

## Traumatic Eye Injury in a 14-Year-Old Male

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A 14-year-old caucasian male presents to the emergency department after being struck by a baseball to the left side of his face. The patient reports that while playing the outfield, he was hit by a line drive to the eye after losing the ball in the sun. He denies wearing glasses or contacts at the time of the injury. He complains of left eye pain and blurry vision but denies loss of consciousness or loss of vision after the accident. He also denies any nausea or vomiting. The patient describes his pain as throbbing which is made worse by eye-opening and bright lights. The patient has no other reported medical history.

On physical examination, the patient is normocephalic with left periorbital ecchymosis and swelling to the left upper eyelid. Pupils are equal and reactive to light, and extraocular muscles are intact. A dark red fluid line is noted in the inferior anterior chamber of the left eye (Figure 1). The fluid line extends horizontally across the bottom third of the iris, almost to the level of the pupil. There is a distinct contrast in color to the iris; the natural green color is only visible above the level of the dark red fluid. There is no involvement of the sclera. The neck exam reveals no tenderness and the remainder of the physical exam is unremarkable. A CT scan of the head without contrast shows no acute intracranial hemorrhages or masses; however, a CT of the face and sinuses shows a nondisplaced fracture involving the superior orbital wall. After CT results are obtained, Tonopen testing shows the intraocular pressure to be normal on multiple readings and visual acuities are checked and are also normal. Prompt ophthalmological consultation is obtained, and the patient is initiated on Prednisolone drops and Cyclogyl. An eye shield is placed for protection until the patient's ophthalmology appointment the next day.

### QUESTIONS:

1. What is the patient's most likely diagnosis?
  - a. Hyphema
  - b. Orbital compartment syndrome
  - c. Retinoblastoma
  - d. Ruptured globe
  - e. Subconjunctival hemorrhage
2. What course of treatment is most important to protect the patient's vision?
  - a. Bed rest
  - b. Elevate the head of the bed
  - c. Eye shield
  - d. Limited eye movement
  - e. Prompt ophthalmological consultation

FIGURE 1:

Left eye fluid collection



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## ANSWERS:

### 1. What is the patient's most likely diagnosis?

Correct Answer: A) Hyphema

When considering a traumatic injury to the eye, a hyphema is a collection of blood found inside the anterior chamber of the eye.<sup>1</sup> However, a ruptured globe and orbital compartment syndrome must be considered due to the substantial risk of vision loss or even enucleation. An irregularly shaped globe and drainage from the eye is suggestive of ruptured globe and proptosis, vision loss, and pupillary defect suggest orbital compartment syndrome. A subconjunctival hemorrhage is a collection of blood under the conjunctiva but above the sclera and outside the dome of the cornea.<sup>1</sup> Retinoblastoma is a rare cause of non-traumatic hyphema formation.<sup>2</sup>

### 2. What course of treatment is most important to protect the patient's vision?

Correct Answer: E) Prompt Ophthalmological consultation

Proper treatment of a hyphema is crucial to prevent vision loss as well as reduce the risk of re-bleeding. Bed rest allows the eye to heal and limiting eye movement reduces the chance of re-bleeding. Elevating the head of the bed while sleeping helps the body to absorb the blood in the eye and placing an eye patch helps protect the eye preventing further injury.<sup>1</sup> All options given are essentially correct; however, prompt ophthalmological follow up is still the most important treatment to maximize vision protection. Even a small crescent hyphema requires prompt evaluation and close follow up with Ophthalmology to prevent further vision loss or recurrent hemorrhage.<sup>1</sup>

## DISCUSSION

A hyphema is a collection of blood in the anterior chamber of the eye that most commonly presents with painful, blurry vision.<sup>3</sup> The mechanism of injury is most often due to blunt or penetrating trauma and post intraocular surgery.<sup>4</sup> Blunt trauma to the eye can cause rupture of the vasculature supplying the iris and ciliary body.<sup>1</sup> The resultant bleeding can occlude the trabecular network in the angle of the eye which causes decreased drainage of the aqueous fluid. This allows the aqueous fluid to build up, increasing intraocular pressure.<sup>1</sup> Since vision can be affected by increasing intraocular pressure; every hyphema should be evaluated and followed daily by an ophthalmologist.<sup>1</sup> There is a higher incidence of hyphema in children under the age of 18 with a male predominance.<sup>4</sup> It may occur spontaneously in patients with iris melanoma, retinoblastoma, myotonic dystrophy, leukemia, sickle cell anemia and Von Willebrand disease and rarely can be a result of an infection.<sup>1,4,5,6</sup> Treatment goals involve reduction of increased intraocular pressure (IOP > 21 mmHg) and prevention of rebleeding to preserve vision.<sup>5,7</sup> One healthcare study involving children under the age of 18 reported that the majority of traumatic hyphemas spontaneously resolve within days to weeks.<sup>4</sup> In the study, out of the patients that had elevated IOP, 70% had normal IOP within one month of medical treatment while 12% had persistent elevated IOP requiring surgical intervention.<sup>4</sup>

