Management of eye injuries in the workplace

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Abstract

Eye injuries which occur in the workplace are more common in developing countries like South Africa where appropriate eye protection might be lacking. The purpose of this paper is to assist the occupational health care provider to correctly assess damage to the eye and interpret the findings to make a diagnosis and appropriate decisions for primary care. Examination of the eyes by health-care doctors and nurses should be systematic, assessing all the structures in order to determine appropriate treatment and referral. The most urgent condition is a chemical burn in which minutes matter and immediate irrigation can prevent long-term vision loss. Lid lacerations are usually easy to identify but penetrating globe injuries or intraocular foreign bodies may be missed and result in permanent loss of vision and disability. Many injuries can be adequately managed by primary care health workers, either medical doctors or nurses, and do not require referral.

Key words: eye injury, workplace, arc eye, corneal foreign body, conjunctivitis, chemical burn, penetrating eye injury, intraocular foreign body

Introduction

It has been estimated that eye injuries severe enough to restrict activities number about 55 million annually worldwide.[1] About 200 000 of these were estimated to be open globe injuries although epidemiologic data are scarce. In South Africa we have concurrent epidemics of trauma from interpersonal violence and motor-vehicle accidents as well as infectious diseases such as AIDS (Acquired Immune Deficiency Syndrome) and tuberculosis. Against this background, workers may present with a range of eye injury and pathology. In addition, South Africans approach sport with a zeal that borders on religious fervour. Squash is especially dangerous but other modern sports have been associated with eye injury where appropriate eye protection is not worn.[2]

In the workplace, doctors and nurses must deal with the injuries resulting from occupations which might place them at higher risk than the average population. Males are known to be at particular risk but those in less developed countries are also at higher risk.[3] It is assumed that about 90% of work-related eye injuries are preventable.[4] The main products involved in 94 500 eye injuries in the United States of America in 2003 were: tools, both power and manual (21%), welding, including arc eye (16%) and chemicals, including glues, paints and acids (13%).[5] Corneal foreign bodies (FBs) were included either under tools or welding.

In approaching the optimal management of these injuries an evidence-based approach is required but many issues remain unresolved.[4] An audit of 274 eye consultations at a Hong Kong hospital showed 43% were managed using evidence from systematic reviews, meta-analyses or randomised controlled trials and evidence for observational studies (prospective or retrospective) supported the intervention in another 34%.[6] With time, even more of our management decisions will likely be based upon some form of hard evidence. Attempts at classifying and scoring eye injuries may facilitate assessment and allow better prognostication as well as better initial assessment[7] but are not routinely done in the workplace.

The purpose of this paper is to assist the occupational health care provider to correctly assess damage to the eye and interpret the findings to make a diagnosis and appropriate decisions for primary care.

Equipment required for basic eye examination and treatment

- Vision chart – 4 or 6 m;
- Direct ophthalmoscope;
- Fluorescein dye strips;
- Cotton buds to evert lids and remove FBs, 18 gauge needles to remove FBs;
- Loupe – or plus 3 glasses;
- Drip set, two litres of Ringers lactate or saline, basin to collect water, pH strips for chemical burn irrigation;
- Eye pads, micropore, chloramphenical ointment, cyclomydril; and
- Topical anaesthetic – Novescine, tetracaine.

Important points when examining an eye trauma patient

Consider whether the injury requires tetanus toxoid and enquire if the patient has had any recently. If not, it might be necessary.

Examine the eye systematically from the front (eyelids) to the back (fundus). Penlight torch examination of the cornea and anterior segment of the eye may show a cloudy (hazy) cornea or obvious signs of damage. The upper lid may need eversion and fluorescein dye may be used to check for staining indicating corneal abrasion. Do not forget to palpate the orbital rim for fractures and X-ray if indicated,

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i.e. if there is crepitus around the orbit, signs of a blow-out or other fractures, or suspected intra-ocular foreign body. Ocular movements should be tested. Pupil reactions can be noted.

Look at the red reflex with the direct ophthalmoscope. If absent, it might indicate blood in the eye or lens damage (cataract). Carefully and systematically examine the retina looking for haemorrhages and retinal detachment.

Test the visual acuity with the best available correction (glasses, contact lenses) or use a pinhole occluder – this estimates the patient's best-corrected acuity.

Intraocular pressure measurement: If a penetrating globe injury is suspected, compression of the globe should be very gentle, using a cotton bud or digital (two fingers) technique on the eyelid. In a case with a known penetrating injury, this should not be done.

Indications for referral to an ophthalmologist

In general, many of the common eye conditions that need definitive management can wait for one day (patient seen by an ophthalmologist within about 24 hours) or even 2–3 days. Sometimes it is desirable that the patient is seen as soon as possible (ASAP) regardless of the time of day.

