Isolated neurological symptoms in a teenager with COVID-19

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Abstract

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) predominantly affects the respiratory system. However, COVID-19 associated Multisystem Inflammatory Syndrome in Children (MIS-C) is a state of hyper inflammatory shock affecting the cardiovascular, gastrointestinal, hematologic and central nervous system. Isolated neurological manifestations have rarely been reported, especially in children and adolescents. We describe a 17-year-old boy presenting with intermittent headaches, altered mental status and right sided weakness, was found to be positive for SARS-COV2 from nasopharyngeal sampling. His neurological symptoms lasted for three weeks and subsequently improved spontaneously.

Keywords: SARS-CoV2; Encephalitis; Headaches.

Introduction

The recent pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) has affected people in all age groups with varied clinical signs and symptoms. The classic symptoms of fever, cough and difficulty in breathing are uncommon in children with SARS-CoV2 [1]. Concerns for neuropsychiatric manifestations in patients infected with SARS-CoV2 have been increasingly reported in some case series [2-4]. They can range anywhere from vague symptoms of anosmia, dizziness, emotional lability, and headaches to more serious complications such as acute neurological deficits, impaired consciousness, seizures, encephalopathy, and psychosis [4-8]. However, there is a paucity of reported cases in children with neurological symptoms [9,10]. We present a case of an adolescent boy with encephalitis that could be explained by SARS-CoV2 after an initial extensive infectious and neuropsychiatric workup.

Case report

17 year old boy with a known history of Wolf-Parkinson-White syndrome status post radiofrequency ablation presented to the emergency department with intermittent episodes of headaches, difficulty in speaking, numbness and left sided weakness for one week prior to presentation. He initially developed intermittent frontal headache and neck pain associated with photophobia and phonophobia that improved with ibuprofen and acetaminophen. However, four days prior to presentation he developed an episode of left-sided weakness, difficulty in speaking, disorientation and confusion for 45 minutes to one hour and would not respond appropriately to verbal commands. Hence, he was taken to an urgent care where a urine drug screen and Computed Tomography (CT) of head were done and results were negative. On the day of presentation, he developed a similar episode of altered mental status with right-sided...
upper and lower extremity weakness along with right sided faci
cial drooling, lasting for one hour that brought him to our emer
gency department. He denied having fever, diarrhea, cough, rhino
orhrea, abdominal pain, rash or similar episodes recently. No fami
ly member with recent illness or psychiatric disorder. No known
COVID-19 exposure. In the past, he was diagnosed with Wolf Park
inson White syndrome on routine electrocardiogram screening for
which he underwent radiofrequency abla
tion twice at 13 and 15 years of age.

In the emergency department, his vital signs were within nor
mal range. He was able to describe his recent episode of inabili
ity to speak, tingling numbness, right sided weakness of up
per and lower extremity and right-sided facial weakness with
“Heaviness” in his tongue. His complete neurological exam
including cognition, strength, deep tendon reflexes, cranial
nerves 2 to 12, sensation to pressure, fine touch and proprio
ception were intact. Cerebellar signs, Romberg’s sign, Babinski’s
sign and pronator drift were negative. A 12 lead electrocardio
gram was normal. Magnetic Resonance Imaging (MRI) of head
was normal. MR angiography showed incidental hypoplastic A1
segment of the right anterior cerebral artery which was an in
cidental finding. MRI cervical, thoracic and lumbar spine was
reported normal as well. His complete blood count, basic meta
bolic profile and C-reactive protein were within normal limits.
Neurology and infectious disease subspecialist were consulted.
Routine screening for SARS-CoV2 by Polymerase Chain Reaction
(PCR) (Cepheid Inc. Sunnyvale, CA, USA) performed on a na
sophyrygeal swab was positive. SARS-CoV2 Immunoglobulin
(IgG) titer (Abbott Laboratories, Lake Bluff, IL, USA) was posi
itive (9.7 S/CO). Multisystem Inflammatory Syndrome (MIS-C)
associated with COVID-19 in childhood was considered, but pa
tient did not meet criteria as he did not have fever, no evidence
of systemic inflammations or other organ involvement. MIS-C
workup that included ferritin, erythrocyte sedimentation rate,
D-dimer, fibrinogen, prothrombin time and activated thrombo
plastin time and troponin were within normal range. Cere
brospinal Fluid (CSF) analysis showed lymphocytic pleocytosis
(449/mm²) with 100% lymphocytes on cytospin differential, el
evated protein (218 mg/dl) and normal glucose (57 mg/dl). Due
to concern for meningitis on preliminary CSF studies, he was
started on intravenous ceftriaxone, vancomycin and acyclovir.
Credit for concern for meningitis on preliminary CSF studies, he was
started on intravenous ceftriaxone, vancomycin and acyclovir.
CSF gram stain and culture was negative. Extensive infectious
infections work-up was done. CSF studies were sent to assess for
West Nile, Epstein Barr Virus (EBV), Lyme disease, Cyto-demo
lovirus (CMV), Herpes Simplex Virus (HSV) 1 and 2, histoplas
mosis, blastomyces, mycoplasma, Lymphocytic Choriomening
gitis (LCM) virus, parvovirus, Bartonella and enterovirus, and all
were found to be negative. Serologies for parvovirus, Bartonella
henselae, mycoplasma and Borrelia burgdorferi were negative.
A Purified Protein Derivative (PPD) test for tuberculosis was also
negative. A 24 hour video electroencephalogram did not show any
electrographic epileptiform discharges. CSF analysis for the 22
most common autoimmune encephalitis disorders including
oligoclonal bands, anti N-Methyl-D-Aspartate (NMDA) receptor
antibodies, and myelin oligodendrocyte glycoprotein was also
negative.

