Clinical Skills

Rinne's and Weber's Tests

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Aims and Outcomes

The aim of this tutorial is to understand the purpose of Rinne's test and Weber's test and to understand when you would use it

Learning Outcomes

- Understand the purpose of the two tests
- Understand when you would use them
- Know how to perform them
- Be able to interpret the results

Introduction

In clinical practice it is common to see patients complaining of hearing loss. It is useful to be able to have a simple test that can distinguish where the site of the cause of the hearing loss is. This can help guide the need for further examination, investigation and management.

Rinne's test and Weber's test are done to differentiate between a **conductive** (middle and outer ear causes) and a **sensorineural** deafness (caused by damage to the cochlea or to the 8th nerve – or its central connections). These tests are always done together. The Rinne test is done first.

Rinne's & Weber's Tests

Anatomy

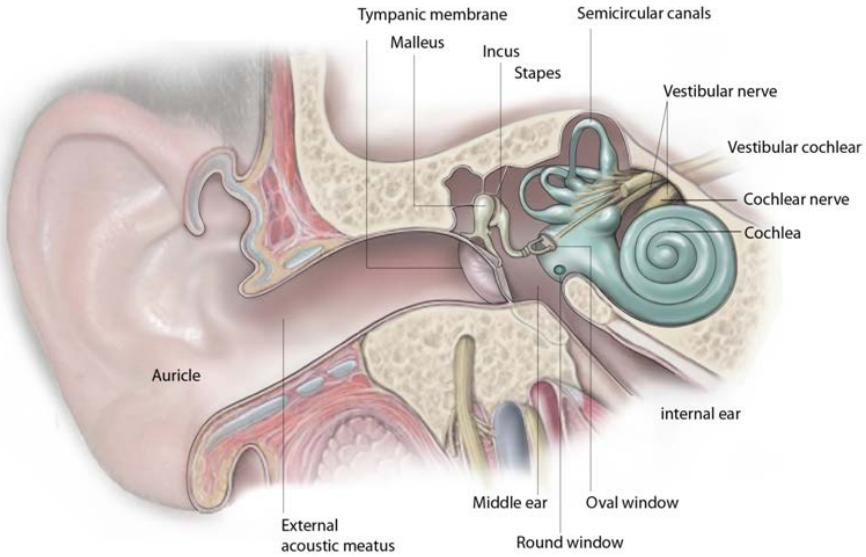
Anatomy

The purpose of the external ear is to collect sounds vibrations form the air and focus these onto the tympanic membrane. These vibrations are then transmitted through the middle ear cavity by the **ossicular chain** (Malleus, Incus and Stapes). The stapes transmits these vibrations to the cochlea through the oval window (*fenestra ovalis).*

Sound can also be transmitted through the bones of the skull to the cochlea.

The hair cells in the cochlea convert the physical vibrations into action potentials that are transmitted via the nerves in the vestibulo-cochlear (auditory) nerve to the brainstem for further processing.

Deafness can occur due to interruption at any point along this pathway.



Rinne's & Weber's Tests

Equipment needed

Equipment

You will need a 512Hz tuning fork.

Please do NOT use 128Hz or 256Hz tuning forks as these are used to assess vibration sensation in neurological examinations.

The room that you are using should be reasonably quiet.

Rinne's & Weber's Tests

Procedure (1 of 3) – Rinne's test

Procedure (1 of 3)

Consent;

You will be touching the patient so verbal agreement by the patient should be sought for performance of this test

Procedure (2 of 3)

How to start a tuning fork vibrating correctly;

- Hold the flattened part of the shaft loosely between your thumb and first finger. Holding it too firmly can dampen the vibrations.
- Strike the tuning fork against a firm surface about a third of the way down the tines of the fork.
- Your knee cap or a firm rubbery surface make good surfaces to hit it against. Hitting against a very hard surface may cause multiple harmonics and distort the frequency.
- Practice your technique for this, as a smooth even pitch of reasonable duration and loudness is key to performing this clinical skill

Rinne's & Weber's Tests

Procedure (3 of 3) – Rinne's test

Procedure (3 of 3)

Rinne Test:

The vibrating tuning fork is presented first with the tines at the external auditory meatus for a few seconds and then the base is pressed firmly on the mastoid process behind the ear. The patient is asked which is heard the louder.

Hold the tuning fork 1-2cm from the ear with the tines in line with the ear canal (not at right angles).

When you are pressing the base firmly on one side of the head it is best to support the other side of the patient's head with your other hand. Ensure you avoid spectacles side arms.

If you are not pressing reasonably firmly then you will only vibrate the soft tissues of the scalp and not the bones of the skull.

Rinne's & Weber's Tests

Results – Rinne's test

Results;

The tuning fork should be heard louder when presented at the external auditory meatus and this is the normal situation. The patient is called Rinne positive on that side (the ossicular chain is doing what it should be doing and acting as an amplifier).

If the bone conduction through the mastoid process is heard louder than through the air then the patient is Rinne negative. This is always abnormal.

