

Increasing hearing loss

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A 40 year old man has been aware of an increasing hearing loss in the right ear. He is no longer able to use the phone on that side. There is a low grade, persistent, high pitched tinnitus and he has recently noticed a tendency to bump into doors or walls when walking. There is no past history of ear disease.

There is very little to note clinically. The tympanic membranes are normal and air conduction right is clearly less than air conduction left but the Rinne test (Figure 1a, 1b) is positive for both sides, ie. air conduction is better than bone conduction.

The Weber test (Figure 2) is heard centrally. When the patient stands with his feet in line and the eyes closed (tandem Romberg's test) (Figure 3) he tends to fall over.

Question 1

Is the hearing loss sensori-neural or conductive?

Question 2

What is the most likely diagnosis?

Question 3

Are this patient's problems with the phone significant?

Question 4

What is the significance of the tandem Romberg's test?

Question 5

Do all patients with this condition require treatment?

Question 6

Does unilateral tinnitus have the same significance as a unilateral sensori-neural hearing loss?



Figure 1a). The fork is held next to the ear to test air conduction

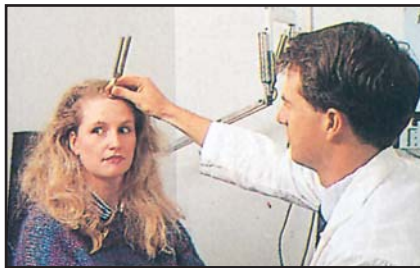


Figure 2. The Weber test

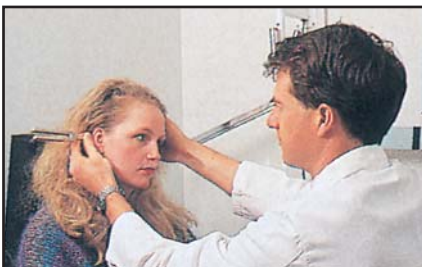


Figure 1b). The fork is applied to the mastoid to test bone conduction



Figure 4. Aluminium tuning fork. Is best struck lightly as shown. Aluminium will hold a tune for much longer than the equivalent steel fork



Figure 3a). The Romberg test



Figure 3b). The tandem Romberg test

Answers



Figure 5. There is a large tumour in the left cerebello-pontine angle with a small extension into the internal auditory canal. There is significant brain stem compression

Answer 1

The patient's hearing loss is sensori-neural. The Weber test gives the best guide to the nature of an asymmetrical hearing loss. It is best carried out with a tuning fork at 512 cycles per second. Lower frequencies transmit vibration rather than sound. If the vibrating tuning fork is placed on the forehead or the top of the skull, it will be heard in the ear with the conductive loss, even when this is very minor. This can be simulated in the observer by repeating the manoeuvre on oneself, firmly occluding the external ear with a finger.

If the hearing loss is sensori-neural, the central tuning fork will be heard in the 'good' ear or in the middle of the head.

When the middle ear is working as it should, air conduction will be heard better than bone conduction, so hearing loss in the test ear in these circumstances is probably in the inner ear (sensori-neural). However, because the middle ear mechanism amplifies sound to a significant degree, a conductive loss has to be marked before bone conduction becomes greater than air conduction.

Answer 2

In this patient, there is strong suspicion of an asymmetrical inner ear hearing loss. If this is confirmed by an audiogram, a tumour of the cerebello-pontine angle has

to be excluded, preferably by magnetic resonance imaging (MRI) (Figure 5).

In approximately 80% of patients with asymmetrical hearing loss no cause is found. Meniere's disease is one of the recognisable causes, as is an acoustic tumour. Head trauma will occasionally produce the same effect as will oto-toxic drugs applied locally.

This patient is unlikely to have Meniere's disease as he does not have the fluctuating hearing loss that characterises this condition. Also in Meniere's disease the vertigo is of the rotatory type, associated with nausea, vomiting and often prostration.

Magnetic resonance imaging is the gold standard investigation in cases such as these. CT scan can also be used, however, smaller tumours - those that project less than 1 cm into the cerebello-pontine angle - may be missed. Caloric tests, ENG or other audiological tests no longer have much of a role in the diagnosis of cerebello-pontine angle tumours as MRI is so accurate.

Answer 3

Problems with using the phone are significant as tumours of this type result in a loss of ability to understand amplified speech, referred to as the speech discrimination score (SDS). An inability to understand speech on the phone, out of proportion to the degree of hearing loss, is a pointer toward an underlying tumour.

Answer 4

Romberg's and its more severe variant tandem Romberg's, is a nonspecific test which, by narrowing the proprioceptive base (feet together or in line) and closing the eyes, throws the greater part of the responsibility for keeping upright on the labyrinths. It does not tell us which labyrinth is at fault so the direction in which the patient falls has no significance. The test is invalid if there are problems with proprioception, eg. knee or hip disease or if cerebellar function is not normal.

Answer 5

As tumours in the cerebello-pontine angle are nearly all benign histologically

(acoustic neuroma or schwannoma, meningioma, epidermoid cyst) many can be followed, having serial imaging at yearly intervals. This is especially so in the elderly or infirm. In younger patients, especially when contact with the brainstem is beginning, surgical treatment is required.^{1,2}

Answer 6

Unilateral tinnitus, which is steady and persistent, should be assessed in the same way as a unilateral inner ear hearing loss.

Tinnitus which is pulsatile (ie. pulse synchronous) has different implications. If a stethoscope on the scalp reveals a bruit, an arterio-venous malformation has to be excluded. A mass in the middle ear in these circumstances would suggest a glomus tumour.

References

1. Al-Abdulwahed S, Fagan P A. Acoustic neuroma: the use of radiotherapy and a comparison with the results of surgery. *Aust J Otolaryng* 1999; 3:211-218.
2. Glasscock M E, Pappas D G, Manolidis S, Vondorsten P G, Jackson C G, Storper I S. Management of acoustic neuroma in the elderly population. *Am J Otol* 1997; 18:236-242.