

# Anterior Traumatic Optic Neuropathy and Optic Nerve Avulsion With One-Year Follow-Up

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## ABSTRACT

Optic nerve avulsion is a rare form of anterior traumatic optic neuropathy. Usually severe and permanent vision loss develops in the affected eye. In this case report I showed a partial optic nerve avulsion case with 12 months follow-up with pictures.

**Key Words:** Optic nerve avulsion, Blunt ocular trauma, Magnetic resonance imaging.

## INTRODUCTION

Optic nerve avulsion is a rare form of anterior traumatic optic neuropathy and may occur after penetrating trauma or indirect damage after blunt trauma. The most common traumas that cause optic nerve avulsion in the literature are sports injuries by finger gouging (diving injury, basketball injuries), eye injuries with the door handle, traffic accidents and falls.<sup>1</sup> Optic nerve is separated from the sclera due to the weak structure of lamina cribrosa. Optic nerve avulsions may be partial or complete. The most common mechanisms of optic nerve avulsions are sudden extreme rotation or anterior displacement of the globe that breaks the optic nerve fibers and sudden rise in intraocular pressure leading to the expulsion of nerve out of scleral canal.<sup>2</sup> The rotational movement of the globe after sudden forces cause the optic nerve fiber rupture at the level of the lamina cribrosa without affecting the optic nerve sheath. Usually severe and permanent vision loss develops in the affected eye.<sup>3</sup>

In this case report I showed a partial optic nerve avulsion case with 12 months follow-up with pictures

## CASE REPORT

An eight year-old boy was admitted with swelling, redness and loss of his vision in his left eye. When he fell down he

hit his eyeball with the pencil in his hand. Visual acuity was 0.0 logMAR in the right eye and light perception in the left eye. A relative afferent pupillary defect (RAPD) was detected in the left eye. Color vision was normal in the right eye but could not be evaluated in his left eye. Eye movements were normal in both eyes. Anterior and posterior segment examination of the right eye was unremarkable. The left eyelids were edematous, ecchymosed and there was small superficial laceration on the lateral side of the upper eyelid. Subconjunctival hemorrhage and (++++) positive cells were detected in the anterior chamber. Intraocular pressure was 16 mm Hg in the right eye and 15 mm Hg in the left eye. Fundus examination revealed subretinal and preretinal peripapillary hemorrhages and vitreous hemorrhage extending from papillae to the vitreous. Papillae boundaries could not be evaluated. There was a suspicious area suggesting avulsion in the temporal part of the optic nerve. There was a fluffy elevation between the papillae and the fovea. Optical coherence tomography (OCT) revealed deep cavity due to ghosting caused by hemorrhage at the optic disc and subretinal thickening between disc and fovea. (Figure 1a,b,c). Systemic evaluation and computed cranial tomography was normal. A B-scan ultrasonography showed vitreous hemorrhage and irregularity at the junction of the optic nerve and glob. Orbital computed tomography (CT) was normal and there was no fracture in the optic canal (slice thickness 4mm). Axial and saggittal section magnetic resonance imaging

