

Resolution of Sudden Sensorineural Hearing Loss Following a Roller Coaster Ride

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Abstract We report a case of sudden unilateral sensorineural hearing loss of sudden onset during an aeroplane flight, which completely resolved during a roller coaster ride at Alton Towers theme park. A review of the literature concerning sudden idiopathic sensorineural hearing loss and spontaneous resolution are discussed. Initially, pure-tone audiometry showed a profound sensorineural hearing loss in the right ear and mild sensorineural hearing loss in the left ear (of note, the hearing was normal prior to the episode). Following resolution of the patient's symptoms during a roller coaster ride, pure-tone audiometry showed normal hearing thresholds in both ears. Sudden sensorineural hearing loss is a symptom of cochlear injury and the mechanism of the patient's symptoms was attributed to a patent cochlear aqueduct.

Keywords Sensorineural deafness · Return of hearing · Patent cochlear aqueduct

Introduction

Sudden hearing loss is defined as hearing loss of greater than 40 dB over 4 contiguous pure-tone frequencies within 4 or less days [1]. For research purposes only there may be variations of this definition. The majority of cases are unilateral and it is a relatively rare phenomenon in children. The current pathophysiology postulated includes labyrinthine viral infection, labyrinthine vascular compromise, intracochlear membrane ruptures, and immune-mediated inner ear disease [2–4]. Although a variety of

treatment modalities have been suggested, a standardised approach remains elusive. However, approximately half of all cases of unilateral hearing loss will make a spontaneous full recovery [5].

Here, we report a case of unilateral sensorineural hearing loss of sudden onset during an aeroplane flight, which completely resolved during a roller coaster ride at Alton Towers theme park. To the best of our knowledge, this has not been reported in the literature before. The roller coaster, known as “Rita-Queen of Speed”, is capable of accelerating passengers up to 100 km/h in 2.5 s [www.altontowers.com]. The undulating nature of the ride includes a rapid descent into a tunnel, and generates a G-force of approximately 4.7 g.

Case Report

A 16-year-old schoolgirl presented to the ENT department with acute right-sided earache and hearing loss 2 days following an aeroplane flight back from holiday. Her symptoms started suddenly during the descent portion of the flight, following which her earache resolved but her unilateral hearing loss persisted. The patient denied any otorrhoea, tinnitus, vertigo or any sensation of fullness in the ears.

The patient denied any previous otological surgery, ototoxic drug use, trauma, excessive noise exposure or previous otological problems. The medical and family history revealed no diseases associated with sudden hearing loss.

On examination, normal findings were noted on otoscopy, but the Weber test lateralised to the left using a 512 Hz tuning fork. The remainder of the ear, nose, throat and neurological examination was unremarkable. Pure-tone

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Fig. 1 A profound sensorineural hearing loss in the right ear and mild sensorineural hearing loss in the left ear was documented in the pure-tone audiogram 2 days after the hearing loss

