Failure of Imaging To Detect Optic Nerve Avulsion in Early Posttraumatic Period

Erken Posttravmatik Süreçte Optik Sinir Avülsiyonu Tanısında Görüntüleme Başarısızlığı*

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Case Report *Olgu Sunumu*

ABSTRACT

In this report, authors describe a patient in whom the diagnosis of optic nerve avulsion could not be established in the early posttraumatic period. The diagnosis of optic nerve avulsion was obscured by the presence of concomitant vitreous haemorrhage. Also early radiological imaging studies did not prove helpful in substantiating the diagnosis. The difficulties in diagnosis of optic nerve avulsion in a case with poor visualization of the optic nerve head were discussed.

Key Words: Diagnosis, optic nerve avulsion, radiology.

ÖZ

Bu olguda yazarlar, erken posttravmatik süreçte optik sinir avülsiyonu tanısı koymakta güçlük çekilen bir hastayı tarif etmektedir. Optik sinir avülsiyonu, eşlik eden vitreus kanaması mevcut olduğunda görülemeyebilir. Ayrıca erken radyolojik incelemeler tanıyı doğrulamada yeterli yardım sağlamayabilir. Bu olgu ile optik sinir başının görülemediği durumlarda tanı koymadaki zorluklar tartışılmıştır.

Anahtar Kelimeler: Optik sinir avülsiyonu, radyoloji, tanı.

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INTRODUCTION

Eye injuries are a major and under-recognised cause of disabling ocular morbidity that especially affect the young.[1] Optic nerve avulsion (ONA) is a rare presentation of ocular trauma, which usually results in a serious visual loss. Blunt injury of the orbit, concussion of the globe, or massive trauma of the face may lead to ONA.[2] Many different causes of ONA have been reported including road traffic accidents, sporting accidents, and falls.[3,4] ONA is characterized by traumatic disinsertion of the optic nevre fibers from the vitreous, retina, and choroid. Also lamina cribrosa is retracted from the scleral rim.[5] The diagnosis of ONA is quite apparent if media is clear. The fundus examination in such cases shows an excavation in the disc area.

The diagnosis can only be suspected and not confirmed if disc area is obscured by vitreous haemorrhage. In ONA cases, it is essential to confirm the diagnosis so that the patient may not be subjected to unnecessary treatment. Various additional diagnostic modalities such as computed tomography (CT) scan, orbital magnetic resonance (MR) imaging, orbital ultrasonography (USG), electrodiagnostic tests and fundus fluorescein angiography (FA) can be used in cases with ONA. These diagnostic tests may rarely fail to demostrate the avulsion of the optic nerve. In this report, we describe a patient in whom ONA could not be radiologically verified in early stage of the trauma and discuss the possible difficulties in diagnosing ONA in case of significant vitreous haemorrhage obscuring the fundus.

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Figure 1: Axial CT slice through orbital apices reveals medial blow-out fracture with slight displacement of the medial rectus muscle into the ethmoid cells (double arrows). Also noted is a probable separation of the left optic nerve sleeve from the globe (arrow).

CASE REPORT

A 16-year-old boy experienced loss of vision in the left eye following head trauma due to traffic accident. On the day of trauma he was admitted to the emergency unit of the community hospital. External examination of the left eye revealed moderate periorbital oedema, ecchymosis and a superficial skin laceration in the upper lid.

Examination of the right eye showed normal anterior and posterior segments. On the left side the funduscopic view was hazy because of the concurrent vitreous haemorrhage. Cranium CT showed medial blow-out fracture in the left orbital region with slight displacement of the medial rectus muscle into the ethmoid cells and a probable separation of the left optic nerve sleeve from the globe (Figure 1).

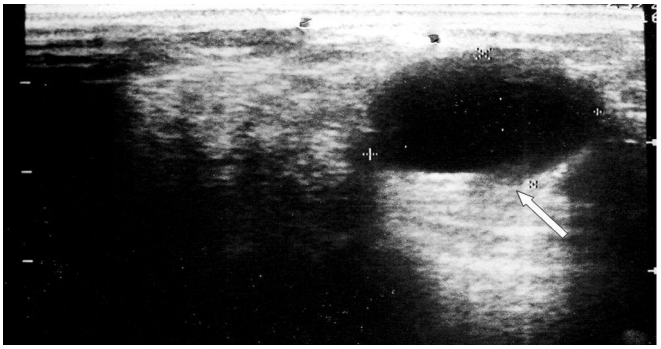

Figure 2: B-scan ultrasonography shows minimal excavation of the optic disc (arrow).

