

Traumatic hyphema after closed-globe injuries: accompanying findings, management and visual outcomes

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ABSTRACT

Aims: The aim of this study is to present the clinical findings and treatment approaches of patients with traumatic hyphema.

Methods: The files of patients with traumatic hyphema who were diagnosed and treated in our clinic were retrospectively reviewed as part of the study. Hyphema grading was based on the level of hyphema at the time of initial presentation

Results: A total of 25 cases of traumatic hyphema were evaluated in the study, consisting of 18 males (72%) and 7 females (28%). The average age of the patients was 44.7 ± 24.4 years. Among the cases, 1 had stage 0 hyphema (4%), 13 had stage 1 hyphema (52%), 5 had stage 2 (20%), 5 had stage 3 (20%), and 1 had stage 4 (4%). At the time of presentation, the best-corrected visual acuity of the patients was 1.24 ± 0.99 logMAR which increased to 0.16 ± 0.27 logMAR at the last follow-up. The intraocular pressures were 25 ± 13.4 at the initial visit and 13.4 ± 9.9 at the last follow-up. Anti-glaucomatous treatment was initiated in 10 (40%) cases due to elevated intraocular pressure. An anterior chamber lavage was performed on 4 cases. The common findings accompanying hyphema included: 12% iridodialysis, 12% phacodonesis, 12% vitreous hemorrhage, 8% traumatic cataract, 8% corneal lamellar laceration and 8% commotio retinae.

Conclusion: Visual outcomes in cases of traumatic hyphema are generally favorable. Close monitoring is essential during the treatment process and in the management of complications in cases of traumatic hyphema.

Keywords: Cataract, glaucoma, hyphema, trauma

INTRODUCTION

Hyphema, the presence of blood in the anterior chamber of the eye, is often caused by blunt ocular trauma.¹ It can also result from various other conditions, including congenital anomalies, coagulopathies, and systemic diseases.² The pathophysiology of traumatic hyphema begins with the disruption of the blood-aqueous barrier, which results in bleeding from the ciliary body or iris.^{2,3} Diagnosis is usually made through clinical examination techniques, including slit-lamp biomicroscopy, which assess the extent of the hyphema and any associated ocular injuries.^{3,4} Treatment typically involves topical and/or systemic corticosteroids, cycloplegics and along with addressing underlying pathology.^{1,2} Complications may include corneal blood staining, synechiae, increased intraocular pressure, and glaucomatous optic atrophy.¹⁻⁵ Rebleeding is more likely in blacks (especially with sickle cell disease), and those who have antiplatelet therapy.² Timely recognition and management are crucial to prevent complications such as glaucoma and corneal blood staining.⁶ Follow-up examinations should be conducted as necessary to monitor healing and potential complications.⁶

Understanding the implications of traumatic hyphema is crucial for clinicians in order to optimize treatment strategies and improve patient outcomes. In this study, cases with closed globe injuries who presented to our clinic due to blunt trauma and were diagnosed with hyphema were evaluated. The aim is to present the demographic characteristics, clinical findings, and treatment processes of all cases.

METHODS

The study was carried out with the permission of the Tokat Gaziosmanpaşa University Non-intervention Scientific Researches Ethics Committee (Date: 04.03.2025, Decision No: 25-MOBAEK091). This research was carried out from 2021 to 2024 at the Department of Ophthalmology, Faculty of Medicine, Tokat Gaziosmanpaşa University. The study adhered to the principles outlined in the Helsinki Declaration. The patients who had closed globe injury with hyphema were included in the study. The patients who had open globe injury with or without hyphema, as well as those with inadequate follow-up duration, were excluded from the study.

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The files of patients with traumatic hyphema who were diagnosed and treated in our clinic were retrospectively reviewed as part of the study. Data were collected from the patients' files, including age, gender, cause of trauma, visual acuity, findings from anterior and posterior segment examinations, intraocular pressure measurements, ultrasonic posterior segment examination findings, treatment administered, and follow-up duration.

