

## Partial optic nerve avulsion: A diagnostic challenge

Optic nerve avulsion (ONA) is the traumatic separation of the optic nerve fibres at the level of the lamina cribrosa, with preservation of the nerve sheath and adjacent sclera.<sup>1</sup> It is a rare but visually devastating form of anterior traumatic optic neuropathy.<sup>2</sup> Complete avulsion results in dense visual loss, whilst a partial avulsion can lead to variable degrees of impairment.<sup>3</sup> We report a case of partial ONA which highlights the risk of severe visual loss from finger gouging injuries and emphasizes key issues in diagnosis and management.

A 30-year-old man presented with acute visual loss, painful eye movements and a superior lid laceration following a punch to the left eye with outstretched fingers during a martial arts match. The right eye was normal. Visual acuity in the left eye was Count Fingers at 2 m and a relative afferent pupillary defect was noted. Intraocular pressure was 7 mmHg in the left and 14 mmHg in the right eye. On slit-lamp examination, there was a left subconjunctival haemorrhage, a clear cornea and normal lens. B-scan ultrasonography demonstrated a vitreous haemorrhage with normal appearance of the retina and optic nerve. Computed tomography (CT) of the brain showed an intact globe and optic nerve (Figure 1). Magnetic resonance imaging (MRI) was not available.

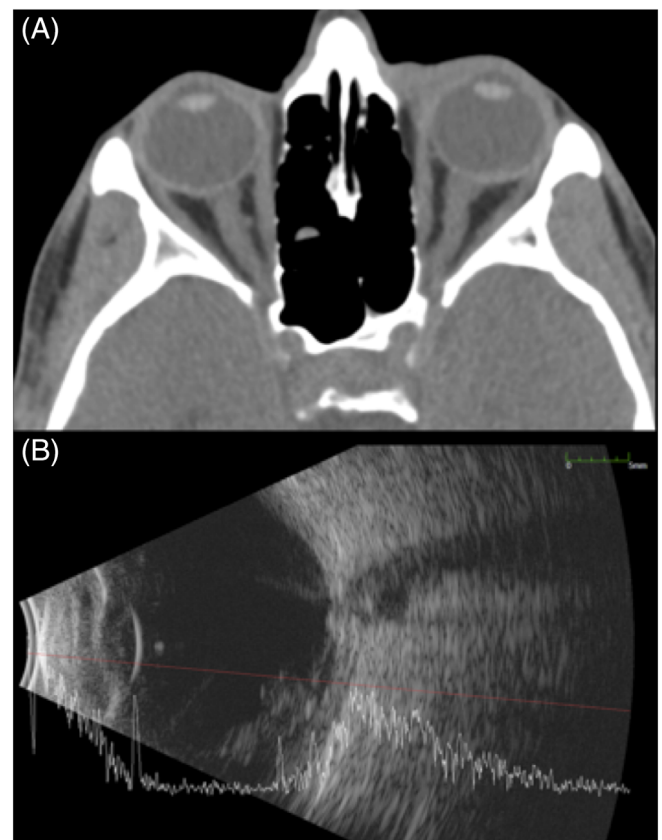
The patient was initially managed conservatively and reviewed 10 days later, at which time a vitrectomy was performed to clear the vitreous haemorrhage, revealing peripapillary intraretinal haemorrhage. Postoperative visual acuity was 6/36.

Upon review 2 months post-injury, fundus examination revealed a left partial ONA with striae radiating from the optic disc (Figure 2). Structural evaluation with ocular coherence tomography showed a deep cavity at the inferior aspect of the disc with thinning of the inferior retinal nerve fibre layer. Visual field tests demonstrated a corresponding dense superior altitudinal defect. The patient was managed conservatively and maintained a visual acuity of 6/12 with a persistent field defect at 6 months follow-up.

