

# Lower motor neuron facial palsy in a postnatal mother with COVID-19

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## SUMMARY

COVID-19 is caused by the novel SARS-CoV-2 and is a potentially fatal disease that is of great global public health concern. In addition to respiratory symptoms, neurological manifestations have been associated with COVID-19. This is attributed to the neurotropic nature of coronaviruses. The authors present a case of Bell's palsy associated with COVID-19 in a term primigravida.

## BACKGROUND

Initial outbreaks of the COVID-19 were first reported in Wuhan City, Hubei Province, China. WHO declared COVID-19 as the sixth public health emergency of international concern on 30 January 2020. The infection spreads by human-to-human transmission via droplets and direct contact. SARS-CoV-2 was found to have a mean incubation period of 6.4 days and the most common symptom was found to be fever, followed by symptoms like cough, sore throat and respiratory distress.<sup>1</sup>

Corona viruses, however, have also been associated with neurotropic and neuroinvasive capabilities. Neurological manifestations including febrile seizures, convulsions, acute cerebrovascular events, encephalitis and Guillain-Barré syndrome have been reported in COVID-19.<sup>2,3</sup>

Viral cellular tropism in COVID-19 in humans is determined by ACE2 receptors in tissues. ACE2 inhibitors are located not only on lung epithelia but also on endothelial cells of the blood-brain barrier. Viral binding at this receptor allows viral entry into the central nervous system (CNS).<sup>3</sup>

Bell's palsy is a unilateral lower motor neuron paresis or palsy of the facial nerve which is characterised by acute spontaneous onset (within 72 hours). It occurs without other neurologic or systemic signs. No specific aetiology has been associated with Bell's palsy.<sup>4</sup>

Bell's palsy may be associated with infections especially herpes simplex virus (HSV), Varicella-zoster virus, Epstein-Barr virus infections, inflammation, ischaemia and acute cold exposure.<sup>5</sup> More recently, Bell's palsy has been associated with COVID-19 and has been reported as the presenting complaint in several cases throughout the world.<sup>6-8</sup> Here, the authors report a case of Bell's palsy in COVID-19 with onset postpartum, midway through the course of the disease.

## CASE PRESENTATION

A 28-year-old woman who was a term primigravida (36 weeks of gestation) with a history of polycystic ovarian disease presented with complaints of fever

of 1-day duration and anosmia with dysgeusia for 3 days. She had no history of cough, shortness of breath, abdominal pain, nausea, vomiting, chest pain or neurological deficits at that time. Her antenatal history was unremarkable. She was tested for COVID-19 at a COVID-19 testing centre by real time polymerase chain reaction (RT-PCR) method and tested positive.

On admission, the patient was haemodynamically stable. Her pulse rate was 82 beats per minute, blood pressure was 120/80 mm Hg and her oxygen saturation was 98% on room air. The general physical examination was unremarkable except for gravid uterus corresponding to term and there were no signs of fetal distress. The patient's respiratory, cardiovascular, abdominal examination was otherwise normal. Neurological evaluation was normal except for anosmia and dysgeusia.

On the day of admission, the patient developed a persistently high blood pressure of 160/110 mm of mercury and she was subsequently taken up for an emergency caesarean section to deliver the baby. The surgery was uneventful and both mother and child were stable postoperatively. However, on the day after the surgery the patient complained of sudden-onset generalised weakness along with numbness of the right side of the face, drooling of saliva from the angle of mouth on the right side and an inability to close her right eye. She also noticed that there was collection of food on the right side of her mouth when she chewed it. There was no fever, headache or altered sensorium.

Neurological examination revealed normal higher mental functions. However, there was a loss of right forehead wrinkling and a complete inability to close the right eye with Bell's phenomenon. The patient also exhibited a deviation of angle of the mouth towards the left along with drooling of saliva on the right side. All of this was suggestive of a lower motor neuron palsy of the right facial nerve. There were no other neurological deficits and examination of respiratory and cardiovascular systems was normal.

