

OCULAR TRAUMA

John D. Conklin Jr. MD
Associate Professor
Comprehensive Ophthalmology
University of Kentucky

Trauma

- “the most under recognized major health problem today”
- “study of injury” could significantly “reduce mobility and realize savings in both financial and human terms”

OCULAR TRAUMA

- permanent impairment to the visual system is rated nearly equal to impairment of the “whole man”
 - ie. total loss of vision in one eye equals 25% impairment of visual system and 24% impairment of whole man

Epidemiology of US Eye Injuries

- 2.4 million cases annually
- about 1 million suffer permanent visual impairment and > 75% monocular blindness
- majority <30 years of age
- > 3yoa, most common cause of enucleation

Epidemiology of US Eye Injuries

- #1 cause of monocular blindness
- #2 cause of visual impairment
- #1 cause of eye-related admissions

Economics of Ocular Trauma

- NSC suggests job-related incidents cost \$300 million annually
- 1985 6 mo. urban hospital study estimates \$5 million in annual direct/indirect costs
- <3¢ of every dollar is spent on eye injury research despite the CDC’s affirmation that such research “will more than pay for itself by reducing economic burden of injury and disability.”

Reduction of Incidence of Ocular Trauma

- PBA study: 90% of eye injuries are preventable
- Eye Injury Registry of Alabama
 - data collection focusing on
 - incidence
 - prevalence
 - demographics
 - causative factors
- Prevention via Education
 - eg. cooperative effort between US/Canadian eye MDs significantly decreased hockey-related eye trauma

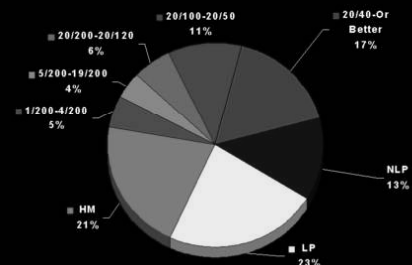


Selected Data
1988-2007
N=16,364

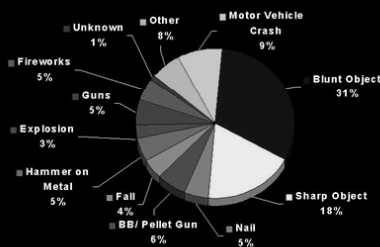
Age

- Range 0-103 years
- Mean 29 years
- Median 26 years
- <30 years = 57%

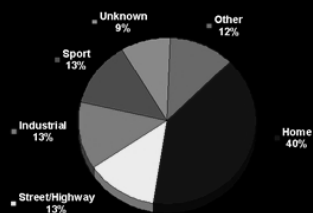
Initial Vision

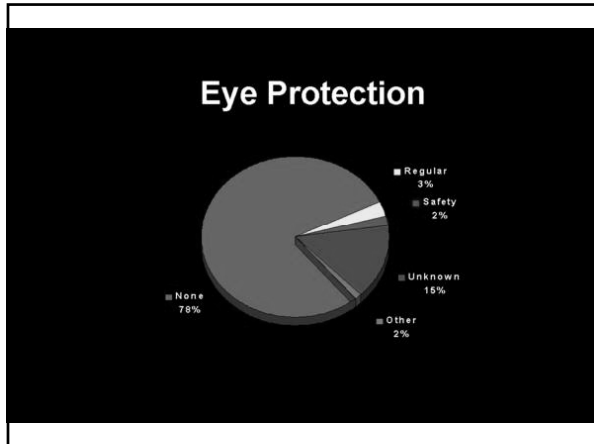


Source of Eye Injury



Place of Eye Injury

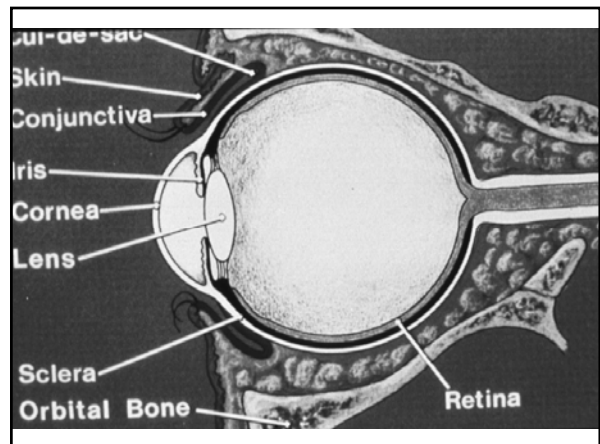
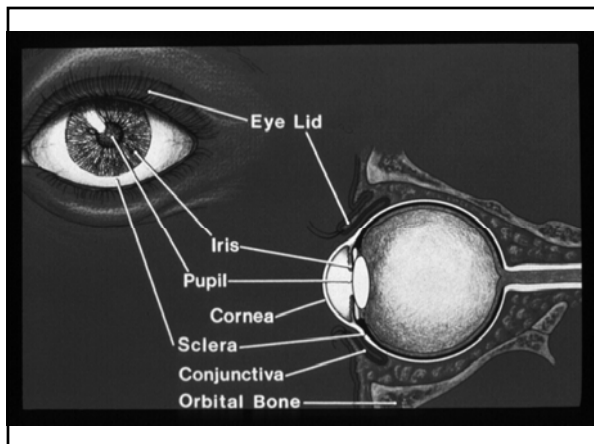


