

# Acute Management of Penetrating Eye Injury and Ruptured Globe

Disclaimer: This Clinical Practice Guideline ('CPG') was written for use in The Royal Victorian Eye and Ear Hospital Emergency Department. It should be used under the guidance of an Ophthalmology or ENT registrar. If clinical advice is required, please contact the Eye and Ear Admitting Officer for assistance: EYE: +61 3 9929 8033; ENT: +61 3 9929 8032. Links to internal Eye and Ear documents cannot be accessed from the website CPG.

See also: [Endophthalmitis](#), [Hyphaema](#), [Peri- and post-operative Management of Penetrating Eye Injury and Ruptured Globe](#), [Procedure for Management of Eye Trauma](#)

## Description:

The immediate management of penetrating eye injury (PEI), with or without intra-ocular foreign body (IOFB), and ruptured globe to maximise outcome.

## Red Flags:

- Immediate Advanced Trauma Life Support (ATLS) assessment: Airway, Breathing, Circulation, Disability, Exposure (ABCDE)
- Establish mechanism of injury to exclude other injuries which may require management at a general hospital, e.g. cervical spine, head injury
- Open globe should be examined carefully to avoid **extrusion** of intraocular contents
- Consider occult injury if mechanism suggestive
- Shield at all times (do not pad)
- Early referral for pre-anaesthetic assessment and medical review (if needed), to assess pre-existing or new medical issues and the patient's suitability for management at Eye and Ear. Preoperative bloods, ECG and imaging as indicated.

## How to Assess:

### Expected Patient:

Refer to and complete the 'Emergency Expect Form' (MR 37) in the Emergency Department. Make sure patient's contact details (mobile) are recorded.

Do not accept patients who have injuries other than ocular, i.e. multi-trauma or who are medically unstable.

Children under the age of 6 months should be referred directly to the Royal Children's Hospital. Children aged from 6 months to 2 years with significant co-morbidities may not be appropriate to be managed at Eye and Ear.

All paediatric patients which may need referral to RCH, must be discussed with RCH Ophthalmology registrar or Consultant PRIOR to referral in order to confirm specialty coverage and operating theatre availability should surgery be required.

Instruct referrer to:

- send records and imaging studies, if done, with patient
- keep patient nil by mouth with eye covered by shield (not eye pad)
- transport options: private transport, ambulance, air ambulance (whichever is faster). Note: air ambulance protocols for low cabin altitude and antiemetic prophylaxis.

Consider phone advice for referrer:

- Adults – Ciprofloxacin 750 mg orally with a sip of water
- Children – Ciprofloxacin (risk of adverse joint effect is low) dose: 20mg/kg stat oral up to 750mg. The RCH Pharmacy Department (Drug Information Centre) recommend crushing and mixing the tablets with a strong flavoured agent such as chocolate topping as there is no commercial oral mixture available. The tablets come in 250mg, 500mg and 750mg strengths and these can be halved (as the tablets are scored) and then quartered if needed.
- Ondansetron
  - Adults: 4-8 mg IV over 2-5 minutes, oral 0.1-0.2 mg/kg 6-12 hourly (max 8 mg)
  - Children: 0.15-0.2 mg/kg IV over 2-5 minutes, oral 0.1-0.2 mg/kg 6-12 hourly (max 8 mg)
- Morphine for pain relief
- Tetanus prophylaxis

### **History:**

- Identify cause of trauma and risk of retained IOFB
  - explosion
  - metal on metal
  - possible size of object and risk of intra-ocular penetration
  - possible organic injury
  - risk of unwitnessed fall (elderly patient), needs medical work up
- Length of time since injury
- Possibility of bone fracture
- Symptoms:
  - pain
  - loss of vision – immediate or progressive
  - nausea, vomiting

## Examination:

- Document visual acuity of **both eyes** and relative afferent papillary defect (RAPD) if present. (Must note presence/absence of an RAPD as this is required for the Ocular Trauma Score (OTS) which will be calculated in trauma patients by ward team)
- Careful examination should be performed with adequate analgesia (use preservative free topical anaesthetic agent or consider intravenous opiate titrated to effect [NB exclude head injury]) with attention to the following:
  - Wear gloves
  - Manipulate lids gently without exerting pressure on globe
  - Do not try to remove foreign bodies: risk of extruding contents
  - Do not instill antiseptic agents
  - Use preservative free dilating agents for fundoscopy
- Look for:
  - Peri-orbital swelling, orbital fracture
  - Through-and-through eyelid wounds
  - Chemosis/sub-conjunctival haemorrhage may be an indicator of occult injury
  - Limited eye movements
  - Full thickness corneal (perform Seidel test with 2% fluorescein for cases where penetration is in doubt) or scleral laceration (uveal tissue visible)
  - Anterior chamber depth disparity (compare to other eye), deep or shallow
  - Intra-ocular pressure disparity if no obvious signs of injury
  - Hyphaema
  - Iridodialysis
  - Iris prolapse or peaked pupil towards wound
  - Iris transillumination defects
  - Careful gonioscopy for IOFB hidden in angle by senior ophthalmologist if suspected)
  - Lens: Lens subluxation or dislocation. Focal cataract may indicate the presence of an IOFB
  - Vitreous haemorrhage may indicate posterior trauma, either from IOFB or in-out injury, e.g. wire or a globe rupture
  - Choroidal rupture
  - Commotio retinae or retinal haemorrhages
  - Retinal breaks and/or detachment