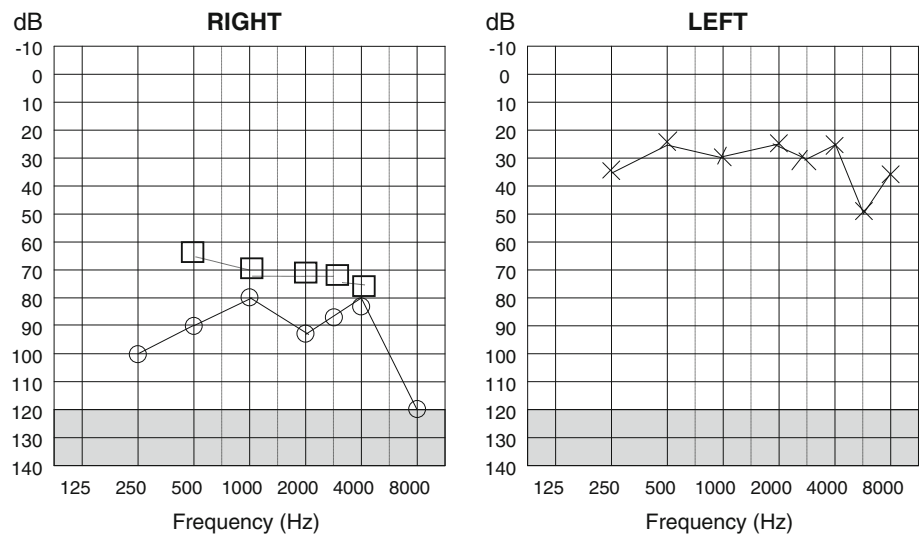
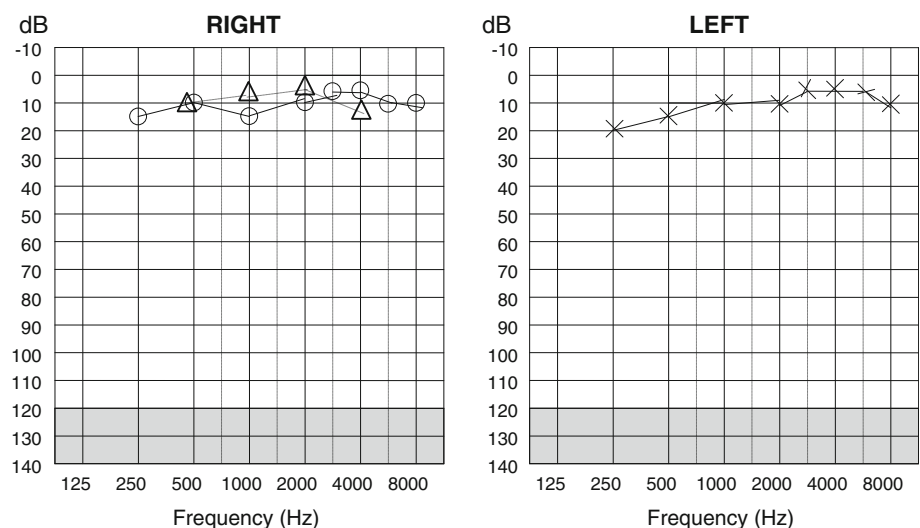


Fig. 2 Normal hearing in both ears was documented on pure-tone audiogram following resolution of the patient’s symptoms following the roller coaster ride



audiometry showed a profound sensorineural hearing loss in the right ear and mild sensorineural hearing loss in the left ear, although the patient was symptomatically unaware of any deficit in the left ear (Fig. 1). Impedance audiometry showed an A-type tympanogram bilaterally.

Conservative therapy was commenced and consisted of a combination of corticosteroids, acyclovir and carbogen. Furthermore, advice was given to the patient regarding the avoidance of intense noise exposure and avoidance of diving or any further flying. The patient’s unilateral hearing loss persisted for 2 months and then suddenly resolved completely during a ride on “Rita-Queen of Speed”, a roller coaster ride at Alton Towers theme park. The patient noticed a spontaneous return to normal hearing during a rapid descent into a tunnel, which is part of the ride. Pure-tone audiometry showed normal hearing thresholds in both

ears, and the results from the other otolaryngological examinations were normal (Fig. 2).

Discussion

Several theories have been proposed to explain the underlying mechanism of sudden hearing loss. These are labyrinthine viral infection, labyrinthine vascular compromise, intracochlear membrane ruptures, immune-mediated inner ear disease, metabolic disorders and medication-induced [2–4]. Each theory may explain a fraction of the episodes of sudden sensorineural hearing loss, but none of the existing theories individually can account for all episodes, perhaps explaining the lack of a coherent treatment approach.

A spontaneous return to normal hearing occurs in approximately half of all patients with unilateral sensorineural hearing loss [5], but in the case that we have described it is difficult to evaluate the underlying mechanism of the initial sudden unilateral loss of hearing and its sudden return to normal 2 months later. Sudden sensorineural hearing loss is a symptom of cochlear injury and, given the circumstances of each event, we suspect that the differential diagnosis lies between a vascular event and a congenital abnormality affected by the pressure changes in the right and left ear.

Intracochlear hyper- and hypotension has previously been described as a cause of sudden hearing loss, for example, following lumbar puncture, stapes gusher and the round window rupture [6]. It was proposed that a change in intracranial and intracochlear pressure leads to the manifestation of sensorineural hearing loss, and we believe that our patient's symptoms may be explained by a patent cochlear aqueduct.

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