

## Clinical Records

# Sudden sensorineural hearing loss following intramuscular administration of penicillin

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### Abstract

We report a case of sudden hearing loss in a patient with acute exudative tonsillitis, occurring 15 minutes after the intramuscular administration of penicillin. Audiological evaluation documented a profound sensorineural hearing loss of the cochlear type. The mechanism of the hearing loss was probably an immediate hypersensitivity (type I) allergic drug reaction. Penicillin is used frequently for the treatment of several infections. Allergic reactions to penicillin are well known and include urticaria, maculopapular exanthems, angio-oedema, bronchospasm and anaphylaxis, but sudden hearing loss has never been recorded.

**Key words:** Hearing Loss, Sudden; Penicillins; Tonsillitis

### Case report

A 67-year-old Caucasian woman has been followed up since 1988 at the Department of Otolaryngology, Egas Moniz University Hospital, in Lisbon, Portugal. When she was 53 years old and 56 kg weight, she presented with sudden hearing loss and tinnitus in her left ear, associated with rotatory vertigo. Aural symptoms developed approximately 15 minutes after the intramuscular administration of penicillin for the treatment of an episode of acute tonsillitis and were associated with the simultaneous development of an erythematous swelling with itching at the injection site. The injection was composed of three different salts of benzylpenicillin (penicillin G): penicillin G benzatine (600 000 UI), penicillin G procaine (300 000 UI) and penicillin G potassium (300 000 UI). The patient denied ear fullness or any other aural, central nervous system, respiratory, cardiovascular or digestive symptoms. She had a history of recurrent acute tonsillitis, treated frequently with penicillin but had no previous manifestations of drug allergy. On examination, normal findings were noted on otoscopy, but the Weber test lateralized to the right using a 512 Hz tuning fork. Results from other otolaryngological examinations were unremarkable except for acute exudative tonsillitis. Pure-tone audiometry disclosed a profound sensorineural hearing loss on the left ear and normal pure tone levels on the right ear (Figure 1). The patient was treated with intravenous steroids, with prompt resolution of cutaneous manifestations. Vertigo subsided in a few days but hearing loss did not show recovery in subsequent evaluations. No other studies were performed nor were available on the clinical record of the patient.

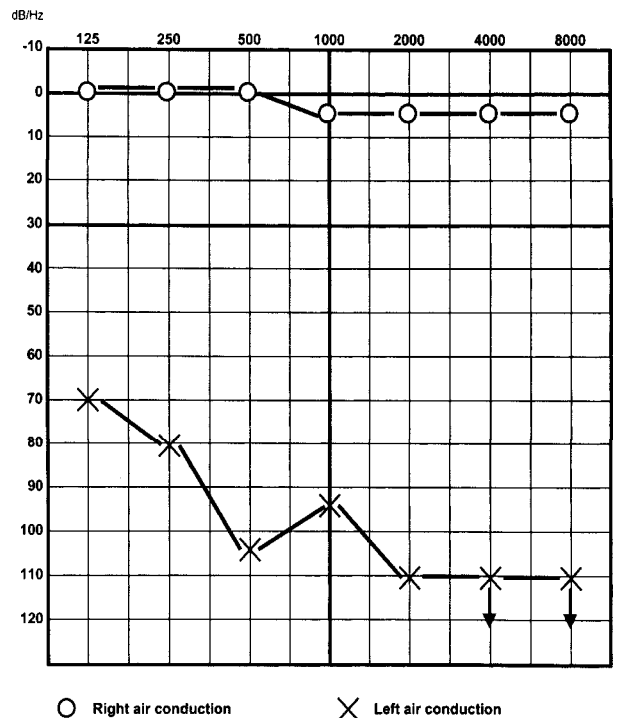


FIG. 1

A profound sensorineural hearing loss on the left ear was documented in the pure-tone audiogram performed in the same day after the hearing loss (only air conduction levels were represented).

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Accepted for publication: 10 November 2003.

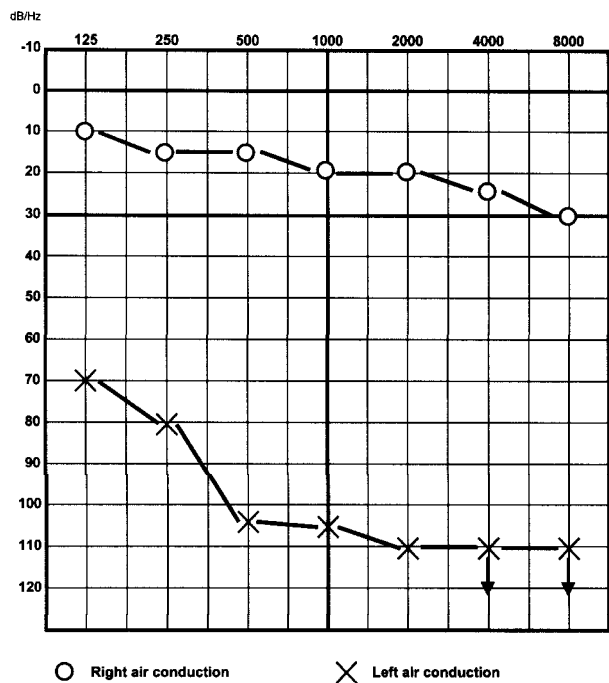


FIG. 2

Current audiogram showed comparable thresholds on the left ear, and a high frequency sensorineural slight hearing loss on the right ear, most probably age-related (only air conduction levels were represented).

