

## Clinical Record

Dr A Goulioumis takes responsibility for the integrity of the content of the paper

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## Abstract

**Objective.** This article presents the case of an adolescent with asymptomatic coronavirus disease 2019 infection who had vestibular neuronitis symptoms.

**Method and results.** The new coronavirus disease 2019 demonstrates neurotropic properties, apart from airway symptoms. Early in the pandemic, coronavirus disease 2019 infection had been associated with olfactory disturbances. Accumulative evidence supports that both the infection with coronavirus disease 2019 and the vaccination against the virus may induce a condition of vestibular hypofunction, known as vestibular neuronitis. Coronavirus disease 2019 may directly affect the vestibular organs and ganglia, or indirectly damage them via immune-mediated mechanisms. In most cases, complete recovery is achieved with the typical therapeutic approaches for vestibular neuronitis, consisting of supportive measures and corticosteroids.

**Conclusion.** Physicians may expect an increased incidence of vestibular neuronitis during the coronavirus disease 2019 pandemic. Conversely, coronavirus disease 2019 infection should be considered in patients with sudden vestibular symptoms.

## Introduction

The coronavirus disease 2019 (Covid-19) appeared as a pandemic in 2020; infected patients primarily presented with lower airway and lung symptoms.<sup>1</sup> Early data suggested that the new virus also has neurotropic properties that affect sensory epithelia, with olfactory epithelium damage reported in 33–68 per cent of cases.<sup>2</sup> The labyrinth is another sensory organ that can be affected by neurotropic viruses.

A typical vestibular organ pathology characterised by peripheral type vertigo is vestibular neuronitis.<sup>3</sup> This condition usually constitutes permanent damage to the upper vestibular ganglion, commonly by reactivation of herpes simplex viruses that remain in the ganglia in a dormant condition. Vestibular neuronitis is accompanied by typical signs and symptoms compatible with unilateral vestibular hypofunction. Accumulating literature indicates that Covid-19 may also induce vestibular neuronitis.<sup>4–10</sup>

This article presents a case of vestibular neuronitis in a child who tested positive for Covid-19 infection. Additionally, we present a review of the literature.

## Case report

Our patient was an adolescent, aged 13 years old, with no previous history of vertigo or other labyrinthine pathologies. He came to the emergency department of our hospital following an episode of dizziness of sudden onset that continued for 48 hours.

Physical examination revealed spontaneous left-sided nystagmus. According to Alexander's law, the nystagmus was more prominent with the left gaze position, characterising it as a first-degree nystagmus. Romberg and Unterberger's tests showed a body inclination toward the right side. The head thrust test that examines the vestibulo-ocular reflex was deficient with a turn of the head to the right side. The head-shaking test brought out nystagmus with the quick phase direction to the left. The patient's otoscopy findings and auditory acuity examined by tone audiometry were normal. A thorough physical examination of the cranial nerves did not reveal any significant concerns. The patient did not complain of headaches or any neurological symptoms. The patient's history and physical examination findings indicated hypofunction of the vestibular organs of the right labyrinth.

A typical rapid Covid-19 test, conducted as part of our hospital policy for patients examined in the emergency department, revealed a positive result. However, the patient did not demonstrate any signs or symptoms of viral airway infection.

The patient was admitted in light of the severity of his vertigo. He was given diazepam 5 mg and methylprednisolone 32 mg per day, per os. He was also examined by a neurologist, who confirmed the absence of central nervous pathology symptoms. After 48 hours,

his subjective feeling of dizziness had improved, and he was discharged from the hospital with a prescription for steroids for 3 additional days. He was given advice for vestibular rehabilitation exercises and booked in for a new appointment for three weeks later. He was also scheduled for a brain, brainstem and cerebellopontine angle magnetic resonance imaging (MRI) scan.

During the re-examination, the patient stated that his symptoms had gradually improved. He did not refer to any subjective dizziness or unsteadiness. In the head thrust test, he demonstrated only mild signs of right labyrinth hypofunction. His MRI examination findings were unremarkable. A diagnosis of vestibular neuronitis was confirmed. We explained to the patient the nature of the disease, the possibility of the sensation of unsteadiness in challenging conditions of unbalance, and the increased possibility of future recurrent episodes of paroxysmal positional vertigo.

