CASE REPORT

Presumed Fourth Nerve Palsy in a Healthy and Asymptomatic Child with COVID-19 Infection

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Keywords:

COVID-19
Strabismus
Cranial nerve palsy
Fourth nerve palsy
Abnormal head posture

Received:
15-Jul-2023
Accepted:
18- Jan-2024
Published:
22- Jun -2024

ABSTRACT

COVID-19 can cause a wide range of ocular manifestations. The most common ocular manifestation is conjunctivitis. Neuro-ophthalmic presentations of COVID-19 are rare. Case reports suggest that COVID-19 infection can cause cranial nerve palsy, including nerves that regulate ocular movements. The present studypresented a case of fourth nerve palsy in a healthy and asymptomatic COVID-19-infected child. A healthy 10-year-old boy was referred to our eye clinic with a complaint of recent abnormal head posture and squint. His past medical history was unremarkable, and he had not received any medication or vaccinations within the last few weeks. No history of ocular or head trauma was observed. The patient was afebrile and had no respiratory symptoms. A comprehensive ocular examination was performed. All examinations, including slit-lamp, pupils, eyelids, and optic nerve heads, were normal. In ocular motor evaluations, left eye hyperdeviation was observed. Because of the history of COVID-19 in the mother of the child, he was referred to an infectious disease specialist and was tested for SARS-COV-2 with a nasopharyngeal swab specimen. The test was positive and SARS-COV-2 was detected. In addition, the patient was referred to a pediatric neurology department. Brain and orbital MRI was performed, and it was unremarkable. The post-viral fourth nerve palsy is uncommon, and post-COVID-19 has not been reported before. Clinicians should consider this infection in any recent strabismus in pediatrics. The children rarely complain of diplopia, and a recent abnormal head posture may be a sign of acquired strabismus.

How to cite this article: Kiarudi MY, Sharifi M, Gharouni A. Shiravi T. Presumed Fourth Nerve Palsy in a Healthy and Asymptomatic Child with COVID-19 Infection. Iran J Child Neurol. Summer 2024; 18(3): 137-141. https://doi.org/10.22037/v18i3.42705

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Introduction

COVID-19 can cause a wide range of ocular manifestations. The most common ocular manifestation is conjunctivitis (1).

Neuro-ophthalmic presentations of COVID-19 are rare. Case reports suggest that COVID-19 infection can cause palsy of cranial nerves, including nerves that regulate ocular movements (2).

In the present study, the authors presented the first case of trochlear nerve palsy in a healthy and asymptomatic COVID-19-infected child.

Case report

A healthy 10-year-old boy was referred to our eye clinic with a complaint of recent abnormal head posture and squint (Figure 1). His past medical history was unremarkable, and he did not receive any medication or vaccinations within the last few weeks. There was no history of ocular or head trauma. The patient also did not experience headaches or any neurological symptoms, was afebrile, and showed no signs of respiratory symptoms.

A comprehensive ocular examination was performed. Visual acuity was 10/10 in both eyes. No ptosis was observed. Pupils were round, regular, and reactive to light. No relative afferent pupillary defect was found. The slit-lamp examination was unremarkable. The optic nerve head of both eyes had a normal appearance.

In ocular motor evaluations, left eye hyperdeviation was observed.

Interviewing the parents revealed that his mother had a recent COVID-19 infection confirmed with reverse transcriptase polymerase chain reaction (RT-PCR) for SARS-CoV-2. Because of the concern of COVID-19 infection, a comprehensive strabismus examination was not performed, and the patient was referred to an infectious disease specialist and was tested for SARS-COV-2 with a nasopharyngeal swab specimen. The test was positive and SARS-COV-2 was detected. In addition, the patient was referred to a pediatric neurology department. Brain and orbital MRI was performed, and it was unremarkable (Figure 2).

Only conservative treatments were administrated. The patient was followed for one year. After one year of follow-up, there was still left eye

