Eye trauma: Primary care for general physicians
H. K. TEWARI, ATUL KUMAR, GUNJAN PRAKASH

INTRODUCTION
The understanding of ocular trauma is important for the primary care physician. Whether based in an emergency room or a private office, a general physician will frequently encounter ocular injuries. Men are affected approximately nine times more often than women, and most victims are under 40 years of age. The visual prognosis for eyes with major injuries has improved in the past two decades. The different modalities of injury are enumerated in Table I, while Table II lists the causes of ocular trauma in children in India in descending order of frequency (our experience). Unprotected sport is one of the common causes of eye trauma. The different sports commonly responsible for blunt as well as penetrating injury are listed in Table III.

Evaluation of patients with suspected ocular trauma starts with a detailed history. The examiner should have an understanding of the potential severity of the injury. Was a foreign body involved? Any hole in the iris, not the pupil itself, is a pointer towards intraocular foreign body. Are potential orbital fractures likely? Were chemicals used? Is a ruptured globe possible? It is critical to determine whether any life-threatening systemic injury has occurred concurrently; such injury should take precedence over the management of the ocular injury.

GENERAL OCULAR EVALUATION
A complete bilateral ocular examination is necessary in all cases of eye trauma, not only for treatment but also for medicolegal documentation. We have provided an algorithm to help general physicians gain confidence in providing primary care to ocular trauma victims as well as to help guide them as to when to refer the patient to a secondary-level hospital with ophthalmological expertise.

For the primary care doctor the physical examination should include the face and lids, conjunctiva, pupils, evaluation of extraocular motility, anterior segment and the fundus. The three areas that provide the most valuable information are the pupil, visual acuity and red reflex (Table IV).

If the vision is normal, the injury is likely to be mild or non-threatening. The vision can be tested with the standard Snellen acuity chart in the office or with the help of a near card. If this is not available, the ability to read a newspaper puts the vision at 20/50. The red reflex of a distant direct ophthalmoscopy (Fig. 1a) evaluates the ocular media. An abnormal red reflex is a good screening tool (Fig. 1b). It indicates that something is wrong with the media of the eye, but it will not localize the defect.

In evaluating the pupils, one should look for symmetry. Isolated blunt trauma to the globe with an irregular pupil indicates a tear of the sphincter muscle. A peaked pupil is a cause for worry as it may be associated with a globe perforation with iris prolapse into the wound. An afferent pupil defect is associated with optic nerve injury.

ORBITAL FRACTURES
Patients with a recent history of orbital trauma may complain of pain on attempting vertical eye movements, tenderness localized to a point at the infraorbital rim, binocular diplopia, or lid swelling, particularly after nose blowing. If the orbital floor is fractured, these patients frequently have diplopia that is worse on looking up, as the inferior rectus is trapped within the fracture site.

Signs include ecchymosis and oedema of the eyelids (Fig. 1c), orbital subcutaneous or subconjunctival emphysema, hypoaesthesia in the distribution of the ipsilateral infraorbital nerve, enophthalmos and ptosis of the globe. Areas of a step-off fracture or discontinuity should be palpated for. A neurological evaluation is indicated if there is a history of loss of consciousness. If a blow-out fracture is present, the patient should be referred to an ophthalmologist.

Cross-references:
1. Recognition of associated life-threatening injuries
2. Emergent eye conditions—chemical injury and central retinal artery occlusion (require urgent management)
3. Concurrent medical illness such as diabetes, etc.
4. Eyelid and adnexal injury
5. Visual acuity (best corrected for both far and near) of the involved as well as uninvolved eye
6. Pupil: whether equal to that of the fellow eye, round, regular, reacting to light
7. Pupillary reactions: both direct and consensual
8. Anterior segment: torch-light examination of the cornea, conjunctiva and sclera
9. Anterior chamber: depth and regularity
10. Red reflex (posterior segment glow) with a direct ophthalmoscope

Table I. Ocular injuries (based on nature of work)

| Children at play | Home accident |
| Road traffic accident | Assault |
| Industrial accident | Adult sport |
| Civil disturbance | Farm accident |

Table II. Common causes of ocular injuries in Indian children

| Sharp instrument | Bow and arrow | Gulli-danda |
| Finger nail | Animals | Domestic |
| Road traffic accident | Chemicals |

