Chapter 4

OPHTHALMIC TRAUMA

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Corneal Perforation and Rust Ring. This patient was using a compressed air wire wheel brush when a wire came loose and lodged in the cornea. He was not wearing safety glasses. The wire was removed in the operating room where it was found to penetrate fully through the cornea and required one corneal suture. Interestingly, the rust ring had formed around the wire only about 3 hours after this injury occurred. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org.)

The authors acknowledge the special contributions of Dallas E. Peak and Carey D. Chisholm for contributions to prior editions.

CORNEAL ABRASION

Clinical Summary

Corneal abrasions present with acute onset of eye discomfort, tearing, and often a foreign-body sensation. A "ciliary flush" (conjunctival injection hugging the limbus) may be seen. Large abrasions or those in the central visual axis may affect visual acuity. Photophobia and headache from ciliary muscle spasm may be present. Associated findings or complications include traumatic iritis, hypopyon, or a corneal ulcer. Fluorescein examination, preferably with a slit lamp, reveals the defect.

Management and Disposition

Instillation of topical anesthetic drops facilitates examination while relieving pain and blepharospasm. Consider using a short-acting cycloplegic (eg, cyclopentolate 1%, homatropine 5%) to reduce pain from ciliary spasm in patients who complain of headache or photophobia. Consider oral opioid analgesics for pain control. Nonsteroidal anti-inflammatory drug (NSAID) eye drops (eg, diclofenac or ketorolac) are equally effective and avoid risks of sedation. Neither treatment with topical antibiotics, nor patching, nor tetanus prophylaxis for uncomplicated corneal abrasions has scientific validation. Follow-up is advised for any patient with complications, or who is still symptomatic after 24 hours.

Pearls

1. Mucus may simulate fluorescein uptake, but its position changes with blinking.
2. Multiple linear corneal abrasions, the "ice-rink sign," may result from an embedded foreign body (FB) adhered to the upper lid. Always evert the lid to evaluate this.
3. Whenever the mechanism includes grinding or striking metal, or high-velocity injuries from mowers or string trimmers, maintain a high index of suspicion for penetrating injury. Fluorescein streaming away from an "abrasion" (Seidel test) may be an indication of a corneal perforation.
4. Routine prophylactic treatment with topical antibiotics remains controversial. When used, inexpensive, broad-spectrum antibiotic drops (sulfacetamide sodium or trimethoprim/polymyxin B) allow clearer vision than lubricating ointments, which may feel better, but blur vision. Avoid topical neomycin antibiotics because of a high risk of irritant allergy symptoms in many people.
5. An "abrasion" in a contact lens wearer should alert one to suspect a corneal ulcer. Consult ophthalmology while the patient is in the emergency department.

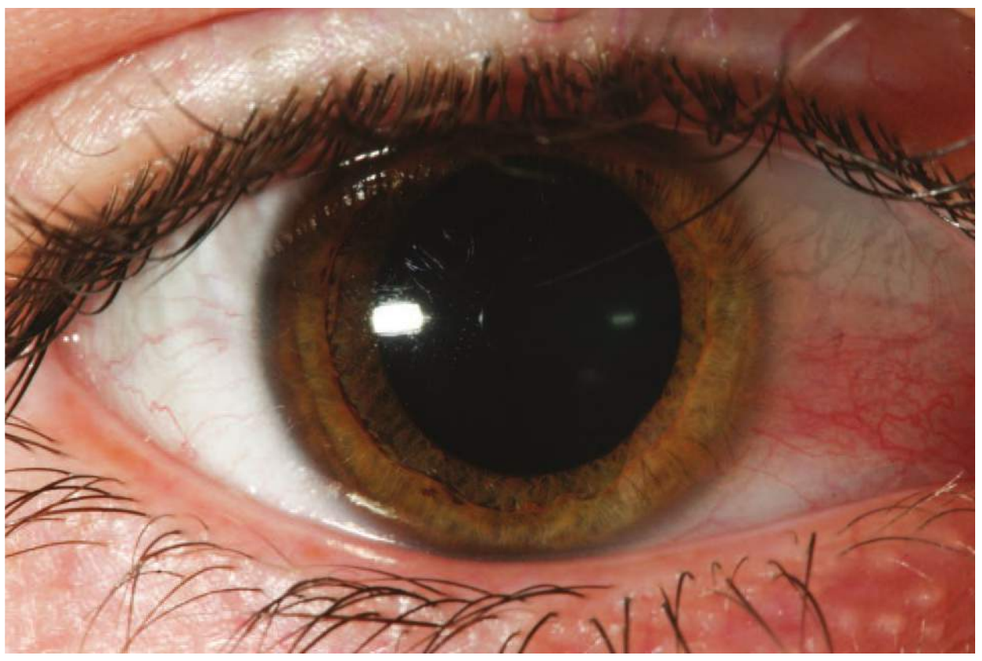

FIGURE 4.1 ■ **Corneal Abrasion.** A small abrasion is seen at the 3-o'clock position, just across the larger white reflection from the flash. Note the brisk localized conjunctival inflammatory reaction and ciliary flush. (Photo contributor: Kevin J. Knoop, MD, MS.)

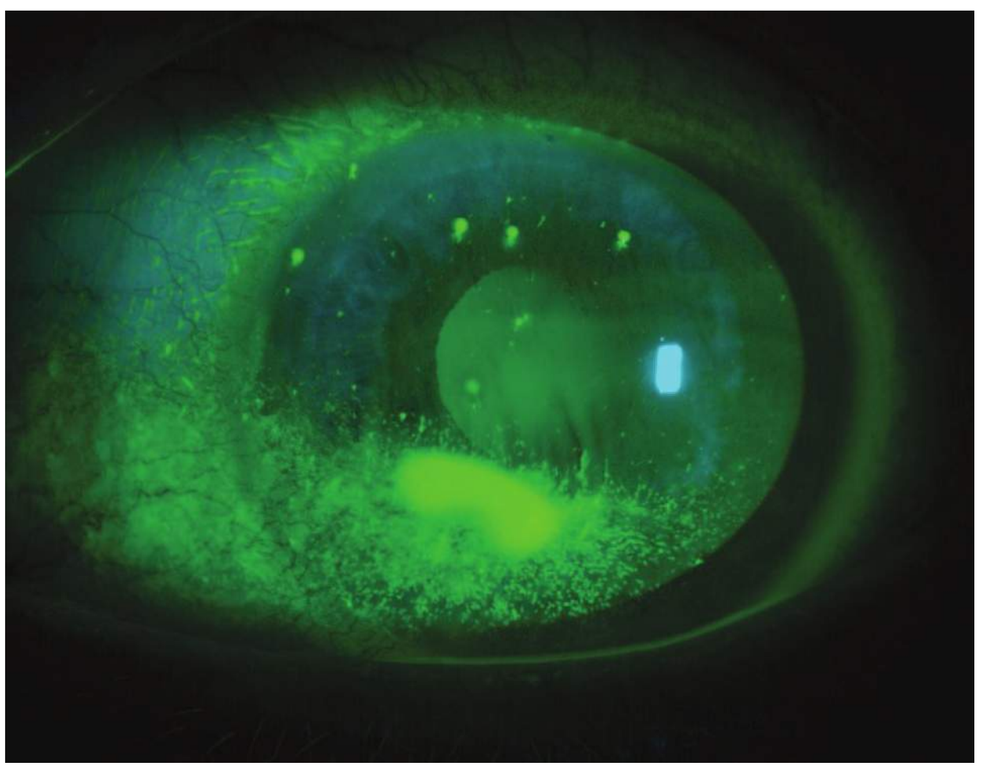

FIGURE 4.2 ■ **Corneal Abrasion.** Multiple punctate and one large traumatic abrasion are seen with fluorescein uptake. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org.)

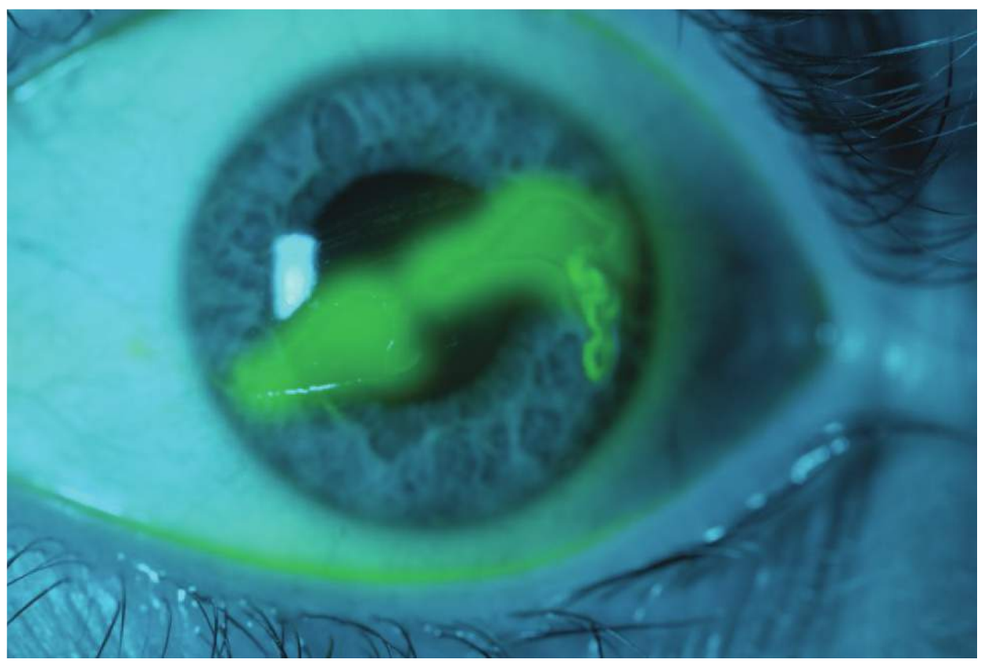

FIGURE 4.3 ■ **Corneal Abrasion.** Abrasions obscuring the visual axis benefit from close follow-up with an ophthalmologist to ensure adequate healing. (Photo contributor: Lawrence B. Stack, MD.)

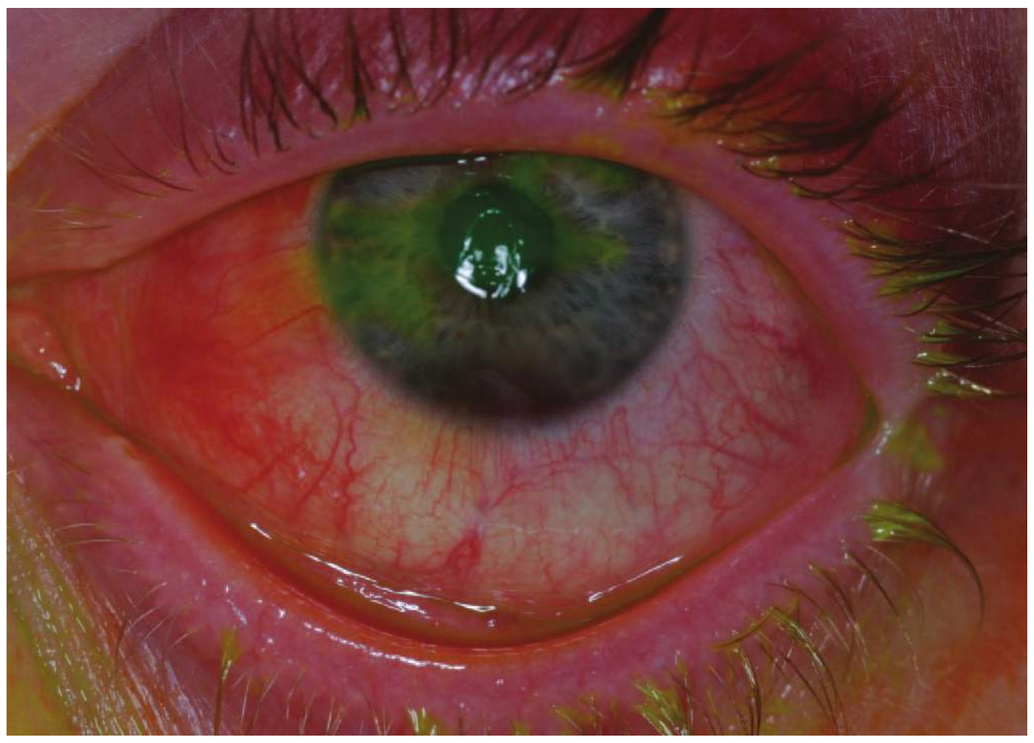

FIGURE 4.4 ■ **Corneal Abrasion.** This injury was due to a bungee cord impacting the eye. An irregular corneal light reflex indicates a disruption in the corneal epithelium (abrasion or perforation). A small hyphema is also seen. (Photo contributor: Kevin J. Knoop, MD, MS.)

