23 OCULAR INJURIES

CORE CONCEPTS

- Assess a casualty with an eye injury.
- Identify various ocular injuries.
- Evaluate and manage a ballistic eye injury.
- Describe the steps to irrigate an eye injury.
- Treat an ocular injury.

INTRODUCTION

On the battlefield, combat medics may encounter a casualty with an injury to the eye or surrounding soft tissues. The immediate goals in treatment of ocular injuries are protecting the intact portions of the visual system while avoiding further injury and accurately assessing the extent of injury. Refer these casualties to a medical officer (MO) for evaluation. Obtaining a detailed history is important. Categorize symptoms such as vision loss or eye pain, report signs such as a change in appearance of the eye, and document the extent of trauma. One example of the importance of a good history is when a soldier informs you that the eye pain started while hammering metal on metal. This would suggest a projectile injury to the cornea or an intraocular foreign body. You must also be a source of information on ocular injury prevention for fellow soldiers.

ANATOMY AND PHYSIOLOGY OF THE EYE

The eyes are delicate organs that provide vision (Figure 23-1). They are protected by the skull, eyelids, eyelashes, and tears. Their shape is maintained by fluid contained within the eye (**vitreous** and **aqueous humor**). The **sclera** (white of the eye) is the tough outer layer that protects the inner structure of the eye and helps maintain the eye's shape. The sclera is connected to six muscles that allow the eye to look up, down, and side to side. The mucous membrane that lines the eyelid is called the **conjunctiva.** This mucous membrane extends from the eyelid to the front of the eyeball and covers the anterior portion of the sclera. **Lacrimal glands** (tear glands) are located in the upper-outer aspect of each upper eyelid. The lacrimal glands prevent infection and moisten the eye. Lacrimal fluid drains through the lacrimal ducts into the nasal cavity.

The inner layer of the eye that contains cells for vision is known as the **retina**. The retina contains two types of vision cells—rods and cones. The cone cells are used for daytime vision, and the rods are used at night or in low-light conditions. During dusk and dawn, a combination of rods and cones is used. **Macula** is a medical term for a small spot or colored area. In the retina, there exists a small oval-shaped, highly pigmented yellow spot near the center and approximately 2 mm lateral to the exit of the optic nerve known as the macula lutea retinae. The macula lutea retinae contains the area that is responsible for the most acute vision, the **fovea centralis retinae.**

The fovea is the center of the macula and is made up of cone cells. The fovea provides the sharp central vision necessary for reading, watching television, driving, and other activities where visual detail is of primary importance.

The **cornea** is the tough, transparent, colorless, and fibrous outer layer of the eye that covers the pupil and iris. Injuries to the cornea may cause opacity and stop light rays from entering the eye. The colored part of the eye located between the cornea and lens is the **iris**. It controls the amount of light entering the eye. The **pupil** is the circular opening in the iris and it is often referred to as the window of the eye. Light passes to the lens and the retina through this opening. The **lens** is a circular structure filled with a jelly-like substance; it adjusts to focus both near and far objects.

