American Association for Pediatric Ophthalmology and Strabismus

Eye Trauma and Common Early Childhood Vision Disorders

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MCHB funded National Center for Children's Vision and Eye Health

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The organization's goals are to advance the quality of children's eye care, support the training of pediatric ophthalmologists, support research activities in pediatric ophthalmology, and advance the care of adults with strabismus.

- AAPOS has 842 members. Members are ophthalmologists who have completed one year of additional training in pediatric ophthalmology or strabismus.
- The mission of AAPOS is to promote the highest quality medical and surgical eye care worldwide for children and for adults with strabismus.

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Eye Trauma and Common Early Childhood Vision Disorders

Objectives: At the end of this presentation you will be able to…

- Recognize and manage an ocular emergency
- Describe three common early childhood vision disorders and the importance of seeking timely care to treat those disorders
- Describe the importance of adhering to a treatment plan from an eye care professional

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Discussion Topics

- **Trauma**
  - Corneal abrasion and foreign body
  - Subconjunctival hemorrhage
  - Hyphema (blood in the eye)
  - Ruptured globes
  - Periocular lacerations
- **Misaligned Eyes (Strabismus)**
  - Horizontal and vertical deviations
- **Vision Loss**
  - Refractive error
  - Amblyopia (“lazy eye”)
    - Strabismic amblyopia
    - Refractive amblyopia
    - Deprivation ambyopia
- **Vision Screening**
  - Evidence-based methodology
  - Keys for success

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Trauma

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Case Report

- Case: 5 year old gets poked in the eye while at school. A little while later she is noted to be tearing and and appears to be in pain and sensitive to light. Eye seems a little red, but difficult to determine as she doesn't want to open the eye.

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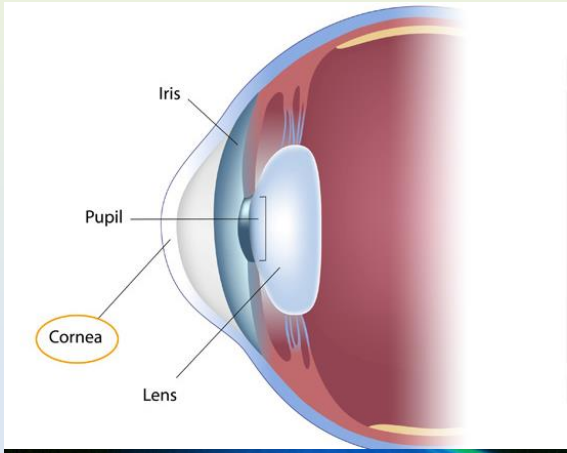
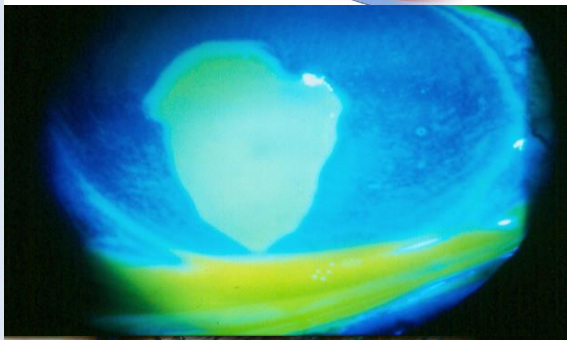
Corneal Abrasion

- Common problem
- Check for signs of impact on eyelid.
- May be associated with more significant ocular injury.
- Key questions:
  - **Was the injury witnessed? History is critical.**
  - **Was it a high impact injury?**

This is an emergency!





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Corneal Abrasion

- Needs immediate referral to a pediatric eye care provider
- Even very young children can be examined

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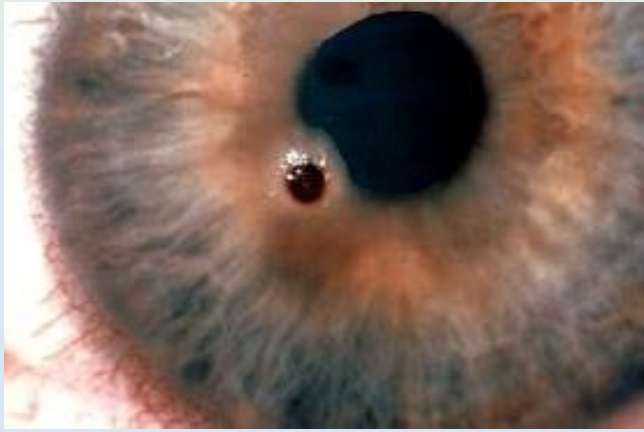
Corneal Foreign Body

- Ocular pain or irritation
- Closing one eye
- History important: dust, debris, especially on windy day. Also see rocks, pencils, etc.
- Often visible on casual close exam



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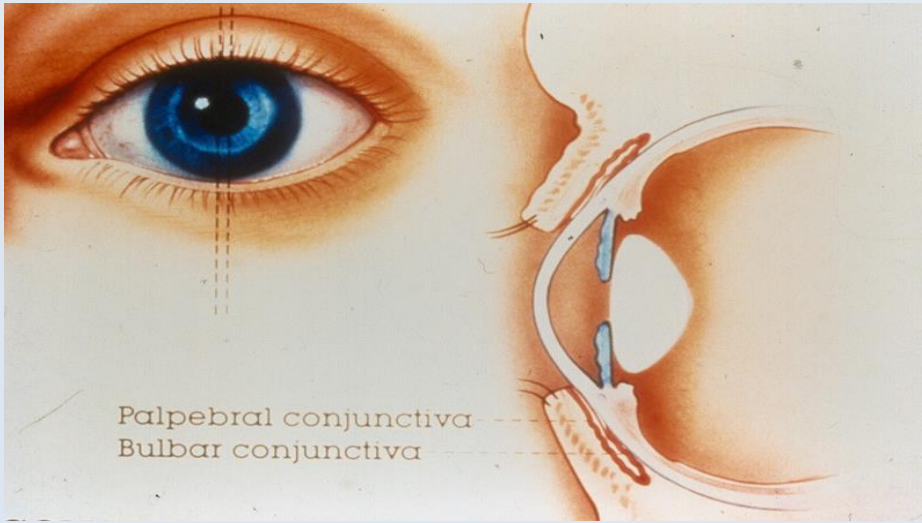
Subconjunctival Hemorrhage



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Red Eye and Traumatic Injury

History is important!

