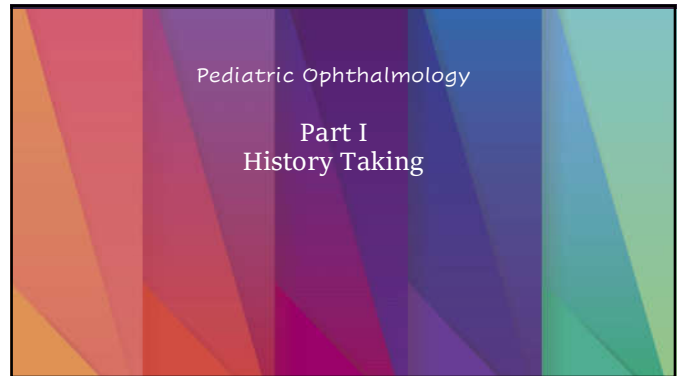
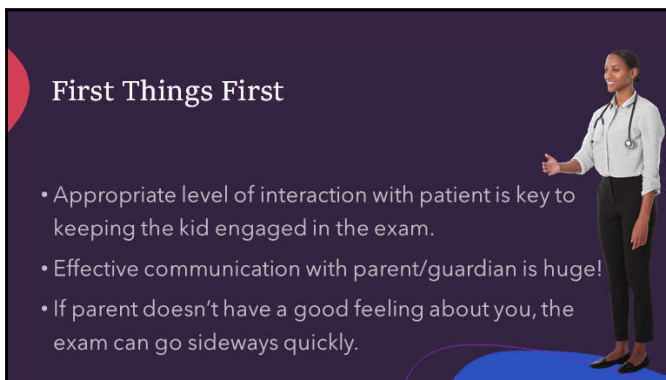


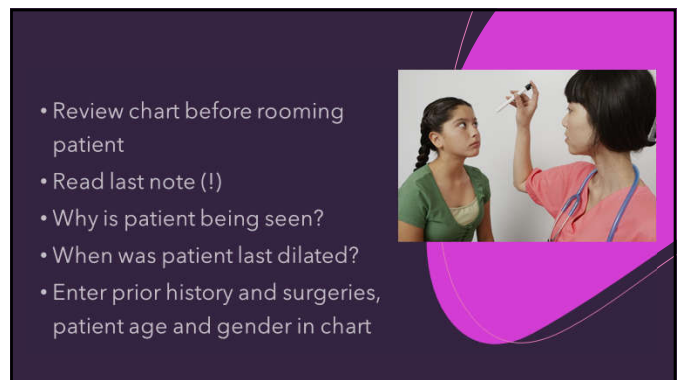
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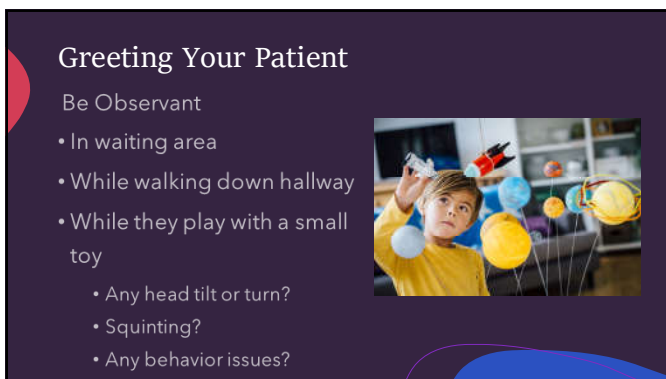
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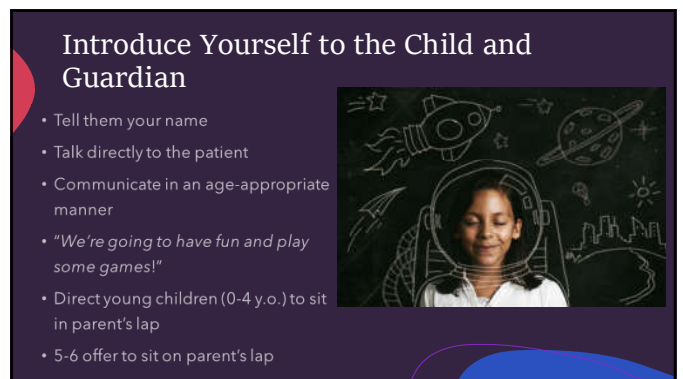
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5