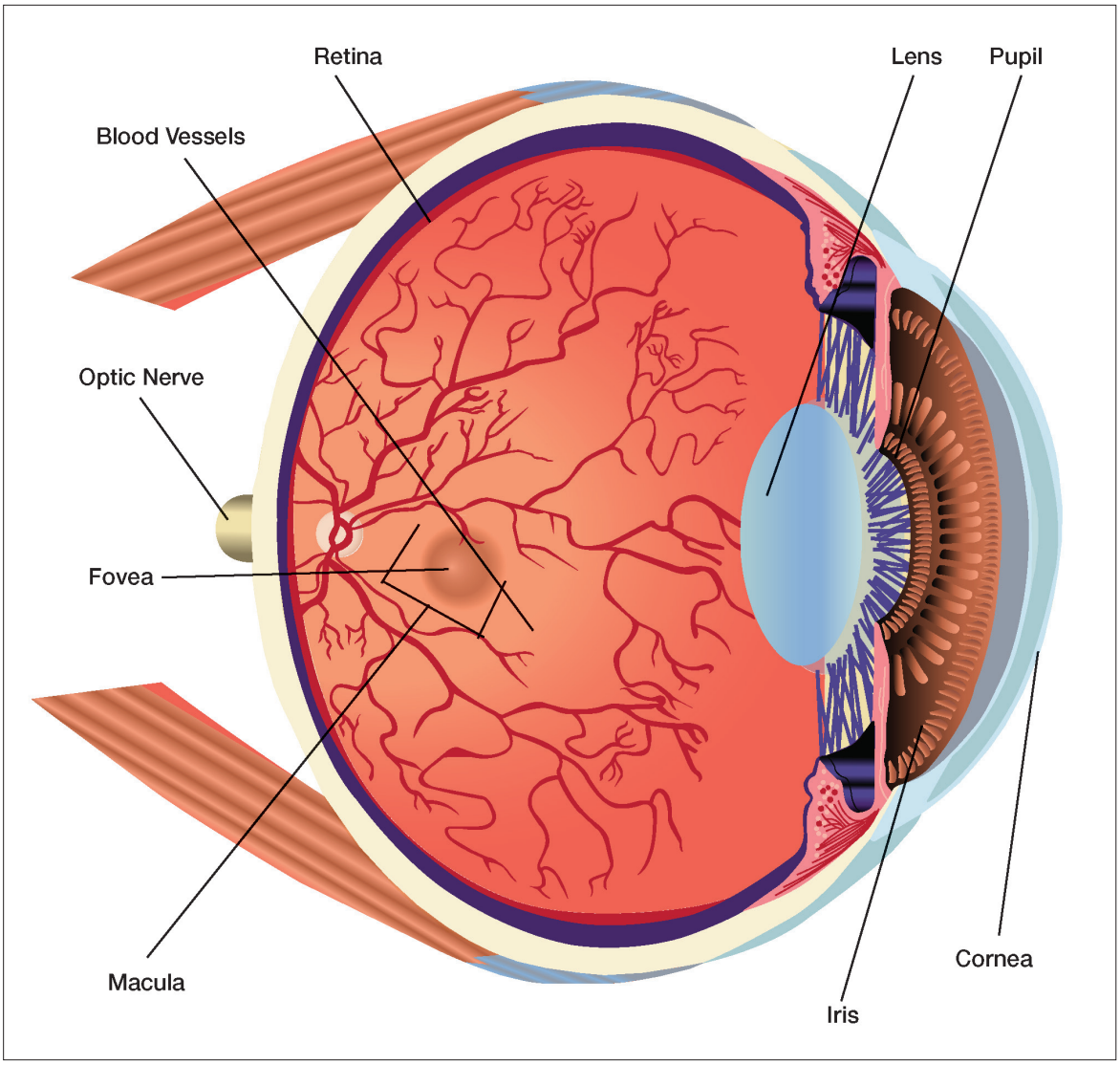

Figure 23-1. Anatomy of the eye.

When a person is looking at an object, light passes through the cornea and the pupil. The iris constricts or dilates to control the amount of light passing through the pupil. In low-light conditions, the pupil will dilate to allow more light to enter the eye. In high-ambient-light conditions, the pupil will constrict to reduce the amount of light entering the eye. This reduces overstimulation of the cells in the retina and prevents the photoreceptor cells from dying. After light passes through the pupil, it shines on the lens, which is positioned directly behind the pupil. The lens inverts the light image shining on it and directs the light to the retina. The light then stimulates the photoreceptor cells (cones and rods), creating electrical impulses that travel via neurons to the optic nerve. The optic nerve transmits these electrical impulses to the brain, which interprets the visual image.

Check on Learning

1. Identify the eight main structures of the eye.
2. Define the function of the conjunctiva.

ASSESSING A CASUALTY FOR AN EYE INJURY

Injuries to the eyes can occur as a result of blunt trauma, penetrating trauma, burns, or chemical exposure. When treating an eye injury, be sensitive to

the fact that the injury may be very frightening to the casualty. The thought of becoming blind, even in one eye, can be a major concern. An accurate history helps establish a possible cause for the eye problem. Ask the following:

- Is there a history (**Hx**) of eye disease (eg, **glaucoma**) or previous eye trauma or surgery?
- What was the mechanism of injury (if there is a history of injury)?
  - The extent of injury is directly related to the mechanism of injury (eg, a small shard of metal can cause a laceration or abrasion to the conjunctiva or cornea, but shrapnel is likely to cause a much more significant injury).
- Was the trauma blunt or penetrating?
  - Blunt trauma injury to the eye may cause swelling and bleeding into the soft tissues surrounding the orbit, resulting in a contusion or hematoma (also known as a black eye).
  - Penetrating trauma to the eye can be caused by large objects, such as sticks, or small objects, such as small shards of metal.
- Was there a projectile or missile injury (eg, glass from a motor vehicle accident)?
- Was there a thermal, chemical, or laser burn?
- Does the casualty wear glasses or contact lenses?

Note: "Contact lenses will not be worn during basic training, field exercises, gas chamber exercises, deployments, or combat."[1] Wearing of contact lenses will worsen chemical exposures of the eyes and corneal injuries such as corneal foreign bodies, lacerations, ulcers, or infections.

- Is there eye pain or loss of vision? If yes, is it in one eye (OD: right eye; OS: left eye) or both (OU: both eyes)?

