



Short Communication

Improvement of otologic symptoms associated with mRNA COVID-19 vaccines with corticosteroid treatment



Mejora de los síntomas otológicos asociados a las vacunas mRNA COVID-19 con tratamiento con corticoides

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Introduction

About 68.5% of the world population has received at least 1 dose of a COVID-19 vaccine.¹ Over 13 billion doses have been administered so far. Otologic symptoms after vaccination have been commonly reported in the medical literature. I describe a case of a man who developed otologic symptoms after all 4 of his COVID-19 mRNA vaccinations. His symptoms consistently responded to oral corticosteroid administration.

Case presentation

A man in his 50s, living in East Africa, with a history of Factor V Leiden mutation and hypothyroidism presented in September 2021 with the chief complaint of bilateral aural fullness and otalgia, muffled hearing, and constant, non-pulsatile tinnitus. Symptoms were greater in the left ear. He complained of constant discomfort in both ears with intermittent severe pain. He felt like he had a “constant ear infection.” His otologic symptoms started 1 day following his second dose of the Moderna COVID-19 vaccine in April 2021. They were accompanied by fever, chills, headache, and disequilibrium, which resolved over the next few days. He denied vertigo. He recalled that he had similar otologic symptoms after his first Moderna COVID-19 vaccination (5 weeks before the second vaccination), but they were mild and transient. He had no history of otologic pathology. He had sinonasal surgery for a condition thought to be related to scuba diving over 30 years ago. His medications included rivaroxaban, levothyroxine, and atovaquone/proguanil, and there had been no change in any of his medications for at least the past few years. He had been self-treating with diphenhydramine, ear drying drops, nasal sprays, and other over-the-counter medications without relief. His otoscopic examination showed normal external auditory canals and tympanic membranes. He was referred to a local otolaryngologist, who prescribed him an oral antihistamine for presumptive Eustachian tube dysfunction. The medication did not provide any relief. His pure tones audiogram demonstrated essentially

normal hearing except for 30 dB threshold at 8000 Hz on the right, and his tympanogram tracing was normal.

Since the second vaccination, he had essentially constant mild otalgia, aural fullness, muffled hearing, and tinnitus. He received his first booster dose or third Moderna COVID-19 vaccination in December 2021, 8 months after the second vaccination. Within several hours, his baseline otalgia, aural fullness, and muffled hearing worsened. He reported that these symptoms became “100 fold” worse and were now “excruciating.” He was evaluated by an otolaryngologist in the United States 2 weeks later. His pure tones audiogram was again essentially unremarkable. Speech discrimination at 50 dB was 100% and tympanogram tracings were normal. Suspecting inflammatory changes in the inner ear due to the COVID-19 vaccine, the otolaryngologist started him on an oral prednisone taper (50 mg daily for 5 days, then 40 mg daily for 5 days, and then 20 mg daily for 5 days). This resulted in dramatic and persistent improvement of the aural fullness and otalgia within 1–2 days. His tinnitus was unchanged.

His symptoms remained stable until receiving his second COVID-19 booster (Pfizer-BioNTech monovalent vaccine) in June 2022. Within a few hours of receiving the vaccine, there was an acute worsening of his residual otalgia, aural fullness, and muffled hearing. His disequilibrium returned, and it was so severe that it impaired his walking. About 12 h later, he started oral prednisone, and within hours, he had resolution of the disequilibrium and significant improvement of his other otologic symptoms.