6

Introduce Yourself to the Child and Guardian

Smile ☺

- Be friendly and cheerful.
- Adjust chair so you can be eye level with the patient. This makes you less scary
- If the patient is not cooperative, considering interacting "playing games with" parents or siblings, if present.
- Goal: put them at ease



7

PEDIATRIC HISTORY TAKING


- Pregnancy & birth
- Developmental
- Medical
- Family
- Social



8

Compliance


- Compliant with current treatment plan?
 - Patching
 - Exercises
 - Patching
 - Eye drops
- How many hours per day does patient wear glasses or patch?
- What time were drops last administered to child?



9

Demographics


- Age
- Grade in school
- Any special services i.e. speech, special ed, PT,



10

Medical History


- Diabetes or other metabolic diseases?
- Cancer
- Hearing loss
- Kidney disease
- Juvenile Arthritis
- Autism
- ADD or ADHD
- Developmental delays
- Medications
- Any changes since last exam?



11

History Taking

- When? Onset, circumstances, changes over time, frequency
- What? Patient states...
- Where? OD? OS? OU? Where on head?
- Why? How? Any known causes? Anything make it better or worse?
- If the patient has been seen by another provider, review records and test results before the patient is seen by the physician.
- Are parents happy with eye position? Any vision concerns?



12

Patient & Patient Concerns, Tech Observations

- If you observe something but patient/parent does not complain of it, note "tech observation..."
- Any concerns
- Questions
- Any Rx's needed?

13

2 Major Concerns with Kids


- Strabismus
- Amblyopia



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Amblyopia


- Unable to improve VA with corrective lenses
- No apparent structural abnormality
- Difference of 2 lines or more between eyes or
 - BCVA 20/30 or worse
- Treatment to 20/30 or 20/25
 - Occlusion therapy on good eye
 - Atropine in good eye
- The older the child, the longer the treatment
 - Stimulus deprivation: first few weeks of life
 - All other causes: age 6-7



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Amblyopia


- Unilateral Causes
 - Strabismus (Suppression)
 - Significant Uncorrected refractive errors of one eye (Anisometropia)
 - Stimulus deprivation
 - Cataract
 - Ptosis
 - Corneal opacities
- Bilateral Causes
 - Bilateral significant uncorrected refractive errors
 - Bilateral stimulus deprivation



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Checking Vision in Patients with Nystagmus


- Use +6D lens for fellow eye
 - More accurate VA than using standard occluder
- Quiets Involuntary Eye Movements



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Beginning your Work Up

- Clean and neutralize specs every visit
- Compare specs with current Rx on chart
 - ALERT MD IF SIGNIFICANT DIFFERENCE
- ALWAYS do sensory testing first!
- BE a CHEERLEADER!
- Let patient know "There are no wrong answers"



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Pediatric Ophthalmology


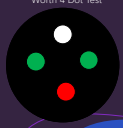
Part 2

Sensory Testing


19

Worth 4 Dot Test

- Detects presence of fusion or suppression of one eye
- Patient wears red & green glasses and reports number and color of lights s/he sees
- Near or distance testing, room lights on
- "How many lights do you see?" (Record what patient says)

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Worth 4 Dot Test

Normal Fusion: White light green and red or alternating

Single Binocular Vision: 4 lights - 2 green, 1 red, one pink or pale green

One Eye Definitely Dominant: White light color of dominant eyes' lens

Diplopia: 5 lights - 3 green, 2 red

Suppressing: 2 red or 3 green (depending on which eye is suppressing)

May have different responses for distance & near

NOTE: Certified Orthoptist (C.O.) performs, but tech may need to perform in C.O. is out.

