

Eye injuries: improving our practice



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Most eye health workers are involved in managing trauma. In fact, ocular injuries around the world make up a major part of daily ophthalmic clinical practice. Eye injuries range from mild, non sight-threatening, to extremely serious with blinding consequences.

Epidemiology

Epidemiological data on ocular trauma is limited. A review undertaken for the World Health Organization (WHO) in 1998¹ estimated that injuries were responsible for the following:

- 1.6 million people blind in both eyes
- 2.3 million people with low vision in both eyes
- 19 million people blind in one eye
- 55 million people with eye injuries that resulted in restricted activities for more than one day a year.

The demographic pattern (age/gender) of ocular injuries varies with the environment and cause of injury. The general pattern is that of a curve with two peaks: one in the age group 5–25 years and another in people aged 70 years and over. Compared to women, the risk of eye injuries in men is four times higher.

Accurate data – essential for guiding



Faustin Ngounou

A 10-year-old with corneal laceration and traumatic cataract after a stone hit him in the eye. CAMEROON

management and prevention – has been difficult to record or compare, due to a number of factors.

- The different environments in which injuries occur
- The wide range of causes
- The wide spectrum of clinical (anatomical) presentations
- Different data sources, e.g. hospital

discharge data, out-patient visits

- The lack of a widely used standardised template for reporting injuries.

Assessment and the BETTS Classification

The introduction of the Birmingham Eye Trauma Terminology System (BETTS)² in early 2000 provided a standardised and simple system to describe mechanical injuries to the eye globe. The panel on page 43 provides an outline of this classification, which is applicable to clinical practice and can also be used to audit and create an appropriate registry for injuries. In this issue we look at how BETTS is used to guide the clinician in management.

In all eye trauma cases, the main concern of patients and their families is the visual prognosis. To address this, the Ocular Trauma Score (OTS) has been developed; it is based on the BETTS classification system and is used to calculate prognosis (with the assumption

ABOUT THIS ISSUE

This issue of the *Community Eye Health Journal* is about eye injuries, including approaches for prevention and tips on how to assess, classify and manage them. Eye injuries affect people, not just eyes. People with eye injuries are in pain and have been through what was very likely a terrifying experience for them; they will also be anxious about their vision. We explain how to reassure and support patients, despite the difficult circumstances in which they find themselves. We also introduce the Ocular Trauma Score (OTS), based on the BETTS classification, which is there to help clinicians estimate the visual prognosis of an eye injury and guide referrals. It is particularly helpful when talking to patients and their family members about what to expect. The OTS isn't perfect, however – it is correct 4 times out of 5 which means that clinicians must always apply their best clinical judgement when using it. Also, the OTS is only valid if the eye injury has been managed correctly. We hope that our article on the management of injuries will provide useful reminders. Enjoy the issue!

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that the trauma is managed optimally). On page 44 we introduce the OTS and demonstrate how it may be used.

Prevention and management

In general, it seems that people assume that eye injuries are the result of 'accidents', i.e. that they are outside of human control. It is not always the case – eye injuries are often preventable. This assumption might go some way towards explaining why, in many countries, not much attention has been given to the development of strategies for eye injury prevention.

The first step in prevention is to understand the local causes of eye injuries, and their patterns. This is why it is important to establish a local injuries register that uses the BETTS classification system and includes age, gender, place and cause of injury. This evidence can guide the development of local prevention interventions, such as protective eyewear in the workplace, legislation and enforcement about the use of seat belts, and first aid management of agricultural eye trauma. Data will also be comparable with other regions and other countries.

In many low- and middle-income countries, trauma cases are often complicated by late presentation and/or previous inappropriate intervention. To have a well-trained first contact person at the primary level is therefore critical for the correct assessment and management of an eye injury.

Conclusion

From a public health perspective, neither bilateral nor unilateral blindness data provide a complete picture of the impact of ocular trauma on society. Severe ocular trauma requires expensive hospitalisation and specialist treatment, and often prolonged follow-up and visual rehabilitation. This has significant economic costs for the patient and the health service. It is therefore very important to better understand the local patterns of ocular injuries (through accurate data collection) and to develop appropriate prevention and management strategies.

'The first step in prevention is to understand the local causes of ocular injuries and their patterns'

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The BETTS classification system

Although the eyewall technically also includes the choroid and retina, only the rigid structures (sclera and cornea) are taken into consideration in the Birmingham Eye Trauma Terminology System (BETTS). If an injury is atypical, or 'mixed', then clinicians can classify based on their best judgement or on the injury with the worst prognosis.

Closed-globe injuries

- These are partial-thickness wounds of the eyewall.
- It is rare to find a **contusion** (caused by a blunt object) and a **lamellar laceration** (caused by a sharp object) together. In such cases best clinical judgment has to be used to describe it.
- With **lamellar lacerations**, a partial thickness wound is present and the clinician should specify whether it is corneal or scleral.
- **Contusions** involve bruising and swelling and may cause some structural changes in the shape of the globe, e.g angle recession.

Open-globe injuries

- These are full-thickness wounds of the eyewall. The choroid and retina may be intact, prolapsed or damaged.
- **Rupture** is caused by a blunt-object impact which produces an 'inside-out' force that ruptures the eyewall at its weakest point and can result in tissue herniation.
- A **laceration** is an 'outside-in' mechanism caused by a



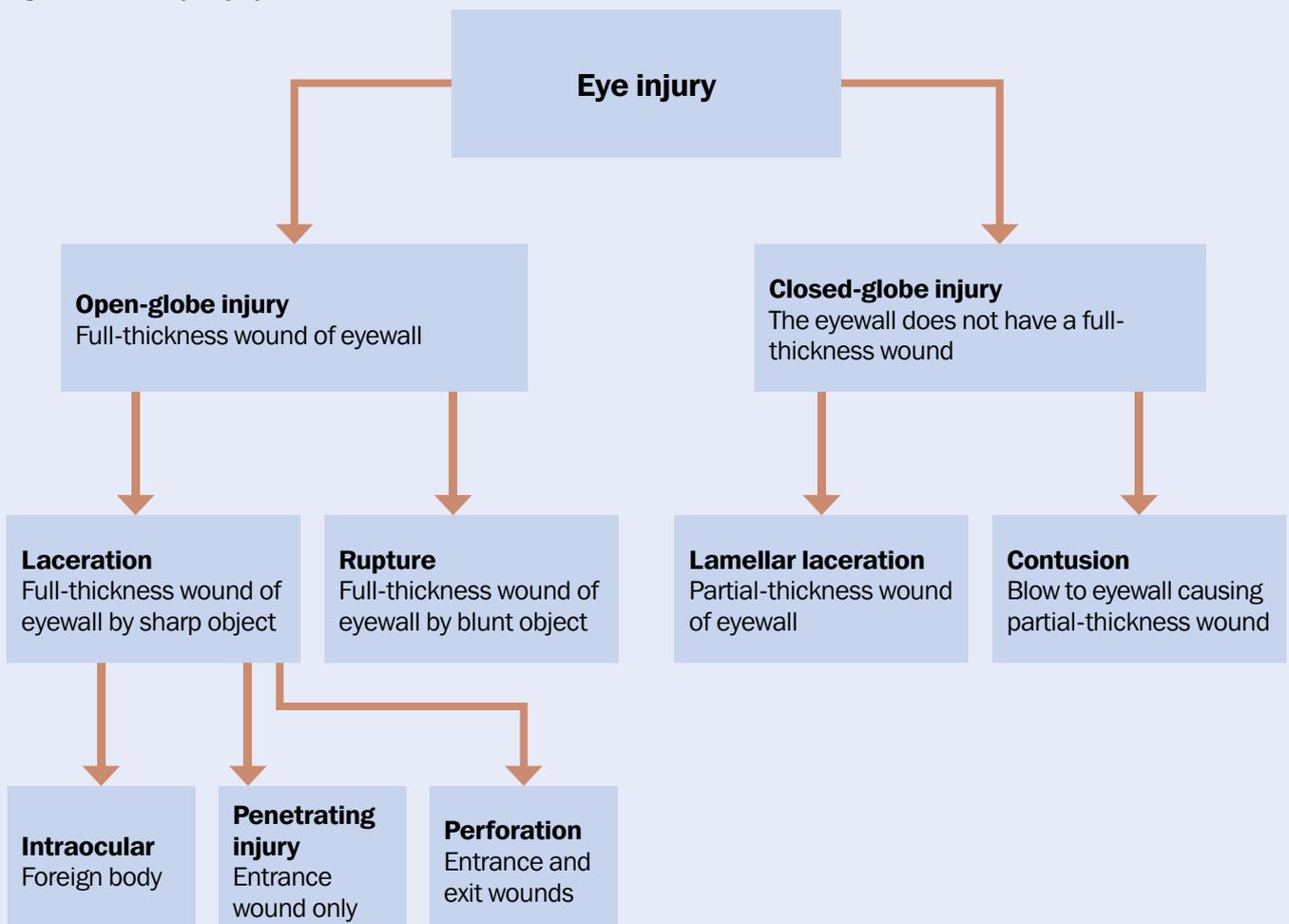
Faustin Ngounou

Examining an eye injury patient using a slit lamp. CAMEROON

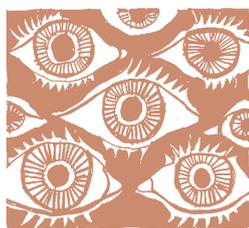
sharp object and resulting in a full-thickness wound at the impact site.

- A **penetrating injury** is a single laceration by a sharp object – there is only an entrance wound and no exit wound
- A **perforation** consists of two full-thickness lacerations caused by the same object (entrance and exit wounds).

Figure 1. BETTS eye injury classification



This figure was published in *Ophthalmology Clinics of North America*, Volume 15, Kuhn F., Morris R and Witherspoon CD. Birmingham eye trauma terminology (BETT): terminology and classification of mechanical eye injuries, pages 139–143, copyright Elsevier, 2002.



The Ocular Trauma Score



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Relatively junior doctors or allied health workers, with little or no training in ophthalmology, are often tasked with the recognition and initial management of eye trauma. In these situations, the lack of clear instructions and guidance to support decision making has been a key challenge, which has been compounded by the inconsistent terminologies used to describe eye injuries.

In order to standardise the description of mechanical eye injuries (excluding those caused by chemicals, electricity or heat), and to link the correct management to the actual clinical situation, an Ocular Trauma Classification Group was convened in 1997. The group reviewed trauma classification systems in ophthalmology and general medicine¹ and then developed the Birmingham Eye Trauma Terminology System (BETTS) (see page 43). This became established as a standardised terminology used to describe and share eye injury information,

and it has been particularly useful in the management of trauma cases in a multi-disciplinary environment (pages 42–43).

Next, the Ocular Trauma Classification Group analysed more than 100 variables for over 2,500 eye injuries recorded in the United States and Hungarian Eye Injury Registries in order to identify the best predictors of outcome at 6 months after injury. From this, they developed the Ocular Trauma Score (OTS), which is used to predict the visual outcome of patients after open-globe ocular trauma. The score's predictive value is used to counsel patients and their families and to manage their expectations. It provides guidance for the clinician before pursuing complex, sometimes expensive interventions, particularly in resource-limited settings.

OTS scores range from 1 (most severe injury and worst prognosis at 6 months follow-up) to 5 (least severe injury and least poor prognosis at 6 months). Each score is associated with a range of predicted post-injury visual acuities. It has a predictive accuracy of approximately 80%, which means that the OTS will be accurate 4 out of 5 times.



Heiko Philippin

The ocular trauma score supports decision making. TANZANIA

How to use the OTS score

- 1 On first examination, assign an initial raw score based on the initial visual acuity (VA) – see **A** in Table 1. For example, for perception of light (PL) or hand movements (HM) 70 raw points would be assigned.
- 2 From this initial raw score, subtract points for each of the following factors (starting with the worst prognosis and ending with the least poor prognosis): globe rupture, endophthalmitis, perforating injury (with both an entrance and an exit wound), retinal detachment, and relative afferent pupillary defect (RAPD): see **B** to **F** in Table 1.
- 3 Once the raw score sum has been calculated, find the relevant category in Table 2 and read off the corresponding OTS score. For each OTS score, Table 2 gives the estimated probability of each follow-up visual acuity category.

