



Isolated Third Cranial Nerve Palsy Secondary to in-Vehicle Traffic Accident Without any Radiological Evidence

Herhangi bir Radyolojik Kanıt Olmadan Araç İçi Trafik
Kazasına İkincil İzole Üçüncü Kranial Sinir Felci

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ABSTRACT

The oculomotor nerve is one of the twelve cranial nerves, and its isolated injury due to minor head trauma is a rare condition. Possible causes of this damage may include skull fracture, aneurysm, subarachnoid hemorrhage, carotid-cavernous fistula, or traumatic brainstem pathologies, but there may not always be such major pathologies that we can demonstrate with classical radiological imaging techniques. Here we report a thirty-six-year-old healthy woman who presented to the emergency department with diplopia caused by left-sided total oculomotor nerve palsy due to a minor car accident. Her classical imaging modalities were revealed to be normal. According to our literature review, the minor pathological impact on the oculomotor nerve at the posterior petroclinoid ligament segment could be the cause behind this clinical scenario. However, to reveal these kinds of minor changes, we need higher-resolution Magnetic Resonance Imaging (MRI) techniques.

Keywords: Isolated oculomotor nerve palsy; minor head trauma; posterior petroclinoid ligament.

ÖZET

Okülomotor sinir, on iki kranial sinirden birisidir ve minör kafa travmasını takiben izole hasarı nadir görülen bir durumdur. Bu hasarın olası nedenleri arasında kafatası kırığı, anevrizma, subaraknoid kanama, karotiko-kavernöz fistül veya travmatik beyin sapı patolojileri olabilir; ancak her zaman klasik radyolojik görüntüleme teknikleriyle gösterebileceğimiz bu şekilde büyük patolojiler olmayabilir. Biz de acil servimize hafif bir trafik kazasını takiben oluşan sol total okülomotor sinir felcinin sebep olduğu diplopi nedeniyle başvuran 36 yaşındaki sağlıklı kadın hastamızı sunduk. Klasik görüntüleme yöntemlerimiz normal sınırlarda saptandı. Literatür taramamıza göre, okülomotor sinirin posterior petroklinoid ligaman seviyesindeki minör patolojik değişikliği bu klinik senaryonun arkasındaki neden olabilir; ancak bu tür minör değişiklikleri ortaya çıkarmak için daha yüksek çözünürlüklü Manyetik Rezonans Görüntüleme (MRG) tekniklerine ihtiyacımız vardır.

Anahtar sözcükler: İzole okülomotor sinir felci; minör kafa travması; posterior petroklinoid ligament.

The oculomotor nerve, which innervates most of the extraocular muscle group, is one of the twelve cranial nerves. The oculomotor nerve could be damaged either by external pressure or directly by internal injury. Isolated oculomotor nerve palsies secondary to minor trauma is a rare condition according to the literature and even with accurate clinical examination for third nerve palsy, major pathologies such as skull fractures, aneurysms, subarachnoid hemorrhages, and carotid-cavernous sinus fistulas may not always be revealed by clas-

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sical imaging techniques.^[1] Additionally, there are certain minor pathologies, such as petroclinoid segment injuries, that may not be detected by standard imaging methods.^[2] There must be high-resolution cranial imaging modalities to show the reason behind this incident.^[3] We reported here a thirty-six-year-old healthy woman who presented to the emergency department with sudden diplopia with left third nerve palsy following a minor car accident. No radiological pathology was detected during the evaluation.

Case Report

A thirty-six-year-old woman was admitted to the emergency department (ED) with sudden diplopia following a minor car accident. As far as she remembers, she reported that the double vision occurred right after the accident. During the accident, the patient was seated in the back seat and reported hitting the left side of her head on the window. She couldn't remember many details due to retrograde amnesia, but she mentioned that she began to see objects double as she got out of the car. Her medical history was unremarkable. The vital signs and blood tests were normal in the ED. Her physical examination revealed a minor laceration on her left side that did not require stitches. The neurological

examination was normal except for total left-sided third nerve palsy with semiptosis (Fig. 1), outward deviation in the primary position (Fig. 2), left dilated pupil (Fig. 2), and restricted eye movement when attempting elevation, depression, or adduction but normal abduction function of the left eye in ocular motility testing (Fig. 3).

There were no abnormalities detected in her cranial imaging modalities, including craniocervical CT angiography, 1.5 Tesla magnetic resonance imaging (MRI) with contrast, cranial MR angiography, orbital CT, and non-contrast cranial computer tomography (CT) (Figs. 4, 5, 6).