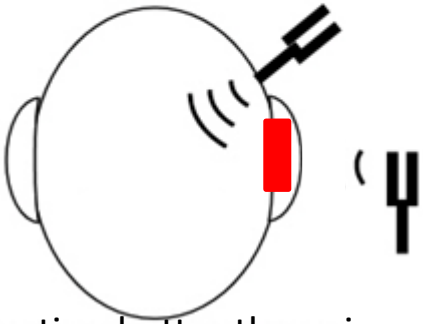
Rinne's & Weber's Tests

Interpretation (1 of 3) – Rinne's test

Interpretation (1 of 3);

If the patient is Rinne negative (abnormal) then this implies that something is preventing air being transmitted through the external auditory canal, the drum, the ossicular chain or the oval window.

Rinne's Negative on left



Bone conduction better than air conduction on left side
= Rinne negative
= left conductive deafness (usually)

Rinne's & Weber's Tests

Interpretation (2 of 3) – Rinne's test

Interpretation (2 of 3);

Causes in the external auditory canal include;

- Wax in the external canal
- Infection in the outer ear canal (otitis externa)
- Foreign body in ear canal

Causes due to the drum are;

- Perforation of the drum (secondary to trauma or infection)

Rinne's & Weber's Tests

Interpretation (3 of 3) – Rinne's test

Interpretation (3 of 3);

Causes in the middle ear include;

- Infection in the middle ear (acute otitis media)
- Serous otitis media (glue ear) caused as the end result of repeated bouts of acute otitis media.

Causes at the oval window;

- Otosclerosis, where there is a failure of transmission of sound from the stapes through the oval window due to abnormal bone growth.

Rinne's & Weber's Tests

Caution

Caution;

A patient with a profound sensorineural deafness may have a false Rinne's negative.

The reason being that with complete loss of innervation to that ear the patient shouldn't be able to hear anything whether the tuning fork is presented to the canal or to the bone of the mastoid. However, they may hear the sound being transmitted through their skull to their remaining good ear on the other side and they may not be able to recognise which ear they are hearing the sound in.

This may give the appearance of bone conduction being better than air conduction when in fact the ear is completely "dead".

The way to distinguish between a true and a false Rinne negative test is to perform Weber's test.

Rinne's & Weber's Tests

Procedure – Weber's test

Procedure

Weber Test:

The base of the vibrating tuning fork is pressed firmly on a point of the skull equidistant from both ears. The glabella or the vertex of the skull are most commonly used. The glabella is the smooth part of the frontal bone between the eye brows. The vibrations should be transmitted through the patient's skull to the cochlea in both ears.

When using the glabella, the back of the patient's head should be supported by the examiner's other hand.

Ask the patient to point to the ear they hear the sound more clearly.

Rinne's & Weber's Tests

Results – Weber's test

Results;

In Weber's test the tuning fork should be heard equally in both ears and this is the normal situation. The patient may have difficulty saying where the noise is coming from and just say all over the head. However, it should be symmetrical.

If the sound is heard louder in one ear then this is abnormal.

Rinne's & Weber's Tests

Interpretation (1 of 2) – Weber's test

Interpretation (1 of 2);

If the sound is heard louder in one ear then this this can be caused by a conductive hearing loss on that side ***OR*** a sensorineural hearing loss on the other side.

A simple way to demonstrate and understand Weber's Test on yourself is to place a finger occluding one ear (mimicking a conductive deafness) and with a tuning fork sounded over the vertex of the skull. Sound will be conducted to the occluded ear.

If both ears are affected by a conductive hearing loss the tuning fork will be heard in the ear which is the more affected.

In a sensorineural hearing loss then the sound is transmitted to the better functioning cochlea.

Rinne's & Weber's Tests

Interpretation (2 of 2) – Weber's test

Interpretation (2 of 2);

Causes of a sensorineural hearing loss include;

•Inflammatory causes – meningitis, viral infections (eg mumps, measles or rubella)

•Ototoxic drugs – aminoglycoside antibiotics (eg gentamycin), aspirin (in overdose) or loop diuretics (eg furosemide).

•Trauma – causing a base of skull fracture causing damage to the cochlear or disruption of 8th nerve

•Tumour – acoustic neuroma – a benign tumour compressing the 8th nerve in the bony canal

•Idiopathic - Meniere's disease (a disease of older people causing vertigo, tinnitus and lower frequency hearing loss)

Rinne's & Weber's Tests

Exercise 1

Exercises not available in PDF version.

Rinne's & Weber's Tests

Exercise 2

Exercises not available in PDF version.

Rinne's & Weber's Tests

Exercise 3

Exercises not available in PDF version.

Rinne's & Weber's Tests

Summary

Summary

- Rinne's and Weber's tests are always performed together
- They are a good way to distinguish between conductive and sensorineural deafness
- Once you know where the site of the lesion is you are in a much better position to perform further examinations (eg otoscopy) or investigations (audiology, tympanometry, CT scanning) to reach a precise diagnosis of the cause of the patient's loss of hearing.
- The results of these two tests will frequently influence your clinical management.

Further Information

Rinne's Test
http://www.gpnotebook.co.uk/simplepage.cfm?ID=-905576435

Weber's Test
http://www.gpnotebook.co.uk/simplepage.cfm?ID=349175824

Video of examination being performed
http://www.youtube.com/watch?v=4WzGmDD0Zq8&feature=related

Diseases of the Ear, Nose and Throat (Lecture Notes Series) 10th Edition
Ray Clarke, Peter D. Bull Wiley-Blackwell 2007