

Amikacin Induced Ototoxicity in an 8 Year Old Patient with UTI: A Case Report

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Abstract

Ototoxicity is an adverse drug reaction of Amikacin and involves mainly bilateral high-frequency sensorineural hearing loss and tinnitus. This case report is essential to identify, resolve and create awareness of the predisposing factors which can lead to ototoxicity. It elaborates the rare adverse effect caused due to Amikacin induced ototoxicity and the treatment strategies adopted at a secondary care hospital in an 8 year old male child. Treatment for Urinary Tract Infection (UTI) included Amikacin for 1 day following which the next day he developed blocked ears and diminished hearing as an adverse reaction to the aminoglycoside antibiotic. Management emphasis is on prevention, as most hearing loss is irreversible. After 3 days of treatment, the patient's condition improved and was discharged with advice to continue liquid paraffin 3drops-0-3drops in both ears for 3 days. Appropriate measures must be put into place to manage aminoglycoside-induced cochleotoxicity effectively, in order to maximize the affected individual's quality of life.

Keywords: *Aminoglycoside, Amikacin, Hearing Impairment, Paediatrics, Secondary Care Hospital.*

Introduction

Amikacin, an Aminoglycoside antibiotic, is widely used for the treatment of serious bacterial infections in different parts of the body. Amikacin's distinctive property is that it exerts activity against more resistant gram-negative bacilli such as *Acinetobacter baumannii* and *Pseudomonas aeruginosa*.

Amikacin also exerts exceptional activity against most aerobic gram-negative bacilli from the *Enterobacteriaceae* family, including *Nocardia* and some *Mycobacterium*. Several forms of the drug are used currently, including an intravenous (IV) or intramuscular (IM) injection [1]. Amikacin induced ototoxicity is a rare but commonly seen adverse drug reaction of aminoglycoside antibiotics.

The class of drugs is even under consideration to be banned in certain developed countries due to its treacherous effects in patients. Ototoxicity is typically associated with bilateral high-frequency sensorineural hearing loss and tinnitus. Hearing loss can be temporary but is usually irreversible with most agents

[2]. The aminoglycosides enter the inner ear fluids via the bloodstream and result in intracellular biochemical and morphological changes of the cochlear outer hair cells (OHCs) [3]. Aminoglycosides bind with iron, forming an oxidative compound that contributes to the formation of free radicals, which are involved in tissue damage in the body due to oxidative activities with proteins and other targets [4].

Generally, antibiotic-induced ototoxicity is bilaterally symmetrical, but it can be asymmetrical. The time of onset is often unpredictable, and distinct hearing loss can occur even after a single dose. Management emphasis is on prevention, as most hearing loss is irreversible. This case report elaborates the rare adverse effect caused due to Amikacin induced ototoxicity and the treatment strategies adopted in a secondary care hospital.

Case Report

An 8-year old male child was presented in the inpatient paediatric unit of the secondary

care public hospital on the 12th of September, 2018, with complaints of fever, vomiting, watery and blood stained loose stools accompanied with 5 episodes of abdominal pain and decreased urine output since three days. Consent was obtained in written form from the patient's caretaker and the data was collected. On examination, the patient was found to be conscious, oriented and afebrile.

The patient was found to be underweight (body mass index – 13.88) and his vitals were as follows: Temperature- 98.4°; Heart Rate- 98/min; Cardiovascular System, Respiratory System and Central Nervous System was found to be normal and his per abdomen was found to be soft. The laboratory investigation details are given in Table 1. The patient was given oral rehydration solution, intravenous

fluid isolyte P-60ml/hour, injection cefotaxime- 1 g IV, injection amikacin-300mg IV, injection ranitidine- 50mg IV twice daily, and tablet zinc- OD. On the second day, the patient complained of ear pain and both ears were blocked with wax (sign of ototoxicity), which is an adverse drug reaction of amikacin.