Discussion

Given that there have been over 13 billion COVID-19 vaccine doses administered so far,¹ post-vaccine otologic complaints are not uncommon. They have reportedly occurred after the Oxford-AstraZeneca, Pfizer-BioNTech, Moderna, Johnson & Johnson, and Sinovac vaccines.^{2–5} Of 803 health-care workers who received the Pfizer vaccine, 1.99% reported tinnitus, 0.87% reported ear pain, and 0.37% communicated changes in hearing.⁶

Three case series describing patients who develop otologic symptoms after COVID-19 vaccination were recently published. Thirty patients (19 men) with a mean age of 60.9 ± 13.8 years had new or

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significantly worsened symptoms shortly after receiving an mRNA vaccine.⁴ Eighty-three percent reported hearing loss, 50% tinnitus, 17% vertigo, and 27% aural fullness. Eleven had a previous diagnosis of Meniere's, autoimmune inner ear disease (AIED) or both. The mean onset of symptoms was 10 days with a range of 1–42 days. Three patients experienced symptoms after each dose. Another 21 patients presenting to 3 neurotologic practices with sudden sensorineural hearing loss (SSNHL) had a mean age of 61 years and were predominantly female (61.9%).⁷ Six patients had a history of autoimmune disease. The mean time from vaccination to onset was 6 days (range, 0–15 days). In another case series, 33 patients (mean age 54.3 ± 14.1) developed “acute vertigo” within 48 h post-vaccination.² Of these, 18% had tinnitus, 12% hearing loss, and 6% aural fullness. Nine were ultimately

diagnosed with benign paroxysmal positional vertigo, while the vertigo in another 17 may have had a “central cause.”

A causal relationship has not been established between COVID-19 vaccinations and SSNHL. In the U.S., the incidence of SSNHL occurring after COVID-19 vaccinations did not exceed that of the general population.⁷ To the best of my knowledge, there has been no scientific attempt to determine if there is an association of the vaccine with other otologic symptoms, such as otalgia, tinnitus, or disequilibrium. Pisani and others recently advocated for more study in this specific area.⁸

The possible mechanism, if any, for post-vaccine otologic symptoms is not known. Vaccination could induce the release of cytokines and the production of antibodies that cross-react with cochlea antigens.^{3,9}

Table 1

Demographic and clinical characteristics of patients treated with corticosteroids for otologic symptoms occurring after COVID-19 vaccination.

Age (y), sex	Medical history	Otologic symptoms	Symptom onset and vaccine type	Therapy	Time from symptom onset to initial steroid therapy	Response	Reference
50s, M	Factor V Leiden mutation, hypothyroidism	Aural fullness & pain, tinnitus	Several hours after 3 rd Moderna	OCS	2 weeks	Substantial improvement of aural fullness/pain. No change in tinnitus.	Current case ^a
		Aural fullness & pain, muffled hearing, disequilibrium	Few hours after 4 th vaccination (Pfizer)	OCS	12 hours	Resolution of the disequilibrium & significant improvement of the other symptoms.	
64, F	None	Right SSNHL	1 day after 1 st AstraZeneca	OCS, then ITS	2 days	Resolution of hearing loss.	3 ^b
42, M	None	Left SSNHL	Same day as 1 st Pfizer	OCS, then ITS	2 weeks	Improvement of hearing.	3 ^b
18, M	None	Severe right SSNHL	2 days after 2 nd vaccination (Pfizer)	OCS, ITS	2 weeks	Hearing loss worsened.	3 ^b
30, M	None	Right SSNHL, vertigo, tinnitus	4 days after 1 st Sinovac	IVS, other medications	~4 days	No significant improvement in hearing.	5
64, F	None	Severe left SSNHL, tinnitus, “ear tightness”	4 days after Sinovac	IVS, other medications	~4 days	No significant improvement in hearing.	5
57, M	None	Right hearing loss, tinnitus	2 days after 1 st AstraZeneca	IVS then OCS; B vitamins; folic acid	~2 weeks	Hearing improved.	11
61, F	Hypertension, dyslipidemia, Hashimoto's thyroiditis	Profound right SSNHL	2 days after 2 nd AstraZeneca	IVS then OCS; aspirin	4 days	Hearing significantly improved.	12
61, F	Hypertension, dyslipidemia	Severe left hearing loss & vertigo due to intralabyrinthine hemorrhage	6 h after 3 rd Pfizer	OCS, dimenhydrinate, diazepam, then ITS	1 day	No significant improvement in hearing. Vertigo was improved at 3 months.	13 ^b
30, M	Hashimoto thyroiditis	Left tinnitus, hyperacusis, dysacusis	6 days after 2 nd vaccination (Pfizer)	OCS	3 days	Tinnitus and auditory phenomena improved.	9 ^b
37, F	Glaucoma, undifferentiated connective tissue disease	Right tinnitus, dizziness, bilateral aural fullness	7 h after 1 st Pfizer	OCS	24 h	Tinnitus slightly improved. No improvement of aural fullness.	9 ^b
37, M	Glaucoma	Right tinnitus	5 h after 1 st AstraZeneca	IVS, then OCS	1 day	Complete resolution.	15
61, M		Left hearing loss, tinnitus	10 days after 2 nd AstraZeneca	ITS		Tinnitus and hearing loss significantly improved.	16
45, F		Mild right hearing loss, tinnitus	10 days after 2 nd AstraZeneca	OCS		All symptoms resolved.	16
44, M		Bilateral SSNHL, tinnitus	18 days after 2 nd AstraZeneca	OCS		All symptoms resolved.	16
39, M		Right SSNHL, tinnitus	11 days after 1 st AstraZeneca	OCS		All symptoms resolved.	16
43, M		Severe right SSNHL, tinnitus	14 days after 2 nd AstraZeneca	OCS		No improvement.	16
40, F		Vertigo & nystagmus consistent with right vestibular neuritis	~3 weeks after 1 st AstraZeneca	IVS, diphenidol, ondansetron		Symptoms improved/resolved.	16

