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Oculomotor nerve palsy in an asymptomatic child with COVID-19

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We report the case of a 2-year-old girl with acute-onset divergent strabismus and ptosis in the right eye. She had an exotropia of 45^Δ for near, eyelid ptosis affecting the visual axis, adduction, limitations of up- and downgaze, and a discrete mydriasis in the right eye. Neurological conditions were ruled out. Serology was positive for SARS-CoV-2 antibodies. The patient was managed conservatively with ocular physiotherapy and close visual acuity monitoring. On follow-up examination at 1 month, there was marked improvement of the exotropia (25^Δ for near), adduction, ptosis, and mydriasis.

Case Report

A 2-year-old girl presented at Villa Saúde Health Center, a private ophthalmological practice at Serra Talhada, Brazil, for ophthalmological evaluation of acute-onset divergent strabismus and ptosis in the right eye. No head or ocular trauma, recent vaccination, or cold episode was reported. She did not present any other systemic signs at examination, including fever, fatigue, cough, dyspnea, headache, diarrhea, anorexia, or anosmia. Her past medical and family history were unremarkable.

On ophthalmological examination, a superior eyelid ptosis compromising the visual axis and anisocoria with a discrete mydriasis were noted in the right eye (Figure 1). Her visual acuity by Teller visual acuity cards at 84 cm was 6.5 cycles/cm (Snellen equivalent, 20/63) in both eyes. Cycloplegic refraction was +2.00 D sphere in each eye. Cover testing at near and distance revealed an exotropia in the right eye. The Krimsky test, without correction, revealed an exotropia at near of 45^Δ, fixating with the left eye. Ocular versions showed adduction limitation (right medial rectus muscle, -1), uplift limitation (right superior rectus muscle, -2), and depression limitation (right

inferior rectus muscle, < -1). Intraocular pressure, biomicroscopy, and funduscopy were normal in both eyes.

The child was referred for neurological evaluation at a public emergency room, and no neurological or neuroimaging alterations were identified. Blood tests, including infectious disease investigation, complete blood count, and inflammatory markers, were normal. Serology revealed positive immunoglobulin (Ig) M for severe acute respiratory syndrome coronavirus-2 SARS-CoV-2 antibodies and negative IgG.

The child was managed conservatively with ocular physiotherapy, and her visual acuity was monitored closely. Patching was not prescribed. Ocular physiotherapy included visual exercises and proprioceptive neuromuscular facilitation (Kabat's method).¹ One month later, the child showed significant improvement of the exotropia (Krimsky test for near vision measured 25^Δ fixating with the left eye), adduction, upgaze, downgaze, ptosis, and mydriasis.

Discussion

To our knowledge, this is the first reported case indicating a possible association between COVID-19 and acquired non-pupil-sparing oculomotor nerve palsy in a previously asymptomatic child. Although 40%-45% of infected individuals are asymptomatic, early reports have demonstrated that cranial nerve palsies may represent part of the neurologic spectrum of COVID-19.²⁻⁶

To date, 7 cases of cranial nerve palsy associated with COVID-19 infection have been reported, none involving children. All the patients were adults (age range, 21-71 years), who presented with typical COVID-19 symptoms and diplopia. Two patients had ophthalmoparesis and involvement of the hypothalamus and mesencephalic tegmentum,² 1 had a partial acute extrinsic paralysis of the left oculomotor cranial nerve,³ 5 patients had an abducens nerve palsy^{4,5,7} (see also Ben-David GS, et al. Diplopia from abducens nerve paresis as a presenting symptom of COVID-19: a case report and review of literature. Preprint, August 5, 2020. <https://doi.org/10.21203/rs.3.rs-53271/v1>),

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FIG 1. A, Clinical photograph at presentation showing superior eyelid ptosis of the right eye. B, Clinical photograph 1 month later showing improvement of the eyelid ptosis and presence of exotropia and discrete enlargement of the pupil in the right eye.

and 1 had a partial left oculomotor palsy.⁵ Most of them presented severe manifestations of the disease and required intensive treatment.²⁻⁵ In contrast, the present case demonstrates that neurologic manifestations of COVID-19 may appear in the absence of respiratory symptoms and in less severe cases, similar to what has been described by Ben-David and colleagues. Moreover, our case corroborates the suggestion of Dinkin and colleagues⁵ that cranial neuropathies should be considered even in the context of mild COVID-19 symptoms.

Oculomotor nerve palsies caused by presumed inflammation usually present neuroimaging findings confined to the oculomotor nerve, with no other brain or orbital imaging findings.⁸ Our patient had no findings on magnetic resonance imaging, making it plausible that the isolated cranial nerve palsy in this case was caused by SARS-CoV-2.

The SARS-CoV-2 neuroinvasive mechanism is not yet fully understood, although previous studies have suggested that the virus infects the host cell via membrane-bound angiotensin converting enzyme 2 receptors interaction, which is also expressed in various organ systems, including the neurologic system.^{6,9} Vonck and colleagues⁶ hypothesized that the neurological spectrum of COVID-19 may be due to direct viral neurological injury or indirect neuroinflammatory and autoimmune mechanisms. Our patient did not develop any other signs or symptoms that suggest immune involvement. Therefore, we suggest that the oculomotor nerve palsy may have been caused by direct action of the virus.⁹ However, indirect action of the virus via an immune response cannot be discounted.

As regards spontaneous improvement in the present case, we hypothesize that the damage to the oculomotor nerve caused by SARS-CoV-2 is not permanent and that the oculomotor nerve palsy can resolve spontaneously over a short period of time, as has been reported with other cranial nerve palsies associated with COVID-19.²⁻⁵

Literature Search

PubMed and Google Scholar were searched for the period from June 2020 to January 2021 using the following terms: *COVID-19, coronavirus, SARS-CoV-2, nerve palsy, neuritis, and children.*

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Trends in pediatric ocular trauma presenting to an ophthalmology-specific emergency department during the COVID-19 pandemic

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Because children remained at home throughout the COVID-19 pandemic, the potential existed for an increased rate of ocular injuries. We performed a retrospective chart review of children (≤ 18 years of age) presenting to an ophthalmology emergency department (ED) at a single institution from March 1 to August 31, 2020, to describe the trends in ocular trauma during the pandemic. Of the 10,738 ED patients, 6% (643) were children. Of these, 156 (24%) sustained ocular trauma. Although the overall number of visits was 44% lower than the same 6-month period in 2019, trauma-related visits were only 34% lower. The mean age was 9.1 ± 5.53 years (range, 4 months to 18 years) and over half (57%) of patients were male. Most closed-globe trauma was due to blunt (48.6%) or sharp (14.4%) objects, foreign bodies (23.3%), or chemical injuries (13.7%). Ten patients (6.4%) presented with an open globe. Blunt trauma was most common regardless of age; however, chemical injuries tended to occur in younger patients compared with all other diagnosis groups (4.7 ± 4.6 vs 9.7 ± 5.4 years; $P = 0.0002$). Although COVID-19 restrictions limited school, recreational activities, and team sports, ocular injuries remained prevalent in children.

Because children remained at home—the most common setting for eye injuries in children¹⁻³—while COVID-19 stay-at-home orders and mandated school closures were in effect, the potential

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