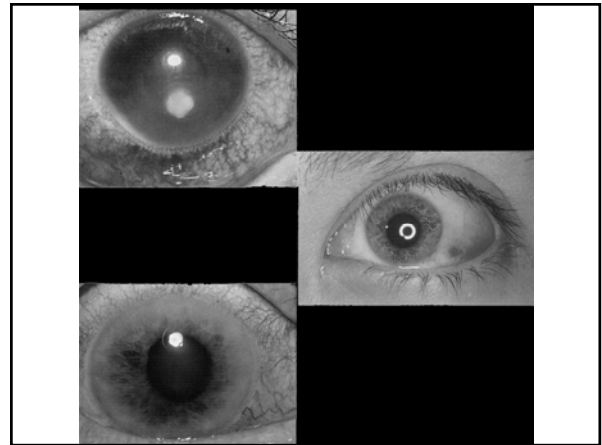
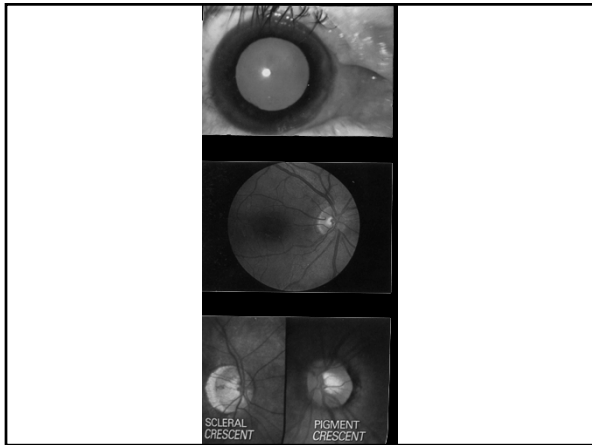
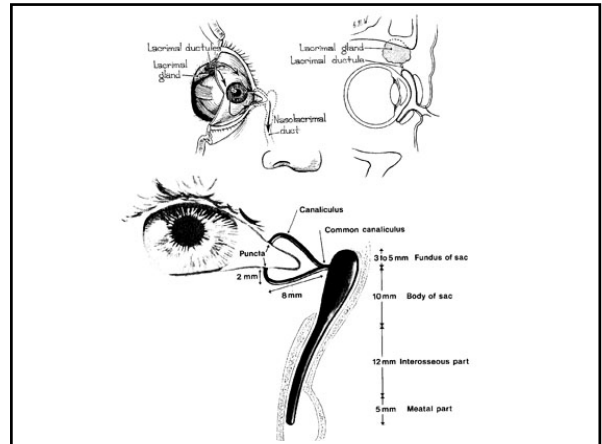
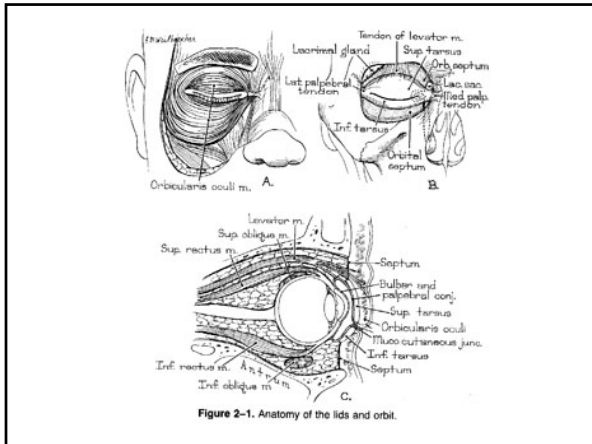


- ### Work Related Eye Injuries
- 16% Work Related
 - 95% were Male
 - Leading reported occupation: Construction
 - Leading reported injury source: Sharp Object

- ### Birmingham Eye Trauma Terminology System (BETTS)
- comprehensive standardized system of eye trauma terms to provide simple unambiguous and consistent classification
 - see handout

- ### Birmingham Eye Trauma Terminology System (BETTS)
- | | |
|---|---|
| <p>Endorsed by the:</p> <ul style="list-style-type: none"> • American Academy of Ophthalmology • International Society of Ocular Trauma • Retina Society • United States Eye Injury Registry • Vitreous Society • World Eye Injury Registry | <p>Mandated by:</p> <ul style="list-style-type: none"> • Graefe's Archives • Klinische Monatsblätter • Ophthalmology |
|---|---|





Ocular Trauma Categories

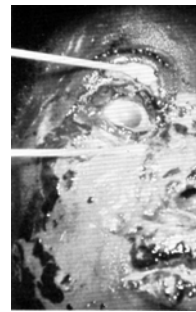
- chemical burn
- blunt/lacerating injury
- intraocular foreign body
- conjunctival/corneal foreign body

Chemical Burns

- vision-threatening injury requiring acute intervention
- types
 - alkali (eg. cleaning agents, fertilizer, pesticides)
 - acid (eg. car battery fluid)

Chemical Burns

- management:
 - topical anesthetic
 - direct copious irrigation for 15 – 20 minutes
 - inspect for foreign bodies and removal
 - check pH via litmus paper
 - evaluate visual acuity
 - Penlight w/cobalt blue filter to look for swelling, opacities and defects
 - if defect, patch with topical antibiotic/cycloplegic



Chemical Burns

- REFER stat if:
 - burn
 - reduced vision
 - severe chemosis
 - cloudy cornea



Blunt/Lacerating Injury

- etiology: sports, fights and MVAs
- mechanism: contusion may tear tissues or rupture globe
- sequelae:
 - globe rupture/penetration
 - hyphema
 - lid lacerations
 - orbital tissue contusion and bony fractures
 - coincidental facial/intracranial injuries

Blunt/Lacerating Injury

- history is key!
 - nature of object
 - site of impact
 - severity of blow
 - age of injury
 - reduced vision or field of vision, diplopia and/or pain?

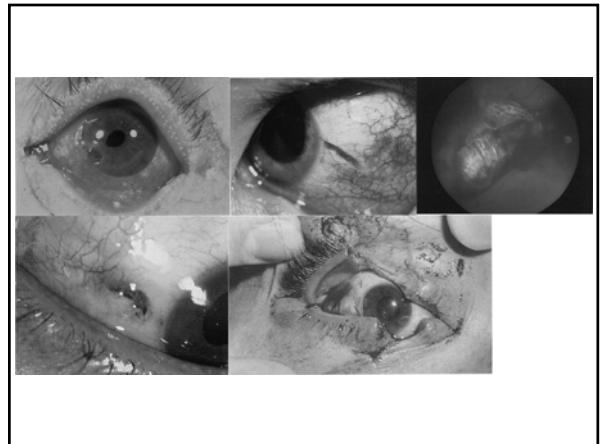
Blunt/Lacerating Injury

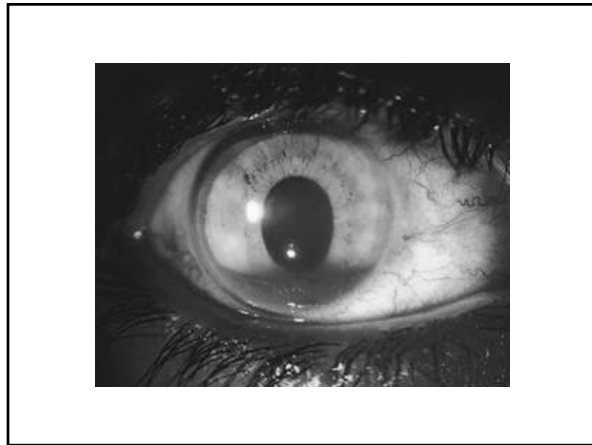
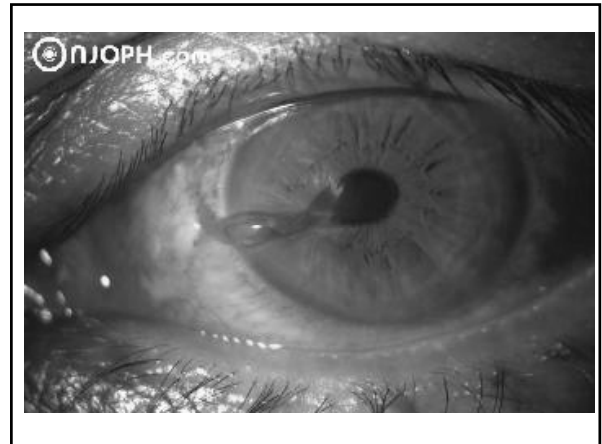
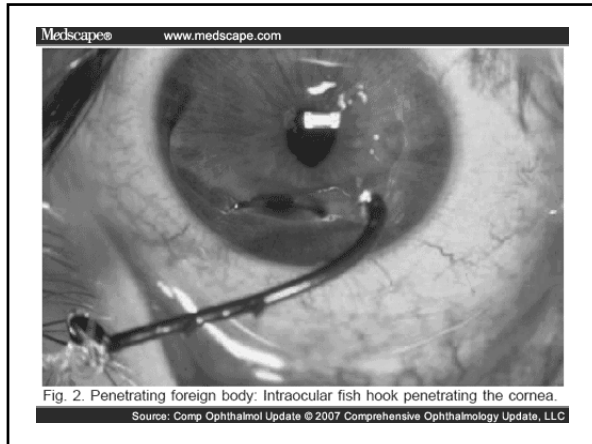
- exam
 - topical anesthetic with lids open for vision (but do not pry open)
 - lid laceration/proptosis
 - check EOMs and MB
 - inspect for small laceration/holes in lids
 - absent red reflex?

