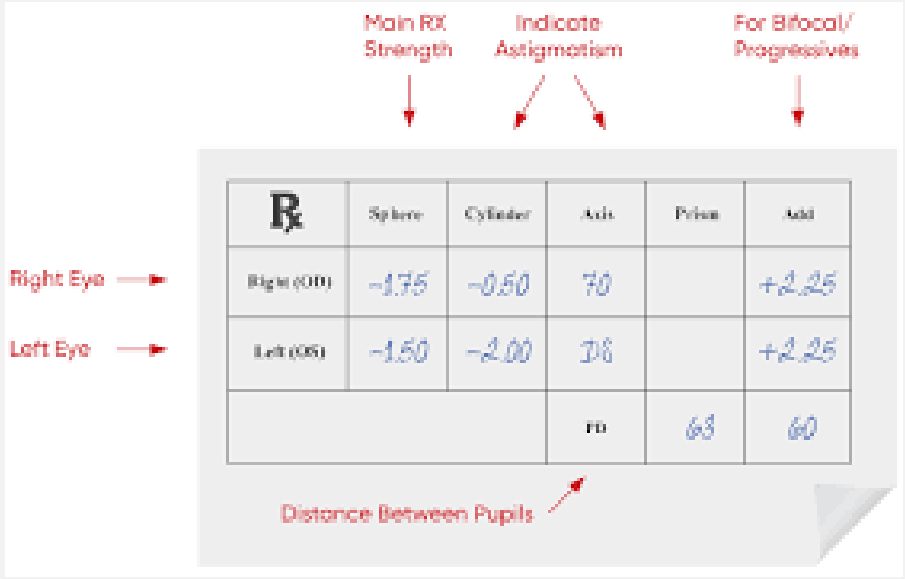

OPHTHALMIC OPTICS AND DISPENSING

Meet with sales representative

Order eyewear

Understand components of eyeglass and contact lens prescription

- Glasses: Single Vision, Bifocal, Progressive, Trifocal
- Contact Lenses: Base Curve, Diameter, Length of Wear

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OPHTHALMIC PRESCRIPTION

- Light travels at 186,000 miles/second in air
  - Fastest in air vs. glass/water/etc.
- When light enters medium such as glass or water at any other angle than 90 degrees, light is refracted or bent
  - Amount on ophthalmic lens refract or bend light can determine its power
- **Diopter (D)-** unit of measure for lens
  - One diopter lens will focus light at one meter
  - Two diopter lens will focus at ½ meter

OPHTHALMIC PRESCRIPTION

- Plus (Convex) Lenses- thick in center and thin on edge, magnified objects
  - Light passing through these lenses will converge
  - Corrects hyperopia and presbyopia
- Minus (Concave) Lenses- thin in center and thick on edge, minimize objects
  - Lights passing through these lenses will diverge
  - Corrects myopia

OPHTHALMIC PRESCRIPTION

- Spherical- all rays of light deviate in same direction
  - 1st number listed on Rx
- Cylindrical- rays of light deviate in more than one direction
  - 2nd number listed on Rx and represents astigmatism
- Axis- where cylinder is positioned
  - Can be from 1 to 180 degrees

- **1.00 prism diopter deviates light 1 centimeter at 1 meter**

OPHTHALMIC PRESCRIPTION

- Examples:
  - -2.00 +1.00 x 180
  - +3.00 -1.00 x 180
  - -1.00sph

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OPHTHALMIC PRESCRIPTION

- Add Power- additional plus power people need to view things at near and arm's length
  - Done by using multi-focals
- Prism- used to correct patient's eyes not aligned correctly
  - Wedge-shaped that deviates or bends light
  - Apex- top of prism, base- bottom of prism
  - Light bent toward base

- **1 prism diopter bends a ray of light 1 centimeter for every 1 meter of distance**

TYPES OF LENSES

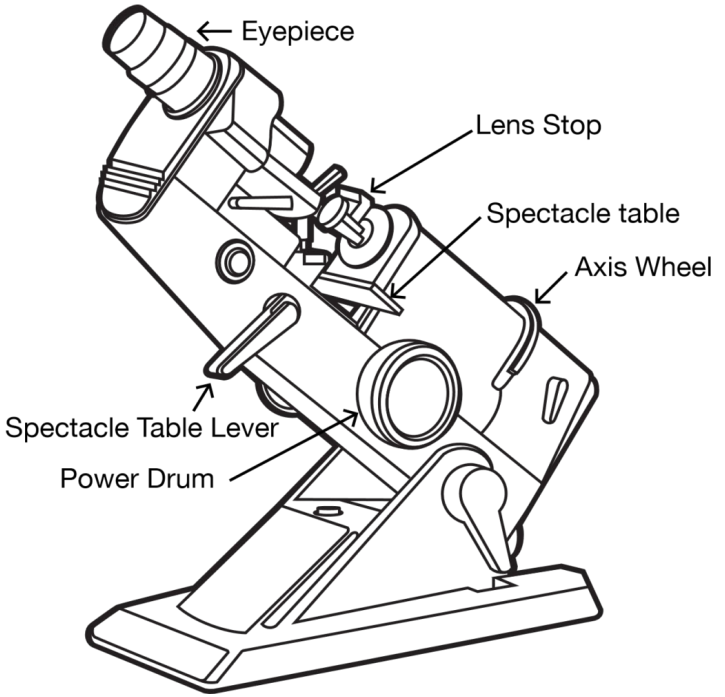
- **Single Vision-** corrects vision at one distance
  - Spherical Lenses- same power in all meridians
    - Examples: -1.00sph or +3.00sph
  - Planocylindrical Lenses- no power in one meridian and power in other meridian 90 degrees away
    - Examples: plano -2.00 x090 or plano -1.00x180
  - Aspherical Lenses- works well for spherical lenses, wider field of view for wearer, thinner lens profile