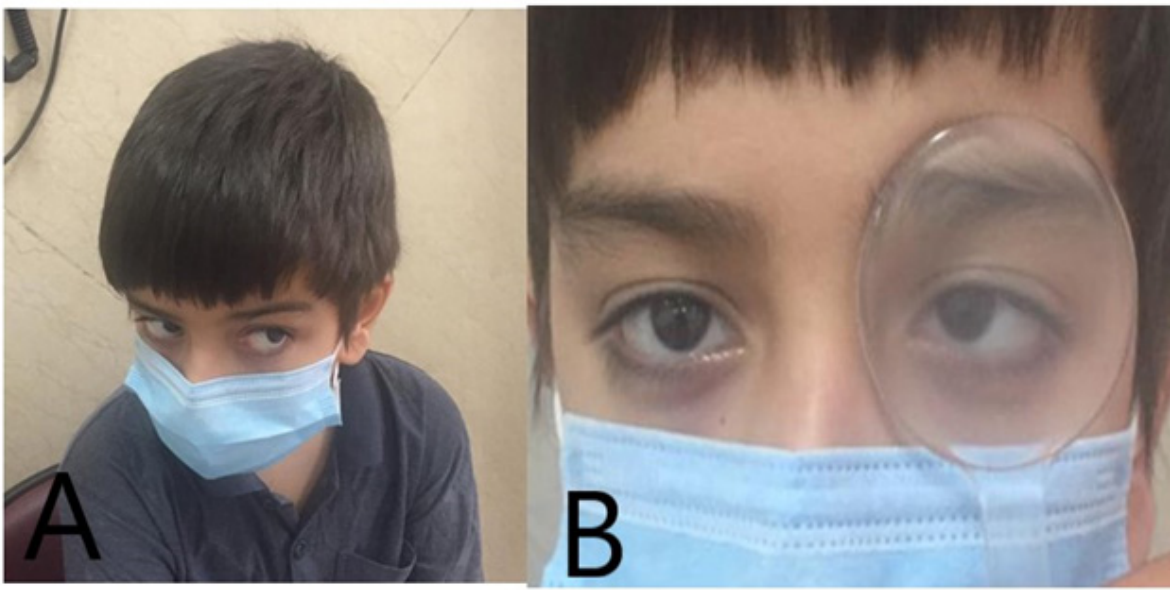

Fig 1. *A) shows the abnormal head posture at presentation. B) shows the vertical deviation of the left eye*

hyperdeviation (10 prism diopters), increasing in the right gaze and left head tilt. Additionally, evidence of inferior oblique overaction in the left eye consisting of left superior oblique palsy was observed (Figure 3). The child took habitual right head tilt to compensate for the vertical squint (Figure 4). Fundoscopy showed extorsion of the left eye. Informed consent for data, pictures, and possible publication of case reports was obtained from his father.