Table III. Sports causing ocular injuries

| Boxing/wrestling | Squash | Cricket |
| Badminton | Racing | Archery |
| Golf |

Table IV. Checklist for evaluation of ocular injury by a general physician

1. Recognition of associated life-threatening injuries
2. Emergent eye conditions—chemical injury and central retinal artery occlusion (require urgent management)
3. Concurrent medical illness such as diabetes, etc.
4. Eyelid and adnexal injury
5. Visual acuity (best corrected for both far and near) of the involved as well as uninvolved eye
6. Pupil: whether equal to that of the fellow eye, round, regular, reacting to light
7. Pupillary reactions: both direct and consensual
8. Anterior segment: torch-light examination of the cornea, conjunctiva and sclera
9. Anterior chamber: depth and regularity
10. Red reflex (posterior segment glow) with a direct ophthalmoscope

All India Institute of Medical Sciences, New Delhi 110029, India
H. K. TEWARI, ATUL KUMAR, GUNJAN PRAKASH
Dr R.P. Centre for Ophthalmic Sciences
Correspondence to ATUL KUMAR; akum66mm@naf.vsnl.net.in
© The National Medical Journal of India 2002
ENOPHTHALMITIS

Traumatic endophthalmitis (infection of the vitreous) is characterized by a hypopyon with gray reflex on direct ophthalmoscopy. It should be diagnosed early and initial treatment with topical concentrated cefazolin (5%) and concentrated tobramycin (1.3%), one drop every 30 minutes, should be started along with intravenous antibiotics. The definitive treatment is intravitreal antibiotics (vancomycin 1 mg in 0.1 ml and ceftazidime 2.25 mg in 0.1 ml) and can be undertaken with due antiseptic precautions by an ophthalmologist. Therefore, when endophthalmitis is suspected, the patient must be referred to an ophthalmologist. This is crucial; done in time it can save the eye. Without treatment the eye will have an appearance as shown in Fig. 1d, when even vitrectomy (last resort) is not possible and evisceration might have to be carried out to relieve the patient’s pain.

TRAUMATIC HYPHAEMA

Traumatic hyphaema (blood in the anterior chamber) can lead to devastating ocular complications (Fig. 2a). Patients may present with blurred vision, pain, photophobia and tearing following blunt, concussive injury to the eye or orbit.

Circumstances surrounding the event, current medicines and previous ocular history are important pieces of data. Bleeding in the eye warrants eliciting a history of systemic blood disorders such as sickle cell anaemia, haemophilia and von Willebrand’s disease.

Ideally, every patient should be examined with a slit-lamp, but this may be impossible in a private office or in primary health centres. If a slit-lamp is not available, a penlight or an ophthalmoscope light can be used. To visualize the anterior chamber, tangential light is the most helpful.

The patient should be given cycloplegics such as 1% atropine ointment thrice a day and topical steroids. If the intraocular pressure is 27 mmHg, it should be controlled using topical beta-blockers twice daily. When the intraocular pressure is very high (>35 mmHg), oral acetazolamide 500 mg twice daily should be prescribed and the patient referred to a specialized centre. To prevent re-bleeding, pain should be relieved only with acetaminophen; aspirin and ibuprofen should be avoided.

CORNEAL ABRASION

A primary care physician can easily evaluate the cornea. This begins with inspection of the corneal epithelium. Trauma that disrupts the corneal epithelium is painful and the patient is uncomfortable. To detect an abrasion, a fluorescein strip is gently placed on the bulbar conjunctiva or that of the lower lid (Table V and Fig. 2b). If the strip is touched to the cornea, the fluorescein could be concentrated at the touched site and could falsely signal an abrasion.

<table>
<thead>
<tr>
<th>TABLE V. Superficial corneal abrasions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps of management</td>
</tr>
<tr>
<td>Anaesthetize the eye with topical agent</td>
</tr>
<tr>
<td>Test vision when pain and tearing have abated</td>
</tr>
<tr>
<td>Retract lower lid, and touch the end of a dry fluorescein sodium strip to the lower cul-de-sac</td>
</tr>
<tr>
<td>Have the patient blink to distribute fluorescein evenly</td>
</tr>
<tr>
<td>Inspect the cornea with cobalt blue light incorporated into the direct ophthalmoscope</td>
</tr>
<tr>
<td>Continue topical antibiotic prophylaxis once or twice a day until the abrasion heals</td>
</tr>
<tr>
<td>Apply a drop of homatropine 2% eye drops, then apply a bland antibiotic ophthalmic ointment</td>
</tr>
<tr>
<td>Prescribe topical non-steroidal anti-inflammatory agent, four times daily, for pain</td>
</tr>
<tr>
<td>Record size and location on every follow up visit</td>
</tr>
<tr>
<td>Re-examine daily until fluorescein staining completely resolves</td>
</tr>
</tbody>
</table>
TEWARI et al.: EYE TRAUMA: PRIMARY CARE