The most important step in evaluating ocular problems is determining **visual acuity**. All casualties with eye complaints should have some type of visual acuity test performed. Compare sight in the injured eye to the uninjured eye. In the case of chemical ocular burns, flush the eyes first. Once the mechanism of the burn has been eliminated, conduct the visual acuity screening.

If you are in a clinic, use a standard Snellen chart (Figure 23-2). When equipment, light, or space does not permit the use of a Snellen chart, a gross vision examination is recommended. A gross vision examination entails having the casualty read any printed

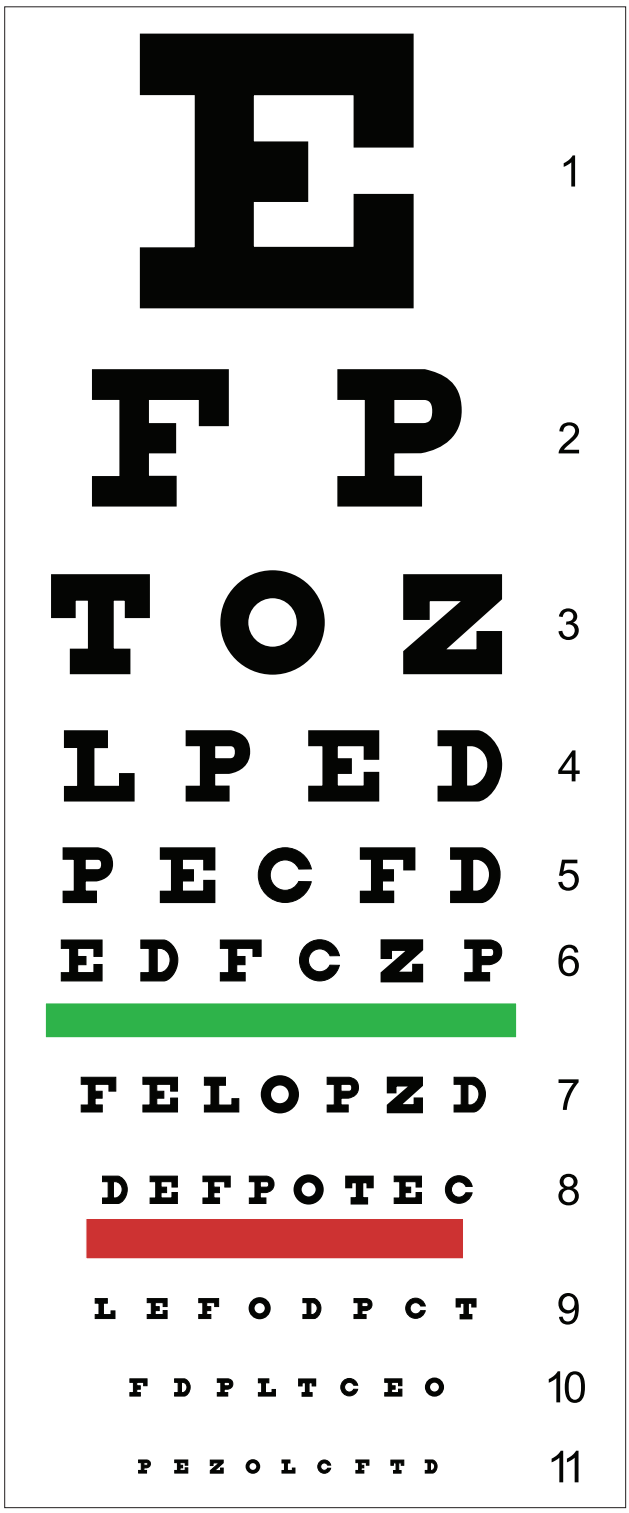

Figure 23-2. A Snellen chart—used to assess a person's visual acuity. Reproduced from Cho RI, Savitsky E. Ocular trauma. In: Savitsky E, Eastridge B, eds. *Combat Casualty Care, Lessons Learned from OEF and OIF*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2012: 214, fig 9.

material, try to determine how many fingers you are holding up, or see if they can distinguish between light and dark.

General physical examination techniques include inspection and palpation in adequate lighting (see Chapter 7, Eyes, Ears, Nose, and Throat Primary Care). **Hyphema** refers to blood or blood clots in the **anterior chamber**. Hyphemas are traumatic or spontaneous. A traumatic hyphema usually results from bleeding from a ruptured vessel in the eye (Figure 23-3). Avoid putting pressure on the globe while performing the examination. Assess for underlying head injuries. Never assume an injury to the eye is isolated strictly to the eye. Assess and reassess mental status. Perform baseline and repeated **Glasgow Coma Scale (GCS)** assessments (Table 23-1).