Blunt/Lacerating Injury

- look for:
 - severe chemosis/subconjunctival hemorrhage
 - corneal laceration
 - corneo/scleral laceration
 - globe deformation
 - hyphema

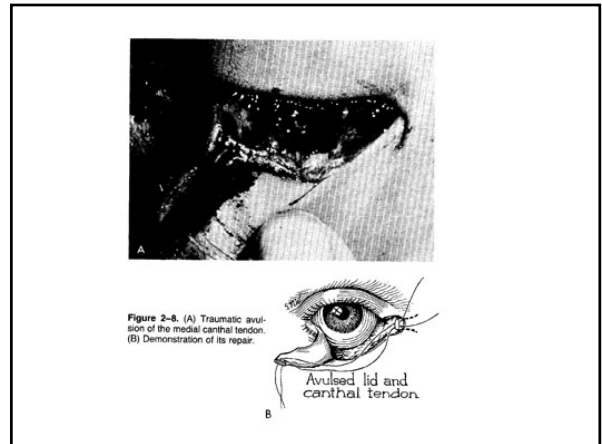
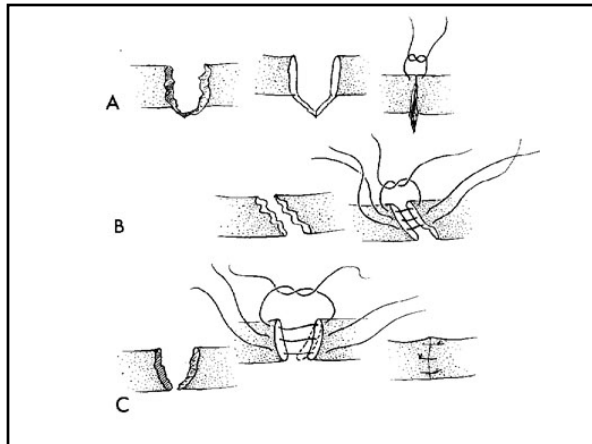
CAUTION: if suspect open globe, DO NOT forcibly open/retract lids!!

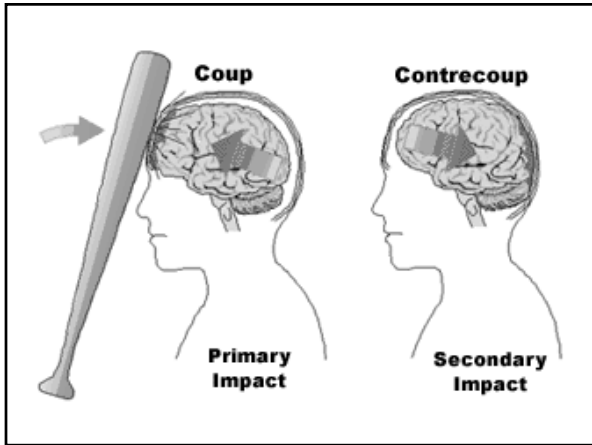
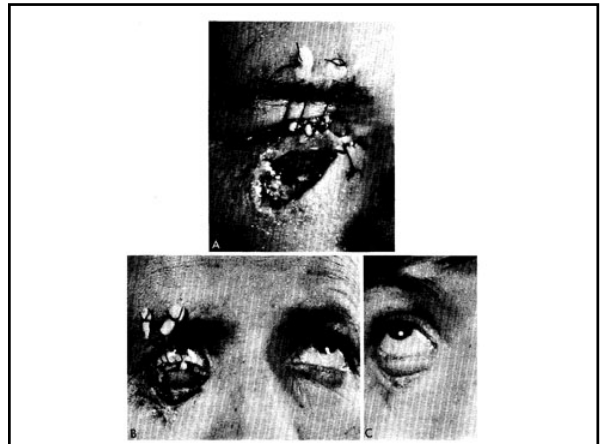
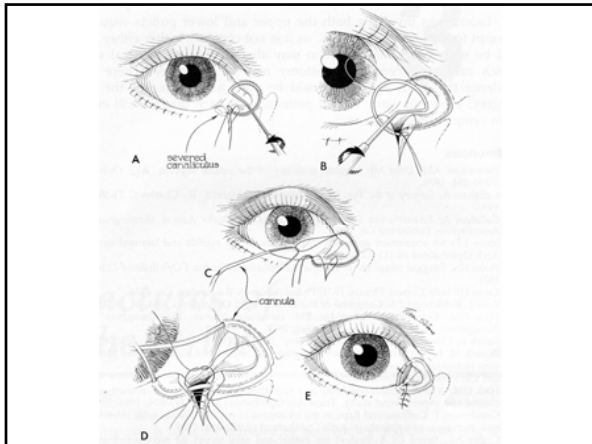