TYPES OF LENSES

- **Multi-focal Lenses-** single lens designed with multiple powers to be used at different distances, corrects presbyopia
  - Bifocal Lenses- lens has power for viewing at two distances (distance and near)
  - Trifocal Lenses- lens has power for viewing at three distances (distance, intermediate, and near)
  - Progressive Lenses- lens has gradual change in power of lens with distance at top and near at bottom
    - No lines

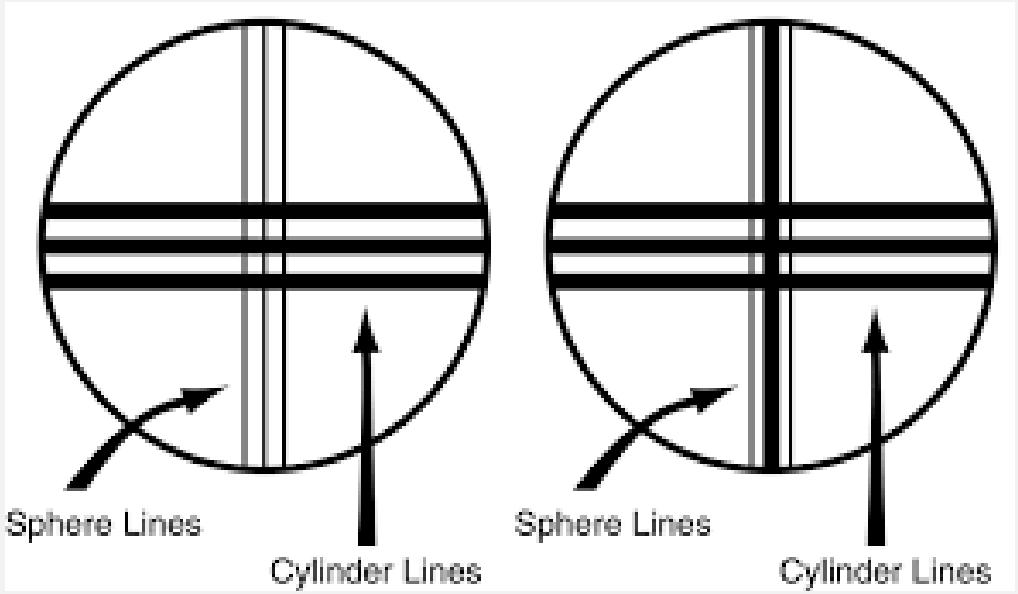
LENSOMETRY

- Set-Up:
  - Power wheel set at zero; examiner focuses eyepiece
  - Check right lens first
  - Place glasses in lensometer with ocular surface away from you
    - Lens held in place by lens holder and held level on lens table
  - Center lens by moving it so image of lensometer target is aligned with center of eyepiece reticle



LENSOMETRY

- Determine which set of lines is for sphere and cylinder



- If lines don't come into focus at the same time, then there is a cylinder component

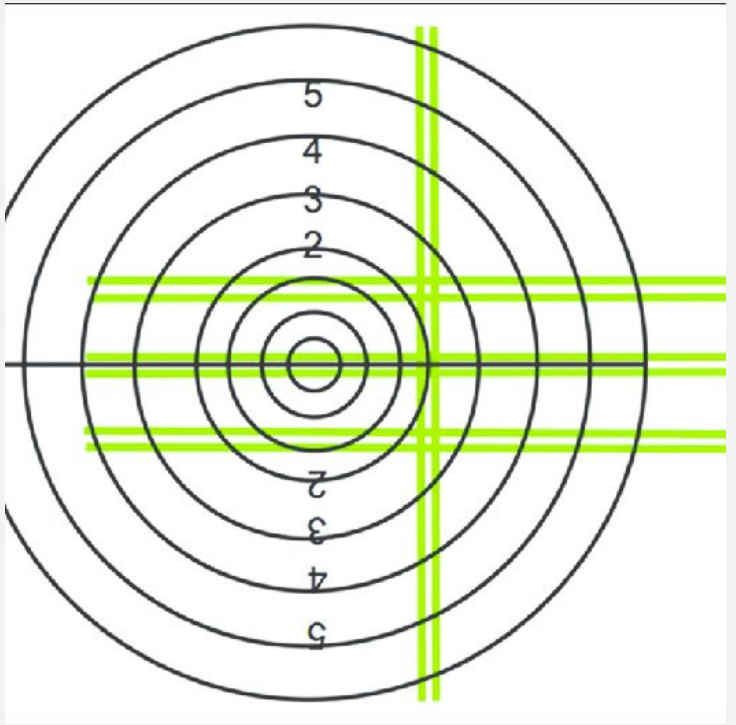
LENSOMETRY

- **Spherical Power-** start with enough plus power to blur lensometer target and then rotate power wheel until spherical line in focus
- At same time, rotate the axis wheel so spherical lines are continuous
- Document spherical portion of prescription from power wheel