Check on Learning

3. What type of visual acuity assessment can be completed in an environment with limited equipment, light, and space?
4. What is the first step in treating a chemical burn to the eye?
5. When assessing a casualty with an ocular injury, what other type of injuries should you consider and assess?

Figure 23-3. Hyphema (blood in the anterior chamber of the eye). Reproduced from Cho RI, Savitsky E. Ocular trauma. In: Savitsky E, Eastridge B, eds. *Combat Casualty Care, Lessons Learned from OEF and OIF*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2012: 315, fig 21.

PREVENTION

While ballistic eye protection will guard against penetrating injuries, lasers, and burns to the eye, glasses and sunglasses do not provide adequate eye protection in tactical environments. Authorized

Table 23-1. Glasgow Coma Scale.

BEHAVIOR TO STIMULI	RESPONSE	SCORE
EYE OPENING RESPONSE	Spontaneous	4
	To Speech	3
	To Pain	2
	No Response	1
VERBAL RESPONSE	Oriented (A&OX4)	5
	Confused	4
	Inappropriate Words	3
	Incomprehensible Speech	2
	No Response	1
MOTOR RESPONSE	Obeys Commands	6
	Localizes Pain	5
	Withdraws from Pain	4
	Flexion (Decorticate)	3
	Extension (Decerebrate)	2
	No Response	1
TOTAL SCORE	BEST RESPONSE	15
	COMPLETELY UNRESPONSIVE	3

A&Ox4: alert and oriented times 4 (to person, place, time, and event).

Figure 23-4. First Lieutenant Anthony Aguilar wears the ballistic protective eyewear that prevented a bomb-fragment from possibly damaging his eyes when an IED detonated near his Stryker vehicle while on patrol in Mosul. Photograph by Company C, Task Force 2-1. https://www.dvidshub.net/image/22317/eye-protection

ballistic eye protection is listed on the Army's Authorized Protective Eyewear list (APEL) at http://www.peosoldier.army.mil/equipment/eyewear/. For eye injuries, the best treatment is prevention (Figure 23-4).

Laser Injuries

At low energy levels, lasers may produce temporary reduction in visual performance in critical tasks, such as aiming weapons or flying aircraft. At higher energy levels, they may produce serious long-term vision loss and even permanent blindness. Passive protection consists of taking cover and wearing ballistic eye protection. Active protection consists of the following:

- scanning battlefields with one eye,
- minimizing use of binoculars in areas known to have lasers in use,
- using built-in or clip-on filters, and
- using battlefield smoke screens.

Laser protective eyewear will prevent ocular injury from laser radiation emitted by low-energy laser rangefinders and target designators. Ballistic and laser protective eyewear will protect the eye against ballistic fragments and specified fixed wavelength laser hazards (Figure 23-5). Risk of laser injury increases with the use of night vision goggles (NVGs).

In the retina, laser injury can include burns and hemorrhage that result in vision loss. In the cornea, laser injury can include burns, vision loss, corneal scarring, and corneal perforation. Burns of the cornea and skin are treated similarly to other types of thermal burns. The main symptom of laser injury is reduction in visual acuity; another symptom may be pain.

Suspect laser exposure when a casualty reports seeing bright flashes of light, experiences eye discomfort and poor vision, and feels unexplained heat. Obvious lesions include corneal burns, retinal injury and hemorrhage, and burns to the skin. You might confuse the use of invisible lasers with chemical agents, which also irritate the eyes and skin. Spontaneous fires and unexplained damage to optical instruments are additional evidence that laser devices or weapons have been employed.

Figure 23-5. Retinal injury caused by a laser range finder. Reproduced from Hollifield RD. Ocular laser injuries. In: Thach AB, ed. *Ophthalmic Care of the Combat Casualty*. In: Lounsbury DE, Bellamy RF, Zajtchuk R, eds. *Textbook of Military Medicine*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2003: 436, Fig 25-5(b).

EYE INJURY TREATMENT

Combat medics play an important role in preventing permanent eye injury or vision loss. Table 23-2 summarizes treatments and contraindications for different types of eye injuries. More detail for each type of eye injury is presented below.