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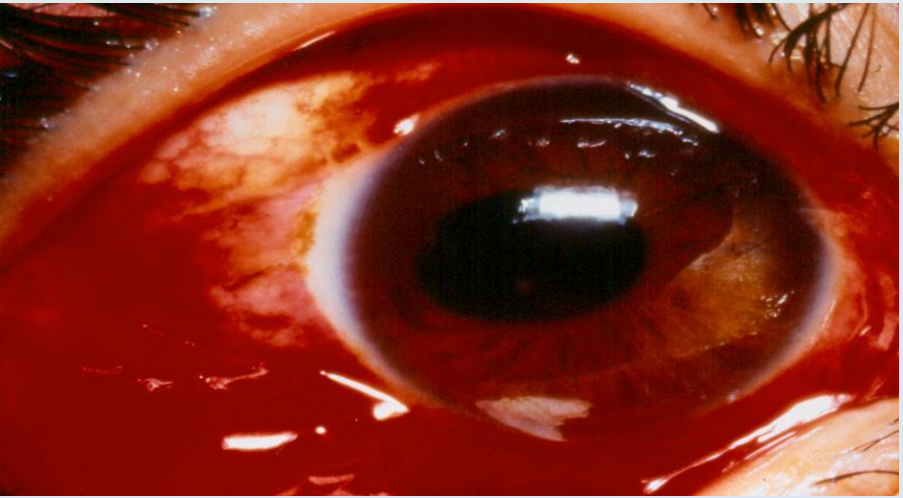
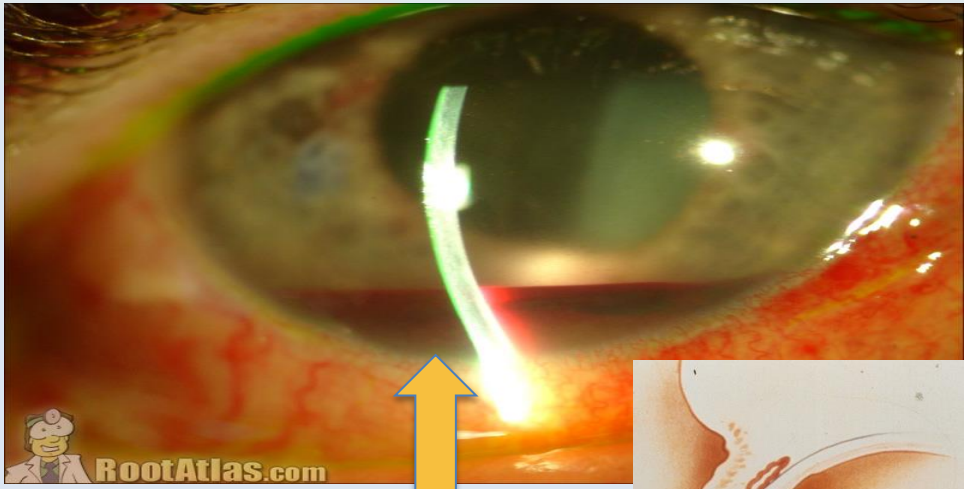
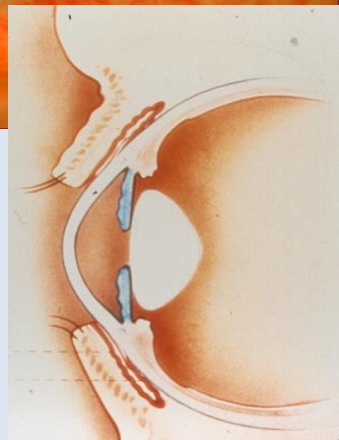
Red Eye and Traumatic Injury





hyphema



This is an emergency!

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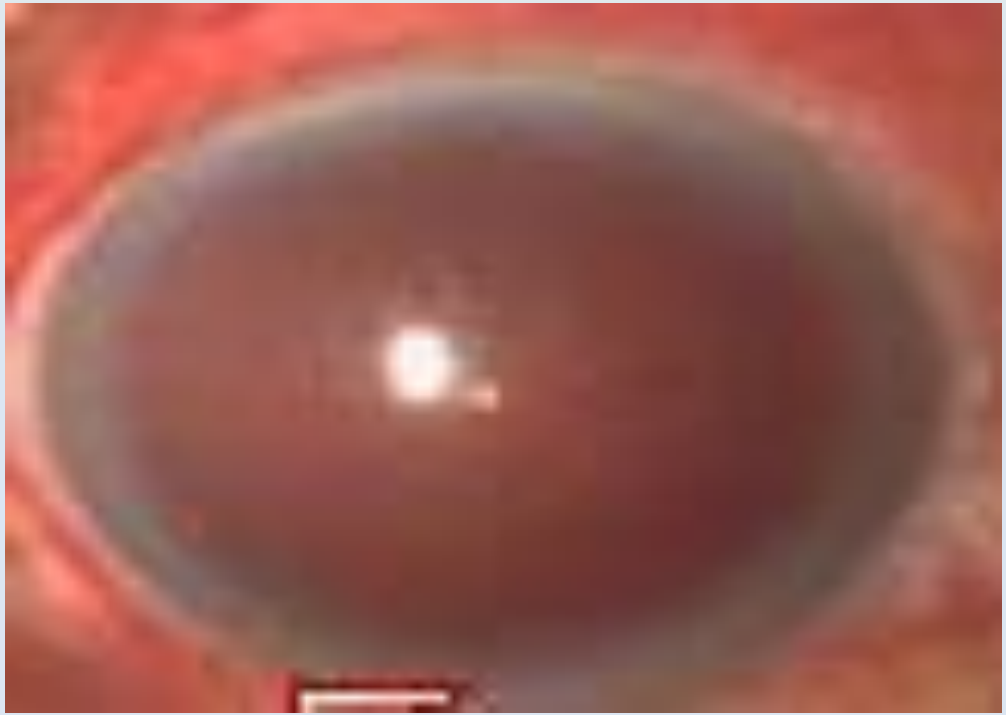
Red Eye and Traumatic Injury



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Case Report

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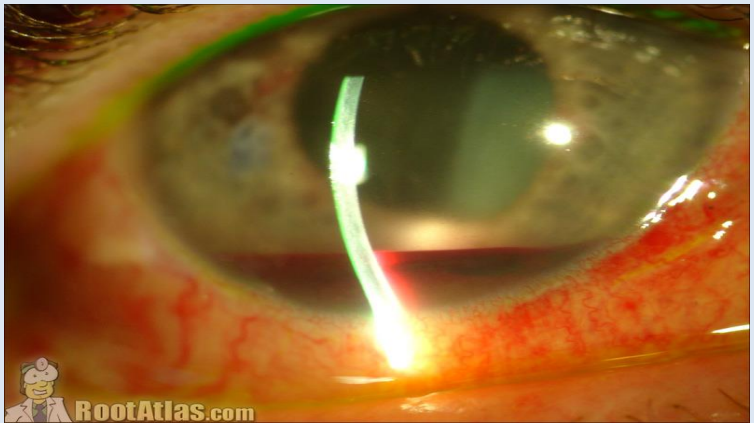
Case Report