Administration of amikacin was stopped while other medications were continued. According to an ENT surgeon's opinion, liquid paraffin-3 drops BD was administered in both ears. As conditions improved the following day, the patient was discharged with advice to continue liquid paraffin 3drops-0-3drops in both ears for 3 days and to return for follow-up review in ENT outpatient department after 2 weeks.

Table 1: Laboratory Investigation Details

Clinical parameters	Normal range	Result obtained
Haemoglobin (g/dl)	11.0-13.3 g/dl	12.9 g/dl
Polymorphs (%)	20-40 %	57 %
Lymphocytes (%)	47-77 %	36 %
Monocytes (%)	5-7 %	7 %
Platelet count (10 ³ /mm ³)	194-364*10 ³ /mm ³	3.44* 10 ³ /mm ³
Red blood cells (10 ⁶ /mm ³)	4.0-4.9*10 ⁶ /mm ³	4.89*10 ⁶ /mm ³
Mean cell haemoglobin (pg/cell)	25-33 pg/cell	26.4 pg/cell
Mean cell haemoglobin concentration (g/dl)	31-37 g/dl	32 g/dl
Pus Cells	1-2 pc/hpf	8-10 pc/hpf
Epithelial Pus Cells	1-2 epc/hpf	2-3 epc/hpf

Discussion

Urinary Tract Infections (UTI) are a fairly common problem in childhood and may have either a nonthreatening course responding to simple antibiotic therapy or be accompanied with significant disruption in either the anatomy or function of a child's urinary system. The most common pathogen is *Escherichia coli*, accounting for approximately 85 percent of urinary tract infections in children [5].

According to the American Academy of Family Physicians, when intravenous antibiotics are required for the treatment of UTI's in children, a single daily dose with aminoglycosides is proven safe and effective [6]. However, the incidence of cochlear damage due to aminoglycosides varies from 7-90%, which reveals the high possibility of the present patient to develop ototoxicity following only a single dose administration of Amikacin [1]. Hearing loss that results as the adverse effect, can affect an individual's quality of life, due to the negative impact on one's ability to communicate [7]. Therefore, even in the case of individuals where

permanent hearing loss due to aminoglycoside exposure cannot be avoided, timely detection of cochlear damage is important to enhance quality of life with early intervention. Secondary prevention can take the form of advising the patient of the known risk factors, for example noise exposure [8]. Variables such as drug dosage, once vs. multiple daily administration, and peak serum levels are poorly correlated with the symptoms of cochleotoxicity [9][10]. The available tests that can be included in the diagnostic and/or monitoring test battery include case history, conventional pure tone audiometry (cPTA), high frequency pure tone audiometry (hfPTA), otoacoustic emissions (OAEs), and the auditory brainstem response (ABR), which could not be performed due to the limited facilities available in the secondary care public hospital.

The patient was given parenteral antibiotics, amikacin and cefotaxime, which is the first choice of drug for the treatment of complicated UTI as per the Tamil Nadu State Government treatment guidelines. The doses prescribed for the parenteral antibiotics were

according to the paediatric doses. It is necessary to monitor the renal function tests after 5 days which was not done. Similarly, dipstick testing, ultrasonography, cystography, or renal cortical scanning was not performed in this patient which is a diagnostic test for UTI. The patient had also experienced 4-5 episodes of watery, blood stained loose stools accompanied with abdominal pain and fever for which acetaminophen, oral rehydration salts, and zinc were prescribed for symptomatic relief. The patient was counselled to drink plenty of fluids and maintain a healthy diet to prevent future reoccurrences of UTI.

Conclusion

Authors in developed countries have called for the use of aminoglycosides to be banned

due to their adverse effects [11]. It is essential to identify and resolve the predisposing factors which can lead to ototoxicity. In this patient, the reason for the occurrence of ototoxicity was the administration of amikacin. Hence, appropriate measures must be put into place to manage aminoglycoside-induced cochleotoxicity effectively, in order to maximize the affected individual's quality of life.

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