Blunt ocular trauma occurs frequently in sporting activities, as well as in industrial situations, domestic situations and on farms.

Ocular trauma is the leading cause of blindness in Canada. There is a bimodal distribution, with one peak in adolescents and young adults, and another in those over 75 years of age. Approximately 30% of ocular trauma cases occur in children under 10 years of age and about 35% of hospital admissions involve patients under the age of 15. Hyphema, intraocular foreign bodies and open-globe injuries constitute the majority of injuries. Generally, the younger the child, the more devastating the injury. Abused children with retinal hemorrhages may have experienced what is known as “shaken baby syndrome.”

**History**

In the author’s experience, first as a general practitioner and then as an ophthalmologist, there are several important “eye pearls.” The most important aspect of blunt trauma involves the history, which is the main aspect of the examination. The key questions to ask during the history taking are:

- How did the accident or injury happen?
- What was the mechanism of the blunt trauma?
- What was the injured person doing at the time?
- Where did it happen?
- When did it happen?
- Why did it happen?
- Who was involved? Who was there?
- Was there any antecedent ocular history (i.e., injury, surgery, squint, amblyopia, etc.)?
- What is the status of the patient’s tetanus immunization?

If a farmer has been working on his tractor in the barn, for example, and accidentally pokes himself in the eye with the sharp end of a screwdriver, the
Blunt Ocular Trauma

The examination of the injured eye must, if possible, document the vision in both eyes. This examination begins at the lowest level (i.e., light perception and projection testing, hand-motion detection, counting fingers and measuring the ability to see a light or fingers in all four quadrants of the visual field). Use of the Snellen chart comes next, with documentation of the vision in the injured eye being essential.

In some cases, it may not be possible to document the patient’s vision if the eyelids are swollen shut and cannot be opened. The use of certain instruments, such as Demerre’s retractors, however, help open them. If these instruments are unavailable, a good substitute is the old-fashioned shoe horn, wiped with alcohol. It could be used to gently open the lids so the eyes may be examined from underneath. Such an examination takes two people — one to open the eyelids and one to apply the topical anesthetic (proparacaine hydrochloride 0.5%) immediately after the lids are touched and to hold the light. It is important to guard against a penetrating injury. Do not put pressure on the globe, lift the lids away from the globe and up (to the frontal region) and down (to the nose), respectively.

The papillary examination should establish whether the pupils are round, regular and reactive to light, as well as if a relative afferent papillary defect is present. One must watch for the teardrop pupil, which signifies penetration of the anterior segment (Figure 2).

If the patient has a relative afferent papillary defect, check the color vision with a red-topped container (i.e., cyclopentolate 1% container) to see if there is desaturation of the central vision in the affected eye. This is indicative of optic nerve damage.

Fields on confrontation are easy to measure and use of the extinction phenomenon is a helpful adjunct. This can be done by wiggling one finger in the temporal field of one eye and not in the other to detect relative defects. Remember to have your opposite eye closed and make sure the patient has the opposite side eye closed as you do.

Forced ductions can be carried out with the use of topical anesthesia and a pair of forceps, as well as with the help of a co-operative patient. If you sus-

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Figure 1. A ruptured globe as the result of blunt penetrating trauma. Note the Y-shaped corneal laceration with prolapse of uveal tissue.

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pect entrapment of the medial rectus, adduction and abduction of the eye by grasping the lateral rectus will result in no, or limited, movement of the eye in the horizontal plane. This confirms a blow-out fracture into the ethmoid sinus. An example is shown in Figure 3, except here the eye is held by the nail and cannot move.

**Physical Findings**

Examination of the anterior segment is best done with a slit lamp and a co-operative patient. If the patient has been rendered unco-operative or is a child, one may have to use a flashlight and magnification (a loupe).

Hand-held slit lamps are available in most eye out-patient suites and may be used as a substitute for the regular slit lamp stand and chair. Here, with a loupe and some fluorescein stain, one is able to detect corneal injuries from abrasions or lacerations (the teardrop pupil) with prolapse of iris tissue. One also can examine the conjunctiva, which usually is involved in hemorrhagic chemosis. It is possible to see the anterior segment as well (i.e., how deep is it, if the pupil is round or teardrop shaped, suggesting a penetrating injury).

