

Optic nerve head avulsion and lower canalicular laceration after blunt eye trauma: a case report

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ABSTRACT

Closed globe injuries can cause serious posterior segment injuries even if there is no damage to the anterior segment of the eye. Optic nerve head (ONH) avulsion is a rare but very serious complication of blunt eye trauma. While avulsion often occurs where the optic nerve attaches to the globe, it can also occur at any point along the nerve and there is no effective treatment. Preventing eye trauma will also prevent serious morbidity. In this report, we present a case with ONH avulsion and accompanying inferior canalicular laceration following blunt eye trauma.

Keywords: Closed globe injuries, Lacrimal canalicular laceration, Traumatic optic nerve avulsion.

INTRODUCTION

Optic nerve head (ONH) avulsion is a rare but very serious condition. Optic nerve trauma can occur by several mechanisms. Primary trauma can be either penetrating or blunt trauma. In blunt eye trauma, the pressure applied to the globe is absorbed by the optic nerve. The absence of myelin and supporting connective tissue septa of the axons in the lamina cribrosa causes them to separate more easily.^{1,2} Some optic nerve injuries can occur even with a minor injury. The biomechanical mechanisms of trauma are not clear. Indirect damage to the optic nerve can occur through several mechanisms. Forceful rotation of the globe by a blunt object, forward movement of the globe, and a sudden increase in intraocular pressure (IOP) have been cited as possible mechanisms of optic nerve damage.³ All these hypotheses are also explained by a computer simulation model. The high pressure obtained from the simulations has been shown to cause tearing of the cornea, eyelids, conjunctiva, and sclera, and this is consistent with the location and nature of optic nerve injuries due to blunt eye trauma reported in the literature.⁴ Buchwald et al.⁵ classified traumatic optic neuropathy into two groups as primary and secondary: The primary effect that occurs

due to the effect of external forces at the time of trauma, such as the rupture of nerve fibers and capillaries, and the secondary effect that occurs after trauma due to the deterioration of blood flow to the nerve following edema or angiospasm. In a study retrospectively examining 135 patients with eyelid trauma, it was found that 30% of them had sustained the injury due to blunt trauma.⁶ Also in eyelid trauma, the lacrimal drainage system in 16-37% of all injuries.⁷

Here, we present a case of ONH avulsion and lacrimal canalicular laceration following blunt eye trauma in a 39-year-old male patient.

CASE REPORT

A 39-year-old male patient was admitted to our emergency department with a complaint of sudden loss of vision as a result of slipping and falling on the upright handle of a brush. There was no history of loss of consciousness or nosebleeds. Ophthalmological examination revealed ecchymosis on the right upper and lower eyelids, lower canalicular laceration, approximately 2 cm long conjunctival laceration in the nasal region, and subconjunctival hemorrhage. There was no light perception

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in the right eye, the pupil was dilated, and there was a total afferent pupil defect. Vision in the left eye was 20/20 without correction, and the anterior and posterior segments were normal. Eye movements were normal in both eyes. IOP was measured as 12 mmHg in the right eye and 14 mmHg in the left eye. Fundus examination revealed the absence of the optic disc in the ONH region on the right, intense peripapillary hemorrhage, and accompanying preretinal and intraretinal hemorrhages and edema in the peripapillary area (Figure 1,2). The fundus in the left eye was normal. Computed tomography (CT) scan showed that

the right globe was intact and slightly displaced forward. There was a deterioration where the optic nerve connects to the eyeball. There was no orbital wall fracture (Figure 3). Neurology consultation was evaluated as normal.

DISCUSSION

The pathophysiology of optic nerve avulsion occurring after blunt eye trauma was tried to be explained by Pujari et al.⁸ When there is blunt eye trauma, the eyeball continues to move forward without any active resistance,

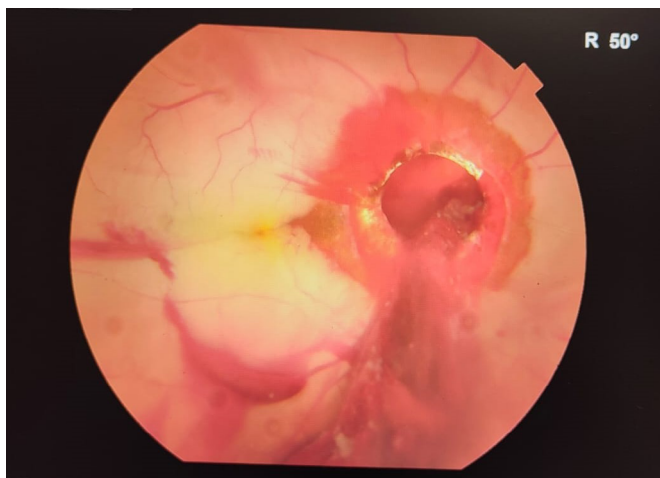


Figure 1: Color fundus photograph of the right eye of a 39-year-old man with no light perception vision at presentation, who suffered trauma with a handle of brush. It shows excavation of the optic disc area, preretinal and intraretinal hemorrhage overlaying the optic disc and retina edema.

