Pediatric Ocular Injuries From Airsoft Toy Guns

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ABSTRACT

Purpose: To report ocular injuries caused by airsoft guns in children.

Methods: A retrospective chart review of pediatric patients who sustained ocular injuries related to airsoft guns between November 2005 and December 2007. Place of trauma, presenting symptoms and signs, surgical interventions performed, and final visual outcome were reviewed.

Results: Thirty-two patients with a mean age of 8.8 ± 4.0 years (range: 1.5 to 18 years) were examined; 28 were boys (87.5%). Presenting visual acuity ranged from hand motions to 20/20 and could not be assessed in 2 patients. Hyphema was a common finding that was present in 24 cases, corneal abrasions were present in 10 cases, and raised intraocular pressure was present in 7 cases. Seven patients presented with traumatic cataract, and two had iridodialysis. Immediate surgical intervention was performed in 7 patients and 7 patients were scheduled for elective surgery. The patients presented after an average of 1.9 ± 1.9 days (range: 4 hours to 6 days) after the injury. Average follow-up was 18 days (range: 7 days to 5 months). Final visual acuity was 20/200 or worse in 5 patients, 20/40 or better in 23 patients, and could not be assessed in 2 cases.

Conclusion: Airsoft guns can cause a variety of serious injuries, sometimes necessitating operative intervention. The long-term morbidity from some of these injuries is significant. Airsoft guns are capable of inflicting serious and permanent ocular damage.

INTRODUCTION

Ocular trauma is one of the significant causes of visual disability in children. Airsoft guns are non-powder firearms in which a plastic pellet is propelled by compressed gas. The gas may be compressed by a powerful spring or by the repetitive pumping of air into a gas chamber. Physicians usually have a tendency to underestimate the injuries caused by airsoft guns. During the past two decades, airsoft gun weapons capable of penetrating the human body were manufactured. This work aims to draw attention to this emerging problem and to prevent serious eye injuries in children resulting from airsoft guns. The study reviews a series of 32 children who sustained ocular injuries from airsoft guns.

PATIENTS AND METHODS

The hospital medical records were reviewed for all patients who presented to the ophthalmology department of Assiut University Hospital between November 2005 and December 2007 following injuries sustained from airsoft guns. Assiut University Hospital is a tertiary care medical center, located in Assiut, Egypt. It serves more than 5 million Egyptians from all over the northern part of Upper Egypt. Demographic information (age, sex, and geographic-
cal location of accident), extent of injury, details of the accident, operative procedure, complications, and long-term morbidity were reviewed.

**RESULTS**

The clinical records of 403 patients evaluated by the ophthalmology emergency department of Assiut University Hospital for ocular trauma between November 2005 and December 2007 were reviewed. During this period, 32 cases of ocular trauma by airsoft guns were encountered, accounting for 8% of all cases of ocular trauma. Nineteen of the cases (59.4%) were admitted to the inpatient floor and the remainder were treated as outpatients. The mean hospital stay for the hospitalized patients was 4 days (range: 1 to 32 days). None of the 32 children had means for ocular protection at the time of the ocular injury. The follow-up schedule frequency was dependent on the severity of the injury.

The mean age of those patients was 8.8 ± 4.0 years (range: 1.5 to 18 years) and 28 were boys (87.5%). The assailant was a family member or a friend in 24 cases (75%) and unknown to the victim in 8 cases. All of the traumatic events occurred in or around the child's home. Presenting visual acuity ranged from 20/20 to hand motions and could not be assessed in 2 patients.

Hyphema was classified as (1) trace: layered blood occupying less than one-third of the anterior chamber; (2) mild: blood filling one-third to one-half of the anterior chamber; (3) moderate: layered blood filling one-half to less than total of the anterior chamber; and (4) severe: total clotted blood, often referred to as blackball or 8-ball hyphema.

Traumatic hyphema was the presenting feature of 24 patients (16 had mild, 3 had moderate, and 5 had total hyphema). Four cases required urgent drainage of hyphema, in 3 cases the indication was total hyphema with persistent rise of intraocular pressure above 50 mm Hg, and in one case the indication was persistence of total hyphema and commencement of microscopic blood staining of the cornea (Table). The remaining 20 cases of hyphema were managed conservatively with a topical cycloplegic, topical steroid, eye shield, and elevation of the head of the bed.

Corneal abrasions occurred in 10 cases and all recovered in less than 48 hours. The observed abrasions were either circular or oval shaped at the site of impact.

Intraocular pressure was elevated initially in 7 cases; in 3 it persisted and warranted evacuation of hyphema, whereas in the remaining 4 cases, intraocular pressure was controlled medically until resolution of hyphema. By the end of our follow-up, we did not detect any case of angle recession.

