

CASE REPORT

Labyrinthitis Ossificans Post COVID Vaccination

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ABSTRAK

Penyakit koronavirus 2019 (COVID-19) adalah penyakit yang sangat berjangkit. Komplikasi penyakit ini berkurangan dengan ketara selepas pengenalan vaksin. Oleh itu, vaksinasi untuk COVID-19 adalah penting dan telah digalakkan di banyak negara. Laporan mengenai kesan sampingan serius yang jarang berlaku telah didokumenkan dengan baik. Kesan otologi selepas vaksinasi COVID-19 yang secara tiba-tiba kehilangan pendengaran sensorineural (SNHL) belah kanan juga dilaporkan. Kami membincangkan kes labyrinthitis ossificans selepas vaksinasi COVID. Seorang lelaki berusia 23 tahun mengalami kehilangan pendengaran sebelah kanan secara tiba-tiba dengan kesan gigitan 3 hari selepas menerima vaksin COVID-19. Audiometri Nada Tulen (PTA) menunjukkan kehilangan pendengaran dalam yang ketara pada sebelah kanan dengan pendengaran sebelah kiri yang normal. Tomografi Berkomputer Resolusi Tinggi (HRCT) pada tulang temporal menunjukkan hiperdensiti yang dilihat pada selekoh basal koklea kanan, dengan Pengimejan Resonans Magnetik (MRI) menunjukkan kehilangan fokus intensiti isyarat hiperintens berwajaran T2 normal bagi tympani scala selekoh koklear, yang mencadangkan labyrinthitis ossificans. Beliau dipasangkan dengan alat bantu pendengaran dan menjalani implan koklear kanan untuk pemulihan pendengaran. Labyrinthitis ossificans biasanya disebabkan oleh jangkitan dan keradangan, dan jarang disebabkan oleh trauma, tumor, pendarahan, halangan vaskular arteri labirintine, pembedahan atau penyakit telinga dalam autoimun. Hubungan dengan vaksinasi masih belum didedahkan dan memerlukan kajian lanjut.

Kata kunci: Cacat pendengaran; koronavirus; 'labyrinthitis ossificans'

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ABSTRACT

Coronavirus disease 2019 is a highly infectious disease. The complications of the disease markedly reduced after the introduction of vaccine. Thus, vaccination for COVID-19 is important and has been prompted in many countries. Reports on rare serious adverse events after COVID-19 vaccinations are well documented. The audio vestibular adverse event after COVID-19 vaccination have been reported. We herein discussed a case of labyrinthitis ossificans post COVID vaccination. A 23-year-old male presented with sudden onset right hearing loss (SNHL) with tinnitus 3 days after received COVID-19 vaccine. Pure Tone Audiometry (PTA) revealed right profound hearing loss with normal left hearing. High Resolution Computed Tomography (HRCT) of the temporal bone showed hyperdensity seen at the basal turn of the right cochlea, with Magnetic Resonance Imaging (MRI) revealed focal loss of normal T2-weighted hyperintense signal intensity of the scala tympani of the basal turn of the cochlear, suggestive of labyrinthitis ossificans. He was fitted with hearing aid and undergone for right cochlear implant for hearing rehabilitation. Labyrinthitis ossificans is commonly caused by infection and inflammation, and less commonly trauma, tumors, hemorrhage, or autoimmune inner ear disease. The correlation with vaccination is yet to be revealed and required further study.

Keywords: Coronavirus; hearing loss; labyrinthitis ossificans

INTRODUCTION

Labyrinthitis is an inflammation of the membranous labyrinth of the inner ear. It can mimic a number of other potentially more dangerous illnesses, such as cerebrovascular accidents (Bokhary et al. 2021). Recent viral upper respiratory tract infections, bacterial dissemination from an infected middle ear or meninges, autoimmunity, and human immunodeficiency virus (HIV)/syphilis are common causes of labyrinthitis (Bokhary et al. 2021). The sequelae of labyrinthitis is labyrinthitis ossificans (LO) which is the abnormal ossification of the membranous labyrinthine spaces following an injury to the otic capsule's endosteum or the membranous labyrinth (Taxak & Ram 2020). During the pandemic of Coronavirus disease 2019 (COVID-19),

labyrinthitis is also among the neurological manifestations to be considered as a result of COVID-19. But it also opens the door to the side effects of COVID vaccine as we discuss in this case.

