


CASE REPORT

Pfizer–BioNTech COVID-19 vaccine-associated tinnitus and treatment with transcranial magnetic stimulation

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Learning points for clinicians

This case report aimed to remind the clinicians of the potentially alternative treatment to manage the cochleopathy after the administration of the Pfizer–BioNTech coronavirus disease 2019 (COVID-19) vaccine. The repetitive transcranial magnetic stimulation might be beneficial to manage the immune reaction-associated cochleopathy.

Case report

The COVID-19 vaccine had been recognized as one of the most important weapons to fight COVID-19. However, the COVID-19 vaccine-associated tinnitus, although not a severe adverse event, had attracted the clinicians' attention gradually.¹ Although it had not been well studied, the vaccination-mediated immune reaction was considered to be one of the major reasons of this adverse event. Therefore, the immune-targeted treatment, such as steroid, was considered to be an effective

treatment.² However, not every patient with COVID-19-associated tinnitus responded well to the steroid treatment.¹ In this case report, we present a case with exacerbated tinnitus after her second dosage Pfizer–BioNTech COVID-19 vaccination, who responded well to the repetitive transcranial magnetic stimulation (rTMS) treatment.

Miss A is a 37-year-old female who had a past history of bilateral ovarian chocolate cyst. She started to have bilateral tinnitus since 2020 with a stationary course. She visited our clinics for further tinnitus management at February 2021 with baseline tinnitus handicap index (THI) 92. The high-resolution computed tomography on 26 February 2021 showed mild temporal bone inflammatory change, which was similar with our previous case report.³ The baseline pure tone audiometry (PTA) on 22 March 2021 showed right extreme high tone mild sensorineural hearing loss and left extreme high tone mild-to-moderate sensorineural hearing loss (Figure 1A). She started to receive low-dosage ceftriaxone 1 gm every week since mid-May 2021. Her objective tinnitus symptoms were relieved gradually and followed THI decreased to 12 on 27 September 2021. However, she received her first dosage of Pfizer–BioNTech COVID-19 vaccine

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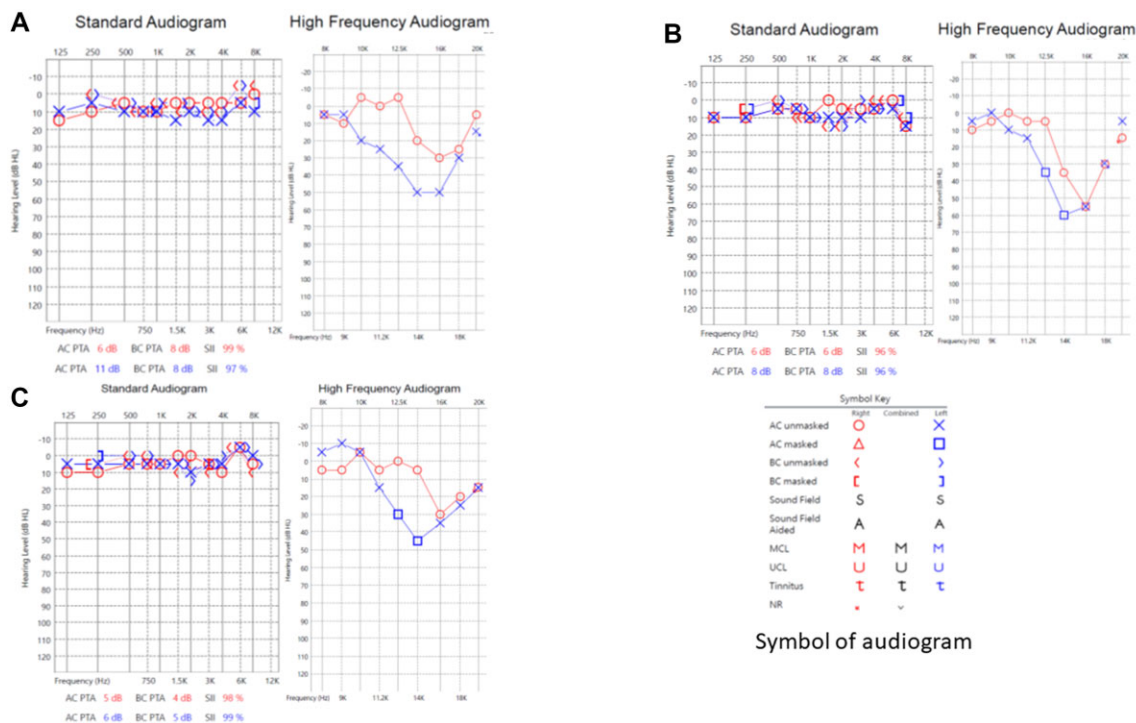


Figure 1. Depiction of the (A) baseline, (B) just after COVID-19 vaccine injection and (C) after repetitive transcranial magnetic stimulation (rTMS) treatment pure tone audiometry (PTA) results. In general, the baseline PTA revealed right extreme high tone mild sensorineural hearing loss and left extreme high tone mild-to-moderate sensorineural hearing loss (A). After COVID-19 vaccine injection, the audiometry revealed bilaterally worsening hearing threshold around 10–20 db in 11.2K to 16K, especially in right ear (B). After the rTMS treatment, the audiometry revealed bilaterally improved hearing threshold in 11.2K to 16K, especially in right ear (C).

on 23 October 2021 and then received second dosage of Pfizer-BioNTech COVID-19 vaccine on 26 November 2021. There is no any discomfort after this vaccination initially. However, her tinnitus, especially in right ear, started to become worsening since 29–30 November 2021. Her THI increased to 96. The rechecked PTA on 1 December 2021 showed bilaterally worsening hearing threshold around 10–20 db in 11.2K to 16K, especially in right ear (Figure 1B). Under the impression of COVID-19 vaccine-associated cochleopathy,² she started to receive our steroid protocol: one dose of 10 mg intravenous dexamethasone and a 3-day oral 5 mg prednisolone three times per day since late-December, 2021. However, her tinnitus persisted with minimally improvement (THI minimally decreased to 88). We started to apply 3-session rTMS protocol (i.e. 10 Hz rTMS 3000 pulses over left dorsolateral prefrontal cortex one session per day) since 16 February 2022. Her tinnitus decreased to THI 66 on 22 February 2022 and THI 6 on 9 March 2022. The followed PTA at 9 March 2022 showed bilaterally improved hearing threshold in 11.2K to 16K, especially in right ear (Figure 1C).

This is the first case report addressing the potential beneficial effect of rTMS on COVID-19 vaccine-associated cochleopathy. In this case, the changes of PTA and THI revealed a clear time-course association with the COVID-19 vaccine injection. In our previous network meta-analysis, the rTMS was found to be beneficial to treat tinnitus without specific origin.⁴ In this case, the FDA approval rTMS significantly relieve the COVID-19 vaccine-associated cochleopathy. In the previous animal model study, the application of rTMS could contribute to anti-inflammatory effect in target and remote brain regions.⁵ Although the mechanism of the COVID-19 vaccine-associated tinnitus had not been well-established, the immune-mediated inflammation might play an important role in this situation.²

Therefore, this would support the findings of significant response of tinnitus to rTMS in this case. We aimed to provide a point of view that effect of anti-inflammation by the rTMS might be considered to be an alternative choice in COVID-19 vaccine-associated tinnitus. Finally, in consideration of benefit and this minor and reversible adverse event, we still strongly recommend the continuation of the administration of the Pfizer-BioNTech COVID-19 vaccine.

Conflict of interest. The authors declared that there was no any potential conflict of interest in this work.

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