Ocular injuries caused by airsoft guns - ten-year experience

Miloš Jovanović1,2, Anica Bobić-Radovanović1,2, Dragan Vuković1,2, Miroslav Knežević1,2, Dušica Ristojević1,3
1Faculty of Medicine, University of Belgrade
2Clinic for Eye Diseases Clinical Centre of Serbia, Belgrade
3Clinic for Eye Diseases Clinical Center “Zvezdara”, Belgrade

INTRODUCTION: The study describes ocular injuries caused by airsoft guns pellets, type of these injuries and their incidence in different age groups.

METHODS: This is a retrospective review of medical charts of patients who were hospitalized due to airsoft guns ocular injuries in ten-year period (from 2000 to 2009). Patient’s age, gender, duration of hospitalization, type of treatment and initial and final visual acuity were analyzed.

RESULTS: Overall 92 patients with ocular injuries caused by airsoft gun pellets were hospitalized in ten-year period. In all patients only one eye was injured and there were 72 (78.3%) male patients. Injuries involved ocular adnexa, anterior and posterior segment of the eye. On initial examination 41 (44.6%) patients were presented with subconjunctival hemorrhages, 42 (45.6%) with corneal abrasion, 42 (45.6%) patients had corneal edema, 6 (6.5%) had traumatic mydriasis, 90 (97.8%) patients exhibited hyphema, 10 (10.9%) iridodialysis, in 27 (29.3%) patients high intraocular pressure (IOP) was measured, one patient had subluxation of intraocular lens (IOL) and one patient had traumatic cataract. Posterior segment findings included vitreous hemorrhage in 3 (3.3%) patients, retinal hemorrhage in 15 (16.3%) patients, retinal edema in 35 (38.0%) patients and one patient had globe rupture. Average duration of hospitalization was 5.7 days (range from 1 to 18 days). Three patients (3.3%) required eye surgery, eight patients (8.7%) had anterior chamber washout while rest of the patients were conservatively managed. Visual acuity at hospital release was significantly improved compared to initial visual acuity, ranging from counting fingers at 1 meter to 20/60 in 7 (8.6%) patients, from 20/50 to 20/30 in 13 (16.0%) patients and from 20/25 to 20/20 in 61 (75.3%) patients. In 11 patients testing the visual acuity was not possible because of their young age.

CONCLUSION: Injuries attributed to airsoft guns were confined mostly to anterior segment. There was also high percentage of severe posterior segment trauma requiring hospital admission. The most important factors in preventing such injuries are restricting access to airsoft guns, especially to minors, as well as mandatory use of protective equipment such as protective eyeglasses.

Key words: airsoft guns, ocular injuries, treatment, visual acuity

INTRODUCTION

As the most of innovations originating either from Europe or the USA gain their popularity in countries of Western Balkans and Serbia with few years of delay, so did the popularity of airsoft guns. Presence of airsoft guns and growth of its popularity brought higher incidence of associated ocular injuries. To our knowledge, data regarding rates of such injuries from Serbia has not yet been published. Nature of airsoft guns, principles of their functioning and airsoft gun pellet characteristics were described with much detail in other studies. Most of previous studies indicate that airsoft gun pellets usually lead to anterior segment trauma. Airsoft gun trauma in comparison with injuries caused by air guns and paintball guns is less severe.

Purpose of our study was to document and describe injuries resulting from airsoft guns in Serbia and to compare it with the results from previous publications.

METHODS

A retrospective review of medical charts of patients injured by airsoft gun pellets was performed. The patients were hospitalized due to severity of injuries at Clinic for
eye disease, Clinical Centre of Serbia in ten-year period (from 2000 to 2009). Each patient underwent a complete ocular examination by an ophthalmology resident at emergency department, following an examination by ophthalmology specialist. Hospital admission was indicated by ophthalmology specialist. Ophthalmological examination included: visual acuity testing, slit lamp biomicroscopy, IOP measurement with Goldmann aplanation tonometry and, if media transparency allowed, slit lamp fundus examination with a 90 D lens. Patients were thoroughly followed-up and were treated medically or surgically (anterior chamber washout or operation). The final visual acuity was assessed in all patients at the day of hospital release.

