

# Persisting, unilateral tinnitus 22 days after first dose of an mRNA-based SARS-CoV-2 vaccine

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### ABSTRACT

**Objectives:** Although vaccination with vector-based or mRNA-based SARS-CoV-2 vaccines is usually well tolerated, they are not free of side effects. Some of these side effects can be severe and concern the primary care physician, otorhinolaryngologist, and the neurologist. Persisting, unilateral tinnitus time-linked to the first dose and worsening after the second dose of an mRNA-based SARS-CoV-2 vaccine has not been reported. **Study Design:** Case report. **Methods:** Routine tests were applied to investigate the patient. **Results:** A 35-year-old male experienced sudden onset of right-sided tinnitus, diffuse headache, and ear respectively facial pressure 22 days after the first dose of an mRNA-based SARS-CoV-2 vaccine. Since symptoms worsened after the second dose, 28 days later, the patient started a self-medication with non-steroidal anti-inflammatory drugs, without benefit. After an otolaryngologist suspected Meniere's disease, prednisone was given for 5 days with significant improvement. After discontinuation of steroids, however, previous symptoms recurred with similar intensity as before. Cetirizin and loratadin were started resulting in complete resolution of headache and pressures but persistence of tinnitus. After exclusion of various differentials, a causal relation between clinical presentation and vaccination was suspected. **Conclusions:** SARS-CoV-2 vaccination can be followed by unilateral persisting tinnitus, headache, and ear respectively facial pressure. Since steroids and anti-histamines had a beneficial effect, an immunological pathophysiology is quite likely.

**Keywords:** COVID-19, headache, SARS-CoV-2, steroids, tinnitus, vaccination

### Introduction

Although vaccination with vector-based or mRNA-based SARS-CoV-2 vaccines is usually well tolerated, SARS-CoV-2 vaccinations are not free of side effects.<sup>[1]</sup> Some of these side effects can be severe and concern the primary care physician, otorhinolaryngologist, or the neurologist.<sup>[2-4]</sup> Persisting, unilateral tinnitus time linked to the first dose of an mRNA-based SARS-CoV-2 vaccine has not been reported.

### Case Presentation

The patient is a 35-year-old Caucasian male, BMI 31, who experienced sudden onset of right-sided, persisting

tinnitus (mostly 4–5 Hz, occasionally 12 Hz), diffuse headache (VAS 3), and right-sided ear respectively facial pressure 22 days after the first dose of an mRNA-based SARS-CoV-2 vaccine [Table 1]. Clinical screening for coronavirus disease (COVID-19) was negative but a polymerase chain reaction (PCR) test for SARS-CoV-2 had not been carried out. Since symptoms worsened after the second dose of the vaccine, 28 days after the first shot, the patient started a self-medication with pseudoephedrine, oxymetazoline, paracetamol, and ibuprofen without benefit. Neomycin and amoxicillin ear drops for suspected external otitis were ineffective as well. The otorhinolaryngologist excluded sinusitis but suspected Meniere's disease, why prednisone (20 mg/d for 5 days) was started 10 days after starting the antibiotics. Steroids were followed by marked clinical improvement but palpitations and tingling of the right face occurred. electrocardiogram (ECG), chest X-ray, and a cerebral computed tomography (CT) scan came out normal.

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Symptoms worsened again after discontinuation of prednisone. Clinical neurologic exam, blood tests, electroencephalography (EEG), and cerebral magnetic resonance imaging (MRI) were non-informative. Cerebrospinal fluid investigations were not carried out. Seven days after discontinuation of prednisone, cetirizin and loratadin were started and improved symptoms except for tinnitus. Ear respectively facial pressure and headache transitioned from constant to occasional. Facial and aural fullness and headache resolved completely 1 month later but tinnitus persisted [Table 1]. Montelukast and fluticasone for 2 weeks were ineffective. A second neurologist prescribed nortriptyline but tinnitus still persisted. Only acetazolamide provided some relief [Table 1].