Limitations of the OTS

Similar to the BETTS, the OTS model covers the description of both open- and closed-globe eye injuries. It is easy to use, as the six predictive factors (**A** to **F**) are readily assessed, and it can give realistic expectations of the visual potential of an open-globe injury. However, there is a 1-in-5 chance that the score may be wrong, so its use to justify primary enucleation is hazardous. It is better to use the OTS as a guideline in order to make informed treatment decisions.²

An example of this uncertainty can be seen in a recent trauma case where a 32-year-old female accidentally flicked a tent peg into her eye with force and the hook ripped the eye wall and retina. At primary surgical repair, the VA was vague PL, there was globe rupture, retinal detachment, vitreous haemorrhage and relative afferent pupillary defect (RAPD). The raw score OTS from this was calcu-

Table 1. Computational method for deriving the OTS score

Initial visual factor	Raw points
A. Initial raw score (based on initial visual acuity)	NPL = 60 PL or HM = 70 1/200 to 19/200 = 80 20/200 to 20/50 = 90 ≥ 20/40 = 100
B. Globe rupture	-23
C. Endophthalmitis	-17
D. Perforating injury	-14
E. Retinal detachment	-11
F. Relative afferent pupillary defect (RAPD)	-10
Raw score sum = sum of raw points	

Table 2. Estimated probability of follow-up visual acuity category at 6 months

Raw score sum	OTS score	NPL	PL/HM	1/200–19/200	20/200 to 20/50	≥ 20/40
0–44	1	73%	17%	7%	2%	1%
45–65	2	28%	26%	18%	13%	15%
66–80	3	2%	11%	15%	28%	44%
81–91	4	1%	2%	2%	21%	74%
92–100	5	0%	1%	2%	5%	92%

NPL: nil perception of light; PL: perception of light; HM: hand movements

lated as follows: 70 for the VA of PL, -23 for globe rupture, -11 for retinal detachment and -10 for RAPD, giving a total raw score of 26 and OTS of 1, which is associated with a 90% predicted outcome of between NPL and PL vision (i.e., 73% for NPL plus 17% for PL) and only a 3% chance of vision better than 6/60. She underwent a vitrectomy and cryopexy procedure with silicone oil internal tamponade. Following this treatment, her final VA in the affected eye was 6/24 – unexpectedly useful vision. However, the initial score had been useful in preoperative counselling of the patient and it reinforced the guarded prognosis of the operation, even though the eventual outcome was good. In resource-limited settings this predictor may mean better management of expectations, or result in the development of appropriate referral systems for trauma.

There are drawbacks to using such a simplified system. It does not include associated injuries that have a bearing on the outcome of the mechanical injury, such as chemical, electrical, and thermal ocular injuries, nor does it include signif-

icant facial and ocular adnexal injuries. It does not factor in results from ancillary tests including X-ray, computed tomography, or ultrasound 'B' scans that inform the examination of the eye, especially where there is no view of the posterior segment. The clinician must interpret these other clinical and investigational findings to help refine the prognosis predicted by the OTS.³

Additional uses of the OTS

Perhaps the greatest benefit of the OTS is its use as a reference point when auditing surgical results of cases due to mechanical trauma. It can provide useful pointers to guide service redesign in order to maximise outcomes. When managing ocular trauma sustained during the Afghanistan and Iraq wars, it became apparent that improved surgical provision and techniques were not improving outcomes from the worst injuries and that the worst injuries were shrapnel injuries. To counter this, the enforced use of combat eye protection reduced the incidence and severity of eye injuries significantly. In this case, the OTS was used to highlight the problem to policy makers in an

irrefutable form to which they responded.⁴

Overall, it remains a useful system that allows communication between clinicians of different grades, specialties and nationalities, enabling them to efficiently plan, manage and monitor the full range of ocular injuries due to mechanical trauma.

In your setting, there may be other methods that are used to guide clinicians. You can share these on the *Community Eye Health Journal* Facebook page.

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Implementing and applying the Ocular Trauma Score: the challenges



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Ocular trauma is a significant cause of unilateral blindness in the Caribbean in both adults and children.^{1,2,3} In Trinidad and Tobago, blunt ocular injury will typically account for around a third of all referrals from the Accident and Emergency department to the ophthalmology unit.⁴

The Ocular Trauma Score (OTS) aims to estimate a patient's visual acuity six months after an eye injury. A higher OTS score indicates a better visual prognosis.

The OTS was introduced at the Eric Williams Medical Sciences Complex, the main teaching hospital of the University of the West Indies, in 2012. The elements used to calculate the OTS (visual acuity, rupture, endophthalmitis, perforating injury, retinal detachment, relative afferent pupillary defect [RAPD]), were already routinely recorded during initial assessment of ocular trauma patients at the unit. It was expected that this would make the OTS easy to implement.

The OTS was first discussed during a postgraduate teaching session on ocular trauma. It was decided that the first on-call officer would calculate the score following initial assessment in the doctors' on-call examination room. A copy of the OTS was prominently displayed on the

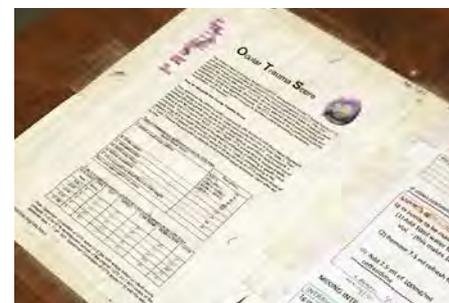
desk used for writing the notes, serving as a reminder to use it. It was decided that the score would be part of the presentation to the consultant on call and would be used to inform management decisions and discussion with the patients and their families.

Unfortunately, the use of the OTS was not sustained in the long term. Initially, there was inconsistent use of the OTS by the different ophthalmology trainees; the consultants also did not request the OTS score when the trainees presented each case to them. Then, when there was a change of staff at the junior and senior levels, its use was discontinued.

Lessons learnt

Critical analysis of the OTS in an academic classroom environment (during the postgraduate teaching session), and displaying the OTS score prominently in examination rooms, helped to make clinicians aware of it and encouraged them to use it in their consultations with patients. However, this was not enough. The OTS should be implemented as unit policy and incorporated in all protocols and treatment guidelines in order to ensure its continued use. Capturing eye trauma patients' OTS scores for auditing purposes and analysing these data regularly will also help to demonstrate its usefulness.

It is worth the effort. The simplicity of the OTS allows medical and nursing staff



Desirée C Murray

A copy of ocular trauma score was prominently displayed. WEST INDIES

with varying levels of experience to have a common understanding of prognosis. It is also an appropriate aid for counselling as it helps patients to understand their visual prognosis, which reduces unrealistic expectations. However, it is not a replacement for good clinical judgement – and the score is only applicable if all efforts are made to provide the correct management of the injury.

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Assessing an eye injury patient

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Eye injuries are common, occurring either as isolated injuries or as part of head or facial injuries.

Health workers at primary level or in a trauma department should have a good knowledge of the presentation and management of ocular injuries. Health workers must be able to skillfully handle injuries to ocular structures in a way that aims to restore vision and prevent further loss of vision.

This article discusses the practical steps that should be taken at first contact with the patient and highlights the level of urgency of referral.

First things first

Your first priority is to manage the anxiety and pain of the person with an eye injury (see article on page 50). Pain has been suggested as a factor in development of post-traumatic stress disorders (PTSD).¹ For the patient with an eye injury:

- Reassure them of your intention to do your very best.
- Let children stay with their caregiver as much as possible.
- Even when the injury looks very bad, avoid giving that indication at the beginning, either by what you say to patients, what you say to other staff members, or through your facial expressions.
- Treat patients with courtesy, even if the cause of their injury is as the result of a fight.
- Give oral analgesics as needed.

Dos

- Use a moist sterile dressing to cover the eye (with a shield for additional protection).
- Prevent secondary injuries, particularly infections, through aseptic techniques and appropriate use of antibiotics.
- Assess both eyes, even if the injury is unilateral.
- Document all the findings and procedures.
- Monitor visual outcome.
- Plan for rehabilitation of the patient.

Don'ts

- Do not assume that a visual acuity of 6/6 excludes serious eye complications.
- Do not delay irrigation in chemical injuries.
- Do not delay referral.
- Do not manage eye injuries in a patient who is not stabilised: life-threatening conditions must be addressed first.
- Do not touch or otherwise manipulate an eye with rupture or perforating injury.
- Do not prescribe topical anaesthetic.
- Do not pull out a protruding foreign body.
- Do not use traditional eye medicines.

Mechanical injuries involving the eyeball can be classified using the Birmingham Eye Trauma Terminology System (BETTS), which applies only to mechanical eye injuries. Chemical and thermal injuries are dealt with separately. BETTS is a practical guide to classifying eye injuries. It ensures that all the health workers involved in the care of the same patient have a consistent understanding of the type of injury.

Further, it helps to ensure that there is uniformity, which enables comparison of data in future audits and research (see article on page 43).

What you need

Essential (the basics)

- Visual acuity chart
- Torch
- Cotton buds
- Lid speculum
- Eye shield (plastic/metallic)
- Local anaesthetic drops
- Antiseptic, e.g. iodine solution
- Tetanus toxoid
- Analgesics
- Irrigating fluid
- Topical anaesthetic drops
- Gloves for examination

Additional (in an ideal scenario)

- Slit lamp
- Tonometer
- Magnifying loupe
- Direct ophthalmoscope
- Eye pads
- Fluorescein strips
- Litmus paper
- Cyclopegic drops
- Topical and systemic antibiotics

Initial assessment

The ABCDE approach to the evaluation and treatment of patients with potentially life-threatening injuries should be followed:

- **A**irway with cervical spine protection
- **B**reathing and ventilation
- **C**irculation
- **D**isability (using Glasgow Coma Scale and pupillary assessment)
- **E**xposure and Environment control.

Patients with serious non-ocular injuries or unstable vital signs should be managed in a trauma facility. Following stabilisation the specific assessment of ocular injuries can proceed.

History

In the following eye injuries, the health worker needs to get a quick description of what happened, institute immediate measures and obtain a detailed history later.

- 1 Suspected chemical injury: immediate irrigation as described below.
- 2 Active bleeding: arrest bleeding and pad the eye.
- 3 Severe pain, especially in children: give analgesia to enhance patient comfort.

For all other eye injury patients, a detailed history should be taken, including:

- **Age and occupation**
- **Presenting symptoms.** Which eye is affected? Is it both eyes? Is there diplopia (double vision)?
- **Source and mechanism of injury.** Chemical and thermal injuries need to be identified and treated immediately. Blunt objects (such as closed fists or blocks of wood) are more likely to cause rupture of the eyeball, whereas sharp objects (such as knives) are likely to cause lacerations. Inert intraocular foreign bodies (such as glass, stone or plastic) cause less reaction than metals (copper, aluminium, lead, iron). Plant material (wood or vegetable matter) are poorly tolerated. If an intra-ocular foreign body (IOFB) is suspected, obtain information on its composition: organic (plant matter) or inorganic (metal), magnetic or not, and any possible chemical property, such as acidic or alkaline.
- **Time of the injury.** This helps to determine the treatment strategy, as a quiet eye with a sealed 1-week-old corneal laceration may be managed conservatively, whereas an acute injury

requires surgical intervention.

- **Place of injury.** Where did the injury occur?
- **Events surrounding the injury.** Was the injury accidental or non-accidental and was protective gear (e.g. protective eyewear or seat belts) in use, where appropriate?
- **Any steps taken to manage the injury prior to presentation at health facility.** These include irrigation, use of any medication, and removal of foreign body at home.
- **Previous ocular history.** This includes the vision before the injury, use of contact lenses, previous trauma or surgery, and current medication.
- **Current and previous medical history.** Existing conditions such as diabetes mellitus, hypertension, bleeding disorders and allergies need to be identified.

