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Case Report

Intraneural hemorrhage in traumatic oculomotor nerve palsy**Thomas Sartoretti^a, Elisabeth Sartoretti^a, Christoph Binkert MD^a, David Czell MD^b, Sabine Sartoretti-Schefer MD^{a,*}**^a Institut für Radiologie, Department of Radiology, Kantonsspital Winterthur, Brauerstrasse 15, 8401 Winterthur, Switzerland^b Klinik für Innere Medizin, Department of Medicine, Kantonsspital Winterthur, Brauerstrasse 15, 8401 Winterthur, Switzerland

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ABSTRACT

Isolated traumatic oculomotor nerve palsy without internal ophthalmoplegia is a rare condition after closed head trauma. The nerve strain leads to intraneural edema with nerve swelling on T2-weighted magnetic resonance (MR) images and traumatic disruption of the blood peripheral nerve barrier with contrast enhancement on T1-weighted MR images. In this patient, susceptibility-weighted MR imaging allowed the direct visualization of the intraneural hemorrhage after suspected traumatic diffuse neuronal axonal injury.

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Introduction

After major head trauma, traumatic oculomotor nerve palsy may occur after direct or indirect injury to the nerve [1]. Oculomotor nerve injuries can be divided into different groups [2,3]: nerve transection or nerve avulsion, nerve straining/stretching, or intraneural hemorrhage. Nerve damage to the oculomotor nerve may happen in its intramedullary part, at the tentorial gap or at the posterior petroclinoid ligament or in the intracavernous and intraorbital part [3,4]. The nerve is especially prone to damage at the posterior petroclinoid ligament [5].

In major head trauma, basilar skull fractures, orbital injuries, traumatic epidural/subdural hematomas, cortical contusions, diffuse axonal injuries DAIs, and traumatic subarachnoid hemorrhage often accompany traumatic

oculomotor nerve transection or nerve compression by adjacent hematoma [2]. Clinically, a complete oculomotor nerve palsy leads to a characteristic down and out position in the affected eye because of the lateral rectus innervated by the abducens nerve and the superior oblique muscle innervated by the trochlear nerve. It also results in a ptosis and mydriasis [6].

In rare cases, isolated complete oculomotor nerve palsy is caused by minor head trauma due to nerve straining at the posterior petroclinoid ligament [5] followed by diffuse axonal injury (DAI) to the nerve itself or to the nuclear area in the brainstem [2]. In very rare cases, isolated traumatic oculomotor nerve palsy without internal ophthalmoplegia is reported [5]. Brain computed tomography (CT) scans are not useful in such cases for CT is insufficient to detect midbrain damage and oculomotor nerve root avulsion or oculomotor nerve straining [7,8]. However, magnetic resonance image

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* Corresponding author.

E-mail address: sabine.sartoretti@ksw.ch (S. Sartoretti-Schefer).

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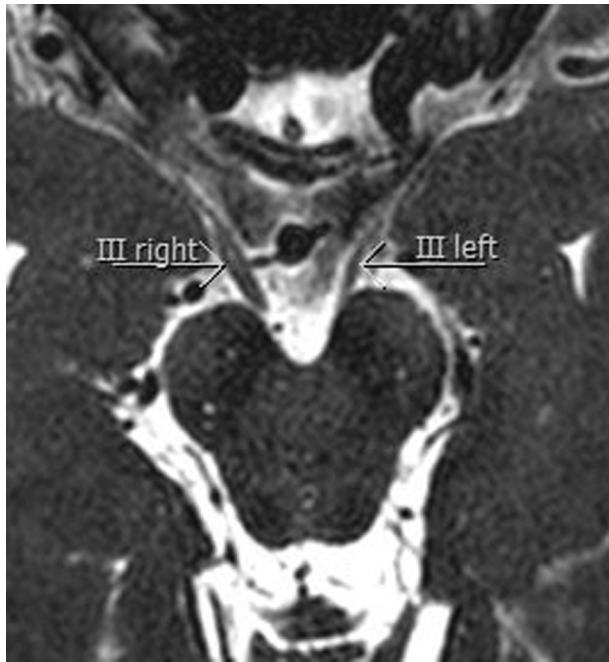


Fig. 1 – Transverse 3D T2w MR image with thickened cisternal segment of right oculomotor nerve (III right) compared to normally sized left oculomotor nerve (III left). 3D, three dimensional; MR, magnetic resonance.

