

## Blindness Linked to Acute Disseminate Encephalomyelitis (ADEM) and Covid 19

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### Abstract

**Introduction:** Covid-19 may cause serious damage to the structure and function of the nervous system due to viral infections in the Central Nervous System (CNS). Acute disseminated encephalomyelitis (ADEM) is an inflammatory demyelinating complication of COVID 19.

**Case Report:** 53- year-old white man was hospitalized to Spinal Cord Unit with blindness, paraparesis and ataxia. Ten days earlier he presented nasopharyngeal swab positive for SARS-CoV-2. Brain Magnetic resonance imaging (MRI) documented the presence of multiple areas of focal hyperintensity signal compatible with Acute Disseminated Encephalomyelitis (ADEM). Case report achieved the maximal motor function recovery through individual rehabilitation program however his both eyes remained blind.

**Conclusion:** This is a rare case, perhaps the first described in literature, of abrupt bilateral blindness in ADEM post COVID complication.

**Keywords:** COVID-19; ADEM; Blindness

### Introduction

ADEM associated with COVID -19 reported in literature by several Authors in pandemic period. ADEM is an inflammatory demyelinating disorder of the CNS. Generally the invasion of the CNS and the subsequent pathology could be caused by neurotropic characteristic of the virus. It described that COVID-19 has potential to cause nervous system damage [1] despite the specific mechanisms of neurologic complications described in COVID-19 is not well characterized yet [2].

ADEM symptoms include: loss of vision in one or both eyes due to inflammation of the optic nerve. Most people make a full recovery and don't have another attack.

### Aim of the Study

The aim of this paper is to describe serious, irreversible ipovisus in case report affected by ADEM associated with COVID -19. Many cases of blindness described in acute or post acute phase of COVID 19 following cerebrovascular attacks or encephalitis signs.

### Case Report

In March 2021 a 53- year-old white man presented high fever and nasopharyngeal swab positive for SARS-CoV-2. He had been quarantined in a non-healthcare setting from 10 days before the abrupt bilateral blindness onset. During hospitalization in Acute Neurologist Unit, lumbar puncture showed mild hyperprotidorrachia (0.74 g/dL), the remaining parameters were within the normal range; the search for oligoclonal bands and anti-CNS and anti-MOG autoantibodies was negative. The PCR for neurotropic viruses (including SARS-CoV-2) and the CSF culture test were negative. The hematic level of TSH, T3 and FT3, FT4 were normal; Ferritin 831 ng/ml (17.9 - 464.0). Patient admitted to the Spinal Unit of the Scientific Institute of Pavia of ICS Maugeri, in the period between June and December 2021 for individual rehabilitation program.

Physical examination revealed atrophy and reduced tone of the lower limb muscles. There was paraparesis in both extremities (4/5), patient presented ataxia and he was not able to walk without the help of the physiotherapist. Deep tendon reflexes were elicited. His visual acuity was compromised in both side. Neurogenic bladder emptied with indwelling catheter. Sensation to light touch, temperature and pain was intact. Patient was confused and disoriented. The outcome of neuro-rehabilitation program finalized to improve the balance posture and independent walking.

Brain Magnetic resonance imaging (MRI) documented the presence of multiple areas of focal hyperintensity signal arranged both in the juxta-cortical and in the periventricular areas. The reported locations were in the frontal, parietal and occipital areas on the right side and in the para-hippocampal and fronto-parietal areas on the left side (Figure 1). The findings were compatible with diagnosis of acute disseminated encephalomyelitis (ADEM).