- **Cylindrical Power-** continue rotating power wheel until cylindrical lines are in focus
- Amount of Cylindrical Power= difference between power when spherical portion of target is in focus and cylindrical portion of target is in focus
- Document axis of cylinder from axis wheel
- Dot optical center of lens while on lensometer

LENSOMETRY

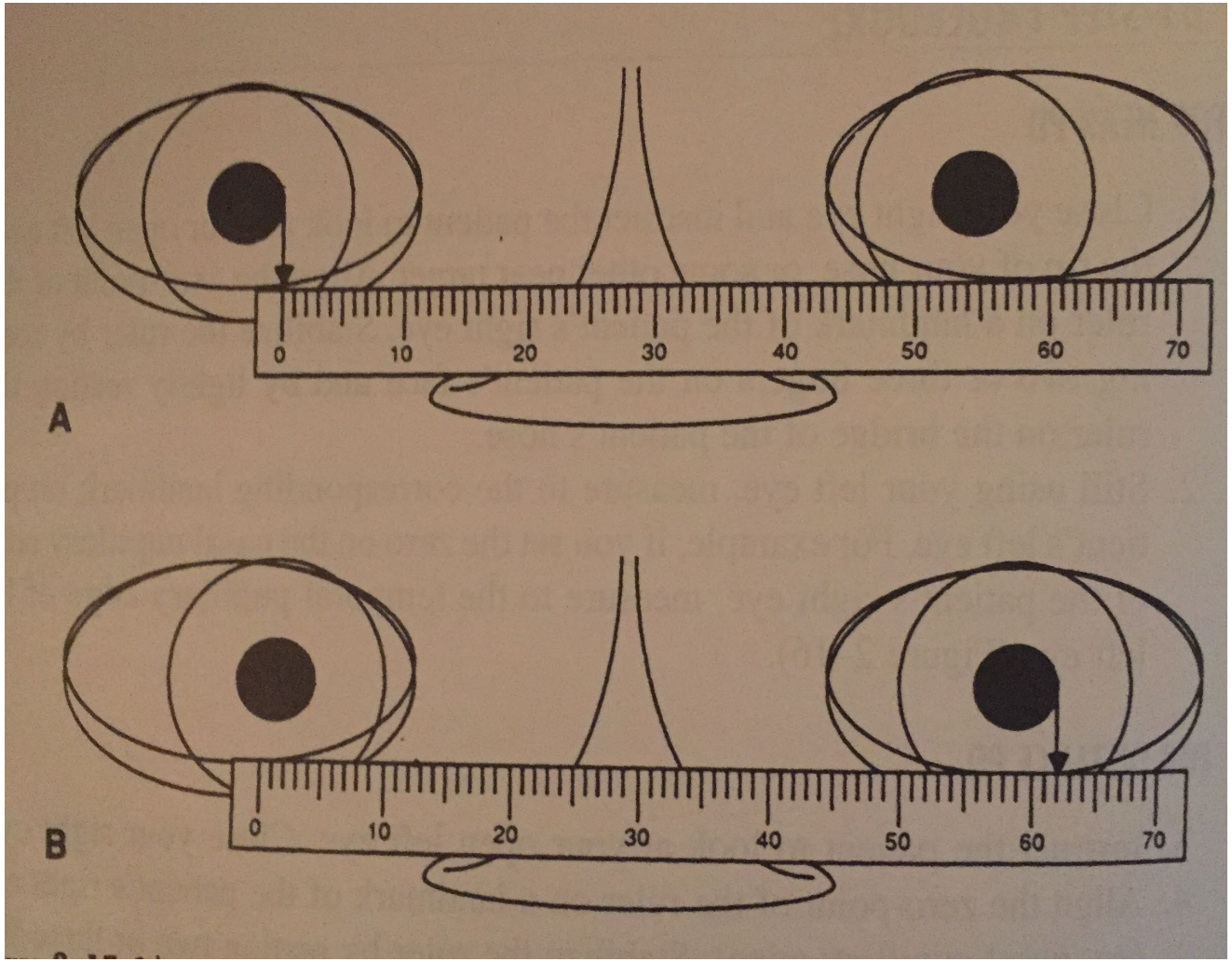
- Multifocal Lenses
  - Turn glasses around so ocular surface faces you
  - Recheck one meridian in carrier and compare power in this meridian to power in same meridian through near portion
    - Difference between two is the add
- Prism
  - May not be able to center lens in reticle
  - Dot lens at location of patient's line of sight and place this location in center in reticle
  - Read amount of prism using prism scale in lensometer



INTERPUPILLARY DISTANCE MEASUREMENT

- Distance in millimeters between entrance pupils of two eyes
- Distance PD:
  - Examiner closes right eye and instructs patient to look at your open left eye/tip of nose/near target
  - Align zero-point of ruler on a landmark on patient's right eye
  - Still using your left eye, measure to corresponding landmark on patient's left eye