The examination

NOTE: If you suspect an open globe injury, stop. You can make it worse by examining it, causing increased prolapse of ocular contents. Refer the patient to theatre for examination under anaesthesia.

The patient may be examined in an upright position if it is possible to do so. If it is difficult to open the eyes, lying down may make it easier. Children should generally sit on their parents' laps or lie down if retraction of the lids may be required.

If the patient has difficulty opening the eyes, topical anaesthetic drops helps to reduce the pain and allows for examination. Ask the patient to tilt their head backwards or to lie down. Instil a few drops on the medial canthus area of the affected eye (i.e. nearest the nose) and ask the patient to blink briefly. This will allow some of the anaesthetic to seep into the eye and provide relief (Figure 1). Retracting eyelids aids in observation of the rest of the structures and in irrigation. Use lid retractors or a lid speculum. If these are not available, use bent paper clips.

Step 1: Visual examination

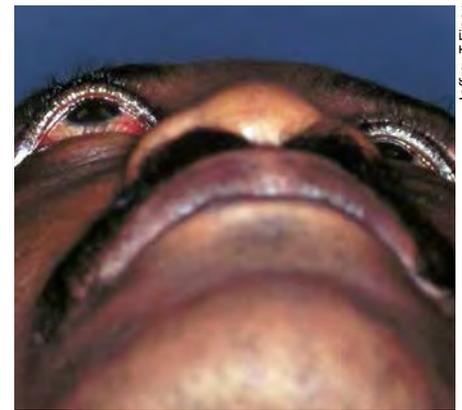
- **Inspection.** Record the location, size and appearance of obvious injuries such as lacerations, swelling (contusions) or foreign bodies (FB). Note any proptosis (Figure 2) or enophthalmos (Figure 3).
- **Visual acuity.** Record the visual acuity for each eye (presenting vision, and vision with pinhole).
- **Orbital wall.** Should be palpated for crepitus or bony deformity.
- **Ocular motility.** Should be assessed in the cardinal directions of gaze (vertical up-down, horizontal right to left, diagonal left to right and right to left)

Figure 1. Instilling topical anaesthetic when the eyelids cannot be opened



Michelle Lin

Figure 2: Proptosis (right eye).



Jeffrey T Finer

Figure 3. Traumatic enophthalmos (right eye).



Source: Yunker JJ, 2014, www.cecentral.com

Figure 4: Everting the upper eyelid using a cotton bud.



Pak Sang Lee

Figure 5: Sub-conjunctival haemorrhage.



Courtesy of Mpekethu Mingame

Figure 6. Hyphaema.



Courtesy of Mpekethu Mingame

- **Visual fields.** May be assessed by confrontation method.
- **Adnexae.** Lid defects (ptosis, lacerations) should be noted. Canaliculi injury should be suspected in medial eyelid injuries.
- **Eyeball.** If the lids of both eyes can open, assess whether both eyeballs are of the same size. A smaller eye could mean a blow-out fracture; or the larger eye could mean bleeding behind the eyeball or orbit.

Step 2: Using a source of light

For the next steps, use a source of light. Where there is a slit lamp, use it, provided that the patient is comfortable.

- **Examining the upper and lower fornix.** Ask the patient to look up as you pull the lower eyelid to expose the lower fornix. The upper fornix and tarsal conjunctiva are observed better if the lid is double everted using a Desmarres lid retractor. A cotton bud may be used to evert the lid (Figure 4) but the upper fornix will be difficult to visualise. Look out for foreign bodies and lacerations.
- **Conjunctiva.** Note any sub-conjunctival haemorrhage (Figure 5) and its furthest extent. This is important for follow up as well as to rule out hidden scleral lacerations.
- **Cornea and sclera.** These may have full length or lamellar lacerations, with

Continues overleaf ➤

or without uveal prolapse (the iris popping out through the cornea). Corneal staining with fluorescein can reveal scratch marks from a hidden conjunctival FB.

- **Anterior chamber.** If there is blood in the anterior chamber (hyphaema), estimate the level of the hyphaema while the patient is in an upright position (Figure 6). If lens matter (whitish material in the anterior chamber) is noted, **refer very urgently (within 1–2 hours)**.
- **Pupils.** Note the size and shape, and the direct and consensual light reaction, as well as the relative afferent pupillary defect (RAPD).
- **Lens.** In some instances, it may be possible to observe a cataractous lens without lens rupture.
- **Intraocular pressure (IOP).** This should also be assessed where there is closed globe injury (no full thickness wound of the eyeball). Low pressure may indicate occult globe rupture or retinal detachment. High pressure can be expected immediately after contusion to the globe.
- **Posterior segment.** Pupils may be dilated for funduscopy if intraocular pressure (IOP) is normal and there is no expanding hyphaema.

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A note on referral

The existing referral system should be used, ensuring that patients are referred to a secondary or tertiary level facility that has doctors with the skills (and equipment) to handle eye injuries appropriately.

Talk to patients about their injury and the reason for the referral (see article on page 50). Write down the most important information if possible. Check that the patient and her or his accompanying person know where to go, and how urgently. Clean as much blood and debris as is possible from around the injured area, even if referring immediately.

In this article and the one following:

- Refer **immediately** means the patient should be seen by an appropriately qualified person within minutes.
- Refer **very urgently** means she or he should be seen within 1–2 hours
- Refer **urgently** means the patient should be seen within 24 hours.



MANAGEMENT

Managing eye injuries



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Based on what you found during the eye examination (see page 46), classify the injury as a non-mechanical injury (chemical or thermal injury), a non-globe injury (orbital or adnexal injury) or as a mechanical globe injury.

In the case of mechanical globe injuries, it is important to classify the injury according to the Birmingham Eye Trauma Terminology System (BETTS) (page 43) and write it down in the patient's notes; this will help to ensure that everyone involved in caring for the patient will have a consistent understanding of the type of injury. The resulting uniformity of terminology also helps with research, making it possible to compare data and do audits of injuries – which is essential for prevention.

Mechanical globe injury: open globe

Ruptured globe

This presents with lowered intra-ocular pressure or flat anterior chamber, bloody chemosis and irregular pupil. Intra-ocular contents may be visible outside the globe.

Treatment: Immediately protect the eye with a plastic/metal shield and give tetanus toxoid. **Refer very urgently.**

Penetrating injury

In this injury an entrance wound can be identified on the globe.

Treatment: Immediately protect the eye with a plastic/metal shield,

Refer urgently. Do not instil medication into the eye.

Figure 1. Penetrating corneal laceration, uvea in wound, traumatic cataract.



Perforating injury

Presents with haemorrhagic chemosis, shallow anterior chamber, hyphaema, irregular pupil, poor view of the fundus and a positive Siedel's test.

Treatment: Immediately protect the eye with a plastic/metal shield.

Refer very urgently.

Intraocular foreign body (IOFB)

Should be suspected where there is history of trauma from flying objects (typically hitting metal with a hammer) and no external FB is found and/or where an entrance wound is noted.

Treatment

- Protect the eye with a hard eye shield (e.g. a metal eye shield) to protect the globe from external pressure.
- Give systemic analgesics.
- Give tetanus toxoid.
- An orbital X-ray, ocular ultrasound or CT scan is necessary.

Refer very urgently.

Mechanical globe injury: closed globe

These are all partial-thickness wounds of the eyewall, i.e. the sclera and cornea.

Contusion

Patients can present with chemosis, hyphaema and irregular pupil following blunt injury.

Treatment: Immediately protect the eye with a plastic/metal shield. Patients with hyphaema should be positioned with the head raised 30–45 degrees.

Refer urgently.

Lamellar laceration

A partial thickness corneal or scleral laceration requires repair, unless it is already self-sealing.

Treatment: Primary closure (repair of laceration) using 10/0 nylon or silk. Pad the eye for 24 hours and give topical and systemic antibiotics.

If repair is not possible, **refer very urgently.**

Foreign body on the surface of the eye

Wash any loose foreign bodies away by irrigating the eye.

For a corneal foreign body (FB):

- Anaesthetise the eye

Figure 2. Corneal foreign body



- Remove the FB using the corner of a clean piece of paper, a Kimura spatula or the tip of a sterile 25G needle. Be **very** careful not to worsen the abrasion.
- Remove the rust left by a metallic FB.
- Evert the upper eyelid to look for additional FBs.
- Instil antibiotic ointment (erythromycin or tetracycline).
- Pad the eye.

Review in 24 hours.

Chemical injuries

Alkali injuries may be caused by household bleach or ammonia-containing products, fertiliser, cement (lime) and fireworks (magnesium hydroxide). Acid injuries may be sustained from battery acid, nail polish remover (acetic acid) or vinegar.

Figure 3. Household chemicals that cause ocular injuries



Immediately, perform high volume-irrigation of the eye affected using ringer's lactate or normal saline (or clean tap water if these fluids are not available).

Figure 4. Irrigating the eye



- Instil topical anaesthetic.
- Insert lid speculum or use your fingers to gently hold the eyelids open (Figure 2).
- Irrigate one eye at a time.
- Position the patient's head sideways. Place a kidney dish ready to receive the fluid and towels to enhance patient comfort. Ideally, use an IV giving set at full speed. However, in the absence of this, a clean container may be used as shown in Figure 4.
- Irrigate with normal saline or Ringer's lactate for at least 30 minutes, taking care not to contaminate the unaffected eye.
- Evert the lid and irrigate the fornices.
- At intervals, check the pH. The target pH is 7.0–7.3.
- Instil cycloplegic drops and topical antibiotic eyedrops and pad the eye.
- Give systemic analgesics.

Refer immediately.

Superglue in the eye

Remove clumps of glue from the eyelashes, apply a warm compress, instil antibiotic ointment and refer for further assessment. If the eyelids are firmly stuck together, do not try to prise them apart as they will eventually separate on their own.

Figure 5. Tube of cyanoacrylate (superglue)



Thermal ocular injuries

These are often sustained as a result of falling into fires or being splashed by hot fluids like boiling water or porridge. They can also be sustained from cigarettes and curling irons.

Treatment: Treat these injuries in the same way as chemical injuries, except that irrigation is not needed. Debridement of necrotic tissue may be required. Antibiotic ointment is instilled into the eye, and then the eyes are covered with a moist sterile dressing.

Refer immediately.

Burns caused by light can occur upon exposure to direct sunlight, observing an eclipse without protection, laser burns and infrared light exposure.

Treatment: Cover the eye with a sterile pad and eye shield

Refer immediately.

Adnexal and orbital injuries

Lid lacerations

Human or animal bites require especially rigorous cleaning, removal of devitalised tissue, and prophylactic systemic antibiotics. Anti-snake venom and rabies post-exposure prophylaxis should be administered, according to recommendations, for snake and dog bites respectively.

Treatment: Clean the wound thoroughly and remove foreign bodies while keeping debridement to a minimum. Handle tissues with care, and carefully align the anatomy before repairing using 6/0 sutures. Close the wound in layers.

Refer very urgently.

Figure 6. Careful alignment of anatomy



Figure 7. Poorly repaired lid lacerations lead to notches and inadequate closure of the lids



Orbital fractures

These may be suspected when the presentation includes double vision, eyelid swelling after nose-blowing, peri-orbital subcutaneous emphysema, peri-ocular ecchymosis and oedema, ophthalmoplegia and enophthalmos. A plain X-ray of the orbit (AP and lateral views) and CT scan of the orbit would be useful.

Refer urgently.

Retrobulbar haemorrhage

This presents with pain, proptosis, RAPD and increased IOP.

Treatment: Apply an eye shield.

Refer very urgently.



Talking with eye injury patients

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Patients with an eye injury are usually in pain and very frightened. They need a gentle, reassuring approach.

