Trauma Case Reports 11 (2017) 20–22

Contents lists available at ScienceDirect

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

Bilateral perforating eye injury with metallic foreign bodies caused by tire explosion: Case report☆

Peter Žiak[a], Peter Mojžiš[b], Juraj Halička[a], David P. Piñero[c,*]

[a] Eye Clinic, Jessenius Faculty of Medicine in Martin, Commenius University, Bratislava, Slovakia
[b] Premium Clinic, Teplice, Czech Republic
[c] Department of Optics, Pharmacology and Anatomy, University of Alicante, Alicante, Spain

Introduction

Eye injury with an intraocular foreign body is always a serious condition with a direct threat to visual function. The most common cause of eye injury with metallic intraocular foreign body (FOB) is the penetration of the fragment into the eye globe, which is typically released during metal-to-metal striking [1]. A typical example is the use of the chisel and hammer. The second leading cause are blast injuries — mostly as part of war injuries or during terrorist attacks. The high kinetic energy allows to enter very little metallic fragments into the eye. This type of accident is dangerous not only because of direct damage to intraocular structures but also due to risk of endophthalmitis and possible metallosis development [1]. Therefore, early detection and subsequent extraction of intraocular body is very important, which is usually performed through pars plana during a vitrectomy procedure [2]. We present a case of eye injury due to a metallic foreign body released after a tire explosion during compressor inflation.

Case report

A 43 year old man was attended to our clinic – an employee of tire repair service – after truck tire explosion accident caused by break during tire inflating by the air compressor. The patient complained of headaches and facial injury. No subjective problems related to vision or eye pain were referred. The patient wanted to perform an eye examination “for safety's sake” because another family member had a perforating eye injury with following intra-ocular inflammation.

On examination, uncorrected visual acuity of both eyes was 0.0 logMAR. In the eyelids and facial area, small excoriations and many small bleeding wounds were present. On slit-lamp examination, small metallic bodies in the form of short fragments of thin wire with an approximate length of 3 mm were found in these wounds (Fig. 1). In addition, in the right eye, a 0.5-mm wide, sealing, and almost imperceptible wound of the cornea was detected as well as a small perforation in the crystalline lens capsule with early signs of cataract. Fundus examination of the inferior temporal quadrant in both eyes revealed the presence of a dark shadow with a haemorrhage associated to this the area, which indicated the presence of bilateral foreign body (Fig. 2). Bilateral retinal laser photocoagulation (532 nm, 200 μm spot, time 0.1 s) was performed at the surroundings of the foreign body.

A computed tomography examination (CT) was performed to confirm the presence of bilateral foreign body (Fig. 2 right). The following surgical steps were then planned: an early pars plana vitrectomy, extraction of foreign bodies, intravitreal antibiotics administration in both eyes and phacoemulsification cataract surgery with intraocular lens (IOL) implantation in the right eye. The bilateral 20G vitrectomy (Millennium, Bausch/Lomb, USA) was performed without complications. After this, endoocular forceps were used to remove the light opaque vitreous foreign bodies. Retinal defects were photocoagulated using bipolar forceps at the site of foreign body extraction. Intravitreal injection of antibiotics was done after this surgical procedure (Vancomycin 1.0 mg/0,1 ml).

☆ The authors have no proprietary or commercial interest in the medical devices that are involved in this manuscript.

* Corresponding author at: Department of Optics, Pharmacology and Anatomy, University of Alicante, Crta San Vicente del Raspeig s/n 03016, San Vicente del Raspeig, Alicante, Spain.
E-mail address: david.pinyero@ua.es (D.P. Piñero).

http://dx.doi.org/10.1016/j.tcr.2017.10.022
Accepted 27 October 2017
Available online 31 October 2017

Fig. 1. External aspect of the eye. Left: foreign body in eyelid. Centre: general aspect of the anterior segment of the right eye. Right: general aspect of the anterior segment of the left eye.