## Acute Management:

- Continuous monitoring of ABCDE
- Keep nil by mouth and determine last oral intake
- Place eye shield to avoid further manipulation
- Adequate intravenous pain management with anti-emetic to avoid vomiting (and consequent valsalva):
  - Nausea/Vomiting: Ondansetron (see page 1 for dosage)
  - Pain: Morphine
- Administer IV fluids as appropriate
- Administer systemic antibiotics:

### OPTIONS:

- Adults
  - Ciprofloxacin 750 mg orally with sip of water
- Children
  - Ciprofloxacin (risk of adverse joint effect is low) dose: 20mg/kg stat oral up to 750mg. The RCH Pharmacy Department (Drug Information Centre) recommend crushing and mixing the tablets with a strong flavoured agent such as chocolate topping as there is no commercial oral mixture available. The tablets come in 250mg, 500mg and 750mg strengths and these can be halved (as the tablets are scored) and then quartered if needed.
- Confirm tetanus status and administer prophylaxis if required
- Admit, bed-rest, advise to avoid valsalva
- Discuss with admitting officer early to:
  - Assess patient
  - **Determine necessary imaging: CT brain and orbits if suspect:**
    - IOFB and cannot visualise anterior and posterior segments. Note: if good view and IOFB unlikely, CT may not be necessary and may delay surgery.
    - Orbital injury/foreign body

**Avoid B scan** if PEI or globe rupture suspected as may extrude intraocular contents and contaminate wound further. Perform under senior supervision if necessary.

## Specialty Clinic Involvements:

Clinic	Involve If:
Cornea	<ul style="list-style-type: none"> <li>• History of corneal transplant or corneal diagnosis impacting on management plan</li> <li>• Associated microbial keratitis</li> </ul>
GIRU	<ul style="list-style-type: none"> <li>• Recalcitrant increased intra-ocular pressure during admission</li> <li>• Severe hypotony due to suspected cyclodialysis cleft</li> <li>• Patients with previous filtering surgery/drainage device directly involved in the injury</li> </ul>
Neuro-ophthalmology	<ul style="list-style-type: none"> <li>• Traumatic optic neuropathy</li> </ul>
OPAL	<ul style="list-style-type: none"> <li>• Orbital fracture with diplopia or globe displacement</li> <li>• Significant retrobulbar haemorrhage with potential LOV</li> <li>• Complicated lid lacerations involving levator, canalicular system, fat prolapse</li> <li>• Severe ocular trauma where evisceration/enucleation may be required</li> <li>• Compartment syndrome</li> <li>• Orbital foreign body</li> <li>• Optic canal fracture with potential need for decompression</li> </ul>
VRU	<ul style="list-style-type: none"> <li>• Any PEI, involving only the cornea is the responsibility of the designated SOS consultant or General Eye Consultant on-call</li> <li>• VRU is responsible for the following:               <ul style="list-style-type: none"> <li>○ presence of an intraocular foreign body in the posterior segment</li> <li>○ if the PEI extends or involves the sclera behind the muscle insertion</li> <li>○ after the primary repair, if there is posterior segment involvement, e.g. retinal detachment.</li> <li>○ endophthalmitis</li> </ul> </li> <li>• The VR fellow may be contacted for advice if it is unclear if the posterior segment is involved. In these cases the VR fellow may be requested to attend theatre should the posterior segment be found to be involved upon exploration. It is the responsibility of the VR fellow to inform VR consultant about these cases</li> </ul>

## **Surgical Planning:**

Consent for repair of injury under general anaesthesia:

- Include removal of foreign body, vitrectomy, lens extraction, repair of skin/lid lacerations, etc. as indicated. Primary enucleation is rarely performed. Such a decision is the responsibility of the managing consultant ophthalmologist.
- Consent should be done by a more senior eye registrar or a consultant.

Anaesthesia

- Contact anaesthetist early to discuss relevant medical issues, and in particular, patients who may be unsuitable for general anaesthesia at Eye and Ear Main Campus or Eye and Ear on the Park (EEPark)

Paediatric Patients

- Anaesthetic, peri- and post-operative care for children can be a challenge as skilled management from both doctors and nurses is needed and clinical issues can escalate quickly. NOTE: there is limited emergency general medical care after hours; House Medical Officers are not present on the wards after 8 pm, with general medical coverage provided by an emergency department doctor overnight.
- All children requiring surgery must be discussed with the anaesthetists prior to patient arrival in theatre. In particular, children less than 12 months may need an anaesthetist who specialises in paediatric anaesthesia. Paediatric patients with co-morbidities may not be suitable for admission or surgery at Eye and Ear.
- All paediatric patients which may need transfer to RCH, must be discussed with RCH Ophthalmology registrar or Consultant PRIOR to transfer in order to confirm specialty coverage and operating theatre availability should surgery be required.