RESULTS

There were 3206 hospitalized patients due to mechanical ocular injuries during ten-year period (from 2000 to 2009). Among them 92 (2.9%) had ocular trauma caused by pellets fired from airsoft guns. There were 72 (78.3%) males and 20 (21.7%) females. All patients had monocular trauma whereby right and left eye were equally affected (46 patients for right and 46 patients for left eye). Mean age of patients was 13.8 years with the majority of injured belonging to the first life decade (41 patients, 44.6%), following the second decade (46 patients, 43.5%). The age of injured patients is illustrated in figure 1. The type of injuries is presented in table 1.

Duration of hospitalization ranged from 1 to 18 days, with average of 5.7 days. Most of the patients were conservatively managed while 8 patients (8.7%) had anterior chamber washout due to hyphema. Remaining 3 patients (3.3%) underwent surgery. Comparing to presenting, visual acuity at the end of hospitalization was significantly improved. Presenting and final visual acuity (at the end of hospitalization) is illustrated in figure 2.

DISCUSSION

Even though airsoft guns are toys and look like harmless replica of a real gun, they can potentially cause substantial ocular injuries. In our study male to female ratio was 3.6:1 which is comparable with ratio of other mechanical trauma. Average age of patients was 13.8 which is in accordance with previous reports1, 2, 4. There were 81 (88.0%) patients under 20 years of age and 11 children of five and younger. Among these children there was even a one year old baby that was injured by his older brother. The oldest patient was 79 years old. Most of injuries were related to anterior segment of the eye. Commonly observed findings included hyphema (90 patients, 97.8%), corneal abrasion (42 patients, 45.6%) and corneal edema (42 patients, 45.6%). Elevated intraocular pressure (IOP) was registered in 27 (29.3%) patients and iridodialysis was seen in 10 (10.9%) patients. One 65 year old patient has developed traumatic cataract after being shut from a near distance by his grandson (with a gun that he bought to his grandson the very same day). Except for the traumatic cataract, this patient also exhibited iridodialysis, hyphema, anterior lens capsule rupture and high IOP. This patient required surgery. Surgery was also indicated in a case of 61 year old pseudophakic male who had IOL dislocation in vitreous body. Our patients had slightly higher percentage of posterior segment trauma in comparison with the results of previous studies2,3. Retinal edema was demonstrated in 35 (38.0%) patients, retinal hemorrhage in 15 (16.3%) patients and vitreous hemorrhage in 3 (3.3%) patients. One patient suffered from globe rupture with iris prolapse. He was one of three surgically managed patients. In 8 (8.8%) patients total hyphema that did not respond to conservative therapy was associated with high IOP, in some cases even above 60 mmHg. These patients required anterior chamber washout. Duration of hospitalization mostly depended on speed of hyphema resolution and on the outcome of other findings. The severity of airsoft gun injuries is evident from presenting and final visual acuities of patients. Even though visual acuity was improved at hospital releasing in 61 (75.3%) patients, 16 (16.0%) patients had subnormal and 7 (8.6%) patients had very low visual acuity. In 11 cases visual

![Figure 1. AGE OF PATIENTS WITH AIRSOFT GUN INJURIES](image1)

![Figure 2. PRESENTING AND FINAL VISUAL ACUITY (N=81)](image2)
acuity could not have been estimated due to their young age.

**CONCLUSION**

Our findings revealed that pallets from airsoft guns can potentially cause substantial ocular injuries and that victims of these kinds of injuries should be hospitalized. Another proof of severity of these kinds of injuries is that the final visual acuity was below normal in one third of patients. Although the most common injuries were related to adnexa and anterior segment of the eye, in certain cases posterior segment of eye was affected. One individual suffered from globe rupture so that surgery was inevitable. The most important factors in prevention of such injuries are restricting access to airsoft guns, especially to minors, as well as mandatory use of protective equipment such as protective eyeglasses.