Conditions which need immediate referral (ASAP) are: severe pain in the eye; sudden visual loss or where the visual loss is severe and the duration cannot be assessed; corneal and corneo-scleral lacerations; possible penetrating injuries including intra-ocular foreign bodies; chemical burns; hyphaema (blood in the anterior chamber, see Figure 1); and eyelid lacerations involving the lid margin (see Figure 2). Of these, the only dire emergencies where minutes matter are in instituting irrigation with water in chemical burns of the eye.

Figure 1. Hyphaema with blood filling a third of the anterior chamber

Figure 2. Full thickness lid laceration with an intact globe

Common conditions requiring management and appropriate time for referral

Corneal foreign bodies

Often occur following the grinding of metal where the hot (usually sterile) metal fragment adheres to the outer corneal epithelium. They may be seen with a torch, and can sometimes be removed using a cotton bud or the tip of a large gauge needle. The metal can be removed but may leave a rust ring (Figure 3) which will usually also need to be removed, sometimes with a needle tip or burr drill.[4]

If no FB is seen on the cornea, fluorescein dye might show linear abrasions on the cornea suggesting a FB trapped under the upper lid. An abrasion of the cornea may feel the same to the patient as a FB (Figure 4).

Management: Instill local anaesthetic drops and stain with fluorescein. If the FB is not visible, evert the upper lid and look at the tarsal plate carefully. FB's are usually easy to see but it is easier with some magnification, like a loupe or plus 3 glasses. After removal of the FB warn the patient that the

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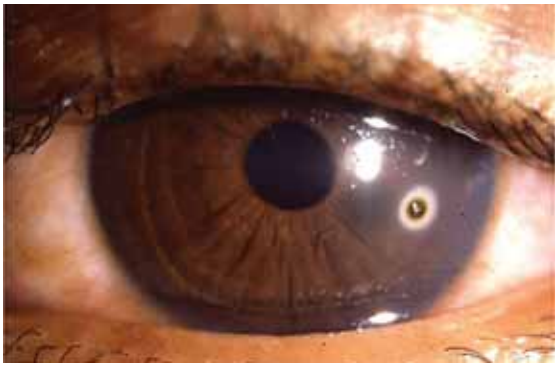

Figure 3. Metallic rusted superficial corneal foreign body with surrounding rust ring and white cuff of oedema

Figure 4. Corneal abrasion with green fluorescein dye showing the area of epithelial defect

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FB sensation might return when the anaesthetic wears off and rather pad the eye closed and use an antibiotic ointment overnight, to let the abrasion heal. Although there is no evidence to show that abraded areas heal faster with padding,[8] some patients are more comfortable with the lid not moving over the abraded cornea. Use oral analgesia as required.

Referral: Rust rings that remain symptomatic should be referred over 1–3 days.

Arc eye

Invariably arc eye occurs after arc welding and results in a UV light-induced superficial punctate keratitis. It causes a burning pain usually affecting both eyes and photophobia.

Management: Local anaesthetic drops can be used to make the patient more comfortable to enable easier examination for diagnostic purposes only. This condition is self-limiting, and does not require any treatment. However, cold compresses may help symptomatically and a topical antibiotic/steroid combination used 6-8 hourly may help the inflammation although there is no evidence it will shorten the duration. Use oral analgesia as required.

Referral: Usually do not need referral.

Conjunctivitis

Infective conjunctivitis is probably not work-related but may be spread among people working together. It may be viral (pink eye), bacterial or non-infective allergic. It is often bilateral and the redness is seen in the conjunctiva on the globe and under the lids. Patients complain of a gritty, sandy, scratchy foreign body sensation and discomfort. Viral conjunctivitis may have a tender preauricular lymph node, and a more watery discharge. A sticky discharge ('eyes stuck shut') is suggestive that it is a bacterial conjunctivitis, whereas a recurrent history or itchiness suggests allergic conjunctivitis.[9]

Management: Viral conjunctivitis is mostly self-limiting and requires the same antibiotic approach used for bacterial cases to treat or prevent secondary infection. Upper respiratory tract infection – sore throat, fever may be associated with or precede adenoviral conjunctivitis which can be quite severe and persist for up to three weeks. Patients should be advised to take precautions to limit spread e.g. avoiding the use of the same towels as others.[4] Routine swabs for bacterial culture are only done in severe cases. Irrigation of exudate from the eyes with water is helpful and the patient can do this as often as necessary. For bacterial conjunctivitis, use a topical broad spectrum antibiotic drop hourly to six hourly[10] and a similar antibiotic ointment at night. Beware of gonococcal conjunctivitis where there is a copious purulent discharge. This requires a systemic antibiotic for the gonococcal infection as well as topical treatment. The conjunctivitis can progress to corneal perforation, endophthalmitis and blindness. For allergic conjunctivitis use anti-histamine drops and mast cell stabilisers.[10]

Referral: In 1-2 days if there is corneal involvement such as opacities or areas of ulceration (fluorescein stain) otherwise it is self-limiting.

