

Case Report

Sudden bilateral sensorineural hearing loss in a patient immunocompromised by the human immunodeficiency virus

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Abstract

It is known that in less than a third of patients presenting sudden hearing loss, the disorder can be attributed to viral infection, trauma, neoplasms, and vascular and autoimmune diseases. However, the role of the HIV in the onset of this disease has not yet been well described. A 46-year-old female, in an immunosuppression state induced by HIV infection, presented with sudden bilateral hearing loss, with no improvement despite treatment. Several mechanisms were reported by which the virus could induce damage to the auditory pathway. However, little is known regarding the prevention and treatment of this morbidity.

Keywords: Human immunodeficiency virus. Sudden hearing loss. Immunosuppression.

INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is an acute inner ear dysfunction characterized by hearing loss greater than 30dB in at least three consecutive frequencies. Its incidence is estimated at 10 to 20/100,000 people per year¹. The cause of this pathology is still unknown, so in most cases it is considered idiopathic. However, it is known that in less than a third of the patients, this disorder can be attributed to viral infection, trauma, neoplasms, ischemic/hemorrhagic alterations, and autoimmune diseases^{2,3}. In an extensive clinical and epidemiological investigation led by Nakashima et al., while studying 3,000 patients with sudden deafness, they verified that the average period between the disease manifestation and the search for medical service was 8.1 days; 31.8% of the patients presented the complaint of dizziness during the first consultation, and there was no significant difference between audiometric thresholds between men and women². Bilateral presentation of the disease is even rarer. It is estimated that the incidence of bilateral hearing loss in patients with SSNHL ranges from 0.44 to 2.78%⁴. However, few studies have evaluated individuals with bilateral auditory involvement.

Several mechanisms by which the human immunodeficiency virus (HIV) can affect hearing are described in the literature: through direct injury to the central nervous system or cochlear

nerve, neoplasms in the central nervous system, by the ototoxic effect of antiretroviral medications, and even predisposition to other viral infections (herpes virus, cytomegalovirus, and others) also related to hearing loss. These data show that HIV plays an important role in the genesis of chronic and acute hearing loss, but the scarcity of studies in the literature still makes the otological management of HIV seropositive patients a challenge.

CASE REPORT

A 46-year-old female patient presented with a 7-day history of bilateral onset hypoacusis and tinnitus without well-established trigger factors. The patient had been previously diagnosed with acquired immunodeficiency syndrome (AIDS) and was undergoing irregular antiretroviral therapy (with tenofovir, lamivudine, lopinavir, and ritonavir), with the last laboratory parameters of disease control showing 322 cluster of differentiation 4 (CD4) lymphocytes/ μ l and a viral load of 2,833 copies/ml. On otoscopic examination, she presented bilaterally intact and translucent tympanic membranes, with no other abnormalities on physical examination. Audiometry was performed, which evidenced bilateral, symmetrical and mild to moderate intensity sensorineural hearing loss (SHL) in frequencies of 2 to 6 kHz (**Figure 1**). A magnetic resonance imaging scan of the inner ear showed normal findings (**Figure 2**). The patient also underwent a series of serological tests for the major infectious agents involved in SSNHL, such as cytomegalovirus (CMV), herpes simplex virus (HSV), rubella virus, syphilis, toxoplasmosis, among others, all of which yielded negative results. The diagnosis of SSNHL was made and corticosteroid therapy with prednisolone at 1mg/kg/