INTERPUPILLARY DISTANCE MEASUREMENT



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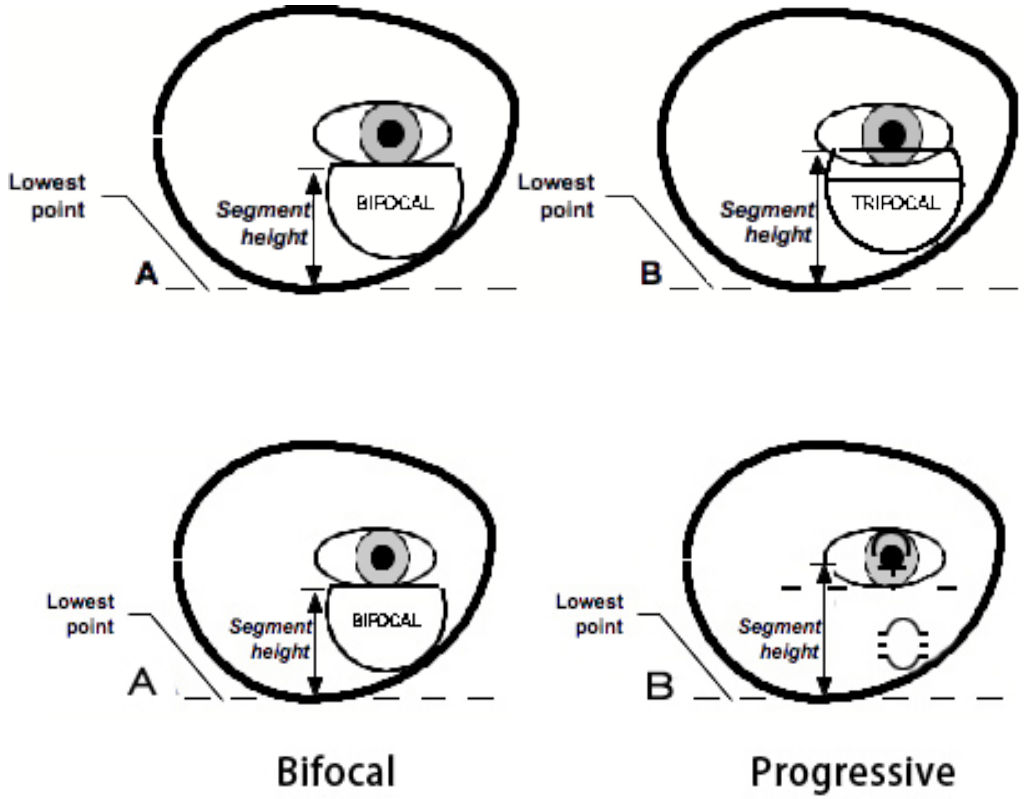
SEG HEIGHT MEASUREMENT



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OPHTHALMIC OPTICS AND DISPENSING

- Educate and Assist Patient in Selecting Eyewear
  - Frame Selection
  - Specialty Eyewear
  - Lens Material
  - Lens Coatings
  - Blue Light Protection

LENS MATERIALS

Glass- hardest surface, easy to break, *scratch resistant*

Plastic (CR-39)- thicker than glass, lightweight, less scratch resistant, easily tinted

Polycarbonate- harder to break, *safety lens for children, athletes, and monocular patients*; less scratch resistant, thinner

Trivex Material- mid-index lenses, less scratch resistant, safety lens for children, athletes, and monocular patients; free from distortions and aberrations

Hi-Index- *thinnest*, less scratch resistant

LENS COATINGS

Scratch-Resistance- coating made from resin

Anti-reflective coating– eliminate internal lens reflections, reduce glare at night, good for computer, more visibility of wearer's eyes

Ultraviolet coating– filters out UV light

Mirror coating– reflect some of the light striking lens, increases density of lens

Sports coating– improves contrast sensitivity, reduces glare

Blue light protection– block or filter blue light given off digital screens, glare protection, reduce damage to retina