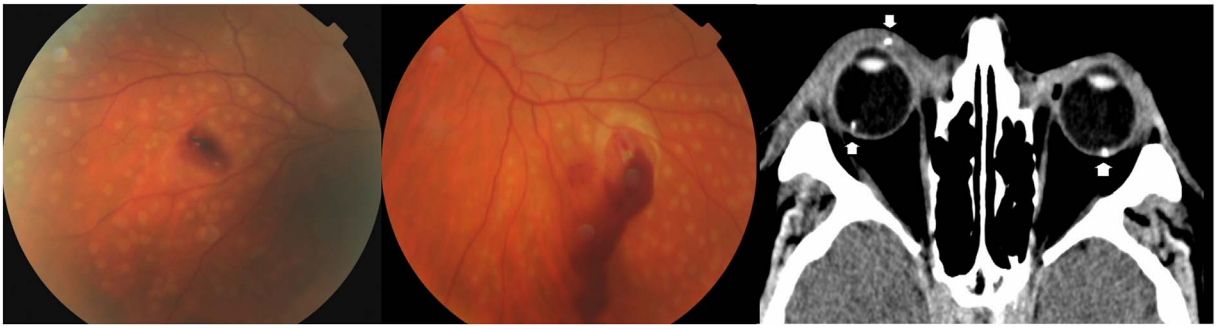

Fig. 2. Localization in the posterior segment of the bilateral foreign body. Left: foreign body in the retina of the right eye (lower temporal quadrant). Centre: foreign body in the retina of the left eye (lower temporal quadrant). Right: computed tomography scan of orbit showing metallic foreign bodies (arrows).

Cataract surgery was uneventful in right eye. As postoperative treatment, Tobradex (Tobramycin, dexamethasone, Alcon, Fort Worth, USA) was prescribed to be applied 5 times daily for 7 days as well as Oftaquix drops (Levofloxacin, Santen, Finland) to be applied 6 times daily.

At 1 month after surgery, no signs of intraocular inflammation were observed. Visual acuities were 0.00 and − 0.10 logMAR for right and left eyes, respectively. At 3 months, visible pigmentation of the laser coagulation spots and a discreet retinal and choroid scar could be seen in the fundus (Fig. 3). In the last control, 5 years after the injury, no change was detected, with no signs of proliferative vitreoretinopathy and no deterioration of visual acuity.

Discussion

During tire explosion, especially when dealing with truck tires, there is a release of high kinetic energy — partly in the form of pressure waves and partly in energy of flying tire debris [3]. In the peer-reviewed literature, numerous cases of injuries due to the explosion of tires of different size have been documented [4,5]. In many cases, difficult polytrauma has been described, with about 20% of such accidents ending with death [6–8]. Eye injury after tire explosion have been reported only rarely, describing the following signs: creation of orbital emphysema [9], blunt eye injury [10,11], bleeding under the conjunctiva associated with esophageal rupture [11], and intrusion of a foreign body in the orbit (stone) [12]. However, in the peer-reviewed literature, we did not

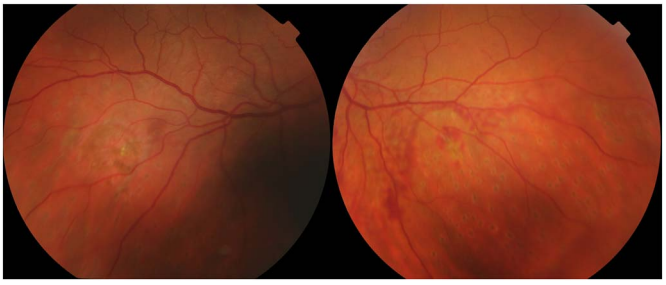

Fig. 3. Aspect of the retina of the right (left image) and left eyes (right image) three months after the foreign body extraction.

find any report of a similar case with a bilateral metallic intraocular body.

