

Peri- and Post-operative Management of Penetrating Eye Injury

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: [Hyphaema](#), [Endophthalmitis](#), [Acute Management of Penetrating Eye Injury and Ruptured Globe](#), [Procedure for Management of Eye Trauma](#)

Description:

Options for peri and post-operative management of in patients with penetrating eye injury (PEI) or ruptured globe to maximise outcome

This CPG is designed for use AFTER the Acute Management of penetrating eye injury and ruptured globe CPG

Red Flags:

- Trauma patients can have a varied and complicated clinical course and these guidelines should be considered on a case by case basis. Monitor closely for complications.
- Increased risk of endophthalmitis with retained intraocular foreign body, delayed presentation of repair, large wound, contaminated injury
- VRU fellow to be alerted if: PEI is behind muscle insertion, significant posterior injury, or if it is unclear as to whether posterior segment involved. Be aware of medico-legal or workcare issues
- Clinical handover of patients between surgical team, ward team, weekend registrars and AO on public holidays and weekends is critical for continuity of care.

Guideline:

- Trauma patients not admitted under the bedcare of a subspecialty clinic will be evaluated daily (Monday-Friday) by ward team consisting of Ward Eye HMO, 1st year Eye registrar, Senior eye registrar (both designated by 'ward' on roster) and ED/Acute Ophthalmology Service (AOS) consultant as needed.
- All new trauma admissions (surgical and non-surgical) should be seen by a consultant within 24 hours of admission. These patients will be identified by the ward team who will request that the rostered ED consultant see the patient on the ward. These patients should not be taken to ED for consultant review.

- If there is no ED consultant rostered, then ambulatory patients may be taken to AOS clinic from the ward to be seen by consultant at the beginning of the morning AOS clinic. They must be accompanied by a member of the ward team to facilitate consultant review and manage care. If the patient is non-ambulatory, the AOS consultant will be asked to review the patient on the ward.

For inpatients with clinical concerns, either the ED or AOS consultant should be contacted, as noted above, to review the patient.

Patients who have had repair of PEI or ruptured globe may also be followed by the operating consultant while an inpatient. Eye registrars involved in patient's surgery are also encouraged to see and follow up the patient during admission.

On public holidays and weekends, patient will be seen by either the ward, post-op registrar, or AO and any concerns will be escalated to the General Eye consultant on-call (list available through switchboard or on intranet (under: Doctors Management, Generic Reports, select 'on call', then 'from' and 'to' date). General Eye on-call consultants are encouraged to see new admissions on weekends and public holidays.

All complications or concerns must be discussed with a senior eye registrar or fellow and consultant.

Subspecialty clinic involvement: see [Acute management of penetrating eye injury and ruptured globe CPG](#).

How to Assess:

Surgical Repair: Considerations

Exploration

- **No surgical exploration required:** obvious PEI involving the cornea and not extending beyond the limbus.
- **Limited peritomy:** wound extending beyond the limbus, involving sclera and where extent of wound is easily delineated
- **360 degree peritomy:** globe rupture with obvious posterior segment involvement or where globe rupture suspected but no obvious globe injury noted. (See specialty clinic involvement re: VRU consult)

Closure of wound

- Suture choice: options
 - Cornea: 10/0 Nylon
 - Sclera: 8/0 Nylon
 - Limbus 10/0 Nylon

Intra-ocular foreign body (IOFB)

- Anterior chamber (AC): small simple AC IOFB to be managed by General Eye team (SOS in hours, General Eye Consultant on-call after hours). Appropriate antibiotics to be used in these cases (see antibiotic use, see below)
- Posterior segment: VRU to manage (see above, subspecialty clinic involvement).

Uveal prolapse

- Every attempt should be made to reposit uveal tissue. Consider uveal tissue and iris excision if the prolapsed material has been exposed for longer than 48 hours, is necrotic and attempts to reposit the tissue leads to further damage

Hyphaema management

- Total hyphaema: do primary closure. LEAVE hyphaema in majority of cases
- Post-op: manage according to traumatic hyphaema guidelines

Lens capsule breach

- Small breach: no lens material in AC:
 - Leave crystalline lens alone
 - Watch for signs of inflammation indicating need for lens surgery
- Significant capsule breach: lens material in AC:
 - Lens removal at the time of surgery
 - Leave aphakic with plan to place a secondary IOL at a later stage
- Consider IOL insertion at the time of primary repair if the other eye is aphakic, biometry available, minimal damage to cornea, and non-organic injury.

