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# A Case of Possible Motor-Sensory Symptoms Event Associated with SARS-Coronavirus-2

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**ABSTRACT**

A new infection emerged into the world which has been declared a global pandemic in December 2019, termed SARS-CoV-2 based on its first pulmonary manifestations. Also, Neurologic consequences can be disturbing complications of these respiratory viral diseases .

Here we present a 51-year-old nurse with motor-sensory symptoms following developed mild coryza symptoms including sore throat, general malaise, and conjunctivitis. However, a week of ocular muscle discomfort and weakness preceded coryza symptoms. She was returned negative by nasopharyngeal swab test twice for detection of the SARS-Cov-2 genome by a real-time polymerase chain reaction (PCR) and Chest X-Ray (CXR) examination. Since the patient had neurological symptoms, MRI was performed, which showed inflammation in the spinal cord and meninges .

Cerebrospinal fluid (CSF) fluid investigation for immunological and Covid-19 examination showed SARS-Cov-2 involvement in this patient. The patient's characteristics show that the involvement of Covid-19 is not limited to the lungs or gastrointestinal tract, and the nervous system, despite the presence of a brain barrier, can be invaded by the virus. From this point of view, we should expect a shadow of the involvement of different parts of the nervous system in Covid-19.

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## Introduction

In December 2019, a new infection emerged into the world which has been declared a global pandemic by the World Health Organization, termed SARS-CoV-2 based on its first pulmonary manifestations (1, 2). A large and growing body of literature has investigated association of clinical disorders with an increased risk of severe complications with COVID (3-5). As the number of infected cases was escalating throughout the globe, evidence of other organ involvements was pointed up including Central Nervous System (CNS) manifestations (6).

Now after nearly two years of this virus journey, although it seems evident that SARS-CoV-2 could affect the CNS, the spectrum of neurological symptoms and the mechanisms of damage to the CNS have not been elucidated (7). It has been hypothesized that this mysterious virus could progress from the periphery tissue to the CNS through synaptic connections and retro-grade-neuronal transport (8). The mechanism of the penta-partite synapse as a nexus of glial, endothelial, immune and neuronal cells involved in synapse formation and remodeling could justify these events (9).

This brief report describes a patient with myelitis due to the SARS-CoV-2 infection with a positive CSF in reverse transcription polymerase chain reaction (RT-PCR) that developed motor-sensory symptoms subsequently dysautonomia during diagnosis and treatment process.

## Case Presentation

On 24 June 2020, a 51-year-old nurse in Mashhad, Iran, with a history of hypertension and carpal tunnel syndrome, developed mild coryza symptoms including sore throat, general malaise, and conjunctivitis. However, a week of ocular muscle discomfort and weakness preceded coryza symptoms. She consulted a doctor at Sina hospital, Iran, and due to occupational exposure and clinical symptoms were referred to a laboratory for a definitive diagnosis of Covid-19. On the 1st of July, she had a nasopharyngeal swab test for SARS-CoV-2 PCR and a chest CT scan which both turned negative for COVID-19. She followed up with her primary care physician who repeated these tests 7 days later (9 July) once again under strong clinical suspicion of SARS-Cov-2 infection including myalgia. Which was returned negative by a nasopharyngeal swab test for detection of the SARS-Cov-2 genome by a real-time PCR and CXR examination. She underwent a biochemistry examination and blood test resulted in negative findings; the wright and 2ME tests, ANA, RF, and the SARS-CoV-2 serology assessment yielded as well as CRP and 1-hour ESR test. Meanwhile, clinical symptoms aggravated and new symptoms came up including low back pain, gait disorder, and abdominal pain. The lumbosacral CT-Scan and abdominal sonography were both normal and Guillain-Barré syndrome was considered as a primary possible diagnosis. Subsequently, on 30$^{th}$ of July, she developed blurred vision, voiding dysfunction, weakness of lower limbs accompanied by tingling dysesthesias, and symmetric paresthesia that started from fingertips and toes spreading proximally. The patient was referred to a neurologist for further investigations. On her neurological examination, she had increased Deep Tendon Reflexes (DTRs) and a slight extensor plantar reflex suggestive of an upper motor neuron disorder. Her spine MRI with and without contrast revealed some degree of dural contrast enhancement in the thoracic and parasitical cord. With a diagnosis of post-infection myelitis, methylprednisolone pulse therapy started on a dosage of 500 mg BID IM.