Seven (21.9%) of the patients required 10 urgent surgical interventions during their initial hos-

<table>
<thead>
<tr>
<th>Effect of Injury</th>
<th>No. of Patients</th>
<th>No. of Surgical Interventions</th>
<th>Visual Disabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyphema (24)</td>
<td>I/A of hyphema (7)</td>
<td>2 cases of blood staining of the cornea, both hemophiliacs</td>
<td></td>
</tr>
<tr>
<td>Mild (1/3 of AC height)</td>
<td>16</td>
<td>1 hemophiliac patient (3)</td>
<td></td>
</tr>
<tr>
<td>Moderate (2/3 of AC height)</td>
<td>3</td>
<td>1 hemophiliac patient (2)</td>
<td></td>
</tr>
<tr>
<td>Total hyphema</td>
<td>5</td>
<td>2 cases (2)</td>
<td></td>
</tr>
<tr>
<td>Cataract (7)</td>
<td>Urgent I/A without IOL implantation (3)</td>
<td>4 cases of unilateral aphakia + 3 cases of pseudophakia</td>
<td></td>
</tr>
<tr>
<td>With intact capsule</td>
<td>I/A + PC-IOL 3 weeks later (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subluxated lens</td>
<td>ICCE without IOL implantation (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corneal abrasions</td>
<td>10</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Iridodialysis</td>
<td>2</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Vitreous hemorrhage</td>
<td>1</td>
<td>Resolved in 1 month on conservative treatment</td>
<td></td>
</tr>
</tbody>
</table>

I/A = irrigation/aspiration; AC = anterior chamber; IOL = intraocular lens; PC-IOL = posterior chamber intraocular lens; ICCE = intracapsular cataract extraction.
Hospitalization. Of those, one patient with hemophilia required three successive surgeries to evacuate hyphema and another child with hemophilia required two evacuation procedures despite receiving intensive factor VIII therapy. Two children had a hyphema drainage surgery and 3 children underwent urgent cataract extractions for ruptured crystalline lenses.

Seven children had visually significant traumatic cataracts. Three of them had urgent irrigation/aspiration of the ruptured lens without intraocular lens (IOL) implantation. The surgical plan was to perform delayed secondary posterior chamber intraocular lens (PC-IOL) implantation, which was not done originally due to lack of adequate capsular support. Three patients underwent irrigation/aspiration of cataract with PC-IOL implantation 3 weeks after the initial trauma. One patient had cataractous subluxated lens and underwent intracapsular cataract extraction without IOL implantation. One patient had traumatic cataract and iridodialysis (Fig. 1).

Average follow-up was 18 days (range: 7 days to 5 months). Final visual acuity was 20/200 or worse in 5 patients, 20/40 or better in 23 patients, and could not be assessed in 2 cases. Eight patients (25%) sustained permanent visual disability related to traumatic cataracts.

**DISCUSSION**

Most ocular injuries caused by airsoft guns in our study led to temporary visual loss. However, permanent visual disability, mostly due to traumatic cataracts, resulted in several patients. Home is the most common site for accidents, especially in children.1,10

An airsoft gun is found as a toy in many department stores. The Consumer Product Safety Commission has estimated that non-powder weapon injuries result in 21,756 trips annually to emergency departments in the United States.11 Therefore, non-powder firearms pose a significant public health hazard to children and untrained adults who use them for play.12,13

In our study, patients presented after an average of 1.9 days (range: 4 hours to 6 days). This may indicate the lack of parental awareness of the seriousness of trauma with airsoft guns. In some instances, children presented as late as 6 days after being treated with decongestant eye drops by general practitioners. This may reflect the false sense of security among physicians facing such a trauma.

When compared to ocular injuries caused by paintball pistols, our series did not include any cases with corneal/corneoscleral ruptures or retinal breaks.14 Although airsoft guns are similar in operation and muzzle velocity (300 to 400 feet/second) to paintball guns, airsoft guns use lighter weight projectiles (Fig. 2). The difference in momentum of the projectiles may explain the more severe ocular morbidities caused by paintball guns.

To this end, recommendations based on this and other reports in the literature may be made regarding the management of airsoft gun injuries4,15-18:

Ocular trauma by airsoft guns mandates thorough ophthalmic examination should be conducted and any damage detected should be managed promptly. A careful history for any hematological disorder is particularly important in cases of trauma with airsoft guns and such a disorder can lead to recurrence of hyphema after evacuation with higher risk of blood staining of the cornea and secondary glaucoma. Use of protective eye wear is mandatory to protect against ocular injuries caused by airsoft guns. In patients with visually significant cataract without capsular rupture, the decision to perform cataract extraction should be postponed at least for 3 weeks to allow subsidence of anterior uveitis. On the other hand, immediate irrigation/aspiration of the ruptured lens with delayed secondary PC-IOL implantation after at least 2 months is indicated.
The airsoft gun is a weapon and not a toy. Review of our cases and of the numerous reports of airsoft gun injuries has led us to the conclusion that such weapons should not be left in the hands of children. Until stricter control is exercised over the sale and design of these weapons, the role of the pediatrician, emergency physician, and surgeon in educating families cannot be overemphasized. Parents should be instructed about the potential for serious injury with airsoft gun use by children and inadequately trained adults.

REFERENCES
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