Foreign Bodies of the Eye or Eyelid

If a foreign body is superficial (eg, dirt or dust), irrigate the eye and cover it with a rigid eye shield. Penetrating eye trauma presents a problem, especially on the battlefield. These injuries can deteriorate without proper care. Avoid placing pressure on the eye,

Table 23-2. Eye Injury Treatment Chart.*

	STOP BURNING PROCESS	IRRIGATE	VISUAL ACUITY / GROSS VISION TEST	STABILIZE OBJECT	RIGID EYE SHIELD	DRY STERILE DRESSING	MOIST 4 × 4 COVERING	CWMP	EVACUATE
Foreign Bodies	N/A	YES (If Superficial)	YES	N/A	YES	NO	NO	YES	YES
Impaled Object	N/A	NO	YES	YES	YES (if possible)	NO	NO	YES	YES
Eyelid Laceration	N/A	NO	YES	N/A	YES	NO	NO	YES	YES
Corneal Abrasion	N/A	YES	YES	N/A	YES	NO	NO	YES	YES
Ocular Extrusion	N/A	NO	YES	N/A	Rigid cup only; no pressure on globe	NO	YES	YES	YES
Orbital Fracture	N/A	N/A	YES	N/A	YES	N/A	N/A	YES	YES
Thermal Burns	YES	NO	YES	N/A	N/A	YES	N/A	Pain med only	YES
Chemical Burns	YES	YES	NO (Irrigate first)	N/A	N/A	N/A	N/A	YES	YES
Laser Injury	N/A	NO	YES	N/A	YES	NO	N/A	Pain med only	YES

*Cells highlighted in yellow represent treatment that is detrimental if performed for the specific condition.
Cells highlighted in blue represent treatment that must be performed for the specific condition. N/A represents treatment that is not applicable.
CWMP: combat wound medication pack

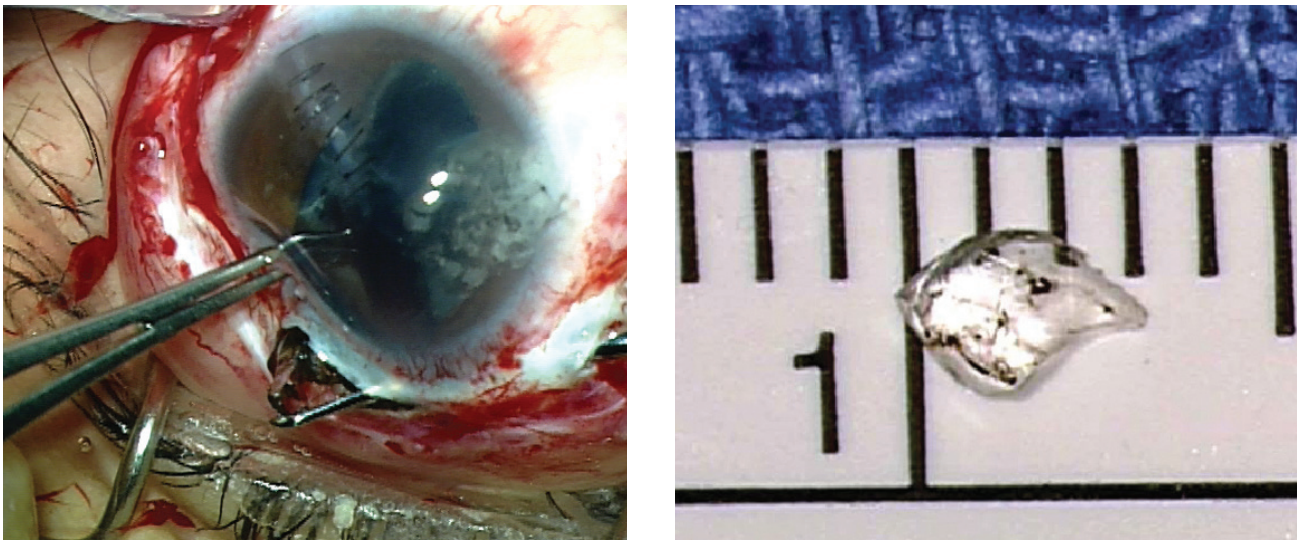

Figure 23-6. Foreign bodies being surgically removed from a casualty's eye. Reproduced from Cho RI, Savitsky E. Ocular trauma. In: Savitsky E, Eastridge B, eds. *Combat Casualty Care, Lessons Learned from OEF and OIF*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2012: 338, Fig 43.

which could cause the internal contents of the eye to be pushed out. If the foreign body is embedded or penetrating, do not attempt to remove it, but instead, stabilize the object if necessary. The object will only be removed in a surgical environment by properly trained medical providers (Figure 23-6).

Warning: Do not apply any dry or moist dressing or bandage to the eye. This could result in permanent loss of vision.

If a casualty experiences a foreign body in the eye, treat as follows:

- irrigate (if superficial like dirt and no ocular penetration),
- perform a visual acuity or gross vision test,
- apply a rigid eye shield (Figure 23-7),
- administer the combat wound medication pack (**CWMP**), and
- evacuate the casualty (with their glasses if applicable).

Note: When preparing a casualty with an ocular injury for evacuation, ascertain whether or not the casualty wears eyeglasses and if so, evacuate the casualty with their glasses.