CASE REPORT

A 23-year-old male presented with sudden onset of right hearing loss with tinnitus 3 days after received COVID-19 vaccine (Sinovac) in 2022. He had vertigo, which resolved after 5 days. There was no prior history of ear infection, upper respiratory tract infection, trauma or family history of hearing loss. Initially he was treated with intravenous steroid, but to no avail. Adverse Effect Following Immunisation (AEFI) was reported. Pure Tone Audiometry (PTA) revealed right profound hearing

loss with normal left hearing (Figure 1). High Resolution Computed Tomography (HRCT) of the temporal bone showed hyperdensity seen at the basal turn of the right cochlea (Figure 2), with Magnetic Resonance Imaging (MRI) revealed focal loss of normal T2-weighted hyperintense

signal intensity of the scala tympani of the basal turn of the cochlear, which was suggestive of LO. He was diagnosed with right single sided deafness. He was fitted with hearing aid, however he did not benefit from hearing aid as the aided threshold was below the speech spectrum

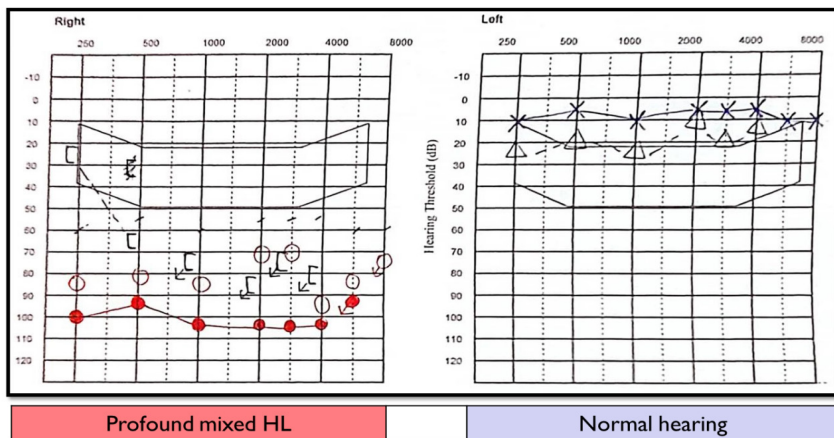


FIGURE 1: Pure tone audiometry showed right profound hearing loss with left normal hearing

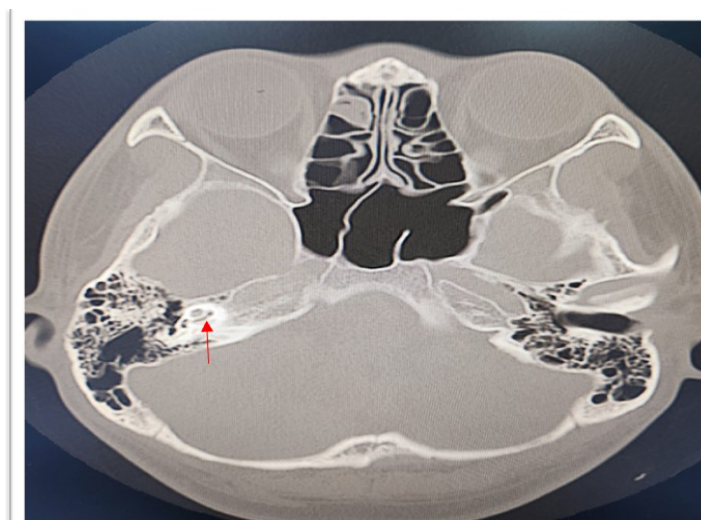


FIGURE 2: High-resolution Computed Tomography (HRCT) of the temporal bone showed hyperdense basal turn of the right cochlea (arrow)

(Figure 3). He can benefit from *Adhear* in quiet environment but limited in noisy setting. Subsequently he underwent right cochlear implant using MED-EL Mi1250 SYNCHRONY 2 using FORM 24 electrode array which was recommended using the OTOPLAN software. There was fibrotic band attached to body of incus intraoperatively (Figure 4). However, the surgeon did not encounter any difficulty upon electrode insertion.

DISCUSSION

COVID-19 remained as the most prominent infection that has left a significant effect on the world's health infrastructure and resources till this day. The well-established impact COVID-19 has on the respiratory system remains its defining characteristic. However, the audio vestibular effects are less common than other neurologically related symptoms, like gustatory or