Management of Uncomplicated Lid Lacerations

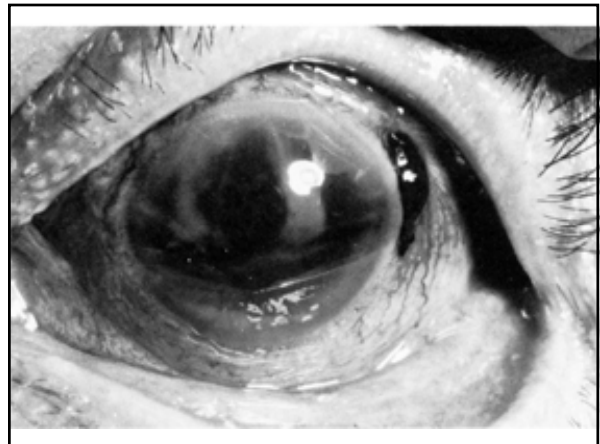
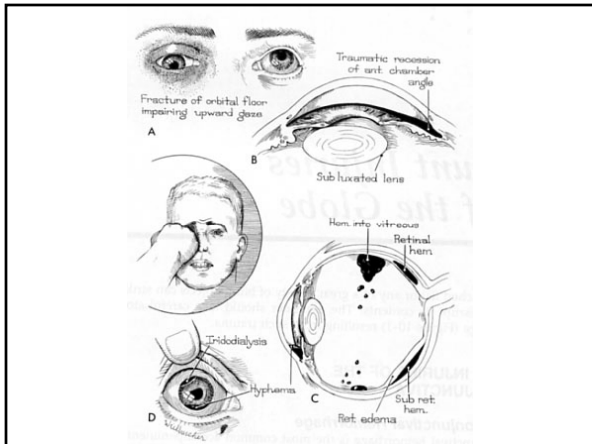
- antiseptic cleaning
- close with 6-0 Vicryl or Silk

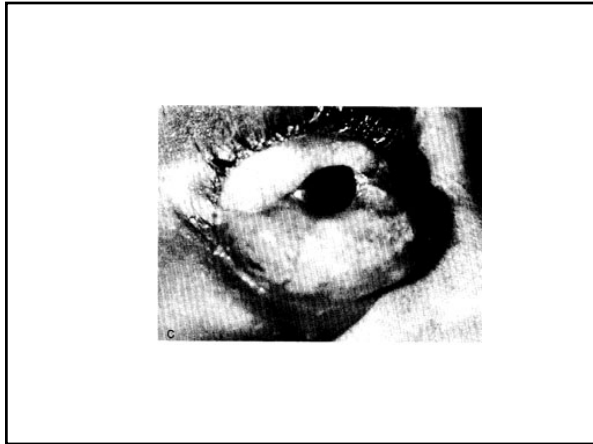
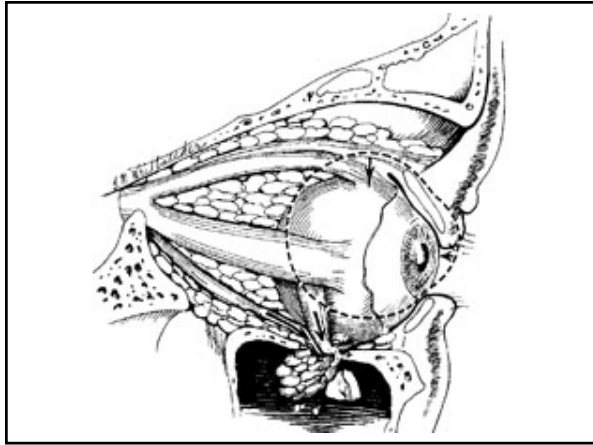
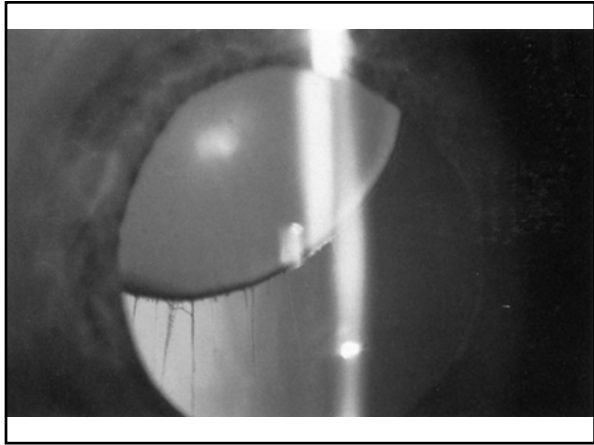
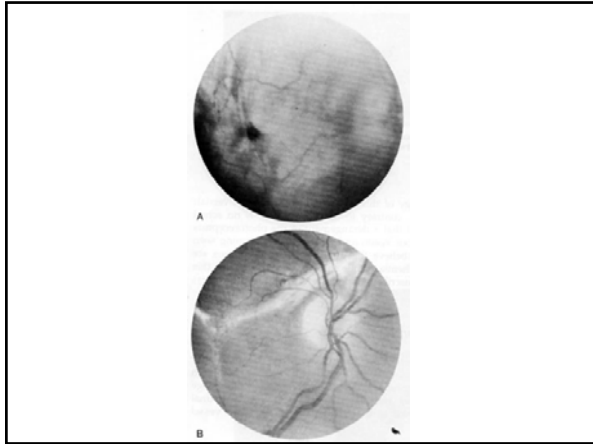
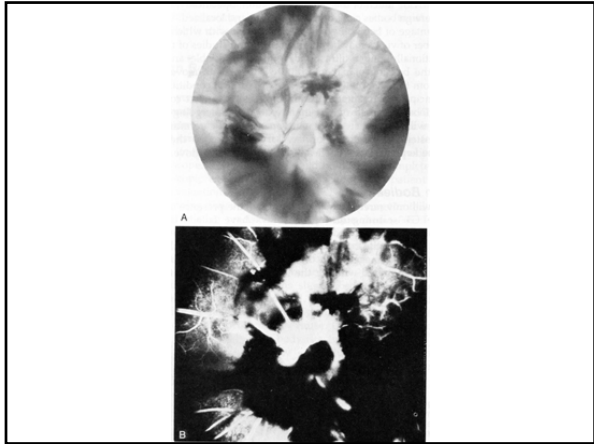


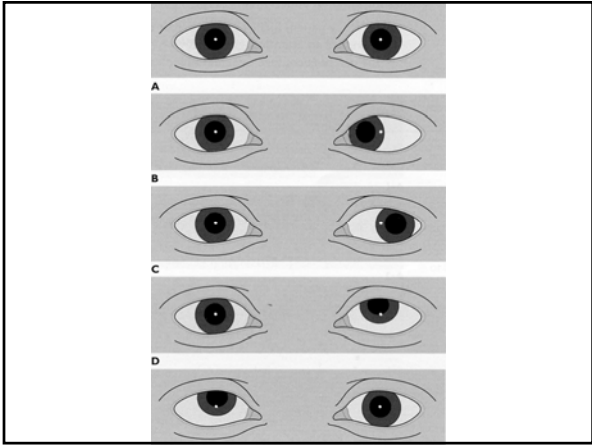
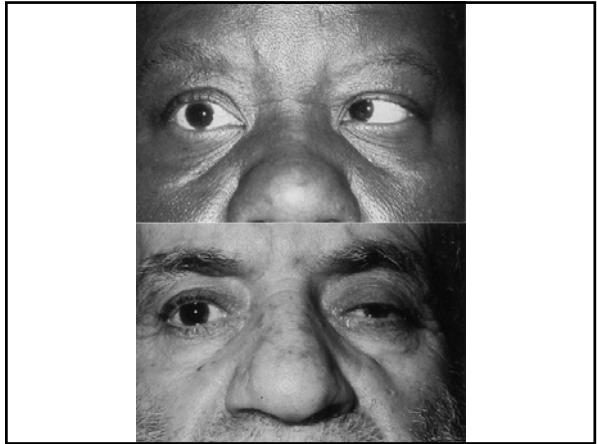
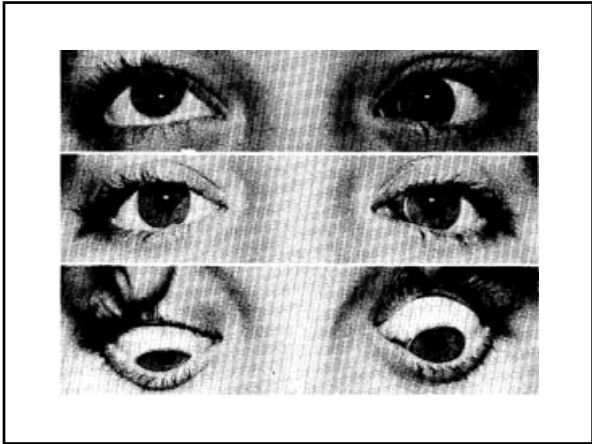


