

TITLE OF CASE

Experience of sudden sensorineural hearing loss following a mild COVID-19 infection.

SUMMARY

A female in her 30s was referred to an otolaryngologist with an acute onset of aural fullness, noise sensitivity, unilateral sudden onset hearing loss, vertigo, and tinnitus. She had a confirmed COVID-19 infection 5 weeks prior. A Pure Tone Audiogram (PTA) confirmed sensorineural hearing loss. Magnetic resonance imaging (MRI) identified an empty sella of the pituitary gland and without an obvious cause for hearing loss. Oral prednisolone and betahistine were prescribed, and her audio-vestibular symptoms slowly improved over the subsequent months. The patient continues to experience intermittent tinnitus.

BACKGROUND

Sudden sensorineural hearing loss (SSNHL) is a syndrome characterised by rapid progression of hearing impairment (loss of 30 decibels (dB) or more) over seconds to days.[1] In 84-90% of cases, it is considered idiopathic and almost always unilateral.[2,3] It is proposed that the SARS-CoV-2 virus attacks the auditory cortex in the temporal lobe, stimulating excess cytokine release. Cytokines then invade the cochlear nerve causing neuritis and the soft tissues of the cochlea causing cochleitis, leading to audio-vestibular disturbance.[4] Published evidence suggests potential association between recent upper respiratory tract infection and SSNHL,[5] with increased prevalence reported during the COVID-19 pandemic.[6] Some authors have suggested that SSNHL might be a symptom of COVID-19 and have observed the presence of SSNHL with or without other signs of infection.[7]

Most of the current literature on SSNHL and COVID-19 appear to be case studies that report development of SSNHL at different time-points during an active COVID-19 infection with varying degrees of illness severity and audiological outcomes.[8,9] There have also been reports of SSNHL arising following COVID-19 vaccination,[10] however evidence suggests that confirming an association between the two might be premature.[11] As evidence around the short and long-term impacts of COVID-19 and vaccines is still emerging and understanding rapidly evolving, it is important for clinicians to recognise both the variety of symptoms patients might present with as well as how these can be experienced by patients. With many reports of increasing burnout among healthcare workers including cynicism/depersonalisation,[12, 13] acknowledging that even those who experience minor COVID-19 illness could be at risk of potentially permanent and debilitating long term effects is important to ensure high quality, person-centred care.[14] We report a case of an adult female (author and patient KG) who experienced SSNHL 5 weeks following a mild COVID-19 infection and continues to experience mild chronic tinnitus.

CASE PRESENTATION

After waking in the morning, a female in her 30s firstly noted aural fullness, noise sensitivity, and mild vertigo. Over the next 24 hours, these symptoms worsened, and she developed unilateral hearing loss and tinnitus in the right ear. She presented to her General Practitioner and on otoscopic examination the ear canals appeared normal and non-inflamed with intact tympanic membrane. A referral to an otolaryngologist (one of the authors) was provided. Over the proceeding 24 hours these symptoms worsened, and she further developed paroxysmal positional vertigo. She was reviewed by JL within 48 hours of her initial symptoms.

Relevant medical history included hypertension (managed with 4mg perindopril daily) and resolved gestational diabetes (now 8 years post-partum). She had received 3 doses of the BNT162b2 (Pfizer Comimaty) COVID-19 vaccine. She had a polymerase chain reaction-confirmed COVID-19 infection 35 days prior to SSNHL onset. During her COVID-19 infection she experienced sore throat, headache, nasal and sinus congestion, and lethargy. She did not require medical treatment and recovered by 2 weeks. She had no previous history of hearing loss or ear pathology and was relatively well prior to SSNHL but experienced ongoing mild nasal congestion since.

INVESTIGATIONS

Serial Pure Tone Audiograms (PTA) are provided in **figure 1**. 48 hours after initial symptom development a PTA was conducted measuring hearing thresholds from 250 Hz to 6000 hertz (Hz), identifying hearing loss in the right ear between 35-85 dB (**figure 1, a**). Magnetic resonance imaging (MRI) was conducted on the same day with no identifiable cause for acute right sided hearing loss, but revealed an empty, slightly expanded sella of the pituitary gland, suggestive of a previous auto infarction of a possible pituitary adenoma.

PTA was repeated 3 weeks later indicating a reduction in hearing loss (30–70 dB loss between 250 to 6000 Hz) (**figure 1, b**). An extended-frequency PTA (including air and bone conduction) was conducted the following month and hearing thresholds were measured from 250 Hz to 16 kHz (**figure 1, c**). Hearing thresholds in the left ear were within normal limits for all frequencies tested, whereas a mild sensorineural hearing loss was observed in the right ear in the mid frequencies (500-3000 Hz) and extended high frequencies (8-16 kHz). A PTA at 3 months showed marked improvement with 10-35 dB

loss (**figure 1, d**). A final PTA at 4 months demonstrated hearing within normal limits (5-25 dB) (**figure 1, e**).

TREATMENT

Audio-vestibular symptoms were treated with oral prednisone burst for 7 days (25mg daily) and taper (12.5mg daily) for another 7 days. A 12-day course of oral betahistine 16mg twice daily was also prescribed.