Your first task is to assess the general state of your patient. If they are alert and orientated and their general health is good, you can continue to examine them in the eye department. If their immediate general health is at risk, you will have to address this first.

Immediate communication

It is to be expected that the patient and family members will be anxious. A primary task is to manage this anxiety, which can be achieved by adopting a calm, sympathetic, reassuring and yet authoritative presence. Once the environment is settled, you are then free to enquire gently and clearly what happened and when. Even if emotions are running high, it is imperative that you focus on the assessment and treatment of the injury, particularly if there may be any retained foreign material in the eye.

Where possible, involve the people who have brought the patient to the hospital in the consultation. This is because:

- The patient may take in very little of what is being said and may not be able to explain what happened.
- Caring for the patient is a team effort – and the people accompanying the patient might be needed to instil eyedrops at home, etc.

If you suspect a non-accidental injury you will need to handle this very delicately – focus on the patient and the injury and obtain information without assigning blame or responsibility to anyone. Your hospital should have guidelines for this.

When the immediate pain and injury have been addressed, further communication of a different nature is needed.

Communication about the prognosis

It is important to be brave and clear but also gentle. Be realistic about the



Heiko Philipp

Listening to trauma patients and the people who brought them is an important part of good communication; it will help to reassure patients that they are in safe hands. Children should be kept together with their parents or carers as much as possible.

chances of regaining vision or keeping the eye but allow the patient and carers time to accept this. You could say something like the following: 'The injury is very severe and her/his chances of regaining vision are very poor, but we will do everything we can.'

Even when using the Ocular Trauma Score (see page 44), it can be difficult to predict the prognosis with accuracy in the early stages of management. We advise a cautious approach that avoids any unrealistic optimism. Address what you have worked out is the patient's worst-case scenario.

If you are not sure of the prognosis, we suggest using phrases like the following:

- 'We don't know yet.'
- 'Let's see how we get on.'

Blame nothing but the injury. Do not personalise anything or blame any part of previous care, or a delay in referral. It is what it is and the injury is the cause. Bear in mind that everyone in your consultation room might still be in shock following a traumatic incident. Where relevant, offer leaflets and contact details regarding trauma counselling services, support groups, etc.

It is important to give patients and carers time to come to terms with what you have told them about their prognosis. Write down important information and encourage them to ask questions. Verbally repeat the information at least once more before they leave the clinic. Check they understand by asking them to repeat the information back to you and ensure, where appropriate, that they have

follow-up appointments and the contact details of who to talk to for further information regarding their prognosis.

Management and follow-up

Patients may need admission even if they are not having surgery.

If you are happy to send them home, ensure that patients understand how to look after their injured eye.

Make it easy for them to return earlier than asked if something is wrong, or to make contact if they have any questions.

Make sure that you have given the patient and/or the person accompanying them adequate opportunity to ask questions and that you have answered them as best you can.

Explain that long-term follow-up is essential as conditions related to the injury (such as raised IOP or cataract) may develop.

Prevention of further injury

Evidence suggests that someone who has sustained an eye injury is more at risk of a second eye injury, so prevention should be addressed (see page 51). It may be helpful to discuss this with the patient and carers at a later consultation. Do not hesitate to repeat the information or to contact relevant organisations that can support prevention activities. Keeping a good record of the types of injuries seen in your setting will allow you to develop an appropriate approach for communication about prevention at a local level.

Legal aspects of injury

Injuries may result in legal action, during which your notes may be required as evidence. As always, write comprehensive notes clearly and avoid any bias or blame. Information that you cannot be sure is fact should be written as: 'The patient reports that he was injured by a colleague,' rather than 'The patient was injured by a colleague.'

In conclusion, patients with injuries do need additional consideration in the way in which you deal with them. The psychological impact of injuries, especially those inflicted deliberately, may be lessened by an empathetic and caring approach from you.



Preventing eye injuries



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The main challenge in developing a strategy to prevent eye injuries is that there are so many different causes and situations that can lead to eye injuries, each requiring a different approach.

In general, the first step in prevention is to inform people about the risks so that they can either avoid them or take action to protect their eyes. People can be informed by means of appropriate safety messages (e.g. on posters) in the areas where eyes are at risk, or through a range of media campaigns. In some environments, such as in industrial settings, messages can be supported by education/training sessions.

Prevention messages and education certainly increase people's knowledge about avoiding and protecting themselves against risks, but there is insufficient evidence that these, by themselves, will result in changed behaviour in the long term. A recent Cochrane review² indicates that the overall impact of education is

'In some high-risk environments, information and education is not enough'

short-lived and that it often needs to be reinforced or supported in practical ways. For example, in high-risk environments (e.g. agricultural and industrial settings) where people are advised to wear protective eyewear (safety glasses), it might be necessary to also provide the correct eyewear. This will improve compliance.

When considering the use of protective eyewear, it is important to pay attention to the practicalities: is the eyewear comfortable to use, and is it suited to the task at hand? Eye protection has to be suitable in its visual properties (i.e. can people see well enough?), size and weight and must have the appropriate strength of material for the protection required.

The influence of legislation on risk reduction has been well documented. In the UK, studies have demonstrated a reduction of up to 73% in motor vehicle-related eye injuries after the introduction of compulsory seat belt use.¹

Injuries in the home lack a specific pattern of aetiology and are therefore the most challenging to prevent. Creating general awareness about the safe use of domestic chemicals, kitchen equipment

or gardening tools is therefore essential. Safety standards for toys, tools and home equipment might also be needed in some countries.

Despite the challenges, prevention is essential. Table 1 gives suggestions for the prevention of the most common eye injuries, both at an individual and at a community/public health level. Overleaf there is a case study on prevention in the agricultural environment and one looking at evidence on eye injury prevention in a work setting. In our online edition, there is also a case study looking at the prevention of road traffic accidents in Kenya by ensuring that commercial drivers have good visual health and good visual acuity (www.cehjournal.org/article/vision-testing-to-prevent-road-traffic-accidents-in-kenya/). This will in turn help to prevent eye injuries. A next step would be the introduction of seat belt wearing – backed up by legislation – to prevent an accident from causing blinding injuries.

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Table 1. Suggestions for the prevention of eye injuries at individual and community level

	Prevention at individual level	Prevention at community/public health level
Home	Keep sharp objects/chemicals away from children and look for safety standards in household products	Raise safety awareness on the use of tools and kitchenware around the house
Industry	Emphasise the use of helmets and eye protection	Raise awareness and advise industries on safer modifications of the work environment. May require introduction of safety legislation
Agricultural	Encourage the use of eye protection, particularly at harvest time	Audit injuries and their seasonality so that appropriate advice/education can be provided e.g. to fruit pickers or during grain harvests
Sport	Encourage the use of eye protection and/or helmets, e.g. for contact sports and racquet sports	Consider advocating for legislation to encourage compliance with protective eyewear use
Conflict	Give advice on the importance of using helmets and protective eyewear	Lobby government to provide protective gear and appropriate training for soldiers
Assault	Difficult to advice specific action at individual level	Encourage and support multidisciplinary action to reduce violence at a community level
Transport	Encourage motorists to wear seatbelts and cyclists and motorcycle users to wear eye protection	Advocate for legislation to support compliance
Fireworks	Promote keeping a safe distance during firework use, especially for children	Organise prevention messages in media during periods of festivity
Contact lenses	Give advice on contact lens wearing habits and discourage overnight use	Raise awareness among eye workers on lens types and correct wearing habits for contact lens users



Challenges of agriculture-related eye injuries in Nigeria

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Agriculture, which includes crop farming, livestock rearing and fishing, provides work for up to 70% of the labour force in Nigeria.¹ The agricultural sector contributes up to 20% of the gross domestic product (GDP) of Nigeria, with an average real growth rate of 3.5% from 2014 to 2015.²

People involved in agriculture and farm-related activities are at greater risk of eye injuries.

Unpublished data from the Nigeria National Blindness and Visual Impairment Survey showed that, of the participants who had a history of eye injury, over half (53%) were farmers. Of those without a history of eye injury, only 39% were farmers. A 5-year hospital review of people with eye injuries showed that more than two-thirds of all eye injuries were sustained on a farm. Although non-penetrating eye injuries were more common, 15% of people were already blind in the injured eye at presentation.³ In a multi-centre retrospective review of ocular trauma among older people, eye injury most commonly occurred on the farm (37.2%).⁴

Some of the **main causes** of agriculture-related eye injuries include:

- 1 Accidental direct trauma with farm implements (e.g. cutlass, hoe, fishing hook, etc.)
- 2 Vegetable/plant/organic material hitting the eye, or spillage into the eye (cocoa pod, cornstalks, sticks/twigs, palm tree stalks, thorn, leaf, kernel, etc.)
- 3 Sand spillage into eye
- 4 Other foreign body (FB) in the eye
- 5 Animal attack injury (e.g. cow horn injury, spitting cobra, insect sting)
- 6 Assault injuries during communal conflicts involving crop farmers and cattle herdsman.

A hospital series reported vegetative/plant material as a cause of 42% of eye injuries.⁵ Cow horn injury is an important cause of monocular blindness as it often results in severe open globe injuries with corneo-scleral lacerations.^{6,7} Life-threatening poisonous arrow injuries to the eye sustained during communal conflicts between farmers have also been reported.⁸

The **effects of injury to the eye** include:

- 1 Embedded foreign body in the eye
- 2 Corneal abrasion



Fatima Kyari

People involved in agriculture are at risk of eye injury. NIGERIA

- 3 Traumatic cataract
- 4 Penetrating laceration resulting in lens injury, vitreous haemorrhage, or retinal tear/detachment
- 5 Microbial keratitis – fungal or bacterial
- 6 Panophthalmitis/endophthalmitis, or sympathetic ophthalmitis – often requiring enucleation/evisceration

Four decades ago, a hospital case series in Nigeria reported that 15 out of 21 patients with mycotic keratitis (71%) had a history of eye injury, 10 (66.7%) of which involved vegetative matter.⁹ One recent retrospective review of corneal ulcers/suppurative keratitis showed that the most common predisposing factor was trauma (seen in 51.3%); of these, 36/117 (30.8%) were from plant/vegetable matter.¹⁰

Poor **prognostic factors** for agriculture-related eye injuries are:

- 1 Nature of injury: worse prognosis if due to vegetative material and exacerbated by inappropriate use of traditional eye medication or steroid eye drops.
- 2 Severity of injury: worse if it is a penetrating injury or an injury to multiple ocular structures
- 3 Late presentation at a health care facility
- 4 Evidence of infection at the time of presentation
- 5 Difficulty in management and inadequate treatment options for eye injuries in health care facilities, e.g. lack of required products such as bandage contact lens, visco-elastic and fine nylon sutures; and the lack of support services for therapeutic keratoplasty, corneal repair within 24 hours and vitreo-retinal surgical facilities.

Prevention and management

A large sector of the population is at risk of monocular blindness from agriculture-related eye injuries, so there is a need for prevention. However, there is very little

evidence (from research in this area) to guide and develop appropriate messages or policy. Some possible measures include:

- 1 Raising public awareness and health education through television or radio programmes on eye safety or by giving health education talks in hospital/clinic waiting rooms.
- 2 Encouraging the use of protective eyewear by those at risk and making such eyewear available and affordable.
- 3 Establishing a national or state-based ocular injuries register to record incidence by type, cause and pattern of injury. This could be used to inform appropriate public policy and legislation on eye safety.
- 4 Working with hospitals to develop policies that will allow management of eye injuries on an emergency basis. Departments can collaborate and work out a payment schedule so that treatment/surgery can be initiated without having to wait for payment of fees by patients.
- 5 Lobbying government, or insurance companies directly, for health insurance to cover the treatment of eye injuries.
- 6 Demarcating dedicated ranches or areas of free-grazing for livestock/cattle-rearing which are separate from areas of crop farming. This will help to prevent communal clashes between farmers. This is being implemented in some communities at present.