- Penicillin is used routinely for the treatment of severe infections
- In this case a patient was given intramuscular penicillins for acute tonsillitis and developed sensorineural deafness, tinnitus and vertigo as well as an erythematous rash shortly afterwards
- The patient did not have demonstrable hypersensitivity to penicillin on RAST testing
- The authors suggest that the symptoms were related to vestibulo-cochlear ototoxicity

Recently, 14 years after the acute episode, the patient returned to the hospital for routine examination. She denied any modification on the hearing loss or tinnitus in the left ear since the original episode and was asymptomatic in the other ear. A complete and actualized audiological evaluation was performed. Pure-tone audiometry disclosed a gradually sloping slight hearing loss on the right ear, and a profound sensorineural hearing loss on the left ear, with thresholds on the affected ear comparable to those obtained at the initial presentation (Figure 2). Tympanometry, performed using a 226-Hz probe tone, showed Lidén and Jerger type A admittance tympanograms bilaterally. Acoustic reflexes were absent only in the left ear. Auditory brainstem response (ABR) showed no click-evoked response in the left ear and normal responses in the right ear. A DP-gram failed in the identification of distortion product otoacoustic emissions (DPOAEs) in the left ear (Figure 3) and displayed identifiable DPOAEs at 1000 to 3000 Hz in the right ear. Electronystagmography disclosed normal values on bithermal caloric stimulation. A computed tomography (CT) scan of the brain and

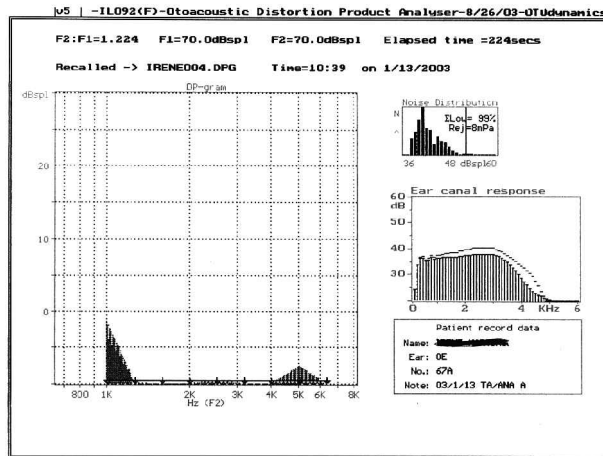


FIG. 3

Otoacoustic emissions were not identifiable on the DP-gram of the left ear.

temporal bones was normal. Detection of serum specific IgE antibodies to penicillin, with the radioallergosorbent test (Rast), was negative.

Discussion

Apart from the cochleovestibular side-effects caused by well-known ototoxic medications, such as the aminoglycoside antibiotics, salicylates, loop diuretics and some other drugs, medications are mentioned rarely as the cause of acute hearing loss. Examples include the anti-thyroid drug propylthiouracil,<sup>1</sup> the vaso-active drug naftidrofuryl,<sup>2</sup> the muscle relaxant agent dantrolene,<sup>3</sup> the chemotherapeutic agent cis-platinum<sup>4</sup> and the immunomodulating agent alpha-interferon.<sup>5</sup> Sudden hearing loss was also described following anti-tetanus serum therapy and other vaccinations,<sup>6</sup> following acute heroin intoxication<sup>7</sup> and following snake bite.<sup>8</sup>

To the best of our knowledge, this is the first report of sudden hearing loss following the administration of penicillin. The mechanism of the cochleovestibular problem in our patient was most probably drug allergy. Some clinical features of the case support this explanation: (1) the very short latency between penicillin administration and occurrence of the symptoms (15 minutes) suggest an immediate hypersensitivity (type I) drug allergic reaction; (2) cutaneous hypersensitivity manifestations in the injection site reinforce the same pathologic explanation for the symptoms; (3) acute hearing loss was never attributed to tonsillitis alone or to other bacterial upper respiratory infections; (4) penicillin G overdosage can be excluded because dosages as high as five to 30 million AU/day can be administered by the i.v. route in severe infections caused by susceptible microorganisms.<sup>9</sup> The assessment of the responsibility of penicillin in the development of the allergy-induced hearing loss, based on previously proposed imputability scales, based on chronological and semiologic criteria,<sup>10</sup> indicated that the drug was probably responsible for the manifestations.

In our patient, a complete audiological study including tests for topodiagnosis of the hearing loss was conducted only 14 years after the acute event. However, immediate pure tone evaluation was performed at the initial episode and documented the type and degree of hearing loss. DPOAEs, ABR and image studies performed at the present, confirmed the cochlear topography of the auditory

disability. Curiously, initial manifestations included vestibular manifestations also. However, prompt resolution of the vertigo, associated with the late demonstration of symmetrical vestibular function by the electronystagmography performed years after the acute symptoms, suggest more important cochlear than vestibular toxicity of the drug reaction. The extent and irreversibility of the cochlear lesion was demonstrated by the profound degree of the hearing loss and the absence of improvement after early corticotherapy.

The slight hearing loss in the right ear is probably age-related. A relationship of this finding with the original episode or with autoimmune inner-ear disease can be excluded based on the absence of clinical profile:<sup>11</sup> the patient neither complained of hearing loss or tinnitus on the right ear at any time, nor had vertigo, dizziness or fluctuating symptoms in the left ear after the first episode.

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Dr P. Escada takes responsibility for the integrity of the content of the paper.

Competing interests: None declared

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