

Chemical Injuries of the eye

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.

Description:

An injury to the eye from exposure to a chemical agent.

Red Flags:

- Alkalis more dangerous than acids as they penetrate deeper into the ocular surface
- Irrigation should commence prior to detailed history taking/examination
- Evert and sweep under eyelid early
- Remove particulate matter
- Beware of the 'white eye' as it may indicate total limbal ischaemia

How to Assess:

History:

- Type of chemical
- Prior irrigation
- Mechanism and details of injury
- Contact Poisons Information (ph. 13 11 26) if unsure about the pH of the chemical

Examination:

- Check airways and breathing, face
- Immediately – check the pH of both eyes then commence irrigation. To measure the pH, pull down the lower eyelid, place pH tape (or equivalent) in the lower fornix (the space between the eyelid and the globe) and release the lid. Wait for a few seconds until some tear film is absorbed on the tape, then remove the tape and record the pH according to the colour scale. Instill a drop of local anaesthetic. Commence irrigation with 1 litre of normal saline or Hartmann's solution. Wait 10 minutes after irrigation, and then recheck the pH. The pH should be around 7.5 or the same pH as the uninvolved eye. If pH in eyes is different, repeat irrigation and pH testing as required. There is no limit to the volume that is required to normalise the pH but if the pH remains abnormal despite 3 litres of irrigation, consider the presence of particulate matter. Additional local anaesthetic drops can be instilled as required. When checking pH ensure it is always checked at least 10 minutes after application of any eye drop or irrigation. After the pH normalises, check the pH again in 30 minutes to ensure it is stable.

- Full anterior segment exam
 - Give a local anaesthetic drop prior to examining
 - Examine, evert and sweep under eyelids to remove particulate matter
 - Examine the cornea for haze and an epithelial defect (with fluorescein). Note that a total epithelial defect can sometimes be missed as there is no bordering normal epithelium demarcating the fluorescein staining.
 - Examine the conjunctiva for degree of epithelial loss (with fluorescein)
 - Limbal ischemia – fluorescein staining over the limbus should alert you to check carefully for limbal ischaemia in these areas. Check capillary refill at the limbal edge by using a cotton bud to compress the limbal vessels to observe for reperfusion.
 - Ischaemia may be present if there is no refill, or the blood vessels do not empty on compression or there is an ischaemic, white appearance of the limbus. Record the number of clock hours of involvement. Hint: if there is no fluorescein staining over the limbus, it is unlikely that there is any ischaemia in this area.
 - Grade chemical eye injury using Roper-Hall (modification of Hughes) classification (see below)
 - Check intraocular pressure
 - Check other body systems

Roper-Hall (modification of Hughes) classification

Grade I	Corneal epithelial defect No corneal haze No ischaemia
Grade II	Cornea mildly hazy Iris details visible Limbal ischaemia < 1/3 of limbus
Grade III	Total loss of corneal epithelium and stromal haze obscuring iris detail Limbal ischaemia 1/3 to 1/2 of limbus
Grade IV	Cornea opaque; iris and pupil obscured Limbal ischaemia more than 1/2 of limbus

Acute Management:

Grade I-II	Chloramphenicol eye drops QID Consider fluorometholone (Flarex®) eye drops QID
Grade III-IV	Consult Cornea Fellow for all grade III-IV injuries for admission where required and to arrange follow up in Cornea Clinic Debridement of necrotic tissue 1. Chloramphenicol eye drops QID 2. Fluorometholone (Flarex®) eye drops hourly (reduces inflammation, collagenase inhibitors) 3. Ascorbic acid 10% eye drops 2 hourly (cofactor for collagen formation) 4. Sodium citrate 10% eye drops 2 hourly (calcium chelator, decreases phagocytosis, decreases neutrophils) 5. Cyclopentolate 1% eye drops TDS or Atropine 1% eye drops TDS (decrease photophobia) 6. Preservative free lubricants PRN 7. Ascorbic acid (Vitamin C) 500mg tablets QID 8. Ural sachet TDS 9. Oral analgesia as required

- Pain management: regular oral analgesia
- Manage chemical injury involving other systems of the body with appropriate consultations
- Every case with an epithelial defect or reduced vision should be reviewed by an ophthalmology registrar

When to consider transfer to General Hospital:

- Chemical injury involving other systems of the body, e.g. skin/respiratory

Follow up:

Review every 1-2 days until closure of epithelial defect to monitor for complications. If grade I with non-toxic chemical exposure, follow up may not be required.

Discharge instructions:

Advise patient to return if increasing pain, photophobia or decreased vision.

Evidence Table

Author(s)	Title	Source	Level of Evidence (I – VII)
Brodovsky SC, et al.:	Management of alkali burns: An 11-year retrospective review. Ophthalmology. 107:1829-1835 2000		VI
-	Chemical Injuries of the Cornea. AAO Focal Points March 2010. Vol 28 No.1		V11

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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