

Bilateral Abducent Nerve Palsy After Neck Trauma: A Case Report

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Abstract

Introduction: The abducent nucleus is located in the upper part of the rhomboid fossa beneath the fourth ventricle in the caudal portion of the pons. The abducent nerve courses from its nucleus, to innervate the lateral rectus muscle. This nerve has the longest subarachnoid course of all the cranial nerves, it is the cranial nerve most vulnerable to trauma. It has been reported that 1% to 2.7% of all head injuries are followed by unilateral abducent palsy, but bilateral abducent nerve palsy is extremely rare.

Case Presentation: A 65-year-old woman presented to the emergency department following a motor vehicle accident. A neurological assessment showed the patient's Glasgow coma scale (GCS) to be 15. She complained of double vision, and we found lateral gaze palsy in both eyes. A hangman fracture type IIA (C2 fracture with posterior ligamentous C1 - C2 distraction) was found on the cervical CT scan. A three-month follow-up of the patient showed complete recovery of the abducent nerve.

Conclusions: Conservative treatment is usually recommended for traumatic bilateral abducent nerve palsy. Our patient recovered from this condition after three months without any remaining neurological deficit, a very rare outcome in a rare case.

Keywords: Head Trauma, Abducent Nerve Palsy, Ligamentous Injury

1. Introduction

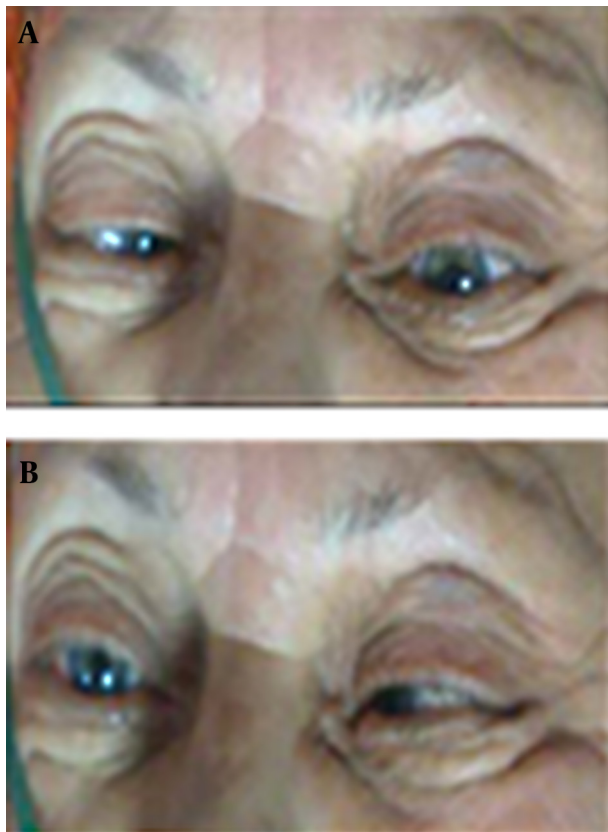
The abducent nucleus is located at the upper part of the rhomboid fossa beneath the fourth ventricle in the caudal portion of the pons. It has the longest subarachnoid course of all the cranial nerves. It is the cranial nerve most vulnerable to trauma. The abducent nerve lies at the lateral side of the internal carotid artery (1, 2). The most common possible locations of lesions that bring about abducent nerve palsy include the brain stem, the subarachnoid space, the petroclival region, the cavernous sinus, and the orbit, along the path of the nerve (3). The incidence of unilateral abducent nerve palsy from head injury has been reported to occur in 1% - 2.7%; however, bilateral abducent nerve palsy occurs only rarely (4). About 10% of patients with abducent nerve palsy have bilateral paralysis, which is conventionally accompanied by further intracranial, skull, and cervical spine injuries (5). Herein, we report a case of bilateral abducent nerve palsy associated with the fracture of the second cervical vertebra in a patient with a Glasgow coma scale (GCS) of 15 following a car accident.

