



Acute Bilateral Vestibulopathy Associated With COVID-19

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Dear Editor,

Coronavirus disease 2019 (COVID-19) patients often experience dizziness and unsteadiness, even after recovering from the main symptoms.^{1,2} Previous studies were based on patient self-reporting, and hence the exact mechanism of these symptoms is uncertain. We report a case suggestive of bilateral vestibulopathy (BVP) as a cause of dizziness and unsteadiness after COVID-19, and propose virus infection as an etiology of acute simultaneous BVP.

A 43-year-old male with COVID-19 who was also experiencing vertigo was referred to the neurology department. The patient had a history of hypertension, end-stage renal disease (ESRD), and congestive heart failure. He had been diagnosed with COVID-19 by real-time reverse-transcription polymerase chain reaction 10 days previously after persistent fever and dysgeusia. The patient denied a history of dizziness/unsteadiness, headache, ear fullness, or hearing loss. His vertigo disappeared 2 days after onset, but he still felt unsteady, particularly in the dark or when standing on an uneven floor. The patient had been referred to our department 1 week previously for right posterior auricular pain after jugular vein catheterization. At that time he did not complain of vertigo or unsteadiness, the Romberg test was negative, and tandem gait was possible without assistance.

Neurological examination showed diminished bilateral knee jerks. Limb ataxia and other motor and sensory abnormalities as well as spontaneous nystagmus with or without visual fixation were absent. Nystagmus was not induced by horizontal head-shaking, vibratory stimuli, or positional maneuvers. Head-impulse tests were positive in both directions. Bithermal caloric tests using water irrigation revealed reduced responses in both ears (11.8°/s of summated slow-phase velocities induced by warm and cold stimulation) (Fig. 1A). Cervical and ocular vestibular-evoked myogenic potentials were decreased during stimulation of either ear (Fig. 1B). Pure-tone audiometry was unremarkable (Fig. 1C), and horizontal and vertical saccades and smooth pursuit were normal, as was visual cancellation of the vestibulo-ocular reflex. Findings on diffusion- and susceptibility-weighted images, as well as fluid-attenuated inversion-recovery images of the brainstem and cerebellum were unremarkable. Based on these observations, a diagnosis of BVP was established according to the 2017 diagnostic criteria of the Bárány Society.³ The patient was discharged 1 month after fever onset and instructed to undergo vestibular rehabilitation at home. In a telephone interview conducted 5 months later, the patient reported no dizziness, vertigo, or unsteadiness while walking.

COVID-19 is known not only for its preferential respiratory invasion, but also for nervous system involvement, including the cranial nerves.⁴ It can also manifest as hearing impairment or dizziness due to involvement of the eighth cranial nerve.⁵ Vestibular neuritis can develop during the course of COVID-19,⁶ and patients can present with isolated acute vestibular syndrome without typical vegetative symptoms such as fever, cough, or myalgia.⁷

Our patient presented with BVP during the course of COVID-19. BVP typically manifests as the progressive or sequential involvement of unilateral vestibulopathy followed by contralateral vestibulopathy at months to years later. However, our patient exhibited the simultane-

