

# Management of Traumatic Isolated Unilateral Oculomotor Nerve Palsy in the Emergency Department and Literature Review

Travmatik İzole Tek Taraflı Okülomotor Sinir Felcinin Acil Serviste Yönetimi ve Literatür Taraması

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## Abstract

Cranial nerve (CN) lesions are observed due to congenital, infectious, neoplastic formations, migraine and head trauma. Along with the patient's age, clinical findings and neuroradiological imaging studies guide the diagnosis. A 57-year-old female patient was brought to the emergency room (ER) by Emergency Medical Services (EMS) due to a motor vehicle accident. No medical history. She was conscious, cooperative and orientated. Vital findings were normal. She had ptosis in the left eye, loss in the direct light reflex, restricted medial movements and mydriasis were determined. Radiological examination is normal. The patient was hospitalized with the diagnosis of isolated 3rd cranial nerve palsy (OCNP). Isolated OCNP is a rare condition usually secondary to major trauma. In addition to, there may be isolated unilateral OCNP without any evidence of neuroimaging abnormality. Emergency physicians should be vigilant in such cases that should perform detailed neurological examination and clinical follow-up for the patient's complaints.

**Keywords** Emergency Department; Isolated Oculomotor nerve palsy; Mydriasis; Minor Head Trauma

## Öz

Kraniyal sinir lezyonları konjenital olarak, enfeksiyöz nedenler, neoplastik oluşumlar, migren ve kafa travmasına bağlı olarak görülmektedir. Hastanın yaşı ile birlikte klinik bulgular ve nöroradyolojik görüntüleme çalışmaları taniya rehberlik eder. Bu çalışmada, trafik kazası nedeniyle ambulans ile acil servise getirilen 57 yaşında kadın hasta sunuldu. Hastanın bilinci açık, oryante ve koopere olup vitaller stabildi. Hastanın muayenesinde; sol gözde ptozis, direk ışık refleksinde kayıp, medial göz hareketlerinde kısıtlılık ve midriyazis saptandı. Radyolojik görüntülemeler normal olarak değerlendirildi. Hasta izole 3. kraniyal sinir felci tanısıyla izlem amaçlı yatırıldı. İzole 3. kraniyal sinir felci genellikle majör travmaya ikincil nadir bir durumdur. Buna ek olarak, herhangi bir nörogörüntüleme anormalliği kanıtı olmaksızın izole tek taraflı 3. kraniyal sinir felci olabilir. Hastanın şikayetleri ile detaylı nörolojik muayene ve klinik takip yapılması gereken bu tür durumlarda, acil hekimleri yönlendirici muayene bulgularına özen göstermelidir.

**Anahtar Kelimeler** Acil Servis; İzole Okülomotor sinir felci; Midriyazis; Minör Kafa Travması

## INTRODUCTION

Cranial nerve lesions are observed due to congenital, infectious, neoplastic formations, migraine and trauma; besides they mostly occur due to head trauma. Along with the patient's age, main complaint of administration and clinical findings, neuroradiological imaging studies guides the diagnosis.<sup>1</sup>

Injuries due to head trauma are the result of significant kinetic forces in the brain parenchyma and skull bones. Oculomotor nerve fibers are the leading cranial nerve in these traumas. The trauma needed to damage the oculomotor nerves usually severe and may be accompanied by bacillary skull fracture, orbital injury and intracranial hemorrhage. In these cases, in addition to cranial nerve injury there are coinstantaneous neurological deficits usually seen.<sup>2</sup> However, in rare cases, isolated oculomotor nerve palsy may occur without any other signs of minor head trauma. This frequency has been reported between 0-15% in different studies. Although patients with minor head trauma have few important clinical features, the mechanisms of damage to the nerve and imaging studies are rarely discussed in the literature.<sup>3</sup>

Isolated oculomotor nerve palsy shows different clinical presentations related to the affected muscle in the affected eye, but in complete paralysis, there is ptosis, mydriasis and a downward-looking eye in the physical examination. In the cases of partial paralysis, within the detection of the affected muscle, pathologies in the cavernous sinus, nerve fascicle and subarachnoid space should be reviewed along with pathway that is followed by the nerve.<sup>4</sup> The patient and his family were informed that data from the case would be submitted for publication and gave their consent. This case was written to review diagnostic processes related to isolated 3rd cranial nerve palsy and practical guide to emergency physicians.

