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A study of Anterior Segment Trauma: Evaluation, Considerations and Initial Management

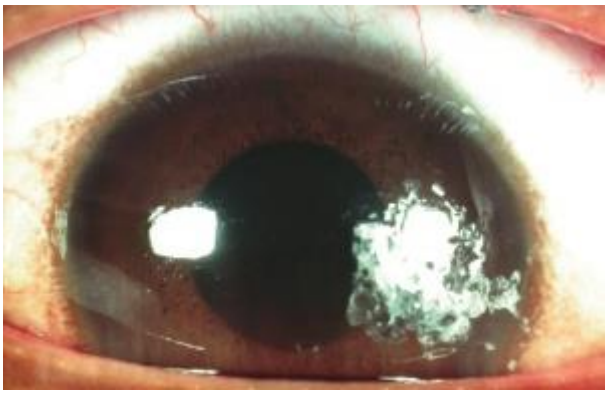
Dr Goutam Pradhan. M. Optom.
goutampradhan. him@gmail.com

Introduction : Disorders of the anterior segment of the eye are leading causes of ocular morbidity. Such conditions include dry eye conditions, infections, traumas of various types, inflammatory reactions, hereditary disorders, and cataract. For a number of these patients, the rule is a continuous progression and aggravation of symptoms. The end stage is varying degrees of visual loss with or without pain.

The anterior segment comprises the cornea, the anterior chamber, and the iris. More than 50% of HIV-positive patients manifest anterior segment complications, including dry eyes (keratoconjunctivitis sicca), corneal infection (keratitis), and anterior chamber inflammation (iridocyclitis). Common symptoms include irritation, pain, photophobia, and decreased vision

Corneal Burns

Thermal



Thermal burn

Thermal injuries result from heat damage to ocular tissues. The etiology and mechanism of action of the thermal injury can provide important information that will help to determine the extent of the tissue damage. Thermal injuries may result from contact with hot objects, such as a curling iron, hot liquids, and fire. It is vital to remember that ocular injuries from fires may occur in association with burns in other regions of the body. This type of injury is frequently unilateral. Studies have determined that long-term sequelae were rare and seen in only 3% of patients with corneal burns. Although uncommon, thermal injuries in children should always

be evaluated with the possibility that they were the result of child abuse, especially in the setting of multiple past injuries.

Common injuries in the home, such as with curling irons, are usually mild with resolution of signs and symptoms within 1 to 2 week after onset with proper wound care, topical antibiotics, cycloplegia, and pressure patching

Ultra Violet Light

The short, high energy wavelength (40-400 nanometer energy) properties of UV light can damage ocular tissue, especially the cornea, conjunctiva, or lens. Corneal/conjunctival UV light injuries commonly result from exposure to sunlight, tanning lamps, and welding arcs, and are usually bilateral. Minor UV light injuries result in punctate keratitis and conjunctival chemosis, which usually occurs 3–12 h after exposure. Patients typically experience pain, tearing, and blepharospasm, but symptoms are usually self-limited and resolve after re-epithelialization. Patients may be treated symptomatically with lubricants and patching. Topical antibiotics may be used if the keratitis is significant but less epithelial toxic topical antibiotics should be selected to avoid delayed healing. Although topical corneal anesthetics provide immediate pain relief, these are not recommended for use outside the examination, due to the high abuse potential, which is associated with severe corneal complications. Chronic exposure to UV can cause premature cataract or acceleration of cataract formation.

Chemical Injury

Chemical injury is the most common cause of a corneal burn, with other potential sources being thermal and ultraviolet insults. Chemical injuries to the eyes occur in the home, industrial setting, farm and other sites. Chemical injuries from assaults represent approximately 11% of chemical injuries and tend to result in severe injuries. In general, immediate irrigation with sterile saline solution (or tap water, if a sterile saline solution is not available) should be started as soon as possible. Then, a thorough history and physical examination can take place. The chemical agent should be identified, if possible. The OSHA chemical identification standard data (CISD or SDS) will identify the chemical(s), toxicity, and possible treatment, if it is available. Otherwise, the poison control center may be able to provide this information. Both eyes should be thoroughly examined since 42% of injuries are bilateral. Acid and alkali agents can be assessed by pH testing of the agent or the affected tissue. Alkali injuries tend to be more

severe than acid injuries because alkali agents are hydrophilic and lipophilic, causing them to rapidly damage cell walls and penetrate ocular tissues deeper. Chemical solvents, such as acetone, which has a neutral pH, have been reported to cause corneal stem cell damage after being used to remove cosmetic eye lash extensions.