- 6 year old struck in eye with soccer ball
- Noted pain and immediate loss of vision
- Layered blood in anterior chamber
- Retinal bruising
- Traumatic glaucoma



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Ocular Trauma: Soccer

- Soccer balls, especially if underinflated, can deform on impact, enter the orbital opening, and cause more severe globe deformation
- Worse in children with incompletely developed orbital rims
- Orbit still absorbs most of the impact, preventing devastating injuries

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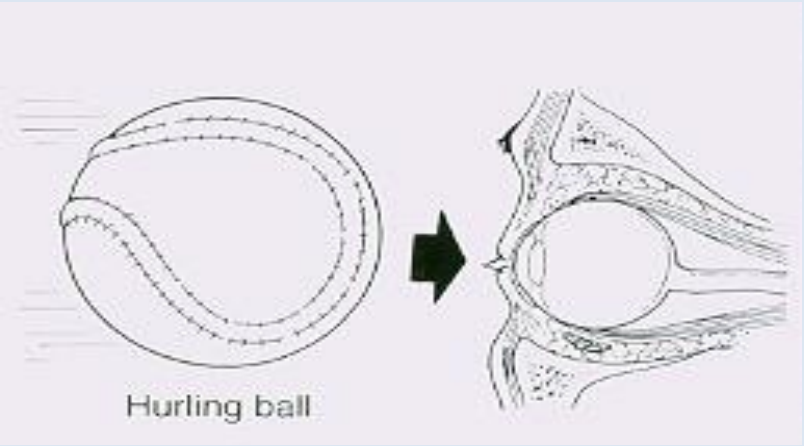
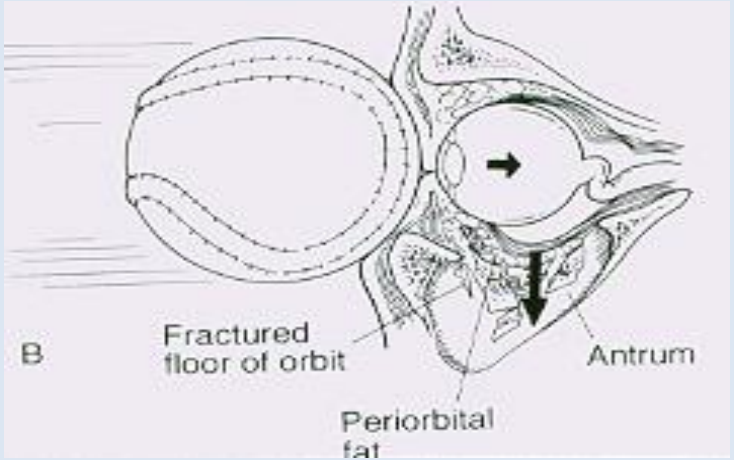
Ocular Trauma: Baseball

- Relatively large size of official baseball makes it difficult to enter the orbit and directly strike the globe





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Ocular Trauma: Baseball

- Number one cause of sports-related eye injuries among the 5 to 14 year old age group
- The younger the batter the greater the risk of being hit by a pitched ball
- In the major leagues, most injuries are caused by batted balls (55%)
- 12 year old pitches at a velocity of 40 to 50 mph

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Case Report

- 10 year old struck in right eye playing basketball
- Noted immediate decrease in vision
- Exam in Emergency Room revealed Light Perception (LP) vision
- Patient referred for further evaluation

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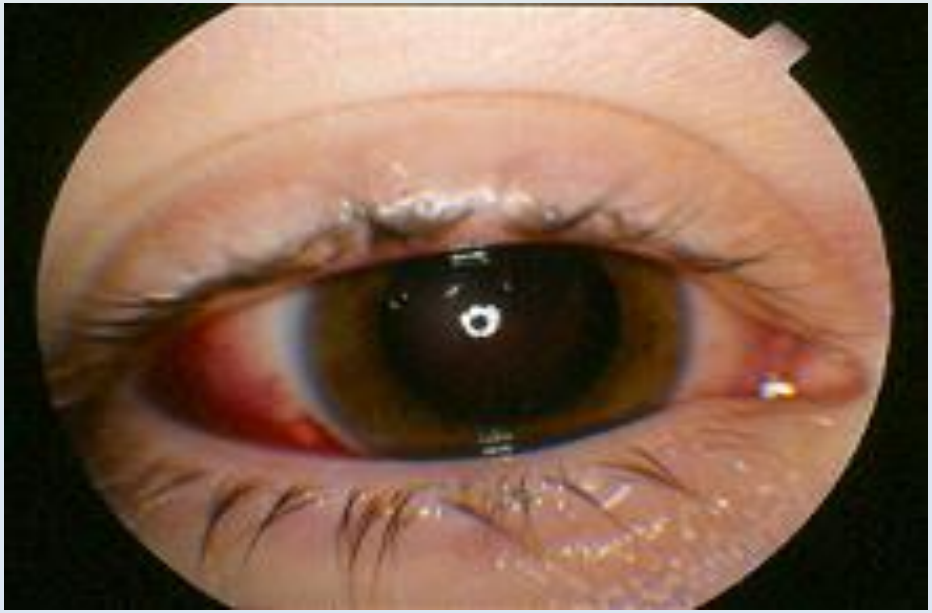
Case Report



- No Light Perception (NLP) right eye, 20/20 left eye
- Conjunctival laceration
- Conjunctival hemorrhage

