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Research Article

AN ANALYSIS OF TRAUMATIC HYPHEMA WITH SECONDARY GLAUCOMA IN A 6-YEAR-OLD CHILD: A CASE REPORT

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ABSTRACT

Background: Hyphema is a condition where blood collects in the anterior chamber of the eye, usually caused by blunt trauma that results in tearing of the uveal blood vessels (traumatic hyphema). This condition is an ophthalmological emergency that can lead to permanent vision loss if not treated promptly. Global data indicates the incidence of traumatic hyphema is 12 per 100,000 patients. In Indonesia, Cicendo Eye Hospital reports that 88.3% of ocular trauma in children is caused by blunt trauma.
Methods: This case report describes a 6-year-old boy who complained of pain in his left eye for 2 days, accompanied by blurred vision, a sensation of darkness, glare when exposed to light, excessive tearing, and a foreign body sensation.
Results: The patient had a history of ocular trauma due to a sports-related injury three days prior. Visual acuity examination showed 6/6 OD and 1/300 OS. Physical examination of the left eye revealed edema of the superior and inferior eyelids, conjunctival and scleral hyperemia with ciliary injection, and blood filling of the anterior chamber reaching approximately 60–70% of the chamber height. The iris and pupil were not assessable. Tonometry revealed elevated left ocular intraocular pressure. The patient was diagnosed with a grade III traumatic hyphema with secondary glaucoma.
Conclusion: Education and conservative management were provided. After 6 days, symptoms improved, the hyphema regressed, and IOP decreased.

Keywords: Traumatic hyphema, Blunt trauma, Sports-related injury, Secondary glaucoma, Children

INTRODUCTION

Hyphema is a condition characterized by the presence of blood in the anterior chamber of the eye-the space between the cornea and the iris. It typically results from blunt trauma that ruptures blood vessels in the iris or ciliary body[1], leading to the mixing of blood with the clear aqueous humor (eye fluid). Traumatic hyphema is a frequent complication of both blunt or penetrating eye injuries. Blunt trauma accounts for two-thirds of hyphema cases, which can lead to visual impairment, pain, and even permanent vision loss.[2-5]

The global incidence of traumatic hyphema is estimated at 12 cases per 100,000 people, with a strong predisposition among children and young adults. Approximately 70% of cases occur in children, with boys disproportionately affected at a ratio of 3.9:1, particularly those aged 10 to 20 years.[4,6,7] A retrospective study from Northern India reported 67.8% of patients with ocular trauma presented with a closed globe injury.[8] A multicenter retrospective study conducted in the United States reported an incidence of traumatic hyphema at 19 cases per 100,000 patients[9], with sports-related injuries and recreational activities being the most common causes.[9-12] The most frequent sports associated with these injuries include basketball, baseball, soccer, and softball. Traumatic hyphema typically occurs when a ball impacts the anterior surface of the globe.[6]

In Indonesia, precise epidemiological data on traumatic hyphema remain limited; however clinical experience and available literature indicate that the condition is not uncommon, particularly among pediatric populations. A study from Cicendo Eye Hospital found that blunt trauma accounts for 88.3% of ocular trauma cases in children.[13] A retrospective study conducted in Jakarta revealed a significant male predominance, with a ratio of 9:1. The primary causes of injuries include toy guns (27.8%), sports injuries (14.4%), work-related injuries (12.4%), traffic accidents (2.1%), and other factors (43.3%).[14] Badminton-related injuries, which constitute 78.9% of cases, are primarily attributed to shuttlecock bounces or accidental impacts with the racket.[15] This demographic pattern underscores the importance of preventive interventions, especially among school-aged children engaged in recreational and competitive sports.

The challenge is further exacerbated by geographic disparities in access to specialized eye care, often leading to delayed presentation in many children, which heightens the risk of complications such as secondary glaucoma and amblyopia.[16,17] For clinicians in Indonesia and beyond, understanding evidence-based management of traumatic hyphema is crucial to optimize outcomes for young patients with this potentially sight-threatening condition. This study aims to present a case report detailing the management of a case of traumatic hyphema complicated by secondary glaucoma in a pediatric patient.

