

You'll Shoot Your Eye Out!
(Or... It's all fun and games until someone sustains a blinding ocular injury.)
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The dangers of eye injury in airsoft were known even before airsoft existed. You could go all the way back to the 1950's when Ralfie in a Christmas Story told his parents he wanted an "official Red Ryder carbine-action, two hundred shot Range Model air rifle with a compass in the stock, and this thing which tells time." (Can you say "original Gear-do?") The medical literature has documented air-gun eye injuries for decades and specifically paintball injuries since 1985 (Easterbrook M., Pashby T.J.: Eye injuries associated with war games. *Can Med Assoc J* 133. 415-419.1985), but airsoft-related eye injuries don't show up in the medical literature until 1999. In this article, I will describe what is known about airsoft eye injuries and how they differ from paintball injuries.

Several series reports have been published describing types of airsoft eye injuries. The severity of injuries in these papers is always skewed toward the most severe injuries because they are based on cases that present to large hospitals and eye referral centers. They do not account for the much more frequent minor injuries that are never seen by a doctor or are easily treated outside of the referral center environment. Even with this slant toward the more serious end of the spectrum, airsoft eye injuries are mostly minor and have relatively little permanent effect on the victim's vision. The injuries almost always occur in a person who was not wearing any form of eye protection and never in a person wearing a product manufactured for the purpose of protection in airsoft.

Eye injuries from blunt trauma can generally affect the eye in one or more of three regions. There are anterior (front of the eye) injuries, posterior (back of the eye) injuries, and adnexal (bones of the orbit and eyelids) injuries. The anterior injuries are the most common. The most common anterior injuries are hyphema, corneal abrasion, and corneal edema. Hyphema is seen in more than two-thirds of cases in most reports. It is a puddle of blood sitting in the eye between the clear cornea of the front of the eye and the colored iris just behind the cornea. The puddle is curved on the bottom, following the rim of the cornea, with a flat top, usually somewhere under the pupil, but sometimes taking up the entire space between the cornea and the iris. A hyphema should be evaluated by an Ophthalmologist without delay. The eye usually resorbs the blood over time with the help of treatment by an Ophthalmologist. It can result in glaucoma (high eye fluid pressure) later in life. Corneal abrasion was also present in about two-thirds of patients. A corneal abrasion occurs when a bb scrapes off a portion of the outside layer of the cornea. This will heal spontaneously if there is no other associated injury. It is protected until it heals by applying antibiotic ointment or drops. Corneal edema which occurs in about two-thirds also is simply swelling of fluid in the cornea, potentially causing blurred vision. It resolves spontaneously, but can be uncomfortable. About half of patients develop traumatic iritis which is a painful inflammation of the colored iris of the eye. It causes the pupil to have little to no normal reaction to light. Drops of anti-inflammatory medication are adequate to treat it along with oral pain medication. More serious anterior effects like cataracts and increased eye pressure that can decrease visual acuity are much less common, occurring in less than 20% of cases.

Posterior eye injuries are more serious. These injuries affect eye structures behind the iris. The two posterior effects reported in the largest series are retinal edema and retinal hemorrhage. Retinal edema occurs in one-quarter to one-third of patients. It happens when there is swelling of fluid in the light-sensing portion of the eye lining the back of the eye. It causes a temporary distortion of vision. The more serious retinal hemorrhage occurs in two to ten percent of injuries. It is bleeding of the back of the eye and must be immediately treated by an Ophthalmologist. The good news is that most cases recover with little to no loss of vision if treated quickly. The largest airsoft series found mean follow-up visual acuity to be 20/25 (Kratz A, et al: Airsoft Gun-Related Ocular Injuries: Novel Findings, Ballistics Investigation, and Histopathologic Study. *Am J Ophthalmol* 149(1). 37-44. 2010). That means the victim was able to see as well at 20 feet what a person with normal vision could see at 25 feet from a given object.

There is no report of significant airsoft injury of the eyelids and bones of the orbit (eye cavity) in the published reports. The large paintball series mentioned earlier reported one orbital fracture and four eyelid lacerations.

This is in contrast to the severity of paintball eye injuries. One recent case series claiming to be the largest paintball series reported eight enucleations (Alliman KJ, et al: Ocular Trauma and Visual Outcome Secondary to Paintball Projectiles. Am J Ophthalmol 147(2). 239-242.e1). An enucleation means that the eye was so severely injured that it had to be removed. This is because it is not unusual for paintball eye injuries to be as severe as actually rupturing the globe (eyeball). This same study found half of the injured eyes to have a visual acuity of worse than 20/200 (including the eight that had been removed). Only one-third on the injured eyes had visual acuity 20/20 to 20/50.

The experts are in agreement that the injuries reported up to the present from paintball are more severe than the injuries from airsoft. There is no report yet of a ruptured globe from an airsoft injury. The reason is that there have not been as many close range injuries from the faster airsoft guns. This may be due to an overall safer approach to use of guns by people able to afford the higher end (faster) guns. The mass of a paintball is 3 grams. That is ten times greater than the mass of a 0.30 gm airsoft BB. Even with higher velocity projectiles, airsoft appears safer because of the lower mass involved, resulting in less total energy transferred to the body tissue to cause injury. It would require a 0.30 gm airsoft BB to travel at over 900 ft/sec. to have the same total energy as a regular paintball traveling 300 ft/sec. Unfortunately the energy of an airsoft BB is concentrated in an area about one-ninth of the size of the area of impact of a paintball. This means that an airsoft BB can cause as much injury as paintball if it travels much faster than 300 ft/sec., even though the total energy is less.

It is interesting to note that of the airsoft eye injuries reported, only one victim was wearing any kind of eye protection. That one case was an individual who was wearing a pair of sunglasses.

Dr. Mark Vaughan, a.k.a. Dr. Airsoft, is an old paintballer from the 1990's who now likes airsoft. He has treated eye injuries as both an Emergency Physician and currently as a Family Medicine Physician in Northern California, where he can be heard on his weekly radio show, Medically Speaking Radio.