21


Titmus Stereo Test

- Explain to child
- Put glasses on confidently
- Ask patient to pinch the tip of the fly's wings
- Have patient "push down" circles that look to be popping up
- Select which animal looks like it's 'popping up at them'
- Recorded in arc minutes
- Cheat sheet on back of test book to help you record results



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Randot Stereo Test (Used in Adult Clinic)



- Tests depth perception AND stereo vision.
- Adults:
 - Stereo testing
 - Patient identifies 6 geometric shapes
 - Adult testing: 400 to 20 seconds of arc
- Peds:
 - Patient is asked to "push animals down" (push on animals which look like they're popping up)
 - Ped testing: 400 to 100 seconds of arc

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Pediatric Ophthalmology

Part 3

Visual Acuity Assessment

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Visual Acuity Annotations (Always Note Which Eye Tested First)

Visual Acuity	Definition
5/400	Can only see 20/400 letter when viewing 5' from chart
CF @ 1'	Can count fingers only at 1 foot
HM	Hand motions only
LP with P	Light perception with projection (can see light and determine where light is)
LP	Can only see light
NLP or Absent LP	No light perception
6/6 (meters)	Metric equivalent of 20/20
Pediatric Visual Acuity	Definition
CSM	Central, steady, maintained
CSNM	Central, steady, not maintained
CUSNM	Central, unsteady, not maintained
NCUSNM	Not Central, unsteady, not maintained


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Vision Preferential Tests

Teller Acuity Cards




Keeler Acuity Cards





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"HOTV" Chart Electronic Visual Acuity



- Pre School - ages 3-7
- Video Acuity Tester with monitor, software and hand controller or standard wall chart
- Video monitor presents single letters are framed with crowding box spaced a letter width around the letter.
- Video monitor calibrated for distance of 3 meters
- High contrast black and white letters (H O T & V)

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Allen picture chart

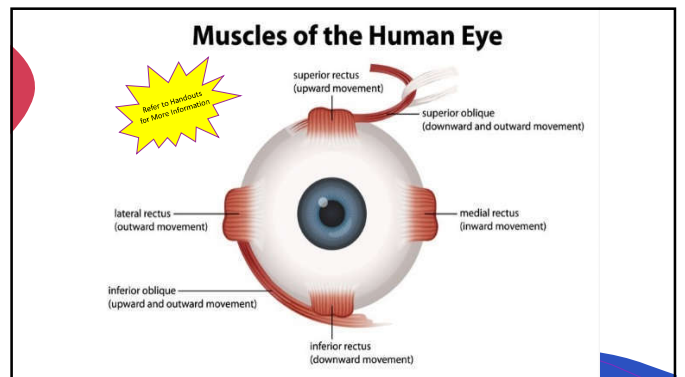


- Pre School Children age 2+ and mentally challenged older children

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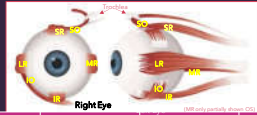
Pediatric Ophthalmology Part 4 Ocular Motility Principles & Alignment Assessment Techniques

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Functions of the Voluntary Extraocular Muscles

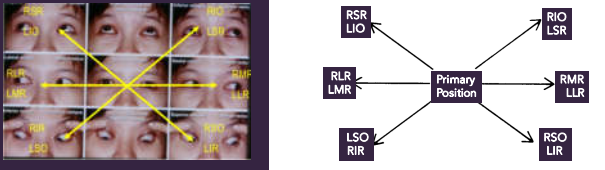


Extraocular Muscle	Primary Function	Secondary Function	Tertiary Function
Medial Rectus	Adduction	none	
Lateral Rectus	Abduction	none	
Superior Rectus	Elevation	Intortion	Adduction
Inferior Rectus	Depression	Extortion	Adduction
Superior Oblique	Intorsion	Depression	Abduction
Inferior Oblique	Extorsion	Elevation	Abduction

