

Case Report

Traumatic Optic Neuropathy and Monocular Blindness following Transnasal Penetrating Optic Canal Injury by a Wooden Foreign Body

Reem Younis^a Eran Berkowitz^c Roni Shreter^b Anat Kesler^c
Itzhak Braverman^a

^aDepartment of Otolaryngology, Head and Neck Surgery Unit, Hillel Yaffe Medical Center, Hadera, Israel; ^bRadiology Unit, Department of Diagnostic Radiology, Hillel Yaffe Medical Center, Hadera, Israel; ^cDepartment of Ophthalmology, Hillel Yaffe Medical Center, Hadera, Israel

Keywords

Transnasal penetration · Sinonasal injury · Wooden foreign body · Optic canal injury · Traumatic optic neuropathy

Abstract

Purpose: To report a case of right eye blindness due to a penetrating injury in the contralateral nostril. **Methods:** This is a case report of a 67-year-old patient who presented to the emergency room complaining of transient blurred vision in his right eye after falling on a small branch with no apparent injury besides minor lacerations. The following day, the patient experienced blindness in the right eye. Physical examination revealed small lacerations on his left forehead and optic neuropathy on the right side with no other obvious discerning physical or imaging abnormalities. **Results:** After elevated suspicion and reassessment of the neuroimaging findings, a radiolucent track was observed in the nasal cavity, continuing up from the left nostril to the right optic nerve. Transnasal endoscopic surgery was performed and a long wooden branch was removed from the nasal cavity. **Conclusion:** A nasally penetrating wooden foreign body can cause traumatic optic neuropathy and vision loss on the unaffected side and can be very

difficult to locate and image without any clear external evidence as to its presence. This case highlights the importance of maintaining a high level of suspicion in these types of cases.

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Published by S. Karger AG, Basel

Introduction

We describe a rare case of right eye blindness due to a wooden branch penetrating through the left nostril, crossing and reaching the right optic canal. The probability of an optic canal injury due to a nasally penetrating foreign body as well as the difficulties in identifying wooden foreign bodies are discussed herein.

Case Report

A 67-year-old patient with a walking disability due to childhood polio, presented to our emergency room (ER) after accidentally tripping and falling onto a small tree branch in his garden. The patient reported that he had experienced transient blurred vision for a few minutes, with no other complaint. On physical examination, small lacerations were observed on his left forehead, with no other obvious discerning physical abnormalities. A non-contrast head computed tomography (CT) scan was performed with no evidence of intracranial hemorrhage or skull fractures. No proptosis was noted on eye examination; visual acuity was 6/6 in the right eye and 6/7.5 in the left. Intraocular pressure was 14 mm Hg bilaterally. The patient's pupils were equal and reactive to light with no relative afferent pupillary defect. He had full eye movements and a normal fundus with a few drusen found in the retina (Fig. 1a). The patient refused to be hospitalized and was released on his own accord.

The following day, the patient returned to the ER due to blindness in his right eye. He also reported a foreign body sensation in his left nostril. On otolaryngology examination, a foreign body was detected in his left nostril. An attempt at removing it was unsuccessful. A visual acuity examination of the right eye revealed no light perception and trace of a right afferent pupil defect. Macular and retinal nerve fiber layer optical coherence tomography (Topcon OCT-2000 Spectral Domain OCT) was normal (Fig. 1b). Fluorescein angiography was also normal. The Humphrey visual field revealed a complete visual field defect in the right eye and mild constriction of the left visual field (Fig. 1c). A second brain CT and CT angiography were performed and interpreted as normal.