Abbreviations: SSNHL, sudden sensorineural hearing loss; OCS, oral corticosteroids; ITS, intratympanic steroids; IVS, intravenous steroids. Other cases can be found here.⁷

^a The patient developed otologic symptoms after all 4 COVID-19 vaccinations and took corticosteroids after the last 2.

^b Additional information that was not found in the journal articles was obtained directly from corresponding authors (personal communication).

Immunologic and inflammatory responses might result in vasculitis or vascular ischemia of the cochlea. One or more of these mechanisms are also suspected to underlie idiopathic SSNHL.³

The treatment of SSNHL is the same whether it is related to a vaccine.³ According to clinical practice guidelines, systemic corticosteroids may be administered, ideally within 2 weeks of onset.¹⁰ An alternative treatment is intratympanic corticosteroids. Of the 14 patients who developed SSNHL after COVID-19 vaccination and had complete post-treatment audiometric data, 8 (57.1%) experienced improvement after receiving oral or intratympanic steroids, or both.⁷ There are additional reports of patients who have had significant recovery with corticosteroids, while others describe patients who have not (Table 1).^{3,5,11–13}

Similarly, tinnitus after COVID-19 vaccination may benefit from steroid therapy. Large trials have not been performed to establish its efficacy.¹⁴ Tseng and others recommend prompt steroid treatment, which resulted in the resolution of tinnitus thought to be due to inflammatory cochleopathy in 1 patient (Table 1).¹⁵ Limited data suggests that tinnitus may be amenable to corticosteroids.^{9,15,16}

My patient developed otologic symptoms after each of his 4 COVID-19 vaccinations. Symptom severity appeared to increase after each successive vaccination. For the last 2 vaccinations, he took oral corticosteroids with significant and rapid improvement of his aural fullness, otalgia, and disequilibrium. His consistent response to corticosteroids suggests that some of his otologic symptoms may be due to an inflammatory or immune response from the vaccine. Even though an association between SSNHL and COVID-19 vaccines has not been established, the clinical course of my patient suggests that there may be a causal association between some otologic symptoms and the vaccine. Corticosteroids may be beneficial in patients with vaccine-associated otologic symptoms other than SSNHL or tinnitus. Patients with new or exacerbated otologic symptoms should be promptly referred for evaluation.^{4,15}

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Ethical approval statement

The patient gave written informed consent to use his medical information in a publishable article.

Disclaimer

The findings and conclusions in this report are those of the author and do not necessarily represent the official views or policies of the U.S. Department of State.

Declaration of Competing Interest

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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