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Eye Movements

6 Cardinal Positions of Gaze

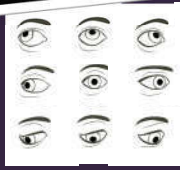


Refer to handouts for more information

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Ductions

Movement involving only one eye




- Abduction: outward movement
- Adduction: inward movement
- Supraduction: upward movement
- Infraduction: downward movement
- Incycloduction: torsional inward movement
- Excycloduction: torsional outward movement

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Versions

- Simultaneous movements of both eyes in the same direction
- Babies prefer to follow a face or light



Cyclo = rotation
cyclo-dextro-version = rotation to the right

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Vergences

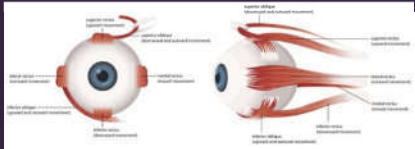
Simultaneous movements of both eyes in opposite directions

- Convergence
- Divergence

35

Sherrington's Law of Reciprocal Innervation

- Sherrington's Law = Same Eye Law
- Law of Reciprocal Innervation
 - When one muscle contracts the antagonist (opposite) muscle in the same eye must relax



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Herring's Law

- Law of Yoke Muscles (Binocular Law)
- A muscle of one eye is paired with another muscle of the fellow eye to produce a cardinal gaze
 - Example: RLR & LMR in dextroversion
- During any conjugate eye movement, equal & simultaneous innervation flows to both yoke muscles
 - The amount of innervation of both eyes is determined by the fixating eye

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Cover Tests



3 Types

- **Monocular Cover-Uncover Test**
 - Differentiates phoria from tropia
- **Alternate Cover Test (aka Prism and Cover Test)**
 - Measures total deviation
- **Simultaneous Prism and Cover Test**
 - Measures tropia only

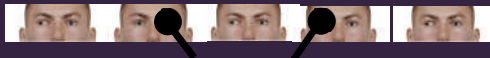
All tests can be performed distance or near

Results not valid in patients who cannot maintain constant fixation on target

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Monocular cover-uncover test

- The most important test for
 - Detecting presence of strabismus
 - Differentiating phoria from tropia

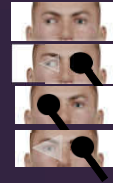


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Alternate cover test with prism

aka "Prism and cover test" (Standard skill performed by all technicians)

- Measures total deviation, both latent and manifest
- Does not specify *how much* of each type of deviation is present - only indicates a deviation is present
 - Does not differentiate a phoria from a tropia
- Two horizontal or two vertical prisms should not be superimposed on each other
 - Doing so can induce significant measurement errors
- How to do
 - Perform alternate cover test while using prism to neutralize deviation
 - Amount of prism required = amount of deviation in PD



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Simultaneous Prism and Cover Test

(MD & C.O. perform)

- Determines amount of tropia
- How to do
 - Cover fixating eye while placing prism in front of deviating eye
 - Increase prism power until deviated eye no longer shifts



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HIRSCHBERG CORNEAL LIGHT REFLEX TESTING



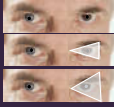
An Approximation of Deviation
Further defined by Krimsky Test
1 mm = 7° deviation

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KRIMSKY CORNEAL LIGHT REFLEX TESTING

Hold Prism Bar in front of fixating eye

Strength of prism required to center corneal reflection in deviating eye = amount of deviation



7° deviation = 15 prism diopters

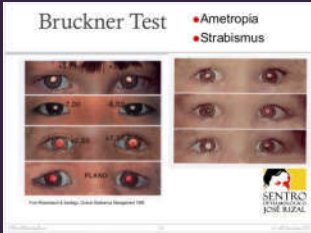
43

Brüchner Test

- Direct ophthalmoscope
- Sit directly in front of patient about 2' from the patient
- Keep light perpendicular to eyes (important)
- Simultaneously shine light on both eyes
- Do so *briefly* (prevents pupillary constriction)
- Look through ophthalmoscope
- Is there a difference in intensity between the light of reflex between the eyes?
- Reflexes in the eye opening of the child facing the straight line will be dark, while the reflection of the eye in deflection will be significantly brighter.