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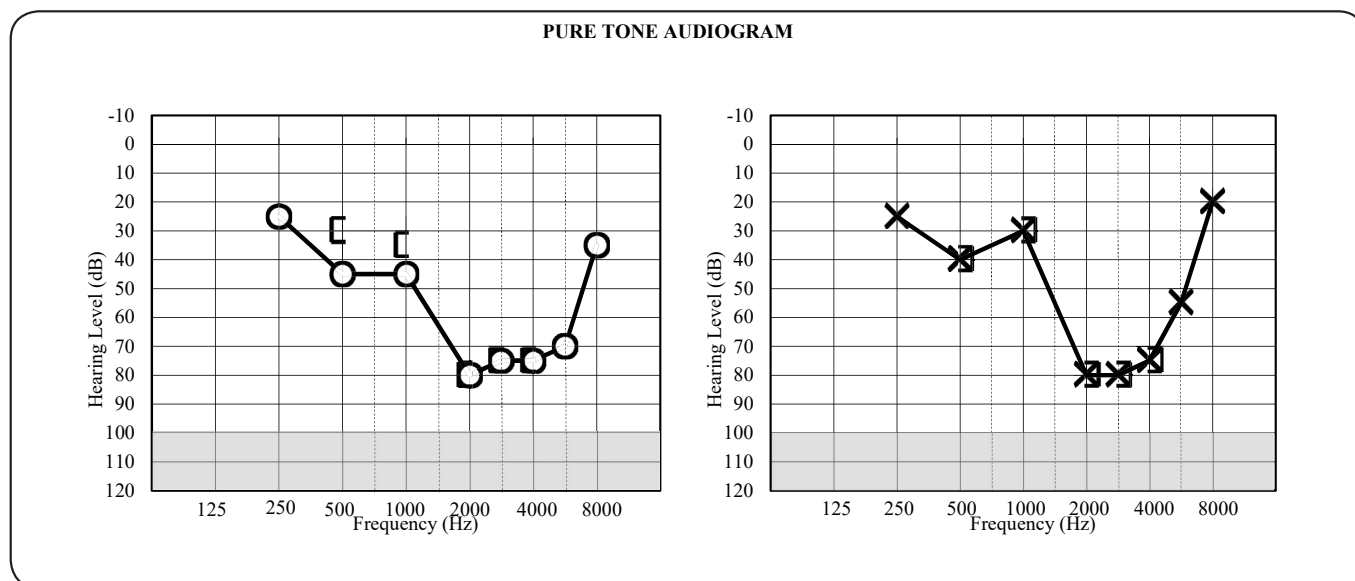


FIGURE 1: Pure tone audiogram at the time of diagnosis, showing mild to moderate bilateral and symmetric SHL greater in frequencies of 2 to 6kHz. Vocal Audiometry: Speech Recognition Index in the right ear: 70dB, 92%; left ear: 65dB, 88%. Speech Recognition Threshold in the right ear: 30dB; left ear: 25dB. SHL: sensorineural hearing loss; kHz: kilohertz; dB: decibel.

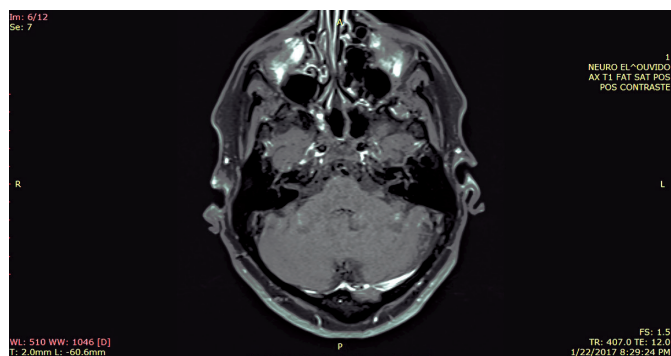


FIGURE 2: Magnetic resonance imaging scan of the inner ear: T1-weighted axial cut with gadolinium and fat saturation. Absence of anomalous uptake in the inner ear, internal acoustic meatus and pontocerebellar angle.

day was initiated. The patient was reassessed after 7 days of treatment without improvement of the symptomatology; repeat audiometry revealed persistent hearing loss (Figure 3) without signs of improvement of thresholds. The patient evolved with hearing loss stability with no change in hearing status despite corticosteroid treatment.

DISCUSSION

The relationship between HIV and hearing loss is still unclear. Recently, van der Westhuizen et al.⁵ studied hearing loss in patients with and without HIV infection and found that HIV seropositive patients had a higher prevalence of SHL (in pure tones in the frequencies of 500, 1,000 and 2,000Hz) and, in addition, found a positive relationship between disease staging and SHL frequency. In that study, the prevalence of

dysacusis was higher among patients with stage 3 of the disease according to the Centers for Disease Control (the disease has 3 stages, with stage 3 representing greater severity of the disease with lymphocyte count below 200 TCD4 (CD4 lymphocytes) per microliter), and in patients receiving antiretroviral therapy.

Similarly, HIV-infected and non-HIV-infected patients matched by age, sex, race, and history of noise exposure were investigated in order to evaluate hearing loss at low and high frequencies in these two groups⁶. There was an increase in the audiometric thresholds for high and low frequencies in the seropositive patients, which for the best ear was statistically significant [relative risk (RR) 1.18; 95% confidence interval (CI) 1.02-1.36 for acute tones and RR 1.12, 95% CI, 1.00-1.26 for low frequency tones with $p < 0.05$]. In this same article, Torre III et al. proposed that this low-frequency hearing loss could also be related to a worse speech recognition performance in HIV seropositive patients, since some vowels and consonants have a predominance in low tones.

