Ocular emergencies in the South Asia region

Eye care providers at different levels in South Asia must be able to diagnose, manage, initiate first-aid and refer during an ocular emergency.

Ocular emergencies are an important cause of morbidity in South Asia and studying their spectrum and presentation is vital for developing local preventive and therapeutic programmes. Primary care providers must be able to diagnose, manage, initiate first-aid, or refer, as any delay in treatment during an ocular emergency can result in permanent loss of vision.¹

Ocular trauma

Any form of trauma is an emergency and prompt treatment can arrest complications and long-term morbidity (Figure 1). The prognosis of any injury is commonly made worse by delayed presentation and use of inappropriate, untested products and traditional medicines.² Health promotion interventions in injury prevention include raising awareness and actively involving the community. Workplace trauma can be prevented through occupational health laws which educate workers and promote the use of protective eyewear. Children are often victims of ocular trauma, so health education in schools is very important.

Ocular trauma can be classified into

- Penetrating injuries
- Blunt injuries
- Chemical injuries
- Ocular burns

Penetrating injuries

Open globe injuries are caused by sharp objects in which there is full thickness wound in the eyewall. The patient may present with a sudden loss of vision, pain, watering and an inability to open the eye. Visual acuity should be measured for each patient. Surgical closure is necessary in case of open globe injuries in order to minimise the risk of further infection. Intraocular foreign bodies, if present, should be removed; this requires specialist facilities and surgery.

Blunt injuries

Closed-globe injuries are caused by blunt objects, where there is no full thickness wound of the eyewall comprising sclera and cornea.

The patient may present with loss of vision, pain and inability to open the eye. Visual acuity, pupillary reactions and the posterior segment should be evaluated in all cases. The management will depend on the severity of the injury. With conservative treatment, a simple hyphema will usually reabsorb after a few days.

Chemical injuries

Chemical injuries may present in different ways, depending on the nature of the chemical agent, its concentration and volume, and the duration of exposure.³ Both acids and alkalis can cause eye injuries. Many occur in men who are at risk of exposure to chemicals such as lime (calcium hydroxide), ammonia, sodium or magnesium hydroxide in the workplace (Figure 2).
The first step in the management of chemical injuries is immediate and meticulous irrigation of the eye. This is done by evertting the eyelids and flushing with ringer lactate or normal saline until the pH of the ocular surface is neutralised. Timely treatment that includes topical antibiotics, cycloplegics, topical steroids, topical sodium ascorbate & citrate 10%, oral doxycycline, oral ascorbate and tear substitutes must be instituted.

**Ocular burns**
Ocular damage from thermal burns can result from contact with boiling liquid, molten metal, flames, gasoline explosions, steam or hot tar. Firecrackers can cause combined chemical and thermal burns on the ocular surface.

The management of ocular burns depends on the type of injury. However immediate cleaning and irrigation with normal saline or clean water is an important first aid measure.

**Corneal Ulcer**
Corneal ulcers are common in the South Asian region, especially in countries with rural and developing economies. A corneal ulcer is defined as a corneal epithelial defect with infiltration of the deeper stroma, most commonly caused by infection. Viral ulcers arise spontaneously on a previously intact epithelium, while bacterial and fungal ulcers occur after a traumatic break in the corneal epithelium. Fungal ulcers typically start after an injury with organic matter.

Patients with a corneal ulcer present with pain in the eyes, foreign body sensation, photophobia, discharge, watering and blurred vision. It is important to elicit a proper history and sequence of events. Patients should be asked about ocular medications, especially the use of corticosteroids, previous eye surgery, ocular disease and systemic illness.

On examination, the eye will typically look congested with a white corneal lesion indicating stromal infiltration (Figure 3). A corneal scraping can be taken and sent for Gram and KOH staining along with bacterial and fungal culture and sensitivities, since determining the infectious aetiology is important to guide future treatment.

Immediate initiation of a topical antibiotic followed by prompt referral to a higher centre is necessary. Fortified antibiotics such as tobramycin and a cephalosporin or vancomycin are appropriate for severe, deep, or central corneal ulcers. Fungal ulcers are treated with topical natamycin 5% or topical voriconazole 1% eyedrops. Supportive treatment like cycloplegics, oral analgesics and antiglaucoma agents maybe required. Close follow-up is essential for all corneal ulcers as non-resolving ulcers or penetrating ulcers (Figure 4) may require an urgent therapeutic keratoplasty to debulk the cornea of infectious tissue and/or restore the integrity of the eye (Figure 5).

