

## Case Report

# Post COVID-19 ischemic stroke in a 15-Year-old patient

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### ABSTRACT

ارتبط مرض فيروس كورونا 2019 (COVID-19) في الأدبيات بارتفاع خطر الإصابة بالسكتة الدماغية لدى الشباب الذين ليس لديهم عوامل خطر سابقة. نستعرض في هذا التقرير حالة واحدة لفتاة تبلغ من العمر 15 عامًا مصابة بسكتة دماغية إقفارية خلفية أدت إلى شلل نصفي أيمن كثيف وعدم تناسق مخيخي. ثبتت إصابة المريض بعدوى COVID-19 دون إظهار أي أعراض لعدوى COVID-19 النشطة في وقت الإصابة بالسكتة الدماغية. أظهر فحص الدماغ بالرنين المغناطيسي احتشاءات حادة في الجزء السفلي من الدماغ ونصف الكرة المخيخ الأيسر، وأظهر تصوير الأوعية الدموية المقطعية المحوسبة للجهاز الدماعي الوعائي انسداد الشرايين الفقرية والقاعدية اليسرى، وأبرز سمة لهذه الحالة هي عدوى COVID-19 التي تظهر سريريًا على شكل جلطة دماغية وعائية في فتاة شابة تتمتع بصحة جيدة وليس لديها أمراض مصاحبة موجودة مسبقًا ولا توجد نتائج مخبرية لتجلط الدم باستثناء ارتفاع طفيف في D-dimer.

Coronavirus disease 2019 (COVID-19) has been reported in the literature to be associated with a higher risk of stroke in young individuals with no previous risk factors. We present here one such case of a 15-year-old girl with posterior circulation ischemic stroke resulting in dense right hemiplegia and cerebellar incoordination. The patient tested positive for COVID-19 infection without displaying any symptoms of active COVID-19 infection at the time of the stroke. An MRI brain scan showed acute infarcts in the pons and left cerebellar hemisphere, and a CT angiogram of the cerebrovascular system showed occluded left vertebral and basilar arteries. The most salient feature of this case is COVID-19 infection manifesting clinically as cerebrovascular thrombosis in an otherwise healthy young girl with no pre-existing comorbidities and no laboratory findings of coagulopathy except for mildly elevated D-dimer.

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Various neurological complications following novel coronavirus disease 2019 (COVID-19) infection among both adults and children have been reported in the literature. Acute cerebrovascular disease has been reported to occur in 2–6% of patients admitted to hospitals with COVID-19 infection.<sup>1</sup> The hypercoagulable state associated with COVID-19 infection can be the cause of cerebral thrombosis and strokes in young adults with no cerebrovascular risk factors.<sup>2</sup> Here we report a unique case of COVID-19, followed by stroke, in a previously healthy young girl with no pre-existing comorbidities.

**Case Report. Patient information.** A 15-year-old female patient without any previous medical history presented at Amiri Hospital, Kuwait, on March 6, 2021, with a one-day history of facial asymmetry and weakness in the right upper and lower limbs, accompanied by impaired sensation. She reported feeling unwell with fatigue and loss of appetite a few days prior to admission. She had a low-grade fever on the day of admission with no other infective/coryzal symptoms. She had not received vaccination against Covid-19 infection. Her temperature was 37.8°Celsius, her pulse rate was 90 per minute, her blood pressure was 100/60 mm Hg, and her oxygen saturation was 98 percent on room air.

**Clinical findings.** Neurological examination revealed normal cognition, mild dysarthria, right-sided upper motor neuron facial weakness, and monocular diplopia affecting the left eye. There was no ptosis or nystagmus, a full range of motion in the external ocular muscles, and normal swallowing. In the right upper and lower limbs, the muscle power was 0/5 according to the Medical Research Council (MRC) Scale for Muscle Strength, accompanied by hypertonia, hyperreflexia, and ankle clonus. Superficial sensations were impaired on the right side of the body, although deep sensation was preserved. She had no bladder or bowel incontinence.

**Diagnostic assessment.** She tested positive for nasopharyngeal COVID-19 real-time reverse transcription polymerase chain reaction (RT-PCR) test carried out on admission to the hospital.

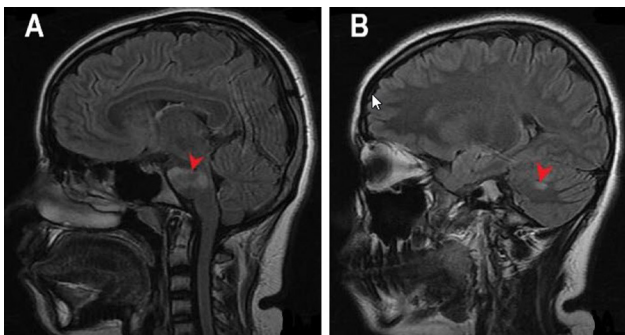
Magnetic resonance imaging (MRI) of the patient's brain revealed acute infarcts in the pons and left cerebellum (Figure 1). There were no definite features of demyelinating disease. A computed tomography (CT) angiogram of the cerebrovascular system and carotid doppler findings showed occluded left vertebral and basilar arteries (Figure 2). The MRI findings of the brain and neck (T1 with fat suppression) suggested a thrombotic etiology rather than dissection. A conventional angiogram was not performed, as the patient's family did not want to take the risks involved with the procedure. The findings of the transthoracic echocardiogram bubble study were unremarkable.

