



COVID-19 Vaccination and Tinnitus: A Case Report

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Abstract

The COVID-19 disease was first observed in December 2019 and became a big challenge for the World Health Organization in a short period of time. Getting infected with COVID-19 has very dangerous complications and is considered a serious threat to people's health. One of the most important ways to prevent this disease is vaccination. Like other vaccines, the Covid-19 vaccines also have various side effects, The side effects of existing vaccines are usually mild and transient, and the side effects related to hearing are very rare. In this study, we have presented a report of a 40-year-old woman with a complaint of tinnitus 24 hours after the injection of the second dose of Sinopharm vaccine. The patient did not have any history of hearing problems or tinnitus before the vaccine injection. According to the results of the evaluations, the necessary counseling regarding tinnitus, sound therapy and counseling sessions were provided to reduce the patient's anxiety. After one month, the patient was very satisfied with the cessation of tinnitus. Tinnitus without hearing loss is reported as a rare side effect of vaccination. Since the exact mechanism of tinnitus after vaccination is not fully clear yet, there is a need for more studies in this field.

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Introduction

The present study seeks to investigate the effect of COVID-19 disease on hearing disorders. As we know, the COVID-19 disease was first observed in December 2019 and became a world pandemic in a short time (1,2). The symptoms of this disease were reported to include chills, fever, headache, muscular pain, shortness of breath, coughing, diarrhea, running nose, and sore throat (3-5). Among the otological symptoms of this disease, one can point to the loss of hearing, tinnitus, and dizziness (2,6,7).

After the outbreak of the COVID-19 pandemic, tremendous effort was made to produce vaccines to fight this disease. Various types of vaccines were developed and administered, including mRNA and human adenovirus vector-based vaccines, as well as vaccines with inactivated viruses (8,9).

The reported side effects of the existing vaccines are usually mild, ranging from injection site pain, chills, fever, and muscle pain, to tiredness (10,11). However, severe symptoms such as thrombotic thrombocytopenia (12), venous sinus thrombosis (12,13), myocarditis (14), and Guillain-Barre syndrome (13) have been observed. Some other symptoms are sensorineural hearing loss, vestibular symptoms, and tinnitus (15,16).

Formeister et al reported 28 and 12 cases of sudden sensorineural hearing loss (SSHL) following vaccination

with Pfizer and Moderna, respectively (17). Jeong et al reported two cases of SSHL after injection of the Pfizer-BioNTech vaccine and one case of SSHL after taking the Oxford-AstraZeneca vaccine (18). In addition, vertigo is among the complications reported from the injection of the COVID-19 vaccines; Di Mauro et al reported of 33 cases of vertigo after taking the COVID-19 vaccines. Out of this number, 23 cases occurred after the injection of the Pfizer vaccine, four after Moderna, five after Oxford-AstraZeneca, and one case after the injection of Janssen (19).

Parrino et al reported three cases of sudden unilateral tinnitus after the injection of the BNT162b2 mRNA vaccine with no change in hearing thresholds (20).

Presently, some cases are reported to indicate the occurrence of tinnitus following vaccination with mRNA, and viral vector vaccines (20-22). What follows is a report of a 40-year-old woman with tinnitus 24 hours after injecting the second dose of the Sinopharm vaccine.

Case Report

A 40-year-old woman visited our clinic with a tinnitus complaint for two weeks. The patient said that her tinnitus had begun 24 hours after taking the second dose of the COVID-19 vaccine Sinopharm. The patient had no COVID-19 symptoms at the time of vaccination.



The patient did not report any history of underlying disease, the use of certain drugs, or any allergy history. She had no previous experience of tinnitus or any other hearing problems prior to the vaccination. Upon the otolaryngological examination, the eardrums of both ears were found to be normal. According to the pure tone audiometry test, both ears were of a type, and the acoustic reflex thresholds were within the normal range in both ears (Figure 1). The results of the psychoacoustic evaluations of the tinnitus are as follows:

- Pith matching of tinnitus (PMT): 250 Hz/ tonal
- Loudness matching of tinnitus (LMT): 2 dB SI
- Residual inhibition (RI): The patient’s tinnitus with the intensity of 20 dB HL during 60 seconds decreased by about 80%, but after 15 minutes, it rose to the initial intensity.