After 5 days of steroid therapy commencement, she noted that her heart rate had dropped to 40 bpm, hence presented to the emergency department for further investigations where she was admitted to the intensive care unit (7 August). She had a normal temperature and respiratory rate; however, she was bradycardic with a sitting blood pressure of 150/110 mmHg. The methylprednisolone pulse therapy continued. On the 4$^{th}$ day of ICU admission, because of a severe headache, a neurologist examined and diagnosed rise of the Intracranial pressure (ICP). She underwent lumbar puncture and the CSF was clear with the following analysis: Glucose: 66 mg/dl, protein: 18.6 mg/dl, WBC: 1.2 µl, Lym: 59%/HPF, Neut: 5%/HPF, and the encephalitis autoimmune profile was

negative, however, the CSF RT-PCR returned positive for SARS-Cov-2. Her clinical manifestations and laboratory findings were consistent with Myelitis results in the SARS-Cov-2 virus. The patient was released and started on subcutaneous Interferon beta-1a (ReciGen) 44mcg SC for 5 days in addition to enoxaparin 30 mg twice a day. After 5 days of treatment, the patient's heart rate returned to normal and neurological function briefly improved. During the hospitalization period, her blood pressure remained normal. She was followed up for the next 4 months as an out-patient and she had not reported a full return to her previous baseline level of health.

### *Specimen collection*

Clinical samplings for SARS-CoV-2 virus diagnostic were obtained in agreement with guidelines of National Institute of Infectious Diseases (NIID) (10). Synthetic fiber swabs were used for nasopharyngeal swab specimens. The swab was inserted into a sterile tube comprising phosphate-buffered saline (PBS) with 0.5% BSA. Spinal fluid was collected in sterile specimen containers. Specimens were immediately examined at the Yamanashi University Hospital Laboratory Department or stored at 4°C until ready for examination.

### *Diagnostic testing for SARS-CoV-2 Viral*

RNA of the specimen was extracted using maglead 6gC (Precision System Science Co., Ltd.). The SARS-CoV-2 RNA was distinguished using AgPath-ID™ OneStep RT-PCR Reagents (AM1005) (Applied Biosystems) on CobasZ480 (Roche).

## Discussion

Neurological involvement in addition to the chief complaint of human coronaviruses including respiratory manifestation to acute respiratory failure have been reported (11). We aimed to describe the case of CNS involvement associated with SARS-CoV-2. The RT-PCR test of our patient using the nasopharyngeal specimen was twice negative while she had neurological symptoms and the neuro-invasive potential of SARS-CoV-2 virus.

As mentioned in a recent study, the similarity of genomic sequence between SARS-CoV-2 and SARS-CoV was more than 50% homology (12). This homogeneity was particularly related to SARS-CoV receptor binding domains that were structurally parallel to that of SARS-CoV-2 (13). The structural analysis of scientists in 2019 indicated that SARS-CoV-2 may be connected to the angiotensin-converting enzyme 2 (ACE2) receptor in humans (13) like SARS-CoV. This might be the suggested cause of the virus invasion to the human brains.

In the current case, since the patient had neurological symptoms, especially spiral cord and meningeal involvement, MRI was performed, which showed inflammation in the spinal cord and meninges. Especially in the upper part of the thoracic spinal cord, which was consistent with clinical findings. Subsequently, for further investigation, CSF fluid was sent to the laboratory for immunological examination, including examination of Covid-19, using PCR test. This patient reminds us that Covid-19 can involve the central nervous system and cause serious clinical symptoms. One mechanism for the development of these clinical signs is the inflammatory process caused by the virus in the nervous system. The patient has significantly (but not completely) improved in subsequent visits, which again indicates the inflammatory process and autoimmunity in this patient. The patient's characteristics show that the involvement of Covid-19 is not limited to the lungs or gastrointestinal tract, and the nervous system, despite the presence of a brain barrier, can be invaded by the virus. From this point of view, we should expect a shadow of the involvement of different parts of the nervous system in Covid-19.

This case is important because the clinical CNS manifestations are potential in early diagnostic of SARS-CoV-2. These claims have been strongly contested in recent years by several investigations. In February 2020, Moriguchi et al. in Shimokato, Japan have been reported the first case of Meningitis/Encephalitis associated with SARS-Coronavirus-2that RNA virus was not recognized in the nasopharyngeal sample but was recognized in a CSF (14). The study on Florida also been reported the presence of SARS-COV-2 virus in neural and capillary endothelial cells of a tissue obtained from a patient that was infected with Severe Acute

(15). Zoghi et al. have been investigated a 21-year-old male involved with encephalomyelitis and malaise for 4 days. They reported possible atypical demyelinating events of the CNS in the patient following SARS-COV-2virus (16). Therefore, an implication of this is the possibility to keep a few symptoms in mind that may be the first indication, as important as respiratory symptoms, to diagnosis the unseen SARS-CoV-2 patients. This research has thrown up many questions in need of further investigation.

## Abbreviations

**PCR :** polymerase chain reaction **; CXR :** Chest X-Ray ; **CNS :**Central Nervous System ; **RT-PCR :** Reverse transcription polymerase chain reaction **; DTRs :** Deep Tendon Reflexes ; **NIID :** National Institute of Infectious Diseases ; **PBS :** phosphate-buffered saline ; **ACE2 :** angiotensin-converting enzyme 2.

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### Highlights:

- The SARS-CoV-2 RNA was not distinguished in the nasopharyngeal swab in several examination but it was distinguished in a CSF sample.
- This case gives a warning to the physicians about patients with CNS symptoms.

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