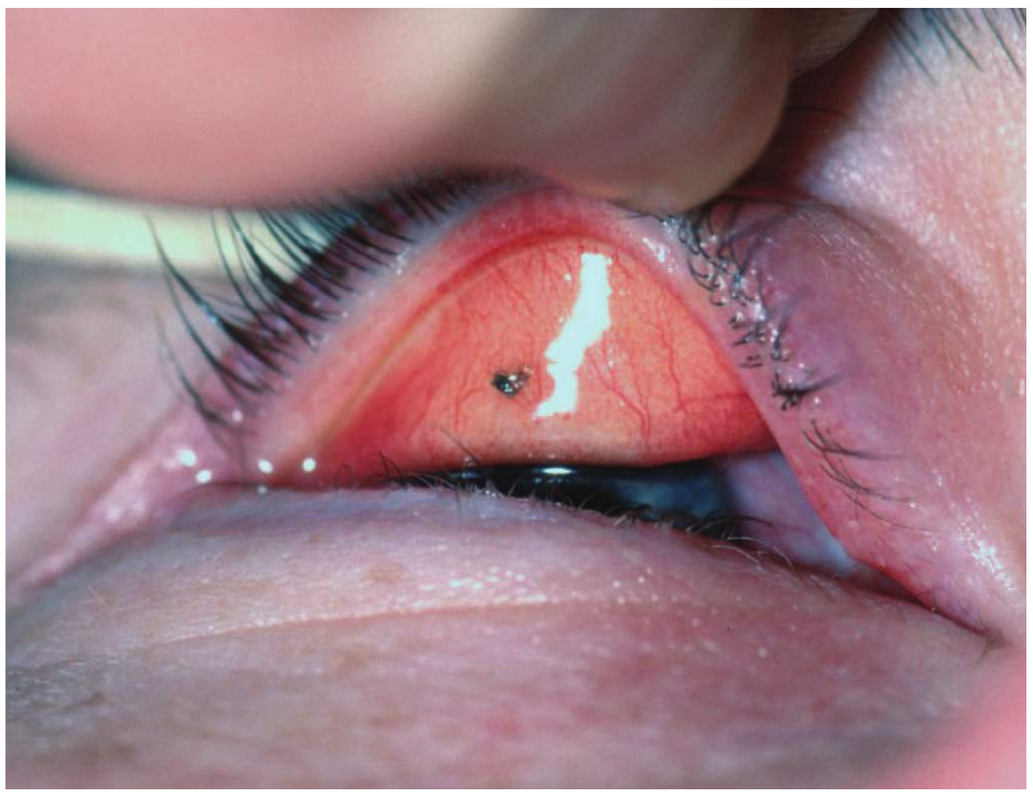

FIGURE 4.5 ■ **Foreign Body under the Upper Lid.** Lid eversion is an essential part of the eye examination to detect foreign bodies. (Photo contributor: Lawrence B. Stack, MD.)

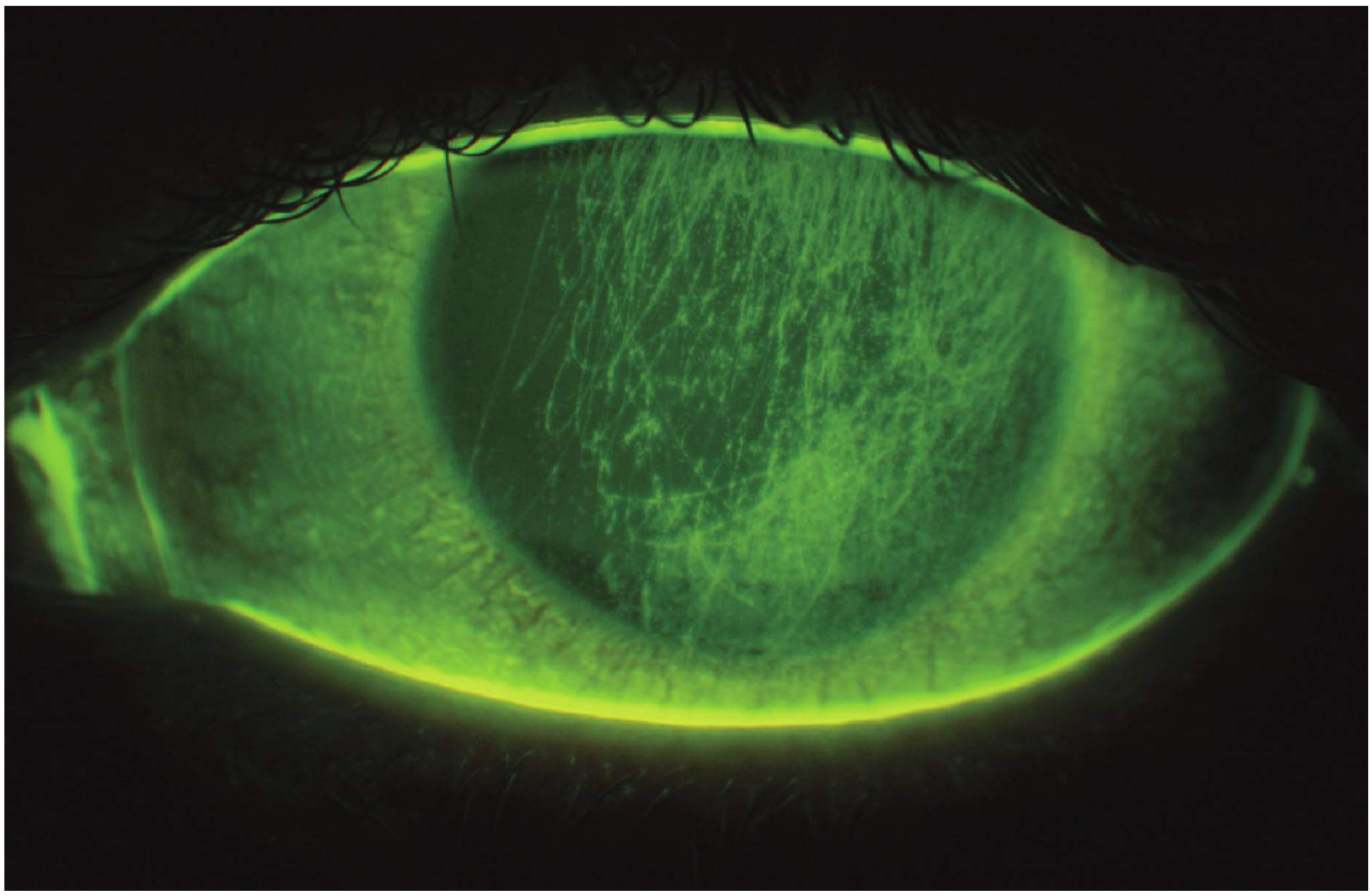

FIGURE 4.6 ■ **"Ice-Rink Sign."** Multiple linear abrasions caused by upper lid foreign body. (Photo contributor: Aaron Sobol, MD.)

SUBCONJUNCTIVAL HEMORRHAGE

Clinical Summary

A subconjunctival hemorrhage or hematoma occurs with often trivial events such as a cough, sneeze, Valsalva maneuver, or minor blunt trauma. The patient may present with some degree of duress secondary to the appearance of the bloody eye. The blood is usually bright red and appears flat. It is limited to the bulbar conjunctiva and stops abruptly at the limbus. This appearance is important to differentiate the lesion from bloody chemosis, which can occur with scleral rupture or nontraumatic conditions. Aside from appearance, this condition does not cause the patient any pain or diminution in visual acuity.

FIGURE 4.7 ■ **Subconjunctival Hemorrhage.** Subconjunctival hemorrhage from blunt trauma. The flat appearance of the hemorrhage suggests its benign nature. (Photo contributor: Dallas E. Peak, MD.)

Management and Disposition

No treatment is required. Instruct the patient to expect the blood to resorb in 2 to 3 weeks.

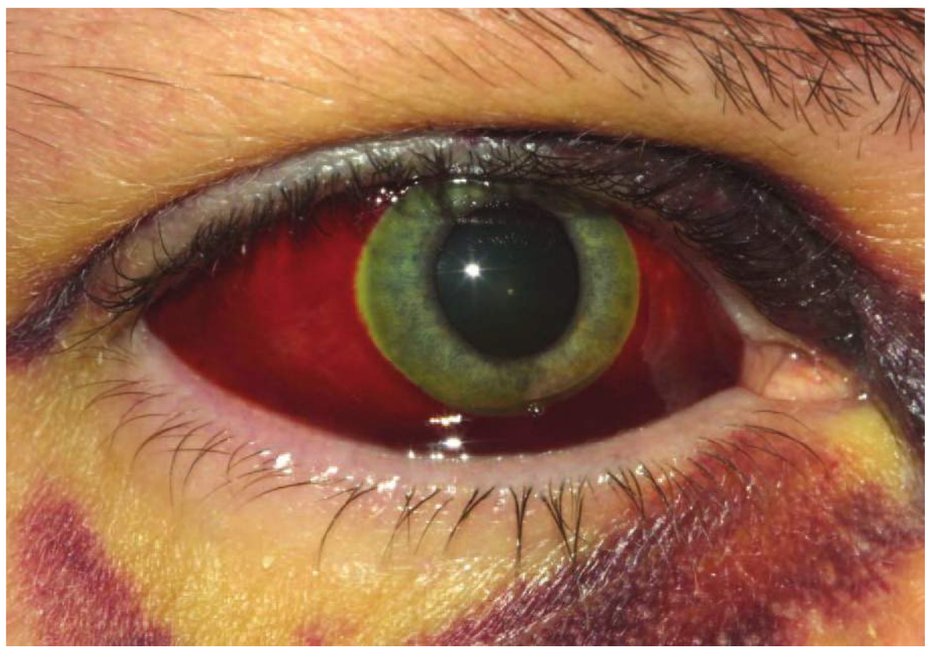

FIGURE 4.8 ■ **Subconjunctival Hemorrhage.** Subconjunctival hemorrhage that completely surrounds the eye, but stops abruptly at the limbus in a patient with blunt trauma. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org.)

Pearls

1. Subconjunctival hematoma differs from bloody chemosis with the flat appearance of the conjunctival membranes.
2. A subconjunctival hematoma involving the extreme lateral globe after blunt trauma is very suspicious for zygomatic arch fracture.
3. Evaluate patients with nontraumatic bloody chemosis for an underlying metabolic (coagulopathy) or structural (cavernous sinus thrombosis) disorder.

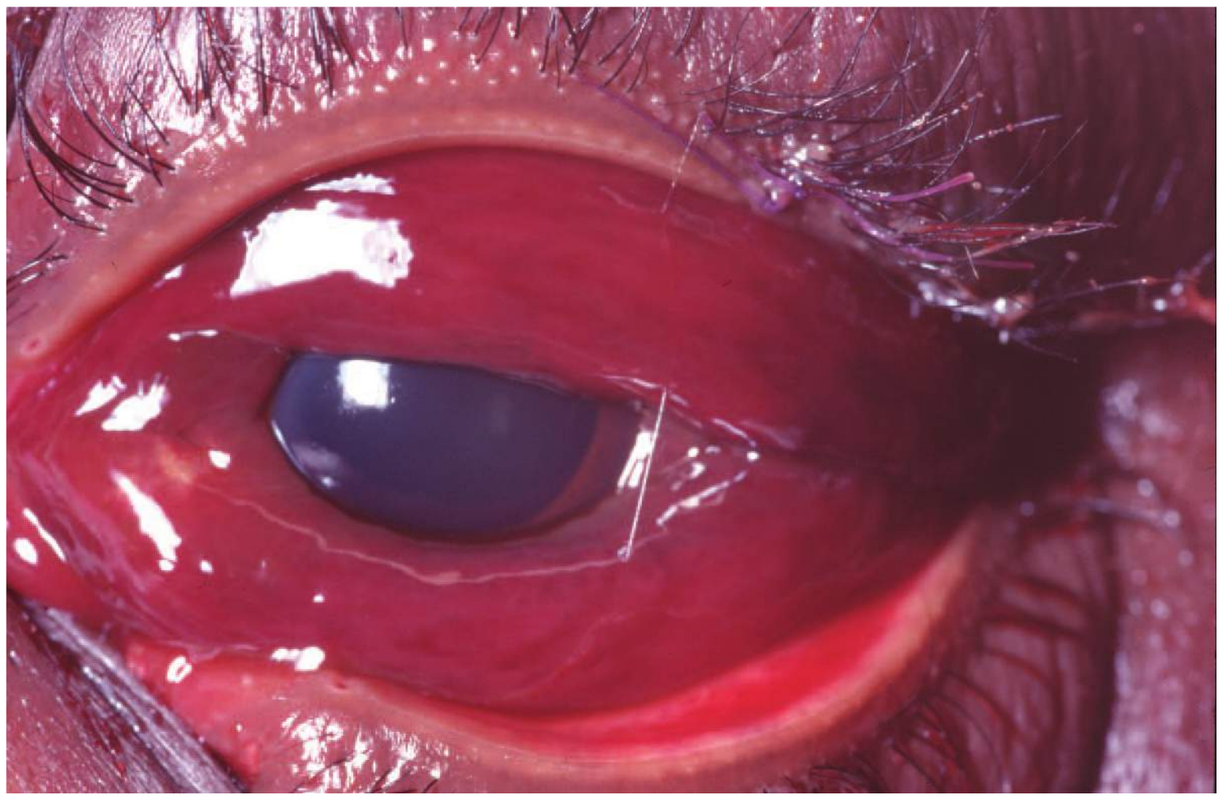

FIGURE 4.9 ■ **Traumatic Bloody Chemosis.** Suspicious for globe penetration, open globe was ruled out in this patient with CT. Dilated pupil is a result of pharmacologic agent. (Photo contributor: Lawrence B. Stack, MD.)

Clinical Summary

Patients typically report getting something in the eye or complain of FB sensation. FBs that overlie the cornea may affect vision. Tearing, conjunctival injection, headache, and photophobia may also be present. The most important consideration is the possibility of a penetrating globe injury. One must elicit a meticulous history about the mechanism of injury.

Management and Disposition

Topical anesthetic drops (eg, 0.5% proparacaine or tetracaine) facilitate examination and removal. If superficial, removal with saline flush may be attempted before using a sterile eye spud or small (25-gauge) needle. Consider topical antibiotic drops or ointment for the residual corneal abrasion. Tetanus prophylaxis is indicated. A "short-acting" cycloplegic (eg, cyclopentolate 1% or homatropine 5%) may benefit patients with headache or photophobia. FB or "rust ring" removal should be conducted using slit-lamp microscopy, only by a physician skilled in rust ring removal due to the risk of corneal perforation or scarring.