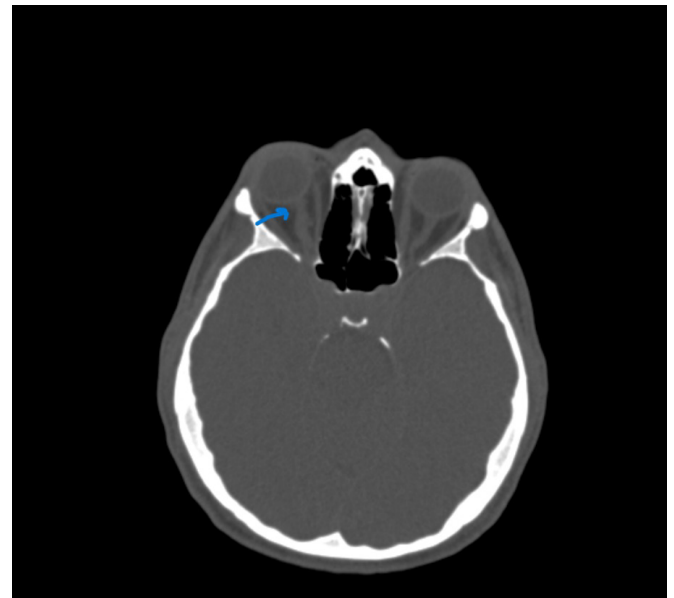


Figure 3: Axial computed tomography scan showed an intact right globe with anterior displacement and disruption of optic nerve at the attachment to globe (blue arrow).

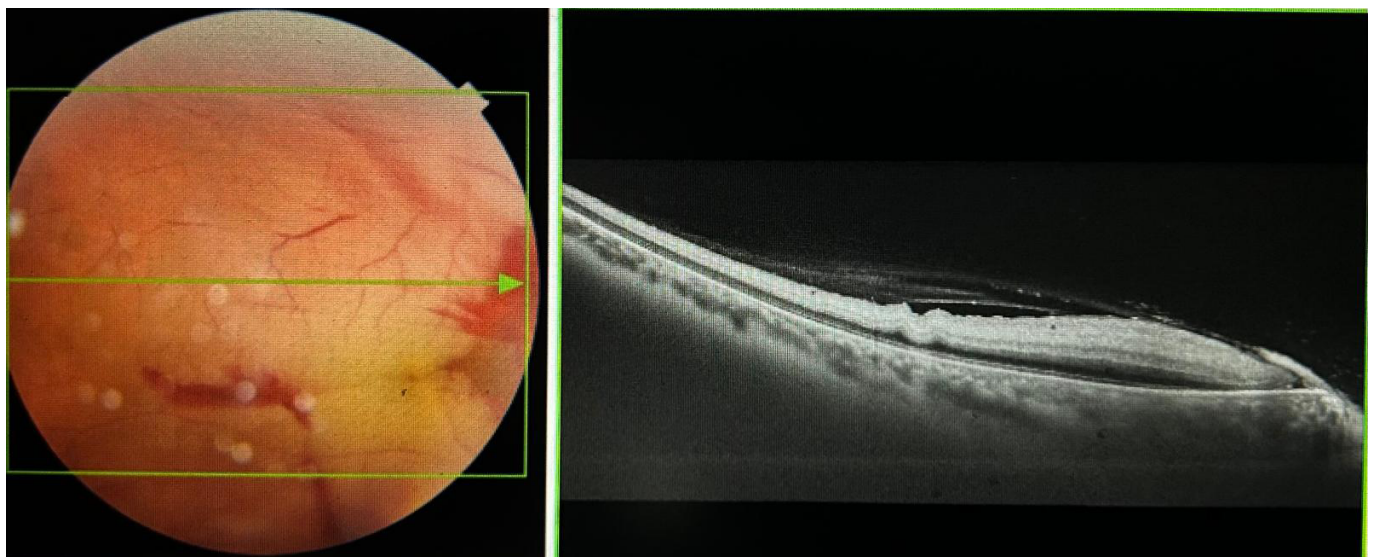


Figure 2: OCT horizontal line scan passing through the fovea. It shows inner retinal hyperreflectivity of the area nasal to the fovea and ruptures of the optic nerve axons were suspected.

unlike the globe. The optic nerve has more delicate bone and soft tissue relationships and likely remains relatively static. In addition, the physiological Bell phenomenon can cause severe separation of the optic nerve from the eyeball by torsional tension at this junction. While avulsion often occurs where the optic nerve attaches to the globe, it can also occur at any point along the nerve. As stated by Tamase et al.⁹, at the optic chiasm level; as in the case shared by Şahin et al.¹⁰ it may be from where the optic nerve attaches to the globe. In our case, the avulsion was at the globe-optic nerve junction, consistent with the literature.

Optic nerve avulsion may occur due to reasons such as falling on a toy antenna⁵, being hit by a ball¹¹ or a finger¹², or falling from a tree.¹³ In our case, the patient fell on the handle of the toilet brush.

Vitreous hemorrhage often occurs after trauma and impairs the visibility of the optic nerve. In our case, there was no vitreous hemorrhage and we could easily examine the retina with a 90 diopter non-contact lens. Computed tomography and magnetic resonance imaging are valuable in cases where the retina can not be seen directly.^{9,14-16}

Closed globe injuries can also cause periocular injuries. In a review of serious eye trauma caused by hitting a door handle, eyelid and canalicular laceration was observed in 9 of 15 patients, while ONH avulsion was detected in 14.¹⁷ In a study compiling 6 patients with blunt eye trauma, 3 patients had lacrimal system damage and ONH avulsion was observed in 2 patients.¹⁸ Our patient had ONH avulsion with inferior canalicular and conjunctival laceration. The patient was transferred to another hospital at their own request. There, the canalicular and conjunctival lacerations were sutured.

Healing after optic nerve avulsion occurs through fibroglial tissue proliferation.¹⁹ Although we cannot do anything to increase vision during treatment, patients should be monitored for phthisis bulbi and neovascular glaucoma.

Eye injury is a major public health problem worldwide. ONH avulsion is a rare but very serious condition and has no effective treatment. Preventing eye trauma will also prevent serious morbidity.

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