COVID-19 provoked internuclear ophthalmoplegia in a child with arrested hydrocephalus

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Internuclear ophthalmoplegia (INO) is a neuro-ophthalmic disorder caused by damage in the medial longitudinal fasciculus between the third and sixth cranial nerve nuclei. We present a 4-year-old female diagnosed with INO triggered by coronavirus disease 2019 (COVID-19) infection. The patient had history of neonatal meningitis with hydrocephalus without history of surgical intervention. To the best of our knowledge, this is the first case with combined COVID-19 and chronic hydrocephalus as an etiology for INO in a child. COVID-19 may trigger neurological manifestations as INO in susceptible cases.

Key words: COVID-19, hydrocephalus, internuclear ophthalmoplegia

Internuclear ophthalmoplegia (INO) is a neuro-ophthalmic disorder caused by damage in the medial longitudinal fasciculus (MLF) between the third and sixth cranial nerve nuclei, which halts the transmission of neural impulses to the ipsilateral medial rectus muscle.[1] Clinically, INO is described as failure to adduct the ipsilateral eye with nystagmoid movements in the abducting eye. Multiple sclerosis and infarction have been the most common reported causes of INO.[2] Infectious diseases have been described as the possible causes of INO in some patients.[3] Recently, coronavirus has been added as one of the potential infectious causes of INO.[4]

Hydrocephalus is one of the causes described in INO development, though it is rare. The mechanism of INO in hydrocephalus is likely related to mass effect from enlarged ventricles and increased intracranial pressure (ICP), causing impaired transmission through the MLF.[5]

We present a case of INO triggered by coronavirus disease 2019 (COVID-19) infection in a child with arrested hydrocephalus.

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Case Report

A 4-year-old female child referred to the pediatric casualty unit with convulsions. She had history of coughing and runny nose 2 days back. The mother gave history of neonatal meningitis and hydrocephalus without history of surgical intervention or special medications afterward. The patient was diagnosed as having generalized tonic clonic convulsions, which was treated accordingly.

After 4 days, the patient was stable with full consciousness. The mother noticed abnormal deviation in the right eye with abnormal movements in the left eye. Upon ophthalmic examination, the patient was orthotropic with right limited adduction in levoversion with fine nystagmus saccades in the left eye [Fig. 1a–i]. Her pupils were equal and reactive to light without an afferent pupillary defect (APD). No papilledema was detected. Examinations of her anterior and posterior segments were otherwise unremarkable. Visual acuity could not be assessed. There was no previous history of head trauma, surgery, strabismus, and eyelid or intraocular surgery. No history of special medications was reported by the mother. The remainder of the neurological examination were unremarkable. A provisional ophthalmic diagnosis of unilateral INO was given.

Investigations

Nasopharyngeal polymerase chain reaction (PCR) swab for COVID-19 test was positive; otherwise, standard blood tests were negative.

Brain computed tomography (CT) scan revealed chronic supratentorial hydrocephalic changes with normal cerebellum and upper brain stem. No intra\extra-axial, supra\infratentorial masses, edema, or hemorrhage was noted. Magnetic resonance venography (MRV) of the brain showed that the superficial and deep venous systems were normal in appearance. The dural sinuses showed normal flow signal pattern with no evidence of thrombosis. Magnetic resonance imaging (MRI) of the brain confirmed the chronic supratentorial hydrocephalic changes including lateral and third ventricle dilatation with no subependymal cerebrospinal fluid (CSF) permeation and no signs of increased ICP [Fig. 2a–d].

The diagnosis of arrested hydrocephalus was given. Progressive ventricular enlargement could not be ascertained or omitted as there were no previous MRI scans. The mother denied any abnormal increase in the head circumference of her child. The patient was cleared from the neurosurgery side.