**SUMMARY**

POVREDE OCIJU UZROKOVANE VAZDUŠNIM PIŠTOLJEM - desetogodišnje iskustvo

Uvod: U radu su predstavljene povrede oka nanete projektilom iz vazdušnog pištolja, ušestalost tih povreda po godinama ‘ivota i priroda povreda.


Rezultati: U posmatranom desetogodišnjem periodu ukupno su hospitalizovana 92 pacijenata sa povredom oka metkom iz vazdušnog pištolja. Povredjena su 72 (78,3%) muškarca. Povrede su uvek zahvatale samo jedno oko. Povrede su registrovane na adneksima oka, prednjem segmentu i zadnjem segmentu očne jabučice. Kod 1 (1,1%) povredenog je postojalo subkonjunktivalno krvarenje, kod 42 (44,6%) abrazija ro'nja, kod 42 (45,6%) edem ro'nja, kod 6 (6,5%) traumatska midrijaza, kod 90 (97,8%) hifema, kod 10 (10,9%) iridodijaliza. Kod 27 (29,3%) povredjenih je registrovan povišen intraokularni pritisak. Kod jednog pacijenta je postojala traumatska katarakta, a kod jednog subluxacija intraokularnog sočiva na pseudofaknom oku. Na zadnjem segmentu očne jabučice kod 3 (3,3%) povredjenog je postojalo krvarenje u staklastom telu, kod 15 (16,3%) retinalno krvarenje, kod 35 (38,0%) edem retine. Kod jednog pacijenta je registrovana ruptura očne jabučice. Trajanje hospitalizacije prosečno je iznosilo 5,7 dana (od 1 do 18 dana). U 81 (88,0%) slučajevima je primenjena konzervativna terapija, kod 8 (8,7%) povredjenih je učinjena laža učenja. Očne jabučice, a 3 (3,3%) obolela su tretirana hirurški. Vidna oštrina pri otpustu je bila znatno bolja nego pri prijemu i iznosila je od 1/60 do 0,3 kod 7 (8,6%) pacijenata, od 0,4 do 0,7 kod 13 (16,0%), a kod 61 (75,3%) povredjenog je bila od 0,8-1,0. Kod jedanaestoro povredjenih dece mladje od pet godina vidna oštrina nije mogla biti odredjena.

Zaključak: Povrede oka metkom iz vazdušnog pištolja najčešće su zahvatile strukture prednjeg segmenta očne jabučice, ali su u visokom procentu slučajeva postojala i oštećenja zadnjeg segmenta očne jabučice. Povrede su bile ozbiljne i bila je neophodna hospitalizacija. Ove povrede se mogu prevenirati kontrolisanom prodajom vazdušnih pištolja, posebno dece. Treba razmišljati i o obaveznom nošenju zaštitnih naočara pri igri sa vazdušnim pištoljem.

Ključne reči: vazdušni pištolj, povrede oka, terapija, vidna oštrina

**REFERENCES**


**TABLE 1.**

<table>
<thead>
<tr>
<th>Adnexal injuries</th>
<th>Anterior segment injuries</th>
<th>Posterior segment injuries</th>
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<tr>
<td>LC 1</td>
<td>SCH 41</td>
<td>CA 42</td>
</tr>
<tr>
<td>1.1%</td>
<td>44.6%</td>
<td>45.6%</td>
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</table>

LC-conjunctival laceration; SCH-subconjunctival hemorrhage; CA-corneal abrasion; CE-corneal edema; TM-traumatic mydriasis; HYPH-hypHEMA; ID-iridodialysis; IOP-intraocular pressure; CAT-cataracta; DIOL-dislocation of IOL; VH-vitreous hemorrhage; RH-retinal hemorrhage; RE-retinal edema; RG-globe rupture