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Cystic Fibrosis Research News

Title:

Ototoxicity in Cystic Fibrosis Patients Receiving Intravenous Tobramycin for Acute Pulmonary Exacerbation

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What was your research question?

We wanted to know whether people with cystic fibrosis (CF) who experienced acute lung infections and received aminoglycoside antibiotics such as intravenous (IV) tobramycin suffered hearing loss and other related symptoms after one course of treatment.

Why is this important?

Hearing loss, tinnitus, and vertigo or dizziness are major side effects of aminoglycoside antibiotics including tobramycin and amikacin, which are commonly used to treat acute (sudden and develop rapidly) and chronic (long lasting) lung infections. These side effects are known as “ototoxicity” since they involve damage to the inner ear which controls hearing and balance. Hearing loss caused by these antibiotics can be permanent and progress to severe impairment or deafness. People with CF may be at greater risk of ototoxicity than other people, as they often receive multiple IV antibiotic treatments over the course of months and years.

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What did you do?

We observed people with CF who were starting IV tobramycin for at least 10 days of treatment at a fixed daily dose. We tested the individuals' hearing using audiometry (testing of a person's ability to hear pure tones presented at different volume intensities), the Words-in-Noise Test, (simple words presented at varying volume intensities above background noise), and otoacoustic emissions (a test of auditory hair cell function). We also asked questions about their tinnitus and vertigo severity. We performed these tests at baseline before beginning their IV tobramycin treatment, and at 2 and 4 weeks after the end of IV tobramycin treatment to see how long the side effects lasted and whether they might be permanent. We defined hearing loss based on ototoxicity change criteria from the American-Speech-Language-Hearing-Association (ASHA) and the American Academy of Audiology (AAA).

What did you find?

We found that the majority of individuals suffered significant hearing loss. We showed much higher rates of hearing loss compared to prior studies that did not use the ASHA and AAA criteria or did not test hearing before and after as rigorously as our studies' methodology. Half of the individuals also showed tinnitus, vertigo, and reductions in the Words-in-Noise Test. We observed these ototoxic side effects following one course of IV tobramycin treatment and two follow-up tests at specific intervals.

What does this mean and reasons for caution?

The results of this study indicate that just one 10- to 14-day treatment with IV tobramycin can cause inner ear damage, which could be permanent and progressive. Two limitations of our study are that we followed the individuals for 4 weeks after the end of treatment and not longer, and that we excluded those individuals who already had severe hearing loss at the initial baseline visit.

What's next?

We would like to know if we can prevent or reduce the ototoxic side effects of IV tobramycin by treating patients at the same time with a drug that can protect the ear from damage. Ongoing trials are testing individuals with an investigational drug to see if the rate of hearing loss and other ototoxic side effects can be reduced.

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