Hyphema grading was based on the level of hyphema at the time of initial presentation.⁷ Accordingly, it was classified as follows:⁷

- **Stage 0:** Presence of hyphema that is too small to be seen microscopically and does not provide a level.
- **Stage 1:** Presence of hyphema with a level up to 1/3 in the anterior chamber.
- **Stage 2:** Presence of hyphema with a level between 1/3 and 1/2 in the anterior chamber.
- **Stage 3:** Presence of hyphema with a level close to 1/2 to total in the anterior chamber.
- **Stage 4:** Presence of total hyphema.

All patients were administered topical 0.1% dexamethasone eight times a day and topical 1% cyclopentolate three times a day. Topical and systemic antiglaucoma medications were added to the treatment for patients with intraocular pressure of 22 mmHg or higher. Anterior chamber lavage was performed if there was no improvement within five days in cases of total hyphema, if intraocular pressure could not be controlled despite antiglaucoma treatment, and in the presence of corneal blood staining.

Descriptive statistics were employed to analyze the collected data, with results presented as mean±standard deviation and percentages.

RESULTS

A total of 25 cases of traumatic hyphema were evaluated in the study, consisting of 18 males (72%) and 7 females (28%). The average age of the patients was 44.7±24.4 years. Among the cases, 1 had stage 0 hyphema (4%), 13 had Stage 1 hyphema (52%), 5 had stage 2 (20%), 5 had stage 3 (20%), and 1 had stage 4 (4%).

At the time of presentation, the best-corrected visual acuity of the patients was 1.24±0.99 logMAR which increased to 0.16±0.27 logMAR at the last follow-up. The intraocular pressures were 25±13.4 at the initial visit and 13.4±9.9 at the last follow-up. Anti-glaucomatous treatment was initiated in 10 (40%) cases due to elevated intraocular pressure. An anterior chamber lavage was performed on 4 cases. In three of these cases, anterior chamber lavage was performed due to uncontrolled intraocular pressure, and this successfully brought the pressure under control. In one case, anterior chamber lavage was performed due to the risk of corneal staining with blood. In a case with stage 4 hyphema, it was known that the patient had no light perception prior to the trauma. Due to no light perception, retinal detachment, uncontrolled intraocular pressure, and the patient's pain, evisceration was performed.

The common findings accompanying hyphema included: 12% iridodialysis, 12% phacodonesis, 12% vitreous hemorrhage,

8% traumatic cataract, 8% corneal lamellar laceration and 8% commotio retinae. **Table** presents the findings associated with hyphema. In one case of traumatic cataract, the patient was monitored due to the presence of an early-stage cataract that did not show progression. In another case, due to the development of advanced-stage cataract, elective surgery was performed after the hyphema completely resolved. In one case with vitreous hemorrhage, vitreoretinal surgery was planned. During the surgery, it was observed that a total dialysis of the upper half of the retina, retinal pigment epithelium (RPE), and choroid occurred, reaching up to the optic disc, revealing bare sclera. This patient lost light perception due to advanced proliferative vitreoretinopathy. In the other two patients with vitreous hemorrhage, the hemorrhage resolved spontaneously. Pars plana vitrectomy was performed due to the development of a macular hole in a case following trauma, and the hole closed. In one case, the patient lost light perception following the development of optic atrophy due to uncontrolled glaucoma.

Table. Anterior and posterior segment complications accompanying traumatic hyphema

Findings accompanying hyphema	n	%
Eyelid laceration	1	4
Corneal lamellar laceration	2	8
Iridodialysis	3	12
Iris sphincter rupture	1	4
Phacodonesis	3	12
Traumatic cataract	2	8
Vitreous hemorrhage	3	12
Commotio retinae	2	8
Retinal detachment	1	4
Macular hole	1	4
Dialysis of the retina, RPE, and choroid	1	4

RPE: Retinal pigment epithelium

DISCUSSION

Traumatic hyphema is an important ocular condition characterized by the accumulation of blood in the anterior chamber of the eye, typically resulting from blunt or penetrating injuries.^{2,6} It is frequently observed in both pediatric and adult populations, especially among individuals participating in contact sports or working in hazardous environments.^{2,8} This condition can lead to serious complications, including increased intraocular pressure, corneal opacities, and in severe cases, permanent vision impairment.¹⁻⁶