If the epithelium is damaged, the fluorescein will adhere to the basement membrane and when cobalt blue light (usually present in the direct ophthalmoscope) is used, it will fluoresce brightly, confirming the presence of an abrasion (Fig. 2c). Once an abrasion is detected, laceration of the corneal stroma should be ruled out. If a laceration is suspected, a referral is necessary.

A patient with corneal abrasion is treated with antibiotic drops or ointment four times a day till the abrasion heals. An initial 24-hour patch with an antibiotic-steroid eye ointment is highly recommended. Thereafter, a patch is used if the patient feels less pain with the eye covered. A corneal abrasion needs to be followed up daily to look for signs of infection. If there is no improvement after 48 hours, the patient should be referred. The vision and the size of the abrasion should always be documented during the initial examination and at all follow up examinations. Worsening of vision may indicate a corneal infection and the patient should be referred.

CORNEAL LACERATION
In a patient with a corneal laceration (Fig. 2d) there is intense pain initially which may diminish slightly due to corneal desensitization. Patients have photophobia and profuse lacrimation. There is marked associated uveitis and the anterior chamber is shallow or even flat in a full-thickness laceration. Visual acuity is substantially reduced. The diagnosis of corneal laceration must be made early and with as little intervention as possible. Measurement of the intraocular pressure should be avoided in any patient suspected to have a full-thickness laceration, as any pressure applied to the globe may cause uveal tissue to extrude through the wound.

Unnecessary manipulation of an eye with a full-thickness laceration should be avoided. An eye shield is used to protect the eye. The laceration should be surgically repaired by a corneal specialist at the earliest. The patient should be warned that the initial visual acuity may represent the best vision that can be expected after surgical repair. Although vision may improve after surgical repair, it is best not to raise a patient’s expectations.

CORNEAL FOREIGN BODY
Patients who have a foreign body on the cornea generally present with pain. Excessive tearing, blurred vision and photophobia are also common. The most critical sign is the finding of particulate matter at the surface of, or embedded within, the cornea (Fig. 3a). Ensure that the object has not perforated the cornea. If no penetration has taken place, the object should be removed under topical anaesthesia (1–2 drops of 0.5% proparacaine). A direct stream of sterile irrigating solution may be sufficient to dislodge some small foreign bodies. If irrigation does not help, consider that the foreign body is likely to be embedded. The instrument of choice in this case is a spud (Figs 3b and c) that allows the foreign body to be excavated and flicked off from the surface. If this is also unsuccessful, refer the patient to a secondary-level hospital where it can be removed under slit-lamp illumination and magnification.

When a corneal foreign body is in the line of the visual axis, patients should be counselled about the possible loss of visual acuity due to unavoidable scarring; this should be well documented to avoid clinicolegal ramifications. The patient should also be counselled about the possibility of a scar remaining on the cornea that might be cosmetically bothersome.

A conjunctival foreign body can be removed in a similar way, or by using a pair of forceps or a cotton-tipped applicator (Fig. 3d). If a general physician is unable to rule out the possibility of a penetrating ocular injury, a shield should be applied to the affected eye (without any topical medication) and the patient referred immediately to an ophthalmologist.

EYELID TRAUMA
While evaluating the lids one should consider damage to the globe. Are there puncture wounds? Are there lacerations (Fig. 4a)? If there are lacerations, are they full-thickness or partial? Do they include the lid margin?

A laceration involving the lid margin needs to be referred to an ophthalmologist because simple repair will leave a lid notch that will be cosmetically unacceptable. One must also suspect canalicular involvement if the lacerations are at the medial aspect of the
lids. Frequently, the internal aspect of an external wound can be extensive and involve the canalicular system.

