

Chemical Burns

SESLHDPR/498

Aim:

- Early identification and treatment of sight-threatening causes of eye emergencies including suspected chemical injuries, and escalation of care for patients at risk.
- Early initiation of treatment / clinical care and symptom management within benchmark time.

Assessment Criteria:^{3,6} On assessment the patient should have one or more of the following signs / symptoms:

- | | | |
|---|--|---|
| <input type="checkbox"/> History of chemical injury thermal, chemical, acid, alkaline | <input type="checkbox"/> Loss of vision due to recent chemical burns | <input type="checkbox"/> Eye pain / redness |
|---|--|---|

Escalation Criteria: Immediate sight-threatening presentations that require escalation and referral to a Senior Medical Officer (SMO):

- | | | |
|---|--|--|
| <input type="checkbox"/> Potential Inhalation of chemical, gas or fumes | <input type="checkbox"/> Significant corneal haze or limbal ischemia | <input type="checkbox"/> Meets local trauma call activation criteria* |
| | <input type="checkbox"/> Sudden loss of vision | <input type="checkbox"/> Hoarse voice |

Primary Survey:

- | | |
|--|---|
| • Airway: patency | • Breathing: respiratory rate, accessory muscle use, air entry, SpO ₂ . |
| • Circulation: perfusion, BP, heart rate, temperature | • Disability: GCS, pupils, limb strength |

Notify CNUM and SMO if any of the following red flags is identified from Primary Survey and Between the Flags criteria.¹

- | | | |
|---|---|--|
| <input type="checkbox"/> Airway – at risk | <input type="checkbox"/> Breathing – respiratory distress | <input type="checkbox"/> Circulation – shock / altered perfusion |
| • <i>Partial / full obstruction</i> | • <i>RR < 5 or >30 /min</i> | • <i>HR < 40bpm or > 140bpm</i> |
| | • <i>SpO₂ < 90%</i> | • <i>BP < 90mmHg or > 200 mmHg</i> |
| <input type="checkbox"/> Disability – decreased LOC | <input type="checkbox"/> Exposure | • <i>Postural drop > 20mmHg</i> |
| • <i>GCS ≤ 14 or a fall in GCS by 2 points</i> | • <i>Temperature <35.5°C or >38.5°C</i> | • <i>Capillary return > 2 sec</i> |
| | • <i>BGL < 3mmol/L or > 20mmol/L</i> | |

History:

- Presenting complaint
- **Allergies**
- **Medications:** Anticoagulant Therapy, Anti-hypertensives, Diabetic meds, Analgesics, Inhalers, Chemotherapy, Non-prescription meds, Any recent change to meds
- **Past medical past surgical history** relevant
- **Last ate / drank & last menstrual period (LMP) / bowel motion**
- **Events and environment** leading to presentation
- **Pain Assessment / Score:** **PQRST** (Palliating/ provoking factors, Quality, Region/radiation, Severity, Time onset)
- **Associated signs / symptoms / key information:**
 - What was the chemical? (Acid or Alkaline)
 - Any first-aid treatment administered at time and for how long?
 - Any obvious penetrating injury noted?

Systems Assessment:

Inspection: Inspect eye/s and any surrounding areas – face, mouth and nose. Note skin coloration of lips, face

Notify CNUM and Senior Medical Officer (SMO) if any of following red flags is identified from History or Systems Assessment.

- | | | |
|--|--|--|
| <input type="checkbox"/> Any suspected/ obvious penetrating eye injury | <input type="checkbox"/> Suspected inhalation of chemical or fumes | <input type="checkbox"/> Confirmed Alkaline injury |
| | | <input type="checkbox"/> Hazy of cornea |

Investigations / Diagnostics:

Bedside^{3,5}:

- Ensure the face and other exposed areas are thoroughly washed with water
- Instill 0.5% Tetracaine (amethocaine) as per standing order
- Eye Irrigation

Laboratory / Radiology:

- Not clinically indicated

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<ul style="list-style-type: none"> Checking the eye pH on both post irrigation (<i>acceptable range 6.5-8.5</i>) post eye irrigation 	
<p>Nursing Interventions / Management Plan:</p> <p><u>DO NOT</u> do an eye pH prior to eye irrigation as this is a waste of time – time is valuable.</p> <p>Perform Hand Hygiene and don personal protective equipment as soon as possible</p> <p>Immediate Treatment:</p> <ul style="list-style-type: none"> If patient presents with chemical/irritant on face/hands wash off thoroughly. Instill topical 0.5% Amethocaine to affected eye(s) as per District Standing Order. This may be used at 10-15 minutely intervals throughout the irrigation process at the discretion of the SMO. Irrigate immediately with 0.9% Sodium Chloride solution or Hartmann's solution, for at least 30mintues, by: <p>Connect irrigation fluid to an IV giving set (provides a direct and controllable jet) or Morgan lens (if used in unit). Ask the patient to open the eye – another clinician may need to assist if the patient is unable.</p> <ul style="list-style-type: none"> Direct the flow firstly over the cheek so the patient can feel the temperature of the irrigation fluid. Then direct flow systematically around the eye, keeping the flow constant. Ask the patient to rotate their eyes in each direction (up, down, left, right) to expose all parts of the conjunctiva and cornea. Ensure that both upper and lower eyelids are everted to ensure all solid material is removed. <p>At some point in the irrigation evert eyelids:³</p> <ol style="list-style-type: none"> Explain to the patient that they will experience some discomfort. When everting the upper eyelid the patient should look down through the whole procedure, as it provides some protection for the cornea. Place a cotton bud across the top of the tarsal plate of the upper lid (ensure no pressure is placed on the globe). Take hold of their eyelashes and gently pull the eyelid slightly down and away from the eye, then flip the lid back over on itself, this will expose the upper conjunctiva. Remove the cotton bud and hold lid up with your hand. Irrigate area, and remove any debris with another moistened (using Normal Saline) cotton bud. When finished, instruct the patient to blink a few times to return the lid to the normal position. Get the patient to close their eyes, run your fingers over the upper lid that you have just everted to verify if there is any material left behind. If so repeat procedure. <ul style="list-style-type: none"> All particles of chemical matter should be removed, by wiping conjunctiva with a moistened (using normal saline) cotton bud. Repeat anaesthetic drops every 10–15 minutes during the irrigation if required by patient. If a Morgan lens is being used to perform the eye irrigation, at some point the lens needs to be removed and the eye irrigated manually. <p>After 30 minutes of irrigation</p> <ul style="list-style-type: none"> Test pH using Universal Indicator paper 3 to 5 minutes after irrigation has ceased to ensure the testing of tears and not the irrigating fluid. Insert approved testing paper in the lower fornix (lower lid) both eyes (for comparison of pH), allow strip to moisten. Acceptable range 6.5-8.5, always tests pH of both eyes for comparison. <p>Post procedure</p> <ul style="list-style-type: none"> Assess visual acuity at the end of the procedure to establish a baseline. Document time started and finished the type and volume of irrigating fluid used. Document pH levels and clinical condition of the eye/s. <ul style="list-style-type: none"> In the event of an alkaline injury, the chemical will leach out of the eye over several hours keeping the pH high. Consult Ophthalmologist regarding continuation of procedure and the patient's condition. 	
<p>Resuscitation / Stabilisation⁴:</p> <ul style="list-style-type: none"> Oxygen therapy and cardiac monitor [as indicated] IV Cannulation (consider large bore i.e. 16-18 gauge) IV Fluids: Sodium Chloride 0.9% 1 litre stat (<i>discuss with SMO</i>) 	<p>Symptomatic Treatment^{4,5}:</p> <ul style="list-style-type: none"> Analgesia: as per district standing order Topical Eye Drops: Tetracaine (Amethocaine) as per district standing order Eye Irrigation: Procedure for eye irrigation can be found online in Eye Emergency Manual 2009 on page 39.
<p>Supportive Treatment:</p> <ul style="list-style-type: none"> Nil By Mouth (NBM) If patient has a severe penetrating eye injury irrigation would have to be re considered. Monitor vital signs as clinically indicated (BP, HR, T, RR, SpO₂) 	<ul style="list-style-type: none"> Monitor neurological status GCS as clinically indicated Monitor pain assessment / score

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Practice Tips / Hints:

- Complete a primary/ secondary assessment to assess for life threatening injuries, potential and actual injuries
- Consider mechanism of injury to eye and potential for other injuries.
- Explain to person exactly what you are going to and you will find you have better co-operation.
- Further detailed Ophthalmology resources are available from the ACI (cited 2021) [ophthalmology resources](#)

Further Reading / References:

1. SESLHD Deteriorating Patient Emergency Response System for Management of Adult and Maternity Inpatients. SESLHDPR/283, 2019. <https://www.seslhd.Deteriorating Patient-Clinical Emergency Response System for Management of Adult and Maternity Inpatients>
2. Pane, A and Simcock, P. (2005) Practical Ophthalmology- a survival guide for doctors and optometrists.
3. NSW Health Eye Emergency Manual Second Edition 2019 – Found online ACI (cited 2021) [Eye Emergency Manual | Agency for Clinical Innovation](#).
4. SESLHD Framework for Emergency Nurse Protocols and Standing Order.2018 SESLHDPR/369. <https://www.seslhd.health.nsw.gov.au/sites/default/files/documents/SESLHDPR369.pdf>
5. SESLHD Standing Order Emergency Department Tetracaine (Amethocaine) Hydrochloride June 2020 <http://SESLHDStandingOrders/ed/2020/SESLHDEDSTOTetracaineAmethocaine>
6. Emergency Care Institute New South Wales. Ophthalmology.2021- Found online: (Cited 2021)<https://www.aci.health.nsw.gov.au/networks/eci/clinical/clinical-resources/clinical-tools/ophthalmology>
7. Emergency Care Institute New South Wales. Nurse Delegate Emergency Care. Eye Problems Nurse Management Guidelines 2020-found online: (cited 2021)<https://www.aci.health.nsw.gov.au/networks/eci/clinical/ndec/eye-problems-nmg>

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- Murphy, M (2007) Emergency Department Toolkits. Westmead Hospital, SWAHS
- Hodge, A (2011) Emergency Department, Clinical Pathways.SEH

Revision & Approval History

	0	Drafted by: Beverley Latham Acting CNC (Ophthalmology) Sydney/Sydney Eye Hospital
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