Pearls

1. Always evert the upper lid and search carefully for an FB. An FB adherent to the upper lid abrades the cornea, producing the "ice-rink" sign, caused from multiple linear abrasions.
2. Vigorous attempts to remove the entire rust ring are not warranted. This may await emergency department or ophthalmology follow-up in 24 hours.
3. Use of cotton-tipped applicators to attempt FB removal should be discouraged (large surface area and potential to cause a larger corneal defect).

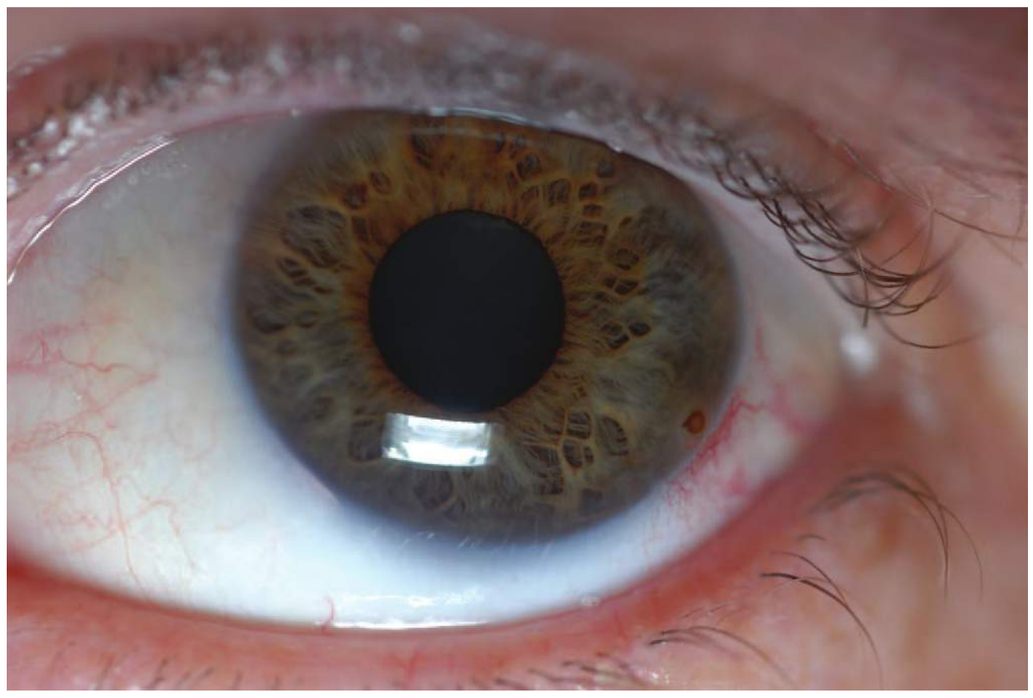

FIGURE 4.10 ■ **"Rust Ring."** A rust ring has formed from a foreign body (likely metallic) in this patient. A burr drill can be used for attempted removal, which, if unsuccessful, can be reattempted in 24 hours. (Photo contributor: R. Jason Thurman, MD.)

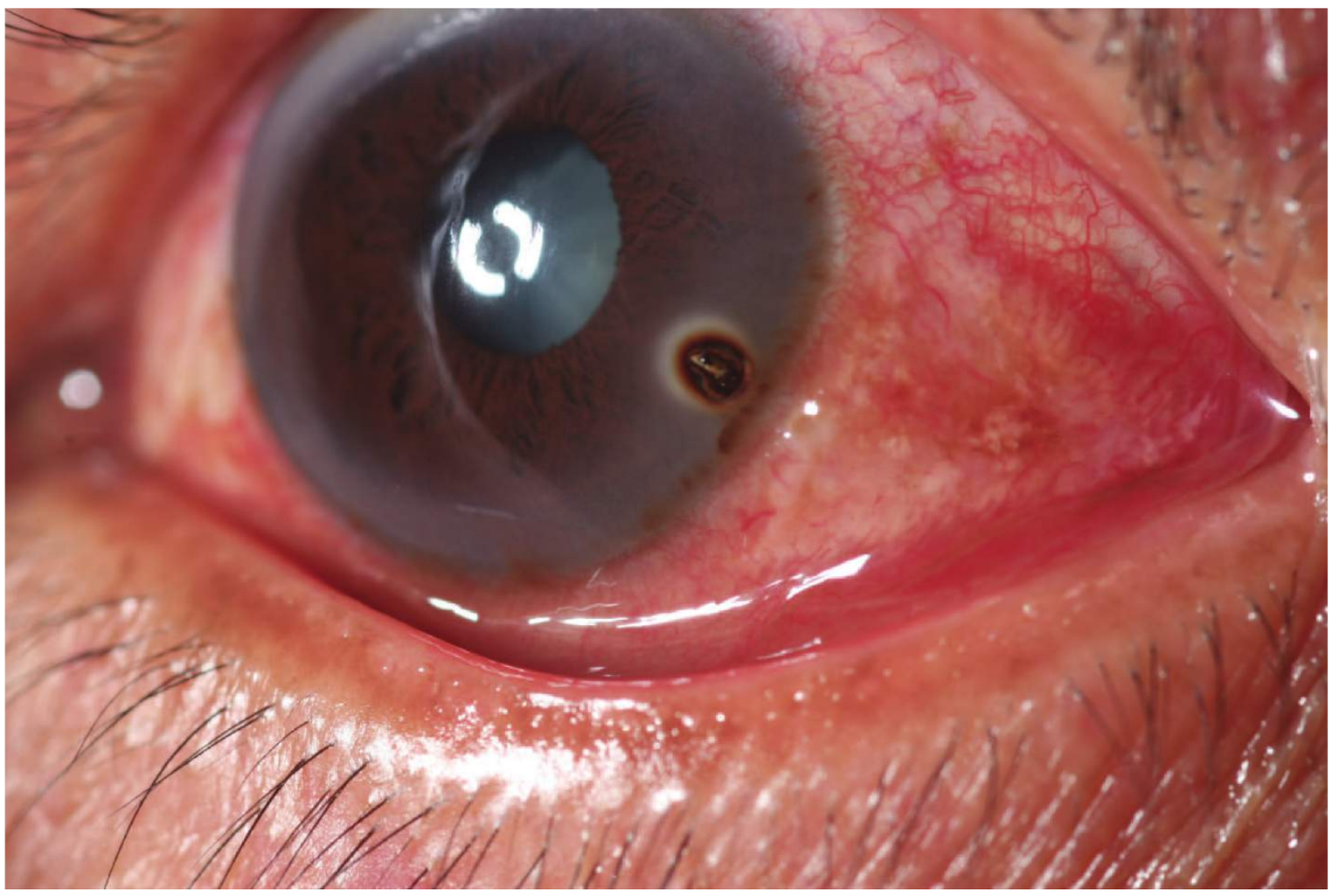

FIGURE 4.11 ■ **Foreign Body on the Cornea.** A small foreign body is lodged at 4-o'clock position on the cornea. (Photo contributor: Kevin J. Knoop, MD, MS.)

HYPHEMA

Clinical Summary

Injury to the anterior chamber that disrupts the vasculature supporting the iris or ciliary body results in a hyphema. The blood tends to layer with time, and if left undisturbed, gravity will form a visible meniscus. Symptoms can include pain, photophobia, and possibly blurred vision secondary to obstructing blood cells. Nausea and vomiting may signal a rise in intraocular pressure (glaucoma) caused by blood cells clogging the trabecular meshwork.

Management and Disposition

Prevention of further hemorrhage is the foremost treatment goal. Most rebleeding occurs within the first 72 hours and is usually more extensive than the initial event. Keep the patient at rest in the supine position with the head elevated slightly. Use a hard eye shield to prevent further trauma from manipulation. Avoid oral or parenteral pain medication and sedatives with antiplatelet activity such as NSAIDs. Use antiemetics if the patient has nausea. Further treatment at the discretion of specialty consultants may include topical and oral steroids, antifibrinolytics such as aminocaproic acid, or surgery. Measure intraocular pressure (IOP) unless there is a suspicion of penetrating injury to the globe. Treat elevated IOP with appropriate agents, including topical β-blockers, pilocarpine, and, if needed, osmotic agents (mannitol, sorbitol) and acetazolamide. Ophthalmologic consultation is warranted to determine local admission practices.

Pearls

1. Instruct patients specifically not to read or watch television, as these activities result in greater than usual ocular activity.
2. Rebleeding may occur in 10% to 20% of patients, most commonly in the first 2 to 5 days when the blood clots start to retract.
3. An "eight-ball" or total hyphema often leads to elevated IOP and corneal bloodstaining, and typically requires surgical evacuation.

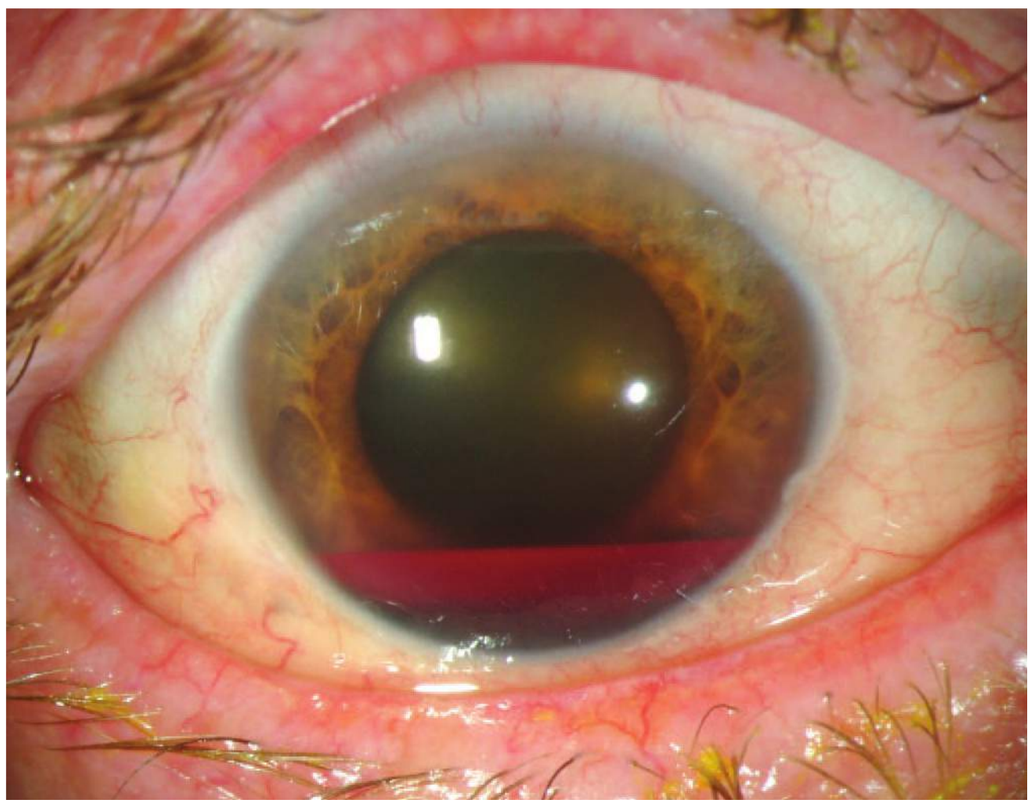

FIGURE 4.13. ■ **Hyphema.** This hyphema has completely layered out in the anterior chamber. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org.)

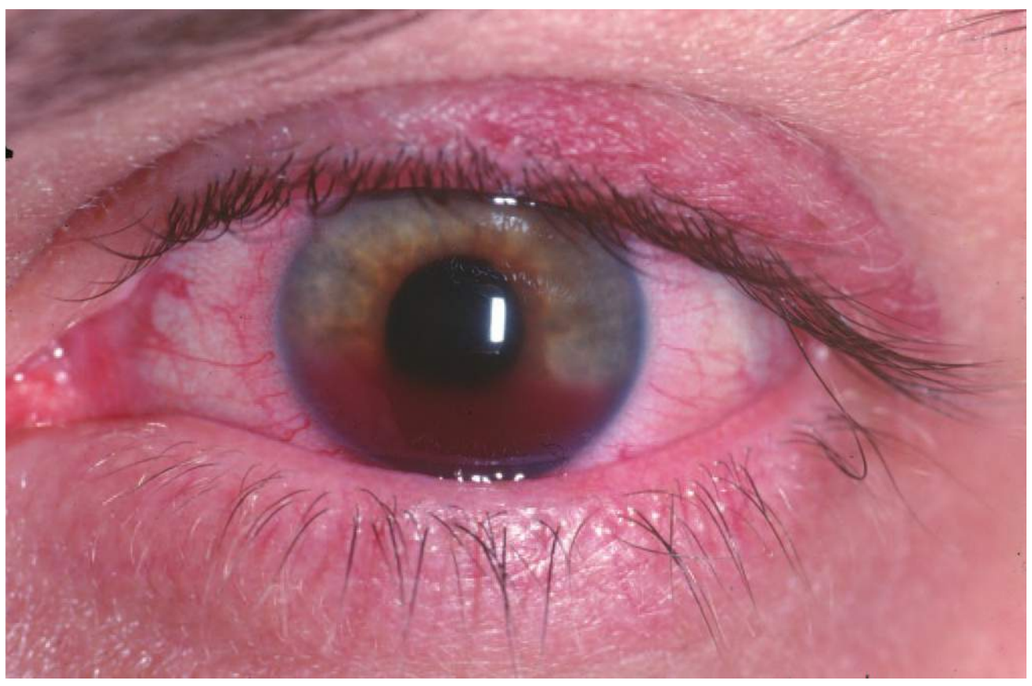

FIGURE 4.12 ■ **Hyphema.** This hyphema is just beginning to layer out, reflecting its acute nature. (Photo contributor: Lawrence B. Stack, MD.)