## CASE REPORT

A 57-year-old female patient was brought to the emer-

gency room by Emergency Medical Services (EMS) due to a motor vehicle accident. The history of accident was taken from the patient herself. It was seen that the patient couldn't open the left eyelid after trauma. No medical history was taken in her background and family history. The general condition of the patient was good, conscious, cooperative and orientation was complete. Vital findings were measured within normal limits. In the physical examination, there was a scalp incision in the right parietooccipital region extending up to bone that approximately 10 centimeters in long and had a subcutaneous hematoma in the left frontal region with a size of approximately 5x5x0.5 centimeters. There was also no raccoon eye sign, battle's sign, rhinorrhea or otorrhea noted that evidence of bacillary bone fracture. No motor or sensory deficits were detected in the neurological examination. However, ptosis in the left eye, loss in the direct light reflex, restricted medial movements of the eye and mydriasis were determined. The pupil was dilated (6 millimeters) and non-reactive to light (Figure 1).



Figure 1. Ptosis (1a), mydriasis (1b) of left eye and Restricted movements of left eye (1c, d)

No pathology was detected in the right eye examination. According to these physical examination findings, we reviewed Brain Computed Tomography (CT) (Figure 2) and contrast enhanced Magnetic Resonance Imaging (MRI) scans (Figure 3) to eliminate any possible bleeding or fra-

cture. They were reported normally. Blood samples taken from the patient was within normal limits. The patient was consulted to eye, neurology and neurosurgery clinics. She was hospitalized with the diagnosis of isolated 3rd cranial nerve palsy. After 2 months, the symptoms improved minimally and continued to observation.

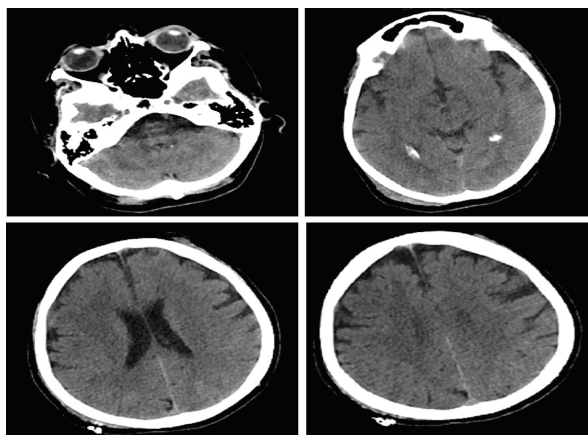


Figure 2. CT scan of the patient (Reported normally by radiologist)

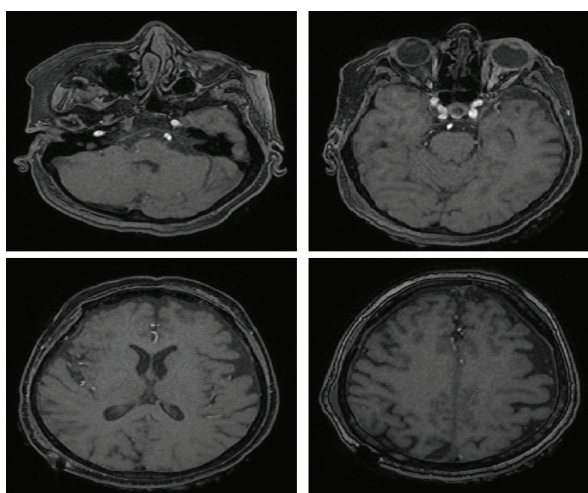


Figure 3. MRI scans of the patient (Reported normally by radiologist)

