Traumatic optic nerve avulsion: A case report

Avulsion traumatique du nerf optique : à propos d’un cas

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Summary
Introduction. — Case report of a traumatic optic nerve avulsion.
Observation. — We report the case of a traumatic right optic nerve avulsion in an 11-year-old boy as a result of a contusion with a surfboard. On initial examination, the patient exhibited bilateral mydriasis with a right afferent pupillary defect. Visual acuity was no light perception. A moderate microhyphema was noted along with intraocular pressure of 12 mmHg and no open globe. Fundus examination revealed retinal ischemia with white retinal edema, attenuated arteries and segmentally occluded vasculature. In place of the optic nerve, there was a hole with associated vitreous hemorrhage. Non-contrast CT and MRI demonstrated vitreous prolapse into the optic nerve sheath, which still appeared securely attached to the globe. Spectral domain OCT and visual evoked potentials confirmed disruption of the ganglion cell layer.
Discussion. — While obvious in the presence of clear media, an avulsion may remain undetected in the case of associated vitreous hemorrhage. Orbital imaging may clarify the diagnosis.
Conclusion. — Although rare, optic nerve avulsions exhibit the same risk profile as open globe injuries and arterial occlusions.

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Introduction

Optic nerve avulsion also called anterior indirect traumatic neuropathy is rare and dramatic condition in which the optic nerve is forcibly disinserted from the retina, choroid and the vitreous [1,2], and lamina cribosa is retracted from the scleral rim.

Case report

We report the case of a traumatic optic nerve avulsion in an eleven-year-old boy after having being hit by a surfboard. At admission, he had no light perception in his right eye. The eye was white and he had a minor orbit hematoma. Ocular motility was normal. Slit lamp examination showed non-reflective mydriasis, a small hematic Tyndall in the anterior chamber and a clear lens. Fundus examination disclosed small vitreous haemorrhage, large ischemic oedema, cherry red macula with a central artery occlusion aspect and an empty optic disc. There was no retinal detachment (Figs. 1 and 2) No focal neurologic signs were associated.

Final diagnosis was traumatic total optic nerve avulsion.

The child underwent CT-san (Fig. 3) and MRI (Fig. 4) in emergency focused on orbit and brain without contrast product injection. Curvilinear reconstructions of the orbit revealed the avulsion of the optic nerve from the globe at the level of the lamina cribrosa without rupture of the optic nerve sheath. Neither orbit fracture nor brain hematoma was found. The patient was hospitalized in the Ophthalmology Department for further exams and medical care. A bi-antibiotherapy combining third generation cephalosporin and fluoroquinolones was initiated and was associated with 250 mg of methylprednisolone in order to reverse any component of optic neuropathy.

Flash visual evoked potentials (VEP) were flat, assessing the nervous influx interruption. High-resolution spectral domain OCT of optic disk and retina showed ganglionnar cell layer interruption and a massive Berlin oedema (Fig. 5). It

Résumé

Introduction. — Description d’une avulsion traumatique du nerf optique.

Observation. — Nous rapportons le cas d’une avulsion traumatique du nerf optique droit par contusion chez un enfant de 11 ans par une planche de surf. À l’examens initial, il existe une mydriase bilatérale, avec un déficit afférent pupillaire droit. L’acuité visuelle est réduite perception lumineuse négative. Cliniquement on note un Tyndall hématic modéré, une tension à 12 mmHg et pas de plaque de globe. Au fond d’œil la rétine est ischémique avec un œdème rétinien blanc, des artères grêles et une circulation interrompue sur certains segments. En lieu et place du nerf optique il y a un trou avec une hémorragie intravitréenne en regard. Un TDM non injecté et une IRM sont réalisés et montrent une issue de vitré dans la gaine du nerf optique qui semble solidaire du globe. L’OCT spectral Domain ainsi que les potentiels évoqués visuels confirment l’interruption des fibres ganglionnaires.

Discussion. — De diagnostic évident lorsque les milieux sont clairs, l’avulsion peut être mécon- nue en cas d’hémorragie associée. L’imagerie orbitaire peut montrer des images évocatrices.

Conclusion. — De survenue rare, les avulsions du nerf optique exposent au même risques qu’une plaie du globe ou une occlusion artérielle.

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Figure 1. Image of total optic nerve avulsion showing an empty optic disc, intravitreous hemorrhage and ischaemic retina with cherry red macula.

Figure 2. Wide angle image with Optomap showing large ischaemic oedema.
also showed a small vitreous haemorrhage extending from the optic disc. MRI displayed a T2 hyper signal of the optic nerve head and a direct image of the avulsion.

The patient was followed up every month. At one month, later gliosis had closed the avulsion with a ‘‘morning glory syndrome’’-like aspect. Fundus exam revealed retinal striae with a macular membrane traction due to vitreous incarceration in the hole and a peripheric retinal atrophy secondary to ischemia (Fig. 6). The intraocular pressure remained stable, retinal arteries were reperfused and no neovascular glaucoma was observed. OCT showed a progressive RNFL loss.

No further modifications of the clinical presentation were found during follow-up.

**Discussion**

Optic nerve avulsion is a rare condition and only few cases have been reported in literature. It can be isolated or combined with other globe or orbital injuries. Finger poking seems to be one of the most common causes of injury [2]. It can also result from blunt injury, as an object intrudes between the globe and the orbital wall leading to an extreme rotation of the eye [2,3]. Other mechanisms had been described, such as sudden marked rise in intraocular pressure forcing the nerve out of the scleral canal [4], or volunteer self-avulsion in psychiatry called oedipism [5]. Partial avulsion can cause variable degrees of visual loss, thus motivating for intra venous steroids administration. The diagnosis is obvious when media are clear, but it can

![Figure 3. CT scan with curviline reconstruction showing optic nerve avulsion at the level of lamina cribosa without rupture of the optic nerve sheath.](image)

![Figure 4. MRI in T2 pondered sequence.](image)

![Figure 5. Spectral domain OCT showing inner layer of the retina ischaemic oedema and interrupted ganglionar cells layer.](image)

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be unknown for a long time if fundus exam is obscured by hyphema or intravitreal haemorrhage [2]. Ultra sound tomography can inconstantly show an hypoechoegenous dimple behind the optic nerve head or a hole of the globe [2,5,6]. CT scans can demonstrate complete or partial optic nerve avulsion with a linear hyperluency with a retrodisplaced lamina cribosa [7,8]. Furthermore, CT scans can provide the indication of surgical decompression in case of a lesion of the optic nerve in the optical canal [9]. MRI was shown not to be sensitive enough to evaluate an optic nerve avulsion [2] because of a lack of resolution and a long scanning time producing artefacts. Moreover, in MRI, distinguishing the optic nerve from surrounding orbital fat can be difficult [10]. OCT can show oedema of the inner layer of the retina in acute injury and is undoubtedly useful to monitor RNFL loss over time [11].

Conclusion

The prognosis of this condition remains very poor and total optic nerve avulsion usually leads to unilateral complete loss of vision. Medical imaging can be helpful for grading and prognosticate the injury.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References