

CASE REPORT



Bilateral deafness two days following influenza vaccination: a case report

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ABSTRACT

Objective: We report a case of deafness occurring in a temporal context of an influenza vaccination in a 79-year-old woman. **Methods:** Case report and review of the literature on influenza causing deafness. **Results:** A 79-year-old woman with normal hearing developed acute bilateral sensorineural hearing loss two days after a seasonal influenza vaccination, other obvious reasons for acute hearing loss were excluded. **Conclusion:** This patient appears to be the first reported case of bilateral deafness following a trivalent seasonal influenza vaccination.

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Introduction

Sudden sensorineural hearing loss (SSNHL) is defined as a minimum of 30 dB hearing loss over 3 consecutive frequencies in a pure tone audiogram, occurring in less than 3 days.¹ While the aetiology of the more common unilateral SSNHL (uni-SSNHL) is idiopathic in over 90% of cases,² bilateral SSNHL (bi-SSNHL) can be caused by inflammation of the eighth cranial nerve³ due to local hypersensitivity response and antigen-antibody reaction caused by viral infections, vascular diseases, Meniere’s disease, neoplasia,³ systemic diseases like hypertension, immune reactions following vaccination as seen in cases of hepatitis B-, mumps- and tetanus and diphtheria vaccination, toxic factors⁴ and round window membrane rupture.⁵

Our case report describes the first adult patient to develop bilateral deafness in a temporal context of a trivalent influenza vaccination containing inactivated influenza virus surface antigens.

Patient presentation

Two weeks after an influenza vaccination, a 79-year-old woman presented at the ER of a teaching hospital of the University Rostock, Germany, with sudden bilateral deafness, vertigo, headache and impaired balance. She had a history of insulin-dependent diabetes mellitus and atrial fibrillation, and had suffered a right-sided thalamic stroke 37 years before. Two days after the patient received a seasonal influenza vaccination with Xanaflu[®], she experienced acute bilateral deafness, vertigo, impaired balance and left-sided temporal headache. Prior to the vaccination, her hearing had been normal and no symptoms of vertigo, impaired balance or headache had been reported. The otolaryngological investigation revealed no focus of infection, Rinne tuning fork test turned out positive on the right side and

negative on the left side, Weber tuning test was impossible to test and audiometry showed deafness on both sides. A CT scan and a MRI of the brain showed no pathological findings except the residual thalamic stroke. Cerebral tumors, a vestibular schwannoma and cerebral infections like encephalitis could be ruled out. Electroencephalography revealed discontinuous interruption in a lesion frontotemporal on the right side, but no focus for epileptic seizure. A lumbar puncture produced normal results excluding cerebral inflammation like meningitis and a biopsy of the temporal artery ruled out arteriitis temporalis. Syphilis infection, herpes virus I and II, cytomegalovirus, hepatitis B virus, hepatitis C virus and thyroid dysfunction were ruled out by blood tests. Additionally, an endocarditis, a pneumonia and a urinary tract infection could be excluded by echocardiography, X-ray and urine test. On the suspicion of Cogan’s syndrome, a rare systemic vasculitis of unknown origin, the patient was initially treated with prednisolone. However, in the absence of interstitial keratitis, Cogan’s syndrome could be ruled out and prednisolone was tapered off. Hearing loss and vertigo did not improve with corticoid therapy. Three months after the initial presentation the patient finally received a cochlear implant on the right side. Her hearing improved minimally, while the vertigo persisted for at least seven months.

Discussion

Viral infections known to cause SSNHL include mumps, varicella zoster, influenza group A and B, herpes simplex type 1, rubella, measles and cytomegalovirus.^{6,7} Viral infections bring about sensorineural hearing loss by triggering inflammatory responses which cause direct damage to cochlear structures, including inner hair cells in the organ of Corti.⁸

Influenza infection can cause bilateral profound non-reversible deafness, as seen in a two-year-old girl who became

deaf two months after suffering bronchopneumonia caused by influenza A (H1N1).⁹ Sudden right ear sensorineural hearing loss and a sensation of fullness in the ear, both occurring on the fourth day of H1N1 infection, were reported in a 73-year-old man. After 24 hours of treatment with prednisolone 60 mg daily, the symptoms improved markedly, and he recovered completely when prednisolone was tapered out gradually over the next few weeks.⁵

Hearing impairment due to vaccination has been reported in patients who received vaccines containing live attenuated strains of measles and mumps,¹⁰ and in one case, fluctuant unilateral sensorineural hearing loss with tinnitus was reported after hepatitis B vaccination, with full recovery after 6 months.¹¹

A 17-year-old girl developed sudden bilateral hearing loss, dizziness, nausea and bilateral tinnitus 14 hours after a H1N1 influenza vaccination. The California (H1N1) inactivated vaccine consisted of H1N1 strain, thimerosal, formalin and polysorbate 80. During the period of deafness, audiometry showed bilateral 55 decibel (dB) hearing loss. Magnetic resonance imaging of the brain ruled out a tumor. Syphilis infection, herpes virus I and II, cytomegalovirus, hepatitis B virus, hepatitis C virus and thyroid dysfunction were ruled out by blood tests. After six days of therapy with prednisolone 1 mg/kg/d, dextran 500ml/d and vitamin B complex the patient's hearing improved, and after one month, pure tone audiometry showed a hearing threshold of 30 dB in both ears.³

Some components of vaccines may be examined as causing otological symptoms. Thimerosal has been shown to elevate intracellular calcium in the outer hair cells of the cochlear in guinea pigs in a dose-dependent way.^{12,13} Outer hair cells, which are involved in the auditory transduction process by modulating the micromechanics of the organ of corti, have contractile properties, and the actin-myosin interaction is regulated by intracellular calcium concentration.¹² One could speculate that this may explain the symptoms displayed by the 17-year old girl who received a H1N1 vaccination containing thimerosal. Since the concentration of thimerosal in the vaccine is very low (0.05 mg), this effect is very unlikely.³

Xanaflu[®] is a suspension containing the inactivated surface antigens, hemagglutinin and neuraminidase of the influenza virus type A strains H1N1 and H3N2, and of the type B strain, plus traces of egg, formaldehyde, cetrimeronium, polysorbate and gentamicin.¹⁴ Systemic Gentamicin is the most common cause of iatrogenic ototoxicity, which manifests as bilateral vestibular loss and imbalance.¹⁵

Since obvious viral infections and systemic diseases could be ruled out in our patient, her bilateral deafness might be caused by an undetected infection or disease, or speculatively may be related to influenza vaccination. A toxic effect of gentamicin on the cochlea seems very unlikely, because it is traces of gentamicin.

Disclosure of potential conflicts of interest

No potential conflict of interest was reported by the authors.

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