Figure 5. Severe corneal burn with corneal opacification and intense limbal ischaemia due to alkali burn

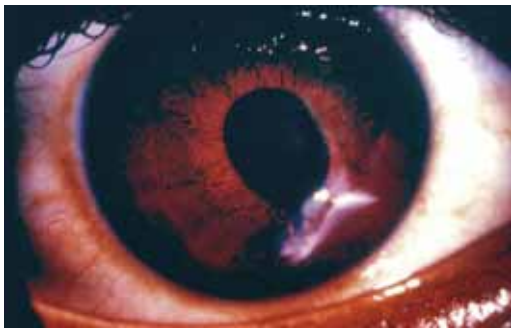

Figure 6. Corneal laceration with iris prolapse

Ocular burns

Chemical or thermal burns need immediate attention and are true emergencies[4] as the damage can be ongoing (see Figure 5). Alkalis penetrate faster and deeper than acids but both are very damaging if strong solutions are involved. All require immediate and profuse irrigation[4] then refer ASAP to an ophthalmologist. Tap water can be used but it is better to use local anaesthetic drops then irrigate with a sterile drip solution eg. Ringers or saline. Direct the stream of water away from the unaffected eye or chemical might be irrigated into the normal side. There are better available irrigation solutions like Diphoterine. Never attempt to neutralise the acid with an alkali and *vice versa*.

Lack of corneal clarity so that iris detail is obscured as well as pallor of the limbal conjunctiva indicating ischaemia are ominous signs and indicate severe damage with a poor prognosis for healing and vision.

Referral: ASAP if there is corneal involvement with cloudy iris detail or they look to be severe but initial copious irrigation is the cornerstone.

Eyelid lacerations

Eyelid skin lacerations can be sutured but do not attempt

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this if the lid edge or canaliculi are involved – these need referral.[4] If they are not correctly repaired, the eyelashes turn in and subsequently scratch the globe. Ensure the globe is not also damaged.

Conjunctival lacerations

These are only repaired if very large. Make sure there is not an underlying scleral laceration. If in doubt refer ASAP for slit-lamp assessment.

Penetrating eye injuries

Where penetration is diagnosed or suspected, avoid further damage to the eye. The patient should not bend over but rather keep the head upright. The eye must not be rubbed and neither should the doctor apply pressure to the eye during the eye examination. A soft eye (hypotony) is such an important sign that in the case of possible penetrating globe injury, compression of the globe should be very gentle. After assessment, protect the eye with a pad or shield, without antibiotic ointment or drops. X-ray if intra-ocular foreign body or fractures are suspected and refer patient ASAP.

• *Corneal and corneo-scleral lacerations:* The actual wound can be seen and usually there is also iris or ciliary body prolapsed (see Figure 6). The anterior chamber may be flat with the eye soft. Swelling around the eye may make it difficult to exclude a penetrating injury. It is less common to have a penetrating injury where there is a good red reflex as there is often blood inside the eye, either a hyphaema or vitreous haemorrhage.

• *Penetrating wire injuries:* This can be a difficult injury to diagnose because the penetrating wound may be small and not easy to see. Any intraocular haemorrhage, reduced vision or hypotony should raise suspicions. Wire may be contaminated and give rise to endophthalmitis (intraocular infection) or cause extensive intra-ocular damage to the iris, lens or retina.

• *Intra-ocular foreign bodies:* Often the small entry wound can be missed. When a history suggesting the possibility is present, an X-ray must be done. Referral for urgent surgery is required as endophthalmitis will also be a threat in these patients.

Conclusions and recommendations

Many eye injuries are effectively managed in the workplace but efforts to prevent injuries are needed worldwide. The key to accurate eye assessment is thorough and systematic examination of the eye and being alert for the vision-threatening but less common injuries that will need to be definitively managed by an ophthalmologist.

Lessons learned

1. The history will often provide a clue as to the nature of the injury. Beware of people who were hitting or hammering metal and felt something strike the eye. They usually do not have a superficial corneal FB – those are caused by grinding – suspect an intra-ocular FB. An X-ray of the orbit is mandatory. An MRI scan is contra-indicated because the metal can heat up and move, causing further damage.
2. NEVER give a patient local anaesthetic drops to take home as it is toxic to the cornea if used excessively.
3. One of the important decisions with eye trauma is to establish whether the injury was blunt or penetrating. The eye will usually be soft with decreased vision and loss of the red reflex due to vitreous haemorrhage after penetrating injuries.
4. In the case of a chemical burn, try and establish whether the agent was an acid or alkali – acid is less harmful because strong alkali penetrates deeper into the eye. Special effort is needed in alkali burns to eliminate all of the chemical from the eye.
5. With eye injuries there might be legal consequences so carefully document the visual acuity. If no Snellen chart is available use a magazine or newspaper and if the patient can read that with either eye it should be noted. With a patient in bed it can be useful to have the patient compare how your hand and fingers appear with either eye. If vision seems the same in the injured and normal eye it is noted and is an important finding.

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