

Prevention of Ocular Injuries

Eye injuries are very common among ocular emergencies. They can occur in a wide variety of settings including household, sports as well as work-related eye injuries. The consequences of eye injuries can vary from temporary visual disturbances to permanent blindness. Ocular injuries can be caused by mechanical, chemical or physical events. Each type of injury is more common in a different group of individuals and accordingly can be prevented by a unique set of precautionary measures. Despite the different causes of ocular injuries, prevention involves three common major aspects; awareness, the use of protective eye-wear and legislative changes [1].

For mechanical injuries the main event is the occurrence of mechanical contact between a solid object and the surface of the eye, usually associated with high speed. Mechanical ocular injuries can occur in nearly any setting, which is why primary prevention is complex. Sports are an important cause of mechanically induced ocular injuries, especially in the pediatric age group. Sports can result in injuries where implements used in the sports are the main cause of injury; here the risk of injury is related to the speed of implements as balls and their size; where quicker and smaller implements are more serious as in paintball, golf or squash. Sports can also result in injuries as a result of bodily contact as that which occurs with boxing or wrestling. Environmental hazards can also result in injuries as that which occurs with cycling or skiing. Spectacles worn during sports are also a hazard, where contact can result in them breaking in players' eyes [2,3].

In addition to teaching players about the potential hazards and the importance of safety in sports, the prevention of sports related ocular trauma involves the mandated use of protective eye wear in high risk sports, as the use of helmet-visors in American football or goggles in hockey. An interesting example that highlights the importance of legislation and mandating the use of protective eyewear is that of the predominantly Scandinavian sport of floorball. Similar to hockey, it involves a small plastic ball and plastic bats with balls travelling at speeds reaching 200 km/h. In Sweden, for adults playing floorball protective eyewear is highly recommended but not mandatory, as opposed to Finland where it is mandatory for adults to wear goggles. Between 2008 and 2011, the estimated incidence of ocular injuries related to floorball in Sweden was double that in Finland [4,5,6].

Similarly in the United states the incidence of ocular injuries related to field hockey were reduced by 84 % after protective eyewear was mandated in 2010 [7]. Protective eyewear must have certain characteristics, in addition to being strong enough to withstand contact with high speed implements without breaking, protective goggles must be transparent providing distortion and fog free vision and allowing for peripheral vision. They should also be light and stylish. Most of them are made of polycarbonates as polyurethane which is strong and durable, but light and easy to mold. A shortcoming in the manufacture of protective eyewear is a leading cause of non-compliance in their use [8].

Another important cause of mechanical injuries to the eye is toys and fireworks. Firework related injuries are common

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especially during national holidays or religious feasts. Prevent Blindness warns that there is no safe way for nonprofessionals to use fireworks. It is only safe to enjoy the splendor and excitement of fireworks at a professional display. A common story in my practice over the past few years is that of a child with bilateral severe ocular injury and possibly permanent blindness following fireworks injury. The story goes like this: for some technical reasons there is a delayed start of the firework following its ignition, the victim then turns the firework to his face and tries to see what has gone wrong. Only then the explosion occurs and he receives its full impact in the face and eyes. The prevention of firework-related ocular injuries follows similar lines to sports related ocular injuries with awareness playing an important role. Children are the most at-risk group for firework related ocular injuries, so awareness programs should be directed towards explaining the hazards of firework related ocular injuries and the potential sight threatening risks related to fireworks to children. Legislation is an important issue, countries vary in their stance towards the purchase and use of fireworks, some countries have a complete ban on the use of fireworks, and others restrict the time of their use or prohibit the sale of fireworks to unsupervised minors. The main issue with legislation is not the passing of laws, rather their implementation [9].

In this day and age, an important cause of mechanical ocular injuries is gunshot and explosive related injuries both in civilian life and in warfare. During the Arab spring between January of 2011 and January of 2013 thousands of civilians lost their eyes as a result of penetrating wounds, perforating wounds or intraocular foreign bodies related to the use of small caliber pellets. There is anecdotal evidence of Egyptians using improvised protective eyewear as motorbike helmets with visors or swimming goggles when faced with small caliber pellets. Though not standard nor perfect, it was all that was available [10].

In modern warfare the use of protective eyewear is essential. In addition to the protective role against shrapnel and projectiles, protective eyewear is required to protect against blast related injuries with the ability to absorb pressure and prevent blast related ruptures. In this regard goggles that are closely fit to the face of a soldier are superior to protective spectacles because they prevent the negative pressure associated with a blast from communicating with the space around the eye [11,12].

In addition to the aforementioned common mechanical causes of ocular injuries a seemingly infinite number of objects can result in mechanical trauma, with wooden objects around the house, scissors and knives all reported in the literature. Therefore, common sense and general safety are important in the prevention of miscellaneous causes of mechanically induced ocular injuries [13,14]. Another important fact to remember is that regular glasses do not provide sufficient protection during household repair or other similar activities. Another mode of ocular injuries is chemical burns. Chemical burns commonly develop in occupational settings, but can also develop domestically, in criminal settings and modern warfare. Similar to mechanical injuries; awareness is essential for the prevention of chemical related ocular injuries [15]. The use of protective eyewear and legislation that makes their use mandatory is also essential to prevent these injuries especially in the occupational setting. In addition to these measures, the prevention of serious morbidity following exposure to chemicals can also be achieved by raising awareness about the importance of quick irrigation after exposure to chemicals [16,17].

Chemical ocular injuries that occur in criminal settings are more prevalent in Southeast Asia with acids used to mutilate victims' faces. Tough legislation against acid offenders seems like the only way to overcome these serious crimes [18]. In modern warfare the use of gases as sulfur mustard can also result in chemical related ocular injuries and also requires the use of protective eyewear and to understand the importance of rapid irrigation if exposure occurs. In the context of riot control, tear gas can also result in ocular injuries. As with pellets, improvised protective eyewear was used during the Arab spring against tear gas exposure [19,20]. Finally, the eye can be affected by exposure to infrared or ultraviolet light or lasers. The use of sunglasses with UV filters can protect from retinal photo toxicity. Awareness of the dangers of the inappropriate use of recreational lasers is important as lasers with the potential to cause retinal holes are available commercially. In addition to awareness legislation should be directed towards the restriction of the sale and purchase of such dangerous lasers [21,22].

In summary; the eye can be adversely affected in the course of sports, in occupational settings, at home, or in the battle-field. The three main pillars for the prevention of ocular injuries are: awareness, the use of protective eyewear when injuries are possible and changing legislation to alter circumstances where the eye can be injured.

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