



Emergency department management of penetrating eye injuries

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Received 7 October 2008; received in revised form 13 January 2009; accepted 13 January 2009

KEYWORDS

Nursing;
Ophthalmology;
Eye;
Vision;
Visual loss;
Trauma;
Injury;
Emergency department
(ED);
A&E;
Penetrating;
Ocular

Abstract Penetrating injuries are rare but important for the patient both visually and socio-economically. This guide intends to provide a structure for emergency department personnel to enable targeted history taking, effective examination, appropriate investigation and timely referral for those presenting with penetrating eye trauma.

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Introduction

Any disease or process which can adversely affect vision has many sequelae including ability to work, capacity to drive and psychosocial effects. Penetrating eye injuries occur most commonly in the 20–40 years old age group and accurate detection is vital to facilitate subsequent specialist input (McCormack, 1999). Non-detection of a serious eye injury has potential to jeopardise a potentially treatable sight-threatening condition in addition to the medico-legal

problems for the healthcare workers involved. Penetrating eye injuries are thankfully rare especially after legislation enforcing compulsory seatbelt use in cars (Hall et al., 1985). Incidence is currently estimated at 0.16 cases per 100,000 in the UK with a huge male predilection. The most common mechanism being hammering metallic objects (62% of total) (Imrie et al., 2008). Very severe cases of ocular trauma can be immediately apparent and the extent of the injury easy to determine but other cases may be very subtle. Early detection of this subgroup can markedly improve visual outcomes (Punnonen and Laatikainen, 1989).

The traumatised eye is often very difficult to examine. The patient is usually in pain and agitated, family/friends are often very concerned. In addition, the eyelids can be very swollen and patients are reluctant to cooperate;

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especially when compounded by alcohol consumption which is frequently significant in this patient group. Furthermore, due to many eye units having a dedicated "Eye A&E" there is increasing paucity of knowledge regarding ophthalmic conditions as ED staff only see ophthalmic emergencies infrequently.

This article is designed to be a step by step guide to the initial triage, examination, diagnosis and referral of patients with confirmed or suspected penetrating eye injuries.

Anatomy

A working knowledge of the basic ocular anatomy is useful (Fig. 1).

History

Factual details are essential in determining the type of injury and enable rapid stratification of likely risk to the eye. Important factors include:

- When?: Timing of injury (and any delay to presentation with reasons).
- Where?: Occupational or assault-related injuries should be carefully documented for medico-legal reasons.
- How?:
 - o Description of object causing injury
 - Size.
 - Weight.
 - Velocity.
 - Direction (head-on or glancing impact).
 - Any object which is smaller in diameter than the orbital rim can theoretically cause significant injury as the "crash – helmet" (the strong anterior orbital impact area) may not have protected the orbital contents. Blunt but high force injury from a small projectile can cause posterior blow-out ruptures of the eye which can be missed if not suspected.
 - o Potential infection/toxic risk
 - Any penetrating injury causes a potential tract for infection. Higher risk is carried with any organic

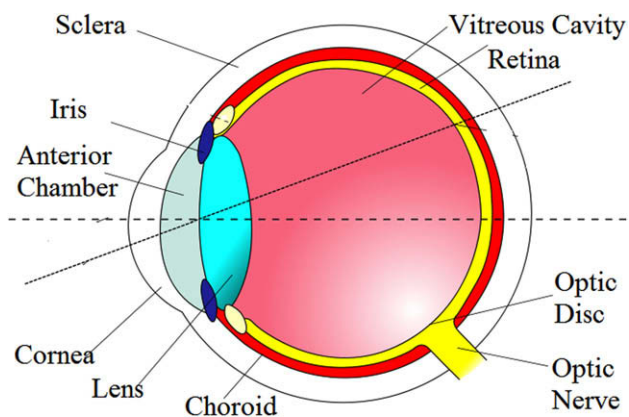


Figure 1 Basic ocular anatomy.

material. Metallic objects especially iron are often oculotoxic.

- o Ocular protection
 - Simple protective glasses or wrap-around goggles.

Examination

Before embarking on examination of the eye, it is imperative that the patient is stable both haemodynamically and neurologically.

First things first: a drop of topical anaesthetic is a great aid to examination. Eyelids are very infrequently "too painful to open". Eye drops containing preservatives are best avoided as allergy can occur and they are retinotoxic if a penetrating injury is present. The following are commonly available for ED use (British National Formulary, 2008):

- Benoxinate hydrochloride (0.4%).
- Amethocaine hydrochloride (0.5% or 1%).
- Lidocaine hydrochloride (4%).
- Proxymetacaine (0.5%) (Note: must be kept refrigerated).

Eyelids should never be forced apart. If topical anaesthesia and verbal encouragement are not sufficient then examination by a clinician with experience of ocular trauma is usually indicated. If the history is suspicious of penetration then this alone should require early specialist ophthalmic input.

A systematic approach to ocular examination is useful. This is helpful twofold: for yourself to ensure no component of the examination is accidentally omitted but it also serves as a logical structure useful for referring patients to ophthalmic specialists. The following is suggested:

- First, assess pupillary reactions
- The presence of a Relative Afferent Pupillary Defect (RAPD) indicates significant obstruction of the sensory pathway and is extremely useful in stratifying of injury. It cannot be caused by cataract or vitreous haemorrhage but instead indicates more serious pathology (e.g. retinal detachment, posterior globe rupture or optic nerve injury) (Fig. 2).
- Use the brightest light possible. A mains-voltage powered ophthalmoscope is best.
- Shine the light into the affected eye: If the pupil constricts this is a normal "direct" response.
- Next shine the light into the fellow eye whilst observing the affected eye. If the pupil constricts in the affected eye then a "consensual" response is present.
- If direct and consensual responses are normal then a swinging light test is utilised to detect subtle differences between the eyes. It is useful to assess the health of the optic nerve by comparing the two pupils' relative response to light. Start by shining the light into the affected eye and then swing the light to the unaffected eye whilst observing the pupil of the affected eye. If there is a difference between pupillary constrictions depending on which eye is receiving the light stimulus then a (RAPD) is said to be present.

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