Seven days after the trauma the patient was referred to our clinic. On our first examination; external examination of the right eye was normal and visual acuity was 20/20. In slit-lamp biomicroscopy examination anterior and posterior segments were normal. Intraocular pressure was measured as 11 mmHg in the right eye. In the left eye external examination revealed ptosis, mild periorbital oedema and ecchymosis. The left globe had limitation in elevation and adduction.

There was no light perception in the left eye. Slit-lamp biomicroscopy showed that anterior chamber and lens were intact and clear. Intraocular pressure was measured as 14 mmHg in the left eye. Funduscopic examination showed that the optic nerve head was obscured by the overlying vitreous haemorrhage, but a peripapillary subretinal haemorrhage and a pale, swollen retina were visible. A B-scan USG with a high-frequency linear probe (10 MHz) showed minimal excavation of the optic disc (Figure 2). MR imaging of cranium and both orbita was scheduled. Axial and sagittal MR images showed discontinuity of the left optic nerve with hollow, bulbous expansion of the nerve sleeve adjacent to the left globe (Figure 3).

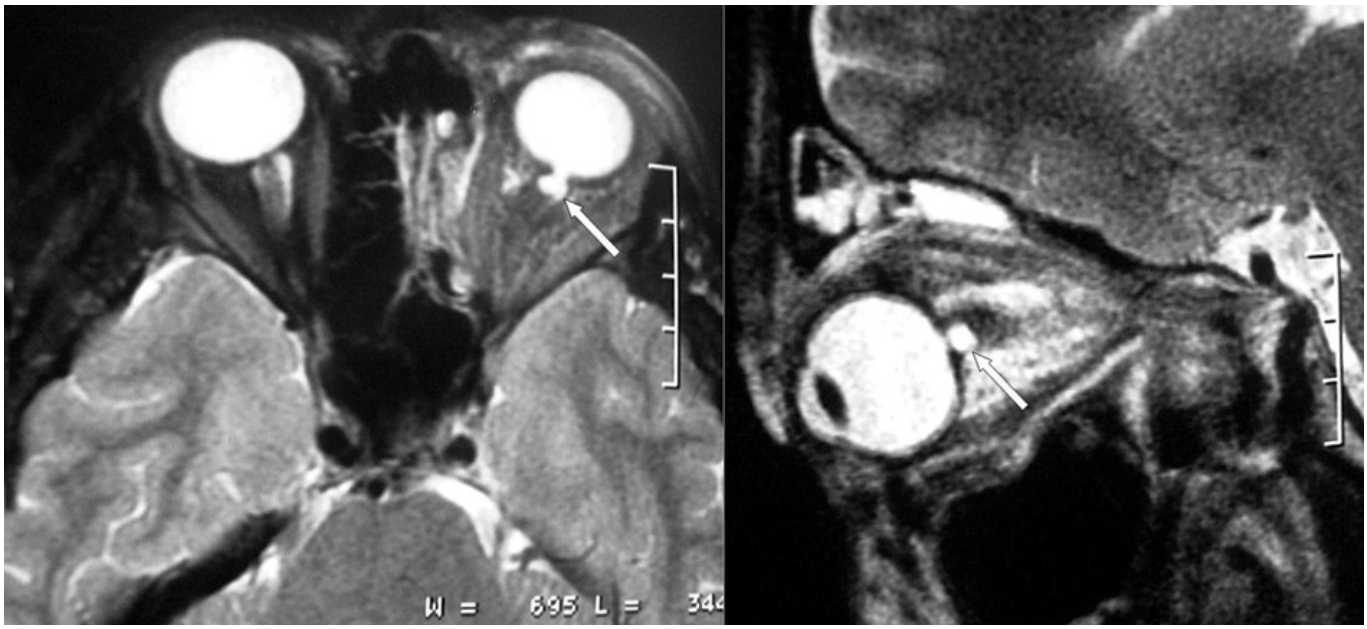

Figure 3: Axial and sagittal T2-weighted MR images show discontinuity of the optic nerve with hollow, bulbous expansion of the nerve sleeve adjacent to the globe (arrows).

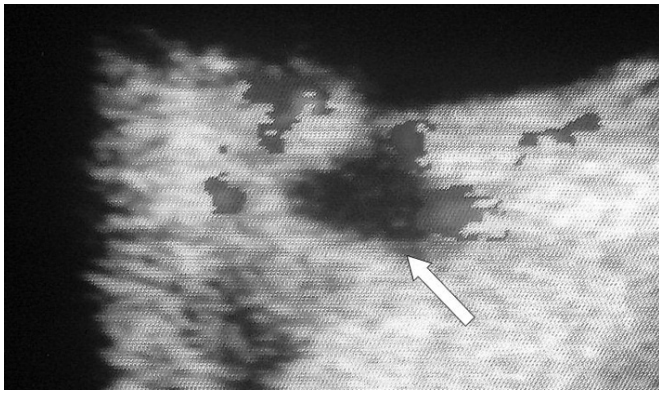

Figure 4: Doppler ultrasonography shows hollowing of the distal sleeve due to the retraction of the avulsed optic nerve (arrow).