Alpha lipoic acid, dexamethasone, and vitamin B12 were started as treatment during the inpatient service follow-up. A lumbar puncture was suggested as a differential diagnosis for mononeuropathy, even though there is a temporal relationship between the car accident and the left third cranial nerve palsy. However, she refused to undergo the procedure. One month after discharge, the control neurological examination and repeat imaging showed no change. We had planned to see her for the third-month follow-up examination, but she did not attend the appointment.



Figure 1. Left upper lid semiptosis.



Figure 2. Left eye deviated outward in the primary position and the left pupil is dilated.



Figure 3. Restricted eye movement when attempting adduction (a) and elevation (b), but normal abduction function of the left eye (c).

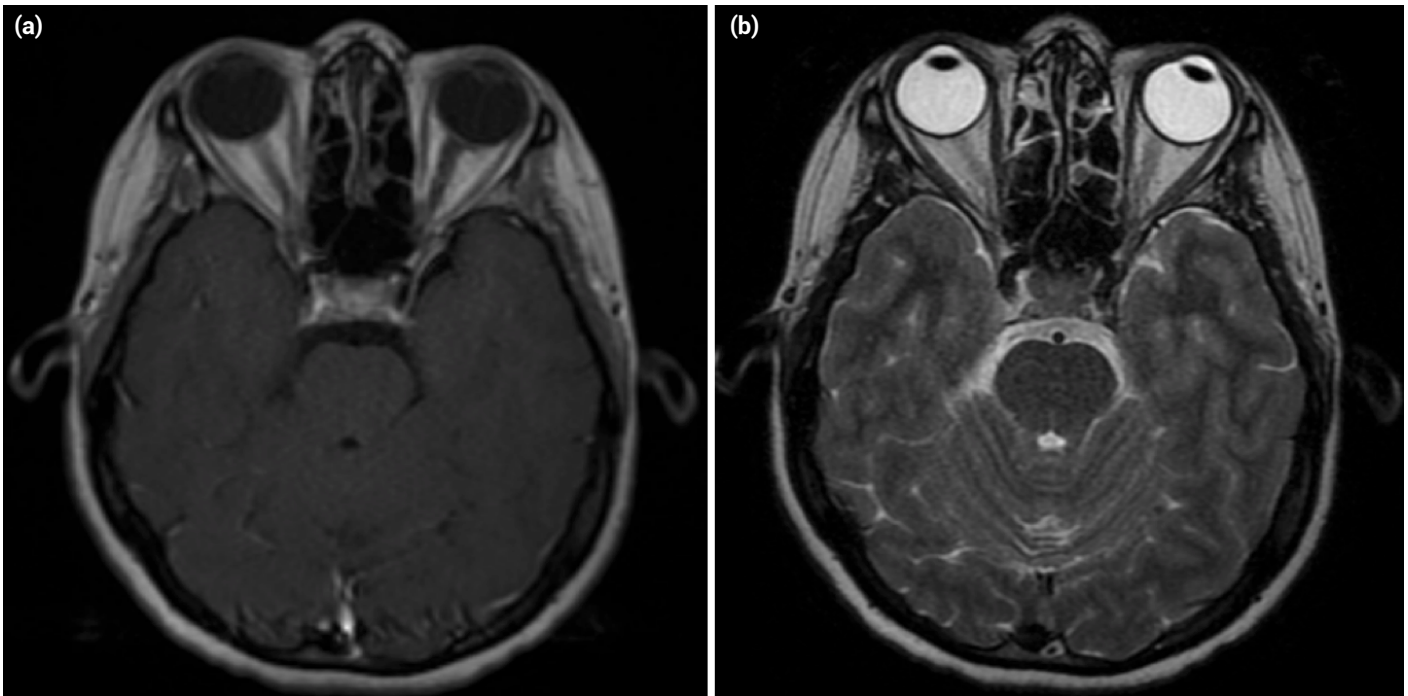


Figure 4. Cranial MRI with contrast T1 (a) and T2 (b) sequence.