2. Case Presentation

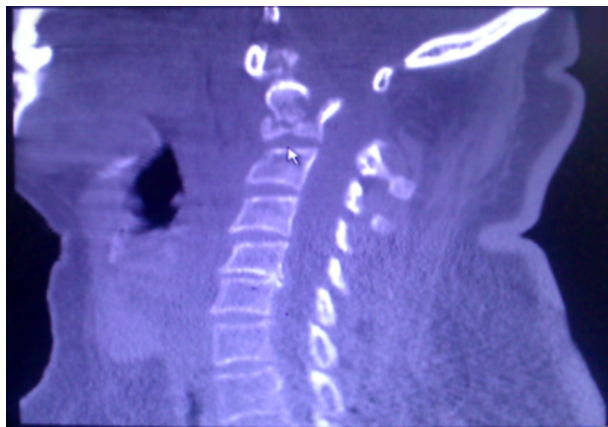
A 65-year-old woman presented to the emergency department following a motor vehicle crash. She was seated in the rear seat of the car and was not wearing a seat belt. During the accident, she sustained a flexion-extension neck injury without head trauma. Severe local tenderness was found in the upper neck. A neurological examination revealed that the patient's Glasgow coma scale (GCS) was 15, and there were no signs or symptoms of head trauma, such as headache, nausea, vomiting, rhinorrhea, rinorrhagia, olfactory nerve palsy, otorrhea, otorrhagia, battle sign, raccoon sign, or seizure. Moreover, she complained of double vision, and we found lateral gaze palsy in both eyes (Figure 1).

There was no significant radiological finding in the brain CT scan. The patient's neck was immobilized using a Philadelphia collar. A hangman fracture type IIA (C2 fracture with posterior ligamentous C1 - C2 distraction) was found during a cervical CT scan (Figure 2).

The patient was discharged after fixation of the cervical vertebrae. A three-month follow-up with the patient showed complete recovery of the bilateral abducent nerve palsy without any specific treatment.

Figure 1. Photographs Taken Following the Accident

Bilateral gaze palsy; A, left gaze; B, right gaze.

**Figure 2.** Hangman Fracture Type IIA in Sagittal View Cervical CT Scan

3. Discussion

Our patient had bilateral abducent nerve palsy associated with the fracture of the second cervical vertebra and the rupture of the posterior ligaments of the first and second vertebrae. The mechanism of injury in this patient was acceleration - deceleration (whiplash). This very rare situation occurs following trauma, and only a

few similar cases have been reported to date. There are several causes for abducent nerve palsy. Previous studies have shown that most common causes of this condition are vascular diseases, inflammatory diseases, and tumors; which account for 29.7%, 19.4%, and 10.9% of causes, respectively (5, 6). There are three angulations in the abducent nerve, and traumatic abducent paresis (3.1%) is rare (6, 7). These three angulation points, which are prone to traumatic palsy namely: 1) Where the nerve pierces the dura mater to enter the dural space (the petroclival region), 2) at the level of the petrous apex, and 3) where the nerve reaches the internal carotid artery (8). Only a few cases of bilateral abducent nerve palsy following trauma have been reported, which reflects how rarely it happens. The mechanism of traumatic bilateral abducent palsy is a contentious issue (9). Ligamentous C1 - C2 distraction leads to caudal displacement of the brainstem in relation to the cranial base, causing a traction injury to the abducens nerve at its entry into Dorello's canal in the cavernous sinus (10). The other mechanisms causing bilateral abducent palsy include increased intracranial pressure, dural puncture, whiplash injury, hangman's fracture, and halo traction (11, 12). Our patient had a second cervical vertebra (C2) fracture with disruption of the posterior ligament between C1 and C2. There is no definite treatment for bilateral abducent nerve palsy, and there are limited cases reports discussing this situation. Some studies have demonstrated that the spontaneous treatment of unilateral abducent nerve palsy occurs more frequently than the bilateral type (13, 14). Some studies have suggested conservative treatment with oral corticosteroids studies (4, 15). A bupivacaine injection into the lateral rectus muscle, accompanied by standard surgical treatment of abducent nerve palsy, has also been tried (16). Although the study by Kao, and Chao demonstrated that treating patients with post-traumatic bilateral abducent nerve palsy with subtenon injection of botulinum toxin increases the recovery rate, compared to more conservative treatments, we routinely treat these patients conservatively (17). Our patient recovered from this condition after three months without any remaining neurological deficit.

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Footnotes

Authors' Contribution: Study supervision: Hamed Aminiahdashti; concept study, critical review of manuscript for conceptual content: Sajad Shafiee; data gathering: Mohammad Sazegar and Nazanin Nosrati; drafting of the manuscript: Hamed Aminiahdashti.

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