Bruckner Test

- ● Ametropia
- ● Strabismus



(Good to know, but TEG technicians don't typically do)

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Pediatric Ophthalmology
Part 5
Ocular Motility Disturbances

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COMMON TYPES OF STRABISMUS


- ● Exotropia
- ● Esotropia
- ● Accommodative Esotropia
- ● Hypertropia
- ● Nystagmus
- ● Cranial Nerve Palsies



Left Hypertropia

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A LEFT EXOTROPIA



If the exotropia is acquired rather than congenital, it is usually because of poor vision in one eye

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A LEFT ESOTROPIA


Congenital esotropia: 1 - 2 % of population
Most common form



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ALTERNATING TROPIA

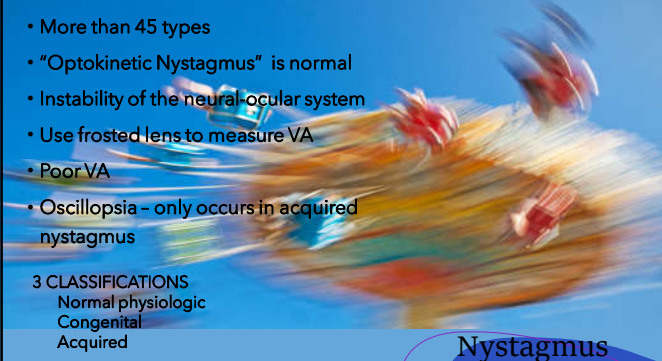
- One eye always deviates
- Patient can and does fixate with either eye
- Patients who alternate (spontaneously or induced by occlusion therapy) are able to use both eyes for monocular fixation, have normal visual acuity in each eye



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- More than 45 types
- "Optokinetic Nystagmus" is normal
- Instability of the neural-ocular system
- Use frosted lens to measure VA
- Poor VA
- Oscillopsia – only occurs in acquired nystagmus

3 CLASSIFICATIONS
 Normal physiologic
 Congenital
 Acquired




Nystagmus

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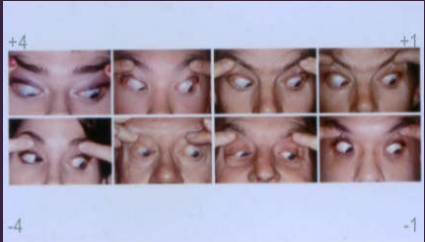
Duane's Syndrome

- Congenital Defect
- 3 Types
 - MR, LR contract simultaneously
 - Thought to be caused by misfiring of medial and lateral recti muscles
 - Females > Males
 - Usually occurs in left eye
- Signs & Symptoms
 - Horizontal deviation
 - Inability to ADduct, ABduct or both
 - Eye retraction when attempting to ADduct
 - Lid fissure narrows upon ADduction attempt




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Right Superior Oblique Dysfunction



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Left Inferior Oblique Dysfunction



53

WHAT'S A NERVE PALSY?

