Isolated Third Cranial Nerve Palsy after Mild Head Trauma

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Abstract

Isolated third cranial nerve palsy in patients with a head injury can be the result of direct or indirect nerve injury. There are numerous causes for cranial nerve injury that include head trauma or other lesions. In most cases, oculomotor nerve injury is associated with severe cranial trauma. Traumatic oculomotor nerve palsy associated with mild head injury is uncommon. We report the case of isolated third cranial nerve palsy associated with minor head injury in the absence of abnormal brain imaging findings.

Keywords: Mild Head Trauma; Oculomotor Nerve Palsy

Introduction

Head injury is frequently present in motor vehicle accidents. There are numerous causes for cranial nerve injury that include head trauma or other lesions. The oculomotor nerve is somatic and visceral motor nerve. When it is completely injured the result is ptosis, dilated non-reactive pupils and restricted elevation, depression and adduction of the eyeball. Traumatic isolated third cranial nerve palsies are rare and usually associated with severe head trauma, with minor head trauma is uncommon. [1-3]

Case Report

A 42-year-old woman was transported to the emergency department following a motor vehicle accident. At the time of the accident she was a backseat passenger in a head-on automobile accident and she lost consciousness for several minutes. The patient’s past medical history was positive for hypertension and negative for diabetes, hyperlipidemia, smoking, previous head injury and other neurologic or metabolic disorders. On examination, her vital signs were stable, she was alert, but with retrograde amnesia concerning events related to the accident. She had ptosis of left eye with fixed and dilated pupil measuring 6 mm in diameter (Figures 1 to 6). Otherwise, her neurological examination was without focal abnormality. Her neck and back showed no tenderness or deformity, her abdomen showed slight tenderness on right side.

Figure 1. Dilatated Pupil.

Brain computerized tomography and brain magnetic resonance imaging were normal. Abdomen computerized tomography showed hepatic contusion. After discussion with neurologist and ophthalmologist she started to use the occluding lens, she was discharged two weeks after injury. One year after injury, disabling diplopia and pupillary dilatation of her left eye persisted, recovery of ptosis was found. She is being followed up regularly in ophthalmology clinics.
The oculomotor nerve is quite a strong motor and vegetative nerve. The nerve exits the midbrain at the sulcus medialis cruris cerebri, enters the cavernous sinus and travels forward and passes through a dural ring near the posterior clinoid process. The nerve then passes anteriorly through the superior orbital fissure into the orbit. The motor fibers of third cranial nerve innervate extraocular muscles – the levator palpebral, the superior rectus, the medial rectus, the inferior rectus and inferior oblique. The parasympathetic fibers innervate the iris sphincter and ciliary body. Complete unilateral oculomotor nerve palsy causes ptosis and pupillary dilatation with limited infraduction and abduction of the eyeball. The pupillary dilatation on the affected side causes glare in bright light and paralysis of accommodation causes blurred vision for near objects. [2]

The mechanism of nerve injury can be direct or indirect. The indirect mechanism of injury is caused by compression of the nerve from the environment (expanding hematoma, aneurysm or bone fragments). [3, 4] In patients with negative findings on imaging methods direct nerve injury may be a result of extreme distraction, root avulsion, injury of spinal nerve fascicles [5] or interruption of blood supply and nerve disorders of the internal environment caused by trauma. [3] The exact mechanism of oculomotor nerve damage during mild head injuries is not exactly explained.

The most likely mechanism of direct third cranial nerve injury is related to its anatomical position. [5-7] The oculomotor nerve runs over the posterior petroclinoid ligament and this part is most susceptible to damage as the brainstem moves downward at the time of injury. Most likely it is caused by dragging through the petroclinoid ligament at the time of the accident. [5] This mechanism can explain some cases of complete oculomotor nerve palsy seen after mild head trauma without abnormal brain imaging. [8-10]

Parasympathetic fibers lie near the posterior petroclinoid ligament and are first injured only in cases of compression by a tumor or an aneurysm. Their injury causes isolated internal ophthalmoplegia (mydriasis and the impossibility of accommodation). The injury of motoric fibers causes external ophthalmoplegia (impairment of the oculomotor muscles) and
motoric fibers injury is improving faster than the internal ophthalmoplegia. [7, 11]

The isolated oculomotor nerve injury due to mild head trauma is infrequent its incidence is given 0-15%. [12-16] Elston described 20 patients with traumatic oculomotor nerve palsy. All 20 patients suffered moderate to severe cranial trauma with or without loss of consciousness and had multiple permanent neurological deficits. [16] Occasionally the oculomotor nerve palsy occurred as a result of minor head trauma without abnormal brain imaging, only a few cases have been described in the literature. [3, 5]

The prognosis of patients with traumatic oculomotor nerve palsy is not favorable and the full recovery is rare. [3, 4, 14] The therapy is difficult because oculomotor nerve palsy affects several extraocular muscles. Surgical therapy is not possible. The occluding contact lenses are helpful for patients in recovery. [17, 18] The injection of botulinum toxin to treat exotropia can help some patients. [17, 18] Most often remains limited mobility of eyeball with diplopia, which limits the ability to work and interpersonal relationships. Many patients with traumatic oculomotor nerve palsy have problems with reading, writing, and walking. [19, 20]

**Conclusion**

The mild head injuries can cause isolated oculomotor palsy without pathological findings on brain imaging. Although third cranial nerve injury is rare after mild head injury, this disease entity should be kept in mind in the management of patients with cranial trauma, regardless of the severity of the injury. Further cases collections with modern imaging studies are needed to clarify the mechanisms and clinical characteristics associated with this phenomenon.

**References**