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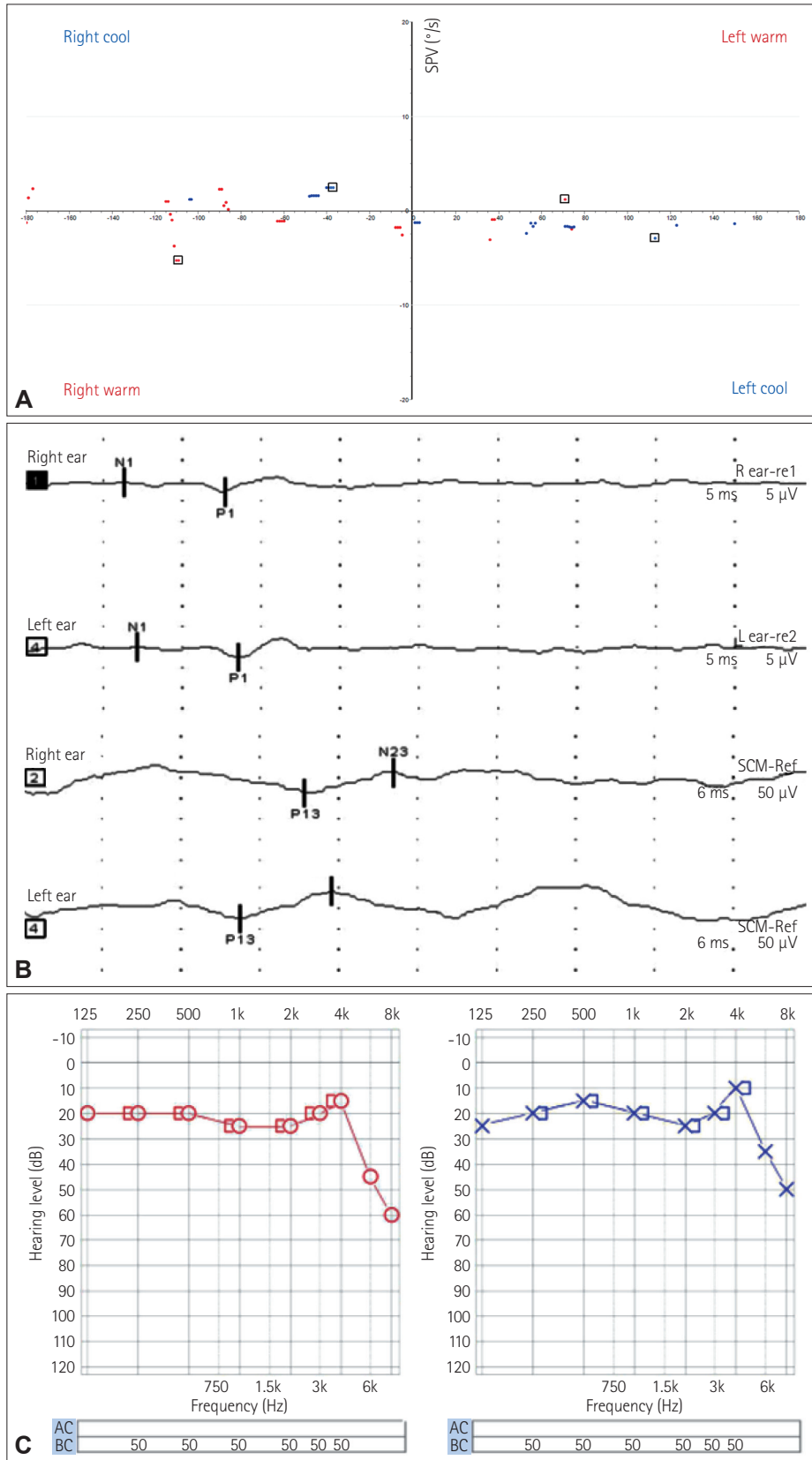


Fig. 1. Vestibular function tests and pure tone audiometry. A: Bithermal caloric tests show diminished caloric responses in both ears with a summed slow-phase velocity (SPV) of 11.8°/s. B: Cervical and ocular vestibular-evoked myogenic potentials show diminished responses during stimulation of either ear. C: Pure tone audiometry revealed non-specific high tone loss, bilaterally.

ous and acute onset of BVP and COVID-19. Two similar cases have been reported in which acute bilateral vestibular symptoms occurred at 5 and 7 days after febrile illness.^{8,9} Those cases presented clinical features suggestive of viral illness (fever, upper respiratory infection, lymphadenopathy), but the causative agent was not identified. The present case report is the first describing acute simultaneous BVP in which the etiology of viral illness was confirmed. Consistent with previous case reports, this case suggests that acute simultaneous BVP can occur with progressive and sequential temporal profiles.

Since the patient reported unsteadiness after vertigo, it is also possible that BVP developed sequentially to pre-existing unilateral vestibulopathy. However, one of the two previously reported patients with acute BVP had vertigo that lasted 1 day, which is a possible symptom of transient vestibular asymmetry due to the involvements of the two vestibular nerves occurring at different rates. In addition, critical illness caused by COVID-19 or ESRD could be related to the pathogenesis of the BVP in our patient. However, a viral etiology is suggested by the BVP developing acutely, being isolated, and readily resolving.

Among confirmed COVID-19 patients, 18.4%–37.4% reportedly complained of dizziness during illness or recovery, but generally these symptoms were nonvertiginous.^{1,10} The causes of vestibular symptoms after COVID-19 infection vary, and more attention is needed to assess for the presence of BVP. We suggest that the actual prevalence of BVP could be higher among COVID-19 patients owing to scarce diagnostic tests during the pandemic and the high infectivity of COVID-19 restricting accessibility to vestibular function tests.

In conclusion, this case report suggests that BVP can be an underlying cause of dizziness after COVID-19. Other viral illnesses might also cause acute simultaneous BVP.

Ethics Statement

This study was approved with a waiver of informed consent by the institutional review board of Soonchunhyang University Bucheon Hospital (IRB No. 2021-07-024).

Availability of Data and Material

Data sharing not applicable to this article as no datasets were generated or analyzed during the study.

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Conflicts of Interest

Sun-Uk Lee, Tark Kim, and Eek-Sung Lee, a contributing editor of the *Journal of Clinical Neurology*, was not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

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