The Tinnitus Handicap Inventory was completed for the patient, and a score of 54 was registered, which showed a moderate handicap caused by the tinnitus problem. A score of 9 was registered for the patient in the Beck Anxiety Inventory, indicating that the patient’s anxiety was mild.

Vitamin E capsules (400 units twice a week), magnesium sachets (300 mg twice a week), and *Ginkgo biloba* tablets (one a day) were prescribed to the patient for one month.

Concerning the evaluations performed, the necessary consultation was given to the patient, and some strategies were presented to help her lower her anxiety.

To make the patient more compatible with tinnitus, tinnitus retraining therapy was considered. This method, combining sound therapy and counseling, reduces the patient’s stress and helps the patient get accustomed to tinnitus. It also lowers bad emotional responses. As a result, it helps the patient achieve a better life quality.

In order to monitor the patient’s improvement process, all of the tests were repeated for the patient two months after the first session. The results of the patient’s pure tone audiometry and tympanometry tests were still normal. The patient was highly satisfied with the tinnitus

cessation. Her anxiety score also decreased to two.

Discussion

Vaccination is certainly considered to be one of the most essential strategies to prevent affliction with COVID-19 disease (9,20). The side effects of the existing COVID-19 vaccines are usually mild and transient (23,24).

The symptoms related to ear and hearing are very rare (9,20,24). Sinopharm is one of the vaccines with the lowest side effects (23). Our patient suffered from tinnitus without hearing loss after the injection of the second dose of the Sinopharm vaccine.

The mechanism of the relationship between the COVID-19 vaccine and hearing symptoms, including tinnitus, is not well known yet (9,20,24). However, some causes are suggested in previous studies. These causes include the molecular mimicry phenomenon (25,26), self-immune responses after vaccination (24,27,28), vascular diseases and decrease in blood supply to the ear (24,29), the ototoxicity probability of the vaccine components (9,24), and worrying about efficacy and symptoms of the vaccine (30,31).

Since anxiety and stress are among the factors that intensify tinnitus (31-33), it was important to take this into account regarding our patient. Since our patient had received a vaccine with inactivated viruses, some of the above-mentioned causes could not have brought about her tinnitus. With regard to the evaluations performed and the patient’s improvement after consultation, it seems that anxiety is the most probable cause for the beginning of tinnitus in our patient.

Conclusion

Vaccination is one of the most effective ways to prevent the COVID-19 disease. However, vaccination has certain symptoms that should be taken into account. The occurrence of tinnitus without hearing loss is reported as a rare vaccination symptom. Since there is no exact explanation for the occurrence of tinnitus after