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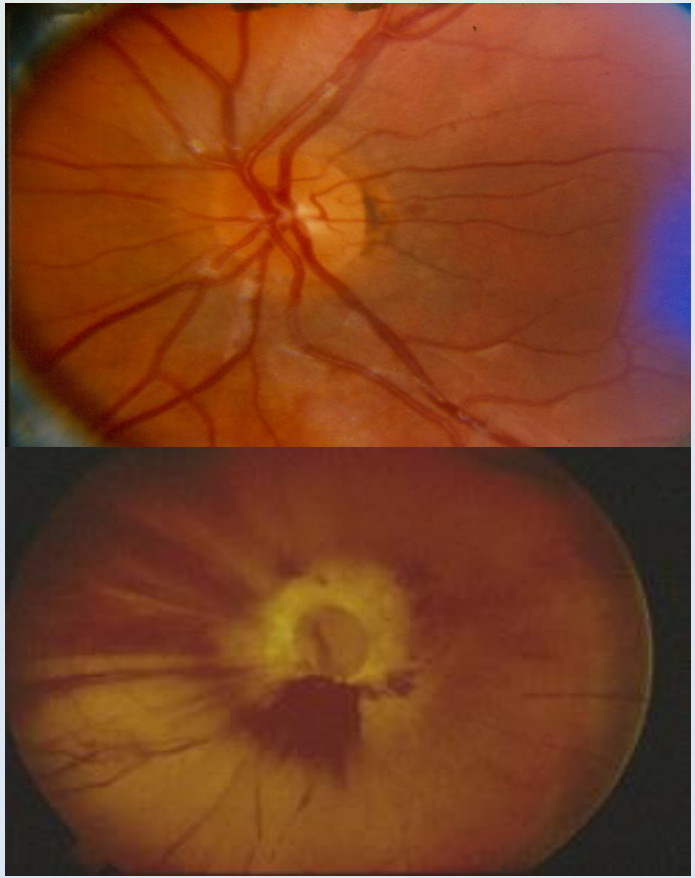
Case Report



- Optic Nerve Avulsion
- Most cases occur when blunt object intrudes between globe and orbital walls
- Globe is suddenly rotated or anteriorly displaced
- The sclera around the optic nerve is torn, the weakest portion of the ocular coat

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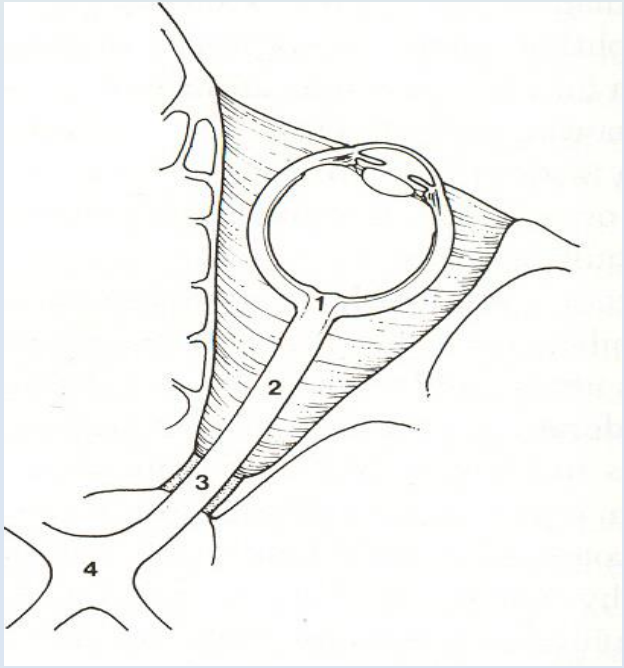
Case Report



- Patient admitted, placed on high dose steroids
- No improvement
- Polycarbonate safety glasses

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Ocular Trauma: Basketball

- Most injuries caused by opponent's finger (36%) or elbow (29%) while rebounding
- Skills (shooting, rebounding) occur above athletes head; inadvertent contact unavoidable

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Ocular Trauma: Basketball

- Globe rarely threatened by projectile-type injury
- Size and inelastic properties of basketball make it unlikely to fit into orbit, and strike globe directly

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Case Report: Paintball

- 15 year old male struck in right eye with “high propulsion paint ball”
- Noted to have reduced vision and referred

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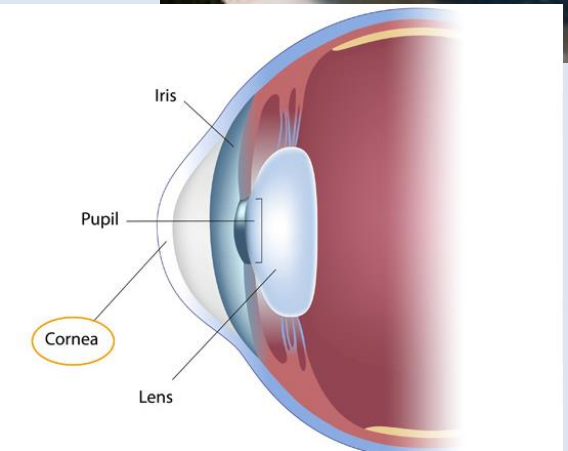
Case Report: Paintball



- Vision: 20/300 right eye
- Conjunctival hemorrhage
- Corneal abrasion and hyphema
- Subluxed lens and cataract
- Cataract surgery
- Developed glaucoma; had glaucoma surgery
- Final visual acuity: Hand Motion

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Ocular Trauma: Paintball

- Strongly advise adequate ocular protection

Ocular Trauma: Golf

- Golf injuries are often severe, although relatively infrequent

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Ocular Trauma: Golf

- Golf balls fit nicely within the orbital rim
- Club heads fit nicely within the orbital rim

