

CASE REPORT

Topical gentamicin-induced acute vestibulopathy: A case report

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Abstract

Evidence suggests that otologic injury from ototopical aminoglycoside preparations is infrequent when used to treat ear infections with an intact tympanic membrane. Meanwhile, parenteral administration of aminoglycosides, is well known to be associated with a significant incidence of cochlear and vestibular damage. The discrepancy between topical and parenteral ototoxic effects is thought to result from a combination of factors, including the protective function of debris overlying the round window membrane, low antibiotic concentrations of topical antibiotic preparations, length of exposure and inability to detect subtle hearing or vestibular changes. Herein, we present a case of acute vestibulopathy following a 2-week course of topical gentamicin otic drops. Awareness of vestibulotoxicity following topical gentamicin therapy is prudent as vestibulopathic symptoms can be severely debilitating.

Introduction

Vestibulocochlear toxicity, also known as ototoxicity, can be caused by a variety of drugs and topical agents. Aminoglycosides are well known for its ototoxic potential, which can damage either hearing, the vestibular apparatus or both.¹ Vestibulotoxicity is the ability of a pharmacological drug to destroy or damage vestibular structures, which could involve the end-organ at the hair cell level, the vestibular aspect of the eighth cranial nerve and connections within the central nervous system. As opposed to vertigo, which would be an unusual presentation, the main symptoms of vestibulotoxicity are dizziness, dysequilibrium, and oscillopsia. The effect of vestibulotoxicity may affect an individual quality of life negatively. The development of vestibulotoxicity may prolong hospitalization, requiring intensive vestibular rehabilitation therapy.² This case reports on a 45-year-old-female who developed acute vestibulopathy following a two-week course of topical gentamicin otic drops.

Case presentation

A previously healthy 45-year-old woman with no prior history of vestibulopathy presented with a 3-day history of persistent spinning sensation and veering when walking. The patient developed spinning sensation second day following treatment completion and was not triggered by head movement or position changes, and she had no recent trauma or

upper respiratory tract infection. However, the patient claimed she had a recent ear infection two weeks prior and was prescribed topical gentamicin ear drops. She had pain and minimal yellowish discharge over the right ear for the past one week before she sought treatment. She denied the use of other topical antibiotics prior to visiting the doctor. The ear infection settled after completion of ear drops. Besides that, the patient denied any facial asymmetry, blurring of vision, headache, upper or lower limb weakness,

Upon examination, the patient was comfortable. Her vital signs were within normal range. Neurological examination and HINTS (Head impulse test, nystagmus, and test of skew) examination performed were not suggestive of any central pathology. On physical examination, both pinnae appeared normal. Otoscopy examination of the right ear revealed subtotal tympanic membrane perforation with no evidence of cholesteatoma or granulation tissue in the middle ear, whereas the left tympanic membrane was intact. The fistula test was negative, and the gaze test demonstrated horizontal left beating nystagmus. The cerebellar test showed an abnormal, wide-based gait and a positive sharpened Romberg. Weber test showed lateralization to the right side, whereas Rinne was negative. The pure tone audiogram showed conductive hearing loss of 50dB in the right ear. A video head impulse test performed

showed an abnormal gain of the right anterior, lateral and posterior canal. Her subjective visual acuity was within normal range. She was treated with oral steroid tapering doses (60 mg for 3 days, 40mg for 3 days, 20mg for 3 days, 10mg for three days and 5 mg for 2 days then off) for 2 weeks and vestibular exercises. The patient claims her symptoms improve following the vestibular rehabilitation therapy and has been asymptomatic to date.

Discussion

Drug-induced ototoxicity has been observed in patients treated with aminoglycoside antibiotics since the use of streptomycin for treatment of tuberculosis in the 1940s.³ Since then, a variety of new aminoglycosides have been developed to search for a drug with a broader antimicrobial spectrum and less toxicity. Nevertheless, all drugs in this class have been shown to be ototoxic, exerting varying degrees of cochleotoxicity and vestibulotoxicity.⁴⁻⁵

The most common side effects of gentamicin are vestibulotoxic. Hearing loss, vertigo, vertical oscillopsia, gait ataxia, and vertigo are common complaints among patients with ototoxicity and vestibulotoxicity.⁶⁻⁷ In a study by Kaplan et al., most patients were found to experience symptoms of vestibulotoxicity by day 12 following medication usage.⁸⁻⁹ A longer duration of therapy in an open infected ear may be the culprit, as in our patient. In addition, the medication has the potential to seep through the round window membrane into the endolymph, causing symptoms of labyrinthitis.⁷ This was noted in our patient, who developed a spinning sensation and imbalance after two weeks of usage of a topical gentamicin ear drop.

Gentamicin ototoxicity is diagnosed following the positive history of exposure to gentamicin, documentation of vestibulotoxicity complaints, and exclusion of other reasonable alternatives. High-frequency audiometry can be used to detect cochleotoxicity, but without pre-gentamicin audiometry, it is impossible to determine the cause of high frequency (4–8 kHz) hearing loss, especially in elderly patients, as noise and ageing are much more common

causes.¹⁰⁻¹¹ Fistula testing has no role other than to exclude another alternative diagnosis. Patients with vestibulotoxicity were found to have positive results following the head impulse test, vertical head-shaking test for vertical oscillopsia, and a foam Romberg test.

Gentamicin therapy should be stopped as soon the patients exhibit symptoms of ototoxicity or vestibulotoxicity. Early treatment aimed at alleviating vestibulotoxicity symptoms is associated with better outcomes.⁷ Steroids reduce the amplitude of inflammatory response to aminoglycosides in the cochlear, decreasing hair cell swelling, dysfunction and apoptosis. For vestibulotoxicity, vestibular rehabilitation has demonstrated favorable results as seen in our patient.¹²

Conclusion

The ototoxic nature of aminoglycoside eardrops has been proven. Physicians prescribing topical aminoglycoside eardrops should be aware of the potential of ototoxicity in the presence of a tympanic membrane defect. When possible, topical antibiotic preparations free of potential ototoxicity should be used in preference to ototopical preparations that have the potential for otologic injury in patients with a tympanic membrane perforation. In the same vein, owing to the possibility of vestibulotoxicity, patients prescribed gentamicin ear drops should be informed regarding the possible complication of notable vestibulopathy.

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All involved in managing this patient.

Conflict of interest

All authors have no conflict of interest

Author contribution

Lau Teik Beng: Drafting, Writing, Literature review
Jeyasakthy Saniasiaya: Writing, Editing, Literature review, Supervision

Revadi Govindaraju: Editing, Supervision

Patients' consent for the use of images and content for publication

Informed consent obtained and given via verbal means from patient for this case report.

What is new in this case report compared to the previous literature?

- This case highlights a case of acute vestibulopathy following a short course of topical gentamicin otic drops.
- Otic drops ought to be prescribed with caution in patients with perforated tympanic membrane as the effect is not only on the cochlea but also on the vestibular end-organs.

What is the implication to patients?

- Increasing awareness among physicians that topical aminoglycoside eardrops can cause ototoxicity in the presence of a tympanic membrane defect.
- Raising awareness of vestibulotoxicity following topical gentamicin is prudent, as vestibulopathy symptoms can be severely debilitating.
- Patients prescribed gentamicin ear drops should be informed regarding the possible complication of notable vestibulopathy.

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