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**Received:** 13.02.2020

**Accepted:** 03.04.2020

*Ret-Vit* 2020; 29: 352-356

DOI:10.37845/ret.vit.2020.29.64

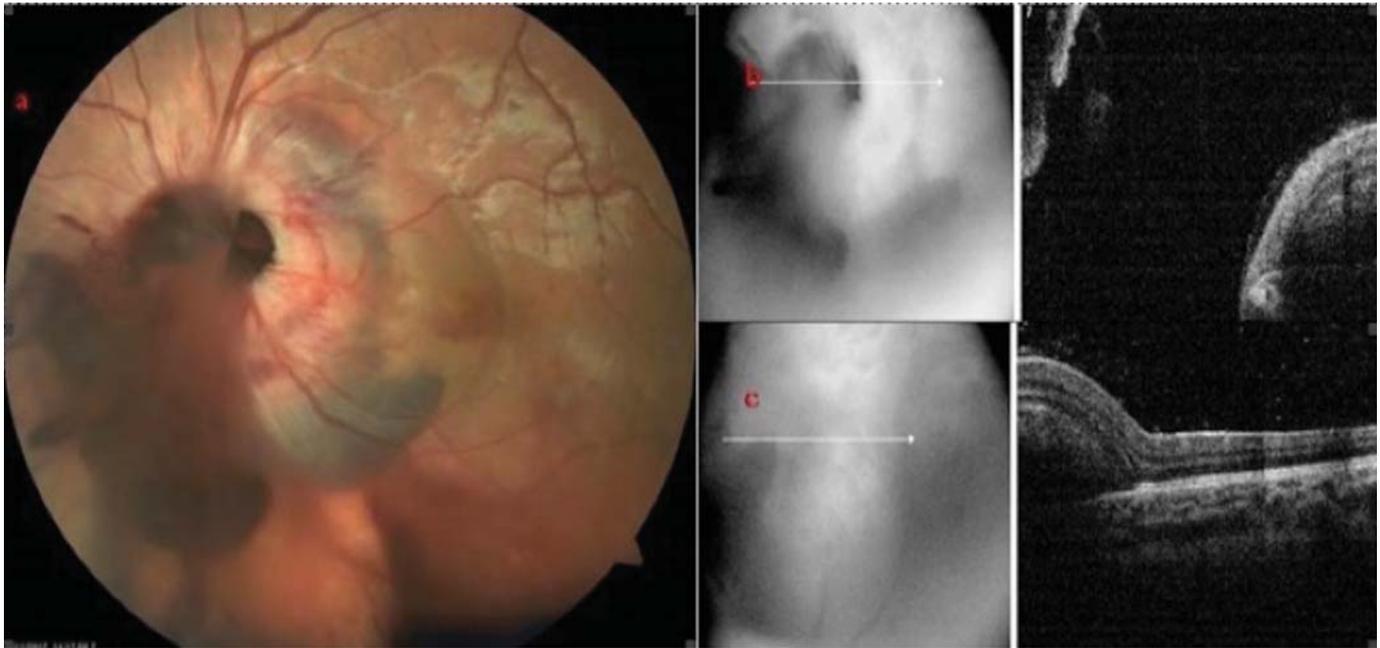
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**Figure 1a.** Fundus photograph of the left eye illustrating subretinal and preretinal peripapillary hemorrhages and vitreous hemorrhage extending from papillae to the vitreous.

**Figure 1b.** OCT image of the left eye illustrating deep cavity due to ghosting caused by hemorrhage at the optic disc.

**Figure 1c.** OCT image of the left eye illustrating subretinal thickening between disc and fovea.

(MRI) revealed deterioration of the optic nerve and globe junction at the left eye and sagittal MRI showed suspicious dissociation at that region (slice thickness 4mm) (Figure 2 A,B,C,D,E).

The patient was diagnosed as anterior traumatic optic neuropathy and partial optic nerve avulsion. Intravenous methylprednisolone 500mg/day was started for 3 days then oral methylprednisolone 1mg/kg/day was given for 1 week. Topical steroids for the anterior chamber reaction and bed rest in an upright position was recommended.

At 20<sup>th</sup> day OCT revealed deep cavity due to partial optic nerve avulsion (Figure 3a,b,c). Subsequent 1.5<sup>th</sup>, 4.5<sup>th</sup>, 6.5<sup>th</sup> and 12<sup>th</sup> months follow up, his vision increased to -0.3 logMAR and fundus hemorrhages began to withdraw. The avulsion in the temporal part of the optic nerve became clear after hemorrhages decreased. A white opacity remained in the vitreous above the papilla (Figure 4).