During the hospital stay, he developed two episodes of al
terated mental status, disorientation, confusion, unable to follow
verbal commands as well as emotional lability in the form of
crying and agitation and right sided weakness and numbness
lasting for up to 1 hour. He continued to have waxing and wan
ning headaches. His vital signs remained stable during these epi
sodes. A repeat COVID-19 nasopharyngeal swab was sent on
day 10 of admission that remained positive. He was discharged
two weeks later with no residual weakness, paresthesia, loss of
sensations or focal neurological deficits. At neurology outpa
tient follow up 3 weeks later, he remained asymptomatic with
no recurrent episodes since hospital discharge.

Discussion
Increasing evidence regarding the neuropsychiatric mani
festation of COVID 19 during the pandemic is rapidly evolving.
Multi-center studies have shown comparable neuropsychiatric
symptoms in patients during Severe Respiratory Distress Syn
drome (SARS) and Middle East Respiratory Syndrome (MERS)
pandemics [5,6]. Various theories regarding the pathogenesis of
neuropsychiatric disease include immune mediated neuro
injury, neurotropism and neuronal proliferation of the virus,
neuro-inflammatory injury of endothelium causing blood stasis
and direct neuronal injury [2,6]. The most common neurologi
cal symptoms seen in COVID-19 include dizziness and headache
whereas the common psychiatric symptoms included anxiety
depression and delirium [2,5-8]. Neurological symptoms in four
children with MIS-C with a median (interquartile range) age of
12 years [8-15], included encephalopathy (4/4), headache (3/4),
dysarthria or dysphagia (2/4), meningism (1/4) and cerebel
lar ataxia (1/4) [10]. All four patients had fever, cardiovascular
shock and fever. A 14-year-old boy presenting with abdominal
pain, rash and fever who met the criteria for MIS-C developed
fluctuating impairment in awareness, psychosis and agitation
[9]. Our patient presented with headache, altered mental status
and unilateral weakness of face, upper and lower extremities
without respiratory or systemic symptoms suggesting the pos
sibility of isolated neurological symptoms. His vital signs were
normal with no fever and MIS-C work up did not show elevated
inflammatory markers to suggest a hyperinflammatory state.

Central nervous system disease in the form of ischemic stroke, intracerebral hemorrhage, acute disseminated enceph
alomyelitis, encephalitis, and Central Nervous System (CNS)
vasculitis as well as peripheral nervous system involvement in
the form of Gillian Barre syndrome and its variants has been
reported in patients with SARS-CoV2 [4-7]. In the above men
tioned series of four children, two had normal Cerebrospinal
Fluid (CSF) analysis with normal protein and glucose levels [10].
However, in our patient, lymphocytic pleocytosis and elevated
protein was noted in the CSF suggesting viral meningoenceph
alitis likely due to SARS CoV-2. PCR test for SARS-CoV2 in the CSF
was not available to confirm the diagnosis, however, extensive
CSF work up for viral and autoimmune encephalitis all returned
negative. Signal abnormalities with diffusion restriction in the
splenium of corpus callosum as well as centrum semiovale have
been described on Magnetic Resonance Imaging (MRI) in chil
dren with neurological symptoms [10]. However, our patient
had no abnormalities on MRI. MRI showed incidental hypo
plastic A1 segment of the right anterior cerebral artery that
could not explain his symptoms.

Improvement in the neurological as well as systemic symp
ıoms in children has been shown with the use of immunomodu

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latory therapies such as steroids, intravenous immunoglobulins, anti-TNF alfa drugs and rituximab [9,10]. Our patient’s symp-
toms improved gradually over the course of hospital stay and
did not require any immunomodulatory therapy as there was
no concern for MIS-C and MRI brain did not show signs of in-
flammation.

As the typical respiratory symptoms are less common in chil-
dren with acute COVID 19, a high index of suspicion is necessary
to diagnose children presenting with other organ involvement.
Neuropsychiatric manifestations have been reported in a few
children that have been a part of their systemic COVID-19 ill-
ness. However, isolated neurological findings in children are ex-
tremely rare and further studies are necessary to establish the
pathogenesis of SARS-COV2 in the central nervous system.

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