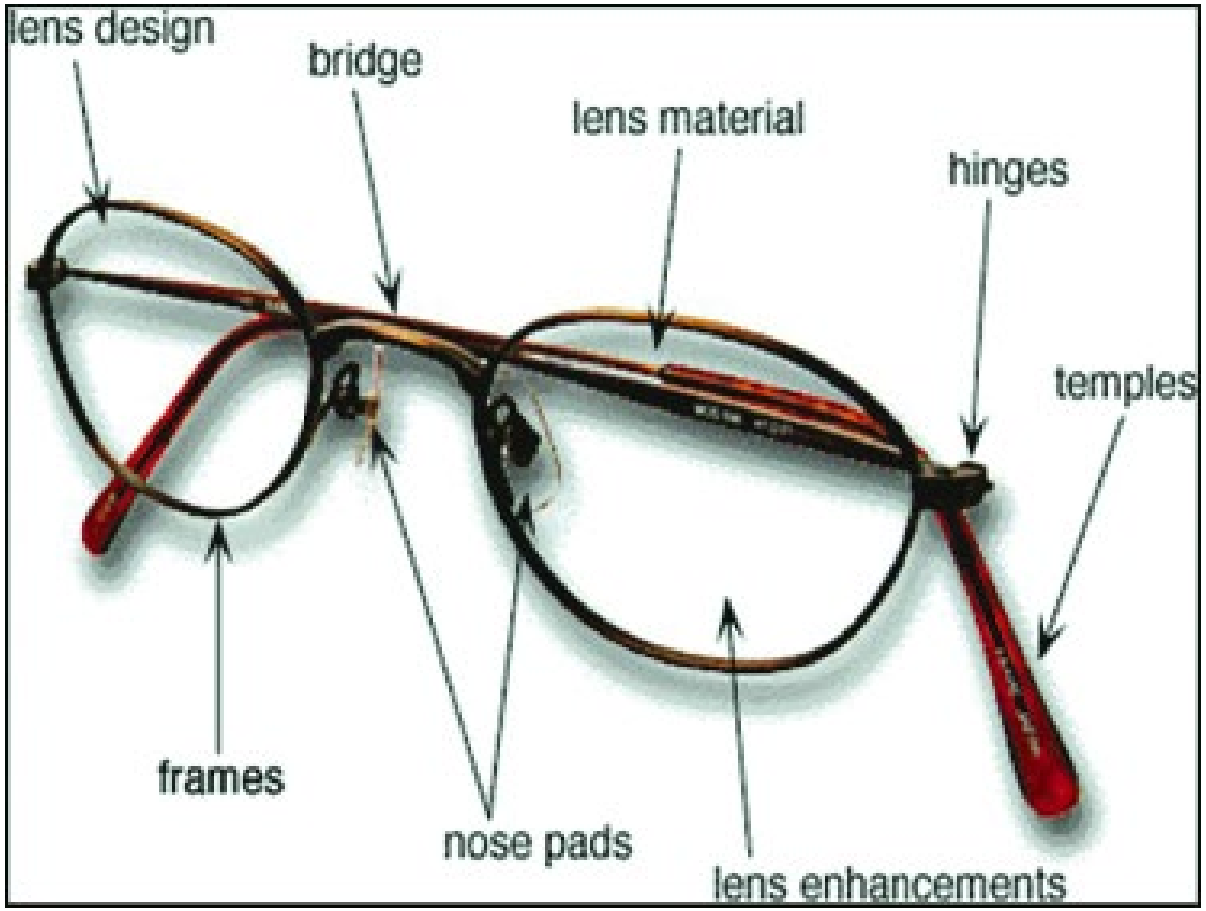
FRAME MATERIALS

- Plastic- made of rugged polymers
  - Need heat to make material more pliable and able to bend
- Metal- front and temples are metal
  - Need pliers to adjust
  - Held in place by eye wire that is tightened with screw
- Titanium-based alloy
  - Example - Flexon
  - Lightweight, hypoallergenic, corrosion resistant
  - Memory metal, so bendable and will return to original shape
  - Difficult to adjust

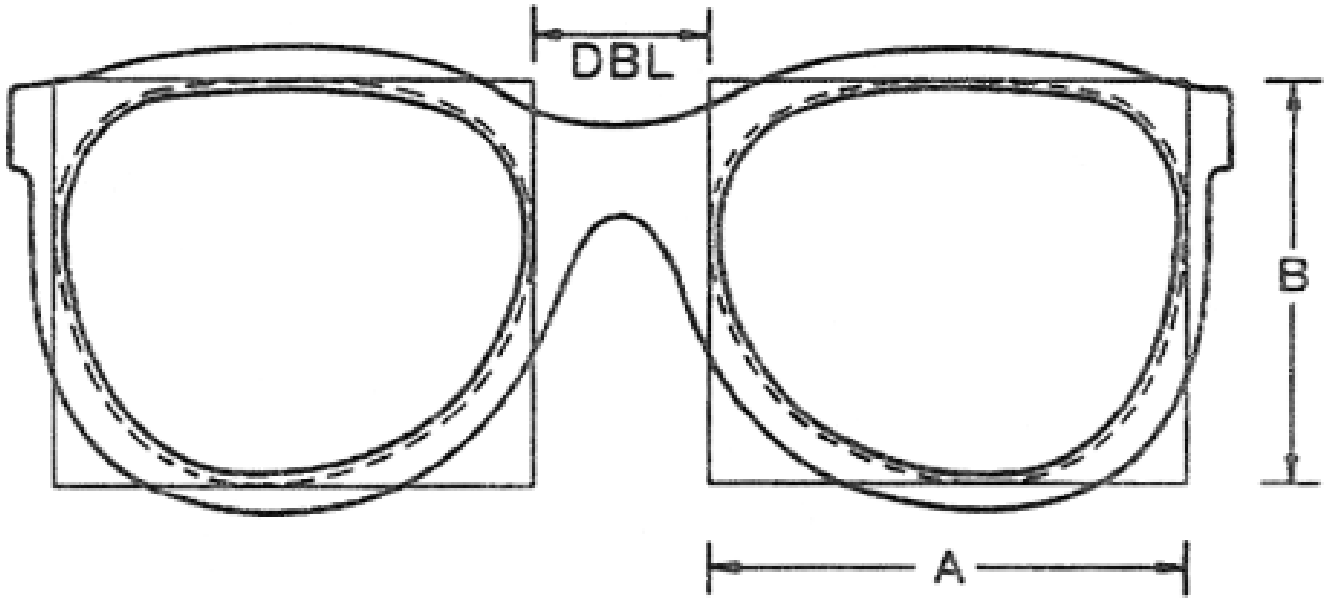
FRAME SELECTION

- Width of frame = width of patient's face
- Longer face = greater vertical depth of frame
- Bridge of frame should rest flat on side of nose
  - Distributes weight
- Temples should be able to bend around patient's ears to help shape fit of frames to contour of head

OPHTHALMIC DISPENSING



OPHTHALMIC DISPENSING



BASIC ADJUSTMENTS DEFINITIONS

Fitting Triangle - pressure points between frame and view of patient's head

- Goal is to equalize pressure of frame over bridge and widest part of head on each side of the ears