METHODS

A 6-year-old boy accompanied by his mother presented to the ophthalmology clinic at Ciawi Regional General Hospital with a two-day history of left ocular pain following blunt trauma. The patient reported being struck in the left eye by a soccer ball three days prior. Initial symptoms of blurred vision and severe pain (VAS 7/10) with darkening of vision developed one day post-injury. By the second day, he experienced photophobia, excessive tearing, and foreign body

sensation. Despite prior treatment with unspecified topical medications (eye drops and eye ointment) at the Community Health Center, his symptoms persisted without improvement.

RESULTS

CASE REPORT

A 6-year-old boy accompanied by his mother presented to the ophthalmology clinic at Ciawi Regional General Hospital with a two-day history of left ocular pain following blunt trauma. The patient reported being struck in the left eye by a soccer ball three days prior. Initial symptoms of blurred vision and severe pain (VAS 7/10) with darkening of vision developed one day post-injury. By the second day, he experienced photophobia, excessive tearing, and foreign body sensation. Despite prior treatment with unspecified topical medications (eye drops and eye ointment) at the Community Health Center, his symptoms persisted without improvement.

The patient had no prior episodes of similar ocular complaints. Both personal and family histories were negative for bleeding disorders or hematologic abnormalities. He had no history of refractive error correction. The patient was delivered at full-term via spontaneous vaginal delivery with a normal birth weight of 2.5 kg and a birth length of 49 cm. There were no reported complications during pregnancy, and he had received all age-approariate vaccinations. His growth and development milestones were appropriate for his chronological age.

The patient's vital signs were within normal limits. Anthropometric measurements showed a height of 112 cm and a weight of 20.5 kg. Visual acuity was 6/6 in the right eye (OD) and 1/300 in the left eye (OS). Upon examination of the left eye, superior et inferior palpebral edema was noted, accompanied by conjunctival and scleral hyperemia with marked ciliary injection. The cornea appeared cloudy, and the anterior chamber was more than half filled with blood, predominantly pooling in the inferior portion. A distinct fluid level (meniscus formation) was observed, occupying approximately 60–70% of the chamber height. The iris was partially obscured by the inferior hyphema, and the pupil appeared irregular, with its inferior border obscured by the blood, making assessment of the complete light reflex challenging. The lens was clear in the superior quadrant, but the inferior portion was not visualized due to the overlying hyphema. Examinations of the right eye was unremarkable, with no abnormalities detected. Intraocular pressure (IOP) measured using a Schiotz tonometer was 15.6 mmHg in the right eye and elevated at 22 mmHg in the left eye. Fundus examination of the left eye was limited due to the hyphema, while the right eye fundus appeared normal.

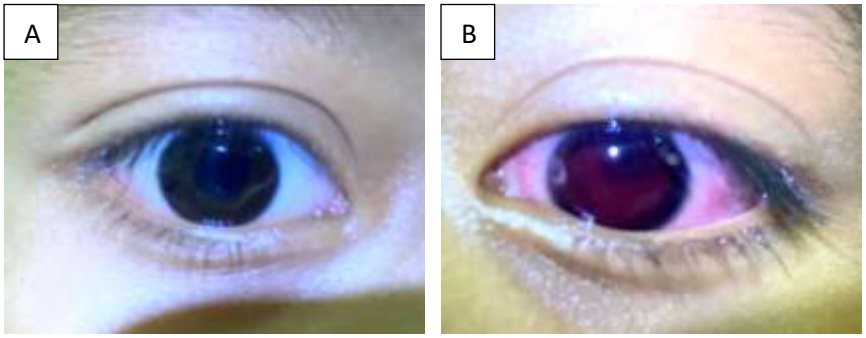

Figure 1. Ocular Examination (a) Right eye; (b) Left eye

Based on the clinical findings, the patient was diagnosed with traumatic hyphema in the left eye complicated by secondary glaucoma OS. To manage the condition, a comprehensive treatment plan was initiated. The patient was advised to maintain bed rest in a semi-Fowler position, with the head elevated at 30–45 degrees, to promote settling of the hyphema. For local therapy, timolol 0.5% eye drops were prescribed twice daily in the left eye to reduce intraocular pressure, polynel eye drops were administered six times daily to support corneal healing and lubrication, and cyclon eye drops were prescribed three times daily. Systemic medications included cefixime syrup twice daily for infection prophylaxis and ibuprofen syrup three times daily for pain management and anti-inflammatory effects. The patient was advised to be hospitalized, but the family refused and wanted outpatient treatment first. The patient and his mother were thoroughly educated on the importance of adhering to the treatment regimen. They were also instructed to avoid activities that could increase intraocular pressure, such as straining or lifting heavy objects. A follow-up appointment was scheduled in 5 days to reassess the volume of hyphema in the left eye. Additionally, the patient was advised to seek immediate medical attention if there were any signs of worsening, such as increased pain, further vision loss, or recurrent bleeding.