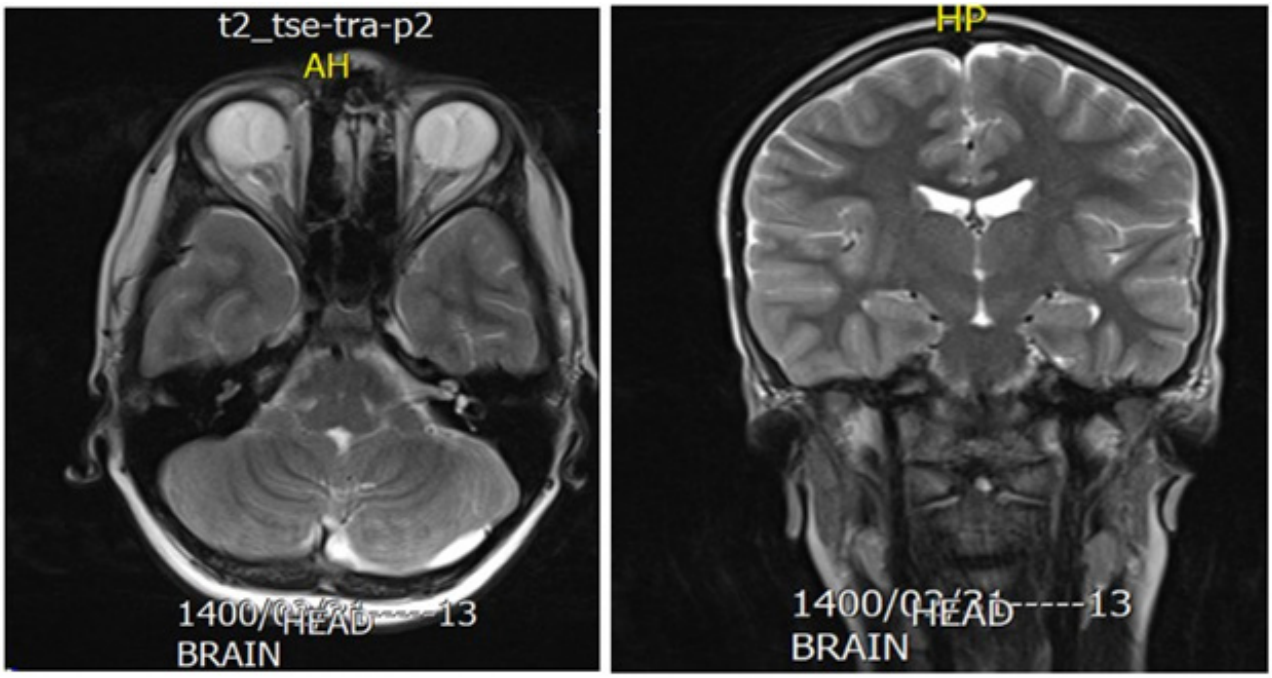

Fig 2. *Normal Brain MRI*

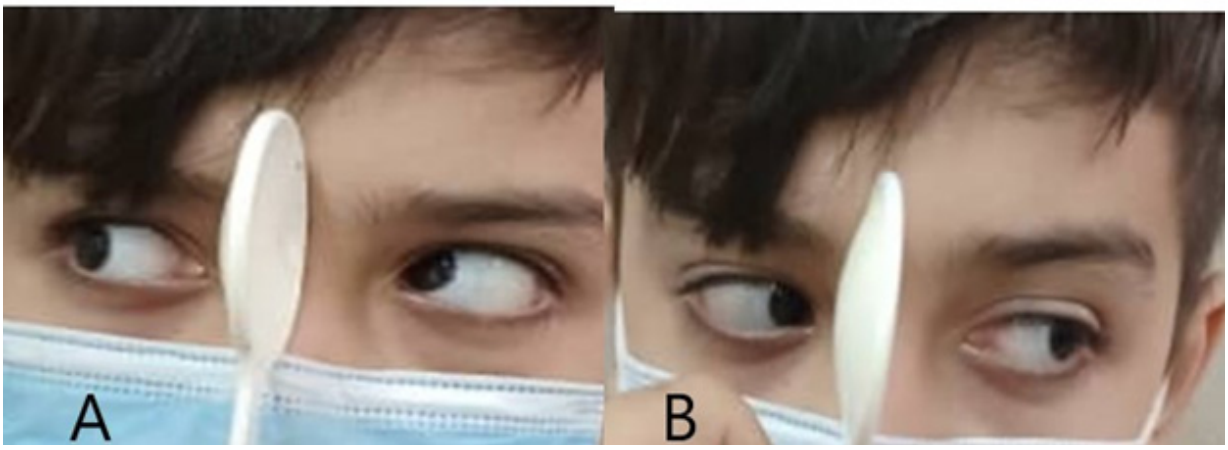

Fig 3. *A) left side inferior oblique muscle overaction due to left side superior oblique palsy. B) normal version in left gaze*

Fig 4. *Final right head tilt because of the left side superior oblique palsy*

Discussion

The present study has put forward a hypothesis suggesting that COVID-19 can cause neurological damage through two distinct pathways: direct viral injury to the nervous system and indirect forms of injury. SARS-CoV-2 may cause direct damage by entering CNS through a hematogenous or retrograde neuronal route, identical to MERS and SARS viruses. Another form of injury is indirect injury caused by neuroinflammatory and autoimmune mechanisms (3),(4), (5).

Cranial nerve palsies regulating ocular movements, including third, fourth, and sixth nerves, are uncommon in pediatrics, with an incidence rate of 7.6 per 100,000 (6).

Ocular motor nerve palsy has been reported following COVID-19 infection. Previous reports showed that COVID-19 affects the abducens nerve more than the oculomotor and trochlear nerves (7), (8).

Additionally, there are some reports of sixth nerve palsy following COVID-19 vaccination. However, to the best of the authors' knowledge, this is the first case of unilateral acute fourth nerve palsy in a healthy and asymptomatic boy with occult COVID-19 infection. Despite the sixth nerve palsy in pediatrics that has been described following viral and bacterial infections, there is no report of a fourth nerve palsy after a viral infection in the literature.

The most common cause of fourth nerve palsy in pediatrics is congenital. Head trauma is one of the critical causes of acquired fourth nerve palsy both in children and also adults (9).

In previous reports, the majority of post-COVID-19 cranial nerve palsies, especially sixth nerve palsies, showed an excellent prognosis (10), with complete recovery in most cases and diminishing diplopia. However, the patient suffered a frank fourth nerve palsy with significant vertical deviation after one year of follow-up. Therefore, these patients should be monitored closely for the possible existence of strabismus and its proper management.

A critical point in recent strabismus in children is that despite recently acquired strabismus in adults, children with extra-ocular motor cranial nerve palsy may not complain of diplopia, and a recent abnormal head posturing may be a soft sign of strabismus (9). For example, in sixth nerve palsies, abnormal head posturing may be a face turned to the right or left, and in fourth nerve palsy, it may be head tilt.

In summary, in this report, the researchers presented a healthy and asymptomatic child with acquired fourth nerve palsy and occult COVID-19

infection. The post-viral fourth nerve palsy is uncommon, and post-COVID-19 has not been reported before. Clinicians should consider this infection in any recent strabismus in pediatrics. The children rarely complain of diplopia, and a recent abnormal head posture may be a sign of acquired strabismus.

Acknowledgment

The authors would like to thank the Eye Research Center at their university for supporting them.

Authors' Contribution

Mohammad Yaser Kiarudi: Investigation, supervision, data curation, Mohammad Sharifi: Review, editing, submission, Ahmad Gharuni: Data curation, writing, original draft, Tayebe Shiravi: Data curation,writing,original draft.

Conflict of Interest

None declared.

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