Frame Height - can adjust nosepads to raise or lower frame

Vertex Distance- distance from back of lens to cornea, should be equal distance from each eye

BASIC ADJUSTMENTS DEFINITIONS

Face Form- how frame front follows contour of face

- Frame protrudes at nose and farther back near temples

Pantoscopic Tilt- refers to angle of temple of frame makes with the frame front

- Bottom of frame closer to cheeks than top, which is closer to eyebrows

Temple Adjustment- temples bend around ears at 45 degree angle, flat against skull

ADJUSTMENT TOOLS

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CONTACT LENSES

MAINTAIN/ORDER/INVENTORY CONTACT LENSES

- Refill trial lenses
  - Running list of trials, scan barcode and get ordered automatically
  - Check weekly to see what needs to be reordered
  - Visit from contact lens representative
- Ordered from third-party vendor that has access to all brands

EDUCATING PATIENTS ABOUT LENS OPTIONS AND FEES

- Fees for Contact Lens Fitting
  - New vs. old wearer
  - Type of lens being fit (multifocal, custom lens, spherical)
- Contact Lens Options
  - Wear length
  - Wear time
  - Underlying medical conditions
  - Hygiene
  - Spherical vs. toric
  - Multifocal, monovision

DETERMINE/VERIFY CONTACT LENS MEASUREMENTS

- Need updated glasses Rx in order to select trial contact lenses
  - Single vision lenses match glasses Rx
    - If Rx >/= -4.00DS, refer to vertex calculator/conversion chart
  - Toric lenses
    - < -0.75DC then use spherical equivalent
    - >/= -0.75DC then use toric lens
      - Most only come in -0.50DC, so round to closest astigmatic correction
      - Axis powers usually come in increments of 10 degrees
  - Custom lenses
    - Multiple base curves
    - Horizontal visible iris diameter (HVID): use to select appropriate diameter for patients, ~1mm larger than HVID in soft lenses to cover both sides of limbus
    - Use keratometry measurements for gas permeable lenses

EXAMPLE

Prescription A: -2.50 -0.75 x004

Prescription B: -2.50 -1.00 x177

Starting Contact Lens Prescription: -2.50 -0.75 x180

EVALUATING GAS PERMEABLE CONTACT LENSES

- Centered horizontally on cornea
- Lid attachment (may decenter superiorly)
  - Smaller than size of cornea
- Move with each blink to allow tear exchange
  - Ask patient if vision is stable

EVALUATING GAS PERMEABLE CONTACT LENSES

- Fluorescein strips are used to assess tear film and assess how large lacrimal lake is underneath lens
  - **Central** clearance (yellow) = well-fitting lens
  - Too much clearance (deep yellow) = air bubbles, poor-fitting lens
  - Touch (dark spot) = poor-fitting lens
  - **Mid-Periphery** stabilizes lens on eye
    - Some corneal touch (dark spot)
  - **Periphery/Edges of Lens**
    - Some clearance (yellow)
    - Too much clearance= edges appear to lift off of cornea

EVALUATING SOFT CONTACT LENSES

Lens position

Cover entire cornea with 0.5-1.00mm coverage past limbus in all quadrants

Some movement with blink

Stable Vision

Possible rotation of toric lens

SELECTING PROPER CARE SYSTEM FOR CONTACT LENSES

- Prevents infection and improves comfort of lenses
- Multipurpose cleaners–most common, standard cases
- Hydrogen Peroxide-special case with cage and deactivator at bottom of case, hydrogen peroxide neutralizes over ~6 hours
- Cleaning and Conditioner Solution for Gas Permeable contact lenses
  - Clean lenses by rubbing in hand with cleaning solution --> rinse with saline solution → store in standard contact lens case with conditioning solution

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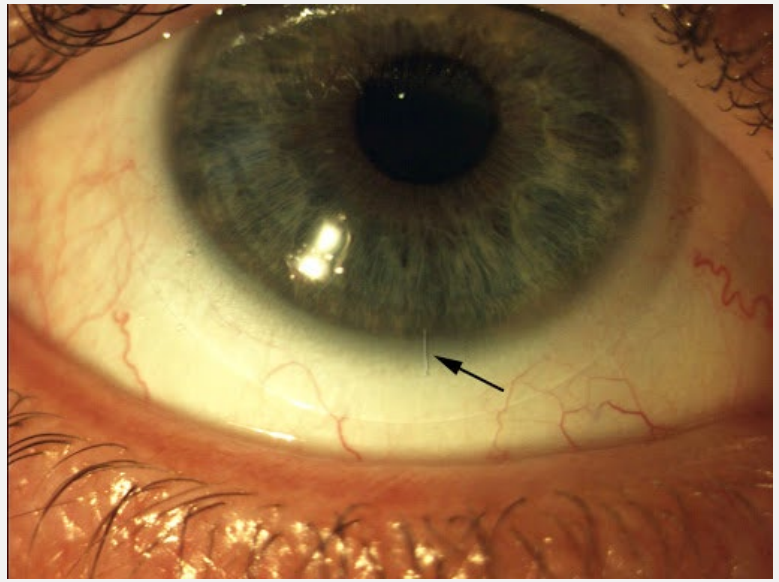
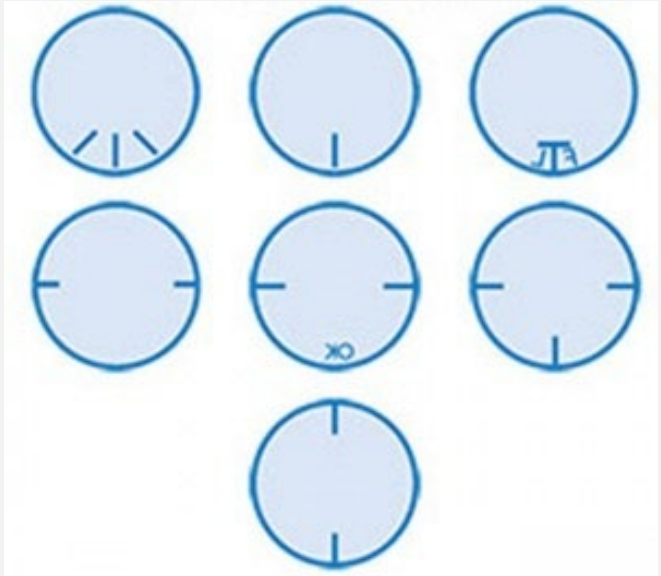
PERFORM PROGRESS CHECKS ON PATIENTS