## Discussion

Dizziness is a common symptom affecting about 8 per cent of Covid-19 positive patients.<sup>6</sup> Nevertheless, not all studies support an increased incidence of co-existing vertigo and coronavirus infection.<sup>11</sup> Among cases of vertigo, many fulfil the criteria of vestibular neuronitis.

- Dizziness is common in coronavirus disease 2019 (Covid-19), affecting about 8 per cent of patients
- The disease may directly damage nerves, intruding into them via the angiotensin receptor or damage them indirectly through the immune system's reaction
- Evidence indicates that both Covid-19 infection and the vaccination may induce vestibular hypofunction, known as vestibular neuronitis
- Most Covid-19 patients with vestibular neuronitis have been treated with supportive measures and corticosteroids
- Vestibular neuronitis with Covid-19 infection may occur even in paediatrics, as in our case
- Increased vestibular neuronitis during the Covid-19 pandemic is expected; conversely, Covid-19 should be considered in patients with sudden vestibular symptoms

As with other neurotropic viruses responsible for vestibular neuronitis, Covid-19 may directly damage the nerves, intruding into them via the angiotensin receptor,<sup>12</sup> or it may damage them indirectly through the immune system's reaction.<sup>12</sup> The latter assumption is also supported by the fact that vestibular symptoms have been described even after the Covid-19 vaccination, particularly with the Pfizer vaccine.<sup>13,14</sup> Again, the suggested pathophysiology of Covid-19 vaccine related vestibular neuronitis and Covid-19 infection includes the reactivation of latent viruses, like herpes zoster, local angitis of the cochlear capillaries, and immunoglobulin G mediated autoimmune reaction against the vestibular nerve.<sup>13</sup> Retrospective studies show that vestibular symptoms may appear weeks after infection.<sup>6</sup> However, in the case of immunisation, vestibular symptoms can appear even a few hours after the first dose of the vaccine, which could not be consistent with an autoimmune reaction.<sup>4</sup> Other studies speculate that the virus may also affect the central nervous system, through haematogenous transmission or retrograde transmission via the peripheral nerves.<sup>5</sup>

Most Covid-19 patients with vestibular neuronitis have been treated with supportive measures and corticosteroids.<sup>6</sup> This therapeutic approach does not differ from the protocols

that already exist for vestibular neuronitis. It is unclear whether the steroids alter the effectiveness of the immunisation. The mean age of the patients referred to in the aforementioned study was about 50 years.<sup>6</sup> Only one article similar to our study describes a paediatric patient with Covid-19 and vestibular neuronitis.<sup>15</sup> Of note, 60 per cent of Covid-19 patients with vestibular symptoms experience complete resolution of symptoms.<sup>16</sup> Of those who recovered, in two-thirds of cases the recovery occurred within two weeks of the onset, but the recovery period may have spanned a few days to six weeks.<sup>16</sup> In only 4.5 per cent of the cases, vertigo preceded the viral symptoms.<sup>16</sup> However, some Covid-19 positive patients with vertigo do not exhibit any airway symptoms, as in our case. Not all series included MRI in the diagnostic battery. Notably, one study showed that in 19 per cent of patients with coronavirus infection and vertigo symptoms, who underwent an MRI scan, another neurological pathology was revealed.<sup>17</sup>

## Conclusion

Physicians may expect an increased incidence of vestibular neuronitis during the Covid-19 pandemic. Conversely, Covid-19 infection should be considered in patients with sudden vestibular symptoms. Solid statistical findings indicate that the two conditions can co-exist. Pathological findings for tissue samples obtained with molecular techniques are expected to illuminate the pathophysiology of coronavirus-related damage to the vestibular ganglia or neuroepithelium. Cumulative evidence indicates that vestibular neuronitis can be a side effect of the Covid-19 vaccination, revealing the need for ongoing surveillance regarding the safety of vaccines.

**Competing interests.** None declared

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