Antibiotics: indications and dosages

- Intracameral
 - ALL PEIs involving the anterior segment, AC IOFB, no sign of endophthalmitis
 - **Cephazolin 1mg/0.1ml**
- Intravitreal injection (if indicated)
 - Consider in cases with high risk of endophthalmitis: suspected or retained IOFB, delayed presentation (>24hrs), soil /organic material contamination, lens disruption.
 - Vancomycin **1mg/0.1 ml, Ceftazidime 2mg/0.1 ml**
 - Amphotericin B 5microg/0.1mL or Voriconazole 100microg/0.1mL in suspected fungal infection, (withhold until VRU consulted)
 - Dexamethasone 0.4mg/0.1mL (withhold until VRU consulted)

NOTE: if suspect endophthalmitis at presentation, VRU should be consulted. Discussion with VRU should be considered in cases where intravitreal injection is outside the area of expertise of the operating clinician the VRU fellow may be asked to attend theatre. If the VRU fellow is unavailable after hours contact AO or senior registrar on call.

Refer PC6.3 Intravitreal Injection Procedure for the Treatment of Endophthalmitis – Emergency Department

- Subconjunctival
 - Alternative to intracameral Cephazolin.
 - **Cephazolin** 100mg/1.0 mL (Dilute 1g in 10mL of normal saline to give a dose of 100mg/1.0mL)
- Systemic antibiotics
 - see Acute Management of PEI and Ruptured Globe CPG
 - Endophthalmitis prophylaxis:
 - Adult
 - Oral ciprofloxacin 750 mg BD for 5-7 days. Reduce dose in renal impairment (Calculated Creatinine Clearance <50mL/min)
 - Children
 - Ciprofloxacin (risk of adverse joint effect is low) dose: 20mg/kg oral stat up to a maximum 750mg BD for 5-7 days. **Note:** 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.
- Topical antibiotics
 - as per individual case

Post Operative Management:

Routine post-operative assessment

- History: assess for change in vision, pain, nausea/vomiting.
- **Examination**
 - General: periocular swelling/ecchymosis, repair of skin/lid laceration, motility
 - Visual Acuity (VA) with/without pinhole, IOP, pupils (RAPD)
 - Slit lamp exam:
 - Wound: assess repaired laceration/rupture integrity, sutures (location/buried/unburied), bandage contact lens. Seidel test: check for wound leak on **ALL** repairs even if IOP normal and AC deep
 - Cornea: clarity, oedema, Descemet's folds
 - Conjunctiva: chemosis, haemorrhage, sutures
 - Anterior chamber (AC): depth and cells, hyphaema, fibrin, hypopyon
 - Pupil: shape, sphincter tear, iridodialysis, missing iris segment
 - Lens: capsule breach (anterior/posterior), cataractous, aphakic
 - Fundus exam or B scan if poor fundus view. Note: if B scan needed, perform gently over closed eyelid.

Complications: monitor for the following and discuss with senior eye registrar, fellow and/or consultant.

- Inflammation: trauma related, lens related or infection. Increase frequency of topical steroids once infection ruled out.
- Endophthalmitis: signs - increased pain, decrease vision, hypopyon. Contact VRU for opinion and for tap/inject if indicated
- Hyphaema: see CPG hyphaema
- Wound leak: Seidel positive, AC may be deep with normal IOP. Assess flow through leak (slow or brisk), wound integrity/sutures, AC depth.
 - For mild/slow leak consider: oral acetazolamide (Diamox) 250mg TDS if no sulfonamide allergy and no contraindications, bandage contact lens.
 - Brisk leak: re-suturing likely, consider corneal referral if complex corneal wound.
- Elevated intraocular pressure: routine topical glaucoma medications. Prostaglandin analogues may increase inflammation. Avoid Pilocarpine. Consider oral Diamox if no contraindication. If medical management inadequate consider Glaucoma consult.
- Cataract: assess status of capsule, lens opacity, and associated inflammation. Delay surgery if possible to allow inflammation to settle. If cataract surgery imminent consider referral to SOS. Note: children at risk of amblyopia (age < 8 years old) will need prompt surgery for visually significant cataracts and subsequent visual rehabilitation.
- Posterior trauma/retained IOFB: gentle B scan over closed lids. VRU consultation