The average best corrected visual acuity of the cases included in our study at the time of presentation was 1.24±0.99 logMAR. This average increased to 0.16±0.27 logMAR after the treatment process. Visual improvement was observed in 22 cases, while two patients lost light perception. One patient lost light perception due to uncontrolled glaucoma. The other lost light perception due to advanced posterior segment complications. One patient who underwent evisceration already had a negative light perception before the trauma. Bursalı et al.⁴ reported that the initial average visual acuity was 1.7±0.8 logMAR, and the final average visual acuity was 0.2±0.3 logMAR. Similarly, Ersöz et al.³ also reported a significant increase in visual acuity after treatment.

Elevated intraocular pressure frequently accompanies cases of traumatic hyphema. As the level of hyphema increases, the risk of elevated intraocular pressure also rises.² In the literature, the incidence of increased intraocular pressure following traumatic hyphema has been reported to be around one-third of all patients.^{2,3} In our study, elevated intraocular pressure was found to be 40%.

The elevation of intraocular pressure (IOP) is primarily due to several interrelated mechanisms. Initially, the presence of blood in the anterior chamber can obstruct the trabecular meshwork, which is responsible for draining aqueous humor from the eye. This obstruction leads to impaired outflow and subsequently increases IOP.^{2,4} A large blood clot in the anterior chamber can cause a pupillary block, resulting in an increase in intraocular pressure.^{2,4} Additionally, the trauma that causes hyphema can also induce inflammation, resulting in the release of inflammatory mediators. These mediators can contribute to increased permeability of the blood-aqueous barrier, allowing additional fluid and inflammatory cells to enter the anterior chamber. This accumulation further complicates drainage through the trabecular meshwork, exacerbating the rise in IOP.^{2,4} In summary, elevated intraocular pressure in traumatic hyphema arises from a combination of mechanical obstruction of the aqueous outflow pathways and inflammatory responses, necessitating careful monitoring and management to prevent potential complications.

If intraocular pressure remains uncontrolled, surgical intervention should be considered.^{2,9} In our study, anterior chamber lavage was performed in three cases (12%) where intraocular pressure could not be controlled, and this successfully brought the pressure under control. Additionally, anterior chamber lavage was performed in one case (4%) with corneal blood staining. Bursalı et al.⁴ reported performing anterior chamber lavage in a total of 3 cases (6.25%), including 1 case with persistently elevated intraocular pressure despite medical treatment and 2 cases at risk for corneal staining. Similarly, Ersöz et al.³ performed anterior chamber lavage in 3 cases (4.5%) to control intraocular pressure.

Complications in both the anterior and posterior segments are frequently associated with traumatic hyphema, often impacting visual acuity. The literature frequently cites complications such as traumatic cataract, vitreous hemorrhage, and phacodonesis accompanying traumatic hyphema.^{3,4,8,10-13} In our study, the most common complications associated with hyphema were iridodialysis (12%), phacodonesis (12%), and vitreous hemorrhage (12%). One case presented with vitreous hemorrhage along with extensive retinal, RPE, and choroidal dialysis. Despite undergoing vitreoretinal surgery, this case showed a poor prognosis.

CONCLUSION

Visual outcomes in cases of traumatic hyphema are generally favorable. However, the presence of accompanying complications, particularly those affecting the posterior segment, can negatively impact on visual results. Increased intraocular pressure, which is commonly encountered, can usually be controlled with topical anti-glaucomatous treatment. Treatment protocols often include monitoring of intraocular pressure, pharmacological interventions, and,

in some cases, surgical intervention. Close monitoring is essential during the treatment process and in the management of complications in cases of traumatic hyphema.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Tokat Gaziosmanpaşa University Non-intervention Scientific Researches Ethics Committee (Date: 04.03.2025, Decision No: 25-MOBAEK091).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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