Before evaluating a traumatic hyphema, it is important to examine and manage any life-threatening injuries, including any other blunt or penetrating trauma before assessing the ocular trauma.<sup>7</sup> Laboratory studies and CT scans of the head, neck, chest, and abdomen are widely utilized to ascertain any additional injuries in trauma patients. Indications for immediate ophthalmology consult and evaluation include orbital compartment syndrome and an open globe.<sup>1</sup> Orbital compartment syndrome results from rapidly elevated pressure within the limited space of the orbit.<sup>1</sup> Key findings on physical exam include proptosis, decreased visual acuity, subconjunctival hemorrhage, and an afferent pupillary defect.<sup>1</sup> If prompt treatment is not available, retinal ischemia can result, leading to possible permanent vision loss.<sup>8</sup> Open globe injury must be ruled out before a physical examination is performed as the exam can cause unwanted increased pressure on the eye.<sup>1</sup> Other indications that warrant an immediate consult is a traumatic hyphema associated with a grade III or IV injury (Figure 2), increased intraocular pressure, or those occurring in patients having a sickle hemoglobinopathy or other hematologic disorders as these have a higher risk for rebleeding and vision loss.<sup>1,9</sup>

Computed Tomography scans of the face/orbits are recommended to exclude a possible intraocular foreign body.<sup>1</sup> They are also recommended when severe swelling is present so that underlying structures can be evaluated for possible fractures or open globe.<sup>1</sup> Computed Tomography should be used with caution in adolescents due to higher radiation sensitivity in this population.<sup>10</sup> Estimates have shown that tumor rates can be as high or higher than one out of one thousand CT scans.<sup>10</sup> Therefore, every effort should be made to reduce unnecessary radiation in children. The benefits of scanning in children include visualizing bone, soft tissue, and blood vessels in a quick manner to exclude life-threatening injuries after a trauma.<sup>10</sup>

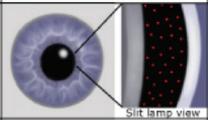
## MEDICAL TREATMENT

After obtaining and documenting the visual acuity, management of a traumatic hyphema includes appropriate placement of an eye shield to the affected eye to protect the eye from further injury.<sup>1,11,12</sup> Dim lighting, bed rest, and elevation of the head of the bed should be employed to decrease stress on the blood vessels and promote clearance of the hyphema.<sup>1,5,11,12</sup> Once a ruptured globe is excluded, IOP should be determined. Patients experiencing nausea and vomiting should receive prompt treatment with an antiemetic to prevent a sudden increase in intraocular pressure that can be precipitated by emesis.<sup>7</sup> Pain control is important in these patients to perform a proper eye exam.<sup>7</sup> Topical analgesics such as tetracaine or proparacaine are safe options in patients without an open globe.<sup>7</sup> Topical eye drops should not, however, be sent home with the patient due to corneal toxicity.<sup>7</sup> Furthermore, the use of nonsteroidal anti-inflammatory medications is also discouraged due to platelet inhibition.<sup>3</sup>

For patients with increased intraocular pressure, beta blockers and carbonic acid anhydrase inhibitors (CAIs) should be used in conjunction with ophthalmology consultation.<sup>1</sup> However, in those patients with Sickle cell hemoglobinopathy, CAIs should be used with caution as it can cause further sickling of blood cells.<sup>15</sup> With all hyphemas, an eye shield is kept in place until evaluated by an ophthalmology.<sup>1</sup>

FIGURE 2:

Hyphema grading and prognosis

Grade	Anterior chamber filling	Diagram	Best prognosis for 20/50 vision or better
Microhyphema	Circulating red blood cells by slit lamp exam only		90 percent
I	<33 percent		90 percent
II	33-50 percent		70 percent
III	>50 percent		50 percent
IV	100 percent		50 percent

Adapted from Brandt MT, Haug RH. Traumatic hyphema: a comprehensive review. *J Oral Maxillofacial Surg* 2001; 59:1492.

When medically managing a hyphema, it's essential to hospitalize or maintain daily observation through outpatient ophthalmological evaluation to decrease associated complications.<sup>5</sup> Deciding to hospitalize is considered on an individual basis.<sup>3</sup> Outpatient care is appropriate for reliable patients having grade I or II hyphemas (see Fig. 2).<sup>3</sup> Patients having sickle cell anemia, increased intraocular pressure, hyphemas greater than 50%, or vision loss should be considered for admission.<sup>3</sup> Patients should be screened for history of bleeding disorders as this can increase chances of rebleeding.<sup>1</sup> Returning to normal activities is recommended only after complete resolution of the hyphema and the patient has been cleared by the ophthalmologist.

#### AUTHOR DISCLOSURES

No relevant financial affiliations.

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