



Sudden Sensorineural Hearing Loss in a Patient with COVID-19: A Case Report

Maryam Delphi^{1,2}, Maryam Kardouni^{3*}

¹Department of Audiology, School of Rehabilitation Sciences, Ahvaz Jundishapur University of Medical science, Ahvaz, Iran

²Musculoskeletal Rehabilitation Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

³Hearing Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract

Background: Several viral infections may lead to hearing loss. It's still unknown whether COVID-19 has effects on the auditory system or not. In this regard, to evaluate the possibility of sudden sensorineural hearing loss due to COVID-19, this study aimed to report sudden sensorineural hearing loss (SSNHL) in patients with COVID-19 in Iran.

Case Report: The patient was a 7-year-old girl diagnosed with COVID-19 and sensorineural hearing loss. An audiogram revealed normal hearing in the right ear and severe sensorineural hearing loss in the left ear. The tympanometry test result was bilateral type A. The treatment started with prednisolone (1 mg/kg/d). The audiogram of follow-up pure-tone audiometry did not reveal any improvement.

Conclusion: SSNHL appears to be a possible complication of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. COVID-19 infection could have deleterious effects on cochlear hair cells and eighth nerve functions. Therefore, audiological monitoring should be initiated in patients presenting with COVID-19.

Keywords: Sudden sensorineural hearing loss, Audiometry, COVID-19

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Introduction

Sudden sensorineural hearing loss (SSNHL) is classified as a medical emergency because of the discomfort it causes for the patient and the need for immediate treatment. Sudden hearing loss is defined as a sensorineural hearing loss higher than 30 dB for three contiguous frequencies developed within three days (1). It is one of the common hearing system pathologies with a prevalence incidence ranging from 5 to 160 cases per 100 000 population per year (2).

SSNHL has multiple causes, such as vascular occlusion, cellular stress response, autoimmune disorders, and viral causes. Its incidence is increasing yearly. Hearing loss caused by viruses can be mild, severe or profound, unilateral or bilateral, and congenital or acquired. The inner ear and organ of Corti can be directly damaged by viral infections leading to sensorineural hearing loss. Conductive and mixed hearing losses due to infections with certain viruses are not rare. Occasionally, recovery of the hearing system after viral infections can occur spontaneously (3,4).

COVID-19 is a novel pandemic disease caused by a new coronavirus-2019. This disease has already affected more than 187 countries worldwide. This disease firstly occurred in a province of China and then spread

worldwide. Three-and-a-half million cases of COVID-19 and subsequent 250 000 deaths have been reported (5,6).

Coronavirus mainly affects the upper respiratory system, causing fever, cough, runny nose, and nasal obstruction, leading to pneumonia. Other symptoms are fatigue, headache, myalgia, odynophagia, dyspepsia, gastrointestinal manifestations, and multi-organ failure (7). It was reported that 20%-86% of COVID-19 cases are asymptomatic or have mild symptoms (5). Neurological symptoms such as sudden loss of taste and smell were also seen in many COVID-19 patients. There is little information available from previous studies on the relationship between COVID-19 and sudden hearing loss. The mechanism by which COVID-19 can cause hearing loss is not explained.

Recent evidence indicates that the COVID-19 virus, similar to severe acute respiratory syndrome coronavirus (SARS-CoV) viruses, interacted with the angiotensin-converting enzyme 2 (ACE2). This is a significant factor in the transmission of the virus. In addition, the virus may increase cytokine release, endothelial damage, and systemic micro-circulatory dysfunction. Therefore, the virus can infect the peripheral and central nervous systems. Also, the virus can invade the cochlea-vestibular nerve and soft tissues of the cochlea (8,9).



Case Report

On November 16, a 7-year-old girl has been referred to an audiology clinic with a confirmed COVID-19 case. Written consent for participating in the study was obtained from her parents. On July 15, a polymerase chain reaction (PCR) test was accomplished and it showed a positive result for COVID-19. She experienced slight corona symptoms including nasal congestion and body aches during this period. The patient was retested with PCR three weeks later. The result of the respiratory swab PCR test was negative. Since unilateral hearing loss is a hidden disorder, the child and his family did not notice the hearing loss. They went for a hearing assessment four months later when they noticed that their child has a communication problem.

When visiting the audiology clinic, C-reactive protein (CRP) was negative and the erythrocyte sedimentation rate (ESR) was 4.30.

Serology tests revealed negative results for cytomegalovirus, HIV, hepatitis B and C, rubella, and syphilis. Autoimmune screening test (antinuclear antibodies) result was also negative. She had no history of ototoxic medications, head trauma, or noise exposure during isolation. The patient had passed a school hearing screening a year ago. She has not reported discharge, ear pain, or vertigo. The ear examination showed that her ear canals were patent and tympanic membranes were normal.

Test hearing threshold was demonstrated using audiometry. An audiogram revealed normal hearing in the right ear and severe sensorineural hearing loss in the left ear (Figure 1). Tympanometry test showed bilateral type A with present acoustic reflex in the right ear and absent acoustic reflex in the left ear.

The treatment started with prednisolone (1 mg/kg/d) and was tapered in 10 days (3). After Follow up pure tone audiometry done one week after Corticosteroid therapy. The audiogram did not reveal any improvement (Figure 2). The intratympanic injection was not performed because

of the patient's parents' refusal, and the course started for another 10 days with the same method. Unfortunately, there was no change in the hearing threshold after the second phase of drug therapy.

Discussion

Auditory complication due to coronavirus is little mentioned in the literature. In our case, sudden hearing loss was the only symptom, and the typical symptoms of COVID-19 like fever, cough, and expectoration did not present. All the test results were normal except the COVID-19 test, which could explain the cause of the sudden hearing loss.

