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A Case Report of Eye Blunt Trauma and Alkali Burns Secondary to Automobile Air Bag Inflation

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ABSTRACT

Air bags have received widespread support as an effective means of enhancing automotive safety, and they are becoming more common as standard automobile equipment on many cars. With the increasing number of airbag equipped vehicles, there has been a corresponding increase in the incidence of air-bag associated ocular and facial trauma. We report a case of air bag associated severe ocular injuries, hyphema, vitreous hemorrhage by a low speed car accident. In this case report, a 36-years-old woman was involved in a car accident with airbag deployment in a rural setting. Ocular irrigation was performed 9 hours after the accident. Over the course of 6 months, airbag related alkali injury caused corneal epithelial defects, cicatricial scarring, haze, and corneal/limbal vascularization. It is importance ocular irrigation following airbag deployment in the ophthalmology and emergency medicine communities.

KEYWORDS

Airbags; Car accident; Eye injury; keratitis

1. INTRODUCTION

Traffic accidents are common occurrences every day, causing mild to severe human injury, including injuries to the eyes. Ocular involvement in road traffic accidents may involve the eyelids, lacrimal canaliculi, orbita, conjunctiva, cornea, sclera and extra-ocular muscles. Air bags have received widespread support as an effective means of enhancing automotive safety, and they are becoming more common as standard automobile equipment on many cars. Airbags are made of woven nylon, which are explosively deployed upon automobile impact [1]. In addition to inflationrelated thermal and blunt trauma, eye injury can occur as a result of alkaline burn due to the chemical components of the inflation reaction. In order to create rapid inflation within the airbag, a solid propellant, sodium azide, is ignited and converted to hydrocarbon gases, rapidly expanding the volume of the airbag [2]. This conversion creates byproduct sodium hydroxide, sodium bicarbonate, and metallic oxides in a fine powder form. The airbag is deflated within two seconds of inflation though side

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exhaust ports [2]. However, small amounts of sodium hydroxide powder can escape through the woven nylon meshwork upon impact, creating the potential for direct exposure of sodium hydroxide powder onto the cornea, conjunctiva, and in the cul de sac of the lids, particularly inferiorly due to Bell's reflex [3]. This exposure to caustic alkali chemicals may be magnified greatly if a tear in the airbag occurs, releasing large amounts of powder [3,4]. The alkali powder causes saponification of fatty acids and disruption of cell membranes [4]. The elicited inflammatory response exacerbates the potential necrosis of corneal tissue. With the increasing number of airbag-equipped vehicles, there has been a corresponding increase in the incidence of airbag associated ocular and facial trauma [5]. We report a case of air bag associated severe ocular injuries, hyphema, vitreous hemorrhage by a low speed car accident.

2. CASE REPORT

A 36-years-old woman was appear at the Department of Ophthalmology in Mother Theresa Hospital with eye injury. She lost control of her vehicle 9 hours before, while driving at approximately 70 km/h and crashed into a concrete barrier, by inflating the driver’s air bag, which struck her on the right side of the face [6]. Car damage was limited to the bumper on the right. She was wearing a seatbelt and was not wearing glasses or contact lenses in the moment of car accident. Attention was paid to several other life-threatening traumatic injuries before sending her to ophthalmology department [7].

In the hospital emergency department, she complained of moderate periorbital pain and decreased of vision in the right eye. External examination showed an upper eyelid abrasion, ecchymosis, and periorbital edema in the right eye with slight limitation at up gaze. Pupillary examination showed abnormal in the right eye, no abnormality in the left eye. Visual acuity without correction was finger count close to face in OD and 10/10 in OS [8-10].

On slit lamp examination, the right eye had a mixed conjunctival injection, corneal abrasion and mild corneal edema, and 1 mm - 2 mm hyphema in the anterior chamber. Midriatic pupil was evident (Figure 1). Intraocular pressure measured by applanation tonometry was 24 mmHg in the right eye and 14 mmHg in the left eye.