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Preventing eye injuries in quarries



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Eye injuries often occur in the workplace in low and middle-income countries, particularly in the construction, agricultural, mining, and manufacturing industries. Even if there are safety regulations in these industries, their enforcement is often unsatisfactory, and owners are not required to provide safety equipment.

In 2005, Christian Medical College in Vellore, India, conducted a pilot study in stone quarries in the area. At the start, they found that between 10% and 20% of workers had sustained injuries sufficiently severe for them to seek treatment (often costly) and that, of these injuries, 10% were sight threatening.

Plastic protective eyewear was then given to all workers after a single educational session (a health talk). Posters showing eye trauma due to quarrying were also displayed around the mine.

Regular use of protective eyewear was monitored by a health worker during surprise checks, and at three months 188/218 workers (86%) were regularly using them. A repeat slit lamp examination showed that the incidence of new eye injuries had reduced to 6% (13/218), and none were sight threatening.

The next challenge was to encourage sustained use of the eyewear, particularly as workers expressed their dissatisfaction, including: fogging and staining with sweat, a feeling of heaviness, and the development of scratches within two weeks, leading to difficulty with vision and requiring frequent replacement.

In order to answer the question 'What is the evidence that educational interventions are effective in preventing ocular injuries?' a Cochrane systematic review in 2009 assessed all available evidence and concluded that it was insufficient to answer the question, particularly in low- and middle income settings.

The Vellore group then carried out a follow-up randomised control trial (RCT) to assess the effectiveness of an educational strategy to encourage sustained compliance with the wearing of protective

eyewear and to see whether this would reduce the incidence of eye injuries at three months and at six months.

In one arm of the RCT, a standard, single education session was provided, while in the other an enhanced education programme was provided over 11 sessions in 6 months. This included a standard talk, pre-recorded street plays and messages on the regular use of suitable protective eyewear, group motivational sessions, and individual counseling. In both arms, workers were given shatter-proof, impact-resistant, heat-toughened protective eyewear with side shields.

Compared to standard education, the enhanced education had increased sustained compliance by 25%. The cumulative reduction in eye injuries over 6 months was greater in the enhanced education group (12%) than in the standard education group (7%). The effect of the intervention was limited by the small sample size and was not as large as in the pilot (which is often the case), but it was nevertheless a real effect.

This study demonstrated that:

- Protective eyewear designed to suit the harsh working conditions are accepted and welcomed by quarry workers
- Their regular use reduces the incidence of ocular trauma and prevents sight-threatening injuries
- Continued compliance with protective eyewear is improved by an enhanced educational programme that is sustained over longer periods than just one educational session.

Unfortunately, however, the eyewear used in the study was not easily available locally, and use of the eyewear (which was provided to quarry owners free of charge) was not sustained long after the study.

We recommend that researchers and eye health workers engaged in prevention of occupational eye injuries take the following action to ensure that evidence-guided service provision is established.

- Disseminate and discuss research findings with business owners (focusing on the economic benefit) and workers' unions (focusing on safety and rights in the workplace)
- Create links between the business (or quarry) owners and local protective eyewear providers – and encourage the local eyewear providers to offer bulk discounts
- Submit the findings to a local public health and occupational health authority.

Protective eyewear for agricultural workers

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Figure 1. The locally made personal protective eyewear

cost, we came up with a design for protective eyewear which can be easily prepared locally at a minimal cost.

Description

A 18 cm x 7 cm aluminium net used in windows is cut in the shape of goggles. The openings in the net are 2 x 2 mm in size. The edges are covered with a lining of thick cotton cloth and an elastic band is attached at the back. The nose band is covered with cloth as well. The eyewear is light and flexible and the net is placed about 15 mm anterior to the corneal surface.

We recommend the use of this inexpensive, home made device for agricultural workers. It meets all the requirements of ideal personal protective eyewear, apart from its inability to protect against UV radiation.

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Lids provide natural protection to the eyes.

However, they may not provide sufficient protection in occupations such as agriculture, industrial work, certain sports, medicine, etc. Agricultural work is one of the riskiest occupations for the eye and protective eyewear can prevent eye injuries in 90% of cases.¹

Despite the availability of a range of protective eyewear, the reasons for their non-use are perceived lack of protection, discomfort, undesirable appearance, interference with visual acuity, slowing down of work pace and no mandate from employers.¹

To address the above problems and also issues like the eyewear falling off, fogging, limiting the field of vision, and

Improving access to refractive and eye health services

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Avoidable blindness and vision impairment affects 74.1 million people worldwide. Uncorrected refractive error (URE) is the major cause, accounting for 84% of all cases, or 625 million people.¹ Despite URE being easily detected, measured and corrected, many countries have inadequate refractive services², in large part due to the limited number of relevant eye care personnel and a lack of health systems integration.³

Human capital

The World Health Organization (WHO) Universal Eye Health Global Action Plan 2014-2019⁴ recognises that more human resources in optometry are required to reach the targets that have been set. Globally, there is an eye health workforce equating to about 167,000 clinical refractionists (e.g. optometrists, ophthalmologists, opticians, refractionists, ophthalmic nurses) providing refractive services full-time. Based on the WHO's conservative requirements of 1 functional clinical refractionist per 50,000 persons⁵, an additional 47,000 eye care workers (providing refractive services full time) would be required to fulfil the VISION 2020 human resource target. However, taking into account the global prevalence of refractive error (>50%), considering a more suitable population coverage of 1 per 10,000, and correcting for some assumptions used to calculate that figure, we estimate that the world would need over 1 million functional clinical refractionists to address the URE challenge. Optometrists are a key professional group involved in the management of URE, particularly in low- and middle-income countries. The training of optometrists is therefore critical to creating the required human capacity in refractive care.

Education as a solution

The WHO has called for the development and maintenance of a sustainable eye care service workforce as well as training and career development for eye health professionals.⁴ The development of a refractive error workforce therefore requires both of the following:

- **Optometry development.** Optometry schools and services must be developed



Jamyshyd Masud, courtesy of Brien Holden Vision Institute

(or reinforced) within existing systems

- **Eye health education.** Existing eye health workers within the health care system must be up-skilled (in specific skills or competency levels) in order to promote the delivery of quality comprehensive services.

Optometry development

The sustainable development of optometric education entails a broad systems approach and should involve local educational institutions, ministries of education and health, local eye health organisations and international funding agencies. The process requires the development of a mutually agreed operating framework to ensure that all partners are contributing equally. Local ministries must be involved in order to ensure that the education programme and the profession are duly recognised and that the relevant systems, both structural and infrastructural, are prepared to receive the workforce.

Due attention should be given to all aspects, including the curriculum, educational resources, faculty, infrastructure and equipment. Refraction should be performed as part of a comprehensive eye health assessment and educational programmes must be formulated accordingly. Despite the lack of formal global standardisation, recent optometric developments tend to require that optometrists, as a minimum, provide ocular diagnostic services (World Council of Optometry level 3)⁶ and that they are educated within a 4- or 5-year framework. This will allow optometrists to reinforce the eye health team and other cadres to be used more effectively.

An optometry programme needs to factor in the requirements of local education and health systems, regulatory and legal frameworks, accreditation systems and quality assurance programmes.

A parallel sustainable service development plan is also essential to programme success.

Eye health education

The establishment of sustainable and comprehensive eye health services that comprise optometric care must also provide education opportunities for existing eye health workers and promote lifelong learning. For an effective eye health workforce, the key factors are the quality of the education delivered, and the trainee's

commitment to professionalism and continuing education.

Education can begin at the community level with teachers, doctors, nurses and local community members participating in the detection and management of eye and vision disorders. At other levels, topical courses in relevant clinical and non-clinical areas such as interpersonal skills, management, public health, etc., need to be delivered, at scale, in an affordable and accessible way.

Current best practice approaches in education should be used to optimise teaching and learning, and effectively motivate trainees to provide quality eye care within the public health realm. For example, an eye health workforce looking to make a significant impact on rates of URE needs a broad base of competencies (e.g. in communication, leadership and advocacy) beyond the knowledge of clinical skills based on an individual patient approach.⁷

Finally, any educational programme needs to measure its impact on knowledge, attitudes and practice to ensure that the intervention is effective.⁸

Costs and benefits

Human resource development in optometric service provision requires significant investment. The total global costs of education, including the capital costs, the cost of educating student refractive care personnel and student ophthalmic dispensers, and the cost of continuing professional development for all new personnel was estimated at US \$543 million.⁵ Given the momentous loss in productivity that results from URE⁹, however, establishing optometric education systems would provide a substantial return on investment.

Visit www.cehjournal.org/article/improving-access-to-refractive-and-eye-health-services/ to read the article with references.



Dr Erika Sutter

1917–2015

We put aside our sadness at the death of Erika Sutter, at the impressive age of 98, to celebrate the life of a truly remarkable pioneering ophthalmologist and inspirational human being.

Some of the *Community Eye Health Journal's* readers will have been touched by Erika's powerful promotion of community development in her capacity as an ophthalmologist, a teacher at the International Centre for Eye Health (ICEH) in London and the Swiss Tropical Institute in Basel, and author of academic papers and educational books, most notably *Hanyane, A Village Struggles for Eye Health*.

Erika Sutter was born and raised in Basel, Switzerland. After completing a doctorate in plant physiology in 1952, she worked for Roche and then the Swedish University of Agricultural Sciences. Throughout this time her faith guided her towards a missionary life. She joined the Swiss Mission in South Africa and took up the position of laboratory technician at the missionary hospital in Elim, an impoverished rural area in North-Eastern South Africa. Here her alertness

to social disparities made her acutely aware of the injustices of apartheid and the need to address the political and social causes of disease.

In 1956, Erika was accepted to study medicine in South Africa. As there was a need for an eye specialist at Elim Hospital, she trained further in Switzerland, returning to South Africa in 1965 as a fully qualified ophthalmologist. She worked tirelessly at Elim Hospital while at the same time developing dreams for a comprehensive approach to blindness prevention. Her dreams were realised in three important projects: the introduction of a Diploma in Ophthalmic Nursing, the establishment of the Rivoni Rehabilitation Centre for Visually Impaired and Blind People, and, most notably, the Elim Care Group Project. Having treated the late effects of trachoma for many years, Erika realised that "it was necessary to come out of the hospital and to the people, there where the disease starts – in order to reach those who could still do something to prevent it." Working with Selina Maphorogo, she founded the Care Groups, village self-help groups working for better health in their communities. Within three years of starting the project, the prevalence of active trachoma had decreased by 50%. The movement is still strong more than 30 years later with around 2,000 members in over 200 villages working for improved health and social development.

Those of us who worked with Erika at ICEH admired her for her humility, her dogged determination to do a job properly with meticulous attention to detail, and her belief that the perspectives of the powerless – village women, and health workers low down in the medical hierarchy – are crucial to finding solutions.

Victoria Francis, London, August 2015

Further reading

Erika Sutter. Seen with Other Eyes. Memories of a Swiss Eye Doctor in Rural South Africa. Told by Gertrud Stiehle. Lives Legacies Legends Vol 10, Basler Afrika Bibliographien 2013. ISBN 978-3-905758-33-7

Peek

Peek, the Portable Eye Examination Kit, is a set of diagnostic tools that allows eye care workers to use a smartphone to screen eye patients. It makes use of 'cloud'-based systems to enable data sharing, referral and follow-up of patients.

The Peek team has developed tests for visual acuity, contrast, colour, visual fields, and childhood vision.

Peek Acuity, the visual acuity test (soon to be released on Android phones in late 2015/early 2016), is shown in a validation study published in *JAMA Ophthalmology* to be reliable, accurate and fast. It has since been used by teachers in a school screening programme in Kenya in which over 20,000 children were screened in two weeks.

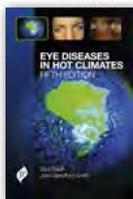
Peek is also working closely with partners to provide population-based survey tools, outreach systems and educational materials – all of which will be done using a smartphone.