Return To Theatre:

For patients needing surgery with Surgical Ophthalmology Service (SOS):

- See Master Trauma Theatre allocation list in ED and on intranet
- See Patient transport procedure for patients needing to be transported to EEOP.
- See CPG Acute management of penetrating eye injury for procedure for contact to coordinate theatre allocation (Elective surgery Access manager in hours, After hours coordinator after hours)

Follow up:

History:

- Change in vision
- Pain
- Compliance with medication and recommendations
- Document current medications

Examination:

- VA: pinhole, refraction when stable
- RAPD, colour plates if ON dysfunction
- IOP
- Gonioscopy if angle recession likely
- Slit lamp examination: document wound, scar, sutures, oedema, AC depth, cells/flare/RBC, hyphaema (height in mm)
- Dilated fundus exam

Management:

- Antibiotics
 - Systemic antibiotics can usually be stopped after 7-10 days
- Topical antibiotics can usually be stopped after 1-2 weeks depending on the nature of the injury.
- Topical steroids
 - Taper as inflammation settles
- Suture removal
 - Corneal sutures may need to remain in place for 3 months
 - Conjunctival sutures can usually be removed after 7-10 days
 - Loose sutures should be removed
 - Topical antibiotic coverage following corneal suture removal, e.g., Chloramphenicol tds for 3/7
- Complications
 - Hyphaema: see CPG, Hyphaema management
 - Prolonged inflammation
 - Consider increasing topical steroid dose, add Hycor ointment at night
 - Consider risk of infection
 - Consider risk of missed foreign body, gonioscopy to examine angle
 - Elevated IOP
 - Routine topical glaucoma medications (avoid pilocarpine; prostaglandin analogues may increase inflammation)
 - Oral acetazolamide as needed if no contraindication. Gradually wean drops when possible
 - Glaucoma opinion if IOP uncontrolled with above measures
 - Corneal astigmatism
 - Pentacam
 - May require spectacles, hard contact lens
 - Refer to Contact lens clinic, private optometrist, Australian College of Optometry
 - Cataract
 - Referral to SOS or private ophthalmologist if visually significant
 - Note urgency of cataract surgery in children at risk of amblyopia

- If unexplained or unexpected visual loss consider:
 - Refractive cause/astigmatism
 - Macular pathology: OCT
 - Optic nerve dysfunction: colour plates, HVF, nerve fiber layer analysis
- Further follow up
 - AOS for acute issues
 - SOS for cataract or other general ocular surgery
 - Subspecialty clinic with approval from fellow or consultant
 - Australian College of Optometry (ACO) or private optometrist for refractive correction, long term monitoring for glaucoma in patients at risk
 - Private ophthalmologist

Discharge Instructions:

- Discharge planning and follow-up to be arranged in consultation with ED/AOS consultant or specialty clinic consultant/fellow.
 - Review discharge medications (systemic and topical)
 - Options for follow up:
 - Subspecialty clinic (on approval by fellow or consultant)
 - SOS clinic if further surgery anticipated (i.e. cataract extraction, secondary lens implant)
 - AOS clinic for acute management
 - Private specialist
- Clear written instructions provided to patient regarding medications, follow up appointments, limitation to physical activity and/or work and indications for them to contact the hospital or present to the emergency department.
- Work cover or medical certificate to be completed before discharge.
- Consider the need for counselling if required.
- GP discharge summary/update to be completed.