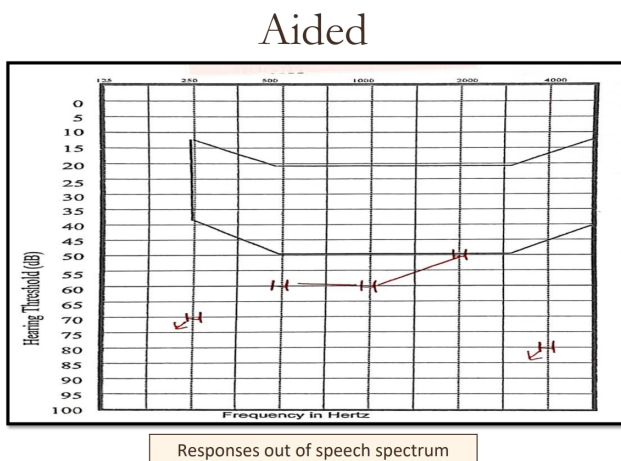


FIGURE 3: Aided hearing threshold was below the speech spectrum

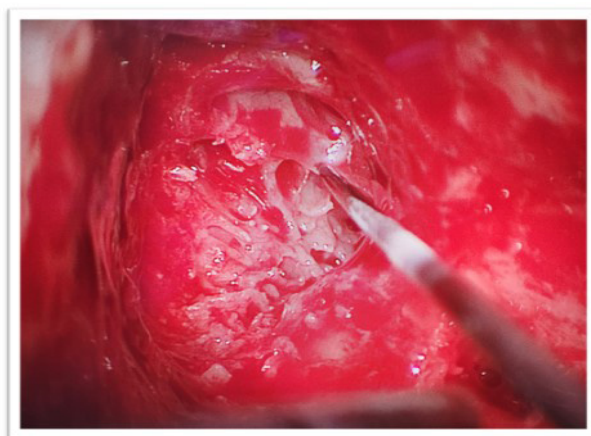


FIGURE 4: Fibrotic band attached to the body of incus seen in the cochlear implant surgery (pointer)

olfactory impairment, which have emerged as important markers to help identify the infection (Bokhary et al. 2021). Among the neurological systems, the virus may target the inner ear, causing damage that can be revealed as vertigo, tinnitus or sensorineural hearing loss (SNHL). On the other hand, the body of research on this subject is still relatively new (Fancello et al. 2021; Gerstacker et al. 2021).

It is of current knowledge that COVID infection can cause hearing loss due to direct viral invasion, the reactivation of a latent virus inside the spiral ganglion, and an immune-mediated mechanism in a systemic viral infection (Perret et al. 2021). COVID virus possessed both neurotropic and neuroinvasive properties (Bokhary et al. 2021). As of right now, the research on the detrimental effects of the COVID-19 virus on the inner ear's hearing organs is still lacking. According to theories, COVID-19 virus binds to Angiotensin-converting enzyme (ACE)-2 to infect bodily tissues after attaching to β -chain haemoglobin in red blood cells whereby cytokine release is subsequently triggered by this complex. Damage to the medulla oblongata and temporal lobe of the brain, which contain crucial structures like the hearing centre and significant sensory pathways, might result in hearing loss since these regions are rich in ACE-2 (Akbar et al. 2022).

These ideas led to the hypothesis that sensorineural hearing loss following COVID-19 virus infection can be caused by disruptions to the vestibulocochlear nerve's blood supply. Thus, explained the reason behind the laterality of hearing loss.

Other common symptom that may accompany hearing loss is vertigo. Acute symptoms of vertigo should be

differentiated from other vestibular conditions such as vestibular neuritis or more life-threatening condition such as cerebrovascular accidents. The combination of acute vertigo with hearing loss and tinnitus favour the diagnosis of labyrinthitis.

Labyrinthitis is defined as the inflammation of the membranous labyrinth of the inner ear (Bokhary et al. 2021). LO is a condition that typically develops as a consequence of purulent inflammation of the inner ear caused by bacterial meningitis. The pathologic process occurs within the lumen of the cochlea and bony labyrinth, whereby there will be ossification of spaces that may lead to the development of new bone (Aygun et al. 2013). The cochlea is most frequently affected, and the scala tympani of the basal turn is frequently where early changes are seen. Next, the cochlear apical turn is affected by the ossification. There are distinct stages have been identified throughout the course of progression i.e. acute, fibrous and ossification (Aygun et al. 2013).

With regards to COVID-19 vaccines, it is established that it carries certain hazards, however no vaccination is 100% risk-free. The BNT162 vaccine, developed by Pfizer-BioNTech, is an mRNA vaccine that encodes the SARS-CoV-2 glycoprotein spike and is produced from lipid nanoparticles modified by nucleosides (Abufares et al. 2022; Mushtaq et al. 2022). The B cell, which generates antibodies to fight the virus, and the T cell, which kills the infected cells, are the two types of immune cells that become active after vaccination (Abufares et al.2022). It was found that, COVID-19 vaccination has the potential to cause the reactivation

of Herpes Zoster through toll-like receptors (TLR), production of interferons, and activation of immune cells, lead to reactivation of latent virus (Abufares et al. 2022). The COVID-19 vaccine's short-term side effects typically start off as minor symptoms. Localised pain and swelling at the injection site, fever, headache, myalgia, and chills are the most typical symptoms. The mRNA vaccines have side effects that include cutaneous eruptions, renal disorders, and myocarditis (Abufares et al. 2022; Mushtaq et al. 2022). However, in this case, whether COVID vaccine causes LO warrants further studies. However, the symptoms occur 3 days after the vaccination, which deemed the vaccine itself to be the likely cause.

CONCLUSION

LO is commonly caused by infection and inflammation, and less commonly trauma, tumors, hemorrhage, vascular obstruction of labyrinthine artery, surgical insult, or autoimmune inner ear disease. The correlation with COVID vaccination is yet to be revealed and required further study.

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