The **coup** injury is caused when the head is stopped suddenly and the brain rushes forward. It not only gets injured by hitting in the side of the skull but is also damaged as it rubs against all the inner ridges.

The **contrecoup** injury is caused when the brain bounces off the primary surface and impacts against the opposing side of the skull. Again, additional injury occurs as the brain again rubs against all the inner ridges.







TO REFER OR NOT TO REFER?

REFER if:

- abnormal vision
- severe pain
- correctopia
- corneo/scleral laceration
- deformed globe
- hyphema
- complex lid laceration

TO REFER OR NOT TO REFER?

- if only reduced motility, shield and refer within 24 hours
- if mild contusion of orbital soft tissues only, refer within 48 hours

Intraocular Foreign Bodies (IOFBs)

- etiology: high velocity missiles
 - metal bits from drilling/hammering
 - shotgun/BB pellets
- diagnosis: history important because of subtle signs

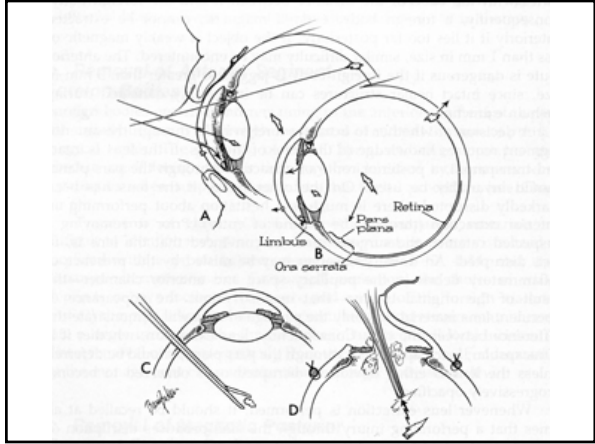
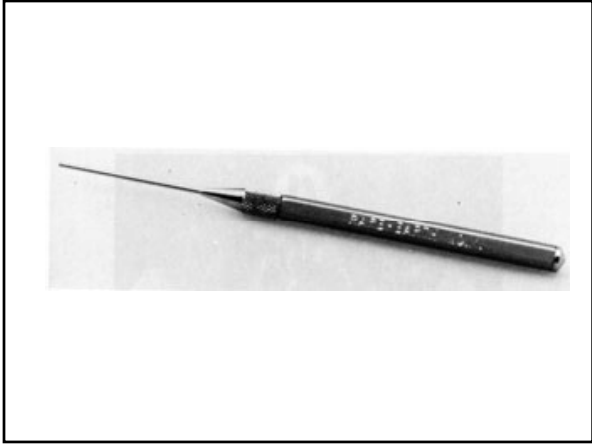
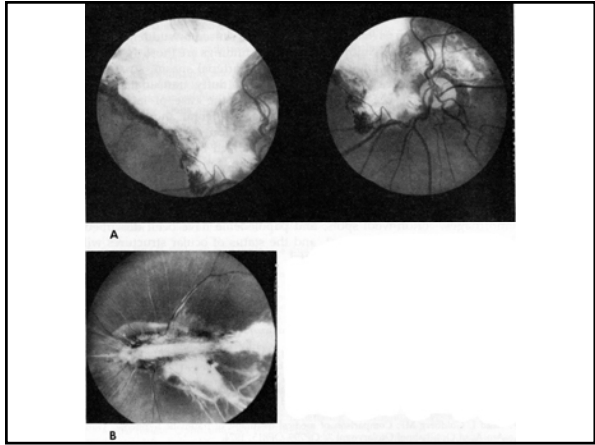
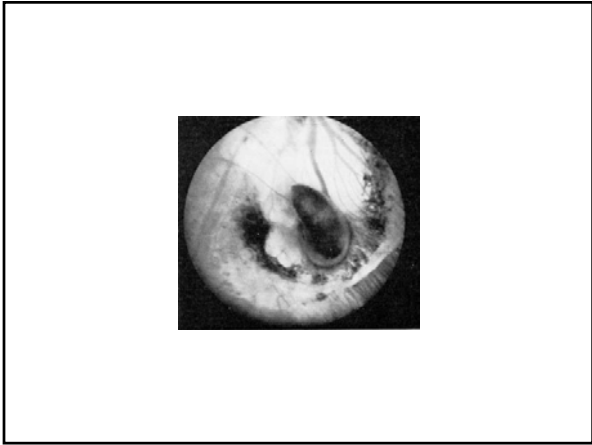
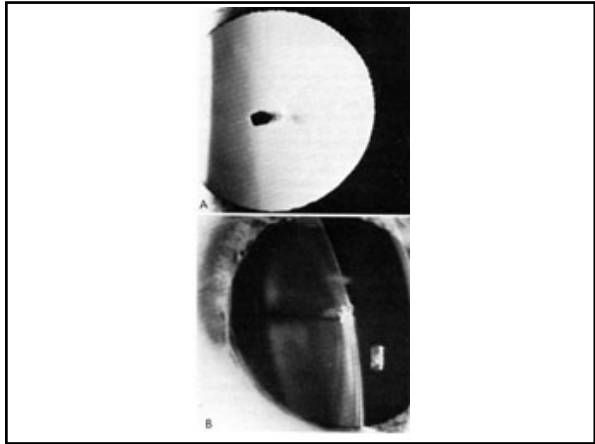
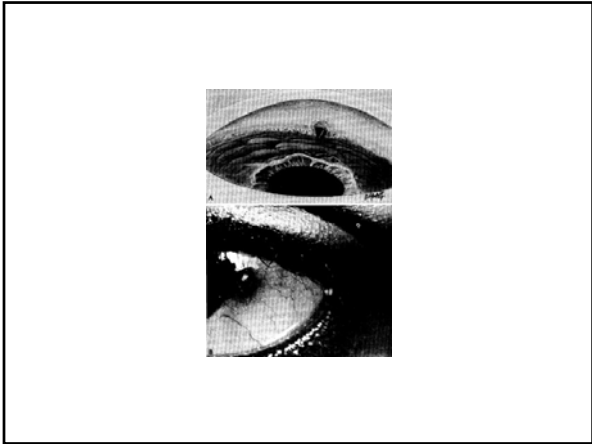
IOFBs