Note: If a rigid eye shield is not available, an improvised eye shield may be fashioned from a structural, aluminum, malleable splint (**SAM splint** [Wilsonville, OR]) or other rigid material that protects the eye from direct pressure against the globe.

Figure 23-7. Shown is a Fox Eye Shield (Sklar Instruments, West Chester, PA; used with permission) being applied to a casualty with a simulated eye injury.

Eyelid Lacerations and Corneal Abrasions

Eyelid injuries often result in marked **ecchymosis**, making examination of injuries to the globe and lid difficult (Figure 23-8). Corneal abrasions result in pain, foreign body sensation, photophobia, and decreased visual acuity (Figure 23-9). When a corneal abrasion occurs, the injured cornea is much more susceptible to bacterial infection, particularly if the casualty wears contact lenses. If a casualty experiences a corneal abrasion and is wearing contact lenses, remove the contact lens and cover the eye with a rigid eye shield. Avoid eye patches because it places the casualty at higher risk of developing a bacterial corneal ulcer. If a casualty experiences an eyelid laceration, treat as follows:

- perform a visual acuity or gross vision test,
- apply a rigid eye shield,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

If a casualty experiences a corneal abrasion, treat as follows:

- irrigate,
- perform a visual acuity or gross vision test,
- apply a rigid eye shield,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Impaled Object

Treating a casualty with an impaled object in the eye is similar to the treatment for a foreign body in the eye with some slight differences. Do not irrigate the eye. If possible, stabilize the object to reduce further injury to the eye. If a casualty experiences an impaled object to the eye, treat as follows:

- perform a visual acuity or gross vision test,
- stabilize the object,
- apply a rigid eye shield if possible,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Orbital Fractures

Orbital fractures can present in several different ways. A fractured orbit can involve the medial area of the face (behind the nose), which may present with **subcutaneous emphysema**, sometimes exacerbated by sneezing or blowing the nose. Orbital fractures can also involve the inferior wall of the orbit (behind the eye), which may cause an entrapment of the eye muscles, possibly causing restriction of upward gaze and **diplopia** of the affected eye. This entrapment of

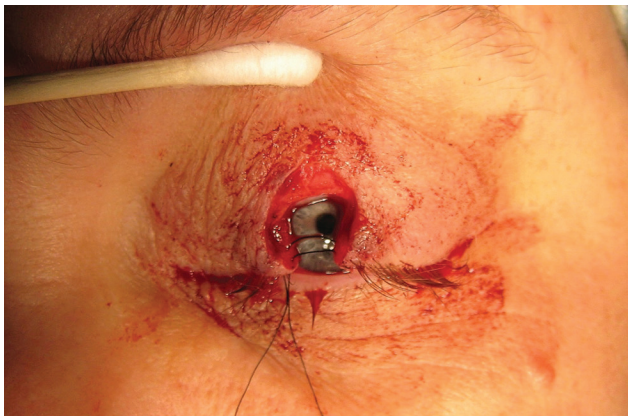

Figure 23-8. Eyelid laceration being repaired with sutures. Reproduced from Cho RI, Savitsky E. Ocular trauma. In: Savitsky E, Eastridge B, eds. *Combat Casualty Care, Lessons Learned from OEF and OIF*. In Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2012: 327, Fig 28.

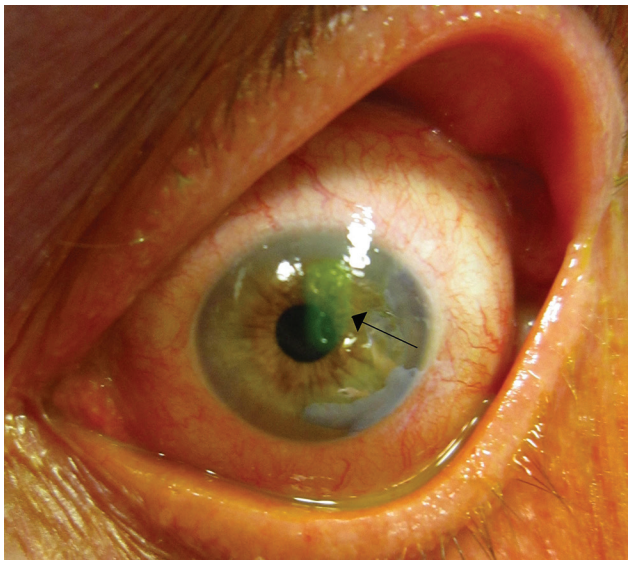

Figure 23-9. Corneal abrasion with fluorescein staining to show the site of injury. The arrow shows the injury site. Photograph by James Heilman, MD. Reproduced from Wikimedia Commons. http://en.wikipedia.org/wiki/File:Human_cornea_with_abrasion_highlighted_by_fluorescein_staining.jpg

Figure 23-10. The patient was kneed in the left eye while playing soccer. The orbital fracture is entrapping the medial tissues behind the eye, which results in the uneven tracking, known as horizontal diplopia. Reproduced from Mazzoli RA, Ainbinder DF, Hansen EA. Orbital trauma. In: Thach AB, ed. *Ophthalmic Care of the Combat Casualty*. In: Lounsbury DE, Bellamy RF, Zajtchuk R, eds. *Textbook of Military Medicine*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2003: 368, Fig 20-40(a).

