Abstract:
Sudden loss of vision is a very uncommon but extremely worrisome symptom. The management of children with acute vision loss in the emergency department requires timely recognition, a focused assessment, and referral to the appropriate subspecialty care provider for further evaluation and definitive care. In this article, we will review the clinical manifestations and early management of traumatic and nontraumatic causes of acute vision loss in children.

Keywords:
vision loss; pediatrics; globe rupture; hyphema; retinal detachment; vitreous hemorrhage; lens detachment; retinal artery occlusion; optic neuritis

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Acute Vision Loss

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Sudden loss of vision is a rare but serious symptom in the pediatric patient. When presented with this complaint, a stepwise approach is helpful. Often in these cases, the role of the emergency physician is to stabilize the patient, quickly recognize significant eye pathology, and seek specialist consultation for definitive care. The consulting service is usually ophthalmology, but a variety of other subspecialties (neurology, neurosurgery, or rheumatology) may be necessary depending on the etiology.

PATIENT ASSESSMENT

The first step is to determine if the vision loss was traumatic or nontraumatic. In children, traumatic causes of acute vision loss are far more common than those not related to injury. The second step is to determine if the patient has monocular or bilateral vision loss. As a general rule, monocular vision loss is due to eye pathology, whereas bilateral vision loss is usually due to an ischemic or embolic phenomenon involving a larger, proximal vessel. The third step is to determine if the vision loss is painful or painless to further differentiate the etiologies.

Several physical examination findings may also deduce the location of the problem. The pinhole test is an important examination maneuver to help distinguish an optical from neurological etiology. If acuity improves when the patient looks through a pinhole, it suggests a refractive error, and is more likely optical in nature. If the symptoms do not improve with the pinhole test, the next step is to test for a relative afferent pupillary defect. The swinging flashlight test, where the examiner shines a bright light alternately at each eye, can reveal a defect. If the pupil dilates instead of constricting when stimulated, this is strongly suggestive of optic-nerve disease. Fundoscopic examination may also show retinal or optic nerve abnormalities.[1]

The eye examination in pediatric patients can be challenging. Most of the examination occurs through close observation of the external eye and by following the patient's visual tracking abilities. A toy or other interesting object can be an effective stimulus for tracking. In infants and children, the retina is indirectly evaluated by the red reflex. This is accomplished by examining both eyes simultaneously for symmetry using a wide beam on the

ophthalmoscope. A sedated examination by an ophthalmologist may be required to assess for significant injury.[2]

TRAUMATIC CAUSES OF VISION LOSS

As with all injuries, management of life-threatening systemic illness or central nervous system trauma must take precedence over the eye injury. Once this critical stabilization is complete, attention can then be focused on the eyes (Table 1). Ensuring the globes are intact is a critical step. Lastly, visual acuity should be checked in both eyes and compared.[3]

TABLE 1. Traumatic vs. medical causes of acute vision loss.

Traumatic Causes	Nontraumatic Causes
Globe rupture	Central/branch RAO
Hyphema	Central/branch RVO
Retinal detachment	Optic neuritis
Vitreous hemorrhage	Infections
Transient cortical visual blindness	Psychogenic
Lens dislocation	Migraine

RAO, retinal artery occlusion; RVO, retinal vein occlusion.

Globe Rupture

Clinical Manifestations

Globe rupture is often due to penetrating injury but can also occur from blunt injury of significant force. This is a major cause of monocular blindness. The eyeball has a remarkable ability to maintain its integrity even with severe intraocular disruption. When lacerated, the iris or choroid immediately plugs the wound. This action results in the classic finding of a teardrop shaped pupillary distortion, with the narrowest segment pointing toward the area of rupture. After the wound is plugged, the intraocular contents are preserved and the external appearance of the eye can appear to be normal. A hyphema, hemorrhage within the anterior chamber, may also accompany the globe rupture. Likewise, subconjunctival hemorrhage can occur. A 360° subconjunctival hemorrhage or conjunctival edema may herald an underlying globe rupture that is not easily visualized. This should be treated as a ruptured globe and referred immediately to an ophthalmologist.

Management

If a ruptured globe is a diagnostic possibility, further ocular examination should cease and ophthalmology should be consulted immediately. No eye drops should be placed. A shield should be placed over the injured eye that contacts the bony prominences of the orbit and secured in place. If a commercial eye shield is not available, then the bottom portion of a styrofoam cup taped over the area may suffice.

Every attempt should be made to keep the child calm, as crying, screaming, and valsalva maneuvers increase ocular pressure and may worsen the extrusion of intraocular contents. Analgesics and antiemetics may facilitate this, but the benefits of placing an intravenous catheter must be weighed against this risk and may be postponed until after ophthalmologic consultation. An orbital computed tomography scan should also be arranged to determine the presence of orbital and intraocular foreign bodies.[3,4]

Traumatic Hyphema

Clinical Manifestations

A hyphema is caused by bleeding into the anterior chamber from damaged blood vessels in either blunt or penetrating trauma to the eye. When sitting upright, a meniscus of blood is visible on gross inspection in the anterior chamber. The degree of hyphema can vary from microscopic hyphemas, detectable only on slit lamp examination, to an "eight-ball hyphema" where the entire anterior chamber is filled with blood. This blood can interfere with the drainage system of the anterior chamber and increase intraocular pressure, causing glaucoma-like symptoms of pain, blurry vision, and photophobia.

The most common complication of hyphema is rebleeding during the following 3 to 5 days after initial injury. The blood is usually resorbed over a period of days to weeks. Obtaining a history of bleeding disorders or hemoglobinopathies, particularly sickle cell disease and sickle cell trait, is very important to identify these high-risk patients.

Management

The mainstay of treatment is to minimize rebleeding. Elevation of the head of the bed to 30° to 45° while at rest and placing a shield over the injured eye are the initial steps that should be taken. Sedation may be considered for the distressed child to minimize the chance of increasing intraocular pressure and rebleeding. A hemoglobin electrophoresis should also be sent unless the