- The nerve can't send impulses normally
 - Disease
 - Trauma
- Deficit depends on
 - Which nerve is involved
 - Where the damage or disease is
- Causes
 - Strokes, Brain Tumors, Diabetes



Right 4th CNP - SO affected

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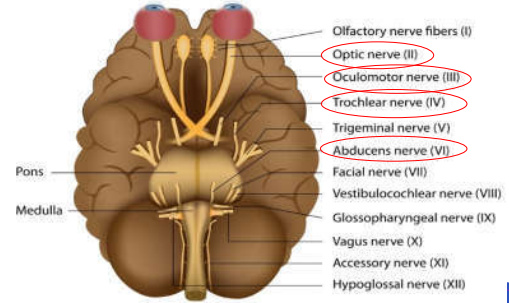
CRANIAL NERVE PALSIES

- **Under Age 40:**
 - Congenital Defects
 - Cranial Artery Aneurysms
 - Head Trauma
 - Multiple Sclerosis
 - Secondary to Increased Intracranial Pressure
- **Over Age 40:**
 - Diabetes
 - CVA (stroke)
 - Basilar Artery Insufficiency
 - Giant Cell Arteritis

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The Cranial Nerves

Remember This Mnemonic: SO4, LR6, 3



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Strabismus surgery



- Frequently uses adjustable sutures
- "Recession"
 - **Weakens muscle**
 - Cuts muscle, re-attaches farther back on eye
- "Resection"
 - **Strengthens muscle**
 - Cuts, removes section of muscle, re-attaches shortened muscle

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Convergence Insufficiency

- Patients with deviation greater at near than at distance usually by ≥ 10
- Symptoms can occur at any age
 - Headaches after work
 - Double vision at near
 - Losing place while reading
 - Closing one eye while reading
 - Letters on page "jumping"
- Treatment
 - Eye exercises are first option
 - Prism not typically Rx'd for these kids at TEG
 - Bilateral LR resection may be option in future



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Near Point Convergence

- Binocular Test
- Measure:
 - Patient looks at small target. Distance at which patient can no longer maintain fusion (one eye will deviate outward)
 - Measured in cm
 - Pt must
 - Be alert and cooperative
 - Have normal fusion (cannot be amblyopic)

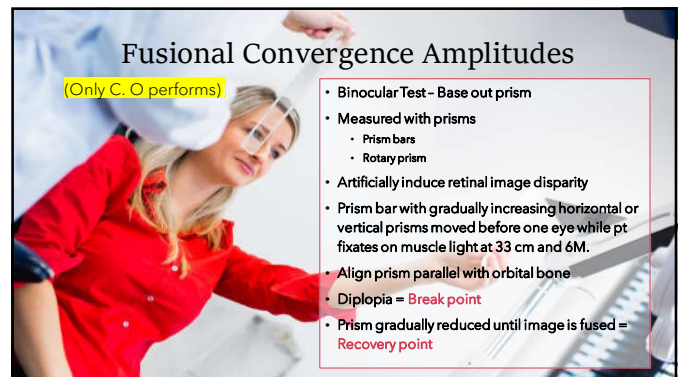


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Fusional Convergence Amplitudes

(Only C.O performs)

- Binocular Test - Base out prism
- Measured with prisms
 - Prism bars
 - Rotary prism
- Artificially induce retinal image disparity
- Prism bar with gradually increasing horizontal or vertical prisms moved before one eye while pt fixates on muscle light at 33 cm and 6M.
- Align prism parallel with orbital bone
- Diplopia = **Break point**
- Prism gradually reduced until image is fused = **Recovery point**



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Convergence Training



- Aka Vision Therapy or Orthoptics
- Trains neurological system
 - Eye isn't strengthened by therapy
 - Brain is readapted so it can accept, receive, store visual imagery
 - Pt must maintain fusion throughout exercise for it to be effective
- 3 basic types of vergence training
 - Sustained - reading through prism
 - Pursuit - track a moving target in depth
 - Saccad - quick changes in fixation distances

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Pediatric Ophthalmology

Part 6 Visual Field Testing

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Assessing the Visual Field in Children

- Count Fingers
- All 4 quadrants

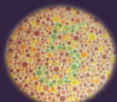
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Pediatric Ophthalmology

