

# Article • Pediatric Hyphema with a Secondary Bleed: Case Report on Childhood Trauma

Elizabeth Murray, OD • Memphis, Tennessee

Katie Connolly, OD • Indiana University School of Optometry • Bloomington, Indiana



**Elizabeth Murray, OD**  
Memphis, Tennessee

Optometrist at LeBonehur Pediatric  
Ophthalmology

Indiana University School of Optometry,  
Pediatric and Binocular Vision

Midwestern University Arizona College of  
Optometry, 2017

Oregon State University, 2012, BS in  
Biochemistry and Biophysics

## ABSTRACT

**Background:** Ocular trauma in childhood can have a lasting effect and is usually preventable with proper education and eye protection. A common manifestation of ocular injury caused by compressive or blunt force trauma is hyphema, which is blood accumulation in the anterior chamber following a tear in the iris or angle structures.

**Case Report:** A 6-year-old white male was referred by the local emergency department following a close-range airsoft gun shot to his left eye. He presented with extreme pain, photophobia, and blur. Visual acuities were attempted, but unsuccessful due to poor patient cooperation. Intraocular pressure was 12 OD and 9 OS. 3+ bulbar conjunctival injection, 2-3+ corneal edema greatest temporally, a small corneal abrasion, and a microhyphema were present. Seidel sign was negative. After 2 days of management, corneal abrasion had resolved, however, the hyphema had a secondary bleed filling 75% of the anterior chamber. A B-scan confirmed that the retina was flat and no vitreous hemorrhage was present. The patient was referred to pediatric ophthalmology and an anterior chamber washout was performed. Final visual acuity was 20/30.

**Conclusions:** Childhood traumas related to sports and recreation are often preventable with proper eye protection. These ocular traumas pose a challenge for eye care providers, as children

are often more difficult to examine and treat. As pediatric providers, we must educate patients, parents, and coaches on the importance of prevention.

**Keywords:** hyphema, pediatric trauma, secondary bleed

## Introduction

According to an 8-year study, 5,615,532 individuals with ocular injuries reported to emergency departments in the United States; 28% were in those under the age of 20.<sup>1</sup> Another 22 year retrospective study reported an average of 19,209 pediatric ocular sports and recreational related ocular injuries reporting to the United States Emergency Departments annually.<sup>2</sup> Pediatric ocular injuries often occur at home and are related to sports and recreational activities. Common non-penetrating injuries include corneal abrasions, foreign bodies, ocular burns, hyphemas, subconjunctival hemorrhages, and eyelid lacerations. Individuals ages 5-25 and over 70 are at a higher risk for injuries represented in a bimodal age-risk curve.<sup>3</sup> It has been reported that ages 5 to 8 are at an especially high risk due to magnitude and severity of hyphema that may lead to higher long-term complications. The combination of pediatric patients having not fully developed motor and cognitive skills makes them more susceptible to ocular trauma; males have a higher risk of ocular trauma compared to females by 1.8 – 5.4:1. The risk is higher, likely due to a more aggressive nature of activities, for males as compared to females.<sup>4</sup>

Ocular trauma in children is often preventable with proper eye protection, especially in sports related injuries. Miller et al. reported hyphema and lacerations more commonly required hospitalization compared to other types of ocular injuries.<sup>5</sup> Of those reported injuries, non-powder gun related accidents required hospitalization more compared to other sports related injuries.<sup>2</sup> A non-powder gun is one that uses compressed air, gases, or springs to fire instead of gunpowder. Examples of common non-powder guns are Air Soft, BB, pellet, and paintball

guns. The number of non-powder gun related injuries reporting to United States Emergency departments has increased by 511% between 2010 and 2012 and the trend has continually increased since.<sup>6</sup>

A hyphema is defined as accumulation of blood in the anterior chamber of the eye and is most often caused by a tear in the iris or an angle structure. The most common cause of this bleeding is traumatic injury from blunt or compressive forces causing injury to the vessels leading to accumulation of red blood cells in the anterior chamber. These traumatic injuries may be a result of direct impact of the ocular structures, projectiles, or as a result of an explosion. Spontaneous hyphemas are less common and are usually related to leaky, weak vessels that are formed in Sickle Cell disease or neovascularization due to ischemic conditions or neoplasms. Another cause of hyphema in pediatric patients is Juvenile Xanthogranuloma, a rare disease that usually presents in children less than 2 years of age. Visual prognosis is excellent in patients with an uncomplicated hyphema, however secondary complications such as optic atrophy, secondary glaucoma, cataracts, and corneal staining may lead to a poor visual prognosis.

