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## CLINICAL VIGNETTE

# Sudden Sensorineural Hearing Loss after COVID-19 Vaccination

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### Case Report

A 69-year-old female with Sjogren's syndrome presented with 3 days of sudden onset of right ear pressure, static-like tinnitus, and "difficulty localizing sound." She had received the second dose of the Pfizer BioNTech COVID-19 vaccine 3 days prior to symptom onset. She denied vertigo, ear pain, ear drainage, or neurologic symptoms. She denied any recent respiratory viruses, trauma, loud noise exposure, or new medications. She had a family history of age-related hearing loss but no personal history of otologic issues.

Vital signs were normal. The otoscopic exam showed a normal external ear canal and tympanic membrane. The cranial nerve exam was intact. Audiogram showed severe to profound right sensorineural hearing loss (SNHL) throughout the frequency spectrum. The next day she saw ENT who started her on prednisone 60 mg daily for 9 days followed by a taper over the next 5 days. MRI of the internal auditory canal was normal. A few days into the steroid taper she reported subjective improvement of her hearing. Repeat audiogram 1 month later showed on average a 40 dB of improvement in hearing throughout the frequencies, more so at lower frequencies. However, given she still had moderate hearing loss at higher frequencies, a hearing aid trial was advised. Her audiogram remained unchanged 1 year later.

### Discussion

Sudden sensorineural hearing loss (SSNHL) is typically defined as sensorineural hearing loss that occurs within a 72-hour period of at least 30 dB over at least 3 consecutive audiometric frequencies. The cause of SSNHL is unclear but postulated etiologies include autoimmune, infectious, neoplastic, ototoxic causes. 90% of cases are idiopathic.

Similar to the patient presented here, there are other case reports of patients who reported SSNHL after COVID-19 vaccination. For example, *Jeong et. al* reports on three patients who experienced SSNHL within two days after COVID-19 vaccination, two of who received the Pfizer-BioNTech COVID-19 vaccine and one who received the AstraZeneca COVID-19 vaccine.<sup>1</sup> Two of the three patients had severe SSNHL. In a retrospective, population-based cohort study<sup>2</sup> using data from the largest health care organization in Israel, where only the Pfizer-BioNTech COVID-19 vaccine is administered, the standardized incidence ratio (SIRs) were 1.35 (95% CI, 1.09-1.65) after

the first vaccine dose and 1.23 (95% CI, 0.98-1.53) after the second vaccine dose. However, the authors concluded that despite this potential increase, the effect size is very small given over 2 million patients had received the vaccination in their study. However, a cross-sectional study<sup>3</sup> reported 555 incident reports of probable SSNHL in the Centers for Disease Control and Prevention Vaccine Adverse Events Reporting System (VAERS) within 3 weeks of COVID-19 vaccination. A retrospective case reported 21 patients who developed SSNHL with a mean of 6 days after COVID-19 vaccination. This did not suggest an association between COVID-19 vaccination and an increased incidence of hearing loss compared with the expected incidence in the general population. A retrospective cohort study of 5.5 million Finnish residents also did not show an increased incidence of SSNHL following COVID-19 vaccination compared with the incidence before the COVID-19 epidemic in Finland.<sup>4</sup>

Patients with SSNHL typically present with rapid unilateral hearing loss or hearing loss upon awakening. However, many describe a blocked ear or ear fullness without realizing they have hearing loss, often with tinnitus and/or vertigo. Patients should be questioned about the rapidity and severity of hearing loss, as well as recent upper respiratory infections, trauma, loud noise exposure, and ototoxic medications.

An otoscopic exam should be performed to exclude conductive causes of hearing loss such as cerumen impaction, middle ear effusion, otitis media, and tympanic membrane perforation. Weber and Rinne tests using a 512 Hz tuning fork should be conducted to distinguish between conductive and sensorineural hearing loss. If a tuning fork is not available, the Rauch hum test, where a patient is asked to hum in a low pitch, may be performed. Conductive hearing loss will cause the hum to be louder in the affected ear, whereas in sensorineural loss the hum will be louder in the normal ear. Careful cranial nerve exam should be performed. Audiometry should be done as soon as possible but within 14 days of symptom onset. An MRI of the internal auditory canal (IAC) with contrast to evaluate for retrocochlear pathology is recommended within three months of symptom onset. CT scan of the temporal bone with ABR (auditory brainstem response) may be used as an alternative.

According to the American Academy of Otolaryngology National Clinical Practice Guidelines (CPG)<sup>5</sup> patients with SSNHL should be offered glucocorticoids within two weeks of

symptom onset. The route of administration may be systemic, intratympanic, or a combination. The treatment modality used may depend on patient preference and comorbidities. A typical oral regimen is prednisone 1 mg/kg/day in a single dose with usual maximum 60 mg daily, for 10 to 14 days. Dexamethasone 24 mg/ml or methylprednisolone  $\geq 30$  mg/mL may be given as an intratympanic injection by an otolaryngologist weekly for 3 to 4 weeks. Patients with an inadequate response, defined as  $< 10$  dB improvement of hearing or who continue to have  $>20$  dB or more of hearing loss, should be offered salvage therapy. Those who received combination systemic and intratympanic glucocorticoids should not receive additional corticosteroids, however those who received only oral glucocorticoids may be offered intratympanic steroids administered within 2-6 weeks of symptom onset. Interestingly, although corticosteroids are considered the standard of care for treating SSNHL, there is still a paucity of quality data in favor of its use. The best and earliest evidence for steroid use is from a randomized controlled trial (RCT) by Wilson<sup>6</sup> and colleagues although some meta-analyses have not shown evidence of benefit of steroids over placebo.<sup>7</sup> Although uncommonly used, patients may be referred for adjuvant hyperbaric oxygen therapy (HBOT) as part of the initial treatment within 2 weeks of symptom onset or as salvage therapy within 1 month of onset of SSNHL.

The CPG strongly recommends against routine prescription of antivirals, thrombolytics, vasodilators, or vasoactive substances.

About two-thirds of patients with SSNHL will experience recovery of symptoms, with markers of favorable prognosis including less severe hearing loss; isolated high or low frequency hearing loss as compared to those with a flat audiogram; in those with frequency-restricted hearing loss, low frequency hearing loss (ascending audiogram) compared to high frequency hearing loss (descending audiogram); presence of tinnitus, and absence of vertigo.<sup>8</sup> Repeat audiogram should be done after completion of initial treatment and followed within 6 months. Those with incomplete or no recovery of hearing and/or tinnitus require ongoing otolaryngologic, audiologic, and psychological support.

## Conclusion

Sudden sensorineural hearing loss (SSNHL) should be regarded as a medical emergency. Primary care physicians should be able to recognize this condition to initiate prompt diagnosis and appropriate management, as a delay in treatment may lead to permanent hearing loss. Thorough history and physical examination are needed to differentiate between conductive hearing loss and sensorineural hearing loss to establish the diagnosis. Prompt initiation of steroid therapy within 14 days of onset is recommended for patients with SSNHL, and in the absence of contraindications, treatment should not be delayed to wait for audiologic testing or otolaryngologist evaluation. Despite reports of SSNHL following COVID-19 vaccination, current data suggests that the incidence of this is similar to the

general population, and therefore, patients should not be discouraged from receiving the vaccination.

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