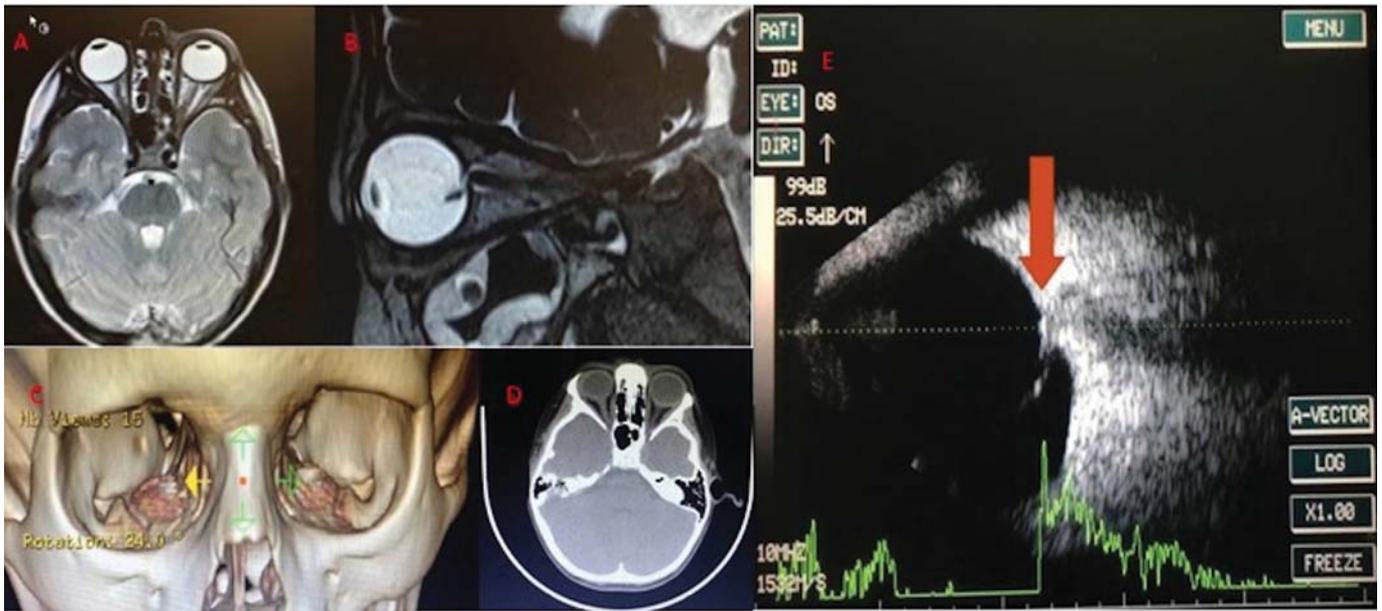
## DISCUSSION

Optic nerve avulsion diagnosis can be difficult because of vitreous hemorrhages. After withdrawn of the vitreous hemorrhage an excavation distinguishable in the disc area. In my case, the first fundus examinations did not show evident excavation in the disc region due to vitreous and peripapillary hemorrhage.<sup>4</sup> Partial avulsion became apparent at fundus and OCT images when hemorrhages began to withdraw.<sup>5</sup>

The MRI should be performed after the intraocular foreign body has been excluded. The MRI is helpful in the recognition of mild bleeding in the optic canal or in the optic nerve sheath but MRI imaging of optic nerve avulsion is rare because the optic nerve dural sheaths are usually attached to the globe. Barnard L.etal,<sup>6</sup> showed MRI visualization of optic nerve avulsion due to ocular perforation (slice thickness 3mm). Değirmenci MFK. et al,<sup>7</sup> showed optic nerve avulsion and retinal detachment after penetrating ocular trauma with CT. However, in my case, no significant optic nerve avulsion appearance was found in CT and MRI.

The integrity of the optic nerve and posterior ocular wall defect in the optic nerve head region can be seen also with B-scan ultrasonography. Sawhney R. et al,<sup>8</sup> showed the optic nerve was not seen to reach the optic disc and an area of hypolucency was seen anteriorly posterior to the optic nerve head.