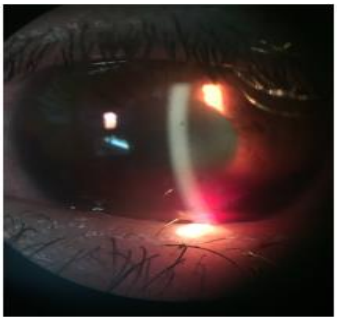

Figure 1: Hyphemia of anterior chamber.

Dilated funduscopic examination was limited by the dispersion of blood in the anterior chamber and corneal edema of the right eye. A+B-scan ultrasonography showed vitreous hemorrhage with no evidence of retinal detachment (Figure 2). A computed tomographic scan demonstrated no orbital fracture [11-13].

The patient's eyes were irrigated bilaterally by emergency room staff with 500 cc normal saline, pH measuring 7.0 for 30 min [12]. Then treatment with topical steroids and cycloplegics was begun. Five days later the hyphema was resolved completely but a moderate vitreous hemorrhage was still present in the right eye [14].

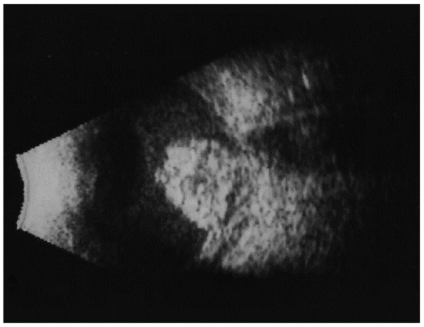

Figure 2: A+B-scan ultrasonography showed vitreous hemorrhage.

During follow-up over the next week, the vitreous hemorrhage gradually clearedwithout any improvement in visual acuity in the right eye. Corneal epithelial defect and vascularization was evidence in the right eye, as u can see from Figure 3.

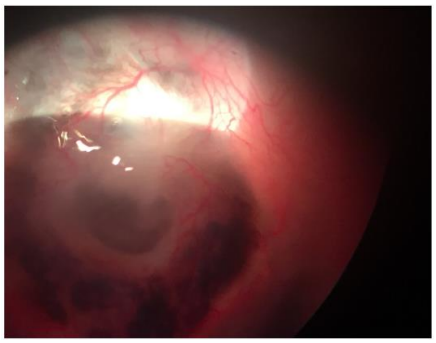

Figure 3: Corneal epithelial defect with corneal vascularization.

We start Vigamox drops (6 times/daily), Tobrex gel (3 times/daily) and lubrificant gel (3 times/daily) to the patients. 4 months after the regular treatment and follow up, the vision was improved 5/10 but little vascularization of the cornea persists [15].

3. DISCUSSION

Every vehicle in Albania is mandated to carry installed and operational airbag restraint systems. While airbags have been far more beneficial than harmful, this case demonstrates the potential for ocular surface injury due to airbag deployment in frontal motor vehicle collisions.

Air bag induced eye injuries can be divided into two categories. The first stems from the mechanical aspects of the deploying air bag and includes injuries such as periorbital contusion, fracture, abrasion, vitreous hemorrhage, hyphema, and retinal tear and detachment; in our case periorbital contusion, vitrous hemorrhage and hyphema were evident [16]. Corneal endothelial cell loss as a result of eyeball deformation during impact is also included in this category, as we find in our case to. Mechanical action may be responsible for most of the airbag related, ocular injuries reported. The second category is alkaline chemical keratitis that is caused by the deposition into the eye of sodium hydroxide. Sodium hydroxide is alkaline and is responsible for eye irritation, which can cause chemical keratitis. In our case corneal vascularization may be consequence to alkaline effect due to late irrigation (9 hours after the accident) of the eye.

This case illustrates that even low-speed, motor vehicle accidents with minimal automobile damage may produce airbag associated ocular injuries that result in permanent visual loss. Therefore, it is important for eye-care providers and car manufacturers to cooperate in research aimed at modifying air-bag design and deployment to minimize the risk of ocular injury even in low speed motor vehicle accidents.

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