Blunt trauma or contusion (Fig. 4b) to the eyelids is a non-penetrating injury by an external force that does not break or lacerate the epidermis or dermis. Care should be taken to ensure that the globe has not been ruptured. Ten-minute ice compresses applied every 2 hours can reduce post-traumatic oedema if applied within the first two days of injury.

CHEMICAL BURNS
The substance, its concentration, and the duration of contact determine the severity of chemical burns of the eyelids. Acid burns are usually self-limiting and not as destructive as alkali burns. An accurate history is necessary to determine the time of injury, the nature of the chemical and the duration of exposure before irrigation. However, no time should be wasted on eye examination—treatment should be started first, as this can save the eye.

Emergent treatment includes copious irrigation of the eyelids, preferably with saline or Ringer's lactate solution for at least 30 minutes. If neither of these is available, non-sterile water should be used. Cool milk can also be used in case of emergencies.

Chemical burn is one of the few conditions of the eye in which, if the treatment is started early enough, the prognosis is good. The lower and upper fornices should be irrigated. Manual use of intravenous tubing connected to an irrigation solution facilitates the irrigation process. Five minutes after ceasing irrigation, litmus paper should be touched to the inferior fornix. If the pH is not neutral (pH=7), irrigation should be continued.
After irrigation, the fornices should be further examined, and any sequestered particles of caustic material and necrotic conjunctiva should be removed. The periorcular skin should be cleaned. Contaminated clothes of the patient should be removed to prevent further damage.

Therapy for uveitis (e.g. 1% atropine ointment thrice daily) along with topical antibiotic ointments (e.g. ciprofloxacin four times a day) and oral ocular hypotensive medication (e.g. acetazolamide) as well as oral pain medication should be used as needed.

SUBCONJUNCTIVAL HAEMORRHAGE
Subconjunctival haemorrhage is usually benign and self-limiting (Fig. 4c). No treatment is required. The conjunctiva should be inspected for evidence of foreign bodies. The upper lid should be everted and injuries looked for. If there is a laceration of the conjunctiva, a possible globe injury should be suspected.

The sclera is a resilient structure and commonly spared in a conjunctival laceration. However, globe rupture (Fig. 4d) is a possibility and appropriate signs and symptoms as already described should be looked for.

POSTERIOR SEGMENT TRAUMA
For the primary care physician, the most important structures to examine are the optic nerve and the macula. These can be visualized by a direct ophthalmoscope. The view of the optic nerve can determine if papilloedema is present, which is important, especially in cases of head injury.

Trauma can cause a retinal tear. If this is not detected, vitreous fluid can enter the retinal tear and detach the retina. If a retinal tear is detected, treatment can prevent a retinal detachment. Blood in the vitreous should make one suspect a retinal tear. The best way to view the retina is by indirect ophthalmoscopy. If needed, the patient should be referred.

PRECAUTIONS
The general physician should know when to stop. He should do no further harm to the injury by doing more than required. Moreover, an overenthusiastic physician might land up in trouble himself, in this era of consumerism. A useful guide of dos and don’ts is provided in Table VI.

CONCLUSION
Most of the visual disability resulting from trauma can be prevented by protective eyewear. A brief review is therefore mandatory. Any eyewear designed for protection should have good optical quality, be light in weight, comfortable, durable, easy to maintain, non-flammable, non-irritant, cosmetically acceptable and compatible with other protective devices. Polycarbonate lenses are recommended for all children, functionally one-eyed people and active adults. For sports that have a potential for eye contact with a ball, 3 mm thick polycarbonate lenses should be used. A helmet with a face shield over the safety glasses should be used in unsafe areas such as factories, etc. Glass lenses, ordinary plastic lenses, open eye guards and contact lenses do not give adequate eye protection.

Ocular trauma is so common that a general practitioner encounters it frequently. Given that it can be successfully treated with good visual prognosis, close cooperation is essential to improve care delivery. An algorithmic outline (box), for assessing a patient with ocular trauma in a primary care setting would be useful. While much of the management must take place in a specialist hospital, it is hoped that screening along with primary care can be undertaken at the level of the general practitioner. This can only be properly achieved, however, if primary care providers are comfortable in interpreting the relevant signs and symptoms and coordinating the subsequent management.

REFERENCES
4 Cherry PMH. Rupture of the globe. Arch OphthalmoI 1966;76:678.