Figure 23-11. A modified SAM (Wilsonville, OR) splint being used as an eye shield for a simulated casualty with an eye injury.

the eye muscles, resulting in the eyes looking in different directions, may result in double vision. Due to the nature of the injury, a casualty with an orbital fracture may not be able to move the eye or focus on objects (Figure 23-10). If a casualty experiences an orbital fracture, treat as follows:

- perform a visual acuity or gross vision test,
- apply a rigid eye shield,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Ocular Extrusion

If a casualty's eye is protruding from the socket (**ocular extrusion**), DO NOT attempt to force the eye back into the socket. Instead, shield and gently cup the avulsed eye with moist 4 × 4 gauze pads and cover with a loose, moist dressing. If a casualty experiences an ocular extrusion, treat as follows:

- perform a visual acuity or gross vision test,
- apply a rigid cup that WILL NOT apply pressure to the globe (Figure 23-11),
- cover the eye with a moist 4 × 4 gauze pad,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Thermal Burns

In cases of thermal burns, first stop the burning process. Thermal burns more commonly affect eyelids than the globe because of the **blink reflex**. Cover the affected eye with a dry sterile dressing, then follow burn assessment and treatment protocols. Consider administering pain management and withholding the CWMP if the casualty suffers exclusively from burns (Figure 23-12). If a casualty experiences a thermal burn to an eye, treat as follows:

- stop the burning process,
- perform a visual acuity or gross vision test,
- apply a dry sterile dressing over the eye,
- administer the analgesic ONLY from the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Chemical Burns

Warning: IRRIGATE FIRST! Do not perform visual acuity, gross visual exam, or physical assessment first for chemical burns to the eyes. Burning and tissue damage will continue to occur as long as any substance is left in the eye, even if that substance is diluted.

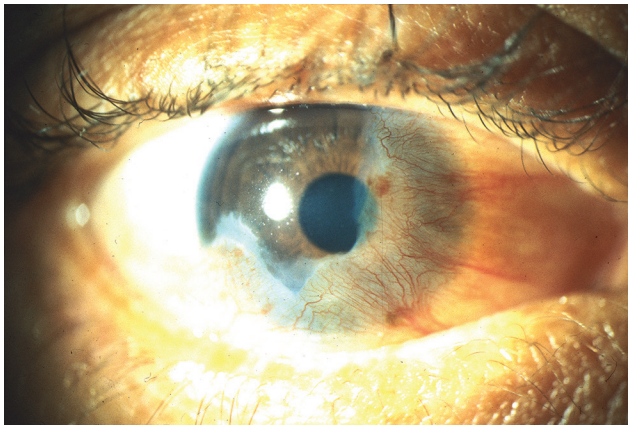

Figure 23-12. Corneal scarring from a boiling water thermal burn to the eye. Reproduced from Trudo EW, Rimm W. Chemical injuries of the eye. In: Thach AB, ed. *Ophthalmic Care of the Combat Casualty*. In: Lounsbury DE, Bellamy RF, Zajtchuk R, eds. *Textbook of Military Medicine*. Washington, DC: Department of the Army, Office of the Surgeon General, Borden Institute; 2003: 117, Fig 7-1.

Figure 23-13. Soldier medics practicing irrigating debris from a soldier's eye with IV fluid.

Chemical burns to the eye are a true emergency. Complications of chemical burns to the eye include scarring of the cornea with permanent loss of vision and loss of the eye due to corneal perforation. Immediately provide copious and continuous irrigation until all irrigation supplies are exhausted or until the casualty reaches the medical treatment facility. Do not conduct an eye examination or testing until irrigation is complete.

If a casualty experiences a chemical burn to the eye, treat as follows:

- stop the burning process,
- irrigate continuously until reaching the medical treatment facility (Figure 23-13),
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Caution: During irrigation of the eye, direct the flow of the water or saline so the solution does not come in contact with the other eye.

Injuries Produced by Lasers

Injuries sustained from laser exposure include retina burns, hemorrhage (causing loss of vision), and cornea burns. Cornea burns can cause vision loss, corneal scarring, and perforation of the cornea. Treatment of these injuries is similar to treatment for other types of thermal burns. If a casualty experiences a laser injury to the eye, treat as follows:

- perform a visual acuity or gross vision test,
- apply a rigid eye shield,
- administer the CWMP, and
- evacuate the casualty (with their glasses, if applicable).