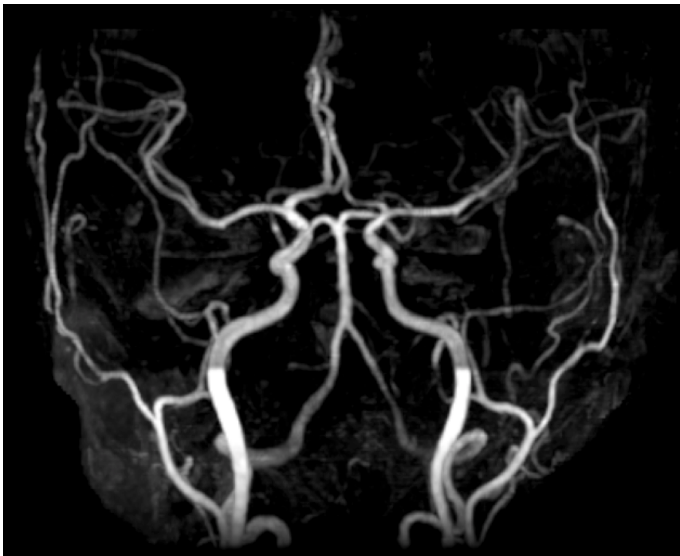


Figure 5. Cranial MRI angiography.

Discussion

The oculomotor nerve is one of the twelve cranial nerves. It originates in the midbrain, passes between the superior cerebellar and posterior cerebral arteries, pierces the duramater, and then extends laterally to the posterior clinoid process.^[4] First, it passes through the cavernous sinus and then reaches the orbit.^[5] The oculomotor nerve has two main functions: motor and parasympathetic functions. The inferior branch of the nerve innervates the majority of extraocular muscles, namely the inferior oblique muscle, medial rectus muscle,

and inferior rectus muscle. The superior branch of the nerve innervates the superior rectus muscle and levator palpebrae superioris.^[4,5] There are two primary parasympathetic functions of the oculomotor nerve. One is constricting the pupil by innervating the sphincter pupillae muscle. The other function is innervating the ciliary muscles, which changes the shape of the lens during accommodation.^[4,5] With unilateral oculomotor nerve palsy, there will be complete ptosis of the upper eyelid with restricted medial, horizontal, and vertical gaze palsy. In the primary position, there will be ptosis and abduction tendency in the affected eye. They all cause binocular diplopia and the affected pupil will also be dilated, which causes the paralysis of accommodation and blurred vision for near objects.^[5] Based on our knowledge, isolated oculomotor nerve palsy with or without pupil sparing due to minor head trauma without revealing any bone fracture or any imaging pathology behind is not common. According to Heinz's classification of oculomotor nerve injuries, there are three groups as follows: avulsion of the oculomotor nerve rootlets, focal stretching in the parasellar segment, and intraneural hemorrhage at the superior orbital fissure.^[6] These causes sometimes can be shown with high-resolution MRI and sometimes there will be no concrete cause or damage to show. Isolated pupil-sparing oculomotor palsy due to mild head trauma in children has been reported by Kaido et al.^[7] in 2005, and the suggested mechanism behind it is stretching of the oculomotor nerve at the posterior petroclinoid lig-