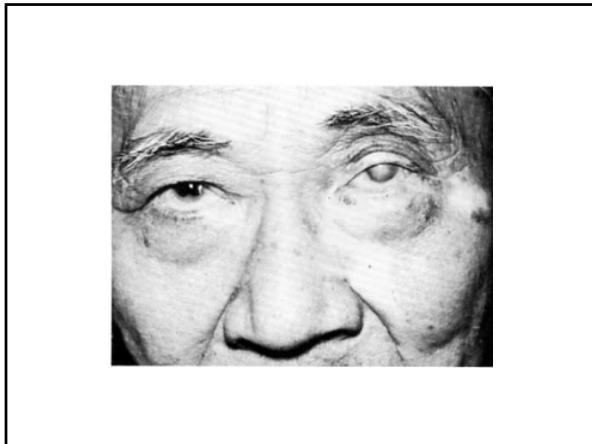
- sequelae: if delayed intervention,
 - cataract
 - glaucoma
 - retinal trauma/hemorrhage
 - chronic metallic toxicity
 - loss of vision
- prognosis: potentially good if early treatment

IOFBs

- REFER: immediately if history of high speed missile (even if no physical signs)







Subconjunctival/Corneal Foreign Bodies

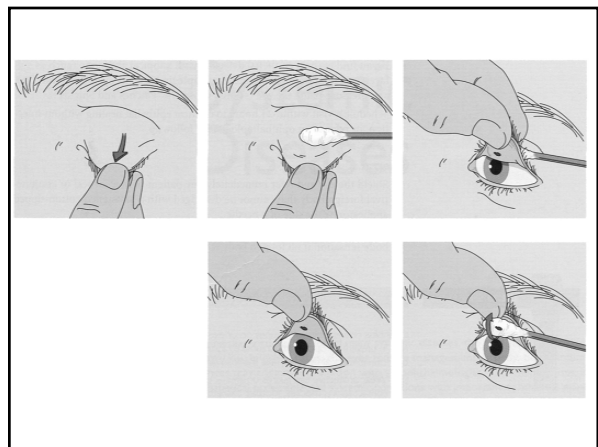
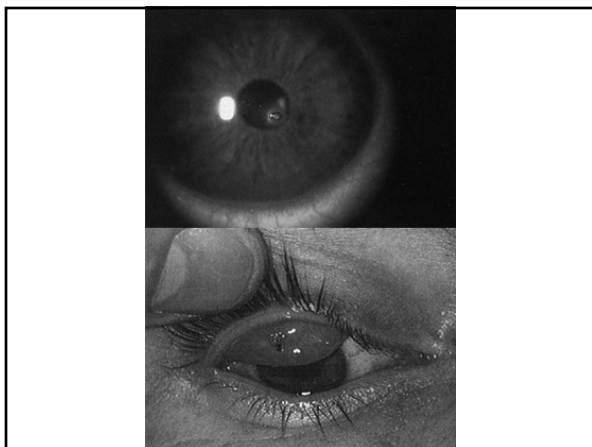
- exam:
 - check vision
 - inspect corneal/conjunctival surfaces with light and magnification
 - perform upper lid eversion and check inferior cul-de-sac
 - apply fluorescein for defects

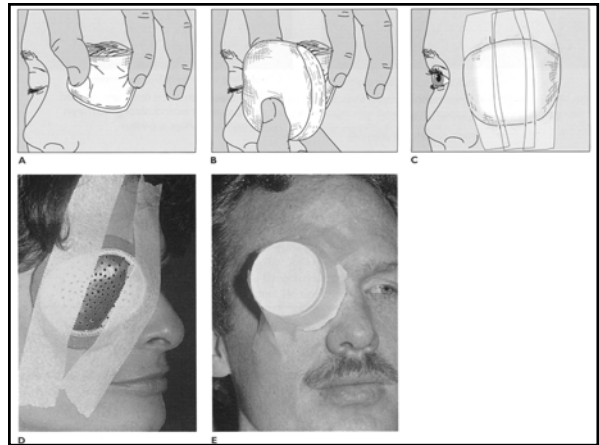
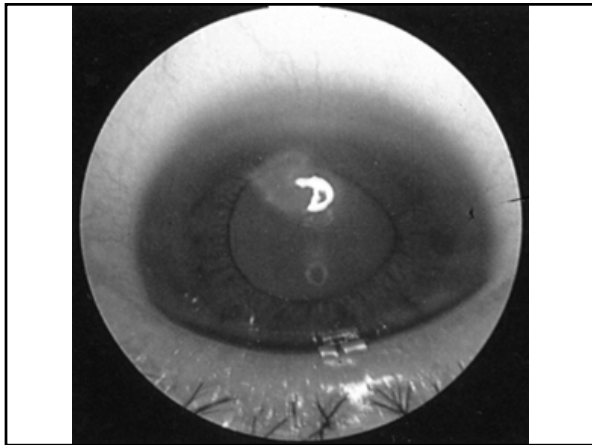
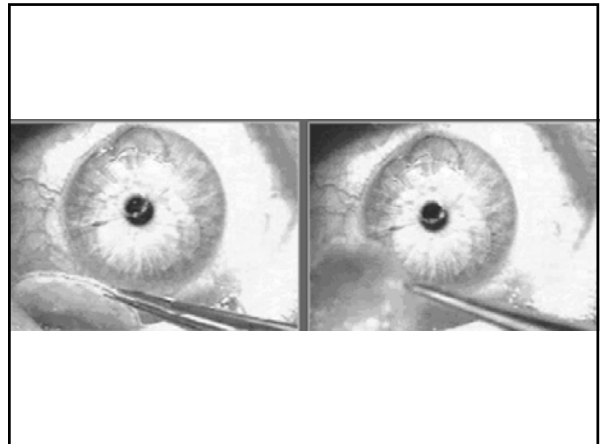
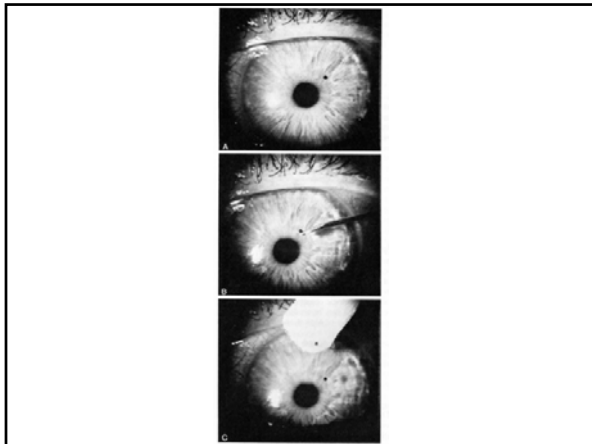
Subconjunctival/Corneal Foreign Bodies