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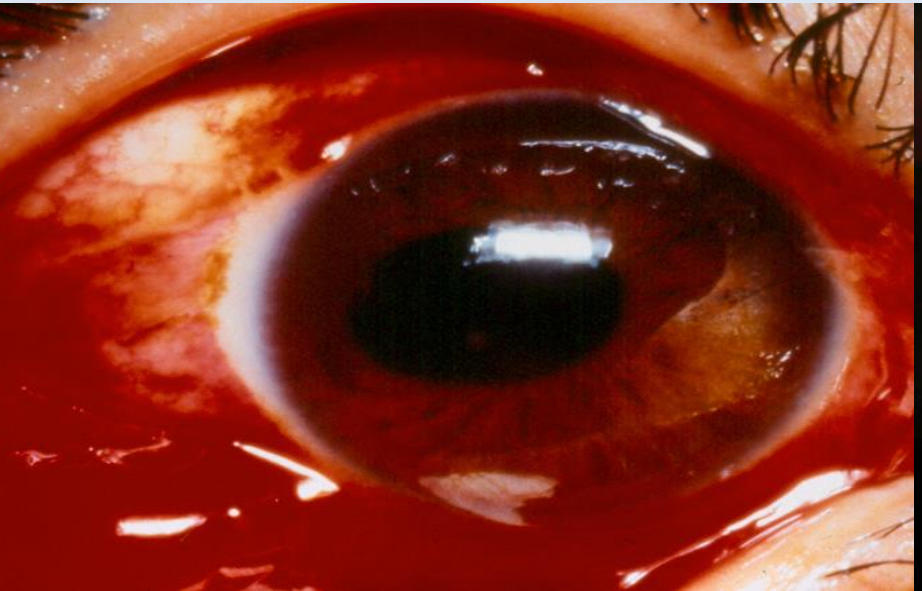
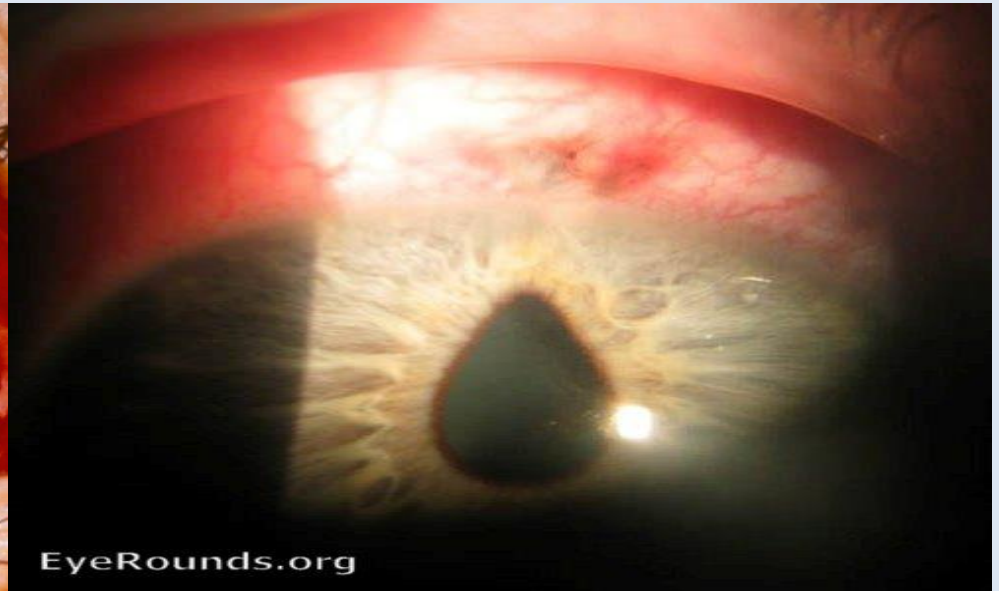
Ruptured Globe

- Look at pupils – Check that both pupils are round





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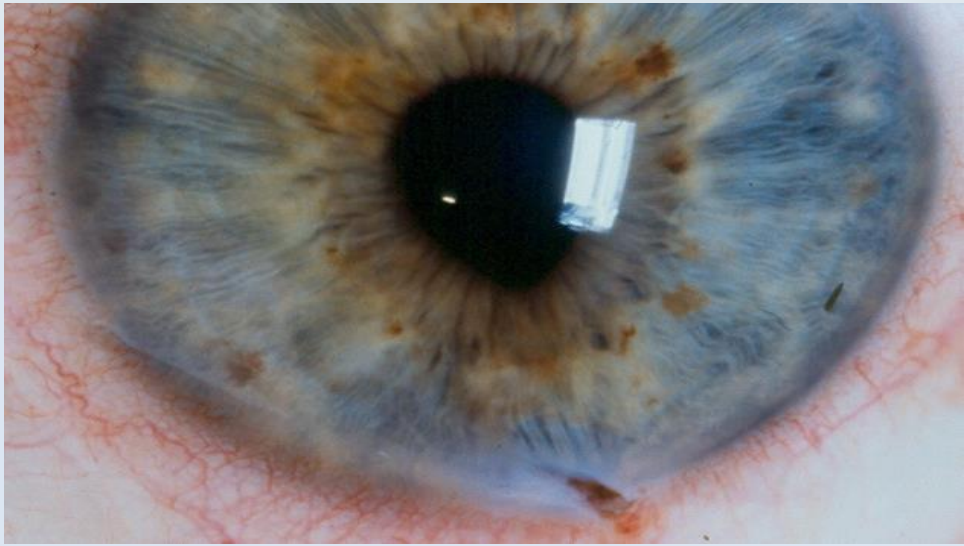
Traumatic Injury



Ruptured globes

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Ocular Trauma: Racket Sports

- Most injuries from high velocity projectile …
- … or a racket

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Ocular Trauma: Racket Sports

- Small, compressible balls contribute to the eye injury

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Ocular Trauma : Racket Sports

- Open eye guards: protective or risky?

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Protective Eyewear

- Polycarbonate: very high impact resistant plastic

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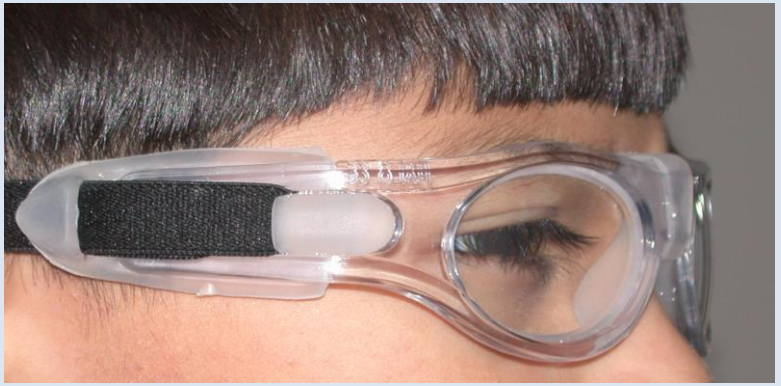
Protective Eyewear

- Sports injuries are not accidents
- They are predictable events
- With education and protective equipment, potential to prevent injury to well over 100,000 eyes per year