The diagnosis of ONA was made on the basis of these MR imaging findings. Visual field test revealed no abnormally for the right side. A fundus examination and doppler USG imaging were performed two weeks later. Funduscopy showed total ONA with retrodisplacement of the optic disc. Further findings were vitreous haemorrhage that was most prominent inferiorly, peripapillary subretinal haemorrhages and surrounding retinal oedema. A pale, swollen retina was visible. A complete hole and an excavation existed at the site of papilla. Through this hole normal sclera was visualized. Doppler USG showed hollowing of the distal sleeve due to the retraction of the avulsed optic nerve (Figure 4). After the retina became visible, fundus fluorescein angiography (FA) was performed. The patient was kept in routine follow-up control checks (Figure 5a-5f, 6).

DISCUSSION

In ONA, the optic nerve is forcibly disinserted from the retina, choroid, and vitreous, and the lamina cribrosa is retracted from the scleral rim.[4] Both complete and partial avulsions have been described. ONA usually results when an object intrudes between the globe and the orbit wall and displaces the eye.[4] Salzman characterized optic nerve avulsion as traumatic separation of the optic nerve from the globe at the level of the lamina cribrosa without rupture of the optic nerve sheath or the adjacent sclera.[6] In the literature, reported ONA cases are mostly associated with significant trauma.[7,8]

Blunt ocular injury or indirect impact leading to ONA is relatively infrequent. Concerning blunt ocular trauma leading to ONA, several mechanisms have been postulated; which included sudden extreme rotation of the globe, sudden rise in intraocular pressure leading to the expulsion of nerve out of scleral canal and sudden anterior displacement of the globe.[4] The diagnosis of ONA is quite apparent if the media is clear. The diagnosis can only be suspected and not confirmed if disc area is obscured by vitreous haemorrhage.

It is essential to confirm the diagnosis in ONA cases so that the patient may not be subjected to unnecessary treatment such as optic nevre decompression or high-dose steroids. The diagnosis should be suspected in a patient with no light perception vision after blunt ocular injury to an intact globe. CT and USG imaging sometimes do not support the clinical diagnosis as in our case.