## INVESTIGATIONS

Routine blood investigation on admission including haemoglobin (139 g/L), total count ( $8.9 \times 10^9/L$ ), platelets ( $246 \times 10^9/L$ ), serum electrolytes, creatinine (0.3 mg/dL), urea (19 mg/dL), liver function tests were within normal limits. Inflammatory markers like ferritin (81.47 ng/dL), Lactate dehydrogenase (226 IU/L), C reactive protein (6 mg/L), D-dimer (0.8 ug/mL) were within normal limits. Complete blood counts, repeated after caesarean section showed a mild drop in haemoglobin



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(11.3 mg/dL) and an increase in total white cell count counts postsurgery (14900/uL).

### DIFFERENTIAL DIAGNOSIS

The acute onset of an isolated unilateral lower motor neuron facial palsy in the absence of any other aetiology conforms to a diagnosis of Bell palsy. The physiological stress of pregnancy could have made the patient more susceptible to neurotropic invasion by the SARS-CoV-2 virus.

A differential diagnoses of a cerebrovascular accident and Guillain-Barré syndrome, both of which have been reported complicating COVID-19, were considered as the patient had transient generalised weakness. However, there was no evidence of motor or sensory deficits in the patient on examination. The subjective weakness resolved completely within few hours of onset and there was no recurrence of these symptoms.

The absence of fever, rash or history of tick bite made the diagnosis of Lyme disease unlikely. The absence of mucocutaneous lesions or ear pain with rash also made the diagnosis of herpes virus infections less likely.

HIV infection can cause facial nerve palsy but was ruled out by preoperative screening. The absence of systemic involvement made the possibility of autoimmune causes for the isolated facial nerve palsy less likely.

### TREATMENT

Our patient was diagnosed to have right-sided lower motor neuron facial nerve palsy, most probably Bell's palsy. She was treated empirically with oral valacyclovir 1g three times a day for 10 days and oral prednisolone 50mg once a day for 7 days, followed by rapid tapering. She was also advised physiotherapy with facial muscle strengthening exercises and eye-protective measures.

The patient developed steroid-induced diabetes as a result of starting steroids and the transient hyperglycaemic was managed with insulin which was stopped at discharge.

### OUTCOME AND FOLLOW-UP

The child was not separated from the mother. Breast feeding was initiated after advising the patient to take all precautionary measures to minimise exposure of the newborn to the virus. Newborn SARS-CoV-2 testing at 72 hours of life was negative.

The patient was discharged 10 days after the onset of symptoms. There was no further worsening of symptoms or onset of new neurological symptoms at the time of discharge from the hospital. At discharge, she reported significant improvement of her neurological deficits with therapy. She had only a minimal decrease in the power of muscles of the right eyelid compared with the left. Deviation of the angle of mouth and drooling of saliva had resolved completely. The patient was followed up 2 weeks postdischarge and reported no specific complaint or residual neurological deficits.

### DISCUSSION

Bell's palsy is the most common cause of acute unilateral lower motor neuron facial nerve palsy. The worldwide incidence of Bell's palsy varies between 11.5 and 40.2 cases per 100 000 population.<sup>9</sup> Bell's palsy has been associated with viral infections like Epstein-Barr virus, mumps, rubella, and most commonly, HSV. A cell-mediated autoimmune response against myelin basic protein has been linked with Bell's palsy.<sup>10</sup> Risk factors for Bell's palsy include pregnancy, severe preeclampsia, obesity, upper respiratory diseases, hypertension and diabetes. The pathophysiology

of Bell's palsy has been a topic of intense debate. Some authors describe it as an acute demyelinating disease similar to Guillain-Barré disease.<sup>11</sup> Murakami *et al* successfully isolated Herpes simplex-1 DNA from the endoneurial fluid of the facial nerve by PCR during the acute phase of Bell's palsy.<sup>12</sup> Autoimmune or virus-mediated damage to facial nerve leads to oedema of the nerve and causes lower motor neuron palsy.