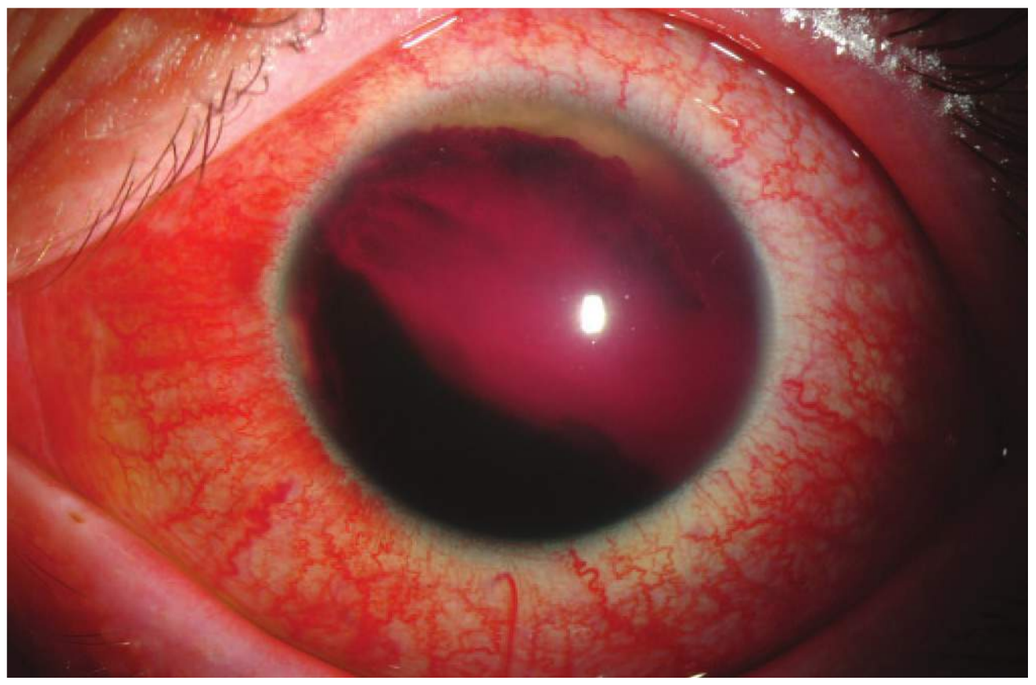

FIGURE 4.14 ■ **"Eight-Ball" Hyphema.** This hyphema completely fills the anterior chamber. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org.)

4. Patients with sickle cell and other hemoglobinopathies are at risk for sickling of blood inside the anterior chamber. This can cause a rise in IOP caused by obstruction of the trabecular meshwork even if only a small hyphema is present.
5. An abnormally low IOP should prompt consideration for presence of penetrating globe injury.
6. Evaluate supine trauma patients for slight differences in iris color to determine the presence of a hyphema.

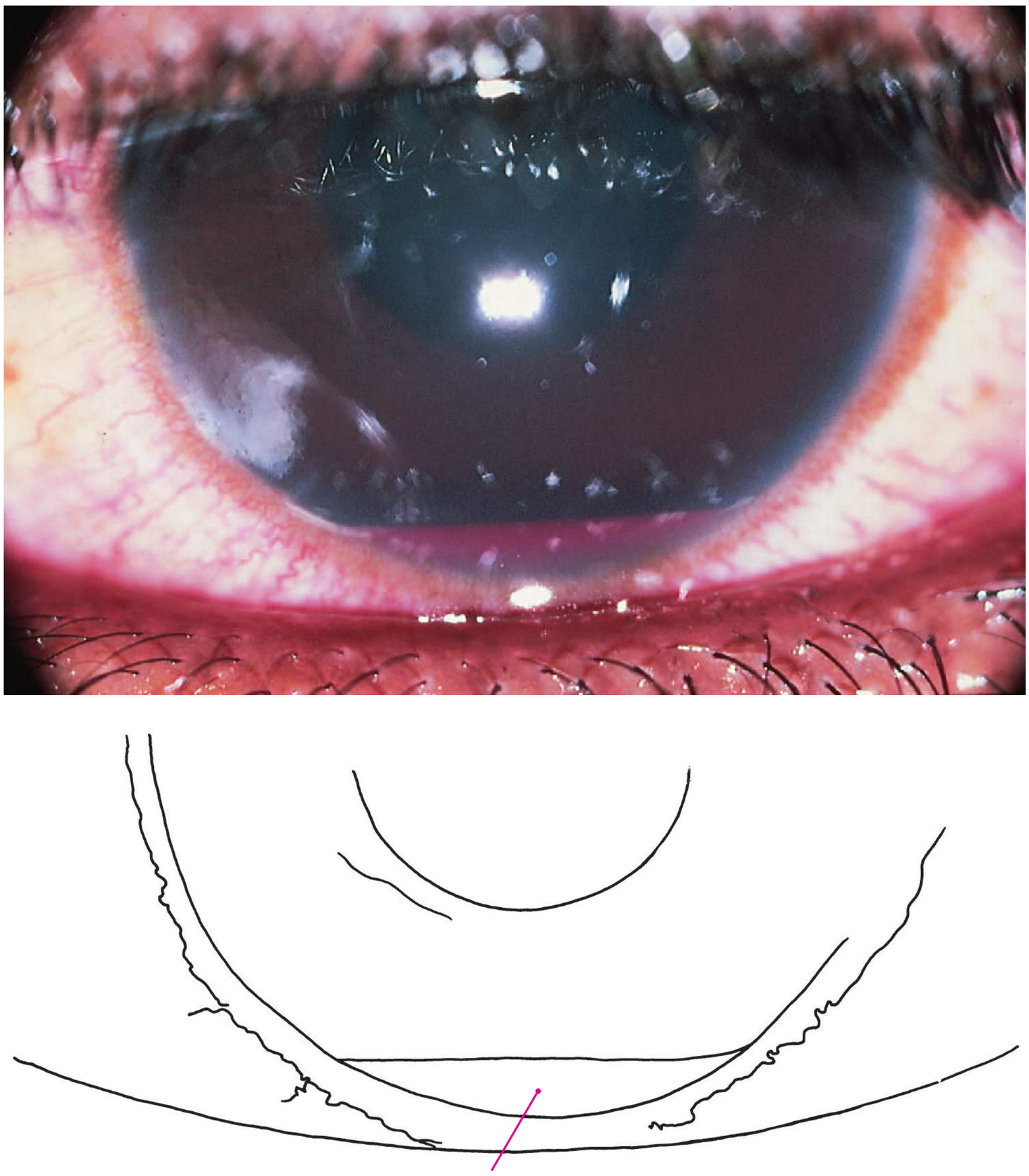

FIGURE 4.15 ■ **Hyphema.** A small hyphema (about 5%) in a patient with sickle cell disease. (Photo contributor: Dallas E. Peak, MD.)

INTRAOCULAR FOREIGN BODY

Clinical Summary

The most important consideration with any eye injury is the possibility of a penetrating globe injury with residual intraocular foreign body (IO FB). Patients may report FB sensation, but subtle presentations occur. A meticulous history about the mechanism of injury (grinding or metal on metal) must be elicited.

Management and Disposition

For suspected subtle injury, a careful examination is required. Bedside ultrasound can be a useful adjunct and allows rapid identification of an IO FB. Care must be taken to avoid any pressure on the globe. A slit-lamp examination with Seidel test (copious amounts of fluorescein instilled and observed for streaming away from the site of perforation) may reveal a microperforation.

Pearls

1. Always maintain a high index of suspicion for penetrating globe injury. Be particularly wary in mechanisms involving use of "metal on metal" such as grinding or hammering. A positive Seidel test demonstrates corneal microperforation.
2. If ocular penetration is suspected, a diligent search for a retained FB is indicated, beginning carefully with bedside ultrasound using a high-frequency transducer. Computed tomography (CT) is the diagnostic study of choice (avoid magnetic resonance imaging [MRI]) with indeterminate results or when confirmation is desired.

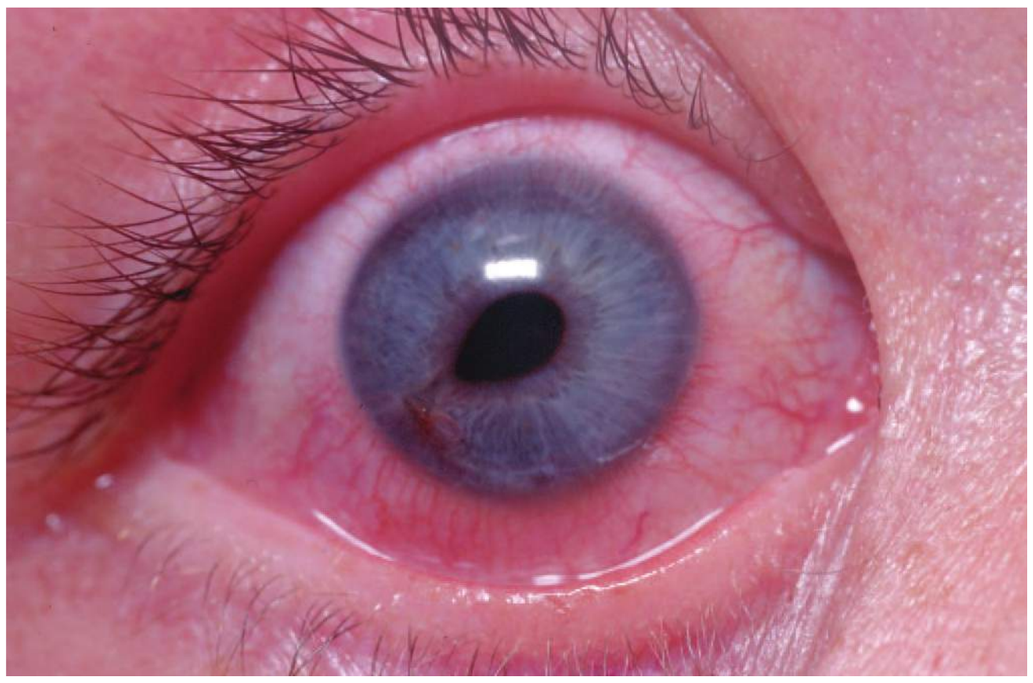

FIGURE 4.16 ■ **Anterior Chamber Foreign Body.** A shard from a nail is seen embedded in the anterior chamber. A "teardrop" pupil is present, indicating perforation. (Photo contributor: Lawrence B. Stack, MD.)

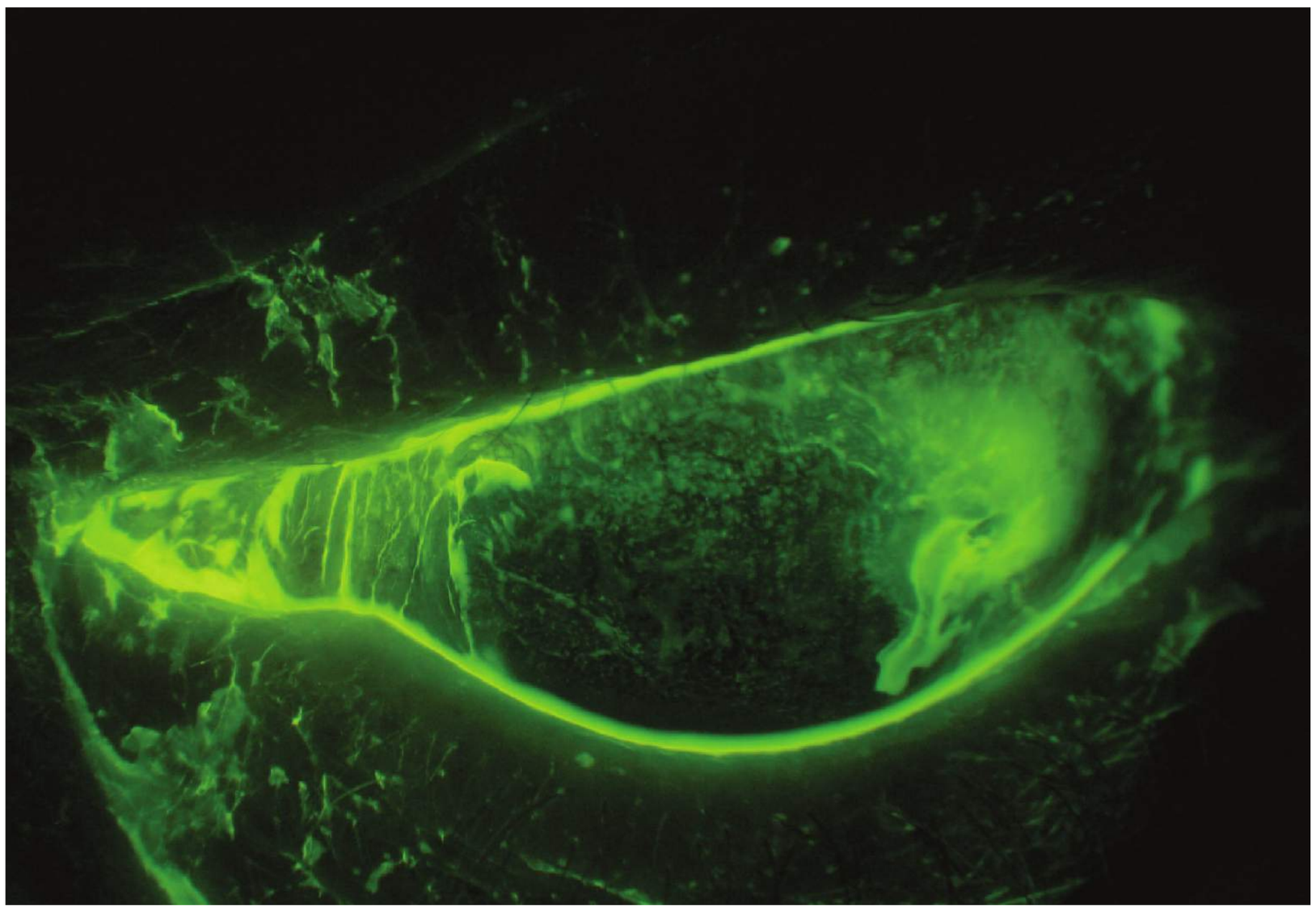

FIGURE 4.17 ■ **Seidel Test.** A positive Seidel test shows aqueous leaking through a corneal perforation while being observed with the slit lamp. (Photo contributor: Aaron Sobol, MD.)

