

Penetrating eye injuries at the workplace: case reports and discussion

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Abstract

We describe two recent cases of penetrating eye injury seen at Mater Dei Hospital, both resulting in a poor final outcome and illustrating the importance of wearing appropriate eye protection at the workplace. In case 1, injury was caused by a metal chip produced by a hammer and chisel that penetrated the sclera and lodged in the vitreous cavity, requiring vitrectomy and lens extraction and ultimately resulting in severe visual loss. In case 2, injury was caused by a shard released from an angle grinder disc that struck the orbit and caused severe disruption of the globe, which required enucleation.

This is followed by a discussion on penetrating eye injuries, summarising the initial assessment and management of a suspected penetrating injury in the primary care setting and highlighting the need for urgent ophthalmic referral in cases where the nature of work was suggestive of high-speed projectiles, even where the trauma is seemingly trivial.

Case 1

A 35-year old gentleman was referred to ophthalmic casualty after sustaining an injury to his left eye at work. He had been using a hammer and chisel, when a small part of the hammer broke off on impact and became a high-velocity missile that struck him on the upper eyelid. No eye protection was worn at the time. He subsequently complained of total loss of vision from that eye.

On examination, visual acuity was limited to perception of light. A 2 mm full-thickness wound was present in the upper eyelid, beneath which a subconjunctival haemorrhage was noted over the supero-temporal sclera. On closer slit-lamp examination, a deeper 2 mm scleral wound was identified that was found to be Siedel-test positive (application of fluorescein dye to the wound which is observed to become diluted by

fluid leakage, implying that scleral perforation had occurred). Examination of the anterior segment of the eye revealed injury to the superior part of the lens, with early traumatic cataract formation. Fundoscopy did not permit any view of the retina due to dense vitreous haemorrhage.

Plain skull X-rays taken in lateral and AP views with the patient looking alternately up and down indicated the presence of a high-density foreign body within the eye, as evidenced by movement of the foreign body shadow on eye movement between films (Figure 1). CT of the orbits confirmed the presence of an intraocular foreign body measuring 5mm x 5mm x 3mm that had lodged in the bottom of the vitreous cavity, as well as bubbles of air within the eye and presence of vitreous haemorrhage. The volume of the injured eye was reduced when compared to the other. Magnetic Resonance Imaging is contraindicated in such cases due to the ferromagnetic nature of the foreign body, movement of which may cause serious intraocular injury.¹

The patient was initially covered with broad-spectrum intravenous antibiotics and the eye was protected with a Cartella shield. Surgery was undertaken later under general anaesthetic. Phacoemulsification of the unstable cataractous lens was performed, rendering the eye aphakic, and the dense vitreous haemorrhage was cleared via 3-port pars plana vitrectomy. A total retinal detachment with several retinal tears were noted, but the foreign body could not be visualised at operation and was thus not removed. The retina was flattened with air exchange, endo-laser was applied to the retinal tears and the vitreous cavity was filled with silicone oil to provide long-term tamponade of the retina and prevent its re-detachment.

Visual acuity five days postoperatively had improved but was limited to perception of hand movement. The prognosis was deemed to be poor, particularly since the iron-containing foreign body could not be removed and might cause siderosis oculi (deposition of iron on intraocular epithelial structures where it exerts a toxic effect). This could lead to further sight threatening complications like secondary glaucoma and pigmentary retinopathy.²

Case 2

A 23-year old gentleman was brought to ophthalmic casualty 30 minutes after sustaining a facial injury at work. A nearby worker had been using an angle grinder when its abrasive disc which was rotating at high speed shattered into many fragments, one of which struck the victim in the left orbit. No eye protection was worn at the time.

On examination, the patient was systemically stable. There was severe trauma to the anterior segment of the eye, with a large horizontal corneo-scleral laceration through which uveal tissue

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Figure 1: Lateral skull X-rays taken with the patient looking alternately up and down. Movement of the foreign body shadow between films suggests that the foreign body is intraocular.

had prolapsed. There were also two small lacerated wounds in the left medial canthal area and lower eyelid. The patient was covered with broad-spectrum intravenous antibiotics, the eye was protected with a Cartella shield, and he was prepared for emergency surgery under general anaesthetic. The situation was discussed with the patient, who was counselled that the prognosis was poor, and consented for possible enucleation of the eye should repair not be possible at the time of surgery.

Exploration of the orbit revealed a sunken eye, prolapsed uveal tissue and horizontal transection of the cornea, sclera and medial and lateral recti which each separated into upper and lower halves. The globe was totally disrupted and was only minimally attached posteriorly on either side of the optic nerve.

The decision was taken to perform primary enucleation of the eye in view of the irreparable damage, and since traumatised ocular tissue might later stimulate an autoimmune granulomatous inflammatory response that could threaten the other eye (sympathetic ophthalmia).³

Discussion

Corneal penetration

Although by definition not a 'globe penetration', partial-thickness penetrating injuries of the cornea are very common. These are frequently caused by metallic foreign bodies associated with the use of power tools on metal, particularly angle grinders that cause showers of white-hot metal fragments to leave the tool at high speed. Approximately five to ten such cases are seen every working day at Mater Dei Hospital.

Superficial foreign bodies adherent to the cornea may sometimes be removed in the primary care setting using a moistened cotton bud.⁴ If this proves unsuccessful the patient should be referred to ophthalmic casualty, since in a matter of hours the metal begins to rust and an infiltrate may develop in the surrounding corneal stroma, with risk of secondary infection and ulceration.² Removal is undertaken at the slit lamp under topical anaesthesia, using a sterile needle to remove the foreign body and any surrounding rust ring. Following this, a course of broad-spectrum antibiotic eye ointment such as 1% chloramphenicol is prescribed.

Penetration of the globe and intraocular foreign bodies

Penetrating eye injuries are serious and sight-threatening: despite time-consuming and expensive treatment, prognosis is often very poor.⁵ The vast majority of such injuries occur in males, the most frequent cause being hammering on metal.⁶

In the primary care setting, initial assessment of an eye potentially injured by a projectile or sharp object should include visual acuity, confrontational visual fields, examination of the pupils, extraocular movements and fundoscopy. The eye should be examined with extreme care since any pressure might cause extrusion of intraocular contents through a corneal or scleral wound. Clues that penetration occurred include a distorted pupil, cataract, prolapsed uvea (pigmented tissue visible on the ocular surface), and vitreous haemorrhage (poor/absent red reflex).⁴

If penetration of the globe is suspected, the eye should be protected preferably with a clear plastic shield over the orbit (resting against the forehead and cheek). Eye patches should not be used in such cases in order to avoid direct pressure on the eye.⁷ The patient should be instructed to avoid coughing or straining, and referred immediately to ophthalmic casualty for further assessment and management.

Relatively small foreign bodies travelling at high speed such as fragments of metal from power tools or explosions may penetrate the eye through very small self-sealing wounds, which might be missed on examination. Subconjunctival haemorrhage may also conceal a scleral entry wound. For these reasons, eye injuries where the history was suggestive of high-speed projectiles should be viewed with a high index of suspicion, and should also be referred to ophthalmic casualty.⁴

Conclusion

The old adage that prevention is better than cure holds especially true with respect to eye injuries such as those described above. Appropriate eye protection should always be worn in the vicinity of power tools, where hammering is involved, or during other such high-risk jobs. Penetrating eye injuries have even been known to occur despite use of approved safety goggles, and some authors recommend the use of a full-face shield instead.⁸ Patients with corneal foreign bodies that are not easily removed, or eye injuries related to high-speed projectiles should be referred to ophthalmic casualty.

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