## Discussion

The presented patient is interesting for primary care physicians, otorhinolaryngologists, and neurologists for unilateral, persisting tinnitus time linked to a vaccination with an mRNA-based SARS-CoV-2 vaccine and for the beneficial effect of steroids. Side effects after SARS-CoV-2 vaccinations, particularly neurological, are increasingly recognized. They include Bell's palsy,<sup>[5]</sup> dizziness, headache, pain, muscle spasms, myalgia, paresthesias, tremor, diplopia, tinnitus, dysphonia, seizures, stroke, intra-cerebral bleeding, Guillain-Barre syndrome (GBS), transverse myelitis, acute disseminated encephalomyelitis, multiple sclerosis, neuromyelitis optica, hypophysitis, venous sinus thrombosis, reversible cerebral vasoconstriction syndrome, small fiber neuropathy, Tolosa-Hunt syndrome, and reactivation of herpes zoster.<sup>[2,5-7]</sup> All physicians involved in the management of SARS-CoV-2 vaccinees should be aware of these side effects to react appropriately in due time.

Arguments for a causal relation between tinnitus and the SARS-CoV-2 vaccination are that complaints started time linked to the vaccination, that reversible tinnitus has been recently reported as a complication of the first Astra Zeneca dose,<sup>[8]</sup> and that cranial nerve neuritis and GBS have been reported as complications of a SARS-CoV-2 vaccination.<sup>[4,9,10]</sup> Arguments against a causal relation are that persistent tinnitus has not been reported earlier and the long latency of 22 days between vaccination and onset of complaints. However, the vaccine adverse event reporting system (VAERS) lists 387 patients having undergone SARS-CoV-2 vaccination, who complained about post-vaccination tinnitus as per the end of May 2021. This means that 2.23% of VAERS reports for side effects of SARS-CoV-2 vaccines mention tinnitus. Thus, a VAERS report for a SARS-CoV-2 vaccine is 4.46 times more likely to mention tinnitus than a VAERS report for a flu vaccine over the 2020–2021 timeframe. Since more arguments can be raised in favor than against, a causal relation between vaccination and tinnitus is quite likely.

The pathophysiology of tinnitus remains speculative. Conceivable are that the mRNA entered the cochlea via hematogenic spread, thrombosis of a cochlear vein occurred, there was isolated neuronitis of the cochlear nerve, there was focal encephalitis, or thrombosis of cerebral veins had occurred. It is also conceivable that immunologic reactions against the virus secondarily affected cochlear structures or the cochlear nerve. Unfortunately, the patient had not undergone magnetic resonance venography and the D-dimer had not been measured in the serum. Missing are also CSF investigations and a cerebral MRI with contrast medium. Missing are cytokine levels and other immunological parameters.

**Table 1: Time course of clinical manifestations, work-up, and treatment**

Symptoms and measures	Date	Consequence
1. Dose of mRNA-based SARS-CoV-2 vaccine	9.1.21	No immediate reaction
	31.1.21	Right-sided tinnitus, diffuse Headache, right-sided aural fullness Right-sided facial pressure
2. Dose of mRNA-based SARS-CoV-2 vaccine	6.2.21	Tinnitus, headache, facial/ear pressure increase, takes pseudoephedrine, oxymetazoline, paracetamol, ibuprofen (no benefit)
PCP diagnoses external otitis and gives neomycin + amoxicillin ear drops	17.2.21	No benefit
ENT diagnoses Meniere's disease and gives prednisone 40 mg/d for 5 days	27.2.21	Headache improves, but tachycardia and paresthesias, tingling of right face
Chest XR + ECG + cCCT at ER	27.2.21	Normal
Off prednisone	3.3.21	Headache, pressures recur
1. Neurologist orders cerebral MRI, blood work	3.3.21	Normal
EEG	10.3.21	Normal
Starts cetirizin, loratadin	10.3.21	Symptoms improve, except tinnitus
Pressures, headache	mid March	Transition to occasional
2. Neurologist gives nortriptyline	2.4.21	Ineffective
Hearing test	7.4.21	Normal
Headache, pressures	mid April	Resolve Completely
PCP gives montelukast, fluticasone for 2 w	23.4.21	No benefit
PCP gives prednisone (50 mg/d)	26.4.21	No benefit
Neurologist stops nortriptyline, starts acetazolamide	4.5.21	Drops volume of tinnitus
Immunologist orders blood work	10.5.21	Non-informative

In conclusion, SARS-CoV-2 vaccination can be followed by unilateral persisting tinnitus, diffuse headache, and unilateral ear respectively facial pressure. Since steroids and anti-histamines had a beneficial effect, an immunological cause of the tinnitus is quite likely. These findings are novel and should be considered by those managing SARS-CoV-2 vaccines.

### Author contribution

JF: design, literature search, discussion, first draft, and critical comments; RE: literature search, discussion, critical comments, and final approval.

### Informed consent

Obtained.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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