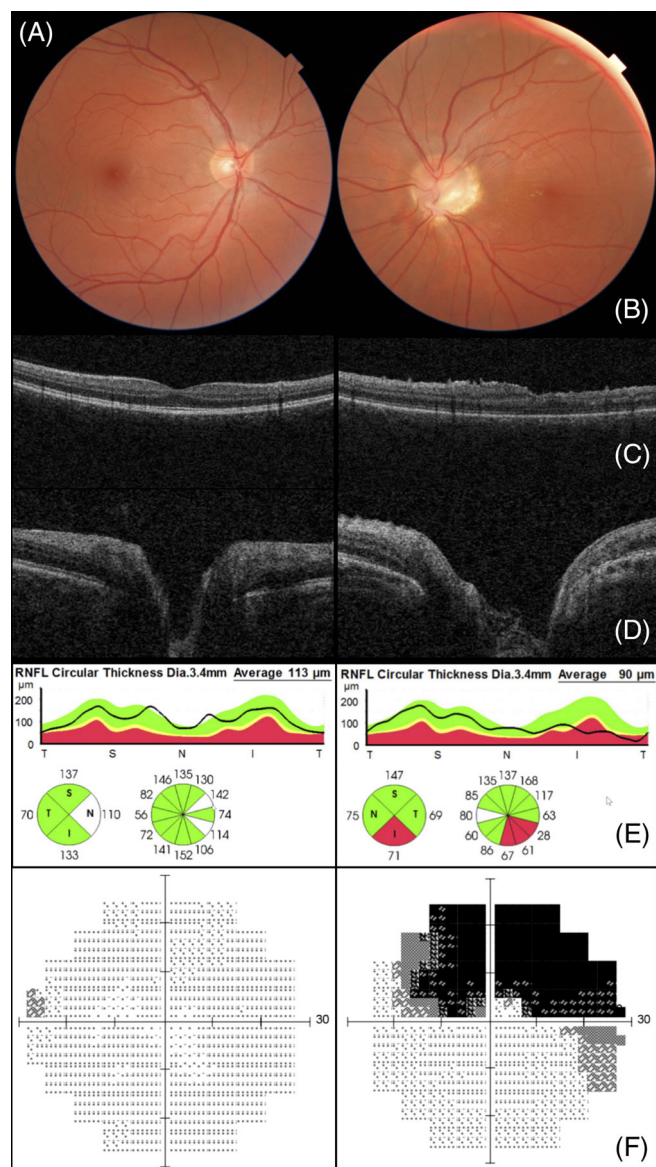
ONA is typically a consequence of blunt injury where an object intrudes between the globe and orbital wall.<sup>1</sup> Proposed mechanisms include: (a) extreme rotational movement around the axis of the globe resulting in

tearing of the nerve parenchyma; (b) deformation of the globe causing an explosive rise in intraocular pressure and forcing the nerve out of the scleral canal; and (c) forced anterior displacement of the globe.<sup>1</sup> Finger gouging is a common cause of injury.<sup>2</sup> Computer modelling has indicated that the nerve insertion point opposite to the side of finger impact is the region subjected to the largest strain, which is consistent with this case.<sup>2</sup> Previous reports demonstrate superior field defect to be a frequent consequence of partial nerve avulsions.<sup>4</sup>

Diagnosis of the condition is usually straightforward when the media is clear, as fundus examination



**FIGURE 1** A, Computed tomography of the orbits within hours of injury indicating an intact globe and no evidence of optic nerve avulsion. B, B-scan ultrasonography of the left eye showing a vitreous haemorrhage and vitreous detachment but no retinal detachment. There is no gross abnormality of the optic nerve



**FIGURE 2** A, Structural and functional testing of the normal right eye presented for comparison. B, Fundus photograph of the left eye at 2 months post-injury showing partial optic nerve avulsion with inferotemporal gliosis and choroidal folds. C, Vertical ocular coherence tomography (OCT) through the macula showing inferior thinning of the retinal nerve fibre layer (RNFL). D, Vertical OCT indicating a deep cavity at the inferotemporal disc. E, Circumpapillary RNFL analysis showing inferotemporal thinning of the RNFL. F, Visual field testing with Haag-Streit Octopus perimeter indicating dense altitudinal defect correlating with OCT findings

demonstrates a cavity in the position of the optic disc.<sup>1,3</sup> Frequently, however, there is a coexisting vitreous haemorrhage, in which case ultrasonography, CT and

MRI may be helpful.<sup>1,2</sup> Ultrasonography should be performed to exclude globe rupture and may reveal an area of hypolucency within the nerve head.<sup>3</sup> CT and MRI can also show a hyperlucent area at the junction of the globe and nerve.<sup>1</sup> Reports indicate that sensitivity of imaging remains low, with several cases showing an essentially normal appearance similar to this presentation.<sup>2</sup>

Recent evidence has failed to demonstrate a benefit for use of high-dose intravenous corticosteroids for ONA, and in fact suggests a considerable risk of harm.<sup>5</sup> As no treatment has proven benefit for ONA, early diagnosis can prevent unnecessary treatment with high-dose steroids.<sup>3</sup> For this reason, there should be a high index of suspicion for all cases of blunt trauma with acute visual loss and vitreous haemorrhage. Due to the absence of reliable tests, ONA with media opacity remains a diagnostic challenge.

### CONFLICT OF INTEREST

None declared.

Mark A. Chia MBBS MMed

Vaibhav H. Shah MBBS DNB

Angus W. Turner FRANZCO MSc(Oxon)

Lions Eye Institute, Nedlands, Western Australia, Australia

### Correspondence

Dr Mark A. Chia, Lions Eye Institute, 2 Verdun Street, Nedlands, WA 6009, Australia.  
Email: mark.chia@live.com.au

### ORCID

Mark A. Chia <https://orcid.org/0000-0003-0339-5186>

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