Clinical Summary

Traumatic iridodialysis is the result of an injury, typically blunt trauma that pulls the iris away from the ciliary body. The resulting deformity appears as a lens-shaped defect at the outer margin of the iris. Patients may present complaining of a "second pupil." As the iris pulls away from the ciliary body, a small amount of bleeding may result. Look closely for associated traumatic hyphema.

Consider etiologies such as penetrating injury to the globe, scleral rupture, IO FB, and lens dislocation causing billowing of the iris.

Management and Disposition

A remote traumatic iridodialysis requires no specific treatment in the emergency department. Recent history of ocular trauma should prompt a diligent slit-lamp examination for associated hyphema or lens dislocation. If hyphema is present, treat it as discussed (see "Hyphema"). Refer cases of iridodialysis for specialty consultation to exclude other injuries; if the defect is large enough to result in monocular diplopia, surgical repair may be necessary.

Pearls

1. The examination should carefully exclude posterior chamber pathology and hyphema. Consider bedside ultrasonography to rule out posterior pole injuries (retinal detachment, vitreous hemorrhage, lens dislocation, or FB).
2. Carefully review the history to exclude penetrating trauma. If the history is unclear, CT scan may be used to exclude the presence of IO FB.
3. A careful examination includes searching for associated lens dislocation.

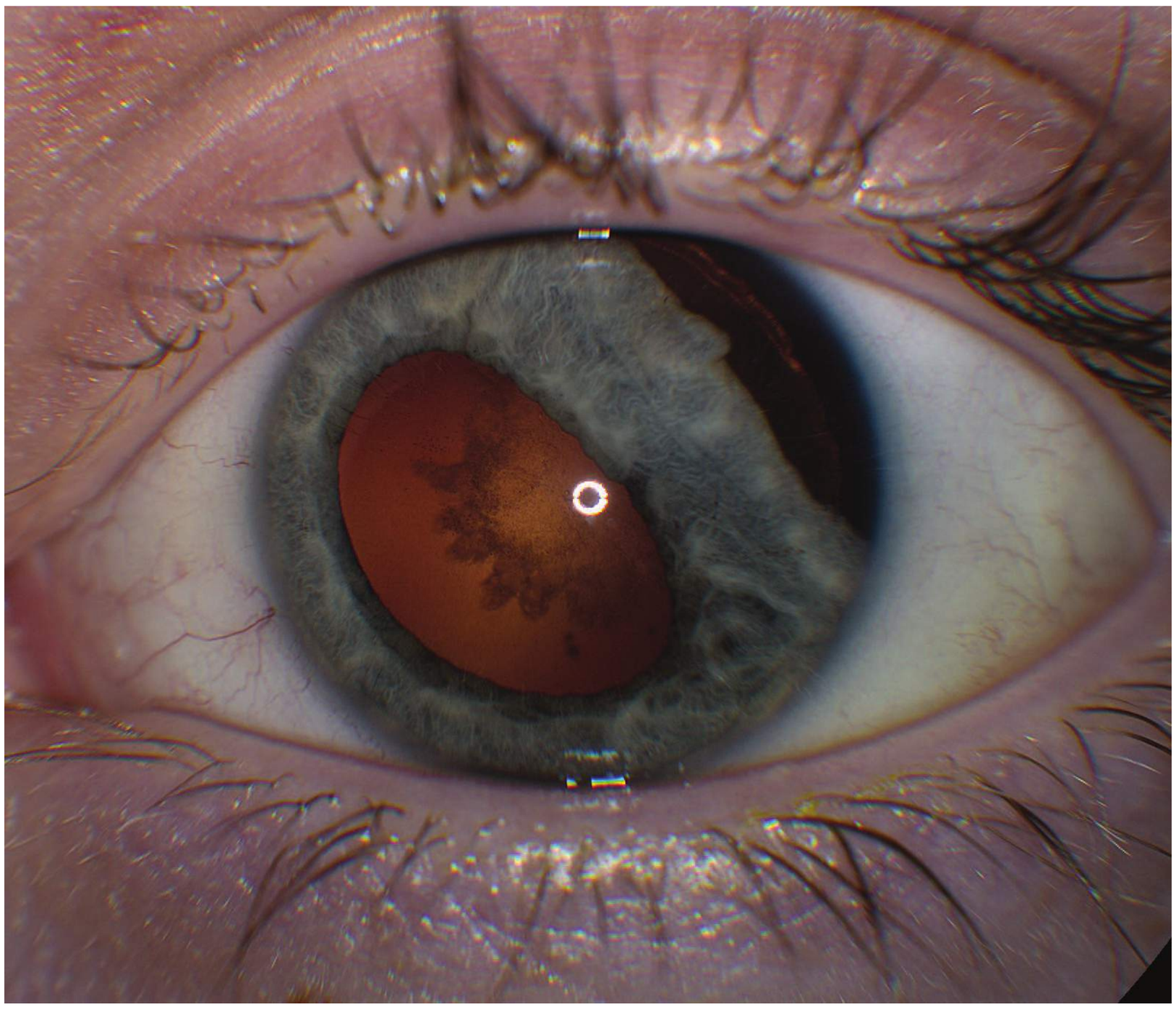

FIGURE 4.18 ■ **Traumatic Iridodialysis.** The iris has pulled away from the ciliary body as a result of blunt trauma. A traumatic cataract is also seen. The rosette pattern is classically seen after contusion injuries. It is due to separation of lens fibers around lens sutures. (Used with permission from Brice Critser, CRA, The University of Iowa and EyeRounds.org)

LENS DISLOCATION

Clinical Summary

Lens dislocation may result from blunt trauma to the globe. As the anterior surface of the eye is struck, there is compression in the anteroposterior dimension with resultant stretching of the globe along its equator in the medial-lateral plane. As this occurs, it stretches the zonule fibers, which suspend the lens in place, and they along with the lens capsule may become disrupted. The patient may experience symptoms of monocular diplopia or gross blurring of images, depending on the severity of the injury. Occasionally there can be dramatic visual fluctuations caused by the lens changing position with resultant phakic and aphakic vision. There is generally a lack of pain except if secondary angle closure glaucoma occurs from the lens causing pupillary block. On slit-lamp examination, the displaced crystalline lens appears as a crescent shape along its edge against a backdrop of the red reflex from the fundus. The edge of the subluxed lens may be visible only with pupillary dilatation. Use caution in dilating the pupil, as this may cause the lens to sublux into the anterior chamber, which occurs if all the zonule fibers are torn. Chronically, the lens may lodge in either the anterior chamber or the vitreous. Marfan syndrome, tertiary syphilis, and homocystinuria may be present and should be considered in patients presenting with lens dislocation.

Management and Disposition

A subluxed lens does not always require surgery; partial subluxations may require only a change in refraction. Surgery is required if anterior dislocation of the lens results in papillary block and angle closure glaucoma results.

Pearls

1. Patients may experience lens dislocation with seemingly trivial trauma if they have an underlying coloboma of the lens, Marfan syndrome, homocystinuria, or syphilis.
2. Iridodonesis is a trembling movement of the iris noted after rapid eye movements and is a sign of occult posterior lens dislocation.
3. Phacodonesis is a tremulousness of the lens itself caused by disruption of the zonule fibers.
4. Lens dislocation or subluxation is commonly associated with traumatic cataract formation.
5. Other associated injuries include hyphema, vitreous hemorrhage, and globe rupture.

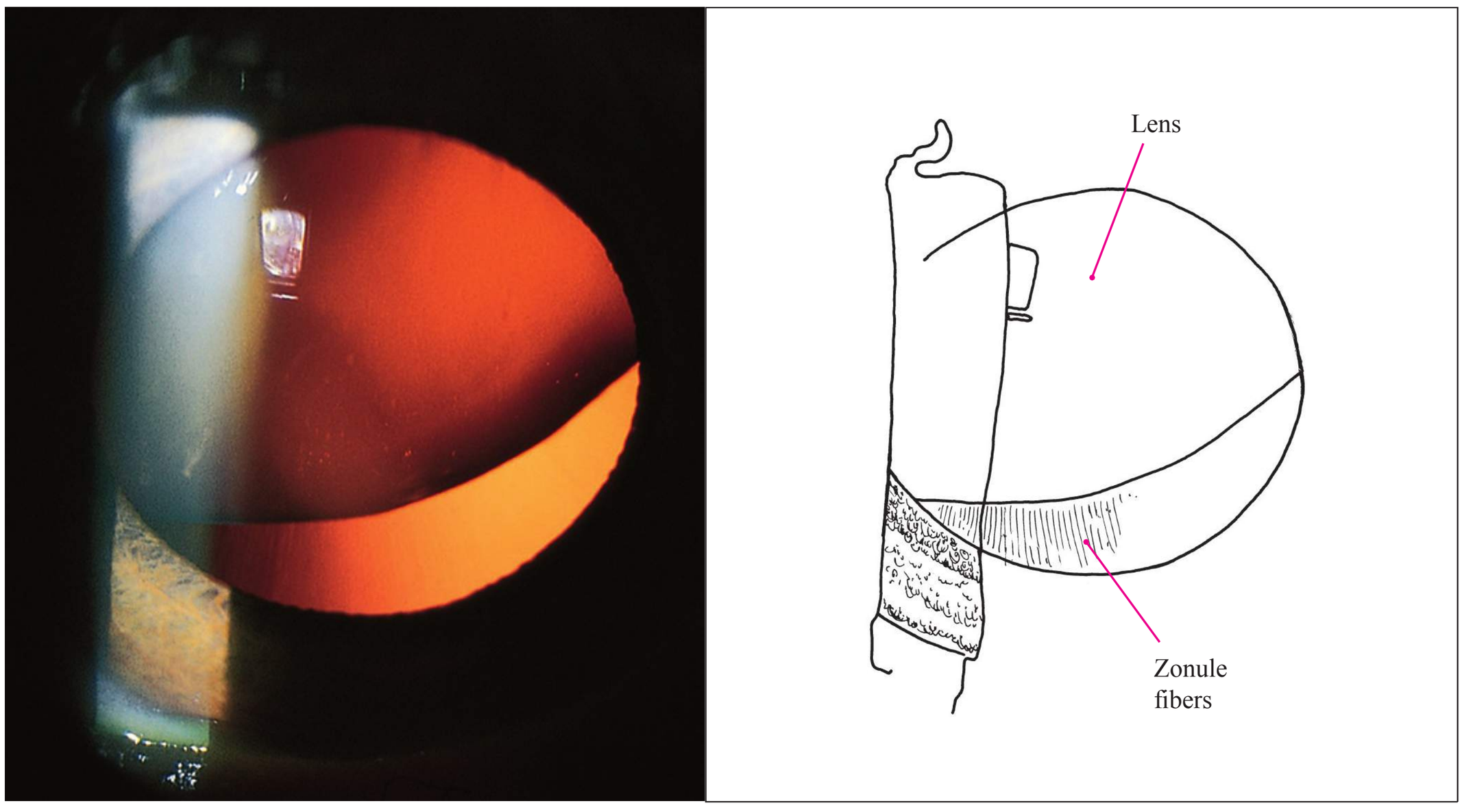

FIGURE 4.19 ■ **Lens Dislocation.** Lens dislocation revealed during slit-lamp examination. Note the zonule fibers, which normally hold the lens in place. (Photo contributor: Department of Ophthalmology, Naval Medical Center, Portsmouth, VA.)

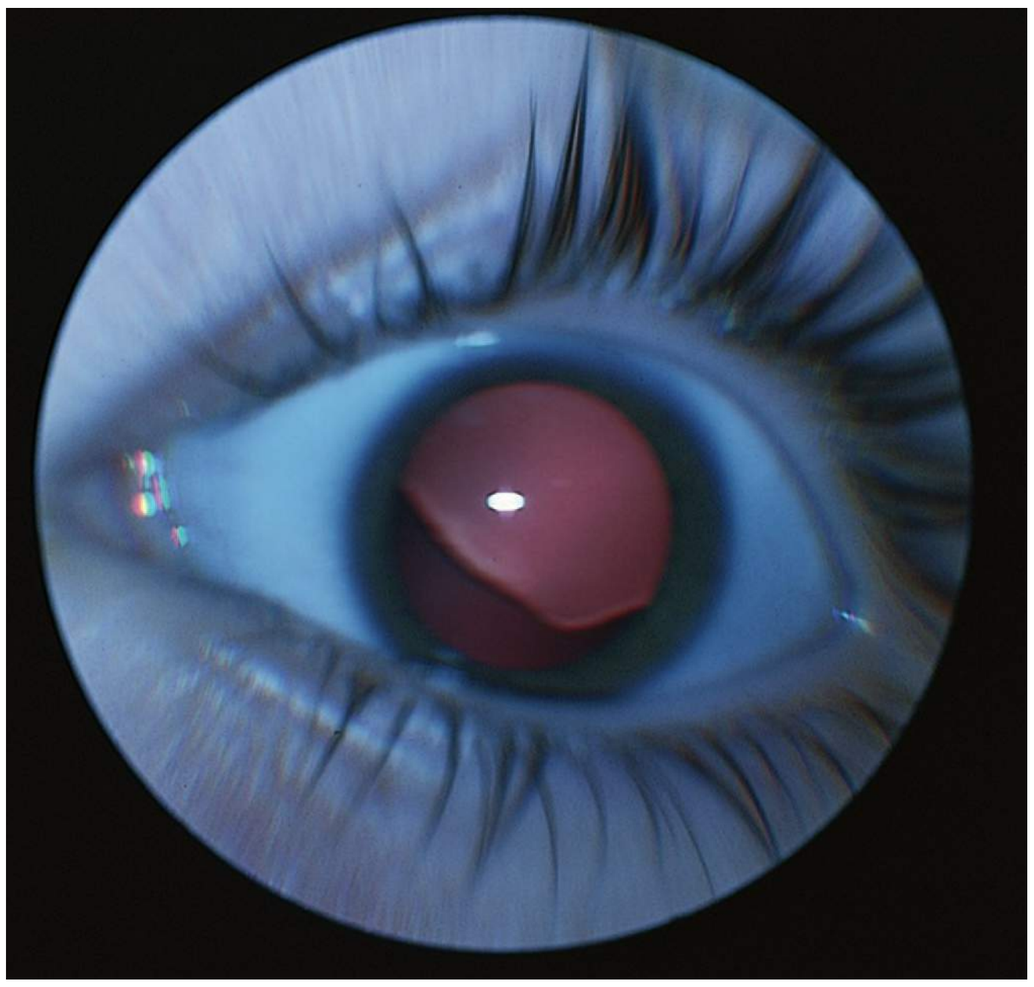

FIGURE 4.20 ■ **Lens Dislocation.** The edge of this dislocated lens is visible with the pupil dilated as an altered red reflex. (Photo contributor: Department of Ophthalmology, Naval Medical Center, Portsmouth, VA.)