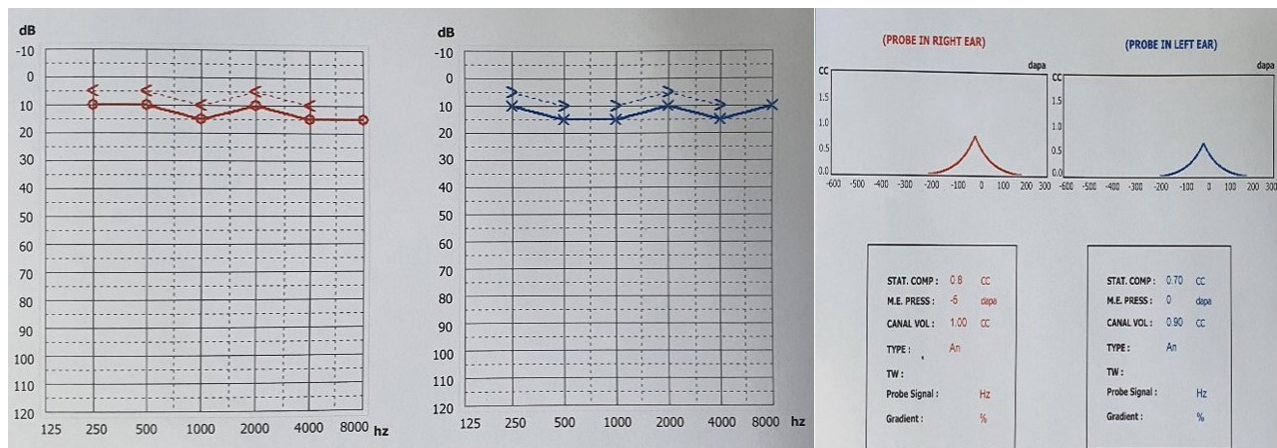


Figure 1. The patient’s audiogram and tympanogram in the first session (14 days after the beginning of the symptoms)

vaccination, it calls for further research in the future.

Authors' Contribution

Investigation: Fatemeh Moghadasi Boroujeni.

Project administration: Mehdi Ghadiri.

Supervision: Mehdi Ghadiri.

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Writing—review & editing: Fatemeh Moghadasi Boroujeni.

Competing Interests

The authors declared that there is no conflict of interest.

Consent for Publication

Informed consent was obtained from the patient for publication of this report.