After 6 days of treatment, the patient reported significant improvement in symptoms. Pain in the left eye has reduced to occasional discomfort, with a visual analog scale (VAS) score of 2/10. Blurred vision, glare, and eye discomfort were minimal, and excessive tearing had also decreased. Notably, the patient no longer experienced a sensation of darkness in the affected eye. On examination, ciliary injection was still present in the left eye, but the volume of blood in the anterior chamber has significantly decreased compared to the initial presentation, now occupying approximately 30-40% of the chamber height. Intraocular pressure (IOP) measurements were 15 mmHg in the right eye (OD) and 19 mmHg in the left eye (OS), indicating improved pressure control.

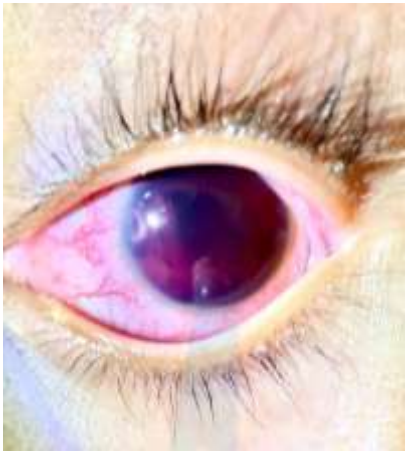

Figure 2. Ocular Examination of Left Eye After 6 Days of Treatment

DISCUSSION

Traumatic hyphema, defined as the presence of blood in the anterior chamber of the eye, is a common complication of ocular trauma. Approximately 70% of cases occur in children[6], with males having a 1.3-fold higher risk than females.[11] The highest risk is observed in patients aged 5-14 years, who have a 1.88-fold greater likelihood of developing traumatic hyphema.[11] Consistent with these findings, the patient in this case report is a 6-year-old boy.

The most common etiology of traumatic hyphema is blunt trauma that ruptures the blood vessels of the iris or ciliary body, although penetrating injuries may also occur.[6,16] Sports-related trauma is the predominant mechanism, particularly in basketball, baseball, soccer, badminton, and softball[9-12,15], where hyphema develops when the ball strikes the anterior surface of the globe.[6] Additional causes include toy-related accidents, traffic collisions, and occupational injuries.[14] In this case, the patient sustained trauma to the left eye after being hit by a soccer ball kicked by a friend.

The pathophysiology of traumatic hyphema involves a cascade of mechanical events following blunt force to the globe. Rapid anteroposterior compression of the eye induces equatorial expansion, stretching of the limbal tissues and displacing the iris and lens posteriorly. This sudden deformation generates shearing forces on the fragile vasculature of the iris and ciliary body, most commonly producing a tear at the angle recess—the junction of the iris root ciliary body. Subsequent rupture of these vessels permits blood extravasation into the anterior chamber.[2]

The clinical manifestations of hyphema include blurred, clouded, or obstructed vision, ocular pain, and photophobia. Most patients report a recent history of ocular trauma or surgery.[5,16] In this case, the patient presented with complaints in the left eye of blurred vision, a sensation of darkness, glare upon light exposure, excessive tearing, and a foreign body sensation, with a history of ocular trauma three days earlier.

Diagnosis of hyphema is established by slit-lamp examination of the anterior chamber, although in cases of large hyphema it may be visible with penlight examination alone.[16] Severity is graded according to the extent of anterior chamber filling: Grade 0 (microhyphema, detectable only by slit lamp), Grade I (<1/3), Grade II (1/3-1/2),

Grade III (1/2 to nearly total), and Grade IV (total hyphema, characterized by bright red blood or 'eight-ball/blackball' when filled with dark red-black blood).[2,16] This grading system guides initial assessment and correlates with the risk of complications such as elevated intraocular pressure and rebleeding. In this case, the patient had grade III hyphema, with the anterior chamber more than half filled with blood, approximately 60–70% of its height.