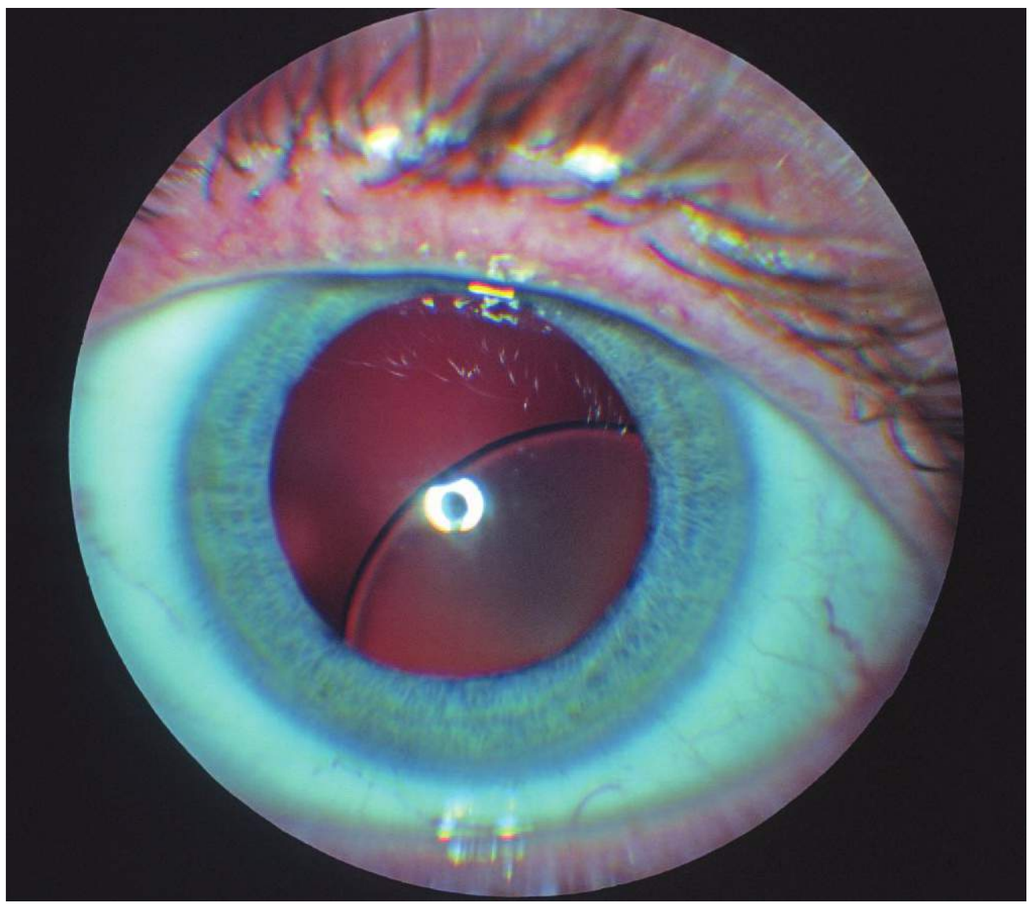

FIGURE 4.21 ■ **Lens Dislocation.** The crescentic edge of this dislocated lens is visible. Red reflex is abnormal. (Photo contributor: Thomas Egnatz, CRA.)

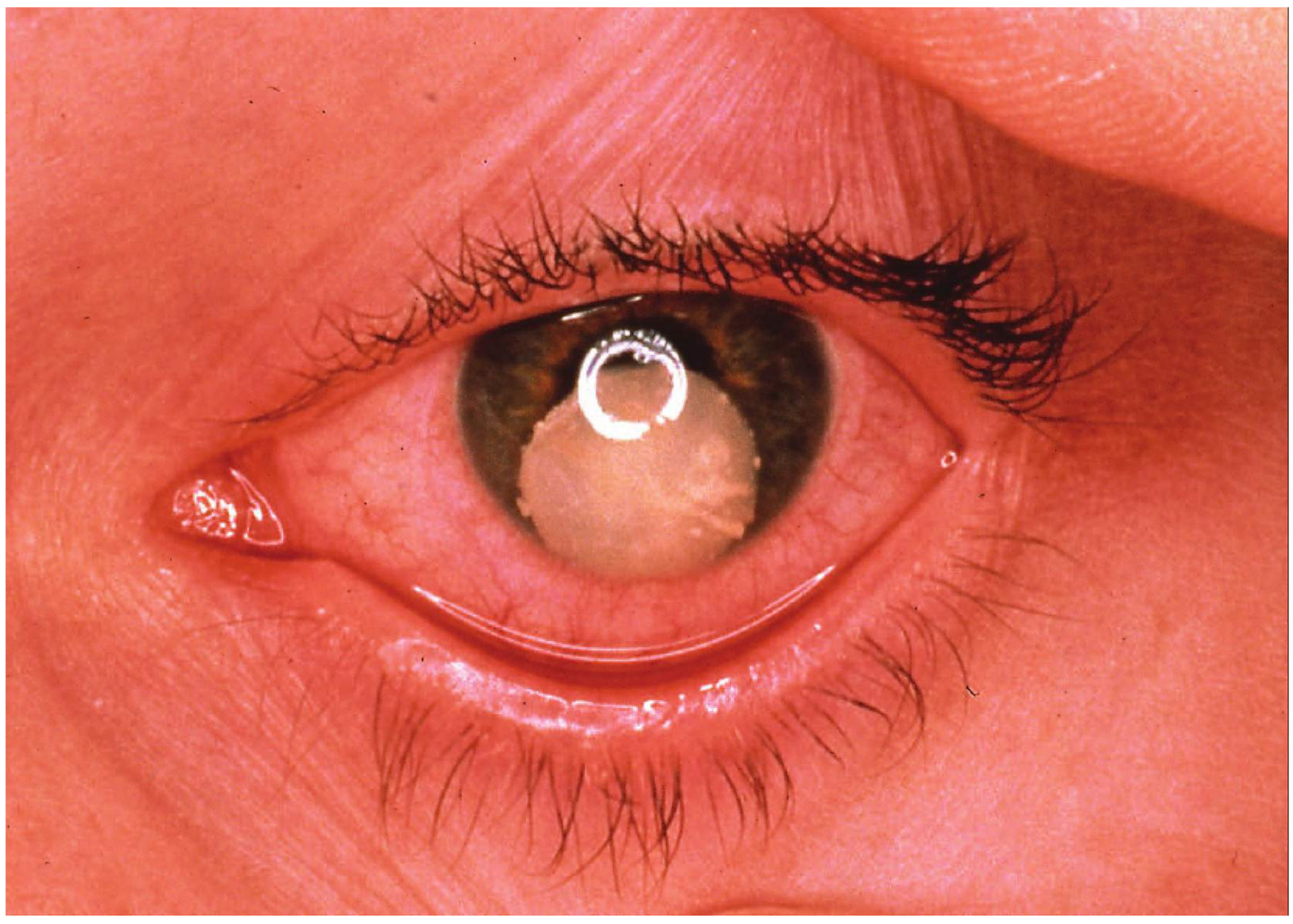

FIGURE 4.22 **Lens Dislocation.** Complete lens dislocation prolapsed into the anterior chamber. (Photo contributor: David Effron, MD.)

PENETRATING GLOBE INJURY

Clinical Summary

Penetrating globe injuries can be subtle and easily overlooked. All are serious injuries. Signs to look for are loss of anterior chamber depth caused by leakage of aqueous humor, a teardrop-shaped ("peaked") pupil, or prolapse of choroid through the wound.

Management and Disposition

All open globe injuries require urgent specialty consultation. Immediately place a rigid eye shield over the affected eye. If a specifically designed rigid shield (eg, Fox metal eye shield) is unavailable, the bottom of a Styrofoam cup may be used. Do not use a pressure patch. Tonometry to measure pressures is strictly contraindicated. It is imperative to avoid inadvertent pressure on the globe with resulting irreversible expulsion of choroid through the wound. Intravenous antibiotics appropriate to cover gram-positive organisms are indicated. Consider adding gram-negative coverage for injuries that involve organic foreign bodies. Sedation and aggressive pain management are crucial to prevent or decrease expulsion of intraocular contents caused by crying, activity, or vomiting. Antiemetics should be given as prophylaxis, and update tetanus status. Other significant blunt trauma may accompany penetrating globe. Always consider the possibility that foreign bodies may have penetrated through the globe into the posterior orbit and possibly extend into the cranial vault.

Pearls

1. Stabilize protruding foreign bodies without manipulation until definitively treated in the operating room.
2. Control of pain, activity, and nausea may be sight saving and requires proactive use of appropriate medications.
3. Use of lid retractors is preferred to open the eyelids of trauma victims with blepharospasm or massive swelling when such examination is indicated. Attempts to use fingers can inadvertently increase the pressure on the globe.
4. Emergency department ultrasound with a high-frequency probe using no pressure technique can be a useful adjunct to detect lens displacement, retinal detachment, and intraocular FB at the bedside. It is not useful to diagnose commotio retina, globe rupture, or retrobulbar hematoma.
5. Penetrating globe injuries are a relative contraindication to the sole use of depolarizing neuromuscular blockade (eg, succinylcholine). Consider a "de-fasciculating" dose of a nondepolarizing agent as a pretreatment to avoid increasing intraocular pressure.
6. CT scanning is the most readily available and sensitive modality to evaluate penetrating injuries. Some nonmetallic objects such as wood, glass, or plastic may be difficult to visualize with CT. MRI is preferable in these cases and is excellent at demonstrating associated soft-tissue injuries to the globe and orbit. MRI is contraindicated when a metallic FB is suspected.

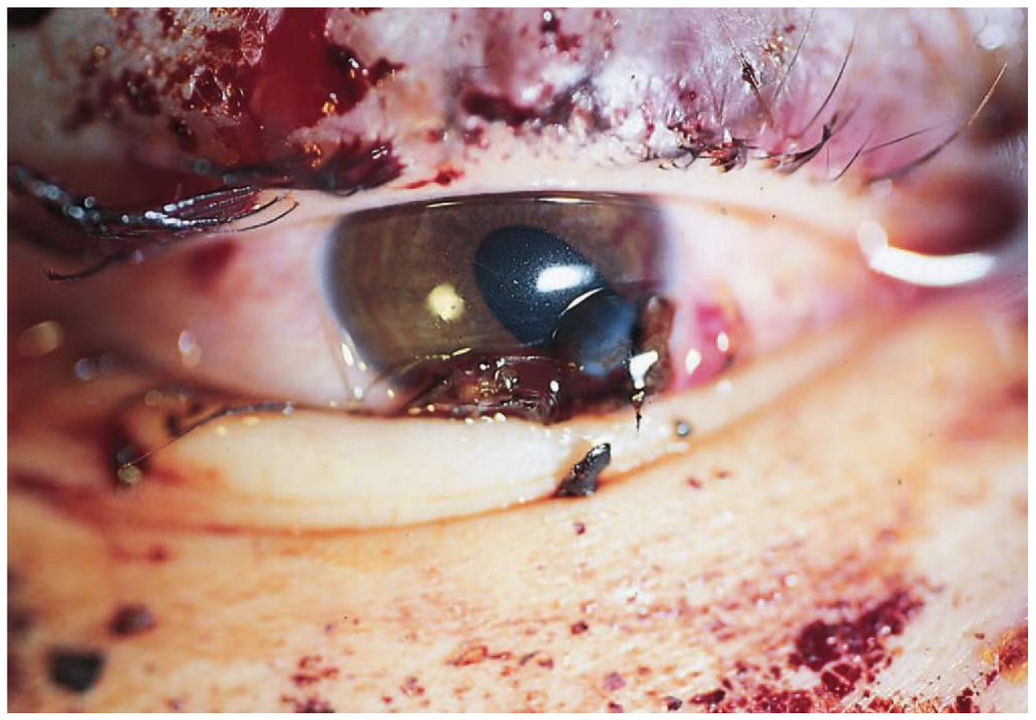

FIGURE 4.23 ■ **Open Globe.** This injury is not subtle; extruded ocular contents (vitreous) can be seen; a teardrop pupil is also present. (Photo contributor: Alan B. Storrow, MD.)

FIGURE 4.24 ■ **Open Globe.** An obvious penetrating globe injury is seen once lids are carefully retracted. The lower lid laceration makes this a high risk for globe penetration. Intraocular foreign body should be suspected. (Photo contributor: David Effron, MD.)