- Ensure proper lens fit
- Check vision
- Review contact lens techniques
- Insertion and removal
- Proper cleaning
- Replacement schedule

TROUBLESHOOT PROBLEMS

- Comfort Issues
  - Moves a lot or not centered = discomfort or feeling edge of lens
  - Too tight = red, irritated eye
  - Too dry/loose = lens may fall out
    - Ways to improve dryness = switch cleaning solutions, contact lens materials, switch modalities, rewetting drops





TROUBLESHOOT PROBLEMS

- Vision Issues
  - Over-refraction
    - Start with spherical power first
  - Toric Lens rotation
  - Fluctuation in vision may be due to dryness

PROFESSIONAL ISSUES

FRONT DESK

- Maintain a neat, orderly, up-to-date office
- Welcome/greet arriving patients
- Screen patients
- Resolve patient complaints and concerns
- Direct patient flow

FRONT DESK

- Perform telephone triage
- Document incoming calls appropriately
  - Calls from patients, vendors, other healthcare providers
- Manage patient appointments
  - Confirm, schedule
- Maintain filing systems
- Present fees and information to patients
- File insurance claims

TELEPHONE AND TRIAGE

Speak clearly, answer in timely manner

Identify office and say your name

Triage Questions:

- What kind of problem?
- When did it happen?
- Does it affect vision?
- Is it getting worse?
- Does anything make it better?

Emergency- evaluated immediately

Urgent-within next 24-48 hours

Routine- to be seen at next appointment

Appointment Times

- Comprehensive- 30 to 45 min
- Follow-up Visit- 15 to 20 min

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BUSINESS SKILLS

- Assist with practice communication
  - Office newsletter, patient correspondence, staff meetings
- Coordinate external advertising or marketing
- Prepare internal reports
- Use new software

BUSINESS SKILLS

- Handle employee payroll
- Negotiate equipment maintenance contracts/agreements
- Maintain and update office manuals
  - Office procedures and policies
- Manage employee schedules
  - Office hours scheduling, staff meetings, vacation time

PRACTICE MANAGEMENT

Maintain examination rooms	- Keep rooms stocked and sanitized
Purchase ophthalmic supplies	- Examination equipment
Take office supply inventory	- Paper, pens, staples, ink
Perform staff training	- One-on-one, in-house education, credentialing

PRACTICE MANAGEMENT-MEANINGFUL USE

- Medicare and Medicaid program that awards incentives for using certified electronic health records (EHRs) to improve patient care
- Core Objectives:
  - Must meet all 15
    - Includes demographics, changes in vital signs, smoking status, active medication and allergy list, clinical summaries of each visit, drug-to-drug and drug-allergy interaction
- Menu Objectives
  - Must meet 5/10
    - Includes drug formulary checks, one public health objective, generate lists of patients by specific conditions, medication reconciliation, summary of care record for transitions of care

PRACTICE MANAGEMENT- MACRA/MIPS

- Medicare Access and CHIP Reauthorization Act (MACRA)- pay-for-performance program that focuses on quality, value, and accountability
  - Focuses on giving better care instead of service
- Merit-Based Incentive Payment System (MIPS)- program that determines Medicare payment adjustments
  - Based on four performance categories: quality, resource use, clinical practice activities, meaningful use of EHR
  - May receive payment onus, payment penalty, or no payment adjustment

PRACTICE MANAGEMENT-PQRS

- Physician Quality Reporting System (PQRS)- federal quality-reporting program that uses a combination of bonuses and penalties to encourage participation in Medicare
  - Replaced by MIPS

PRACTICE MANAGEMENT

- Contact insurance companies regarding participation
- Comply with infection control procedures
- Maintain diagnostic listings and fee schedule
- Comply with federal regulations
  - Health Insurance Portability and Accountability Act- protects sensitive patient health information from being disclosed without patient's consent or knowledge
  - Occupational Safety and Health Administration (OSHA)- regulates workplace safety and health

