

Isolated Abducens Nerve Avulsion at Pontomedullary Sulcus following Trivial Head Injury

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Indian J Neurosurg 2015;4:177–179.

Abstract

Abducens nerve palsy is commonly seen in neurosurgical practice. However, the abducens nerve palsy secondary to an avulsion injury is extremely rare. The patients present clinically with diplopia and show lateral rectus palsy. Here, the authors present a case report of such an unusual condition following a trivial trauma presenting clinically with left lateral rectus palsy. The course of the nerve and a possible mechanism of such an injury and management are discussed. To the authors knowledge, there is no reported case of an isolated unilateral avulsion injury of the abducens nerve following trauma before this report.

Keywords

- ▶ abducens nerve
- ▶ sixth cranial nerve palsy
- ▶ avulsion injury
- ▶ lateral rectus palsy

Introduction

Cranial nerve palsies are debilitating socially and can cause disfigurement. Abducens nerve palsy is one of the commonly encountered conditions in the clinical practice. The age-adjusted incidence of abducens nerve palsy is 11.3/100,000 in a geographically defined population.¹ Head injury is one of the common causes for the cranial nerve palsies. The incidence of cranial nerve injury following closed head injury varies between 5 and 23%.² The cranial nerves most commonly affected following blunt head trauma are olfactory, facial, and vestibulocochlear nerves.³ The incidence of unilateral abducens palsy is rare and reported to be 1 to 2.7% of all the head injury cases.⁴ Of the various types of injuries to the abducens nerve unilateral avulsion injury at the pontomedullary junction is extremely rare. Here, we report a case of a 31-year-old female patient who presented with left lateral rectus palsy due to avulsion injury of the left abducens nerve following a trivial fall.

Case History

A 31-year-old lady was brought to the emergency department of our hospital with a history of slip and fall on ground while walking. She complained of double vision with both eyes open since the time of fall. There was no history of loss of consciousness, seizure, vomiting, or ear nose throat bleed. On clinical examination she was conscious and responding appropriately to commands (GCS = E4M6V5). On inspection, she had left esotropia (→ Fig. 1).

Her pupils were equal in size bilaterally and reacting normally to light. She was able to count fingers with each eye individually from a distance of 6 feet. Fundoscopy was normal bilaterally. Examination of extraocular movements showed left lateral rectus palsy. Examination of other cranial nerves, higher central nervous system functions and motor and sensory systems were unremarkable. She was hemodynamically stable and no other injuries were present. She was admitted and initially evaluated with a

received
April 7, 2015
accepted
September 22, 2015
published online
December 16, 2015

DOI <http://dx.doi.org/10.1055/s-0035-1569001>.
ISSN 2277-954X.

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Fig. 1 Photograph showing the left esotropia.

noncontrast computed tomography (CT) of brain and routine biochemical investigations. The CT showed no evidence of fracture and the normal parenchyma. Her routine biochemistry was unremarkable. Further we evaluated her with magnetic resonance imaging (MRI) brain including three-dimensional-fast imaging employing steady-state acquisition (3D-FIESTA) sequence to evaluate the left lateral rectus palsy. The MRI showed normal neuroparenchyma with no features of hemorrhage or ischemia. 3D-FIESTA sequence acquired showed an abrupt discontinuity in the left abducens nerve at the pontomedullary sulcus with retracted fibers at petroclival junction (→ **Figs. 2 and 3**).

She was managed symptomatically and was discharged with an advice for regular follow-up and consult ophthalmic surgeon for further evaluation and management. However, her abducens palsy persisted and was complete at 1 month follow-up.

Discussion

Abducens nerve is one of the important nerves involved with the extraocular movements of the globe. It contains