Due to the fact that the patient had lost his vision in the right eye without any evidence of external orbital trauma, but with an afferent pupillary defect in the eye and evidence of a foreign body located in the left nostril (suspected to be a tree branch), we decided to reassess our neuroimaging findings, with an emphasis on the optic canal area. After further assessment, a radiolucent track was observed in the nasal cavity continuing up from the left nostril through the nasal septum into the right posterior superior ethmoid cell and ending at the inferior border of the right optic canal, mildly compressing the floor of the canal and abutting the optic nerve (Fig. 2). Transnasal endoscopic surgery was performed by an otorhinolaryngology team using the Medtronic Fusion ENT Surgical Navigation System. An 8-cm long wooden branch was successfully removed from the nasal cavity (Fig. 3). Postoperatively, the patient received empirical intravenous prophylactic antibiotics as well as systemic steroids and was discharged home with no improvement in his right eye vision. The publication of this case report was approved by the Institutional Review Board of Hillel Yaffe Medical Center, Hadera, Israel.

Discussion

Traumatic optic neuropathy can result from direct or indirect trauma. To the best of our knowledge, we report the first case of a left transnasal penetrating right optic canal injury by a wooden foreign body, resulting in traumatic optic neuropathy and monocular blindness. During the patient's first visit to the ER, physical examination was normal with no evidence of optic neuropathy. Twenty-four hours later, the patient lost vision in his right eye. The patient and physician had been unaware of the existence of a foreign body. Without prior knowledge of its existence (as in our case, where the patient did not know or report that a branch had entered his nostril), it may be difficult to visualize the object on imaging studies such as conventional radiography, i.e. a CT [1] or MRI [2]. Due to their air content, wooden foreign bodies are difficult to detect on either a CT or MRI. On a CT scan, wood appears as a low attenuating stripe or area and thus can be difficult to detect, especially in the paranasal sinuses where it is surrounded by air which has a similar attenuation. On an MRI, wood is viewed with low intensity both on T1 and T2 sequences and is also quite difficult to detect [3, 4]. A contrast-enhanced CT and MRI are effective in detecting wooden foreign bodies after the formation of an inflammatory reaction or hematoma in the soft tissues surrounding the object; however, in our case the imaging was performed in an acute setting. Wooden objects are highly echogenic; therefore, ultrasonography is considered the method of choice for detecting a wooden object embedded in soft tissue [5]. However, due to the boney anatomy of the orbit and sinuses, ultrasound imaging has limited use in these areas.

In our case, the wooden object was embedded in the nasal cavity and ethmoid air cells, therefore, its low density was not discovered on the first scans (Fig. 2a), only the edge of the foreign body was found abutting the floor of the orbital canal (Fig. 2g). In this acute situation, only a high incidence of suspicion would have assisted in detecting the wooden object

In the present case, the radiolucent foreign body and a bone fragment protruding into the optic canal were initially missed on the axial CT images (Fig. 2a, d, arrows). The lucent foreign body is better visualized in the oblique sagittal reformations (Fig. 2b: soft tissue window, c: bone window, e: lung window, f: inversion window). The thickness of the bone fragment separating the wooden foreign object from the optic canal and nerve was 0.9 mm (Fig. 2g).

The anatomical relationship between the optic nerve and the posterior paranasal sinuses predisposes the nerve to damage following sinus surgery or trauma. Anatomic variations occur between the posterior paranasal sinuses and optic nerve. In the majority of cases, the optic nerve is found close to the sphenoid sinus; however, in 3% of the general population, as in our case, the nerve was situated close to the posterior ethmoid cells [6].

Visual loss due to traumatic optic neuropathy following blunt or penetrating head trauma is uncommon, but once occurring, the prognosis can be poor [7]. In the present case, the trauma initially appeared to involve only the left forehead. There was no evidence of any ocular involvement, and the patient did not complain of any nasal foreign body sensation. Moreover, a full ophthalmic examination showed no objective signs of orbital trauma. Twenty-four hours later, we presume that due to a slight movement of the foreign body, traumatic optic neuropathy developed. It is well known that infection and inflammation can develop in the vicinity of a wooden foreign body. In our case, although it was a penetrating wooden foreign body, the patient was treated with antibiotics and no abscess or infection developed clinically or radiologically.