- etiology: airborne debris
- history:
 - “blew into eye”
 - foreign body sensation acutely or starts slowly
 - photophobia/tearing

Subconjunctival/Corneal Foreign Bodies

- treatment
 - conjunctival/corneal foreign body – remove via cotton swab/bent tip needle using slit lamp
 - if defects, patch with topical antibiotic ointment and cycloplegic
 - eye MD in 24 hours





**Subconjunctival/Corneal
Foreign Bodies**

REFER:

- if unable to remove foreign body, apply eye shield
- if large corneal abrasion or foreign body sensation without foreign body identification

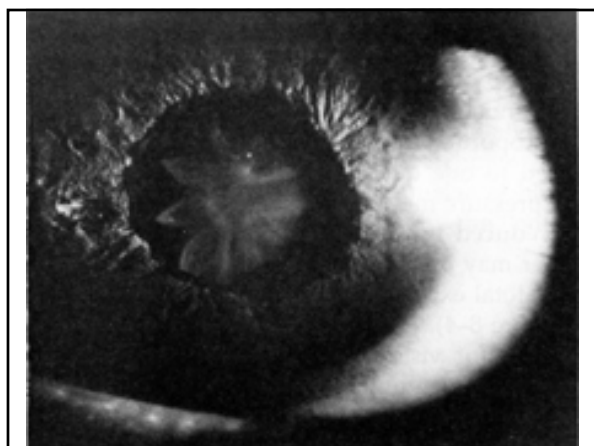
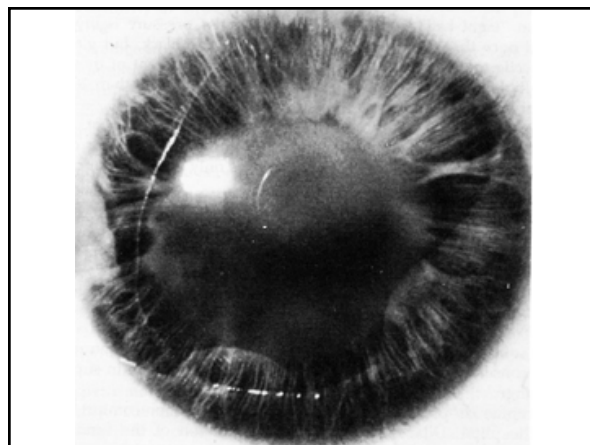
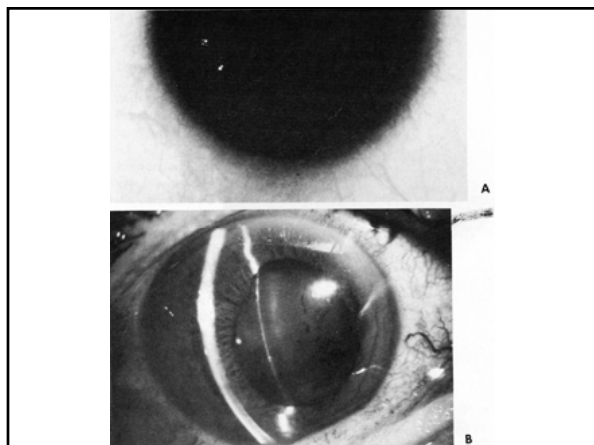


Hyphema

- mechanism: concussive force shears iris root blood vessels resulting in blood in anterior chamber
- complications:
 - harbinger of more serious globe injury
 - re-bleed in 30% cases leading to potentially blinding glaucoma

Hyphema

- management:
 - eye shield and immediate referral to eye MD
 - treatment by eye MD:
 - shield at all times
 - reduced physical activity
 - rest with head of bed at 30°
 - topical cycloplegic/steroid
 - daily eye exam for initial 5d
 - if necessary, hospitalization



Prevention of Eye Injuries

- education (esp. monocular patients!)
- occupation/activity specific safeguards
 - protective eye guards (ANSI approved) for:
 - carpentry/metal work
 - sports
 - contact (hockey, football, basketball)
 - projectile missiles (baseball, lacrosse, racquet sports)

Prevention of Eye Injuries

- wear goggles/plastic spectacles if using:
 - jumper cables/car batteries
 - chemical sprays/cleaning fluid
 - darts, pellet/BB guns, fishing hooks, fireworks, bow/arrows, lawn mowers, weed eaters, and champagne corks
- wear 100% UV blocking sunglasses if exposed to sunlight/snowfields
- NEVER stare into sun, eclipse, tanning or arc-welding lamps

