Ocular Injuries Caused by BB Gun

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• Abstract

Background- Ocular injuries caused by BB guns (civil air-powered guns) are serious and may result in total loss of vision. These injuries occur more frequently in children and young adults.

Methods- A total of 16 patients with BB gun injuries were seen between September 1996 and September 1999 in Farabi hospital, Tehran University of Medical Sciences and a private eye clinic. Six patients had non-perforating eye injuries. Among 10 cases of perforating eye injuries, 2 had single and 8 had double perforations. All of perforated eyes underwent scleral buckling, lensectomy, vitrectomy and silicone injection, after a period of one to two weeks of observation or until a retinal detachment, retinal traction or posterior vitreous detachment was noted on ultrasonography.

Results- Of the 16 patients with BB gun injuries, 15 (93.7%) were males and 1 (6.3%) was female with a variation of age ranging from 3 to 50 years (mean=20.6); 9 (56.2%) of them were 18 years of age or younger. All patients had a preoperative visual acuity of at least light perception. They all had a final visual acuity of hand motion or better. Ten patients achieved a score of 1/10 or better and 5 patients had scored 3/10 or above.

Conclusion- This study shows that various vitreo-retinal surgical procedures can help retain vision in some cases of ocular injuries caused by BB gun pellets.

Keywords • BB gun • eye injuries

Introduction

Due to the delicate nature of ocular tissues, an injury deemed insignificant elsewhere in the body would be a serious one in the eye and may result in immediate or eventual total loss of vision. These injuries occur more frequently in children and young adults.

Before the advent of vitrectomy techniques, which improved the visual and restored the anatomic outcomes,1 most perforating eye injuries resulted in enucleation.2,3

The BB gun is a civil air-powered gun. Ocular injuries caused by these guns are not uncommon in Iran. Community awareness of the danger of air-powered guns is the first step in the process of preventing injuries and represents an area in which ophthalmologists can make a significant contribution to the prevention of blindness.

Patients and Methods

Sixteen patients with BB gun injuries who attended a private eye clinic or Farabi Hospital, Tehran between September 1996 and September 1999 were included in this study. The anatomical and functional status of the eyes were reviewed on initial examination (before repair) and then at the time of surgery. Initial visual acuity after injury, presence or absence of an afferent pupillary defect, orbital fracture, lid laceration, lens damage, vitreous hemorrhage and its severity, and retinal damage (including retinal detachment and type and number of breaks) were noted and recorded. B-mode echography and CT scans were performed in all cases with significant media opacity and in patients with globe perforation. Single or double penetrating wounds and the location of any intraocular pellet were noted.
Globes were explored, and the entrance wound was primarily repaired. However, repair of the posterior wound was not possible in most cases. Eyes with severe irreparable injuries, no light perception (NLP) and 4+ afferent pupillary defect (APD) were usually enucleated after at least one week of observation by the ocular trauma service and subsequently excluded from the study. Among the 10 perforating injury cases, 8 had double and 2 had single perforations. Six patients had non-perforating eye injuries. All of perforated eyes underwent scleral buckling, lensectomy, vitrectomy (standard three-port), endophotocoagulation and silicone injection, after a period of one to two weeks of observation or until a retinal detachment, retinal traction or PVD was noted in ultrasonography.

Details of all primary and subsequent surgical procedures were recorded regarding the anatomic status of the eye, (including development of corneal opacity), cataract, pupillary membrane, retinal detachment, glaucoma, phthisis bulbi, length of follow-up, and final best corrected visual acuity.

**Results**

Of the 16 patients with BB gun injuries, 15 (93.7%) were males and one (6.3%) female. The age of the patients at the time of injury varied from 3 to 50 years (mean=20.6); nine of them (56.2%) were 18 years or younger and the follow-up varied between one to 30 months (average=7.5). The visual acuity at presentation was light perception (LP) with poor projection in 4 cases, LP with good projection in 4 cases, hand motion (HM) in 2 cases and finger counting (CF) 1m to 2/10 in 6 cases. Afferent pupillary defect ranged between 1+ to 4+.

Vitreous hemorrhage was present in all cases. Hemorrhagic choroidal detachment found by echography, was evident in 6 cases. In 3 cases, subretinal hemorrhage was noted during the surgery. Macular perforation or contusions were noted in 6 cases.

The entrance site was sutured in all perforated eye injuries but the exit wound could not be closed in most cases. All of the 10 perforated cases had successful lensectomy, vitrectomy, placement of a scleral buckle, and silicone injection. The timing of vitrectomy, ranged from 10 days to 6 weeks after injury. Of the 6 non-perforated cases, 3 had commotio-retinae, 2 had chorioretinitis sclopetaria, and one had commotio-retinae with sclopetaria; two of these cases had retinal dialysis.

All patients had a final visual acuity of hand motion. Ten patients achieved a score higher than 1/10; 5 of them above 3/10. Clinical data and visual activity results are shown in [Table 1](#).  

**Discussion**

This study shows that BB guns can cause serious eye lesions. In the majority of our cases vision was seriously affected. Most of these patients were aged 18 years or younger and only one was female. A similar male predominance has also been reported in other studies. 4,5,6 Findings show that non-perforating eye injury is associated with better visual prognosis.7 Much of the damage of BB gun injury may be caused at the time of initial contusion, prior to perforation.8 These contusion effects cause a large part of the intraocular damage.

There was loss of intraocular contents as well as incarceration of the retina and vitreous in the exit wound of all patients; hence adherent vitreous should be excised completely during vitrectomy.

Reports of pre-vitrectomy era show that 90% of eyes with BB gun injuries were enucleated. 9,10 Modern vitrectomy techniques have led to improved visual outcomes.1 A major objective of the pars plana vitrectomy is to remove the scaffold along with the proliferation and contraction. However, the operation is usually deferred for at least 1 week, until the posterior wound has formed a plug and the
posterior vitreous has been detached.\textsuperscript{11,12}

As in our series, other studies show that most patients were shot by a friend or relative, were innocent bystanders or were assaulted with a BB gun.\textsuperscript{13} Initial visual acuity has been shown to be a significant prognostic factor in adult eyes sustaining a ruptured globe. In this study, however, initial visual acuity appears to be a less reliable predictor of the final visual outcome. In contrary to other perforating eye injuries, we found a definite correlation between wound size and the eventual visual outcome. BB gun related injuries usually show round entrance wounds and severe global damage.\textsuperscript{14}

The problem of air gun injuries have been recognized in other countries, where attempts have been made to regulate their use.\textsuperscript{2} Parents and children must be educated about the eye injuries and visual defects caused by BB guns. It is necessary for parents to be fully aware of these consequences before purchasing these guns.\textsuperscript{15,16} All participants in war games are strongly encouraged to wear protective polycarbonate lenses.\textsuperscript{16,17} A complete ban on the sale or use of air guns would be ideal, although an alternative approach might be to alter the construction of the gun in order to reduce its potential to cause eye injury.

References

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