COVID-19 has a deleterious effect on the nervous system ranging from anosmia, dysgeusia to acute stroke. Autopsy reports in patient's with COVID-19 has shown brain tissue oedema and partial neuronal degeneration in deceased patients.<sup>13</sup> Moriguchi *et al* reported a case of COVID-19 where the patient had a loss of consciousness, seizures, neck stiffness. SARS-CoV-2 RNA was isolated from the cerebrospinal fluid (CSF) though it was absent in the nasopharyngeal swab, providing further evidence that SARS-CoV-2 is a neurotropic virus.<sup>14</sup> Viral encephalitis, meningitis, encephalopathy, demyelination and acute cerebrovascular accidents have been reported in COVID-19 patients.<sup>15</sup> The mechanism of neuroinvasion by SARS-CoV-2 could be a direct invasion of the nervous system or entry through the blood circulation. Coronaviruses have been known to infect sensory or motor nerve endings achieving anterograde or retrograde transport. Neurotropic viruses induce a proinflammatory state in the brain as evidenced by glial cell proliferation and increased levels of cytokines which contribute to neurological manifestations of the disease. ACE 2 receptors have known to be expressed in glial cells and neurons. ACE2 receptors present in the CNS can act as a gateway for neurological manifestations of COVID-19 as the spike protein of SARS-CoV-2 interacts with the ACE 2 receptors.<sup>16</sup>

In this case, the patient was diagnosed to have Bell's palsy in the background of COVID-19 in a postoperative setting. Similar cases of Bell's palsy in COVID-19 have been reported in patients in Singapore<sup>17</sup> and China.<sup>6</sup> In association with COVID-19 in pregnancy, Bell's palsy has been reported as the presenting manifestation of COVID-19 in a 35-year-old primigravida at 39 weeks of pregnancy<sup>7</sup> in Portugal, and in a pregnant woman at 35 weeks of gestation in Italy.<sup>8</sup> All of these cases were treated

### Patient's perspective

I was very anxious that I was diagnosed with COVID-19. I was even more scared because I was nearing the end of my pregnancy and I was concerned for my child. After I had delivered my baby girl I felt relieved. I was happy that my child was born hale and healthy in the times of COVID-19. However my happiness was short lived because I now had another problem in the form of numbness on the right side of my face. My mouth had deviated to the left side and when I ate or drank something there was leakage from the right side of my mouth. I was afraid I had a stroke and my anxiety levels increased. But my doctors explained the nature of my disease to me. I was explained that even though there were many similarities with my complaints and that of a patient with an acute stroke I was assured that I did not a stroke. I was only partially convinced and I was still scared for myself and my baby. However with medicines and exercise my symptoms started improving. I felt so relieved seeing the improvement every day. I was almost completely normal at the time of discharge. I would like to thank my mother who was so supportive of me through these trying times. I hope doctors around the world can learn something from my case.

## Learning points

- ▶ COVID-19 can present with neurological symptoms including unilateral facial nerve lower motor neuron palsy.
- ▶ SARS-CoV-2 is a neurotropic virus.
- ▶ Management of acute-onset unilateral facial nerve motor neuron palsy in COVID-19 with valacyclovir, prednisolone and physiotherapy on an empirical basis seems to have a good outcome as proven by various clinical experiences.

with steroids and favourable outcomes were reported. Lima *et al* published a case report where eight cases with COVID-19 developed facial nerve palsy. Three of the said patients developed facial nerve palsy as the presenting symptom. Nerve damage was mild in five patients and moderate in intensity in three patients. All patients had complete recovery of symptoms. SARS-CoV-2 was not detected in CSF analysis by RT-PCR.<sup>18</sup> Similarly, in a case reported by Derollez a 57-year-old woman with COVID-19 developed facial nerve palsy and CSF RT PCR did not show presence of SARS-CoV-2.<sup>19</sup>

We hypothesise that Bell's palsy may be a neurocovid manifestation. However, more epidemiological data are needed on neurological manifestations in COVID-19 to establish a causal relationship between the virus and neurological symptoms and to support the hypothesis that neuroinvasion by SARS-CoV-2 virus can cause cranial neuropathies including Bell's palsy to formulate a plan for optimal management.

**Contributors** VK and SS, the corresponding author, identified the symptoms developed by the patient. VK wrote the case report with inputs from PN who followed up with the patient postdischarge. The case report was edited by APM and SS who also gave the final approval for publishing.

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