Peek apps will be free to download from the Google Play store once ready for release. To keep updated on our research, release dates and news, please sign up to our newsletter at www.peekvision.org



A community health worker uses Peek to measure someone's vision in their own home. KENYA

BOOK REVIEW



Eye diseases in hot climates (5th edition)

It is now almost 30 years since this excellent text was first published and ten years since the 4th edition. The book has become a staple

for all eye health professionals who have worked in places where blindness is still such a scourge for poor communities.

The 5th edition, with its striking cover illustration, has been extensively revised to reflect the changes that have taken place over the last ten years. Diseases such as macular degeneration and

diabetic retinopathy now feature more prominently, but all the main causes of blindness, including cataract, are covered.

The book starts with an excellent review of global blindness, its propensity for hot climates, the impact of VISION 2020 and the community eye health approach to prevention and health education.

One of the pillars of VISION 2020 is the eye care team and this book caters for ophthalmic nurses, clinical officers, assistants and medical students as well as ophthalmologists who will find it an

invaluable aid to their practice.

I recommend this book to all those interested in 'tropical' ophthalmology and who want a clearly written, beautifully illustrated and comprehensive text.

Nick Astbury

The book is available at the greatly discounted price of £12 + postage and packing (£30 on Amazon) through the Ulverscroft Foundation. To order the book at this price, contact Joyce Sumner, Ulverscroft Foundation, The Green, Bradgate Road, Anstey, Leicestershire, LE7 7FU, UK. tel: +44(0)116 236 1595 fax: +44(0)116 236 1594. Email foundation@ulverscroft.co.uk or visit www.foundation.ulverscroft.com/EyeBooks.htm to find out about other textbooks available from Ulverscroft.

A 'health system' perspective on scaling up hospital cataract services



Tazeem Bhatia

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Even though cataracts are treatable, they are still a leading cause of blindness in low- and middle-income countries.¹ This is due to supply and demand factors including quality of services, cost, availability and lack of awareness in the community.

What does it take to perform a single cataract operation?

If we want to set up a cataract surgical programme, we might first think about needing a trained surgeon, the right equipment and trained support staff. But we should also ask questions like:

- Where would the operations take place? The facility would need a reliable source of electricity and water.
- How will the programme be funded, and who will pay for the staff, the equipment and the consumables?
- How could we ensure that staff have the right qualifications and skills?
- How will equipment and consumables be procured, and where will they be stored and maintained?
- How will we ensure that people come to us for surgery?

Although surgery to treat cataracts and the associated visual impairment or blindness is a straightforward intervention, establishing an effective programme requires a wider infrastructure or system to support it, which is known as the eye health system. Essentially, it requires much more than a surgeon to perform the cataract operation and it is the strengthening of this wider infrastructure that is key to increasing the availability and uptake of cataract services.

How does this relate to cataract services?

According to the World Health Organization (WHO) a health system comprises six building blocks that are not separate, but relate to each other (see Figure 1). These blocks can be used as a framework for understanding an eye health system and defining the priority areas that need to be further developed.

If we analyse a hospital cataract surgical programme using the six blocks, how would it look? The following are examples of the problems and solutions that could be identified by using the six building blocks framework.

- 1 Governance** is about how decisions are made. Not just about who makes them, but also about how much influence the community, patients and staff have in making the cataract service relevant and a positive experience for them. An effective programme depends on the active participation and partnership of all these people.
- 2 Health financing.** It is important to know how much the cataract surgical programme costs and how much revenue it generates. What is the shortfall? What are the alternatives sources of funding? Regular monthly and quarterly reviews allows us to predict when there might be gaps in funding so we can advocate for extra funds or plan services differently to avoid interruptions.
- 3 Health workforce.** Are there enough trained personnel? If not, is this because there are not enough personnel being trained nationally or is there an uneven distribution of personnel across the country or region?

Solutions could be on-the-job training of existing staff or advocating nationally for the training and accreditation of staff.

- 4 Medical products** make up a large percentage of the cost of services for patients. Cost is a main barrier for many people, so finding ways to reduce costs is important. Drugs can be procured nationally through a national procurement process or bought in bulk by a group of hospitals working together; all of which drives costs down.
- 5 Information and research.** What eye health information is collected and how is it used? The only way to understand whether a service is doing what it was set up to do is by collecting and analysing the activity and outcome data. This means not just how many cataracts were identified and operated on, but whether the patients could see better after the operation. Having good quality outcomes is important as it helps to justify further funding; it also gives the service a good reputation in the community.
- 6 Service delivery.** What policies and processes are in place to reduce the number of adverse outcomes, for example post-operative infection? Improving service delivery could mean monitoring hand washing or the sterilisation process for theatre and the effect that better infection control has on the post-operative infection rate.

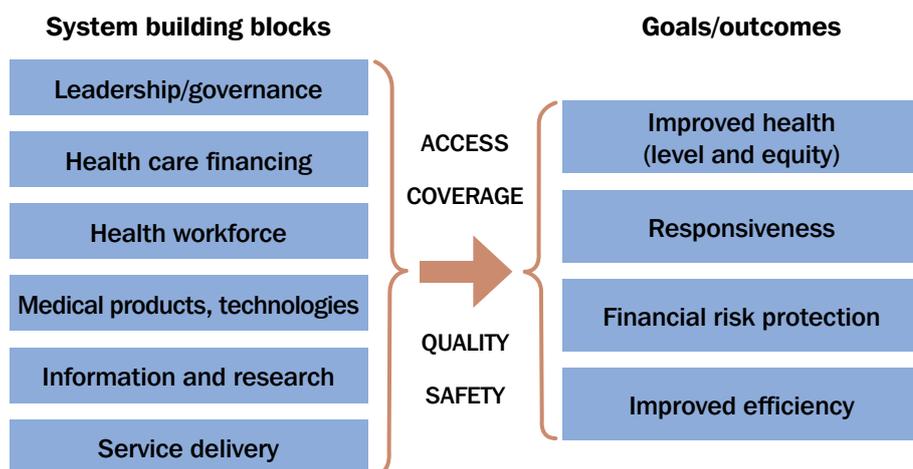
These are just examples of how the building blocks can be applied and used to understand the strengths and weaknesses in an existing cataract surgery programme. The blocks could also be used as a framework for ensuring that all aspects of planning a new cataract service have been thought through.

Breaking down the elements of an eye health system into the six areas is a simple way of categorising the issues and helps to generate a priority list of actions to strengthen the system. It is through strengthening the eye health system that we can build resilient and sustainable programmes. However, it is important to have a whole-system perspective and not to address individual areas separately. Remember that this is a complex, dynamic system in which everything interrelates.²

References

- 1 World Health Organization (2013). Universal eye health: a global action plan 2014-2019 http://www.who.int/blindness/AP2014_19_English.pdf
- 2 Mounier-Jack et al. *Measuring the health system's impact of disease control programmes: A critical reflection on the WHO building blocks framework.* BMC Public Health 2014, 14:278

Figure 1. The WHO Health Systems Framework¹



Caring for A- and B-scans



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An eye ultrasound is a test that uses high-frequency sound waves to measure and create detailed images of a patient's eye.

Ophthalmic ultrasound units (Figure 1) consist of a console, a foot pedal, one or two types of probes, and a keyboard (usually but not always). The probes contain piezo-electric crystals, which convert electrical energy into ultrasonic soundwaves in the frequency range of 8–80 MHz. These waves are sent to the tissue being examined and some of the waves are reflected, as echoes, back to the probe. These echoes are converted into electrical signals, which are processed to measure and create an image of the tissue.

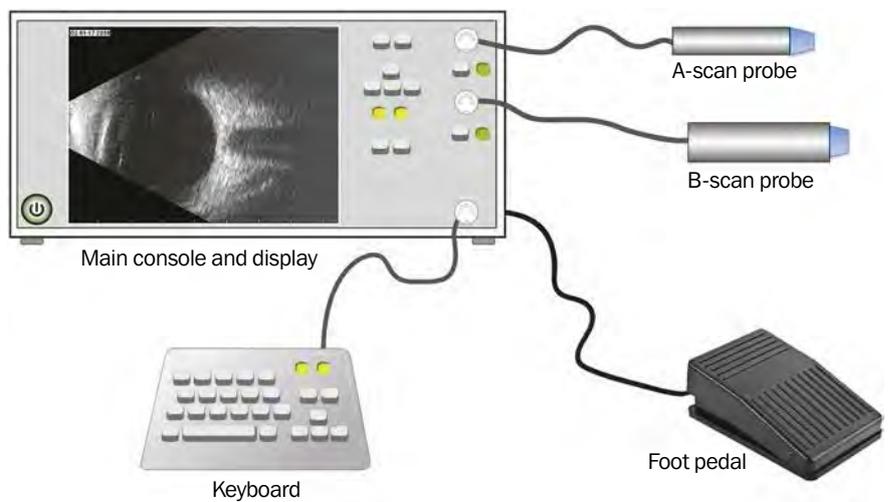
There are two main types of ultrasonic scans. The B-scan probe is larger than the A-scan probe since it houses a small motor that sweeps the crystals back and forth to scan the eye.

- **A-scan** (Figure 2). This measures the length of the eye to determine the correct power of a lens implant before cataract surgery. After the patient's eye is numbed with anaesthetic drops, the small A-scan probe is placed against the cornea to make the measurements.
- **B-scan** (Figure 3). This scan provides information about the inside of the eye, usually when a patient has cataracts or other conditions that make it hard to see into the back of the eye. The B-scan probe is gently placed against the eyelids and the patient is asked to look in many different directions.

Optimal care and use

- Properly store the probes when not in use. Most machines have a designated

Figure 1.



Ismael Cordero

storage place for probes, such as a dedicated holder.

- Avoid dropping the probe or subjecting it to any kind of impact.
- Always inspect the probe, including its lens and cable, before each use.
- Do **not** use damaged probes. Injury to the operator or patient may occur! This is because cleaning and/or gel solutions may leak into the transducer, resulting in electrical shock.
- Avoid sharply bending, twisting, kinking, or pinching the cable. Excessive bending or stress on the cable may result in damage to its casing, causing an electrical shock to the patient or operator.
- Place the patient close enough to the console to avoid stretching and damaging the probe's cord.

Cleaning

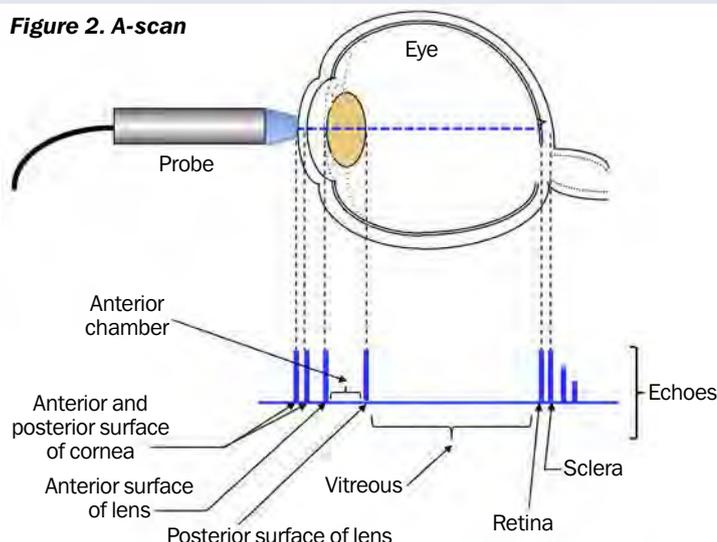
- Use only approved gels and germicides and strictly follow the instructions when applying, cleaning and disinfecting transducers.

- Do **not** steam, heat autoclave, or use ethylene oxide (EO) gas processes on probes.
- Disconnect the probe from the ultrasound console and rinse the probe with a warm, non-abrasive soap and water solution.
- Do **not** immerse the probe connector.
- Meticulously scrub the probe as needed with a soft brush, sponge, or gauze pad to remove all residues.
- Air dry or dry with soft cloth or gauze pad.