### **Case Report**

A 6-year-old white male was referred by the local emergency department following a close range airsoft gun shot to his left eye that occurred without the use of safety glasses. He presented with extreme pain, photophobia, and blur. No history of medications or allergies were reported. Visual acuities were attempted, but unsuccessful due to poor patient cooperation. Pupils were round and reactive to light with the left pupil being sluggish compared to the right. Extraocular muscle movements were smooth, accurate, full, extensive and unrestricted in both eyes with left eye pain in all gazes. Confrontational fields were attempted with poor cooperation limiting results. Intraocular pressure was 12mmHg OD and 9mmHg OS with iCare Tonometer. Anterior segment for the left eye was remarkable for 3<sup>+</sup> bulbar conjunctival injection, 2-3<sup>+</sup> corneal edema greatest temporally, a corneal abrasion approximately 1.5mm round, and a microhyphema. No Seidel sign was observed with fluorescein. Dilated exam was difficult due to patient comfort, cooperation, and corneal edema, but a red reflex was present. 1 drop of Atropine 1% was instilled in the left eye in office. He was started on Durezol ophthalmic emulsion three times per day, 1% atropine sulfate solution twice a day, and erythromycin ointment twice a day in the left eye. He was instructed

to wear a Fox shield over the left eye to prevent rubbing, especially while sleeping. He and his mother were instructed on the importance of strict bed rest and that he was to sit at a 30-45 degree angle with no activity for the next week. He was originally seen over the weekend so the patient was scheduled for a follow-up on Monday morning. He was instructed to call immediately if vision or pain worsened.

The patient returned complaining of pain and headache two days later. The patient's mother had placed a patch over his left eye, not by instruction of the doctor, so he was unaware of whether or not his vision had changed. The patient's mother reported using all drops as directed in addition to alternating Tylenol and ibuprofen orally for pain. Visual acuity was attempted, but unattainable due to cooperation. Intraocular pressure of the left eye was 37mmHg with iCare. The corneal abrasion had resolved, however, there was a secondary bleed that filled 75% of the anterior chamber in the left eye. A dilated exam was not able to be performed due to obstruction of view from the secondary bleeding, however, the retina was flat and no vitreous hemorrhage was visible on B-scan. Anterior segment photography was attempted, but images were unobtainable due to cooperation of the patient. The patient and mother were given the option of going directly to the local emergency department and waiting for on-call ophthalmology for hospital admittance or waiting for the morning to be seen by the pediatric ophthalmology outpatient clinic. After a long discussion, the mother elected to wait until the next morning and to continue strict bed rest at home. He was instructed to discontinue Erythromycin, increase 1% atropine drops to three times daily, and only use Tylenol for pain. They were educated not to use NSAIDs due to risk of further bleeding. He was to continue with Durezol three times per day. Due to the increased intraocular pressure, one drop of Simbrinza was instilled in office and he was instructed to start use twice daily at home until the consultation with ophthalmology the next day.

The patient presented to the pediatric ophthalmology outpatient department with extreme discomfort, vomiting, and headache. Minimal testing was performed due to discomfort. Intraocular pressure was 36mmHg in the left eye with iCare. The patient was given oral Acetazolamide in office which successfully lowered intraocular pressure to soft to touch and less patient discomfort per the ophthalmologist's notes. It was reported that iCare was unable to be repeated after administration of medications. The ophthalmologist continued 1%

atropine twice a day, switched to 1% prednisolone acetate six times per day, Xalatan at night, and Dorzolamide twice a day in the left eye and planned for an anterior chamber washout for the next day.

Anterior chamber washout was successfully performed under anesthesia in the operating room of the local pediatric hospital and at the one-day post operation visit, pain and intraocular pressure had decreased. Two weeks following the surgery, the patient's final visual acuity was 20/30 and unfortunately he was then lost to follow up.

Since the patient was lost to follow up, important elements to monitor for further complications were not performed. Once the hyphema has been cleared, gonioscopy should be performed to monitor for angle recession and iridodialysis. The patient should continue to be monitored for secondary complications, such as glaucoma and optic atrophy with intraocular pressure, dilated funduscopy and optical coherence tomography. In addition to monitoring ocular health, a discussion about safety glasses and prevention methods with the parent and patient would also be included in follow up.

## Discussion

Although medical management is similar to adult cases with the focus being on supportive treatment and preventing a secondary bleed, there are some stark differences between pediatric and adult hyphema. Strict bedrest at a 30-45 degree angle to promote blood settling and decrease the risk of secondary bleeding is crucial. Children tend to be more active compared to adults, so consider hospitalization to ensure bed rest. Hospitalization may be additionally beneficial due to the ability to monitor more closely for intraocular pressure spikes, secondary bleeding, and corneal staining. In addition to limiting activity, topical treatment with cycloplegics and steroids can be used for pain and inflammation management. Additionally consider oral anti-emetics and a Fox shield for nausea and protection respectively. Intraocular pressure lowering medications may be used as needed with topical beta blockers, topical carbonic anhydrase inhibitors, or oral carbonic anhydrase inhibitors being the accepted modalities for pediatric patients. Although some sources suggest it is safe to use alpha-2 agonists in children over the age of 5, some ophthalmologists and optometrists, including the ophthalmologist treating the patient in this case, typically avoid alpha-2 agonists due to central nervous system side effects in patients under the age of 8. In the past, antifibrinolytics have been used and thought to prevent secondary