Part 7 Color Vision Testing

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Color Vision Testing

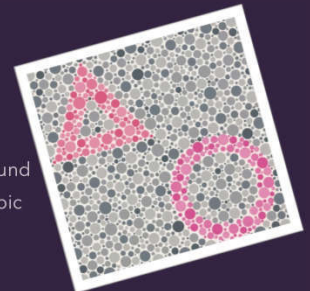


Ishihara

- Ishihara Pseudoisochromatic color plates
 - Book of plates
 - Control plate
 - Multicolored or gray dots
 - Display patterns, numbers or figures
 - Various combinations used to detect different color deficits

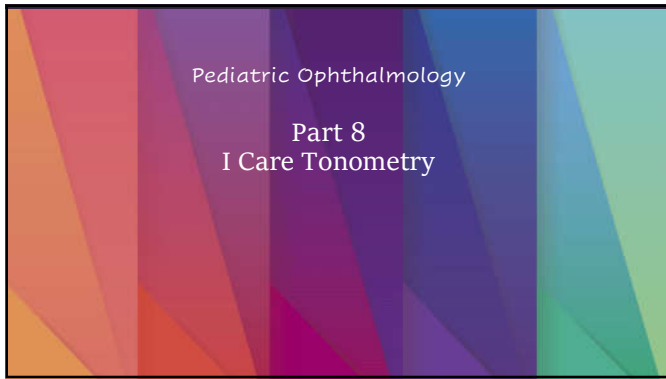
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Color Vision Testing

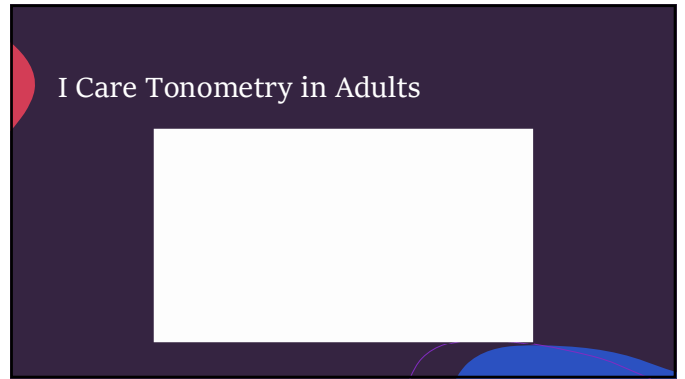


- Hardy-Rand-Rittler
 - Circles, Triangles and Crosses
 - Color on neutral gray background
 - Designed to screen for tritanopic and red-green defects

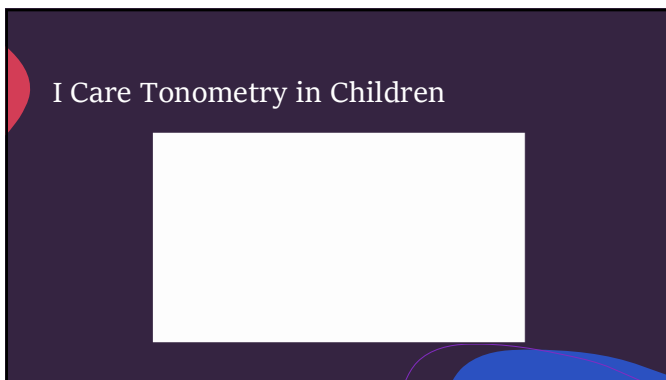
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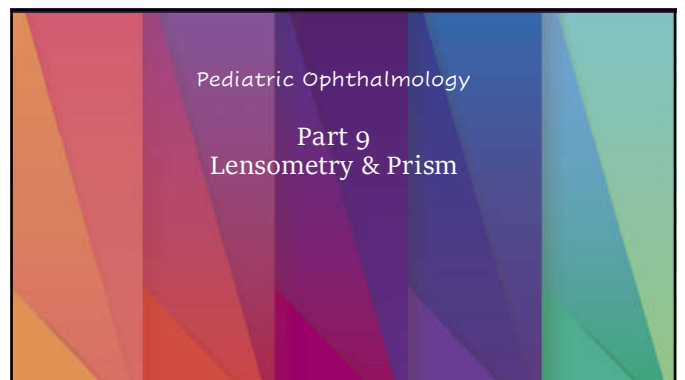
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Manual Lensmeter