PRACTICE MANAGEMENT- ELECTRONIC HEALTH RECORDS

- Electronic Health Records- allow doctors to keep track of health information for patients, able to access when office is closed
  - Able to share with other specialists
  - E-prescribe medications directly to patient's pharmacy
  - Increased privacy and security
  - Reduced paperwork
  - Reduce unnecessary tests
- Personal Health Records- you control what information goes into it
  - Keep track of doctors visits and your health priorities
  - May be linked to electronic health records

PRACTICE MANAGEMENT-MEDICAL CODING

- Billing and Coding:
  - 1) select insurance panels and credential for them
  - 2) set exam fees
  - 3) learn how to submit claims
  - 4) know proper optometry billing and coding procedures

PRACTICE MANAGEMENT- CPT CODES

- CPT Code 92004:
  - Medical exam and evaluation with initiation of diagnostic treatment program, comprehensive new patient, one or more visits
  - 92022- intermediate
- CPT Code 92014:
  - Medical exam and evaluation with initiation of diagnostic treatment program, comprehensive established patient, one or more visits
  - 92102- intermediate

PRACTICE MANAGEMENT- MEDICAL CODING

- Evaluation and Management (E/M) Codes- typically used for patients with medical complaint i.e. diabetes, allergy, glaucoma
  - 992XX
  - Different levels, but depends on length of time spent with patient and complexity of care
- Procedure Codes
- Codes for each Condition Diagnosed
- Modifiers- help describe service and get paid properly
  - Example: -E1 left lower lid, -51 multiple procedures during same session

PRACTICE MANAGEMENT- CARDIOPULMONARY RESUSCITATION (CPR)

- Staff Training
- Lifesaving procedure that is done when someone stops breathing or heartbeat has stopped
- Importance Steps: Call 911, Check for Pulse (Make Sure They are Conscious), Provide Rescue Breaths, Provide Compression
- Compression Depth:
  - Adult- 2 inches
  - Child (usually 1 to onset of puberty)- ½ inch
- Compression Ratio:
  - 2 rescue breaths per 30 compresses

PRACTICE MANAGEMENT-CPR

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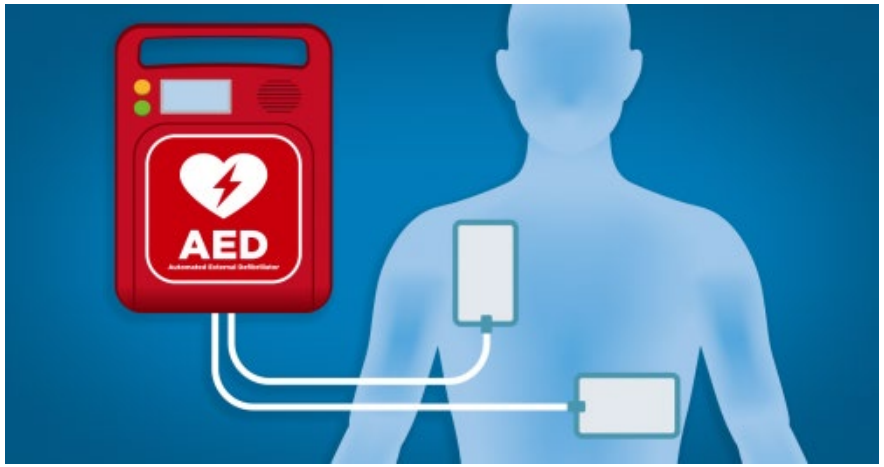

PRACTICE MANAGEMENT- AUTOMATED EXTERNAL DEFIBRILLATOR

Medical device that analyzes heart rhythm and delivers shock or defibrillation to help proper heart rhythm

Restarts patient's heart when experiencing cardiac arrest

Usually done after CPR

Do not do when water is present

Do not touch patient while performing

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QUESTIONS/COMMENTS?

Good luck and thank you!!

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AOA MEMBERSHIP BENEFITS

- AOA members will be able to access this course via EyeLearn as early as Dec. 14th
- If you are not a member and would like to become one, please contact Member Services at memberservices@aoa.org
  - You can also find information on our website at www.aoa.org under Member Center
- If there are any follow up questions regarding this event please reach out to the Education Center at educationcenter@aoa.org

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IMAGE SOURCES

- Slide 6 - https://headandneckcancerguide.org/adults/introduction-to-head-and-neck-cancer/orbital-tumors/anatomy/
- Slide 7 - https://www.pinterest.com/pin/410038741058023073/
- Slide 9 - https://www.ncbi.nlm.nih.gov/books/NBK470534/figure/article-21502.image.f1/
  - All muscles intervated by nerves (CN3- SR, IR, MR, IO; CN4- SO, CN6- LR)
  - Levator Palpebrae- controls eyelid elevation, MR- adduction, LR- abduction, SR- elevation, incyclo, adduction, IR- depression, excyclo, adduction, SO- incyclo, depression, abduction, IO- excyclo, elevation, abduction
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  - https://www.aao.org/eyenet/article/distinguishing-choroidal-nevus-from-choroidal-mela
- Slide 36 - Phenylephrine- rapid dilating effect with stronger concentration, wears off in 1-2 hours
  - Horner's Syndrome- miosis, ptosis
  - Atropine- 10-14 days for full accommodation & pupil size to return; Homatropine is weaker & wears off faster; Cyclopentolate- rapid onset within 30 minutes & wears off in 6-24 hours; Tropicamide- between 20-40 minutes, wears off in 4-6 hours
  - Pilocarpine- action lasts for 4-6 hours; acute care of angle closure glaucoma
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