In 2013, Charlene Lin et al. described a higher risk of SSNHL in patients with HIV in the group aged 18-35 years; it was demonstrated that at that age, the RR of sudden deafness in the HIV-infected group was 2,169 (95% CI, 1.071-4.391) ($p < 0.05$)⁷. In addition, a mean age of 34.56 years was also found, and a higher prevalence of the disease among male patients (RR 2.23, 95% CI, 1.06-4.69). However, the incidence of sudden deafness did not present a statistically significant difference among patients older than 36 years (RR 0.72, 95% CI, 0.29-1.84).

A variety of studies have demonstrated that HIV may affect the auditory system both centrally and peripherally⁸. HIV has been detected in auditory and vestibular hair cells, strial cells, and along the tectorial membrane. However, the otologic

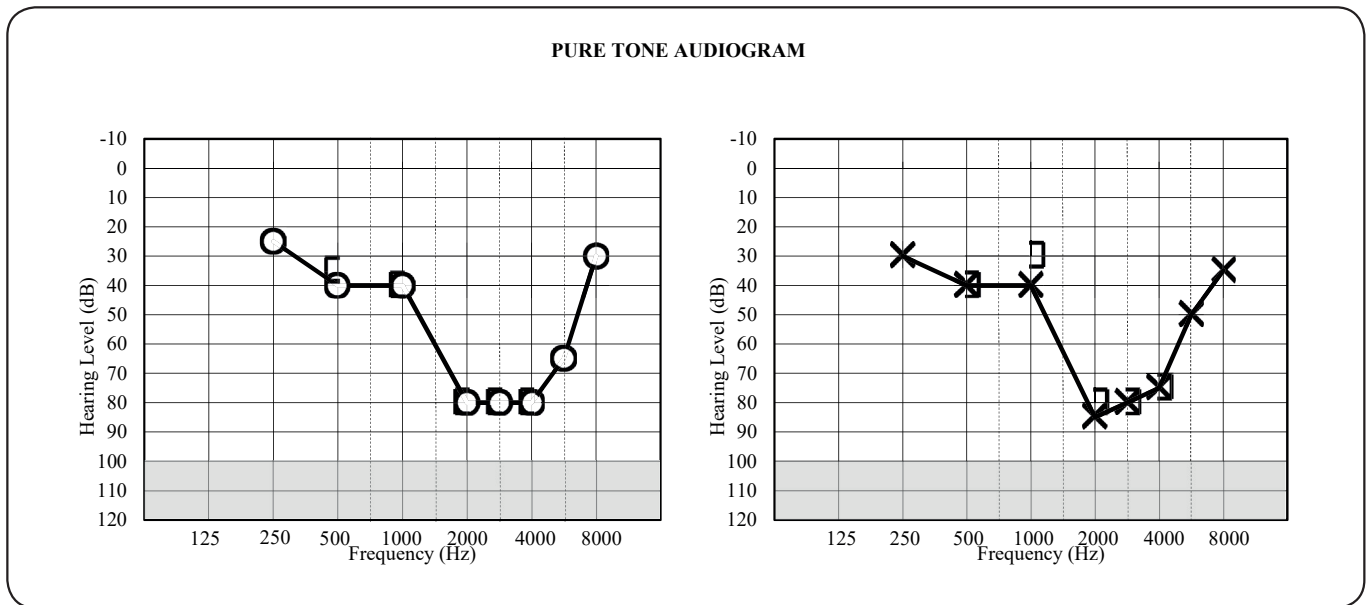


FIGURE 3: Pure tone audiogram after corticotherapy, showing persistence of SHL in both ears tested. Vocal Audiometry: Speech Recognition Index in the right ear: 65dB, 88%; left ear: 65dB, 88%. Speech Recognition Threshold in the right ear: 25dB; left ear: 25dB. **SHL:** sensorineural hearing loss; **kHz:** kilohertz; **dB:** decibel.

symptoms, including bilateral sudden or progressive hearing loss, may represent a combination of the effects of HIV infection coupled with opportunistic microorganisms, such as syphilis, CMV, HSV, toxoplasmosis, herpes zoster oticus, among many others^{7,8}. Therefore, it is essential to titer antibodies against the main agents related to this morbidity, especially CMV, syphilis and toxoplasmosis, which are important causes of hearing loss in the population immunocompromised by AIDS.