(MRI) scans are highly recommended in order to demonstrate the nerve damage with nerve swelling, T2w hyperintensity, and contrast enhancement of the cisternal nerve segment of the oculomotor nerve resulting from DAI of the nerve.

However, to date, no reports are available demonstrating the hemorrhagic diffuse axonal nerve injury itself on high-resolution MRI [7,8].

Case report

In June 2016, a 54 years old previously healthy female patient without previous medical record presented with complete right-sided ptosis, deviation of the right bulb down to the right and out and diplopia of the right eye following a motorcycle accident. Pupillary dilatation was not present. Isolated right-sided posttraumatic oculomotor palsy without internal ophthalmoplegia was clinically diagnosed.

A nondislocated orbital floor fracture on the right side without any posttraumatic damage to the osseous skull or the brain itself was present on the emergency CT examination.

Initial MRI scans obtained on a Philips Achieva 3Tesla MR unit revealed swelling (Fig. 1) and contrast enhancement of the oculomotor nerve along the right cisternal segment (Fig. 2) on 3D T2 spin echo-weighted MRI and on T1-weighted contrast-enhanced MR images. On 3D double inversion recovery sequence, a slight hyperintensity of the cisternal nerve segment on the right side was visible (Fig. 3). On transverse susceptibility-weighted images (SWIs), a focal intraneural hypointense microbleed within the right cisternal oculomotor

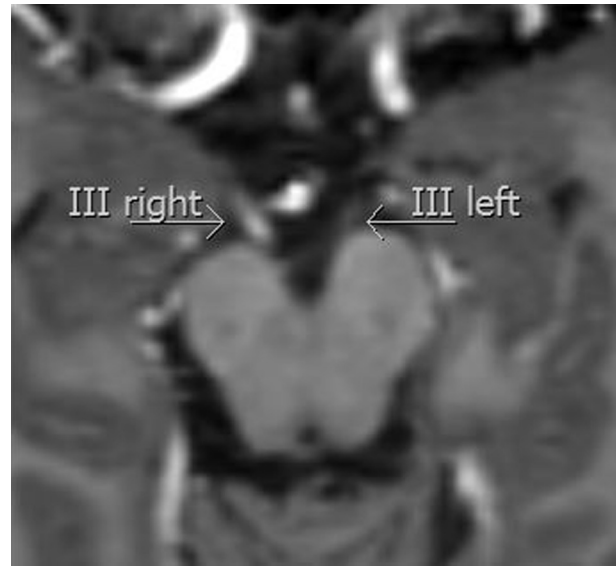


Fig. 2 – Transverse 3D T1-weighted TFE MR image with contrast enhancing cisternal segment of oculomotor nerve (III right) in comparison with nonenhancing cisternal segment of left oculomotor nerve (III left). TFE, turbo field echo; 3D, three dimensional; MR, magnetic resonance.

nerve could be demonstrated (Fig. 4A). Multifocal diffuse axonal hemorrhagic injuries were bilaterally present as hypointense spots on SWI in the amygdala, uncus and parahippocampus, posterior hippocampus, superior cerebellar peduncle, and thalamus (Fig. 4A and 4B). Cortical contusions and epidural or subdural hematomas were absent.

On T2-weighted fat suppressed m-Dixon MR images, a slight hyperintensity of all the ocular muscles supplied by the oculomotor nerve, that is, inferior/medial and superior rectus muscle as well as of the inferior oblique muscle was visible on

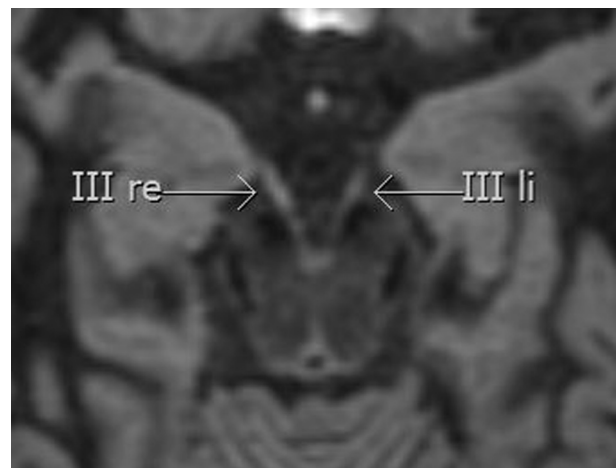


Fig. 3 – Transverse 3D DIR MR image with thickened and slightly hyperintense right oculomotor nerve (III right) compared to the left side (III left). DIR, double inversion recovery; 3D, three dimensional; MR, magnetic resonance.

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