bleeding, but have a high incidence of side effects.<sup>7</sup> In more recent studies, antifibrinolytics, aminocaproic acid (ACA) and tranexamic acid (TXA), have been said to be effective in the prevention of rebleeding without prevention of other complications. Topical ACA may be an alternative when steroids are contraindicated.<sup>8</sup> The prevention of secondary bleeding has historically been the main goal of hyphema treatment due to the increased risk of visual impairment. In this particular case, secondary bleeding did not have a detrimental effect on final visual acuity. Final visual acuity relates more to type and severity of initial injury with open globe injuries significantly relating to poorer visual outcomes.<sup>4</sup>

A secondary bleed is a result of a clot being lysed from the bleeder vessel that it has blocked and typically occur 2-7 days after the initial injury.<sup>8,9</sup> Re-bleeding can be prevented by limiting eye rubbing and movements of the patient and also with the use of pharmaceutical agents, such as corticosteroids or antifibrinolytics.<sup>8,9</sup>

Young patients are especially difficult to examine when in pain as there is limited ability to reason or negotiate with them compared to adults. When evaluating pediatric patients, consider the risks involved in attempting examination elements with poor cooperation versus the benefits. It is suggested to approach pediatric ocular traumas in a systematic manner; rule out and manage other injuries, differentiate between open and closed globe injuries, and attempt to evaluate vision in both the injured and uninjured eye, and seek an additional opinion if treatment does not respond as expected.<sup>5</sup>

A thorough case history is required as it is important to rule out any suspicion of abuse. A systematic review in the United Kingdom found that all kids presenting from physical abuse with ocular injuries presented with a subconjunctival hemorrhage and urged pediatric physicians to be suspicious of non-accidental injuries. One third of patients in that study were not identified as abuse victims on initial presentation.<sup>10</sup> In this same study, they found traumatic hyphemas from non-accidental injuries caused by corporal punishment and were more common in 4-14 year old patients.<sup>10</sup>

When treating children after trauma, it is important to educate both the child and the parent on long-term effects and the risks of complications in the future, including cataracts and the increased risk of glaucoma. About 40% of traumatic cataracts following traumatic hyphema require surgery within 2 months following the injury and present as early as 2 weeks post injury.<sup>11</sup> Encourage regular dilated exams and gonioscopy to monitor for delayed complications

even after resolution of the hyphema. Young children do not realize their compliance and cooperation may affect their future, so you must ensure the parent realizes the seriousness of this condition in order to support the management plan outside of your office.

Although being proficient in the examination and treatment of pediatric trauma is important, the optimal treatment is prevention. In a retrospective study by Lee and Fredrick, out of 71 cases reporting eye protection status in non-powder gun related injuries, only one patient was purposely wearing sunglasses for protection, demonstrating the lack of public knowledge of the importance of safety glasses when using these devices.<sup>2</sup>

Optometrists are well trained and qualified to manage complex hyphema cases. However, as in the case presented above, an uncooperative child with a secondary bleed may require an exam under anesthesia. This can be considered to ensure a thorough posterior segment evaluation. Surgical intervention is warranted in 5-7.5% of cases.<sup>8</sup>

## Conclusion

Although traumatic hyphema in children is uncommon, there may be serious long-term complications including glaucoma, optic atrophy, and decreased vision. Evaluation in children is often more challenging given poor cooperation when children are in pain. Health care providers should use precautions to avoid further injury while evaluating young patients whom are not cooperating; judgments should be made in weighing what tests are most important and most effective in these situations and which tests can be sacrificed.

Ocular injuries are often preventable with proper protection; parents and coaches should become more aware of the importance of prevention through protective eyewear. Optometrists can help by discussing the importance of safety eye wear as well as the dangers of eye injuries, especially with non-powder guns, during comprehensive vision exams.

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*Correspondence regarding this article should be emailed to Elizabeth Murray, OD, at [enmurray24@gmail.com](mailto:enmurray24@gmail.com). All statements are the authors' personal opinions and may not reflect the opinions of the representative organizations, ACBO or OEPF, Optometry & Visual Performance, or any institution or organization with which the authors may be affiliated. Permission to use reprints of this article must be obtained from the editor. Copyright 2020 Optometric Extension Program Foundation. Online access is available at [www.oepf.org](http://www.oepf.org), and [www.ovpjjournal.org](http://www.ovpjjournal.org).*

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