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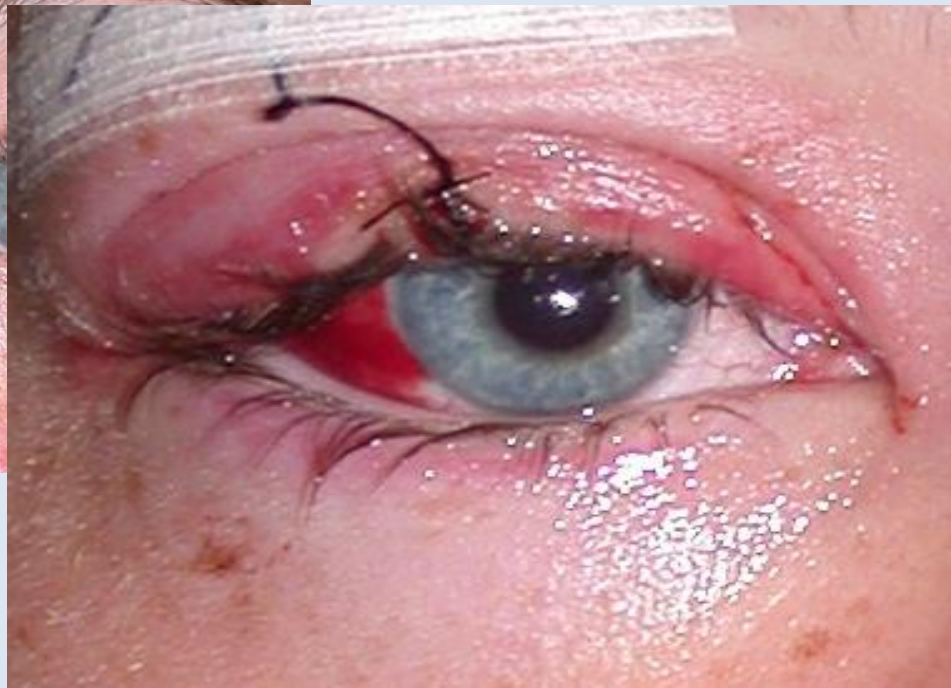
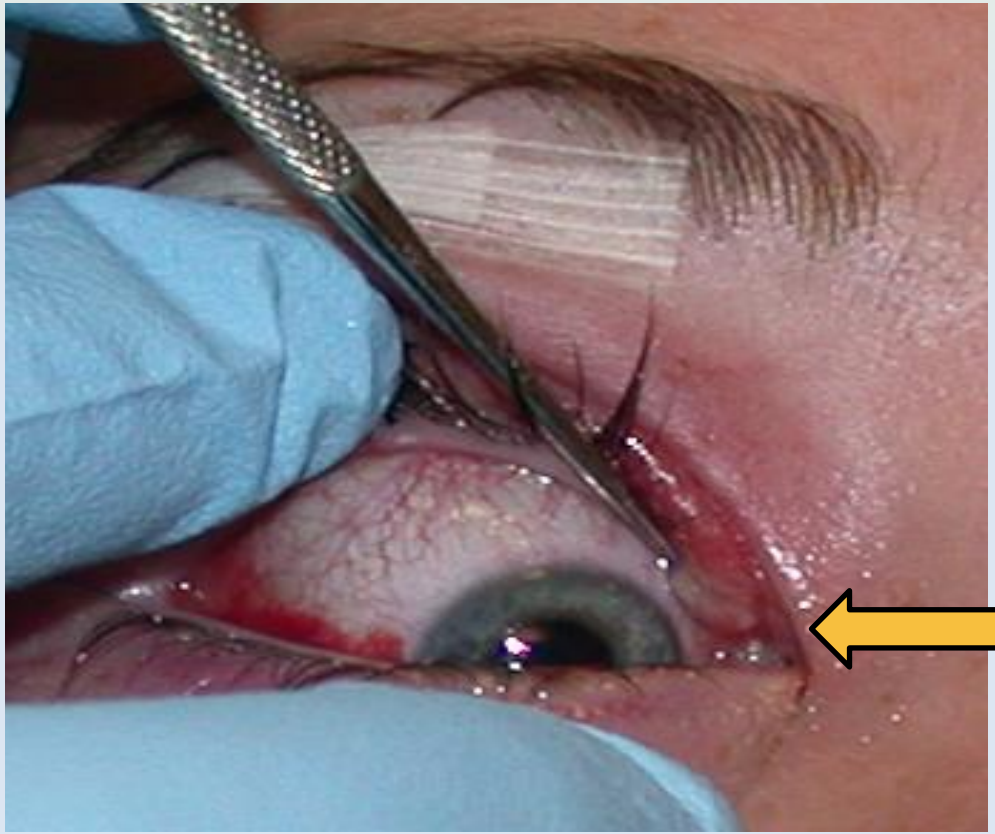
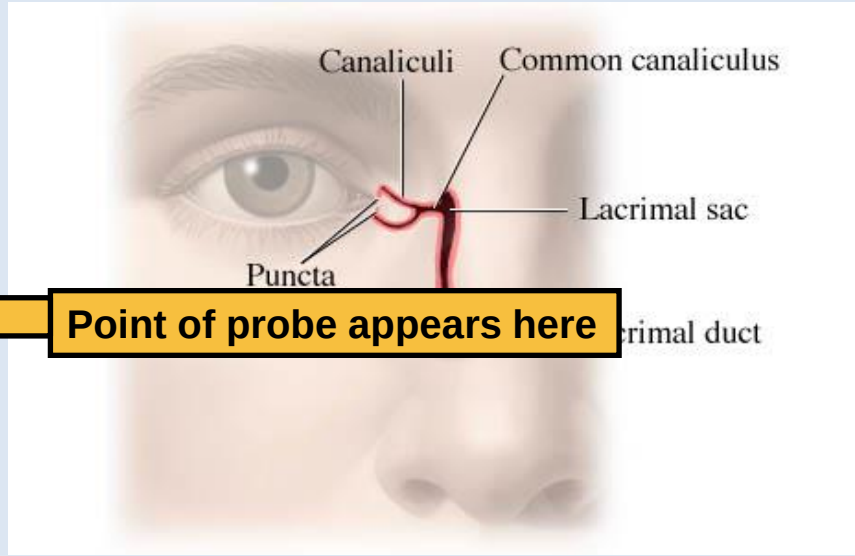
Case Report: Eyelid Laceration






Canaliculi
Common canaliculus
Lacrimal sac
Puncta
Point of probe appears here
rimal duct

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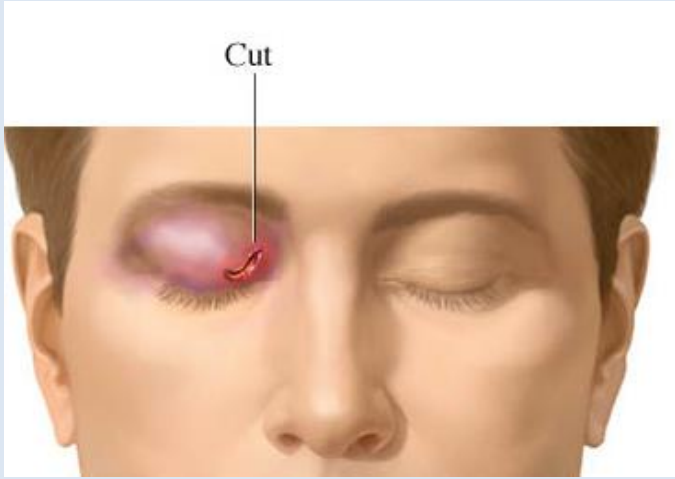
Eyelid Laceration