Laboratory investigations were normal except for mildly elevated D-dimer level, at 299 ng/ml (normal range: 0–250 ng/ml). Her coagulation profile was

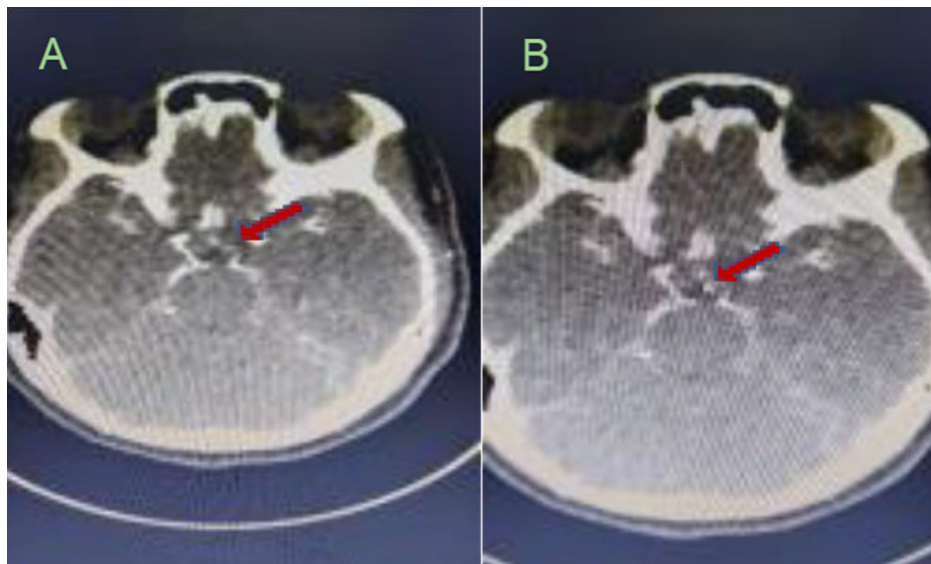
normal. Serum ferritin and lactate dehydrogenase (LDH) levels were not elevated. The patient's thrombophilia and vasculitis screens were all negative. Tests for mycoplasma, herpes simplex virus, varicella-zoster virus, and cytomegalovirus antibodies were also negative.

**Therapeutic intervention.** On admission, a preliminary diagnosis of a demyelinating disease was considered, and she was empirically treated with intravenous Methylprednisolone. When investigations revealed cerebrovascular thrombosis, Methyl Prednisolone was discontinued. She was then started on dual antiplatelet therapy (Aspirin and Plavix). Five weeks later the patient was transferred to the Physical Medicine and Rehabilitation Hospital, Kuwait, for rehabilitation. By this time, she exhibited partial motor recovery. Superficial sensations were still impaired on the right side. The cerebellar signs could not be assessed at this time due to the patient's muscle weakness. The functional assessment revealed that she could take a few steps with the assistance of one person. She needed assistance for the activities of daily living, and her functional independence measure (FIM) score was 82/126. The patient underwent a comprehensive rehabilitation program, which included physiotherapy, occupational therapy, and robotic hand therapy sessions, as an inpatient as well as an outpatient at the Physical Medicine and Rehabilitation Hospital and showed significant improvement.

