

Acute Onset Isolated Abducens Paralysis After Exposure to Arc Welding

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Abstract

Exposure to welding is associated with many diseases, especially some of the eye injuries. We present a 49-year-old male patient applied to us with the complaints of double vision and blurred vision for a week. The symptoms started after looking welding machine light for a few minutes without protective glasses. After excluding another cause, the diagnosis of idiopathic abducens paralysis was made. As a result of exposure to metals and ultraviolet radiation, conjunctival disorders, presbyopia, refractive errors, corneal damage, and retinal pathologies can be seen in patients. It is also known that UV is a stress factor that will initiate reactions that lead to apoptosis of neurons. We think that exposure to UV rays may have played a role in the possible etiological process in our case. The patient was followed up with conservative treatment and all symptoms resolve within a month.

Keywords: Abducens paralysis, welding, double vision

Introduction

Welding is a process that is widely practiced in many industrial areas, the main purpose of which is to join two metals. It has known that exposure to welding is associated with many diseases, especially some of the eye injuries (1-3).

Abducens nerve is an isolated motor nerve which is innervates the lateral rectus muscle which abducting the ipsilateral eye (4, 5). Its nucleus is in the pons and is located lateral to the medial longitudinal fascicle and at the base of the fourth ventricle. It leaves the brain stem via the pontomedullary junction and follows a long subarachnoid course. It reaches the orbit through the superior orbital fissure via passing through cavernous sinus near carotid artery. During this long course, injury of the abducens nerve can occur anywhere and for any reason (4-6). Therefore, it requires extensive research to find the right cause in abducens paralysis.

In our article, we report a case of a patient has an acute isolated abducens paralysis after looking at a high light source from welding, which is unique in the literature.

Case Report

A 49-year-old male patient applied to us with complaints of double vision and blurred vision for a week. The symptoms started after the patient looked at an intense light source from an electric-powered welding machine for a few minutes without protective glasses. When his symptoms did not go away, he applied to our center. During this period, he did not have any complaints such as headache, vision loss, nausea, vomiting, and cough. His double vision did not improve during the day and was present constantly without showing a diurnal rhythm. The patient had no regular medication and no diagnosed chronic disease. He has a history of subacute thyroiditis and the presence of maternal diabetes in his family history.

At first admission, he was conscious, cooperative, and oriented. The vital signs were normal (Tension arterial 115/70; heart rate: 84, SpO₂:94; capillary blood glucose: 98). There was no nuchal rigidity or signs of meningeal irritation. Direct and indirect light reflexes were normal in both eyes. His left eye could not abduct and could not cross the midline

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when looking to the left. He did not feel pain during eye movements. However, he had photophobia, and to prevent this, the patient was voluntarily closing his left eye. He was able to open his eyes when asked. The sclera and cornea were normal in both eyes. Other neurological and systemic examinations, including visual field examination and fundus examination, were normal. Isolated left abducens paralysis was detected in the patient.

Complete blood count (CBC), kidney function tests, liver function tests, serum electrolyte levels, sedimentation, C-reactive protein (CRP), HbA1c, thyroid function tests, anti-thyroglobulin, anti-thyroid peroxidase, and antiacetylcholine receptor antibody tests were normal. Also, his COVID-19 Polymerase chain reaction (PCR) test was negative. No significant findings were detected in thorax computerized tomography (CT), diffusion magnetic resonance imaging (MRI), Brain CT, and Optical coherence tomography (OCT) examinations. Contrast-enhanced brain MRI showed gliotic foci with a tendency to coalesce in periventricular and subcortical white matter (Figure 1), but the lesions seen did not explain the patient's complaint. Orbital MRI with contrast, brain MRI angiography, cervical MRI angiography, visual evoked potential (VEP), and electromyogram (EMG) examinations were normal. Isolated abducens paralysis developed secondary by welding light exposure was considered in the patient.

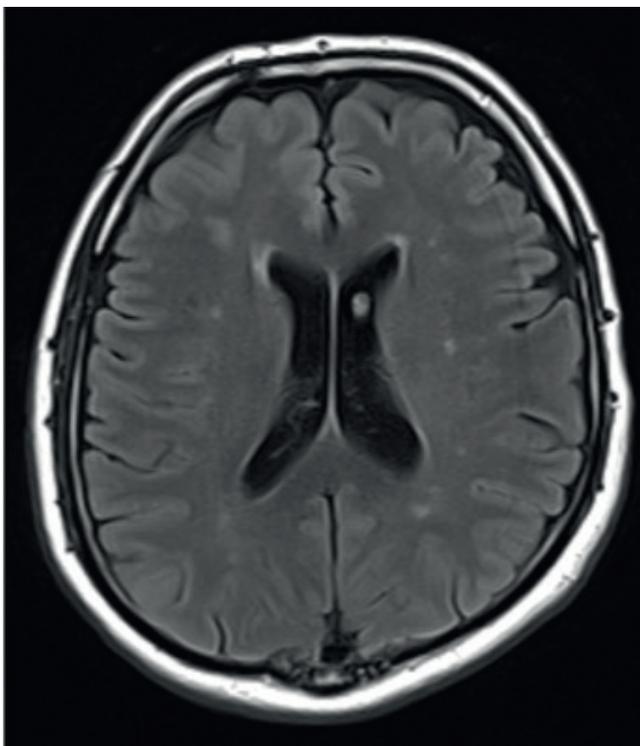


Figure 1. Gliotic foci with a tendency to coalesce in periventricular white matter in MRI