Conclusions

The present case highlights the possibility of vision loss due to a nasally penetrating foreign body and illustrates the difficulty of finding and diagnosing wooden foreign bodies with no clear external evidence as to their presence. Furthermore, detecting wooden foreign bodies via radioimaging and the unusual entrance and exit route taken by the branch (from the left nostril to the right optic canal), was quite challenging. In addition to a high level of suspicion and goal-directed diagnostic approach in cases such as this, suspicion of penetrating orbital and facial wounds, presumed to be of an organic nature, should be imaged carefully in all positions, with thin sections and including oblique views.

Acknowledgement

The authors thank Mrs. Phyllis Curchack Kornspan for her editorial services.

Statement of Ethics

The authors have no ethical conflict to disclose. The subject has given his informed consent, and the study protocol has been approved by the institute's committee on human research.

Disclosure Statement

The authors declare that they have no conflicts of interest.

Funding Sources

No funding was received for this research.

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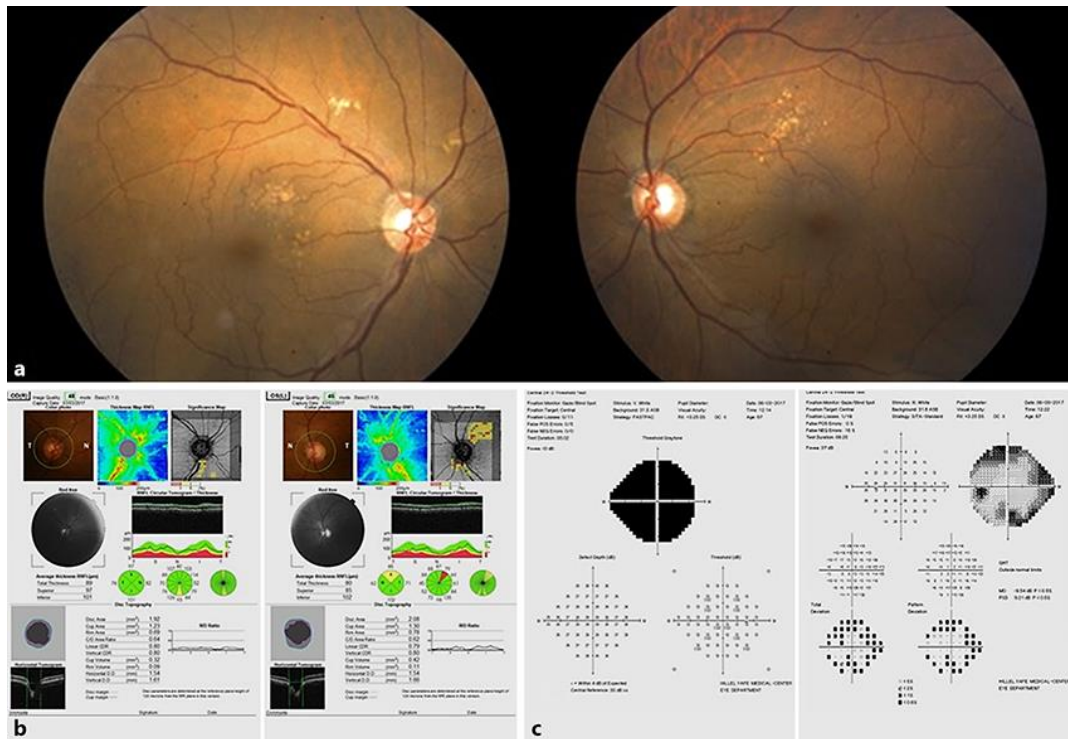


Fig. 1. **a** Color fundus photo of the patient’s retina. Drusen in the superior temporal and temporal to the optic disc can be seen. **b** Optical coherence tomography of the retinal nerve fiber layer using Topcon OCT exhibiting mild superior thinning of the RNFL in the left eye. **c** Humphrey visual field 24-2 exhibiting a complete scotoma in the right eye and left constriction of the visual field.