Calibration

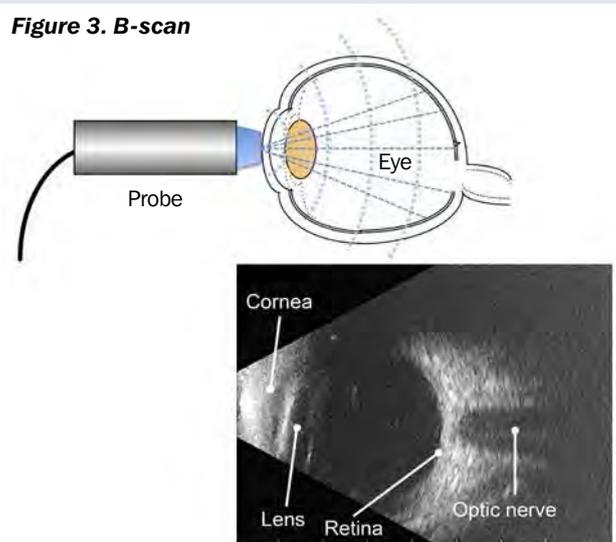
Many ocular ultrasound units have a plastic test block that can be used as a reference for calibration verification. Units have a special mode to allow measurement of the test block; this should yield a specified measurement (for instance, axial length of 24.10 mm \pm 0.25 mm). You should routinely use this block and calibration mode to test the accuracy of the unit.

Figure 2. A-scan



Ismael Cordero

Figure 3. B-scan



Ismael Cordero

Manuals, guidelines and toolkits to support the elimination of blinding trachoma



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The year 2020 is the target date for the elimination of blinding trachoma as a public health problem. There has been great progress, and there is unprecedented funding available – particularly from DFID, the Queen Elizabeth Diamond Jubilee Trust, and USAID. There is also reason for optimism that, over the next five years, further success will be seen in many endemic countries.

In order to achieve elimination, countries need the technical and programmatic capacity to implement and scale up the World Health Organization's (WHO) recommended SAFE strategy: **S**urgery, **A**ntibiotics, **F**acial cleanliness and **E**nvironmental improvement. To assist with capacity strengthening, a number of manuals, guidelines and other tools have been developed or are in the process of being developed. Some of the materials are designated for overall programme management while others are specific to various components of SAFE. The manuals and guidelines are based on preferred practices that have been developed through analysis of the available evidence; this ensures that programmes are both effective and efficient. Those available online (see below) are referenced by number, and those with an asterisk (*) are available from the author.

Strengthening the national leadership of a trachoma programme is important in order to achieve trachoma elimination objectives. The manual 'Guidance for Strengthening Leadership'* has therefore been developed and focus is given to strategies that delegate specific management tasks to others; this will allow the national coordinator to better lead elimination efforts. A guide for Trachoma Action Planning (TAP)¹ has also been developed; the TAP guide assists countries to set their own ultimate intervention goals and to determine the activities needed to achieve them.

Reduction of the global backlog of trachomatous trichiasis requires focus on the quality of surgical outcomes, the quantity of trichiasis operations



Some of the manuals available from the International Coalition for Trachoma Control

performed and the efficiency with which these services are provided. In response to these needs, and as an adjunct to the WHO 'Trichiasis Surgery for Trachoma' manual², the manual 'Training for trainers of trichiasis surgeons'³ has been developed to include the use of the newly-developed HEAD-START mannequin. This mannequin provides a transition for surgical trainees between classroom work and practising on a live patient

Supportive supervision of surgeons is needed to ensure the quality of trichiasis surgery and to increase productivity. A recently developed 'Trichiasis Supervisor Training Manual'* focuses on training supervisors and providing specific supervision strategies and checklists. Two other completed manuals include: 'Training of Trichiasis Case Finders'* and 'Counseling of Trichiasis Patients'*. Evidence shows that most operations are conducted through the use of outreach activities; a guide for organising effective and efficient outreach campaigns has therefore been developed.⁴

Mass drug administration with Zithromax®, the antibiotic donated by Pfizer (through the International Trachoma Initiative) for trachoma prevention and elimination, seeks to bring the clinical signs of active trachoma to below elimination thresholds of less than 5% among children aged 1–9 years. A number of capacity-building materials have been developed to assist countries

to achieve this, including a guide for supervision* and a training guide for distributors.* Because planning at the local level is essential for achieving the necessary antibiotic coverage, a guide for micro-planning* is also available. An additional guide is in development that aims to improve the supply chain management of Zithromax®. Last year, a handbook on managing serious adverse events⁵ was published by RTI International and is available for adaptation to specific national contexts.

Finally, work is ongoing to provide countries with support for the inclusion of F and E into their national programmes. A toolkit for F and E⁶ provides a scope of work and a set of activities for trachoma programme managers to achieve successful coordination and implementation of F and E interventions for trachoma control and elimination. The toolkit includes strategies related to ensuring coordination with the main WASH stakeholders.

Many materials can be found on the website of the International Coalition for Trachoma Control (ICTC) at www.trachomacoalition.org. Efforts are being made to ensure that these documents are available in French and Portuguese as well as English. A number of resources are also being translated into Arabic and Amharic. To maximise the usefulness of these tools, it is recommended that they be adapted to the context of the endemic country where they will be used.

Manuals available online

- 1 Trachoma Action Planning – a planning guide for the national elimination of blinding trachoma: www.trachomacoalition.org/TAP-planning (French: www.trachomacoalition.org/PAT-guide)
- 2 WHO 'yellow' manual 'Trichiasis surgery for trachoma': www.who.int/trachoma/resources/9789241549011/en/
- 3 Training of trainers for trichiasis surgeons: www.trachomacoalition.org/TrichiasisToT
- 4 Organizing trichiasis surgical outreach ENG: www.trachomacoalition.org/TrichiasisOutreach FRENCH: www.trachomacoalition.org/ChirurgieMobile
- 5 Preferred practices for Zithromax® MDA ENG: www.trachomacoalition.org/MDA-preferred-practices (French: www.trachomacoalition.org/DMM-bonnes-pratiques; Portuguese: www.trachomacoalition.org/MDA-practicas-preferidas)
- 6 A handbook for managing adverse events following mass drug administration and serious adverse events (SAEs) (English): http://www.ntdenvision.org/resource/SAE_Handbook
- 7 All you need for F&E - a toolkit for planning and partnering: www.trachomacoalition.org/FandEToolkit



Test your knowledge and understanding

This page is designed to help you test your own understanding of the concepts covered in this issue, and to reflect on what you have learnt. We hope that you will also discuss the questions with your colleagues and other members of the eye care team, perhaps in a journal club. To complete the activities online – and get instant feedback – please visit www.cehjournal.org

1. The BETTS classification has been introduced to standardise classification of ocular injuries. This simplified system can NOT be used to:	Select one
a Audit ocular injuries at a hospital	<input type="checkbox"/>
b Assist with visual prognosis in conjunction with the ocular trauma score	<input type="checkbox"/>
c Assess trauma with intraocular foreign body	<input type="checkbox"/>
d Describe chemical injuries	<input type="checkbox"/>
2. In assessing a patient with ocular trauma, the patient is most likely to be in a state of anxiety. What is the most appropriate action to take to manage the anxiety?	Select one
a Adopt a calm, sympathetic, reassuring and yet authoritative presence	<input type="checkbox"/>
b Take a quick visual acuity and make a prognosis	<input type="checkbox"/>
c Establish with some urgency who and what caused the trauma	<input type="checkbox"/>
d Provide intravenous analgesics/painkillers immediately	<input type="checkbox"/>

ANSWERS

1. d. BETTS is tailored to describe mechanical injuries to the eye globe. All definitions are in relation to corneal and scleral tissue penetration. It does not assist with classifying chemical injuries.
2. a. It is important to manage oneself first when trying to deal with another person's anxiety. Even if the eye injury is very bad, avoid giving that indication at the beginning, whether by what you say to the patient or to your colleagues. It is often necessary to stabilise the patient prior to any examination or the use of painkillers.

Ocular Trauma Score: case study and quiz

A 65-year-old man suffered an injury to the right eye, caused by a stone which ricocheted while using a weed cutter in his garden at home. He had not been wearing eye protection. At initial assessment when he presented to the hospital 17 hours following the injury, his visual acuity was nil perception of light (NPL). He had a corneal perforation and early signs of endophthalmitis, including mucopurulent discharge and anterior uveitis, were already present. A CT scan showed no intraocular foreign body. Answer the questions and then compare them with how the team approached the situation. See article on page 44.

- 1 What is the raw score?
- 2 What is the ocular trauma score (OTS)?
- 3 What would you say to the patient and his family?
- 4 How would you treat the patient?
- 5 What is the likely clinical and visual outcome if the infection cannot be controlled?

Case study courtesy of Desirée C Murray

ANSWERS

1 Raw score = 60 - 17 (endophthalmitis) - 14 (penetrating injury) = 29
2 OTS = 1
3 According to Table 2 (page 44), an OTS of 1 (the poorest prognosis) gives a probability of 73% that the final visual outcome will remain nil perception of light (NPL), and just a 1.7% probability that the patient would have perception of light (PL) at follow-up. From a clinical perspective, the presence of endophthalmitis, and VA of NPL at presentation, supported this finding and moreover suggests that the probability of regaining any vision is closer to 0%. The patient and their relatives had to be counselled with sensitivity (see page 50) about the prognosis.
4 In this instance, the team repaired the corneal full-thickness laceration and treated the patient with antibiotics (intravitreal vancomycin and ceftazidime; topical and oral moxifloxacin) and antifungals (intravitreal and topical amphotericin and topical natamycin).
5 Despite the above treatment, the infection failed to be controlled and the patient developed a corneal abscess. Having understood the extremely low probability of visual recovery and the risk of sympathetic ophthalmitis, the patient and his family accepted the need for removal of the eye and gave informed consent for the procedure. Evisceration of the ocular contents was performed 9 days after the injury.

REFLECTIVE LEARNING

Visit www.cehjournal.org to complete the online 'Time to reflect' section.

Picture quiz



Allen Foster

This is a picture of a 10-year-old boy who was hit in the eye by a stone.

Q1. What abnormality can you see on examination? (Select one)

- a. Corneal ulcer
- b. Hypopyon
- c. Orbital cellulitis
- d. Iritis
- e. Hyphaema

Q2. Which of these examinations/investigations would be appropriate? (Select all that apply)

- a. Ocular movements
- b. Examination of the pupils
- c. Slit lamp examination of the lens
- d. Measurement of intra-ocular pressure (IOP)
- e. Ophthalmoscopy

Q3. Which of the following may be indicated in treatment? (Select all that apply)

- a. Aspirin
- b. Immediate referral for surgical removal of the hyphaema
- c. Rest
- d. Acetazolamide tablets
- e. Annual check of intraocular pressure (IOP)

ANSWERS

1. e. The picture shows blood in the anterior chamber, known as hyphaema, which can occur after blunt injuries. **2. All of the tests are appropriate.** A blunt injury can cause a blow-out fracture of the orbit with entrapment of the inferior rectus muscle, causing diplopia and limitation of upward gaze. Blunt injuries can cause tears of the iris, whether iridodialysis or sphincter tears with traumatic mydriasis. The lens may be sub-luxated or dislocated by a blunt injury and there may be a concussion (traumatic) cataract. The IOP may be raised due to blood in the anterior chamber or damage to the trabecular meshwork (angle recession). Blunt injury can cause macula oedema or retinal dialysis.
3. c, d and e. Aspirin is contra-indicated as it may cause further haemorrhage to resolve. Rest is appropriate to allow the haemorrhage to resolve. If the IOP is raised then acetazolamide tablets may be indicated to reduce aqueous secretion. A hyphaema can cause damage to the trabecular meshwork, which increases the risk of glaucoma in the future. Annual IOP checks will detect glaucoma at an early stage, before it causes irreversible sight loss.