References

1. Beukes E, Ulep AJ, Eubank T, Manchaiah V. The impact of COVID-19 and the pandemic on tinnitus: a systematic review. *J Clin Med*. 2021;10(13):2763. doi: [10.3390/jcm10132763](https://doi.org/10.3390/jcm10132763).
2. Jafari Z, Kolb BE, Mohajerani MH. Hearing loss, tinnitus, and dizziness in COVID-19: a systematic review and meta-analysis. *Can J Neurol Sci*. 2022;49(2):184-95. doi: [10.1017/cjn.2021.63](https://doi.org/10.1017/cjn.2021.63).
3. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382(18):1708-20. doi: [10.1056/NEJMoa2002032](https://doi.org/10.1056/NEJMoa2002032).
4. Yuki K, Fujiogi M, Koutsogiannaki S. COVID-19 pathophysiology: a review. *Clin Immunol*. 2020;215:108427. doi: [10.1016/j.clim.2020.108427](https://doi.org/10.1016/j.clim.2020.108427).
5. Abdel Rhman S, Abdel Wahid A. COVID-19 and sudden sensorineural hearing loss, a case report. *Otolaryngol Case Rep*. 2020;16:100198. doi: [10.1016/j.xocr.2020.100198](https://doi.org/10.1016/j.xocr.2020.100198).
6. Ong KMC, Cruz TLG. Otologic and vestibular symptoms in COVID-19: a scoping review. *World J Otorhinolaryngol Head Neck Surg*. 2022;8(4):287-96. doi: [10.1002/wjot.2.57](https://doi.org/10.1002/wjot.2.57).
7. Kaliyappan K, Chen YC, Krishnan Muthaiah VP. Vestibular cochlear manifestations in COVID-19 cases. *Front Neurol*. 2022;13:850337. doi: [10.3389/fneur.2022.850337](https://doi.org/10.3389/fneur.2022.850337).
8. Han X, Xu P, Ye Q. Analysis of COVID-19 vaccines: types, thoughts, and application. *J Clin Lab Anal*. 2021;35(9):e23937. doi: [10.1002/jcla.23937](https://doi.org/10.1002/jcla.23937).
9. Ahmed SH, Waseem S, Shaikh TG, Qadir NA, Siddiqui SA, Ullah I, et al. SARS-CoV-2 vaccine-associated-tinnitus: a review. *Ann Med Surg (Lond)*. 2022;75:103293. doi: [10.1016/j.amsu.2022.103293](https://doi.org/10.1016/j.amsu.2022.103293).
10. Brüssow H. COVID-19: vaccination problems. *Environ Microbiol*. 2021;23(6):2878-90. doi: [10.1111/1462-2920.15549](https://doi.org/10.1111/1462-2920.15549).
11. Hernández AF, Calina D, Poulas K, Docea AO, Tsatsakis AM. Safety of COVID-19 vaccines administered in the EU: should we be concerned? *Toxicol Rep*. 2021;8:871-9. doi: [10.1016/j.toxrep.2021.04.003](https://doi.org/10.1016/j.toxrep.2021.04.003).
12. Sharifian-Dorche M, Bahmanyar M, Sharifian-Dorche A, Mohammadi P, Nomovi M, Mowla A. Vaccine-induced immune thrombotic thrombocytopenia and cerebral venous sinus thrombosis post COVID-19 vaccination; a systematic review. *J Neurol Sci*. 2021;428:117607. doi: [10.1016/j.jns.2021.117607](https://doi.org/10.1016/j.jns.2021.117607).
13. Finsterer J. Neurological side effects of SARS-CoV-2 vaccinations. *Acta Neurol Scand*. 2022;145(1):5-9. doi: [10.1111/ane.13550](https://doi.org/10.1111/ane.13550).
14. Larson KF, Ammirati E, Adler ED, Cooper LT Jr, Hong KN, Saponara G, et al. Myocarditis after BNT162b2 and mRNA-1273 vaccination. *Circulation*. 2021;144(6):506-8. doi: [10.1161/circulationaha.121.055913](https://doi.org/10.1161/circulationaha.121.055913).
15. Canales Medina M, Ramirez Gómez M. Tinnitus, sudden sensorineural hearing loss, and vestibular neuritis as complications of the AstraZeneca COVID-19 vaccine. *Cureus*. 2022;14(1):e20906. doi: [10.7759/cureus.20906](https://doi.org/10.7759/cureus.20906).
16. Ekobena P, Rothuizen LE, Bedussi F, Guilcher P, Meylan S, Ceschi A, et al. Four cases of audio-vestibular disorders related to immunisation with SARS-CoV-2 mRNA vaccines. *Int J Audiol*. 2023;62(6):587-91. doi: [10.1080/14992027.2022.2056721](https://doi.org/10.1080/14992027.2022.2056721).
17. Formeister EJ, Chien W, Agrawal Y, Carey JP, Stewart CM, Sun DQ. Preliminary analysis of association between COVID-19 vaccination and sudden hearing loss using US Centers for Disease Control and Prevention vaccine adverse events reporting system data. *JAMA Otolaryngol Head Neck Surg*. 2021;147(7):674-6. doi: [10.1001/jamaoto.2021.0869](https://doi.org/10.1001/jamaoto.2021.0869).
18. Jeong J, Choi HS. Sudden sensorineural hearing loss after COVID-19 vaccination. *Int J Infect Dis*. 2021;113:341-3. doi: [10.1016/j.ijid.2021.10.025](https://doi.org/10.1016/j.ijid.2021.10.025).
19. Di Mauro P, La Mantia I, Cocuzza S, Sciancalepore PI, Rasà D, Maniaci A, et al. Acute vertigo after COVID-19 vaccination: case series and literature review. *Front Med (Lausanne)*. 2021;8:790931. doi: [10.3389/fmed.2021.790931](https://doi.org/10.3389/fmed.2021.790931).
20. Parrino D, Frosolini A, Gallo C, De Sisti RD, Spinato G, de Filippis C. Tinnitus following COVID-19 vaccination: report of three cases. *Int J Audiol*. 2022;61(6):526-9. doi: [10.1080/14992027.2021.1931969](https://doi.org/10.1080/14992027.2021.1931969).
21. Tseng PT, Chen TY, Sun YS, Chen YW, Chen JJ. The reversible tinnitus and cochleopathy followed first-dose AstraZeneca COVID-19 vaccination. *QJM*. 2021;114(9):663-4. doi: [10.1093/qjmed/hcab210](https://doi.org/10.1093/qjmed/hcab210).
22. Pisani D, Leopardi G, Viola P, Scarpa A, Ricciardiello F, Cerchiai N, et al. Sudden sensorineural hearing loss after COVID-19 vaccine; a possible adverse reaction? *Otolaryngol Case Rep*. 2021;21:100384. doi: [10.1016/j.xocr.2021.100384](https://doi.org/10.1016/j.xocr.2021.100384).
23. Saeed BQ, Al-Shahrabi R, Alhaj SS, Alkokoahrdi ZM, Adrees AO. Side effects and perceptions following Sinopharm COVID-19 vaccination. *Int J Infect Dis*. 2021;111:219-26. doi: [10.1016/j.ijid.2021.08.013](https://doi.org/10.1016/j.ijid.2021.08.013).
24. Pisani D, Gioacchini FM, Viola P, Scarpa A, Astorina A, Re M, et al. Audiovestibular disorders after COVID-19 vaccine: is there an association? *Audiol Res*. 2022;12(3):212-23. doi: [10.3390/audiolres12030024](https://doi.org/10.3390/audiolres12030024).
25. Kanduc D, Shoenfeld Y. Molecular mimicry between SARS-CoV-2 spike glycoprotein and mammalian proteomes: implications for the vaccine. *Immunol Res*. 2020;68(5):310-3. doi: [10.1007/s12026-020-09152-6](https://doi.org/10.1007/s12026-020-09152-6).
26. Vojdani A, Kharrazian D. Potential antigenic cross-reactivity between SARS-CoV-2 and human tissue with a possible link to an increase in autoimmune diseases. *Clin Immunol*. 2020;217:108480. doi: [10.1016/j.clim.2020.108480](https://doi.org/10.1016/j.clim.2020.108480).
27. Ciorba A, Corazzi V, Bianchini C, Aimoni C, Pelucchi S, Skarżyński PH, et al. Autoimmune inner ear disease (AIED): a diagnostic challenge. *Int J Immunopathol Pharmacol*. 2018;32:2058738418808680. doi: [10.1177/2058738418808680](https://doi.org/10.1177/2058738418808680).
28. Shamriz O, Tal Y, Gross M. Autoimmune inner ear disease: immune biomarkers, audiovestibular aspects, and therapeutic modalities of Cogan's syndrome. *J Immunol Res*.