Examination of the lens may be difficult unless the patient’s eye is dilated with some form of cycloplegia. One rarely causes angle closure glaucoma with dilating drops. In fact, in some 30 years of practice, this has happened to the author only twice.

Magnification, either loupe or slit lamp, is essential to establish the presence of the lens or its absence, signifying subluxation or dislocation.

Determination of the intraocular pressure may be done with the ballottement method, or by the Schiotz tonometer, tonopen or applanation tonometer. The digital method, when used regularly, also will yield a fair degree of reliability and accuracy.

The hard eye of angle closure glaucoma, as well as the pain, redness and fixed mid-dilated pupil with markedly decreased vision is easy to pick up. Such is the case for the very soft eye. If perforation or penetration is suspected, be careful with the digital method.

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**Summary**

**Breaking Down Blunt Ocular Trauma**

- The examination of the injured eye must, if possible, document the vision in both eyes.
- The external examination involves looking at the lids, the lacrimal apparatus, the conjunctiva and the periorbital area.
- The papillary examination should establish whether the pupils are round, regular and reactive to light, as well as if a relative afferent papillary defect is present.
- Examination of the anterior segment is best done with a slit lamp and a co-operative patient.
- Examination of the lens may be difficult unless the patient is dilated with some form of cycloplegia.
- A teardrop pupil may indicate a ruptured globe, with the iris moving to the opening in the cornea like a finger into a leak in the dike. This is the hallmark of anterior segment perforation.
Examination of the vitreous and the retina requires dilatation. An inability to see the retrolenticular eye could mean there is blunt trauma hemorrhage into the vitreous base and possible retinal detachment.

Ancillary methods of visualization of the eye and orbit may require sinus X-rays, orbital X-rays, ultrasound and computerized axial tomography.

Fractures related to blunt trauma usually are blow-out fractures. The blow usually results in the entrapment of extraocular muscles in the split of the orbital wall backed by a sinus, with resultant limitation of movement in all directions in which the entrapped muscle works. The patient may have very swollen lids and the diplopia only becomes apparent when the swelling goes down.

Beware of the white eye, with diplopia following blunt trauma. This is an emergency and could have dire consequences for vision, if not looked after quickly.

Injuries to the medial canthal area are indications for immediate referral to an ophthalmologist because of the possibility of lacrimal duct injury (Figure 4).

Lid lacerations involving the lid margin, or deep cuts into the upper or lower lid sulcus, are indications for a timely referral.

Subconjunctival hemorrhages are common and unrelated to trauma in most cases. When they are associated with blunt trauma, they may hide global ruptures.

A teardrop pupil may indicate a ruptured globe, with the iris moving to the opening in the cornea like a finger into a leak in the dike. This is the hallmark of anterior segment perforation.

The remaining effects of blunt trauma involve the iris, ciliary body, vitreous base, peripheral retina, and the macula and optic nerve.

Tearing of the iris at its insertion into the ciliary body may cause an iridodialysis or hyphema. Hyphema is more frequent and must be assessed on a timely basis, no matter what the degree of fill in the anterior chamber. Usually, the more blood in the anterior chamber, the worse the prognosis. Timely
referral is indicated for small hyphema, but cases involving hyphema of more than 50% should be referred immediately (Figure 5).

The lens may be subluxated or dislocated into the vitreous — a cause of variable vision in the first instance and very poor vision in the second.

Tears at the vitreous base can cause the contra-coupe effect, resulting in separation of the peripheral retina due to a tear at the ora serrata or vitreous base. Dialysis and subsequent retinal detachment may result from these tears.

The macula is the center of the sharpest color vision. It often suffers from contra-coupe blows and can develop edema (i.e., cystoid macular edema, hemorrhage, detachment with serous fluid under the retina or under the retinal pigment epithelium, and hole formation, much like pulling the plug out of the bathroom tub drain). Here, there is a marked decrease in central vision with macular hole formation. There also may be distortion of the object with macropsia or things may appear larger than normal due to a spreading of the receptors at the macula. Alternately, micropsia may develop, with things appearing smaller than normal due to the crushing together of the receptors in the macula (cones) area with hemorrhage or exudation.

With blows secondary to blunt trauma from a fist, for example, there may be rupture of the supronasal sclera (intercaramel) and subluxation of uveal tissue or the lens under the conjunctiva (Figure 6).

Suggested Readings