The case described here is unusual and with not expectable findings. In the anterior segment, there was minimum extent of injury in the right eye and the absence of signs of injury in the left eye. Therefore, the mechanism of tire rupture was primarily not been expected to cause the presence of isolated foreign bodies in the retina. However, a foreign body was present in the retina of each eye. Concerning the source and type of these bodies, a more detailed study of the tire structure showed that these bodies were small metal fragments from the tire metal cord reinforcing fabric.

An excellent functional outcome, even after long period after injury, shows that the procedure chosen as the primary treatment (early vitrectomy with foreign body extraction, administration of antibiotics, with cataract surgery) was the correct option to ensure a fast patient recovery. It is possible to discuss the suitability of the primary implantation of an intraocular lens, as we had a traumatic cataract in the left eye. However, the absence of intraocular inflammation and the performance of the surgery under general anesthesia led us to think that this was the most logical step for obtaining a rapid visual rehabilitation in the right eye.

In conclusion, tire explosion may result in the dispersion of a large number of thin metal bodies with high kinetic energy, which are able to penetrate inconspicuously into deep structures of the eye. Due to the small size of foreign bodies and variability in their tracks, there might not be obvious signs of injury on anterior segment slit lamp examination with the presence of injury in the posterior segment. Therefore, in patients with history of tire explosion injury, it is necessary to think about the possible presence of intraocular foreign bodies in the retina and to perform a detailed fundus examination combined with X-ray or CT imaging of the orbits. An early diagnosis and proper treatment of a bilateral perforating injury with intraocular foreign bodies after truck tire explosion are crucial factors for obtaining an excellent visual acuity outcome.

References

[1] C. Valmaggia, F. Baty, C. Lang, H. Helbig, Ocular injuries with a metallic foreign body in the posterior segment as a result of hammering: the visual outcome and prognostic factors, Retina 34 (2014) 1116–1122.
[2] Y. Yonekawa, J. Chodosh, D. Eliott, Surgical techniques in the management of perforating injuries of the globe, Int. Ophthalmol. Clin. 53 (2013) 127–137.
[3] M. Wood, W. Woodruff, Acoustic levels of heavy truck tire ruptures, J. Forensic Legal Med. 20 (2013) 264–269.
[4] Y. Yu, S. Ding, Y. Zheng, W. Li, L. Yang, X. Zheng, X. Liu, J. Jiang, Esophageal rupture caused by explosion of an automobile tire tube: a case report, J. Med. Case Rep. 7 (2013) 211.
[5] M. Lenz, R. Schmidt, T. Muckley, T. Donicke, R. Friedel, G.O. Hofmann, Wheelbarrow tire explosion causing trauma to the forearm and hand: a case report, J. Med. Case Rep. 3 (2009) 129.
[6] C. Pomara, S. D'Errico, I. Riezzo, G. Perilli, U. Volpe, V. Fineschi, Blast overpressure after tire explosion: a fatal case, Am. J. Forensic Med. Pathol. 34 (2013) 306–310.
[7] A. Suruda, D. Floccare, G. Smith, Injuries from tire and wheel explosions during servicing, Ann. Emerg. Med. 20 (1991) 848–851.
[8] A.M. Sussman, J.S. Williams, C.R. Boyd, E.D. DeLoach, Multipiece tire rim injuries, J. Trauma 31 (1991) 24–27.
[9] T. Li, M.F. Mafee, D.P. Edward, Bilateral orbital emphysema from compressed air injury, Am J. Ophthalmol. 128 (1999) 103–104.
[10] M. Catană, Tire explosion as a new cause of eye injuries, Rev. Chir. Oncol. Radiol. O.R.L. Oftalmol. Stomatol. Ser. Oftalmol. 24 (1980) 185–186.
[11] J. Levy, A. Kratz, T. Lifshitz, Eye injuries due to tractor wheel explosion: report of two cases, Can. J. Ophthalmol. 40 (2005) 747–749.
[12] W. Choi, S.-H. Lee, J.-K. Cho, Y.-G. Park, K.-C. Yoon, A case of a stone in the conal space of the orbit, Chonnam Med. J. 45 (2009) 140–143.