Previous studies have reported that viral infections had an essential role in the etiology of SSNHL (4). Therefore, it is not unreasonable to think that COVID-19, as a viral infection, may also cause SSNHL. A study by Mustafa on the effect of COVID-19 on hearing functions supports our findings which revealed that both transients evoked otoacoustic emissions and high-frequency pure-tone threshold amplitudes were significantly worse in the asymptomatic COVID-19 PCR-positive patient group. He concluded that COVID-19 had deleterious effects on cochlear hair cell functions (10).

Another recently published study reported neurologic changes in 58 out of 64 patients with COVID-19 (11). Due to the lack of improvement in the patient's hearing threshold, it can be suggested that neurological changes in eighth nerve have caused sudden hearing loss.

In Thailand, Sriwijitalai and Wiwanitkit reported an old female COVID-19 patient who had sensorineural hearing loss. There was no observation showing changes in the hearing loss problem (12). In this case, one of the reasons for observing no improvement in hearing after corticosteroid therapy may be the patient's late referral to a hearing clinic.

Conclusion

In conclusion, COVID-19 infection could have deleterious

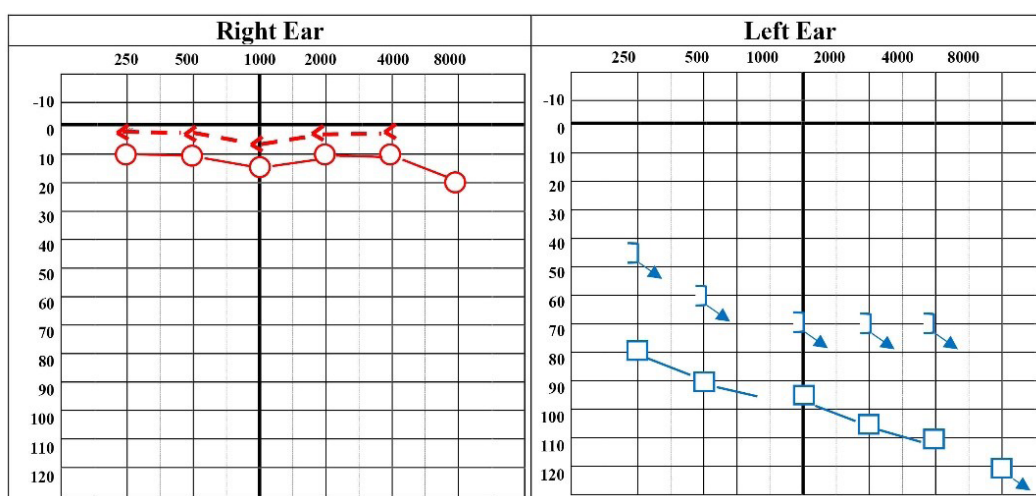


Figure 1. First audiogram before corticosteroid therapy

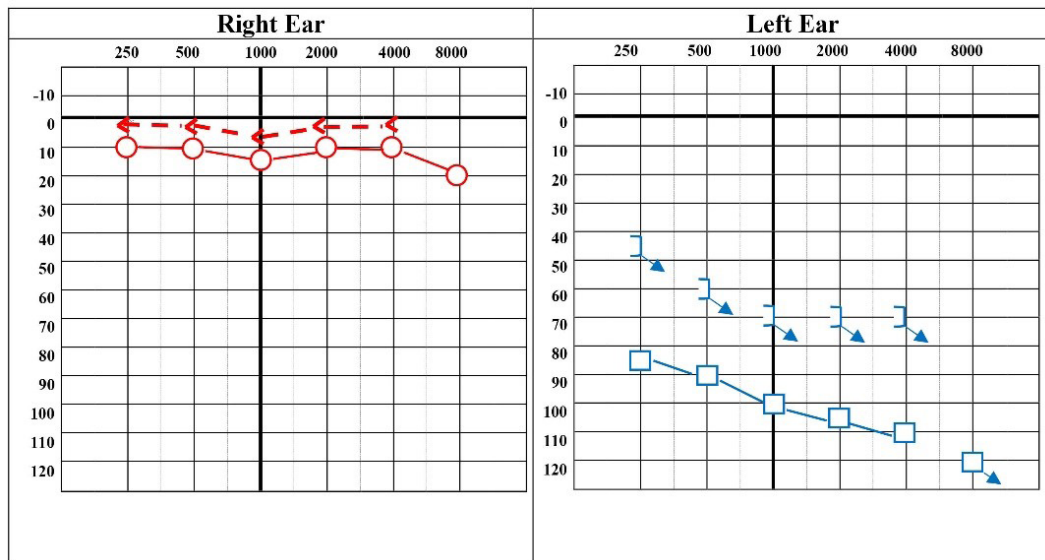


Figure 2. Follow-up audiogram after corticosteroid therapy

effects on cochlear hair cells and eighth nerve functions. Detecting the mechanism of these effects requires further research. In a pandemic condition, every symptom should be considered and shared with the medical community.

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Authors' Contribution

Conceptualization: Maryam Delphi.

Data curation: Maryam Delphi, Maryam Karadooni.

Formal analysis: Maryam Delphi, Maryam Karadooni.

Investigation: Maryam Delphi, Maryam Karadooni.

Methodology: Maryam Delphi, Maryam Karadooni.

Validation: Maryam Karadooni.

Supervision: Maryam Delphi.

Writing - original draft: Maryam Delphi.

Writing - review and editing: Maryam Delphi.

Competing Interests

The authors state that there was no conflict of interest.

Consent for Publication

Written informed consent was obtained from the parents of the patient for publication of this report.

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