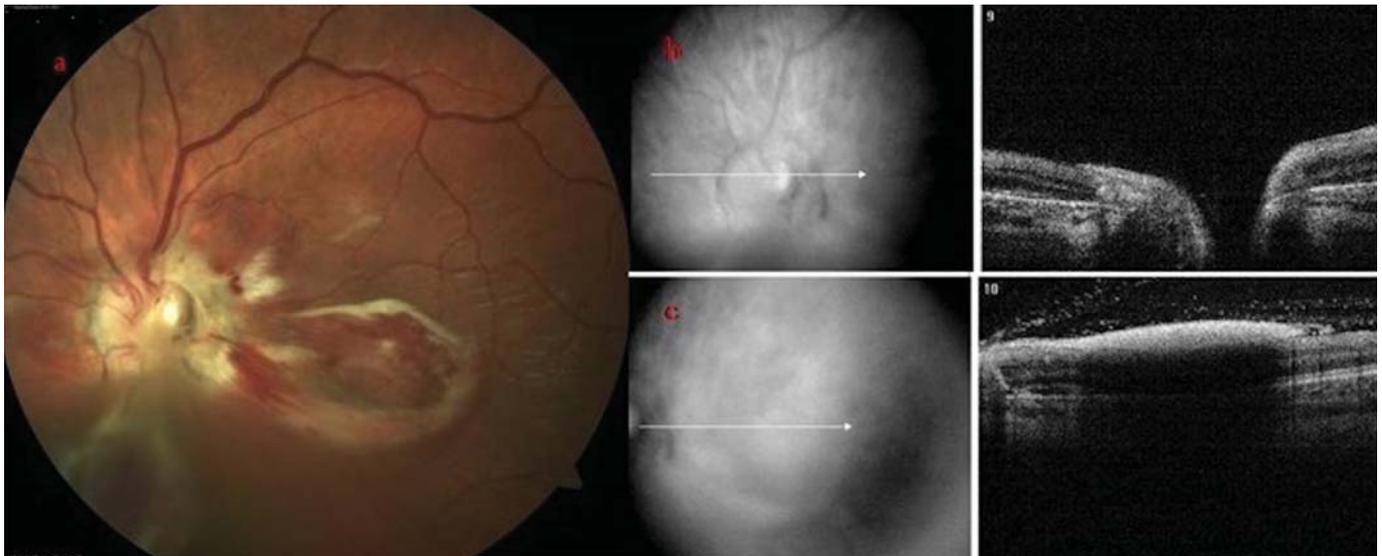
In patients with traumatic optic neuropathy and optic nerve avulsion, to make the correct diagnosis and differential diagnosis is important to protect the patient from unnecessary treatment such as high dose steroids, optic nerve decompression or pars plana vitrectomy.<sup>9</sup> The effectiveness of steroid therapy is controversial, however it may be a suitable option in the young patient group who is presented with sudden loss of vision in the acute period of trauma.<sup>10</sup> In our patient, there was an increase in vision after steroid treatment.



**Figure 2A,B.** Axial (A) and sagittal (B) section magnetic resonance imaging (MRI) revealed deterioration of the optic nerve and globe junction at the left eye and sagittal MRI showed suspicious dissociation at that region (slice thickness 4mm).

**Figure 2C,D.** Orbital computed tomography (CT) was normal and there was no fracture in the optic canal (slice thickness 4mm).

**Figure 2E.** B-scan ultrasonography showed vitreous hemorrhage and irregularity at the junction of the optic nerve and globe.