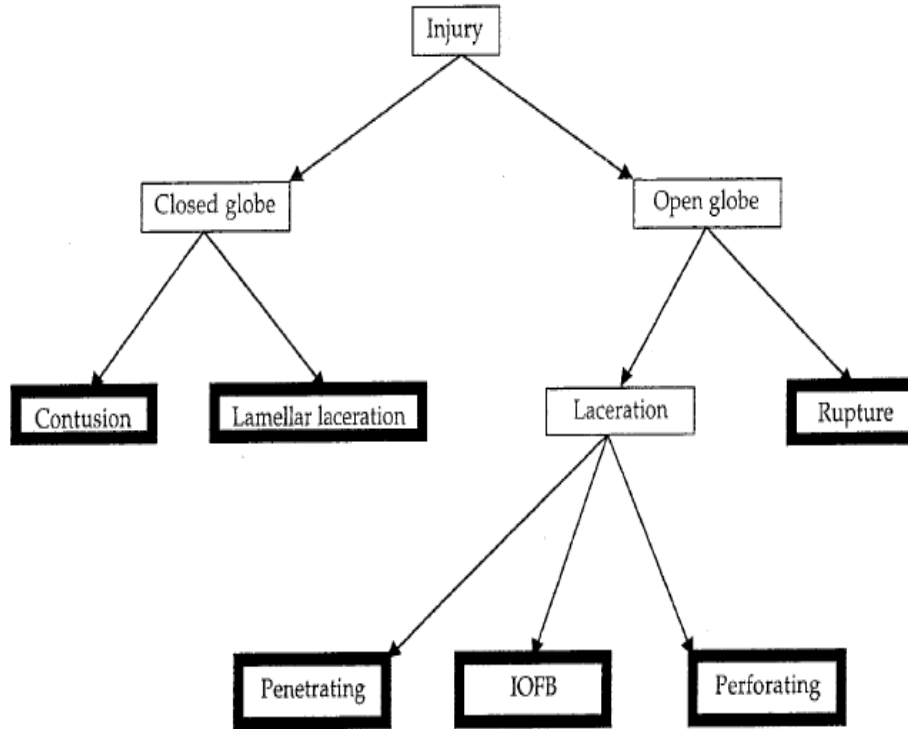
Audit:

There is an ongoing audit of trauma patients. Ward team to determine Betts Classification and Ocular Trauma Score (OTS) on day one of admission. Data to be collected as per audit criteria (clinical audit tool) by ward HMO.

Betts classification

Classification of Injury (Birmingham Eye Trauma Terminology – BETT)

Please circle:



Kuhn F, Morris R, Witherspoon CD. Birmingham Eye Trauma Terminology (BETT): terminology and classification of mechanical eye injuries. *Ophthalmology Clinics of North America*. 2002;15(2):139-43.

Ocular trauma score (OTS)

Parameters	Findings	Points	Unable to assess
Rupture of the globe	absent	0	
	present	-23	
Afferent pupillary defect	absent	0	
	present	-10	
Endophthalmitis	absent	0	
	present	-17	
Retinal detachment	absent	0	
	present	-11	
Perforating injury	absent	0	
	present	-14	
Initial vision	Better than 20/40	100	
	20/50 to 20/200	90	
	19/200 to 1/100	80	
	Light perception or hand motion	70	
	No light perception	60	
Total score (Do not complete if unable to assess any category)			

OTS category

Total score	OTS category
<45	1
45 to 65	2
66 to 80	3
81 to 91	4
92 to 100	5

Conversion of raw points into an OTS category and calculating the likelihood of the final visual acuity in five categories.

Sum of raw points	OTS	No light perception	Light perception/ hand motion	1/200 – 19/200	20/200 – 20/50	≥20/40
0-44	1	74%	15%	7%	3%	1%
45-65	2	27%	26%	18%	15%	15%
66-80	3	2%	11%	15%	31%	41%
81-91	4	1%	2%	3%	22%	73%
92-100	5	0%	1%	1%	5%	94%

Evidence Table

Author(s)	Title	Source	Level of Evidence (I – VII)
	Wills Eye Manual 6 th edition 2012		VII
	Birmingham Eye Trauma Terminology (BETT) terminology and classification of mechanical eye injuries	Ophthalmol Clin N Am 15 (2002) 139-143	VII
	The Ocular Trauma Score (OTS)	Ophthalmol Clin N Am (2002) 163-165	VII
	Post-traumatic Infectious Endophthalmitis	Surv Ophthalmol 56 (3) May-June 2011	V
	Controversies in ocular trauma classification and management: review	Int Ophthalmol (2013) 33:435-445	V
	Open Globe Management	Compr Ophthalmol Update. 2007; 8 (5):111-124	VII
	Post-traumatic Endophthalmitis	Ophthalmology. 2004 Nov;111 (11):2015-22	IV
	Prophylaxis of acute post traumatic bacterial endophthalmitis: a multicenter randomized clinical trial of intraocular antibiotic injection, report 2	Archives of Ophthalmology. 2007 Apr; 125 (4):460-465	II

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 Melynck 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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