Bilateral sudden sensorineural deafness with vertigo as the sole presenting symptoms of diabetes mellitus - a case report

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Abstract This Paper reports a late uncontrolled diabetic presenting to an otolaryngologist with sudden severe sensorineural hearing loss of immediate origin with vertigo and tinnitus as the symptoms. Appropriate investigative and treatment measure resulted in deterioration of hearing in the right ear and mild improvement of hearing in the left ear, with no recovery of imbalance.

Keywords Sudden severe sensorineural hearing loss · Vertigo · Tinnitus · Diabetes mellitus (NIDDM)

Case history

A 55-year-old engineer was admitted to CSJMM University, upgraded KGM University, Lucknow as an emergency with sudden loss of hearing in both ears with vertigo and tinnitus. He noticed a very brief sound in his right ear lasting about a second. He then become completely deaf in both ears and complained of vertigo and high pitched tinnitus. There was no history of facial weakness or discharge from his ears. There was no history of external trauma or sudden straining prior to the onset. There was no history suggestive of a viral infection. There was no family history of deafness. He was a known late diabetic and a hypertensive. There was no other significant past medical history. He was not on any regular medication and described himself as perfectly healthy prior to admission. The hearing in both his ears was known to be normal 12 months before this recent episode.

General physical examination revealed no abnormality in any system. Cardiovascular in central nervous system were normal. ENT examination was normal apart from tuning fork tests which indicated a sensorineural hearing loss in both ears. Hematological investigations including total blood count, ESR, urea and electrolytes, blood glycosylated Hb 1AC and serology for syphilis were done. An audiogram revealed a 110 dB sensorineural hearing loss at 4 KHz. A 55 dB sensorineural hearing loss at 2 KHz and a 45 dB sensorineural hearing loss at 1 KHz in the left ear. It also revealed a 65 dB sensorineural hearing loss at 4 KHz. A 70 dB sensorineural hearing loss at 2 KHz and a 50 dB sensorineural hearing loss at 1 KHz in the right ear. Test for recruitment and tone decay indicated a cochlear loss. Blood glycosylated Hb was 12% without ketonuria. The other investigations mentioned above were within normal limits. The patient was put on insulin drip and anti-hypertensive treatment was begun. Eight days later there was impairment showing deterioration of hearing in the right ear and mild improvement of hearing in the left ear (Figs. 1 and 2). Vestibular tests revealed left beating spontaneous nystagmus present. On performing Binaural Bithermal Caloric test –

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Fig. 1 Audiometry tracing of patient presenting with SSNHL B/L-severe

Cawthorne Hallpike Fitzgerald test: Left beating nystagmus was present. Abnormal canal paresis was found.

CP (n) = + 17% (right)

CP (d) = + 17% (right)

Abnormal directional preponderance was found.

DP = + 30% (right)

On performing unterberger's test craniocorporography angular rotation = 110° right, was extrapolated. Angular deviation = 80° right was extrapolated. Significant right sway was seen on performing Babinski's heel to toe stepping test. Audio vestibular tests therefore suggest a hemorrhagic labyrinthopathy in the right ear. There was no need to dissect the right ear as when the patient was discharged he was Hale and Harty. Slight improvement in hearing in the left ear after 8 days of therapy suggested control of hypertension and diabetes.

Discussion

Sudden sensorineural hearing loss (SSNHL) is defined as a deterioration of more than 35 dB. In at least three different

frequencies occurring within 3 days, with allowance for a longer period of onset if the loss is more severe [1]. There are many causes of SSNHL. These include trauma and labyrinthine membrane rupture, viral and bacterial infections, vascular lesions, immune complex diseases and acoustic neuroma. Diabetes and other metabolic disorders are also well known causes of sensorineural hearing loss.

In our patient the hearing deteriorated at all frequencies after 8 days of therapy in the right ear. In the literature, there are several papers which investigated the relationship between diabetes and hearing loss and vertigo. There is no reported case of any patient presenting with bilateral sudden deafness with vertigo and tinnitus as the only symptoms of diabetes mellitus. Some authors found significant hearing loss in low and middle frequencies in diabetes compared to controls [2–3]. Others found the hearing loss to be significant in high frequencies [4–5].

Audiological tests in our patient showed the hearing loss to be cochlear. The site of lesion in diabetes is thought to be cochlear [6–7], retrocochlear [8–9] or both.

Most of the available experimental and clinical evidence suggests that the complications of diabetes mellitus

Fig. 2 Audiometry tracing of patient presenting with B/L sudden onset hearing impairment 8 days after previous tracing showing deterioration of hearing loss of the right ear

are a consequence of the metabolic derangements, mainly hyperglycemia [10]. Hyperglycemia can cause complications by two important mechanisms:

- Non-enzymatic glycosylation in which glucose chemically attaches to the amino-groups of proteins without the aid of enzymes and after a series of chemical rearrangements, forms irreversible advanced glycosylation end products (AGE). In capillaries for example, plasma proteins such as albumin bind to the glycosylated basement membrane accounting for the increased basement membrane thickening of diabetic microangiopathy. AGEs can also bind to receptors on many cell types resulting in a variety of biological activities including increased procoagulant activity on endothelial cells and enhanced proliferation of fibroblasts and smooth muscle cells.
- Intracellular hyperglycemia occurs in some tissues

(e.g., nerve, lens, blood vessels and kidney) that do not require insulin for glucose transport. This mechanism may be responsible for damage to schwann cells and to pericytes of capillaries with resultant neuropathy and microaneurysms resulting in hemorrhage as is suggested in this patients right membranous labyrinthopathy.

Platelets from diabetic patients show an exaggerated tendency to aggregate, perhaps mediated by altered prostaglandin metabolism. Plasma and whole blood viscosity are increased whereas red blood cell deformability is decreased. All these defects may cause stasis in the microvasculature, leading to increased intravascular pressure and to tissue hypoxia [11] again predisposing to hemorrhage as is suggested in this patients' right membranous labyrinthopathy.

In diabetes, fat may be released from tissues to enter the blood stream and cause fat embolism [12].

Mechanism of simultaneous bilateral cochlear hearing loss in this particular patient

Neuropathy [8], angiopathy [9] and a combination of both may be the underlying pathology of hearing loss in diabetes. Disturbances in the microcirculation of the cochlear end vessels may be prominent aetiological factor [4]. Ischemia of the VIIIth nerve secondary to involvement of small intraneural vessels may be the aetiology in some diabetic patients [9]. Wackym and Linthicum [13] suggest that vascular thickening found around the endolymphatic sac may cause accumulation of toxic waste products in endolymph, which in turn could cause hair cell dysfunction.

About 25–50% of patients with SSNHL recover their hearing partially or completely without any treatment. In the patient under report there was a probable hemorrhagic labyrinthopathy in the right ear, hearing deteriorated inspite of therapy. Since hyperglycemia is the main cause for reversible or irreversible complications, insulin therapy presumably played a major role in partial recovery of hearing in the patient's left cochlea.

This patient presented immediately after the onset of bilateral sudden onset hearing loss with vertigo and tinnitus. It appears to be advisable to hospitalize all such patients of diabetes.

The diagnosis is NIDDM/Type 2 diabetes with cochleopathy left ear and labyrinthopathy right ear.

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