- Need to rule out injury to deeper tissues (such as tear drainage system) and the globe of the eye



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Conjunctival Laceration

Case Report

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Case Report

- 4 year old referred for foreign body injury to eye
- By history, patient fell onto pencil while jumping on the couch
- Trauma unwitnessed

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Case Report

- 12 month old referred from outlying institution with lid laceration and hyphema
- By report, she fell and struck eye on picture frame
- Trauma unwitnessed

Case Report

- Full-thickness laceration of left upper eyelid
- Moderate conjunctival injection, no bullous hemorrhage
- 2-3 mm hyphema in anterior chamber
- Anterior chamber well-formed; no signs of ruptured globe

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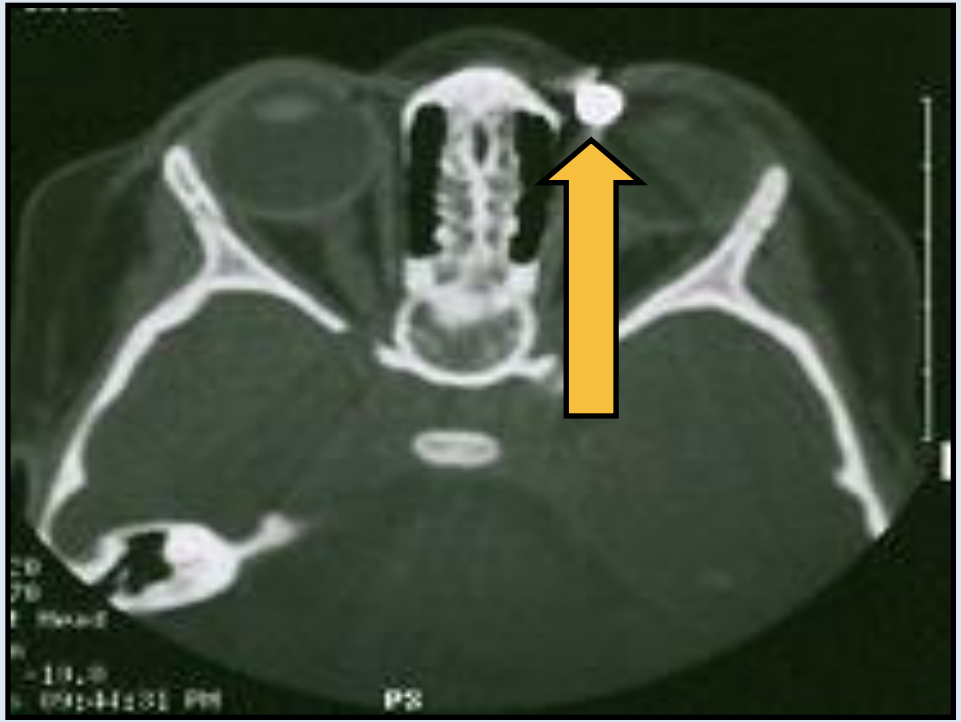
Case Report



- Brain normal
- Globe intact
- Round foreign body in left orbit, adjacent to globe

Case Report: Follow-up

- Exam under anesthesia
- Repair of lid laceration, orbital exploration
- Foreign body removed; found to be a B-B pellet
- B-B was fired by 11-year old playing in the house

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B-B Gun Injuries

- High potential for serious ocular injury; associated with the worst visual prognosis
- Most guns easily attain muzzle velocity of 103m/sec., which can penetrate human cornea
- Estimate responsible for 1000 ocular injuries per year

B-B Gun Injuries

- Of 22 eyes with penetrating BB gun injuries, 19 were unsalvagable, 3 had vision less than 5/200
- Degree of disruption out of proportion to severity of entry wound
- Polycarbonate protective lenses can withstand impact of air gun pellet

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Misaligned Eyes (Strabismus)

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Visual Milestones: When should a child's eyes be straight?

- At birth?
- One month of age?
- Two months of age?
- Six months of age?
- One year of age?
- Three years of age?

Have you heard someone say: "He/she will grow out of it?

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Visual Milestones: When should a child's eyes be straight?

- **Good alignment by two months of age:**
  - Rarely well aligned at birth
  - Child will not "outgrow" misaligned eyes
  - Eyes should be straight when awake and alert and concentrating

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Major Categories of Strabismus

- **Esotropia** (eyes point in)
  - Congenital Esotropia
  - Accommodative Esotropia
  - Sensory Esotropia
- **Exotropia** (eyes point out)
  - Intermittent Exotropia
  - Sensory Exotropia
- **Hypertropia** (vertical)
  - Superior Oblique Palsy

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Misaligned Eyes: Strabismus

- Many people have misaligned eyes
  - May turn in, out, up or down
  - May be constant or intermittent
  - Prevalence: 3.3% white, 2.1% African American (Baltimore Eye Disease Study)
  - Primarily horizontal

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Strabismus

- What does this patient see?

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Diplopia (Double Vision)

- Young children quickly develop the ability to suppress image from the deviating eye
- Patients with early onset misalignment of the eyes and stable deviations are unlikely to have diplopia
- Diplopia results usually from a new acquired misalignment, or worsening of a previously stable misalignment

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Misaligned Eyes: Strabismus

- Any misaligned eyes in children must be evaluated, even if intermittent
- May see misalignment or closure of one eye only when out of doors
- May see misalignment only when reading or focusing at near

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Congenital Esotropia

- Most common strabismus in infancy: 0.26% births
- Large angle, constant esotropia, present before six months of age

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Congenital Esotropia Treatment

- Treatment is early surgery, after treatment of amblyopia
  - Eyes should be well aligned by 24 months of age
- Early treatment may repair cortical binocular functions in some infants

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Accommodative Esotropia

- Over convergence with focusing, i.e. accommodating
- Intermittent misalignment with onset between 1-1/2 and 3 years
- Deviation usually smaller than congenital; may be inapparent
- Amblyopia common

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Accommodative Esotropia Treatment

- Treatment: full time glasses, possible bifocals, possible surgery
- Prompt treatment improves outcome
- Want to maximize development of visual system during sensitive period