## **Time to theatre:**

- Critical to minimise time to surgical repair as delay is a risk factor for endophthalmitis
- It may be appropriate to delay surgical repair until the following morning in certain cases. For example: self-sealing wound with minimal intraocular inflammation
- Cases which should NOT be held overnight or have a delayed surgical repair:
  - Intraocular foreign body (anterior or posterior)
  - Uveal prolapse
  - Monocular patient
  - Increased risk of endophthalmitis
    - Delayed presentation
    - Injury with organic matter
    - Lens disruption

## Procedure:

**NOTE: Interim changes to procedure while Eye and Ear on the Park operational.**

<b>IN HOURS</b>	<ul style="list-style-type: none"><li>• AO or ED consultant to contact the Elective Surgery Access Manager (ESAM) to identify the designated trauma list and organise for this list to do surgery (Sinead Cucanic: extension 8119, switchboard for mobile, contact Executive Director Surgical &amp; Inpatient Services if ESAM absent)</li><li>• Master list for designated trauma theatre allocation can be found in ED and on intranet</li><li>• Contact consultant, anaesthetist, and eye registrar for designated list to discuss case</li><li>• ED Flow Co-ordinator/ Nurse in Charge to notify ward HMO to do medical admission</li><li>• Transfer of patient to EEPark See Patient Transport Procedure: ED nurse in charge/NUM and After Hours Co-ordinator to organise patients not eligible for transfer to EEPark:<ul style="list-style-type: none"><li>○ Surgeries needing VRU assistance</li><li>○ Frail/elderly/poor mobility</li><li>○ Significant co-morbidities</li></ul></li></ul> <p>If uncertain about patient suitability for transfer to EEPark, discuss with eye consultant/anaesthetist.</p>
<b>AFTER HOURS</b>	<ul style="list-style-type: none"><li>• AO contacts After Hours Co-ordinator (AHC) to organise theatre time</li><li>• Contact the consultant (General Eye on-call) and anaesthetist on after hours call schedule to discuss case and timing of surgery (Note: call schedule available through switchboard or Intranet (under: Doctors Management, Generic Reports, select Report 'on call', then 'from' and 'to' date)</li><li>• Contact ward HMO for medical admission if before 8 pm on weekdays, 7:30am-5:30pm on weekends and public holidays. Outside of these hours ED registrar to complete medical admission.</li></ul> <p>NOTE: for Patients being held overnight for surgery in the morning:</p> <ul style="list-style-type: none"><li>○ AHC to designate theatre-options:<ol style="list-style-type: none"><li>1. Designated SOS trauma list at EEPark. AHC to organise transport of patient to EEPark so surgery can commence 8:30 am</li><li>2. Main theatre: precedes subspecialty ophthalmology list in main theatre (most commonly VRU)</li></ol></li><li>○ AHC contacts relevant theatre staff and Director of Surgical Services (0700 the following morning)</li><li>○ AO contacts relevant doctors regarding am theatre after confirmation from AHC: SOS trauma list consultant/registrar, anaesthetist, and consultant/fellow/registrar whose list may be altered by the trauma procedure (0700am the following morning)</li></ul> <p>NOTE: After hours repair of PEI and open globes take precedence over semi-elective cases</p>

## **Follow up:**

- A same day urgent senior opinion should be sought
- The patient should be reviewed daily until doubt is eliminated.

## **Additional notes:**

- If primary repair cannot be performed immediately, it is mandatory for a consultant/AO-to-consultant communication at that time to discuss a plan for theatre, which must be arranged as soon as possible.
- Be aware that you may be asked to produce medico-legal reports some weeks, if not months, later.
- Consider photographs in MedPIC to document injury

## Evidence Table

Author(s)	Title	Source	Level of Evidence (I – VII)
Lippincott Williams, Wilkins Philadelphia	Wills Eye Manual 6th edition 2012		VII

### The Hierarchy of Evidence:

The Hierarchy of evidence is based on summaries from the National Health and Medical Research Council (2009), the Oxford Centre for Evidence-based Medicine Levels of Evidence (2011) and Melynk and Fineout-Overholt (2011).

- I) Evidence obtained from a systematic review of all relevant, randomised control trials.
- II) Evidence obtained from at least one well designed, randomised control trial.
- III) Evidence obtained from well-designed controlled trials without randomisation.
- IV) Evidence obtained from well-designed cohort studies, case control studies, interrupted time series with a control group, historically controlled studies, interrupted time series without a control group or with case series.
- V) Evidence obtained from systematic reviews of descriptive and qualitative studies.
- VI) Evidence obtained from single descriptive and qualitative studies.
- VII) Expert opinion from clinician, authorities and/or reports of expert committees or based on physiology.

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