Acid Injuries

The major settings in which acid injuries occur are: laboratories, industry, and the home; while the most common acids involved in ocular injuries, in order of prevalence, are sulfuric, nitric, hydrochloric, and oxalic acid. Automobile batteries release sulfuric acid when they explode. Hydrofluoric acid tends to cause more severe injuries due to its increased tissue penetration and the added effect of its fluoride ions. The penetration of acids is reduced by ocular tissue as the acid causes protein precipitation and denaturation, which acts as chemical buffer. If the limbal stem cells are damaged, the long-term prognosis is poor and is related to the number of clock hours of the limbus affected and the degree of total stem cells lost. Direct acid related tissue damage, secondary inflammation, and fibrosis can result in secondary glaucoma and cataract formation.

Chemical acid burn

Alkaline Injuries

Alkali injuries are generally more severe than acid injuries because of their lipophilic effects and their ability to penetrate the cornea through saponification of cell membrane components which results in cellular destruction. Alkali is a common cause of ocular chemical trauma. Sodium hydroxide, calcium hydroxide, and ammonium hydroxide are a few of the most common alkali agents involved in ocular injuries. Common household items containing alkali agents are bathroom cleaners, plaster, lye, lime, cement, and ammonia.

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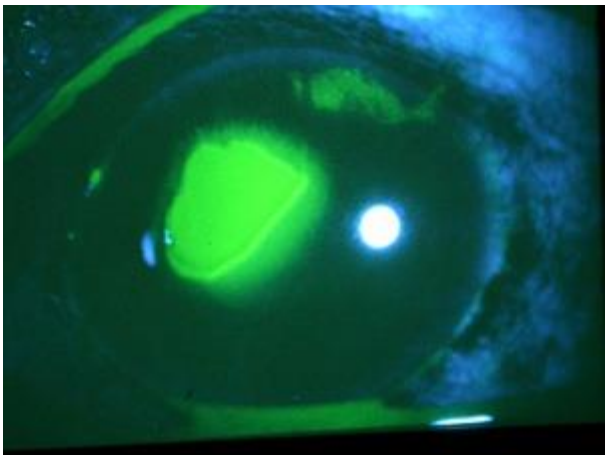
Corneal Abrasion



Cobalt-blue illumination

Corneal abrasions are one of the most common types of anterior segment trauma. One study documented that among all emergency room visits in patients with ocular complaints, approximately 24.3% presented with corneal abrasions. A corneal abrasion occurs when the corneal epithelium is physically removed from the corneal surface. The most common etiologies of corneal abrasion involve the following causes: fingernails, sport related trauma, make-up brushes, and airbags. Children cause many fingernail injuries to the cornea, as patients are often parents who become injured while holding a small child. Automobile airbags can cause corneal abrasions and are frequently associated with blunt force trauma as well as alkali burns. Corneal abrasions can also occur in the hospital setting. These incidents may occur during surgery, when the patient is under anesthesia, and are not recognized until the patient awakens; or they may occur in an admitted unconscious patient.

Corneal abrasions result in acute pain, tearing, blurred vision, photophobia, and a foreign body sensation. These injuries may be associated with corneal lacerations or foreign bodies. The prognosis is largely dependent on the size of the defect, wound contamination, depth of the injury and involvement of Bowman's layer.

Corneal Foreign Bodies

Corneal foreign bodies are the result of a material becoming imbedded in corneal tissue. Corneal foreign bodies frequently occur in the workplace, involving metal workers, patients who use power tools, mechanics who work under automobiles and individuals who work with wood or horticulturists. Although the use of safety glasses has increased, a study found that 45% of patients presenting with metallic foreign bodies actually did use eye protection. A

thorough ocular examination is always necessary, including lid eversion, to detect any retained material.

Corneal foreign bod

Foreign bodies are generally divided into two classes: organic and inorganic. Organic foreign bodies pose an increased risk of infection as they potentially pose a greater threat of contamination with bacteria and fungi. However, it should be noted that inorganic foreign bodies can also carry microbes; therefore, antibiotics should be used with all types of ocular foreign bodies.

Conclusion

Trauma can affect the eye's native structure in unique ways. The astute clinician must be aware of these potential trauma related ocular injuries and may need to utilize different techniques to examine the eye. Early and thorough identification of the affected anterior segment tissues involved will help with prompt and appropriate management.

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