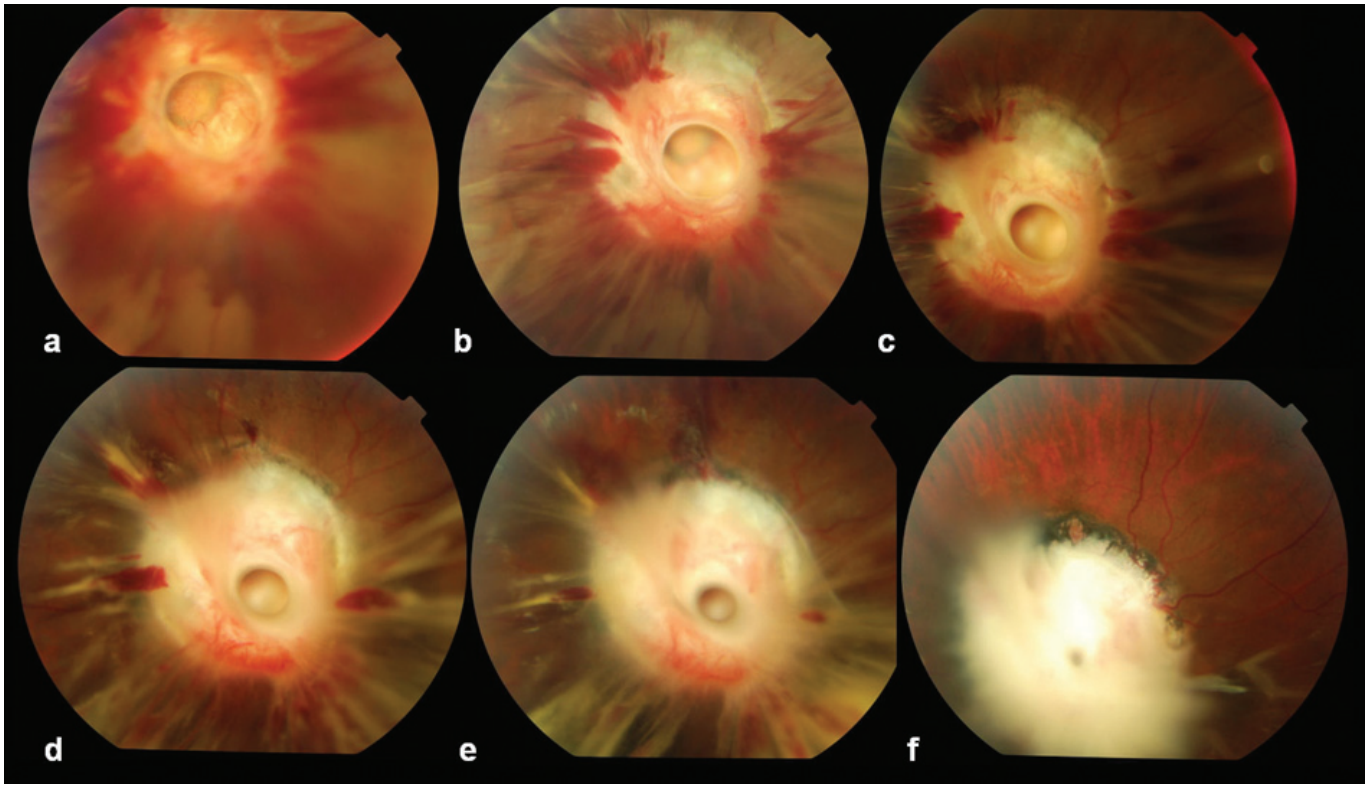

Figure 5: Photographs of the ONA. **a)** 20th day of the accident. Retrakted optic disc (OD) is visible **b)** 29th day, OD is still visible but fibrosis is increased **c)** 39th day, OD is not visible and fibrosis is continued **d)** 50th day, scleral rim is narrowed **e)** 63th day a further narrowing is observed **f)** 164th day, scleral rim is not visible and dense scar is observed.

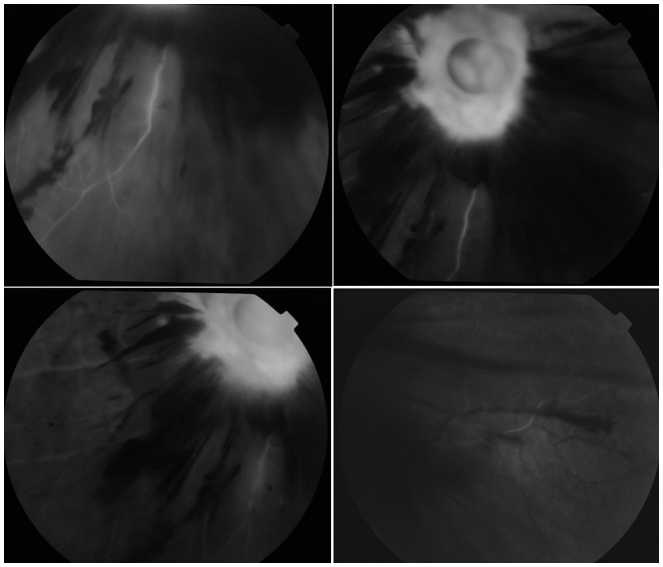

Figure 6: On the 20th day of the accident, FA showed no ischemic area.

Since the dural sheath remains attached to the globe, imaging studies may often fail to reveal the diagnosis.[7] The oftentimes-normal imaging studies in early periods of ONA cases may lead misdiagnosis and even give rise to medicolegal problems due to unnecessary treatments. Concerning the causes of normal-like radiological images in early periods of ONA cases, Sanborn et al., have published a clinicopathological study.[9] They stated that histopathological analysis of the injury may reveal a small size recession filled with blood and such a histopathological condition with an intact dural sheath can easily obscure imaging of ONA in early posttraumatic period.[9] In our case, CT imaging study in the emergency unit only revealed a probable separation of the left optic nerve sleeve from the globe. Seven days after the trauma, B-scan USG showed minimal excavation of the optic disc. ONA diagnosis was established by MR imaging and later supported by doppler USG.

One of the potential complications that may accompany ONA is the chiasmal injury to the fellow eye with severe visual loss.[10] There have been sporadic reports of chiasmal injuries and associated temporal field loss in the contralateral eye.[11] In our case visual field test showed no abnormally for the right side.

As a result, in a case with no light perception following a severe blunt ocular trauma, ONA should be suspected where fundus can not be evaluated because of the vitreous haemorrhage, as early radiological evaluations may fail to reveal a typical avulsion of the optic nerve. Also, a visual field test should be performed for detecting a possible chiasmal injury that may accompany ONA.

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