Still regarding HIV, several researchers have described in recent decades ototoxicity effects of antiretroviral drugs such as zidovudine, lamivudine and stavudine^{6,9,10}. Much of the toxicity of nucleoside reverse transcriptase inhibitors (NRTIs), including hearing loss, has been attributed to mitochondrial deoxyribonucleic acid (mtDNA) mutations⁶. These mutations can be explained by the fact that NRTIs are able to inhibit the synthesis of mtDNA, resulting in insufficient energy production and tissue dysfunction. Moreover, NRTIs may also be associated with oxidative damage to mitochondria, inhibition of mitochondrial enzymes and induction of apoptosis¹⁰.

In the case described, we had a patient immunocompromised by HIV who developed sudden bilateral hearing loss without a well-established etiological factor, after vascular, tumor, inflammatory and infectious causes were discarded after image evaluation and serological analysis. Although it is not possible to confirm that HIV was the direct cause of hearing loss in our patient, it is important to remember that in the literature it is clear that HIV can justify hearing loss and still be related to sudden deafness in patients with AIDS. In addition, it is known that 29 to 44% of individuals with HIV have or will present hearing complaints over the course of their life⁷. For these reasons, continuous otorhinolaryngological evaluation of patients infected with HIV is essential.

In recent decades, the deleterious effect of HIV infection on the integrity of the auditory pathway has become increasingly clear. The case presented not only reaffirms this fact, but also brings a rare manifestation of SHL in immunocompromised individuals caused by this virus. Sudden hearing loss, as already mentioned above, most commonly manifests unilaterally. Its presentation in both ears makes the diagnosis more difficult if there are no previous audiometric parameters of the patient. In addition, such presentation leads to greater morbidity and a significant worsening of the individual's quality of life. It is possible to say that complementing otorhinolaryngological follow-up with audiometric evaluation and the control of AIDS immunosuppression can help detect and prevent SHL in these particular patients and provide a better otological prognosis.

Conflict of interest

The authors declare that there is no conflict of interest.

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REFERENCES

1. Weiss D, Böcker AJ, Koopmann M, Savvas E, Borowski M, Rudack C. Predictors of hearing recovery in patients with severe sudden sensorineural hearing loss. *J Otolaryngol Head Neck Surg.* 2017;46:27.
2. Nakashima T, Itoh A, Misawa H, Ohno Y. Clinicoepidemiologic features of sudden deafness diagnosed and treated at university hospitals in Japan. *Otolaryngol Head Neck Surg.* 2000;123(5):593-7.

3. Kuhn M, Heman-Ackah SE, Shaikh JA, Roehm PC. Sudden sensorineural hearing loss: a review of diagnosis, treatment, and prognosis. *Trends Amplif.* 2011;15(3):91-105.
4. Fetterman BL, Luxford WM, Saunders JE. Sudden Bilateral sensorineural hearing loss. *laryngoscope.* 1996;106(11):1347-50.
5. Van der westhuizen Y, Swanepoel DW, Heinze B, Hofmeyr LM. Auditory and otological manifestations in adults with HIV/AIDS. *Int J Audiol.* 2013; 52(1):37-43.
6. Torre III P, Hoffman HJ, Springer G, Cox C, Young, MA, Margolick, JB, et al. Hearing loss among HIV-seropositive and HIV-seronegative men and women. *Otolaryngol Head Neck Surg.* 2015;141(3):202-10.
7. Charlene Lin BS, Shih-Wei Lin P, Weng S, Lin Y. Increased risk of sudden sensorineural hearing loss in patients with human immunodeficiency virus aged 18 to 35 years. *Otolaryngol Head Neck Surg.* 2013;139(3):251-5.
8. Cohen BE, Durstenfeld A, Roehm PC. Viral causes of hearing loss: a review for hearing health professionals. *Trends Hear.* 2014;18(1): 1-17.
9. Simdon J, Waters D, Barlett S, Connick E. Ototoxicity associated with use of nucleoside analog reverse transcriptase inhibitors: a report of 3 possible cases and review of the literature. *Clin Infect Dis.* 2001;32(11):1623-7.
10. Brinkman K, Kakuda TN. Mitochondrial toxicity of nucleoside analogue reverse transcriptase inhibitors: a looming obstacle for long-term antiretroviral therapy? *Curr Opin Infect Dis.* 2000;13(1):5-11.