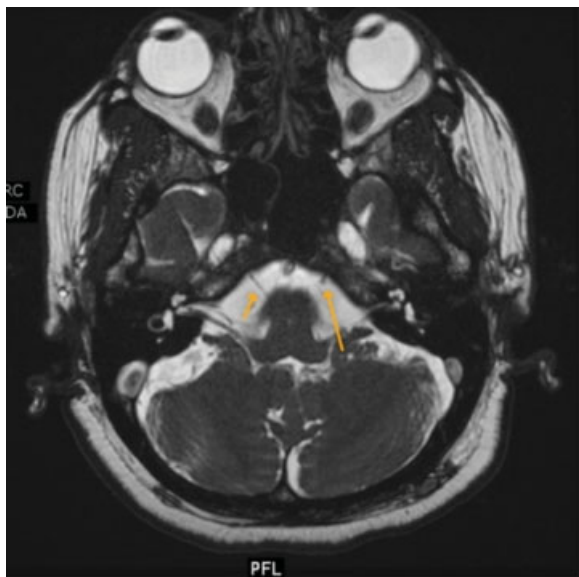


Fig. 2 Axial 3D-FIESTA image showing avulsed left abducens nerve (long arrow) in the form of discontinuity at pontomedullary junction. cf. Contralateral normal abducens nerve noted in prepontine cistern (short arrow). 3D-FIESTA, three-dimensional-fast imaging employing steady-state acquisition.

only the somatic efferent fibers that supply the lateral rectus muscle and helps in the horizontal lateral movement of the globe. Abducens palsy is one of the most commonly encountered false localizing sign secondary to the raised intracranial tension. Abducens nerve dysfunction can occur from lesion anywhere in its course from the pontine nucleus to the lateral rectus muscle in the orbit. The pontine nucleus is present in the pons on the floor of the fourth ventricle close to the midline. The axons from the facial nucleus loop around it forming the “facial colliculus” that is evident as small bulge in the floor of the fourth ventricle. The fibers of the abducens nerve emerge from the brain stem at the pontomedullary sulcus maintaining the most medial position to the exiting facial fibers and entering vestibulocochlear fibers. After exiting from the brain stem it has a very long intracranial course traversing the prepontine cistern (cisternal segment), cavernous sinus in the petroclival region (cavernous segment), and entering the orbit through the superior orbital fissure (orbital segment). The cisternal segment enters the cavernous sinus by traversing the Dorello canal. The nerve is mobile in the subarachnoid space of the prepontine cistern between two relatively fixed points, one at the pontomedullary sulcus and the other at the osteofibrous compartment at petroclival junction (Dorello canal) and thus making it vulnerable to injury. The proposed mechanism for the injury in the cases like the present case could be a sudden vertical displacement of brain, either downward or upward, causing the stretch of the nerve fibers between the relatively fixed points, with the apex of the petrous bone acting as the fulcrum, thereby causing the avulsion.

Cranial nerves are best imaged with MRI using special sequences like steady-state sequences. These sequences are acquired volumetrically with thin sections and are basically T2-weighted gradient sequences. These sequences are named variously by different vendors as CISS (constructive interference in steady state, Siemens [Erlangen, Germany]), FIESTA (fast imaging employing steady-state precession, [Milwaukee, United States]), and b-FFE (balanced fast field echo, Philips [Eindhoven, the Netherlands]). Axial acquisitions of the brain stem can clearly demonstrate various cranial nerves emerging as dark linear structures on the background of high cerebrospinal fluid signal intensity in the adjacent cisterns. We used 1.5T MRI equipment (GE Medical Imaging, Milwaukee, Wisconsin, United States) with a 3D-FIESTA steady-state sequence for imaging the nerve, which revealed the avulsion in the form of pontine detachment at the pontomedullary sulcus.

The prognosis in this type of avulsion injuries is bleak and the deficit is likely to be permanent. Initial management of this condition is symptomatic by occlusion of the eyes with pads and is aimed at prevention of amblyopia in case of children. The deficit in these cases of total nerve avulsion is deemed to be permanent. Surgical intervention may be beneficial in the initial stage of presentation and include



Fig. 3 Coronal 3D-FIESTA image showing nonvisualized cisternal segment of left abducens nerve (short arrow). cf. Normal visualized abducens nerve on the right side (long arrow).

muscle transfer procedures like the transfer of vertical recti insertions, or permanent joining of the vertical and lateral recti, with or without lateral rectus resection.⁵

Conclusion

Isolated unilateral abducens nerve avulsion is a rare entity which is not reported till date. Thorough clinical and radiological evaluation is required in such cases. Steady-state MRI sequence is an excellent modality to pick up the cranial nerve injuries in the evaluation of trauma. Once diagnosed an early surgical intervention may be beneficial as the deficit is deemed to be permanent.

Key Message

Avulsion injury of the abducens nerve following a trivial fall is extremely rare. This injury presents clinically with diplopia and manifests as lateral rectus palsy. Early surgical correction of esotropia may be beneficial as the deficit is deemed permanent.

Funding
None.

Presentation at a meeting

None.

Conflict of Interests

None.

Acknowledgment

None.

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