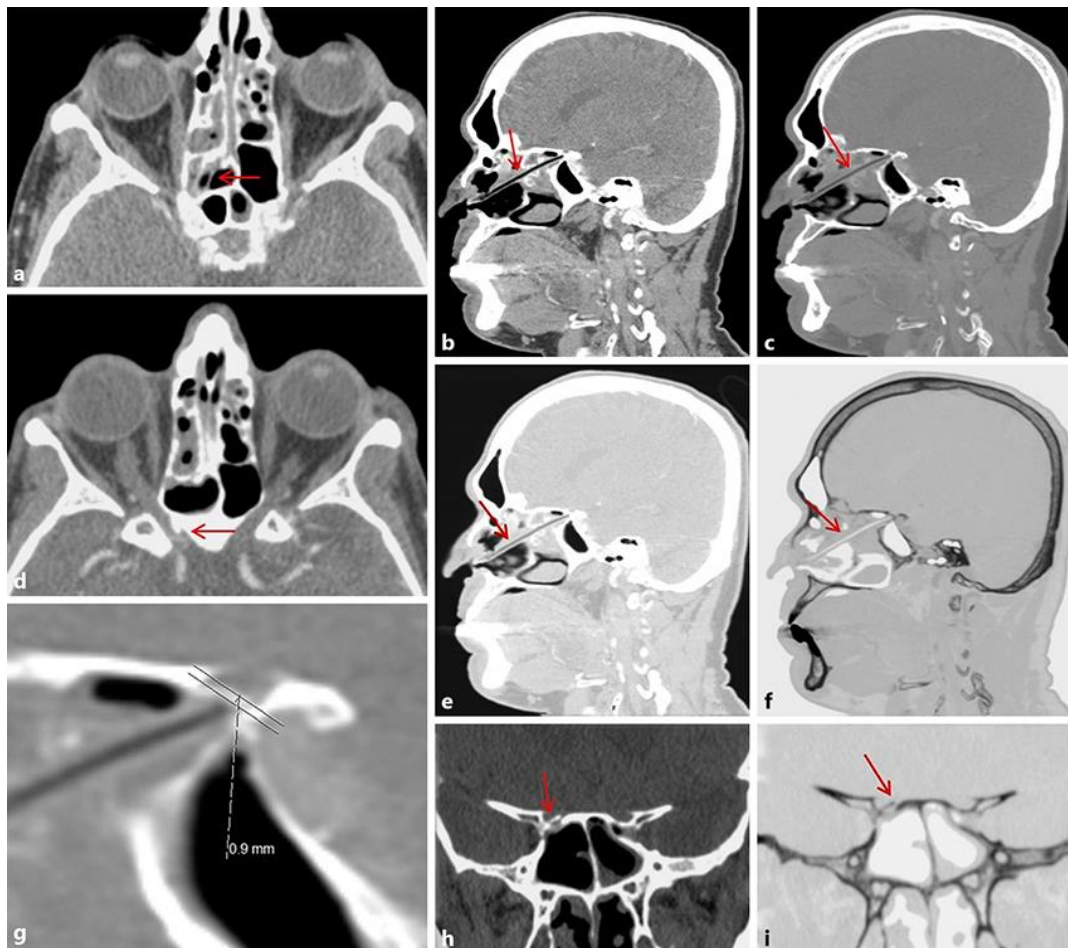


Fig. 2. CT images. Radiolucent foreign body and fracture protruding into the optic canal were initially missed on the axial CT images (**a** and **d** arrows). The lucent foreign body is better visualized in the oblique sagittal reformations (**b**: soft tissue window, **c**: bone window, **e**: lung window, **f**: inversion window). **g** The thickness of the bone fragment separating the wooden foreign object from the optic canal and nerve was 0.9 mm. The fracture can be better visualized on the coronal reformations in the bone window (**h**) and inversion window (**i**).



Fig. 3. A wooden branch, 8 cm long and 0.6 cm wide.