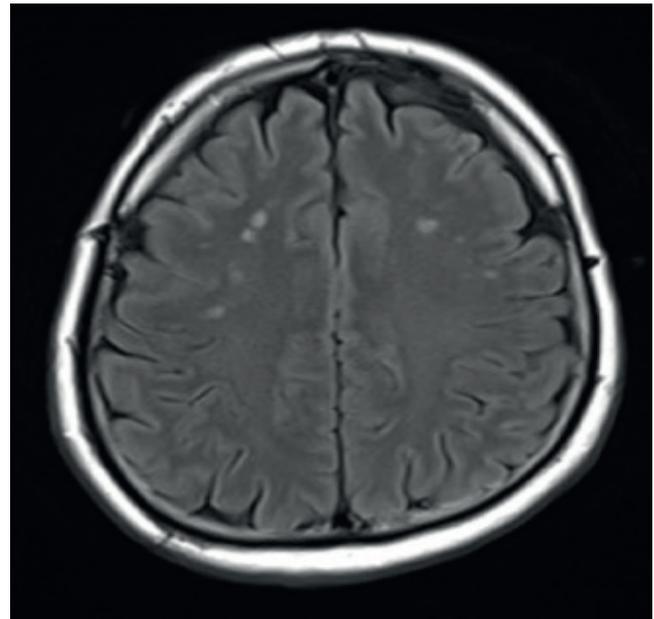


Figure 2. Gliotic foci with a tendency to coalesce in subcortical white matter in MRI

Discussion

Arc welding is recognized as a well-known potential occupational hazard. Pathologies in the eye occur due to UV light burns, flying metal objects, harmful metal gases, and thermal burns (1,2). As a result of exposure to metals and ultraviolet radiation, conjunctival disorders, presbyopia, refractive errors, corneal damage, and retinal pathologies can be seen in patients (3). In addition, it has been reported that the use of appropriate protective glasses during the welding process reduces the harmful effects of infrared, visible, and ultraviolet radiation, providing a kind of mechanical protection for the eye against welding spatter and reducing the intensity of visible light (2,3). The patients present with complaints of tearing and pain in the eyes, blepharospasm, photophobia, and vision loss (2-4). Injuries can include corneal opacity, corneal and conjunctival foreign bodies, traumatic iritis, traumatic mydriasis, or burns (2-4). Diplopia after exposure to welding light is very rare, and isolated abducens paralysis has never been reported in the literature.

Isolated abducens nerve palsy is a common cause of acute horizontal diplopia and is the most common isolated ocular motor cranial neuropathy in adults (5). A study reported its annual incidence as 11.3/100.000 (6). Its etiology includes vascular diseases, infective causes, demyelinating diseases, tumors and other structural lesions, neuromuscular junction disorders, trauma, idiopathic intracranial hypertension, and diabetic mononeuropathy. Also, idiopathic cases were reported. Etiological causes according to anatomical

Table 1: Etiology of abducens paralysis according to anatomical locations⁸

Anatomical location	Etiology
Brainstem fascicle	Infarction, tumor, demyelination
Subarachnoid space	Meningitis, high or low intracranial pressure
Petrous apex	Petrous bone fractures, Gradenigo's syndrome, clivus tumors
Cavernous sinus	Aneurysm, neoplastic infiltration, idiopathic inflammation (Tolosa-Hunt syndrome), infection, cavernous-carotid fistula
Orbital apex	Infection (mucormycosis, aspergillosis), neoplastic infiltration, idiopathic inflammation

localizations are summarized in Table 1. Imaging and laboratory examinations were performed in our case for the differential diagnosis, and possible other reported causes were excluded.

In a study conducted on young patients, the rate of idiopathic abducens nerve palsy was shown to be 22%, and almost all of them resolved in 6-8 weeks (8). After excluding the above-mentioned causes, the diagnosis of idiopathic abducens paralysis was made. It is generally a benign condition, and patients should undergo a follow-up period of several months to exclude the possibility of recurrence (9). In our case, the patient was followed up with conservative treatment and all symptoms resolved within a month.

A study showed that myelin structure absorbs UV (10). The effects of UV are not limited to skin and eye lesions. Pathologies related to the immune system and neuroendocrine system can be explained according to the degree of absorption and transmission of UV (11). UV entering the eyes has been shown to act directly on the central nervous system, with effects on the skin to a similar degree as exposure (12). It is also known that UV is a stress factor that will initiate reactions that lead to apoptosis of neurons (13). We think that exposure to UV rays may have played a role in the possible etiological process in our case

Conclusion

Since there is no example of abducens damage developed after exposure to arc welding in the literature, this case was found worthy of being presented. It is known that UV

exposure can play a role in neuron damage. In this case, we think that the possible etiological cause may be UV exposure.

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