**Acute glaucoma**
Acute angle-closure glaucoma is caused by the sudden closure of the anterior chamber angle. This leads to inadequate drainage of the aqueous humour and a subsequent elevation in intraocular pressure (IOP) which can lead to optic nerve damage. It is more common in the South East Asia region and if not recognised and treated on time can cause blindness within hours.

Patients present with severe ocular pain, decreased vision, nausea and vomiting, intermittent blurring of vision with halos, and headache. Ocular examination shows conjunctival infection, corneal oedema, a mid-dilated pupil that does not react well to light, shallow anterior chamber and decreased vision. IOP usually ranges from 40 to 90 mm Hg.

Once acute angle closure is suspected, IOP is lowered with oral acetazolamide and topical timolol, pilocarpine, and apraclonidine, while monitoring changes to the angle and optic nerve head. Hyperosmotic agents such as oral glycerol or intravenous mannitol are effective in lowering IOP during an emergency. Once IOP is controlled laser iridotomy is performed in both the affected eye and the fellow eye as well to prevent acute attacks. Prompt, appropriate diagnosis, aggressive treatment and management are necessary to prevent, or minimise, significant ocular morbidity in patients with angle closure glaucoma.
Acute loss of vision

Acute loss of vision in a white eye can occur due to central retinal artery occlusion (CRAO), retinal detachment, optic neuritis (Table 1). Immediate evaluation and referral to a tertiary care centre is important. Risk factors for CRAO include old age, being male, smoking, hypertension, diabetes, cardiovascular diseases and coagulopathies. Control of modifiable risk factors via health education and health promotion is the primary prevention of CRAO.

References:
1 Girard B, Bourcier F, Agdabede I, Laroche L. Activity and epidemiology in an ophthalmological emergency center. J Fr Ophtalmol 2002;25:701-11.
2 Epidemiological patterns of ocular trauma. Aust N Z J Ophthalmol. 1992 May;20(2):95-8.
3 Khathutshelo Mashige. Chemical and thermal ocular burns: a review of causes, clinical features and management protocol, South African Family Practice 2016, 58(1):1-4
4 Garg P, Rao GN. Corneal ulcer: diagnosis and management. Community Eye Health. 1999;12(30):21-23

Table 1 Eye emergencies and care at different levels

| Eye emergency   | Primary level                                                                 | Secondary Level                                                                 | Tertiary level                                                                   |
|-----------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Penetrating injury | • History and examination  
• Injection tetanus toxoid  
• Start oral antibiotics  
• Shield/protect the eye  
• Refer to higher centre | • History and examination  
• Admission and urgent primary surgical repair under general anaesthesia  
• Refer to higher centre if facility is not available | • Surgical repair  
• Intraocular foreign body removal by specialist  
• Post-operative rehabilitation |
| Chemical injury | • History  
• Irrigation of the eye ++++  
• Urgent referral to higher centre | • History + examination  
• Irrigation of the eye ++++  
• Remove any particulate matter  
• Start topical antibiotics, cycloplegics, and oral ascorbate  
• Urgent referral to higher centre if indicated | Management depends on the severity and type of chemical injury. Severe alkaline burns may require long-term medical and surgical treatment |
| Corneal ulcer | • History and examination  
• Topical antibiotics e.g. eye ointment chloramphenicol 1%  
• NEVER START STEROIDS  
• Stay away from traditional eye medicines  
• Refer to a higher centre | • History + examination  
• Confirm diagnosis of corneal ulcer  
• Take corneal scraping for KOH/ Gram smear to identify organism  
• Admit the patient if facility is available, if there is a threat to vision and to ensure treatment compliance and follow-up | Refer to a tertiary ophthalmic centre if:  
• the patient is a child  
• there is impending or actual penetration  
• it is in the only functional eye  
• no facility for corneal scraping  

**TREATMENT:**  
• NO FUNGAL HYPHAE  
• Start topical cefazolin 5% and tobramycin 1.3% hourly  
• If no improvement after three days refer  

• FUNGAL HYPHAE seen –  
• Start topical natamycin 5%  
• If no improvement after three days refer  

**SURGICAL OPTIONS:**  
• Surgical debridement  
• Tarsorrhaphy  
• Patch grafts  
• Conjunctival flaps  
• Penetrating/lamellar keratoplasty
### Endophthalmitis
- History of intraocular surgery or trauma
- Redness, pain, watering, lid edema
- Decreased visual acuity
- Hypopyon may be present in most cases.