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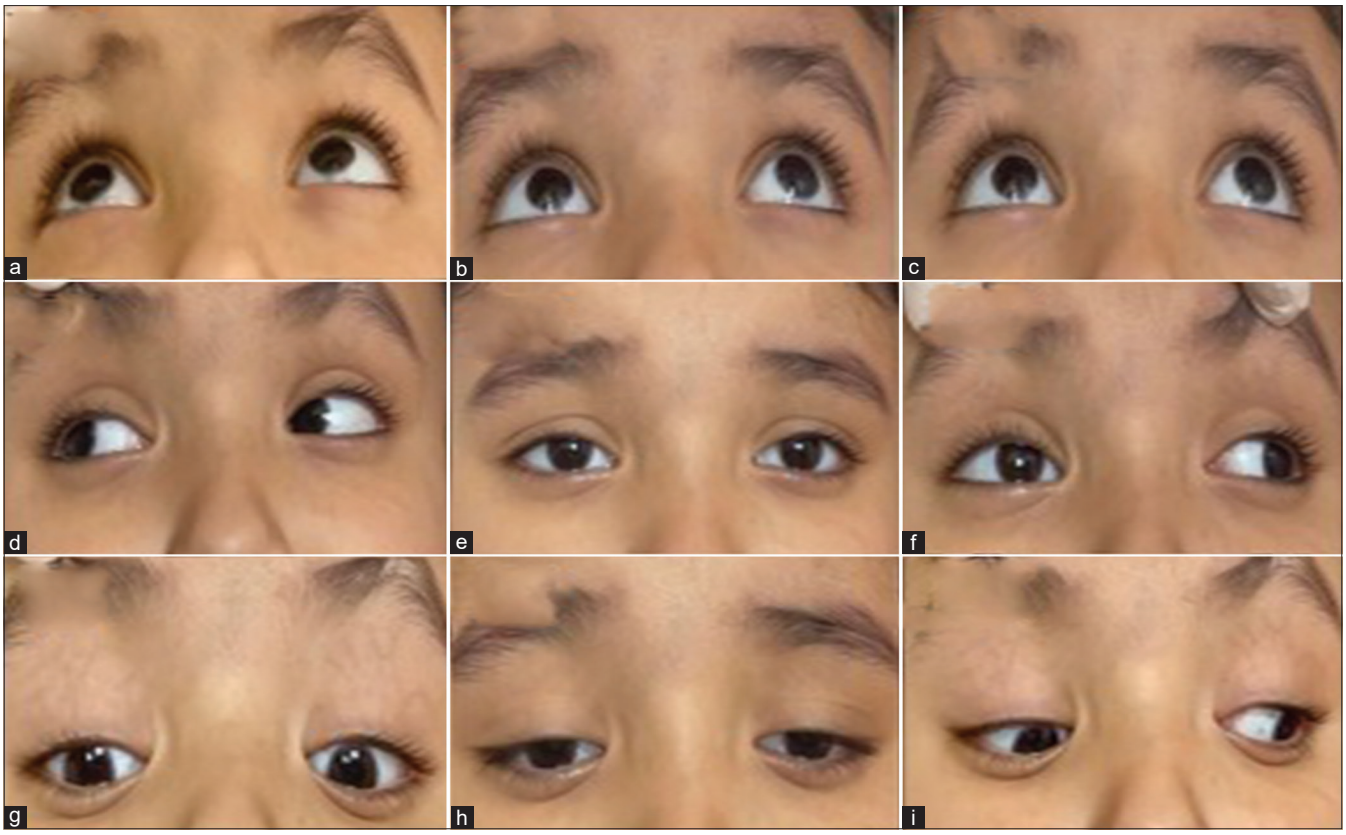

Figure 1: (a–i) Nine cardinal positions of ocular motility of the patient showing orthotropia in the primary position (e) with right eye limited adduction in levoversion (f)

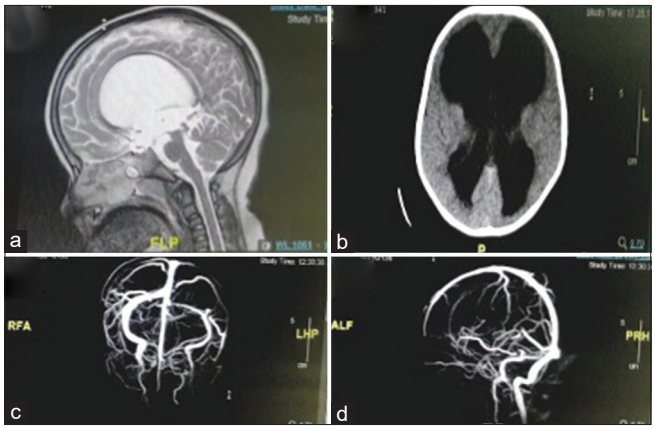

Figure 2: (a) MRI of the brain showing chronic supratentorial hydrocephalic changes with inferior acquired aqueductal stenosis. (b) Brain CT scan showing lateral and third ventricle dilatation. (c and d) MRV of the brain showing normal superficial and deep venous systems and normal flow signal pattern in the dural sinuses with no evidence of thrombosis. CT = computed tomography, MRI = magnetic resonance imaging, MRV = magnetic resonance venography

Treatment

Before sending the patient for investigations, a course of ceftriaxone and acyclovir was started. The latter was discontinued after negative serology for Herpes virus (HSV) was received. Ocular motility improvement was noticed, and the patient was discharged with scheduled follow-up. Unfortunately, the patient did not show up in her follow-up visits.

Discussion

Pediatric INO is seldom described in the literature unlike adult cases. Hydrocephalus as a possible cause of INO is rare. In a case series involving 410 patients with INO, only two patients had hydrocephalus.[2] The course of hydrocephalus can be either progressive or arrested. Arrested hydrocephalus is a diagnosis of exclusion based on the absence of findings suggestive of a progressive state. There should be no signs of acute raised ICP, no progressive deficiencies on neurological and psychological evaluations, and no progressive ventricular enlargement.[6] These criteria apply to our case to some extent. In such cases with suspicion of Arrested Hydrocephalus (AH), close follow-up appears to be the paramount management strategy. In the lack of clinical signs of elevated ICP, a conservative approach can be selected.

INO secondary to infections is also rare.[2] Neurological symptoms in COVID-19 have become well recognized.[7]

With neuroimaging findings of chronic hydrocephalus, it is still difficult to be completely certain about the possible role of COVID-19 in the development of INO.

The main limitation to our study was the lost follow-up. The course of the disease would have aided in solving the dilemma of the exact diagnosis. On the other hand, this report may draw more attention regarding the primary neuro-ophthalmic manifestations of COVID-19. To the best of our knowledge, this is the first case with combined COVID-19 and chronic hydrocephalus as an etiology for INO in a child.

Conclusion

In our case, chronic hydrocephalus remains the possible underlying pathophysiology. However, the rapid clinical improvement without the need of shunt suggests a potential relationship between COVID-19 infection and INO.

Declaration of patient consent

Patient's guardian's consent for publication of this case report and any accompanying images was obtained.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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