- Consists of
 - Eyepiece
 - Lens platform
 - Power wheel
 - Illumination source
 - Lens marking device
 - Range is to +/- 30D
 - Bring dots or lines into sharp focus, then read power
 - Prism Compensation Device (PCD)
- Measure > 3D lenses from back of lens
- Focus eyepiece and ensure lens is centered first!

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Improving lensometry accuracy

- Keep green filter in place except when measuring sunglasses
 - Filter minimizes color aberrations
- Lens neutralizes as a sphere?
 - Ensure no cylinder by rotating axis wheel
 - Small cylinder powers easily to miss
- Double check axis by 'bracketing'
 - Rotate axis wheel slightly on either side of presumed end point
 - Look for most precise alignment of crossing mires

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Optical Center

- Minus lens: thinnest part of lens
- Plus lens: thickest part of lens



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Strabismus With Prisms

- Prism alters direction of light so projection of deviating eye is same as fellow eye
- Corrects sensory alignment of eye without disturbing the motor alignment
- Remember -- **Prism points toward deviation**



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Prescribing Prism

- Can be split between eyes
- Cosmetically better
- Patient may feel better balanced

Example: Pt Rx'd Δ BU OD

Vertical Prism

- Prism oriented in opposite directions
- Rx: Δ BU OD & Δ BD OS

Horizontal Prism

- Prism always oriented in same direction
- Rx: Δ BO OD & Δ BO OS



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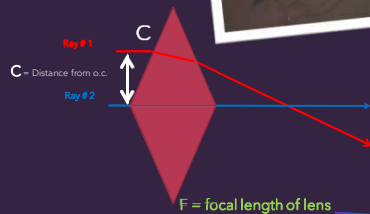
Ground In Prism

- Used for
 - Vertical prism of > 1D
 - Large horizontal deviations
 - Convergence insufficiency
- Mires will not center
- Use prism rings to measure amount of prism in lens
- If mires are beyond the field of view use the PCD or use loose prisms (base in opposite direction of lens) then mathematically calculate prism in lens
- Prism can be simple (BI, BO, BU, BD) or compound (BI&U, BD&O)



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Induced Prism



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Progressive Lenses with Prism

Prism in Progressive Lenses

- Dot reference marks
- Measure lens power at prism reference point

Induced prism

- Dot visual axis on lens
- Measure lens at this point



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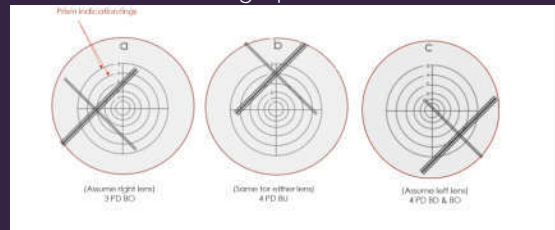
Fresnel Prism

- Press-on Prism
 - Nearly weightless
 - Up to 40 D
 - Cut into shape of spectacle lens
 - Temporary / Removable
 - Magnifies images



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Neutralizing Spectacles with Prism



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Prism Compensation Device

- Use when > 5 prism diopters in specs
- Rotating the knob around its own axis changes the reading of the prism diopter power scale*
- Rotating the knob around the optical axis of the lensmeter changes the base apex line of the prism*



*Exact steps vary by lensometer model and brand.
Check owner's manual for instructions for your model.

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References

<https://www.slideshare.net/AlvinaPaulineSantag/2017-basic-mobility-examination>

Pediatric Ophthalmology and Strabismus edited by Kenneth W. Wright, Peter H. Spiegel
The Ophthalmic Assistant, Stein Slatt Stein

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