### DISCUSSION

The oculomotor nerve nucleus is in the mesencephalon. Somatic and visceral branches of the nerve innervate the elevator palpebrae superioris muscle that lifts the upper eyelid and four of the six muscles (m. rectus internus, su-

perior, inferior and obliquus inferior) that movement of the eyeball. Thus, it provides the eyeball's inward, upward, downward and upward-outward movements. The parasympathetic fibers it carries make the efferent path of the pupillary reflex and narrows the pupil against light (myosis). Oculomotor nerve palsy can occur due to cerebrovascular diseases, inflammation, tumor and severe head trauma. The incidence of isolated unilateral third nerve palsy was reported to be 0-15%. Oculomotor nerve palsy can be classified in different ranges like, it may be congenital or acquired, complete or partial, accompanying pupil or containing pupil, isolated or more extensive signs of neurological involvement.<sup>3</sup>

Many mechanisms are reviewed in the literature regarding the pathophysiology of unilateral oculomotor nerve palsy.<sup>5</sup> The possible mechanism of oculomotor nerve palsy due to head injury is nerve avulsion or focal compression in the posterior petroclinoid ligaments where the nerve is stretched due to the downward displacement of the brain stem during collision. These conditions cause nerve edema with or without intraneural hemorrhage and result in traumatic axonal injury. This hypothesis has been used in the isolated cases of nerve damage for the development of new evaluation protocols.<sup>6</sup> Studies with gradient echo images, gadolinium T1 and T3 MRI have reviewed to define intraneural microhemorrhages and traumatic oculomotor nerve palsy and facial nerve lesion Ksiazek et al. stated that the primary part of nerve fascicles innervated the m. rectus inferior, m. rectus medialis and pupillary fibers. Castro et al. reported that inferior oblique, superior rectus, medial rectus, elevator palpebrae, inferior rectus and pupillary fibers were stimulated by lateral to medial alignment of the oculomotor nerve fibers within this order in the midbrain Saeki et al. reported that the oculomotor nerve fascicles lined from the rostral to caudal order of the brain, innervate the muscle fibers that provide pupillary fibers, extraocular movement and eyelid lift within this order respectively.<sup>4</sup> These models are based on the neuroophthalmological disorders and images of the specified cases. However, the

clinical findings observed in our patient could not be fully explained with these models.

Unilateral oculomotor nerve palsy is manifested as pupil enlargement (mydriasis), limitation of movement in the eye and ptosis. In our cases we observed these clinical findings. Paralysis that protects the pupil is usually seen in ischemic lesions. Traumatic oculomotor nerve palsy mostly occurs as a result of skull or cervical spine fractures and intracranial injuries. When faced with such a case, all other injuries should be evaluated by comprehensive clinical/neurological examination followed by emergency imaging (CT, MRI).<sup>6</sup> A similar approach was shown in our case and no pathology was detected in imaging tests. In our case, we made the diagnosis with the clinical signs and symptoms of the patient.

In the treatment of the patient 6-week corticosteroid treatment can be given. This is considered as useful for cellular edema described in histopathological examinations. 6-12 months are given for spontaneous recovery before surgical intervention is considered. During this observation period, temporary treatment options of diplopia such as using eye pads, wearing prism lenses or injecting botulinum toxin into the lateral rectus muscle may be tried in some patients. Strabismus surgery is recommended when there is not enough recovery.<sup>2</sup>

Traumatic oculomotor nerve palsy prognosis is unpredictable, a slow process and a long follow-up is required, and full recovery is rare.<sup>2,3</sup> The absence of any lesion on CT imaging during the initial admission is considered to as a good prognosis and a high recovery rate is expected. A similar case was reported by Chen et al. the patient was discharged from the emergency room with a follow-up suggestion. After 4 months, the oculomotor nerve partially healed.<sup>6</sup> In another reported case, Erenler et al. hospitalized the patient for follow-up and the patient was discharged with minimal recovery and followed up closely.<sup>3</sup> In our case, the patient was treated with corticosteroid for 3

days in the neurosurgical service. She was discharged after being taken under control of the outpatient clinic. After 2 months, the symptoms improved minimally and continued to observation.

### CONCLUSION

Isolated unilateral oculomotor nerve palsy is a rare condition usually secondary to major trauma. In addition to, there may be isolated unilateral oculomotor nerve palsy without any evidence of neuroimaging abnormality.<sup>7</sup> Emergency physicians should be vigilant in such cases that should perform detailed neurological examination and clinical follow-up for the patient's complaints.

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