OUTCOME AND FOLLOW-UP

Due to the empty sella of the pituitary gland on MRI, serum hormone levels were performed including thyroid stimulating hormone, follicle-stimulating hormone, luteinizing hormone and prolactin. All were reported to be within normal ranges and follow up with an endocrinologist is planned. 3 months since SSNHL the patient now reports overall improvement but experiences intermittent pulsatile tinnitus.

DISCUSSION

This is an unusual case of SSNHL that developed 5 weeks following a mild COVID-19 infection. Like most cases of SSNHL where causation is difficult to prove, we postulate an association in this case especially since PTA revealed a sensory-neural mechanism for the unilateral hearing loss at the mid-to-high frequencies. Previous analysis of 20 asymptomatic people with COVID-19 showed deleterious effects on the cochlear hair cells and reduced amplitude of transient-evoked otoacoustic emissions compared to healthy individuals without a history of COVID-19.[15]

According to a recent systematic review and meta-analysis of cohort studies,[16] during 2020 to 2021, approximately one third of patients with SSNHL were positive for COVID-19 at the time of presentation to an audiology/otolaryngology referral center. Moreover, in 2 included studies that reported epidemiological data, presentations of SSNHL increased during the pandemic.[6,17] In a cross-sectional observational study by Dharmarajan et al,[18] 100 patients who were hospitalised for COVID-19 received audiology testing that revealed sensorineural hearing loss in 53 of them.

There is heterogeneity in COVID-19 severity and the timing of audio-vestibular symptoms reported in published case studies. COVID-19 severity has ranged from asymptomatic or mild,[7,9,19-26] moderate, requiring hospitalisation,[27] to severe, where intubation and intensive care were needed.[28,29] Timing

of audio-vestibular symptoms ranged from being the first indication of COVID-19 [7,19,30] to 3-12 days [9,22,23] and between four and 12 weeks after reporting COVID-19 symptoms.[20,21,25,27-29]

Based on the current evidence, the severity of COVID-19 infection and timing of SSHNL are therefore unpredictable. We recommend that clinicians apply a low threshold for suspicion of potential SSNHL among patients presenting with a wide variety of symptoms during the COVID-19 pandemic. While it is challenging to apprise patients regarding the sheer variety of potential short and long term COVID-19 impacts, we believe SSNHL should be included amongst the kinds of impacts clinicians consider discussing with patients. Rauch[3] highlights that delayed diagnosis is a common challenge with cases of SSNHL with many patients and clinicians attributing sensations of ‘ear fullness’ to impacted cerumen or congestion due to respiratory infection or allergies. Early administration of high-dose corticosteroids is a significant predictor of auditory outcome and is the recommend first-line treatment.[31] It is therefore important for clinicians to carefully consider the potential for SSNHL and ensure prompt referral to specialists when symptoms first develop. This level of vigilance has also been highlighted by authors in relation to SSNHL occurring following COVID-19 infection.[25]

SSNHL and associated symptoms can have a significant impact on quality of life,[32] and are closely associated with anxiety and depression.[33,34] This has implications for patient care and highlights the need for a holistic approach beyond medical treatment of SSNHL. Consideration of adjunct therapies such as stress reduction and wellbeing exercises may be worthwhile in tinnitus management and improvement in psychosocial outcomes.[35]

In the coming months and years, it is likely that many currently unknown or poorly understood impacts of COVID-19 will be realised. As this area of research is largely limited to emerging studies with small population sizes, little is known about the risk factors for SSNHL to inform hearing screening protocols and early treatment with corticosteroids. It is vital that SSNHL be rigorously investigated among people who have active or recently recovered COVID-19 infections, as the risk of permanent audio-vestibular symptoms cannot be disregarded.

LEARNING POINTS/TAKE HOME MESSAGES

- Sudden sensorineural hearing loss (SSNHL) might be a symptom of COVID-19 infection and could also present weeks after full recovery even among patients who only experienced mild illness.
- The everyday impacts of SSNHL can be debilitating and distressing for patients and might lead to long term and potentially permanent disability.

- Clinicians should be aware of the variety of potential short- and long-term impacts of COVID-19 and inform patients regarding what symptoms they should monitor for. Low thresholds for further investigation and follow-up should be considered for impacts that can potentially lead to long term or permanent disability.

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FIGURE/VIDEO CAPTIONS

Figure 1 Serial Pure Tone Audiograms (PTA) in sequential order, demonstrating gradual hearing improvement in the right ear.

HL: hearing loss; dB (decibels), Hz (hertz)

Blue: left ear; red: right ear

PATIENT'S PERSPECTIVE

“Even working in health education, I had no previous knowledge of SSNHL being associated with COVID-19. This was a shocking experience for me that had a significant impact on my way of life for several months as I have never had any problems with hearing before; not even an ear infection. I was unable to drive a car while experiencing severe vertigo. I needed to reduce my workload, negotiate flexible working arrangements with my employer, and take a leave of absence from study. I felt uncomfortable and had difficulty conversing with people and attending social activities due to my hearing loss and noise sensitivity. I was worried that this would be permanent, and that I may require a hearing aid. I now feel nervous about a second COVID-19 infection. What if I experience this again or even worse, it results in permanent hearing loss?”

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