Note: The antibiotic in the CWMP (moxifloxacin) is one of the few antibiotics that is effective in preventing or treating infections to the eye.

Caution: A casualty with both eyes covered is rendered defenseless against the enemy and is completely dependent on others.

Check on Learning

6. What is special about the antibiotic found in a CWMP?
7. Eyes should be irrigated for how long?

SUMMARY

Ocular injuries can be devastating to a casualty, and your actions can have direct, permanent results on the casualty's quality of life. Since the implementation of the tactical combat casualty care program, the methods of treating ocular injuries have changed significantly. Prevention programs in the past were nonexistent; however, today the US military researches and issues ballistic eyewear that is resistant to fragmentation ocular injuries. Since the Department of Defense directed use of APEL-approved eyewear, the total number of ocular casualties has decreased in both peacetime and war. With the introduction of rigid, malleable, lightweight eye shields and battlefield antibiotics, secondary ocular injury through trauma and infection has decreased, resulting in more soldiers being returned to duty and more eyesight being saved.

KEY TERMS AND ACRONYMS

Anterior chamber. The space between the cornea and iris of the eye.
Aqueous humor. The clear, watery fluid in the anterior and posterior chambers of the eye.
Blink reflex. Sudden closing of the eyelids in response to head turning, loud noises, bright lights, or visual threats.
Conjunctiva. The mucous membrane that lines the eyelids and is reflected onto the eyeball.
Cornea. The transparent anterior portion of the sclera (the fibrous outer layer of the eyeball); about one-sixth of its surface.
CWMP. Combat wound medication pack.
Diplopia. Two images of an object seen at the same time.
Ecchymosis. A bruise caused by superficial bleeding in the skin or mucous membrane.
Fovea (fovea centralis retinae). The pit in the middle of the macula lutea that contains only a layer of closely packed cones and functions as the area of most acute vision.
Glasgow Coma Scale (GCS). A standardized system used to determine a patient's level of consciousness.
Glaucoma. A group of eye diseases characterized by increased intraocular pressure resulting in atrophy of the optic nerve and possibly leading to blindness.
Hx. History.
Hyphema. Blood in the anterior chamber of the eye, in front of the iris.
Iris. The colored contractile membrane suspended between the lens and the cornea in the aqueous humor of the eye. It separates the anterior and posterior chambers of the eyeball and is perforated in the center by the pupil.
Lacrimal glands. Glands that produce tears, which prevent infection and moisten the eye. Tears drain through ducts located in the eyelids.
Lens. A circular structure filled with jelly-like substance, which adjusts to focus both near and far objects.
Macula (macula lutea retinae). A yellow spot in the center of the retina approximately 2 mm lateral to the exit of the optic nerve. It contains the fovea centralis.
Ocular extrusion. The eye is protruding from the socket.
Pupil. The contractile opening at the center of the iris of the eye. It is constricted when exposed to strong light and when the focus is on a near object. It is dilated in the dark and when the focus is on a distant object.
Retina. The innermost layer of the eye, it contains the rods and cones and receives images transmitted through the lens.
SAM splint. Structural aluminum malleable splint.
Sclera. The outer layer of the eyeball; made of fibrous connective tissue and visible as the white portion of the eye.
Subcutaneous emphysema. The presence of gas or air in the subcutaneous tissue.
Visual acuity. A measure of the resolving power of the eye; usually determined by one's ability to read letters of various sizes at a standard distance from a test chart.
Vitreous humor. The colorless, transparent jelly that fills the eyeball posterior to the lens and is enclosed by delicate hyaloid membranes.

CHECK ON LEARNING ANSWERS

1. Identify the eight main structures of the eye.

   Iris muscles, pupil, cornea, lens, conjunctiva, retina, sclera, and optic nerve.

2. Define the function of the conjunctiva.

   It is the mucous membrane that lines the eyelid and extends from the eyelid to the front to the eyeball. It covers the anterior portion of the sclera.

3. What type of visual acuity assessment can be completed in an environment with limited equipment, light, and space?

   A gross vision examination.

4. What is the first step in treating a chemical burn to the eye?

   Flush the affected eye to eliminate the mechanism of injury.

5. When assessing a casualty with an ocular injury, what other type of injuries should you also assess for?

   A head injury, which may present with an altered level of consciousness and a finding on the Glasgow Coma Scale of less than 15.

6. What is special about the antibiotic found in a CWMP?

   Moxifloxacin is one of the few antibiotics that is effective in treating infections of the eye.

7. Eyes should be irrigated for how long?

   Irrigation should be maintained for as long as supplies will allow or until the casualty reaches a medical treatment facility.

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