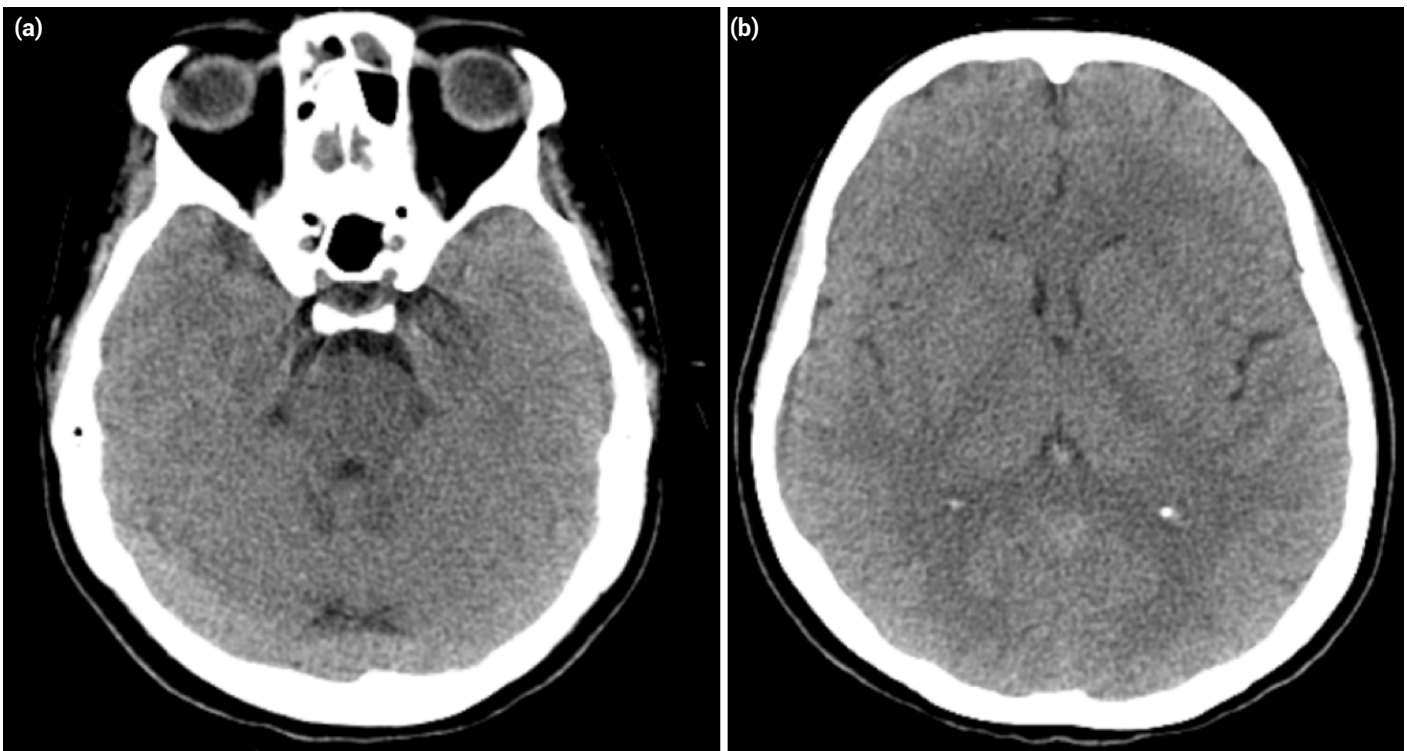


Figure 6. (a) Orbita CT (b) Brain CT.

ament and maintaining an intact pupillomotor nerve. Kim et al.^[8]'s case illustration and literature review suggested that the possible mechanism of oculomotor nerve palsy due to a minor head injury is an internal abnormality in the cisternal portion of the oculomotor nerve, specifically at the posterior petroclinoid ligament, that can be revealed with high-resolution and multi-axial enhanced MRI in the subacute phase even though the clinical symptoms showed up acutely like in our case. These microscopic pathologies seem to be occurring immediately after the accident according to literature similar to our case.^[8,9] The acute major clinical changes and temporal process with the accidents make us think that the possible mechanism behind the palsy could be the stretching of the nerve itself. Based on the literature case reports, the most commonly mentioned pathology of third nerve cranial palsy due to minor head trauma is the stretching of the nerve at the posterior petroclinoid segment when the brainstem moves during the head trauma.^[1,6-9] In this scenario, clinical impairment could occur due to minor pathology of the nerve itself. However, these changes are too microscopic to be visualized with classical imaging techniques. Eisenhut et al.^[3] emphasized in their single case report that high-resolution MRI allows the reliable delineation of the oculomotor nerve and can support diagnosis in trauma patients with isolated oculomotor nerve palsy. Chen et al.^[2] illustrated that minor head trauma can cause isolated oculomotor nerve palsy in

the absence of abnormal findings on cranial CT, MRI, and craniocervical MR angiography. Muthu et al.^[10] suggested in one case report that the cranial nerves may suffer from disturbances in blood supply or the detrimental biochemical effects arising from a head injury. Also, they suggested that their recovery times may be prolonged. In our case, a lack of clinical improvement was also observed during her first month of follow-up. Since oculomotor nerve palsy due to this kind of nerve injury is very rare, it is hard to define the prognosis and clinical improvement time as well as the treatment options. Some reports still mentioned that steroids could be tried for local inflammation and create good clinical outcomes.^[8]

Conclusion

In conclusion, we reported an isolated total third cranial nerve palsy, including pupillomotor fiber effect, resulting from a minor car accident without any pathological anomalies present on classical radiologic imaging techniques. Based on our literature review, the minor pathological changes of the oculomotor nerve near the posterior petroclinoid segment might explain this clinical scenario. To detect such subtle changes, high-resolution MRI techniques are essential. Furthermore, longitudinal follow-up of these patients is necessary to monitor their clinical progression.

Disclosures

Informed consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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