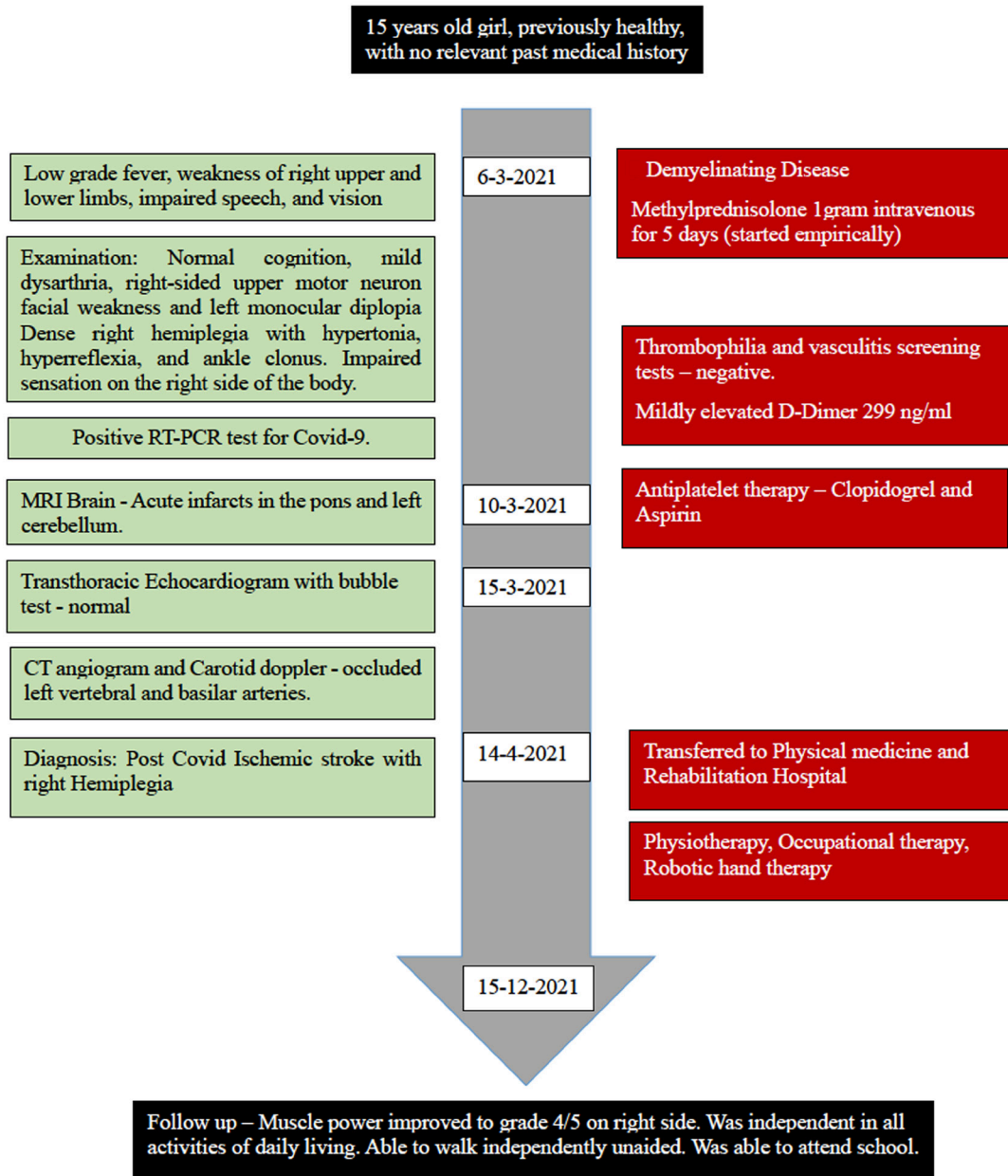
**Follow-up and Outcome.** The muscle power in her right upper and lower limbs had improved to grade 4/5 according to the MRC Scale, except for the finger



**Figure 1** - MRI Brain sagittal view showing acute infarcts in (A) the Pons and (B) left Cerebellum.



**Figure 2** - CT angiogram showing occlusion of A) left vertebral artery and B) Basilar artery.



**Figure 3** - Timeline picture of the case report.

extensors, intrinsic muscles of the hand, and ankle dorsiflexion, which were all graded 3/5. The patient had difficulty with her fine motor skills, especially handwriting, due to intention tremors in the fingers. She was trained to write with her left hand because she found doing so easier and faster than writing with

her right hand. She exhibited mild incoordination. After eight months of rehabilitation, she could walk independently with a mild circumduction gait pattern. She was independent in all the activities of daily living and was able to return to school. At the time of discharge, her FIM score had improved to 123/126 (Figure 3).

**Discussion.** Higher incidences of large vessel strokes and cryptogenic strokes have been reported in areas with a high prevalence of Covid-19 infection.<sup>2</sup> The proposed pathophysiology in these cerebrovascular accidents is a hypercoagulable state produced by pro-inflammatory cytokines and endothelial cell damage, leading to thrombosis.<sup>2,3,4</sup> Virus particles have been identified in the endothelial cells of various organs, including the brain. Thus COVID-19 infection has been implied as an independent risk factor for developing stroke.<sup>2</sup>

There have been previous case reports regarding children developing stroke following COVID-19 infection. Appavu et al<sup>5</sup> reported 2 cases of arterial ischemic stroke due to large-vessel occlusion in children aged 8 and 16 years old, who were previously healthy but presented with right hemiplegia and language impairment in 3 to 4 weeks of COVID-19 infection. Both these patients had features of cerebral arteritis and raised inflammatory marker levels. Khosravi et al<sup>6</sup> reported a 10-year-old girl who had developed left hemiparesis one week after COVID-19 infection due to acute cerebral infarction. The patient's D-dimer level was normal, although her LDH level was elevated. Her magnetic resonance angiography findings were suggestive of angiopathy due to COVID-19 as a cause of the stroke.

Oxley et al<sup>7</sup> reported large-vessel stroke in 5 adults below the age of 50 years. Some of these patients did not have risk factors for stroke, although their laboratory findings suggested a hypercoagulable state related to COVID-19 infection. Multiple case reports have now documented that, in addition to elevated D-dimer levels, antiphospholipid antibodies are also detected in COVID-19 patients.<sup>4,8</sup>

**Conclusion.** This is a unique case of stroke following Covid-19 infection, in a very young patient with no cerebrovascular risk factors. Thus, treating physicians should bear in mind this serious complication in patients who present with neurological deficits following COVID-19 infection.

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