8.13.8. Toxic & Traumatic Injuries (VIII): Perforating Injuries

History

- factors known to predispose to ocular penetration
  - metal-on-metal strike
  - high-velocity projectile
  - high-energy impact on globe
  - sharp injuring object
  - lack of eye protection

Examination

- complete general and ophthalmic examination
- visual acuity
  - the most reliable predictor of final visual outcome
- pupillary examination
  - reverse Marcus Gunn response
- signs that are suggestive or diagnostic of penetrating/perforating ocular injury
  - See Table 13-5
- if a significant perforating injury is suspected, avoid
  - forced duction testing, gonioscopy, tonometry, and scleral depression
- ancillary tests that may be useful
  - See Table 13-6
- all cases should be managed with safeguards appropriate for patients with bloodborne infections

Preoperative management

- studies have not documented any disadvantage in delaying the repair of an open globe for up to 36 hours
- prompt repair can help minimize numerous complications
  - pain
  - prolapse of intraocular structures
  - suprachoroidal hemorrhage
  - microbial contamination of the wound
  - proliferation of the microbes projected into the eye
  - migration of epithelium into the wound
  - intraocular inflammation
  - lens opacity
- temporizing measures
  - apply a protective shield
    - avoid administering topical medications or other interventions that require prying open the eyelids
  - keep the patient on NPO status
  - provide appropriate medications for sedation and pain control, as well as antiemetics
  - initiate intravenous antibiotics
  - provide tetanus prophylaxis
  - seek anesthesia consultation
- risk of bacillus endophthalmitis
  - soil contamination
  - retained intraocular foreign bodies
  - intravenous and/or intravitreal therapy with an antibiotic effective against bacillus
    - fluoroquinolones
    - clindamycin
    - vancomycin
  - surgical repair should be undertaken with minimal delay
  - can destroy the eye within 24 hours

Nonsurgical options

- minimal eye penetrating injuries
  - definition
    - spontaneously seal before ophthalmic examination
    - no intraocular damage, prolapse, or adherence
  - may require only systemic and/or topical antibiotic therapy
  - close observation
- leaking corneal wound with formed anterior chamber
  - pharmacologic suppression of aqueous production
  - patching
  - therapeutic contact lens
  - tissue adhesive
  - if these measures fail to seal the wound in 2 days --> surgical repair

Surgical repair

- primary enucleation
  - only when restoration of anatomy is impossible
  - advantages of delaying enucleation far outweigh any advantages of primary enucleation
  - delay should not exceed 12–14 days!
- anesthesia
  - general anesthesia is almost always required
  - local or topical anesthesia only when
    - patient is at medical risk from general anesthesia
    - laceration is small & self-sealing
  - periocular anesthetic injection to control postoperative pain
    - after surgical repair is complete
- repair of corneal component
  - corneal component should be repaired first
  - tissue prolapse
    - vitreous or lens fragment prolapse
      - do not exert traction on the vitreous or zonular fibers
      - cut flush with the cornea
      - use viscoelastic material to reform anterior chamber
      - uvea or retina prolapse
        - through a separate limbal incision
        - reposit using gentle sweeping technique
        - may be necessary to reposit iris tissue repeatedly
        - only frankly necrotic uvea should be excised

Figure 13-14 (© 2020 American Academy of Ophthalmology)

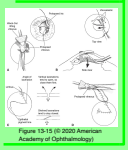

Figure 13-15 (© 2020 American Academy of Ophthalmology)

  - specific suturing techniques
    - try to peel off epithelium that has migrated onto a uveal surface or into the wound
    - close points at which the laceration crosses landmarks (limbus)
      - 9-0 or 10-0 nylon suture
    - close remaining corneal component
    - suture knots should be buried in the corneal stroma, not in the wound
    - if watertight closure of the wound is not achieved
      - x-shaped or "purse-string" sutures
      - cyanoacrylate glue
      - primary lamellar keratoplasty
      - conjunctival flap should not be used!
    - peripheral cornea
      - wider-spaced, longer sutures
    - central cornea
      - long enough to minimize their "cheese wiring"
      - closer, shorter sutures
      - avoid the visual axis

Figure 13-16 (© 2020 American Academy of Ophthalmology)

- repair of scleral component
  - only as necessary to expose the wound
    - gentle peritomy
    - prolapsed vitreous is excised
    - prolapsed nonnecrotic uvea and retina are repositied
    - do not fixate an open globe with rectus muscle sutures

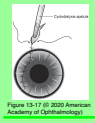

Figure 13-17 (© 2020 American Academy of Ophthalmology)

    - 9-0 nylon or 8-0 silk sutures
    - laceration extends under an extraocular muscle
      - muscle may be carefully removed at its insertion
    - posterior lacerations
      - open globe should not be rotated too far
      - more easily approached with loupes and a headlight
      - very posterior lacerations benefit from physiologic tamponade by orbital tissue and are best left alone
      - repair posteriorly only to the point at which it becomes technically difficult or requires undue pressure on the globe
    - dissection of tenon capsule and management of prolapsed tissue must be repeated incrementally after each suture
- additional interventions
  - if there are any concerns, complete the closure of the laceration and postpone other interventions until a later date
  - repair of adnexal injury should follow repair of the globe itself
  - remove foreign body that is visible in the anterior segment and can be grasped
  - primarily or secondarily
    - removal of opacified lens material
  - iris repair
    - primarily or secondarily
      - to decrease formation of anterior or posterior synechiae
      - 10-0 polypropylene suture
      - long needles
      - McCannel technique

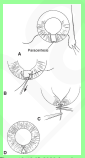

Figure 13-18 (© 2020 American Academy of Ophthalmology)

    - iridodialysis
      - McCannel technique

Figure 13-19 (© 2020 American Academy of Ophthalmology)

- subconjunctival antibiotics
  - to cover both gram-positive and gram-negative organisms
- intravitreal antibiotics
  - for contaminated wounds involving the vitreous
    - vancomycin 1 mg
    - ceftazidime 2.25 mg

Postoperative management

- cephalosporin and aminoglycoside
  - intravenous antibiotics
    - for 48 hours
- moxifloxacin (400 mg po daily)
  - oral antibiotic
    - for 3–5 days
- 4 times a day for 7 days or until epithelial closure
  - topical antibiotics
- taper slowly
  - topical corticosteroids and cycloplegics
- for fibrinous response in the anterior chamber
  - systemic prednisone
- removed incrementally over the next few months
  - left in place for ≥3 months
    - corneal sutures that do not loosen spontaneously
- fibrosis
- vascularization
  - indicators of adequate healing
- to exclude suture erosion through the epithelium
  - apply fluorescein at each postoperative visit
- to exclude retinal detachment
  - if no fundus view
    - frequent examination of the posterior segment
    - afferent pupillary defect
    - b-scan ultrasonography
- refraction and correction with contact lenses or spectacles

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