### Orbital cellulitis
- Fever
- Lid oedema
- Proptosis
- Painful ocular movements
- Decreased visual acuity

### Acute glaucoma
- Sudden onset, unilateral ocular pain
- Headache
- Coloured halos
- Decreased visual acuity
- Nausea and vomiting

### Optic neuritis
- Unilateral visual loss
- Pain with ocular movements
- Afferent pupillary defect
- Colour vision deficiency
- Disc may be normal (retrobulbar neuritis) or swollen (papillitis)
- Visual field loss

### Retinal detachment
- Sudden onset, painless loss of vision
- Flash of light, floaters and curtain falling in front of eye

### Treatment Protocols

| Eye emergency       | Primary level                                                                 | Secondary Level                                                                 | Tertiary level                                                                 |
|---------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| **Endophthalmitis** | • Urgent referral to tertiary centre                                          | • Urgent referral to tertiary centre                                            | • Vitreous tap                                                                  |
|                     |                                                                                | • Start topical and oral antibiotics (fluoroquinolones)                         | • Systemic antibiotics                                                         |
|                     |                                                                                |                                                                                 | • Intravitreal antibiotics                                                     |
|                     |                                                                                |                                                                                 | • Vancomycin 1.0 mg/0.1 mL                                                     |
|                     |                                                                                |                                                                                 | • Ceftazidime 2.25 mg/0.1 mL                                                   |
|                     |                                                                                |                                                                                 | • Amphotericin B 5-10 ug/0.1 mL (if fungal suspected)                          |
|                     |                                                                                |                                                                                 | • Corticosteroids (to modulate the ongoing host inflammatory response), avoid when fungal is suspected. |
|                     |                                                                                |                                                                                 | • Pars plana vitrectomy if no response to treatment                            |
| **Orbital cellulitis** | • Urgent referral to tertiary centre                                       | • Urgent referral to tertiary centre                                            | • Admission                                                                   |
|                     | • Start oral antibiotics                                                        |                                                                                   | • Blood culture and routine blood tests                                         |
|                     |                                                                                 |                                                                                 | • Orbital imaging will reveal pus pockets in the orbit / infection in the paranasal sinuses |
|                     |                                                                                 |                                                                                 | • Intravenous broad-spectrum antibiotics for initial seven days followed by shifting to oral antibiotics for seven-14 days. |
|                     |                                                                                 |                                                                                 | • I.V. Vancomycin 40 mg/kg/day in 2-3 divided doses per day                   |
|                     |                                                                                 |                                                                                 | • I.V. Ceftriaxone 100 mg/kg/day in 2 divided doses per day                   |
|                     |                                                                                 |                                                                                 | • I.V. metronidazole 30 mg/kg/ day in 3 divided doses per day (in case of suspected anaerobic organism) |
|                     |                                                                                 |                                                                                 | • Occasionally surgical drainage of orbital abscess by ophthalmologist and surgical drainage of sinuses by ENT specialist |
| **Acute glaucoma**  | • Immediate recognition                                                        | • Check intraocular pressure digitally (eye will be stony hard) or with TONOPEN | • Check intraocular pressure                                                  |
|                     | • Check intraocular pressure digitally (eye will be stony hard) or with TONOPEN | • Oral acetazolamide 500 mg                                                    | • Oral acetazolamide 500 mg                                                   |
|                     | • Give oral acetazolamide 500 mg stat                                           | • Topical beta blocker (timolol)                                               | • Topical beta blocker (timolol) and / or 2% piocarpine                      |
|                     | • Urgent referral to higher centre                                              | • Admission if facility available                                               | • Hyperosmotic agents (intravenous mannitol or oral glycerine)               |
|                     |                                                                                | • Hyperosmotic agents (intravenous mannitol or oral glycerine)                 | • Gonioscopy to check angle                                                    |
|                     |                                                                                | • Laser PI if available                                                         | • Laser PI                                                                    |
|                     |                                                                                | • Urgent referral to higher centre                                              | • Consider glaucoma filtering surgery once acute stage is managed             |
| **Optic neuritis**  | • Urgent referral to tertiary centre                                          | • Urgent referral to tertiary centre                                            | • Confirm diagnosis                                                           |
|                     |                                                                                |                                                                                 | • Complete blood investigations.                                              |
|                     |                                                                                | • Start intravenous high-dose methylprednisolone for three days followed by 11 days of oral 1 mg/kg/day prednisone after tuberculosis and malignancy is ruled out. |
|                     |                                                                                |                                                                                 | • Neurology referral with MRI brain                                            |
| **Retinal detachment** | • Urgent referral to tertiary centre                                       | • Perform dilated fundus examination/fundus camera                             | • Immediate surgical management by a vitreo-retina specialist                 |
|                     |                                                                                | • Urgent referral to tertiary centre                                            | • Screening of the other eye for any predisposing lesions and prompt laser.   |