- 2018;2018:1498640. doi: [10.1155/2018/1498640](https://doi.org/10.1155/2018/1498640).
29. Loisel AR, Neustaeter A, de Kleine E, van Dijk P, Jansonius NM. Associations between tinnitus and glaucoma suggest a common mechanism: a clinical and population-based study. *Hear Res.* 2020;386:107862. doi: [10.1016/j.heares.2019.107862](https://doi.org/10.1016/j.heares.2019.107862).
30. Yigit M, Ozkaya-Parlakay A, Senel E. Evaluation of COVID-19 vaccine refusal in parents. *Pediatr Infect Dis J.* 2021;40(4):e134-e6. doi: [10.1097/inf.0000000000003042](https://doi.org/10.1097/inf.0000000000003042).
31. Anzivino R, Sciancalepore PI, Petrone P, D'Elia A, Petrone D, Quaranta N. Tinnitus revival during COVID-19 lockdown: how to deal with it? *Eur Arch Otorhinolaryngol.* 2021;278(1):295-6. doi: [10.1007/s00405-020-06147-9](https://doi.org/10.1007/s00405-020-06147-9).
32. Elarbed A, Fackrell K, Baguley DM, Hoare DJ. Tinnitus and stress in adults: a scoping review. *Int J Audiol.* 2021;60(3):171-82. doi: [10.1080/14992027.2020.1827306](https://doi.org/10.1080/14992027.2020.1827306).
33. Kraus KS, Canlon B. Neuronal connectivity and interactions between the auditory and limbic systems. Effects of noise and tinnitus. *Hear Res.* 2012;288(1-2):34-46. doi: [10.1016/j.heares.2012.02.009](https://doi.org/10.1016/j.heares.2012.02.009).

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