News and notices

International Society of Geographical and Epidemiological Ophthalmology (ISGEO)

Join ISGEO and get free online access to Ophthalmic Epidemiology. £70 a year. Email isgeomembers@gmail.com

IAPB Africa newsletter

Useful and highly relevant news and updates (including events) related to eye health. For a free subscription, write to Neebha Budhoo: nbudhoo@iapb.org

Courses

German Jordanian University, Amman, Jordan

Professional diploma and MSc in Vision Rehabilitation. For more information, visit <http://tinyurl.com/rehabcourse> Email: vtc@lju.edu.jo

Community Eye Health Institute, University of Cape Town, South Africa

Short courses, postgraduate diploma, and MPH Community Eye Health. www.health.uct.ac.za or email chervon.vanderross@uct.ac.za

Lions Medical Training Centre, Nairobi, Kenya. Small incision cataract surgery (SICS). Write to: The Training Coordinator, Lions Medical Training Centre, Lions SightFirst Eye Hospital, PO Box 66576-00800, Nairobi, Kenya. Tel: +254 20 418 32 39

Kilimanjaro Centre for Community Ophthalmology International

Visit www.kcco.net or contact Genes Mng'anga at genes@kcco.net and/or genestz@yahoo.com

IAPB 10th General Assembly: 2016



Durban
South Africa
27-30 October 2016



The International Agency for the Prevention of Blindness' (IAPB) 10th General Assembly is the premier global event discussing public health issues related to blindness and visual impairment. It will take place from 27–30 October 2016 in Durban, South Africa. Catering to every eye health professional – ophthalmologists, optometrists, other eye health professionals, development and public health experts, key opinion leaders, procurement specialists, CEOs, and eye care equipment manufacturers – 10GA will be the biggest event in the eye health calendar in 2016.

An expected 1,600 delegates from over 60 countries will have opportunities to discuss good practices, pitfalls and solutions to delivering eye care in challenging environments, and to network with other professionals and organisations in the sector.

With the theme **Stronger Together**, IAPB aims to underscore the key value it delivers to the eye care sector – building partnerships and ensuring that the entire sector speaks in one voice.

Our hosts in Durban will be the Brien Holden Vision Institute and the Assembly will be at the multi-award winning Durban International Convention Centre, which is one of Africa's leading conference centres.

IAPB is now inviting **Abstract submissions** for Free Paper and Poster presentations. Visit <http://10ga.iapb.org> for more information.

Come and visit the Community Eye Health Journal and the International Centre for Eye Health at the 10GA – we look forward to meeting you there!

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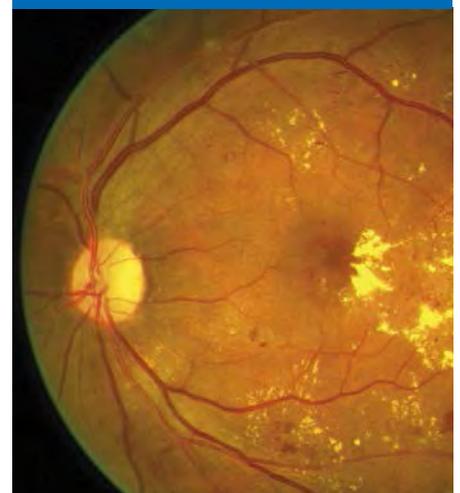
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Next issue



The theme of the next issue of the *Community Eye Health Journal* is **Diabetic Retinopathy**

Prevalence of eyelid lesions in cutaneous leishmaniasis in Pakistan

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Figure 1. Right upper lid superficial ulcerative lesion with moderate ptosis (3 mm). Sultan Asif Kiani

Cutaneous leishmaniasis is endemic in over 80 countries of the world, encompassing almost five continents. According to the World Health Organization, leishmaniasis has an estimated incidence of twelve million worldwide.² Leishmaniasis is a parasitic disease caused by a haemoflagellate *Leishmania*. It is transmitted to humans by the bite of female sand flies, of which there are 30 species. The epidemiology of

cutaneous leishmaniasis is strongly correlated with the temporal and geographical distribution of the vector (the sand fly). The activity of the sand fly is in turn affected by both rainfall and temperature. Extensive land reclamation, the presence of infected rodents and unnaturally moist soil all lead to an increase in the density of the vector.

Cutaneous leishmaniasis is endemic in many regions of Pakistan and is spreading widely.¹ This is probably due to the neighboring endemic belt of Afghanistan that has invaded the rural and urban areas of Pakistan. The Baluchistan Province and the Sindh Province have been declared endemic for the disease.

This study was carried out to measure the prevalence of eyelid lesions in cutaneous leishmaniasis in the central region of Punjab Province in Pakistan.

Materials and methods

A cross-sectional study was conducted to measure the prevalence of eyelid lesions in cutaneous leishmaniasis in 925 patients with known cutaneous leishmaniasis and registered for treatment at Mines Labour Welfare Hospital in District Chacwai. The hospital is a referral centre for leishmaniasis and serves a population of

approximately 5 million people in District Chacwai and adjoining districts. We examined the gender and age distribution of the patients with cutaneous leishmaniasis having eyelid lesions. We described cutaneous and eyelid lesions, measured visual acuity, and determined prevalence of the eyelid lesions in all 925 patients.



Figure 2. Left upper lid superficial ulcerative lesion with moderate ptosis (3mm). Sultan Asif Kiani



Figure 3. Right upper lid plaque-like lesion with moderate ptosis (3 mm). Sultan Asif Kiani

Results

Out of the 925 patients, 395 were male (43%) and 530 were female (57%). The patients had 1,113 cutaneous lesions in total. Of these lesions, 202 were present on the face (18.14%), 22 on the forehead (1.97%), 8 on the eyelid (0.72%), 70 on the nose (6.28%), 97 on lips (8.71%), 73 on fingers (6.55%), 204 on hands (18.32%), 215 on arms (19.31%), 94 on legs (8.44%), 109 on feet (9.79%) and 19 on the trunk (1.70%). Only 8 patients had eyelid involvement, which accounts for a prevalence of 0.86%. Of the 8 patients who had eyelid involvement, 5 were male and 3 were female. The age of the patients with eyelid lesions varied from 1 year to 60 years. The mean age of the 8 patients with eyelid leishmaniasis was 25 years. The right upper lid was involved in 3 cases (37.5%), the right lower lid was involved in 1 case (12.5%)

and the left upper lid was involved in 4 cases (50%). Two patients with eyelid involvement (see Figure 1 and Figure 2) had superficial ulcerative lesions (25%), three had nodulo-ulcerative lesions (37.5%), two had nodular lesions (25%) and one (Figure 3) had a plaque-like lesion (12.5%). Mild to moderate ptosis (2–3 mm) was present in 7 out of the 8 patients who had eyelid (upper lid) involvement. However, the visual acuity wasn't affected in the 7 adult patients who had eyelid involvement with cutaneous leishmaniasis. Visual acuity couldn't be assessed in the infant patient who had isolated upper eyelid involvement.

Discussion

The fact that the upper eyelid was predominantly involved in our study indicates that eyelid leishmaniasis has a potential for causing visual impairment. This disability however can be reversed in adults by reconstruction, while in children; the risk of amblyopia is a concern. Therefore, timely intervention in children is mandatory. We did not come across any globe involvement by leishmaniasis, which is another potential cause of visual impairment. Other reported ocular and periocular presentations of leishmaniasis include lagophthalmos, lacrimal discharge, blepharoconjunctivitis, nodular episcleritis, scleromalacia, ulcerative interstitial

keratitis, conjunctivitis, anterior uveitis, secondary glaucoma and retinopathy.³ These presentations were not seen in the current study.

For diagnosis of cutaneous leishmaniasis, slit skin smears and touch impression smears are done to detect the parasite. There is no serological test for cutaneous leishmaniasis.

The patients in the current study were given injections of intra-lesional sodium stibogluconate (undiluted), which is a pentavalent antimonial compound. Injections were given once weekly until the infection was resolved.

Conclusion

It is believed that poverty, rural background, old buildings, hot climate, relaxation of the insecticide spray regime and poor rainfall are the main factors responsible for the recent outbreaks in Pakistan. Urgent precautionary measures should be undertaken and the physical conditions of the houses and buildings be upgraded. Patients living in these endemic areas should be educated about cutaneous leishmaniasis, sand fly life cycles and preventive measures. Eyelid lesions in cutaneous leishmaniasis can lead to permanent ocular or periocular deformities and should therefore be treated.

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Vision testing to prevent road traffic accidents in Kenya

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Only 28 countries worldwide have laws to address risk factors and prevent road traffic accidents and injuries.¹ Prevention of road traffic accidents requires guidelines on visual acuity requirements, a standardised examination process and, particularly for commercial drivers, regular enforcement of the visual acuity requirements. Enforcement remains a major challenge, and cannot be done without legislation. The process of legislation has to involve multi-sectoral stakeholders as well as public agreement.

In Kenya, road traffic accidents account for 59.6 injuries and 28.2 deaths per 100,000 population.^{2,3} A study involving vision assessment of public service drivers in Nairobi in 2001⁴ found that a significant proportion of drivers who have had an accident also had cataracts. Because driving is a source of income, it is likely that many people might continue driving despite experiencing visual difficulties – perhaps fearing that their income will be at risk if they are identified as having a visual complaint.

In response to the high incidence of accidents in Kenya, Kenya's Traffic Act (revised in 2012) requires that every driver of a public service or commercial vehicle be physically fit (including eyesight and hearing ability) before the license is renewed. Having a mandatory medical assessment before the renewal of a driving license (every 3 years) will also be in line with Kenya's new health policy framework (2014–2030).

Developing the guidelines

With technical support from the World Health Organization (WHO), a technical working group (TWG) was formed to develop practical guidelines to implement these legal requirements. The group was led by the Ministry of Health's Division of Non-Communicable Diseases (NCD) and included representatives of all of the following:

- Medical professionals: both general practitioners and specialists (ear, nose and throat [ENT] and ophthalmic)
- Professional associations and councils

- The National Transport Safety Authority (NTSA)
- The traffic police department
- Owners of public service vehicles (minibuses – also known as ‘matatus’).

During a series of workshops, the group developed feasible technical criteria and a recommended examination process for drivers (involving visual assessment, hearing assessment, and a general health assessment). Here is what was decided in terms of the criteria for visual assessment and the eye examination process.

Criteria for visual assessment

Vision is one of the most important sources of information to ensure safe driving. It is important to have good visual acuity and to be able to judge distances so drivers can react appropriately. Applicants should meet the following criteria in order to be certified fit to drive (with spectacles or available correction).

- Two normal eyes which are aligned (no strabismus), freely moving and able to identify images as one (no double vision)
- Visual acuity of at least 6/9 in the best eye
- Visual acuity of at least 6/60 in the other eye
- Normal visual fields.

The eye examination

The eye examination will be carried out by a registered eye health professional, such as an ophthalmologist, ophthalmic clinical officer, cataract surgeon or ophthalmic nurse, at the county referral health facilities or any other NTSA accredited health facilities, and will entail the following.

1. Visual acuity (VA) testing, performed using a standard (Snellen) visual acuity chart, placed 6 metres away in a well-lit room
2. An anatomical eye examination, using a torch and ophthalmoscope or slit lamp
3. A visual field examination using standard methods, but at least by confrontation method
4. Testing of gross ocular motility to rule out diplopia, and fundoscopy for all patients with (or suspected of having) diabetes or glaucoma.

The road ahead

Finally, before the mandatory assessment is implemented, a wider public discussion is planned and agreement will be sought on guidelines, the assessment form, and the

final medical certificate that will be issued before a license can be renewed. The guidelines will be pilot tested before being Gazetted (i.e. become part of Kenya's law) and will be revised based on trends and new evidence.

Note: These guidelines do not apply to private/small cars.

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