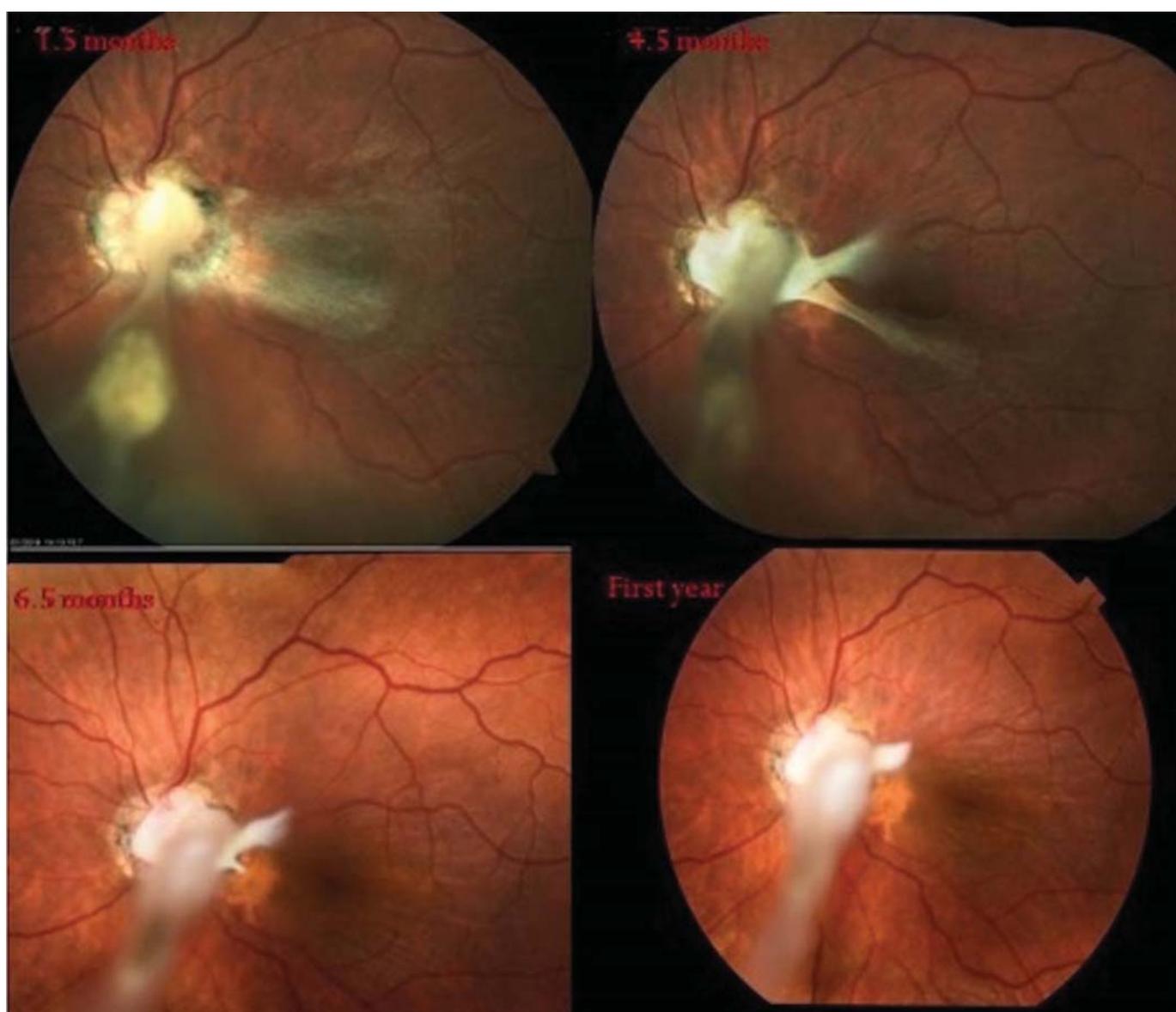
**Figure 3a.** 20<sup>th</sup> day fundus photograph.

**Figure 3b.** 20<sup>th</sup> day OCT image of papilla.

**Figure 3c.** 20<sup>th</sup> day OCT image of macula.

All cases of optic nerve avulsion in the literature have no long-term follow-up pictures. To the best of my knowledge this is the first partial optic nerve avulsion case in the literature which is shown with 12 months follow-up with pictures.

Optic nerve avulsion must be considered in cases of trauma. Steroid treatment is a suitable treatment at early presenting patients. This report shows that multimodal imaging may be helpful in the diagnosis of patients with suspicion of optic nerve avulsion. This report also shows that initially unspecified fundus findings may be more pronounced with



**Figure 4.** Fundus photographs of 1.5<sup>th</sup>, 4.5<sup>th</sup>, 6.5<sup>th</sup> and 12<sup>th</sup> months.

long-term follow-up. In addition, the literature on optic nerve avulsion was reviewed and summarized.

#### **Acknowledgements**

No

#### **Conflict of interest**

I declare that there was no conflict of interest.

#### **Funding sources**

I declare that this study received no financial support. There is no contribution of other colleagues or institutions.

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