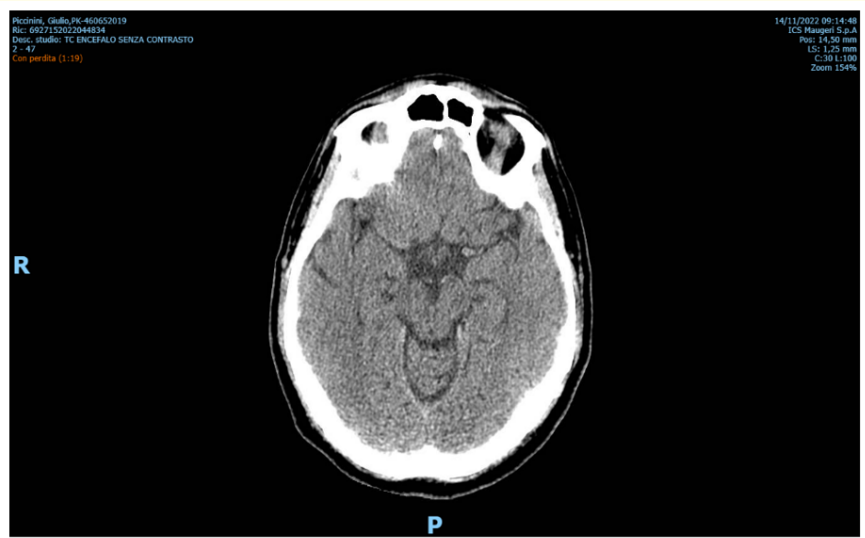


Figure 1: Brain magnetic resonance imaging (MRI).

Visual evoked potentials (VEP), which measures how long it takes the brain to respond to messages sent by the eyes were altered. PEV response presented, reduced amplitude and increased latency.

The neuropsychological evaluation started one month after hospitalization. It was observed that fatigue and communicative difficulties were the most common physical side-effects showed by patient during tests. A non-specific cognitive stimulation work was set up at his bedside. The caregiver was educated in correct cognitive and emotional management of the patient. Spatial and self orientation was normal, on the contrary temporal orientation was altered. Spontaneous speech was fluent with echolalia. Awareness of total-body conditions and attention span improved with neurocognitive rehabilitation program during the hospitalization. None months later his follow up examination there was an improvement in brain NMR and neuropsychological evaluation. PEV and deep visual acuity damage was permanent.

### Discussion

Systematic review reported 31 cases of ADEM associated to COVID -19 during ongoing pandemic [3]. The pathogenesis of ADEM associated with COVID-19 is unknown, it is likely to hypothesize a similar pathogenetic inflammatory and immuno-mediated-mechanism.

The male predominance in ADEM has been described during COVID 19 pandemic due to the fact that men are more affected by COVID-19 [4]. Case report presented a mean number of 10 days since COVID-19 infection to ADEM diagnosis, he reported hypertension in according to the most frequent comorbidity described [5]. Encephalopathy caused mental disorientation and behavioural changes. Neurological signs included paraparesis, ataxia and visual field deficits. Brain NMR showed multiple hyperintense lesions distributed predominantly in the white matter, location were bilateral and asymmetric. The lesions were in the deep and periventricular white matter with involvement of brainstem. CSF showed elevated protein values according to previous ADEM case report [5]. At discharge the patient presented a complete recovery both paraparesis and ataxia; he was able to walk with minimal help of the physiotherapist. Other studies showed favorable recovery goals [6]. However visual acuity resulted deep compromised. Evaluation of fundus oculi and field of view is a partial examination of optic nerve pathways and need to be completed with PEV. Neurophysiological diagnostic procedures adopted in our study discern the degree of central nervous system damage; it measures how long the brain takes to respond to a sensory stimulus sent by the eyes. In case report registration the P100 wave presented minimum amplitude, reduced amplitude and increased latency. Irreversible visual disturbance was reported as a rare and severe complication of Covid 19 [7,8]. A complete and persistent damage to bilateral vision in ADEM post Covid -19 is extremely rare; let's assume this case the first reported in literature. On the contrary other Authors described the resolution of ipovision in ADEM post Covid -19 [9].

### Conclusion

ADEM is a neurologic complication of COVID 19 disease. Most patients with ADEM being to recover within days after treatment, and many will recover completely within six months. Case report showed a persistent visual acuity damage.. Further studies are needed to understand the manifestations associated with COVID 19 and their long term effects.

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### Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research authorship and/or publication of this article.

### Patient Consent

Obtained.

### Ethical Approval

The study was approved by the Ethics Committee of our Centre and all patients provided written informed consent before study treatment.

### Provenance and Peer Review

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