FIGURE 4.25 ■ **Penetrating Globe.** (**A**) This penetrating injury shows an "eight-ball" hyphema. (**B**) Bedside ultrasound shows both intraocular and anterior chamber hemorrhage. (Photo contributor: Kevin J. Knoop, MD, MS.)

FIGURE 4.26 ■ **Orbital Trauma.** A stick is impaled 7 cm into the medial aspect of the eye. Globe penetration was ruled out in the operating room. (Photo contributor: Elena Geraymovych, MD.)

FIGURE 4.27 ■ **Eyelid Retractors.** Retractors fashioned from paper clips can safely be used when standard retractors are not available. (Photo contributor: Kevin J. Knoop, MD, MS.)

FIGURE 4.28 ■ **Protective Metal (Fox) Shield.** A protective shield is used in the setting of a suspected or confirmed perforating injury. (Photo contributor: Kevin J. Knoop, MD, MS.)

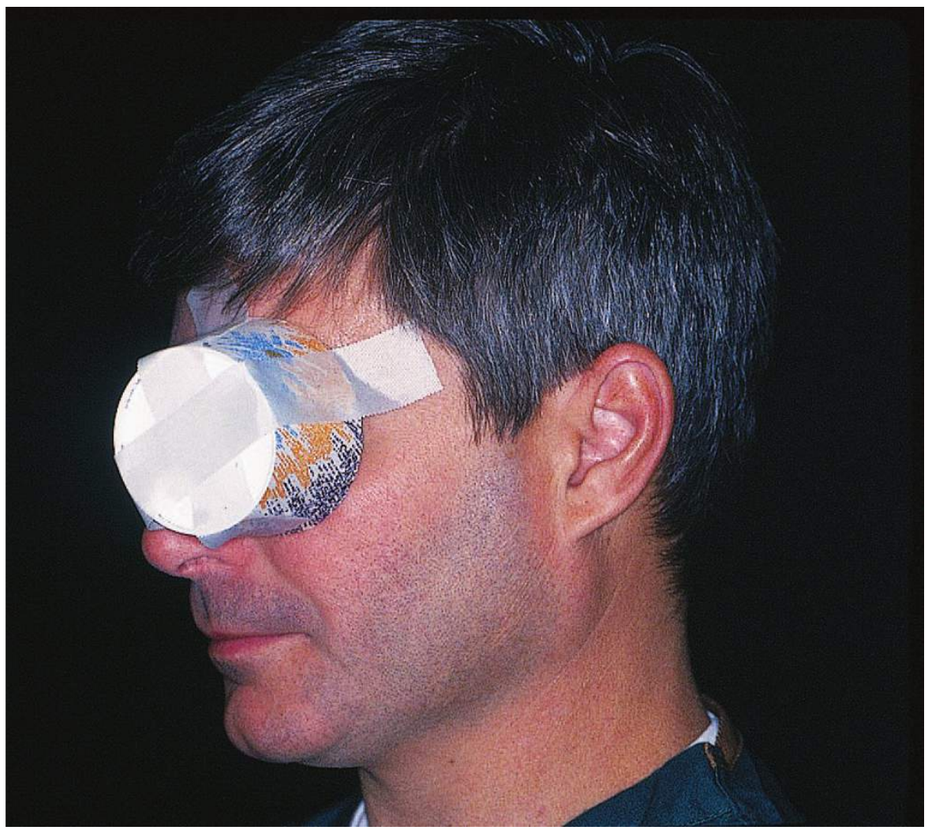

FIGURE 4.29 ■ **Protective Shield.** A protective shield is readily fashioned from a paper cup if a metal shield is not available. (Photo contributor: Kevin J. Knoop, MD, MS.)

GLOBE RUPTURE

Clinical Summary

A forceful blow to the eye may result in a ruptured globe. The diagnosis is obvious when orbital contents spill from the globe itself. Occult presentations occur when there is only a tiny rent in the sclera. Ruptures at the limbus, the margin between the cornea and sclera, may cause a small amount of iris to herniate, resulting in an irregularly shaped "teardrop pupil." A "peaked" or teardrop pupil may also result from a penetrating FB. Mechanism of injury is the key to distinguishing these two causes. Another associated finding is bloody chemosis involving the bulbar conjunctiva. Bulging of the conjunctiva over the wound distinguishes this from a simple subconjunctival hemorrhage. Suspect a rupture when severe conjunctival hemorrhage exists (covering 360° of the bulbar conjunctiva) following trauma.

Subconjunctival hemorrhage, nontraumatic bloody chemosis, corneal-scleral laceration, IO FB, iridodialysis, penetrating FB, and traumatic lens dislocation may have a similar presentation. A coloboma of the iris may appear similar to a teardrop pupil.

Management and Disposition

Urgent specialty consultation and operative management are mandatory. Protect the eye with a rigid eye shield, and all further examination and manipulation of the eye should be discouraged to prevent prolapse or worsening prolapse of choriouveal structures. Intravenous antibiotics to cover suspected organisms are appropriate. Adequate sedation and use of parenteral analgesics is encouraged. Also, address tetanus status. Since vomiting may result in further prolapse of intraocular contents, treat with antiemetics proactively. Consider CT scanning if the presence of an FB is suspected.

Pearls

1. The eyeball may appear deflated or the anterior chamber excessively deep. Intraocular pressure will likely be decreased, but measurement is contraindicated, since this may worsen herniation of intraocular contents.
2. Rupture usually occurs where the sclera is the thinnest, at the point of attachment of extraocular muscles and at the limbus.
3. A teardrop pupil may easily be overlooked in the triage process or in the setting of multiple traumatic injuries.
4. Seidel test (instillation of fluorescein and observing for fluorescein streaming away from the injury) may be used to diagnose subtle perforation.
5. Penetrating globe injuries are a relative contraindication to the sole use of depolarizing neuromuscular blockade (eg, succinylcholine). Consider a "de-fasciculating" dose of a nondepolarizing agent as a pretreatment to avoid increasing intraocular pressure.

FIGURE 4.30 ■ **Prolapsed Iris.** A teardrop pupil is present, with a small amount of iris herniating from a rupture at 8-o'clock position on the limbus. (Photo contributor: Lawrence B. Stack, MD.)

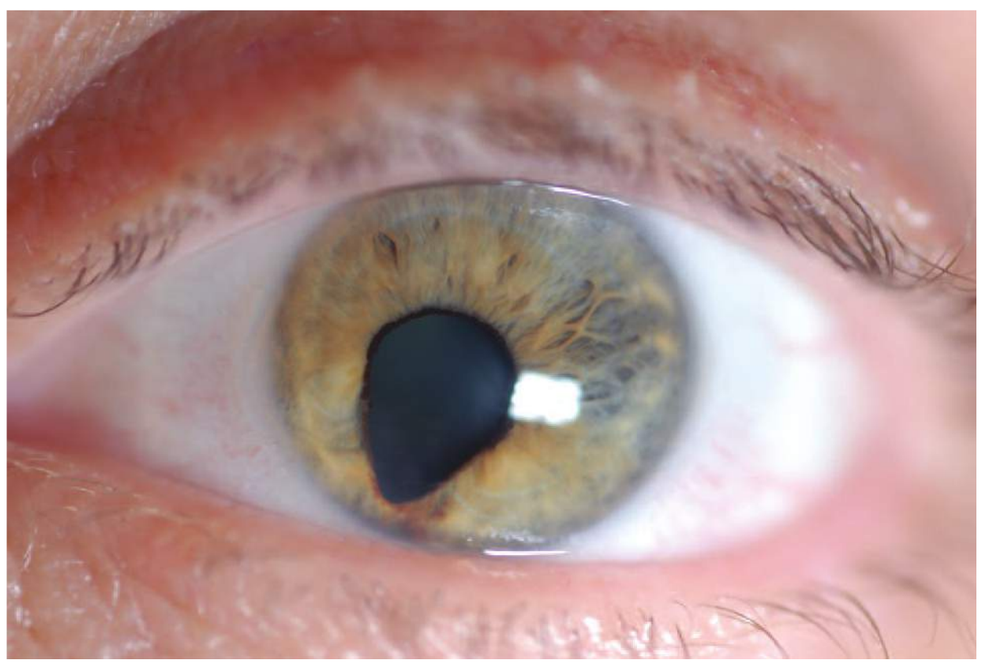

FIGURE 4.31 ■ **Iris Coloboma.** Iris coloboma is a congenital finding resulting from incomplete closure of the fetal ocular cleft. It appears as a teardrop pupil and may be mistaken for a sign of scleral rupture. (Photo contributor: R. Jason Thurman, MD.)

TRAUMATIC CATARACT

Clinical Summary

Any trauma to the eye that disrupts the normal architecture of the lens may result in the development of a traumatic cataract—a lens opacity. The mechanism behind cataract formation involves fluid infiltration into the normally avascular and acellular lens stroma. The lens may be observed to swell with fluid and become cloudy and opacified. The time course is usually weeks to months following the original insult. Cataracts that are large enough may be observed by the naked eye. Those that are within the central visual field may cause blurring of vision or distortion of light around objects (eg, halos).

Management and Disposition

No specific treatment is rendered in the emergency department for cases of delayed traumatic cataract. Most cases require routine ophthalmologic referral.

Pearls

1. Traumatic cataracts are frequent sequelae of lightning injury. Advise all victims of lightning strike of this possibility.
2. Cataracts may also occur as a result of electric current injury to the vicinity of the cranial vault.
3. Leukocoria results from a dense cataract, which causes loss of the red reflex.
4. If a cataract develops sufficient size and "swells" the lens, the trabecular meshwork may become blocked, producing glaucoma.

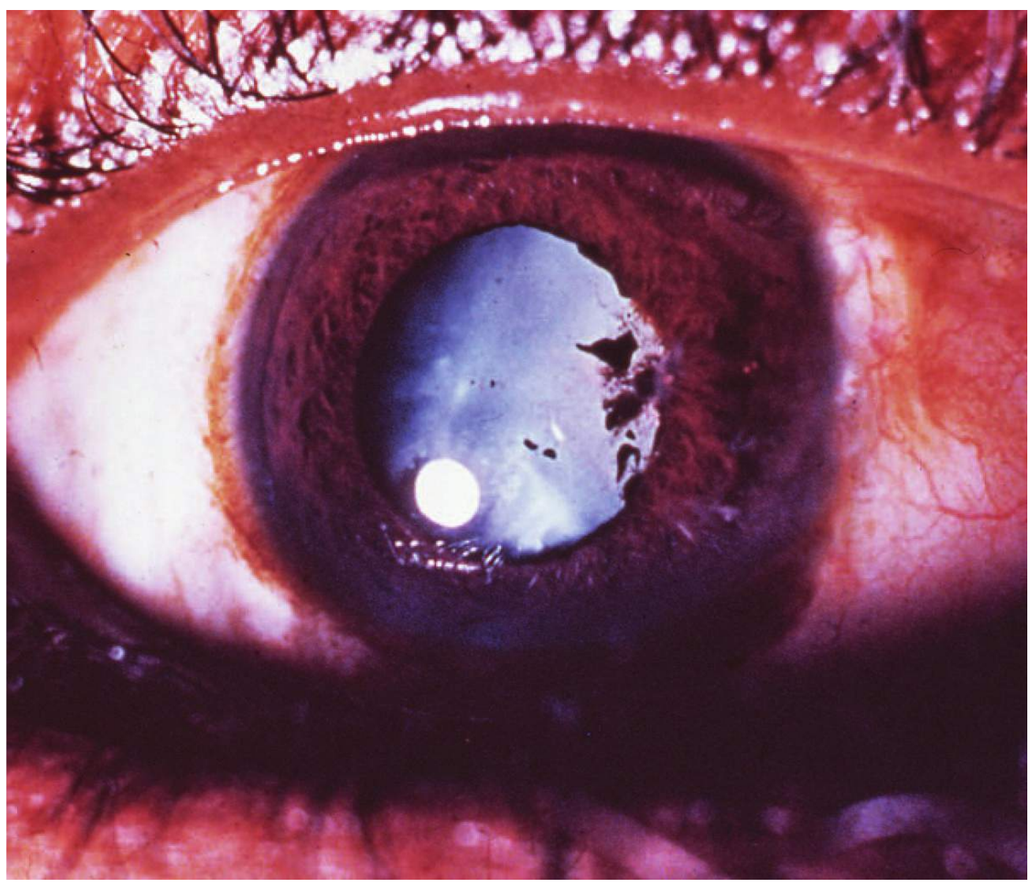

FIGURE 4.32 ■ **Traumatic Cataract.** This mature traumatic cataract is seen as a large lens opacity overlying the visual axis. A traumatic iridodialysis is also present. (Photo contributor: David Effron, MD.)