Beyond the immediate presence of blood, the clinical significance of hyphema lies in its potential complications. Accumulated erythrocytes and clots may obstruct the trabecular meshwork—the primary aqueous humor drainage pathway—resulting in elevated IOP. Approximately 32% of hyphema cases develop IOP exceeding 22 mmHg during the disease course.[2] Sustained elevation can cause optic nerve damage and permanent visual field loss. Moreover, blood in the anterior chamber provokes an inflammatory response that further impairs outflow and promotes peripheral anterior synechiae formation, potentially leading to chronic angle-closure glaucoma.[16] In this case, the patient demonstrated an IOP of 22 mmHg in the left eye, consistent with secondary glaucoma due to traumatic hyphema.

The management of traumatic hyphema has shifted toward conservative measures aimed at preventing complications. Standard care includes strict bed rest with the head elevated (semi-Fowler position) to facilitate inferior settling of blood, ocular protection with a shield, and close monitoring of IOP. Pharmacologic therapy may involve topical corticosteroids to reduce inflammation, cycloplegics to relieve ciliary spasm, and beta-blocker eye drops or IOP-lowering agents when pressure is elevated.[2] Antifibrinolytic agents such as oral tranexamic acid have been shown to reduce the risk of secondary hemorrhage. Around 5% of traumatic hyphema cases need surgical intervention. Surgical options include clot irrigation with a filtering procedure (trabeculectomy), hyphema evacuation using closed vitrectomy equipment, or anterior chamber irrigation and aspiration with a small incision (anterior chamber washout). An anterior chamber paracentesis can also be used to temporarily lower excessive IOP.[16,18] Indication of surgical intervention is reserved for cases of persistently elevated IOP despite medical therapy, total hyphema with corneal blood staining, or prolonged obstruction of the visual axis.[2,6,16,19] The elevated IOP referred to is an increase in IOP >50 mmHg for ≥5 days or >25 mmHg for ≥24 hours in patients with sickle cell hemoglobinopathy despite receiving maximum medical therapy.[16] Surgery is also done when the IOP is >35 mmHg for 7 days to avoid damage to the optic nerve and when the IOP is >25 mmHg for 5 days in cases of total hyphema or near total to avoid blood staining on the cornea. The presence of a persistent blood clot for 10 days is also an indication for surgery to avoid the occurrence of anterior synechiae.[2] Adherence to these principles improves visual outcomes and reduces sight-threatening sequelae. In this case, the patient received education and therapy, including bed rest in a semi-Fowler position, beta-blocker eye drops, a combination of topical corticosteroids and topical antibiotic eye drops, as well as analgesic and antibiotic syrup.

Most patients with hyphema can be managed as an outpatient, with close monitoring of vision, IOP, and regression of

hemorrhage. Hospitalization is warranted for noncompliant patients, those with bleeding diathesis or blood dyscrasia, severe ocular or orbital injuries, or concomitant IOP elevation in individuals with sickle cell disease.[16] In this case, the patient was advised to be hospitalized, but the family refused and wanted outpatient treatment first. The patient was treated as an outpatient with observation and scheduled follow-up after five days. He returned on the sixth day showing symptomatic improvement, regression of the hyphema, and a reduction in IOP.

Additional complications of hyphema include corneal blood staining, which occurs when hemoglobin and its breakdown products infiltrate the corneal stroma, leading to permanent corneal opacification; recurrent hemorrhage, typically peaking between days 2 and 5 after the initial injury and associated with a poorer prognosis; and pupillary block, particularly in total or "eight-ball" hyphema where a dark clot fills the anterior chamber and obstructs aqueous flow through the pupil.[16] In pediatric patients, amblyopia is a critical concern, as persistent visual axis obstruction or induced anisometropia during the sensitive period of visual development may result in irreversible vision loss.[16] Therefore, children with traumatic hyphema require not only acute management but also long-term follow-up to monitor for amblyopia and delayed glaucoma.

CONCLUSION

This case underscores the importance of a systematic approach to traumatic hyphema and highlights the essential principles of diagnosis and management in pediatric ocular trauma. It emphasizes the need for appropriate positioning and vigilant monitoring to prevent complications such as rebleeding, corneal blood staining, and irreversible optic nerve damage. Long-term follow-up is crucial to detect delayed sequelae, including chronic glaucoma and visual axis obstruction. By adhering to evidence-based protocols and recognizing the unique vulnerabilities of children, clinicians can optimize visual outcomes and reduce the risk of sight-threatening complications.

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