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Accommodative Esotropia

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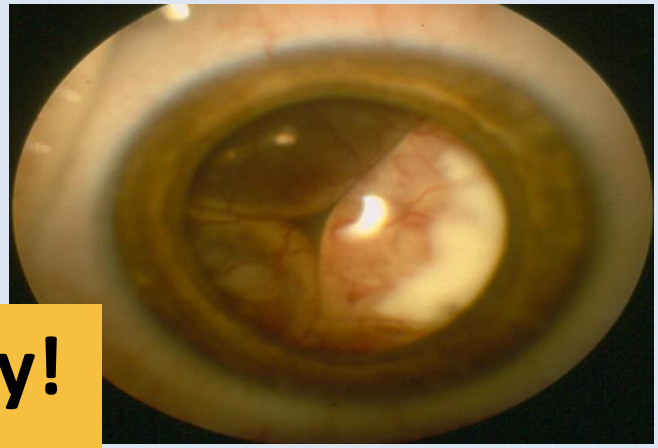
Sensory Esotropia

- Monocular vision loss early in life can lead to esotropia
- An organic lesion may lead to esotropia: microphthalmia, toxoplasmosis…
- Retinoblastoma



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Congenital Exotropia

- Large angle, constant exotropia
- Present before six months of age
- Normal distribution of refractive errors
- Often associated with neurologic or craniofacial disorders
- Surgery required

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Intermittent Exotropia

- Prevalence 1.0%
- Eyes drift out intermittently
- Worse during visual inattention, fatigue, illness, etc.
- High grade stereopsis may be present when eyes are straight
  - Amblyopia uncommon (9-13%)

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Intermittent Exotropia

- Onset usually before age 5
- Manifest more frequently with distant targets
- Reflex closing of one eye in bright light or when out of doors

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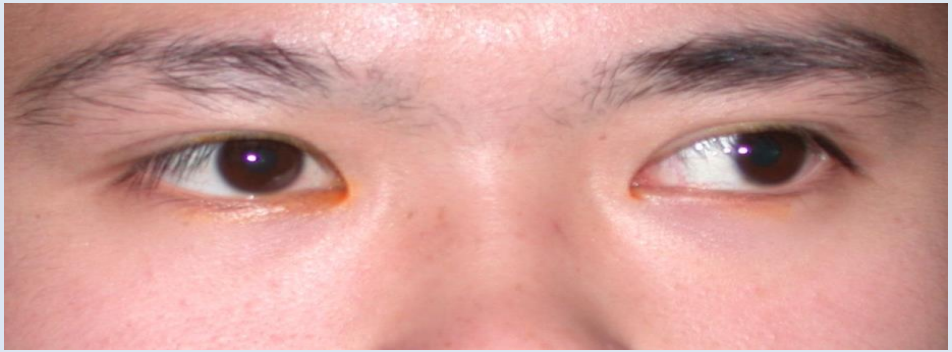
Intermittent Exotropia Treatment

- Correct “significant” refractive error
- Patching to improve control of misalignment



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Intermittent Exotropia Treatment

- Some may require surgery

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Vertical Deviations
Superior Oblique Palsy

Right head tilt

Left head tilt

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Vision Loss

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Refractive Error: Child Needs Glasses

- Myopia (Near-Sightedness)
- Hyperopia (Far-Sightedness)
- Astigmatism

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Types of Vision Loss

Deprivation Amblyopia

Refractive Amblyopia

Strabismic Amblyopia

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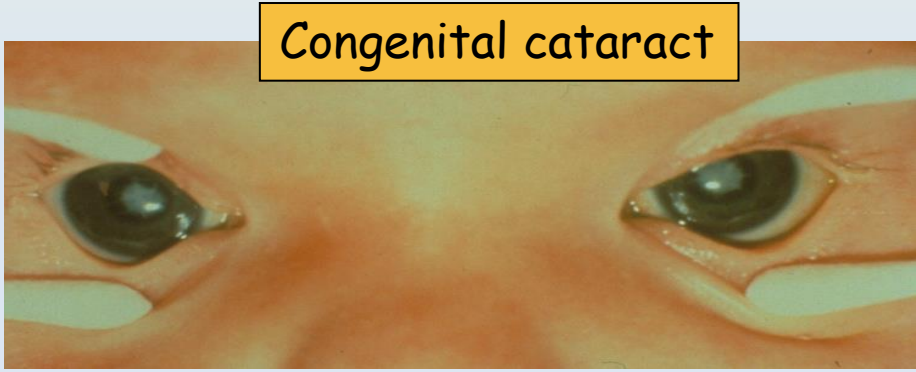
Causes of Vision Loss

- Interference with normal visual development during the "sensitive or critical period", i.e. use it or lose it!!
- Causes: **Media problem**
  - Image not able to be processed



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Deprivation Amblyopia Critical Period

- Brief period of monocular eye closure can cause:
  - Change in brain structure and function
  - Profound and irreversible loss of vision
- Corresponds to approximately the first two months of life in infants
- Visual axis must be cleared and rehabilitated by 2-3 months of age; early identification is critical

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Vision Loss

- Interference with normal visual development during the "sensitive period", i.e. use it or lose it!!
- Causes: **Strabismus**
  - Suppression of the image from one eye early in life leads to vision loss
  - This vision loss is reversible if detected and treated during early period of life: "sensitive period"

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Vision Loss

- Interference with normal visual development during the “sensitive or critical period”, i.e. use it or lose it!!
- Causes: **Refractive Error**
  - High amount of focusing required or asymmetry of focusing
  - Brain gets a blurry image from one or both eyes
  - Eyes may be straight
  - Glasses initially may not improve vision

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Vision Loss

- Refractive Amblyopia
- May be due to unequal refractive error
- Eyes typically straight
- Needs full time spectacle wear
- Patient will not immediately see better with the glasses

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Amblyopia Treatment Summary

- Remove media opacities early, ex. cataract surgery, eyelid surgery
- Straighten eyes with glasses or surgery if needed
- Provide clear visual image with glasses; glasses need to be worn full time.

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Amblyopia Treatment: Patching

- If there is an assymetry in vision, must switch fixation preference:
  - Patching: part-time, full-time
  - Penalization: drops or glasses
- Compliance decreases with increasing age

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Amblyopia Treatment: Patching

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Amblyopia Treatment: Patching

- Remember: "Where there's a will … there's a way!"

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Why Do Early Vision Screening

- Identify vision threatening conditions such as amblyopia
  - Poor vision in an eye that is otherwise structurally normal and healthy appearing
  - Develops in children from birth to 8 or 9 years of age (“sensitive period”)
  - Can be treated only during these early years of life; otherwise**, irreversible visual loss!**

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Preschool Vision Screening

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Preschool Vision Screening

Need evidence-based methodology to assess vision in children