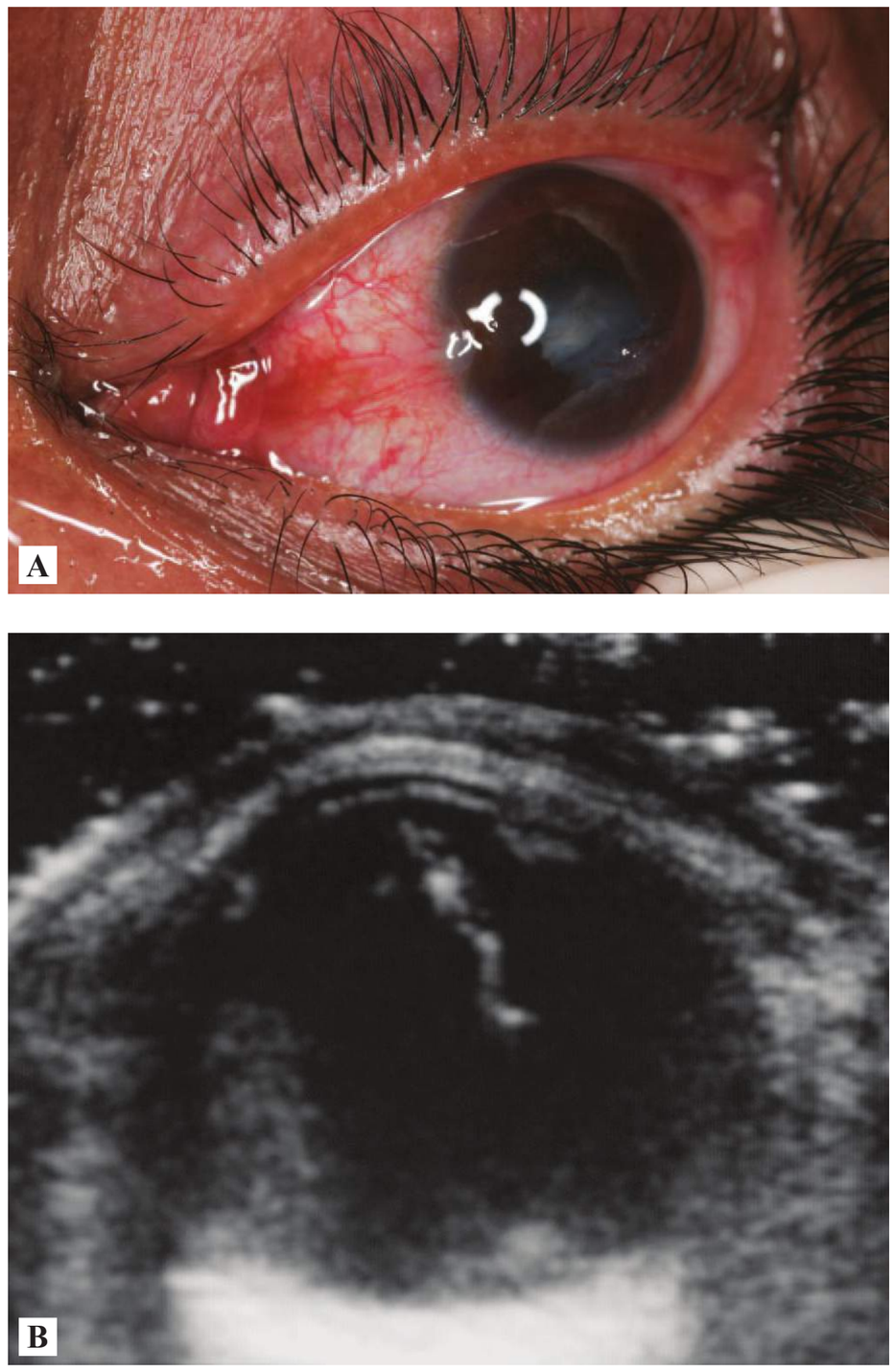

FIGURE 4.33 ■ **Traumatic Cataract.** (**A**) This acute traumatic cataract is seen as a milky cornea at the time of injury. (**B**) Bedside ultrasound shows a collapsed anterior chamber and intraocular foreign body. (Photo contributor: Kevin J. Knoop, MD, MS.)

EYELID LACERATION

Clinical Summary

Eyelid lacerations should always prompt a thorough search for associated injury to the globe, penetration of the orbit, or involvement of other adnexal structures (eg, lacrimal glands, canaliculi, puncta). Depending on the mechanism of injury, a careful exclusion of FB is important.

Management and Disposition

Repair eyelid lacerations involving superficial skin with 6-0 nonabsorbable interrupted sutures, which should remain in place for 3 to 5 days. Lacerations through an anatomic structure called the gray line, situated on the palpebral edge, require diligent reapproximation making referral prudent. Other injuries that require specialty consultation for repair include:

—Lacerations through the lid margins: these require exact realignment to avoid entropion or ectropion.

—Deep lacerations through the upper lid that divide the levator palpebrae muscles or their tendinous attachments: require repair with fine absorbable suture to avoid ptosis.

—Lacrimal duct injuries: these are repaired by stenting of the duct to avoid permanent epiphora.

—Medial canthal ligaments: these require repair to avoid drooping of the lids and telecanthus.

The most important objectives are to rule out injury to the globe and to search diligently for foreign bodies.

Pearls

1. Lacerations of the medial one-third of the lid or epiphora (tearing) raises suspicion for injury to the lacrimal system or the medial canthal ligament.
2. A small amount of adipose tissue seen within a laceration is a sign that perforation of the orbital septum has occurred (there is no subcutaneous fat in the eyelids).

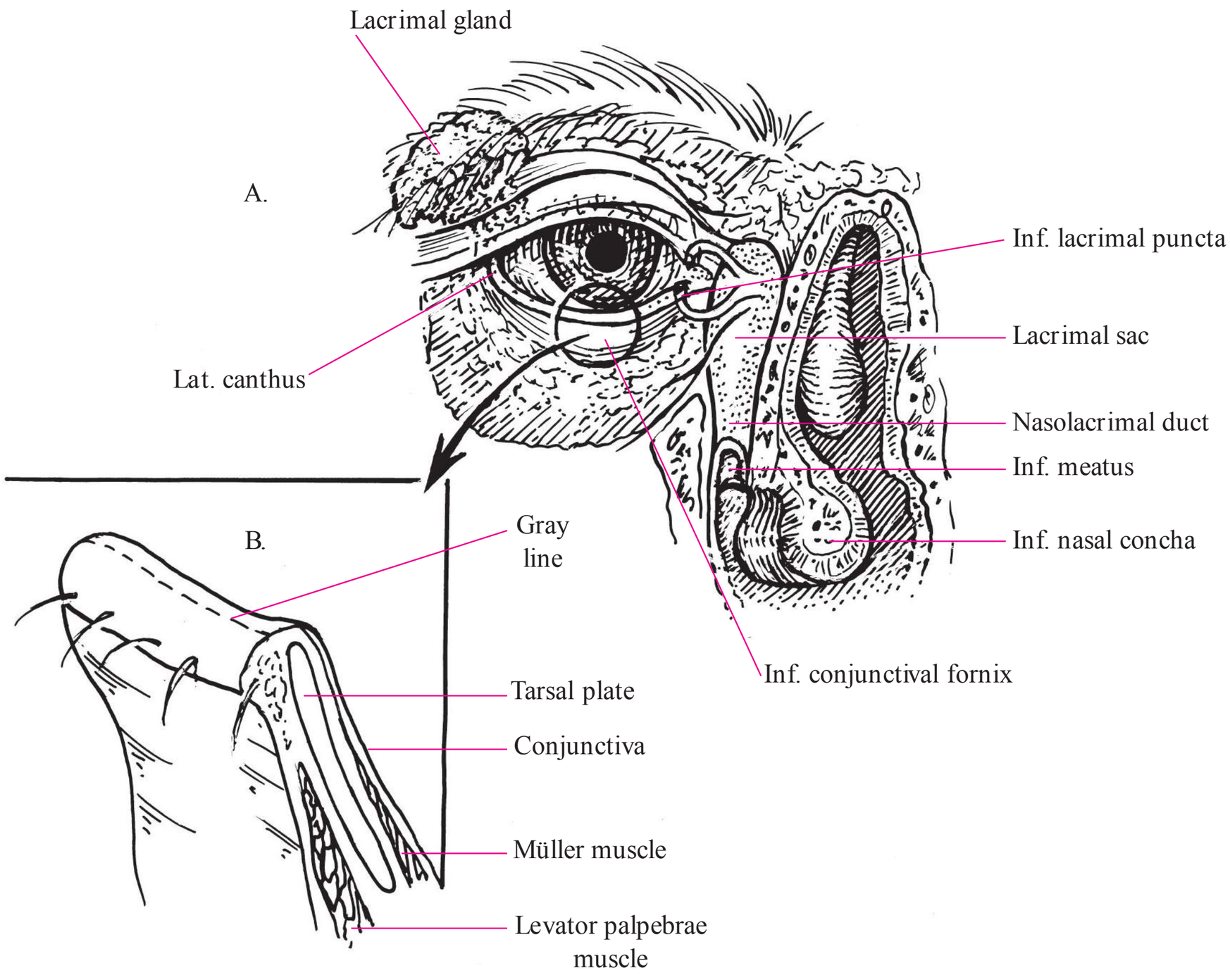

FIGURE 4.34 ■ **Eyelid and Adnexa Anatomy.** Ocular trauma should prompt examination of surrounding anatomic structures for associated injuries.

3. Laceration of the levator palpebrae musculature or tendinous attachments may result in traumatic ptosis.
4. Laceration of the canthal ligamentous support is suggested when there is rounding of the lid margins or telecanthus (widening of the distance between the medial canthi).
5. Anesthesia of the forehead may result from supraorbital nerve injury and should be sought prior to instilling local anesthetics.

FIGURE 4.35 ■ **Eyelid Laceration.** This complex laceration showing the displaced inferior punctum clearly violates the canalicular structures. (Photo contributor: Harold Lee, MD.)

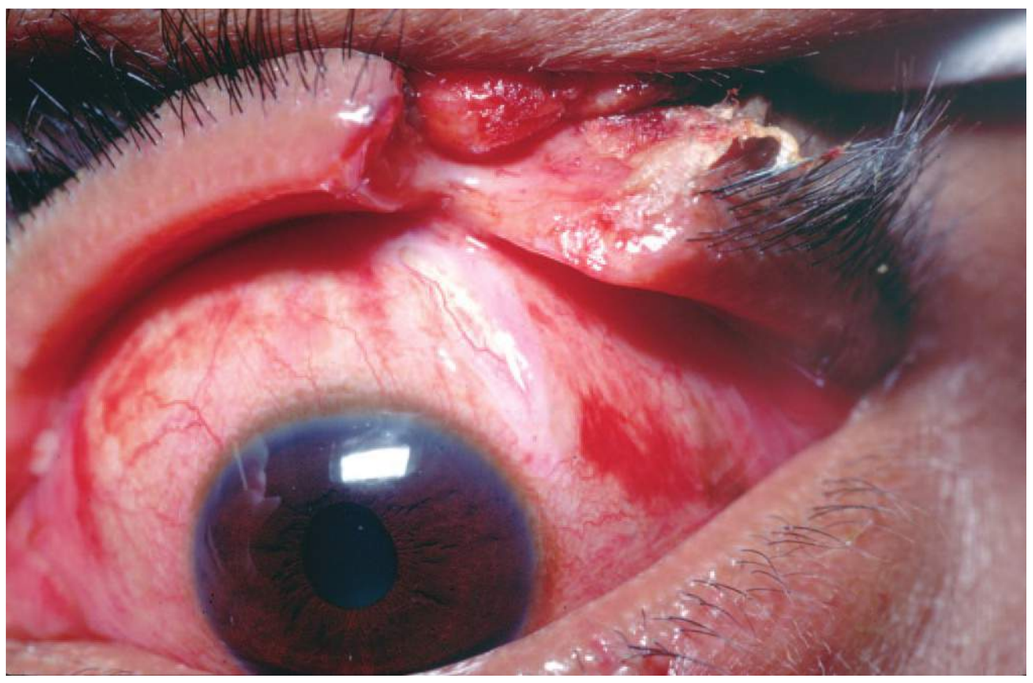

FIGURE 4.36 ■ **Eyelid Laceration.** Laceration involving the lid margin requires anatomic closure, ideally by a specialist. Careful approximation of the lid margins is required for adequate function. (Photo contributor: Lawrence B. Stack, MD.)

FIGURE 4.37 ■ **Eyelid Laceration.** Assault resulting in laceration to upper lid involving the tarsal plate. The assailant was wearing a ring. (Photo contributor: Kevin J. Knoop, MD, MS.)

Clinical Summary

Symptomatic ocular exposures involve either immediate or delayed onset of eye discomfort accompanied either by itching, tearing, redness, photophobia, blurred vision, and/or by foreign-body sensation. Conjunctival injection or chemosis may be seen. Exposure to defensive sprays or riot-control agents (eg, Mace or tear gas) causes immediate onset of severe burning, intense tearing, blepharospasm, and nasal and oropharynx irritation.

Management and Disposition

Begin copious irrigation immediately at the scene. Acute caustic exposures are triaged to immediate treatment. Determine the conjunctival sac pH with a broad-range pH paper without delaying treatment. Continue irrigation until achieving a tear film pH of 7.4. Topical anesthetic drops permit examination and facilitate irrigation. Evert upper lid conjunctiva to examine for concretions. Alkali exposures penetrate deeper into tissues, causing more severe injury (liquefaction necrosis). Acids are less damaging (coagulation necrosis), which creates a barrier to further penetration. The exception is hydrofluoric acid, which acts as an alkali exposure.

Irrigate liberally after all exposures. Many chemicals merely cause irritative symptoms; however, some may also denude the corneal epithelium and inflame the anterior chamber. Perform slit-lamp examination to document corneal epithelial defects or anterior chamber inflammation. Cycloplegics may reduce ciliary spasm and pain. Address tetanus status.

Pearls

1. Immediate onset of severe symptoms calls for immediate treatment and should prompt consideration of alkali or acid exposure.
2. Prolonged (up to 24 hours) irrigation may be needed for alkaline exposures.
3. Concretions from the exposure agent may form deep in the conjunctival fornices. Removal is critical to prevent ongoing injury.
4. A Morgan lens or other eye irrigation system is ideal for effective treatment as blepharospasm severely limits effectiveness of intravenous tubing alone.

FIGURE 4.38 ■ **Alkali Burn.** Diffuse opacification of the cornea occurred from a "lye" burn to the face. (Photo contributor: Stephen W. Corbett, MD.)

FIGURE 4.39 ■ **Alkali Burn.** Diffuse fluorescein uptake of the entire cornea is seen from an alkali exposure. (Photo contributor: Sarah M. Escott, MD.)

FIGURE 4.40 ■ **Caustic Burn Adhesions (Symblepharon).** Scarring of both palpebral and bulbar conjunctivae results in severe adhesions between the lids and the globe. (Photo contributor: Arden H. Wander, MD.)