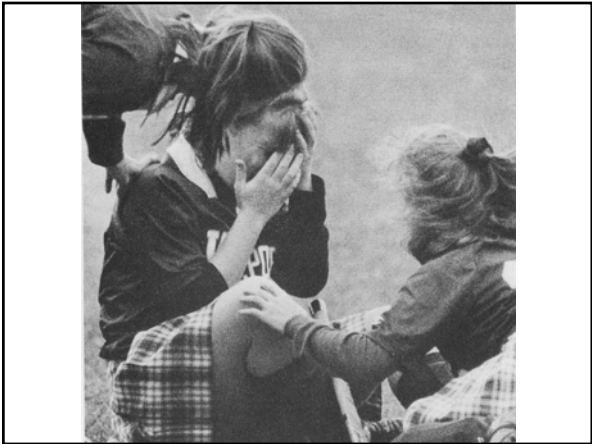
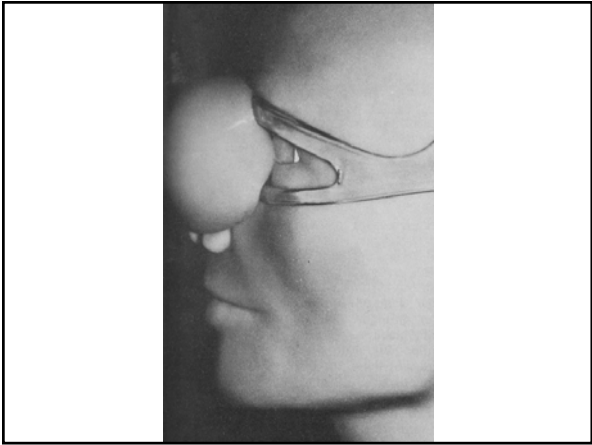
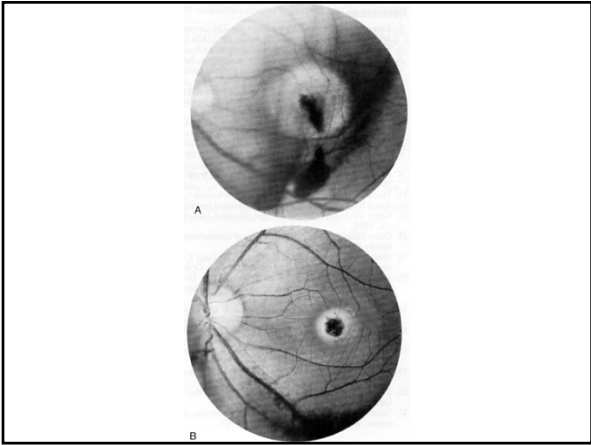
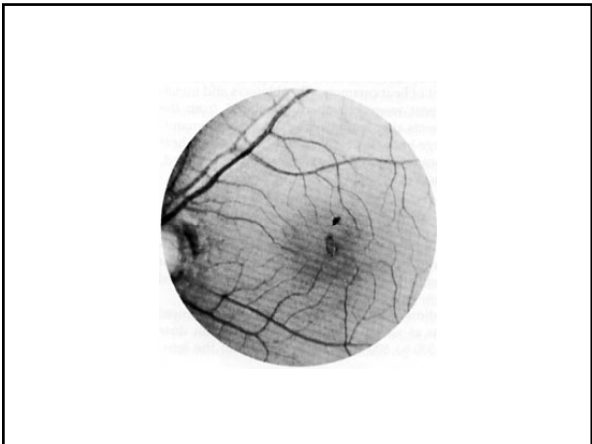
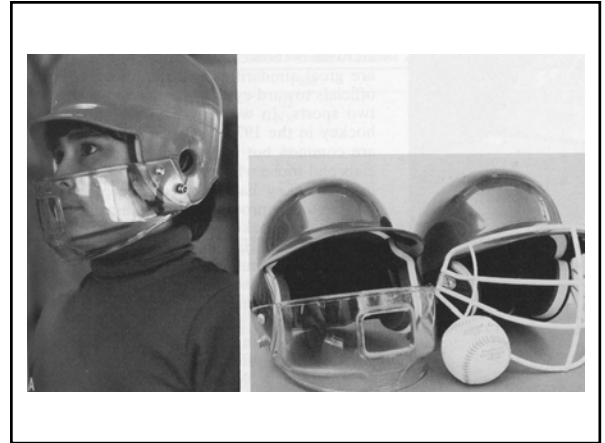
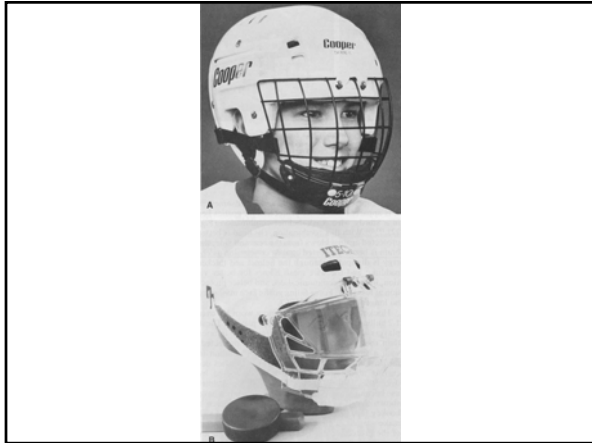


TABLE 6. Fracture Energies (ft-lb) of Different Lens Types

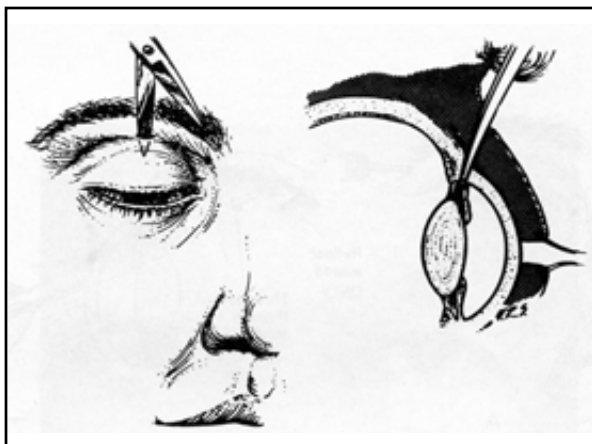
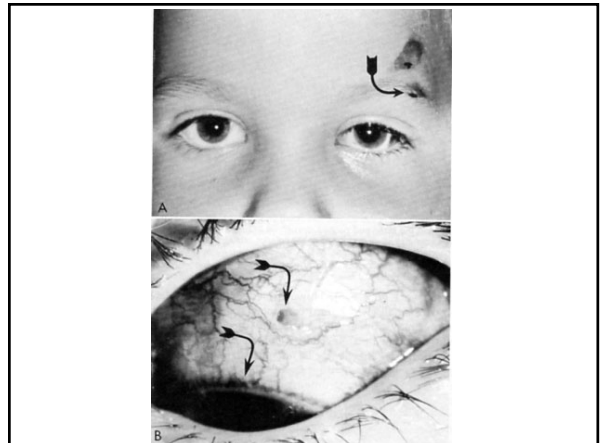
| Lens Type | Missile Size (inches) | | |
|-------------------------------|-----------------------|------|------------|
| | 1/8 | 1/4 | 1 |
| Heat-treated glass (2 mm) | 0.03 | 0.22 | 0.36 |
| Chemical-treated glass (2 mm) | 0.07 | | 0.66 |
| Heat-treated glass (3 mm) | 0.07 | | 2.1 |
| CR-39 (2 mm) | 0.22 | 1.4 | 0.66 |
| CR-39 (3 mm) | 0.37 | | 1.28 |
| Polycarbonate (2 mm) | 4.7 | 13 | No breaks* |





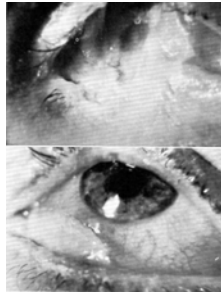
Case Presentation I

A 4 year old girl presents after falling while running with a pair of scissors. Her parents are concerned because she complains of tearing and foreign body sensation in her left eye. There were no witnesses to the incident. How do you proceed?



Case Presentation II

A 34 year old woman presents with complaints of pain in each eye with complete loss of vision OD and following pictures. She denies antecedent trauma, illness or surgery. What do you do next?



References

- The Physician's Guide to Eye Care
Trobe, Jonathan D. 1993 AAO
- Paton and Goldberg's Management of Ocular
Injuries, Second Edition. Deutsch, TA and
Feller, DB. 1985

THE END?