Recommended procedure for Rinne and Weber tuning-fork tests

British Society of Audiology

Introduction

Over the past century, an enormous diversity of methods for conducting the Rinne and Weber tests has evolved. Practicing clinicians are likely to favor the method that they are familiar with, yet scientific data comparing widely used procedures are sparse. Familiarity also plays a role. Hence, clinicians are most likely to achieve satisfactory results with their favorite method. These circumstances have led to a climate of opinion in which many eminent clinicians have strongly held but opposing views as to the "correct" method.

This discourse aims to describe a single method for each test (Rinne and Weber) that is simple and convenient to carry out in a typical clinical environment and which has support from some (but not all) practicing clinicians. Two basic aspects of the method were chosen primarily from pragmatic considerations: to use a balanced comparison method for the Rinne test and a tone of 512 Hz for the Weber test. It was considered that the potential advantages, in terms of ambient acoustical requirements, outweighed the possible slight accuracy obtained by using the threshold comparison methods or by using a 256 Hz tone. Implicit in this choice was the acknowledgement that tuning-fork tests provide only an indirect indication of the type of hearing loss and are not to be used for properly conducted pure-tone and speech tests.

Uses

Tuning-fork tests are used to establish the probable presence or absence of a significant conductive element to a hearing loss. There are two main tests, the Rinne and Weber tests, which are complementary to one another. Of the specially designed otological tuning-forks available, those tuned to 256 or 512 Hz are commonly used. The preferred frequency for this procedure is 512 Hz. It is preferable to carry out the Weber test first, as prior knowledge of the Weber test result may reduce the likelihood of obtaining a "false negative Rinne" (see below).

Striking the fork

Do not strike the fork on a hard surface. Besides damaging the fork, overtones are produced which may give a false result. Preferably, strike the fork on a hard rubber pad, the elbow, or knee. The fork should be struck about two-thirds of the way along the handle to minimize distortion products. A gentle tap is usually sufficient.

The Weber test

Procedure: Strike the fork and place the base on the vertex. Alternative locations are the bridge of the nose, upper lip, or forehead.

Patient response: Ask the patient if the sound is heard and whether it is heard in the middle of the head or in both ears equally, towards the left or towards the right.

Interpretation

In a normally hearing subject, the tone is heard centrally. Otherwise, the tone is generally heard on the side of the better cochlea, but it may be complicated by the presence of a unilateral or asymmetrical conductive hearing loss where there is a tendency for the tone to be heard towards the conductive side or the side with greater conductive
Interpretation of the Weber test in cases of bilateral hearing loss is particularly prone to error.

**Rinne test**

This version of the test compares the loudness of the perceived tone by air conduction (a-c) and bone conduction (b-c).

**Procedure**

**Air-conduction presentation:** Strike the fork and hold it with the axis joining the tip of the fork in line with the axis of the external ear canal for 2 s. The nearest tip should be approximately 2.5 cm from the entrance to the ear canal.

**Bone-conduction presentation:** Immediately transfer the fork so that the base is pressed firmly directly against the mastoid (i.e., no hair between fork and mastoid). Hold these for about 1 s, applying counter-pressure to the opposite side of the head with the other hand.

**Patient response:** The patient should be asked first if the can hear the tuning fork by a-c. He should respond verbally rather than hearing, although a different procedure can be adopted, for example with children. During or after the bone-conduction presentation, the patient must judge which of the sounds louder by a-c or by b-c.

**Interpretation**

When the a-c is louder than the b-c, the test result is referred to as a positive, which is the result obtained from normal ears and the vast majority of ears with a sensorineural loss. When the b-c is louder than the a-c, the result is referred to as negative. A negative result occurs for ears with a significant conductive element, but it can also occur with a severe sensorineural loss precluding that the test side due to the b-c stimulus being cross-heard by the better cochlea on the opposite side. This latter situation is referred to as a Rinne negative and can be distinguished from a genuine negative result by the basis of the Weber test described above. See examples 4 and 5.

**Examples**

Note that these interpretations are not precise and refer to tuning-fork based hearing masking. They must be supplemented by pure-tone audiometry with adequate masking plus tonal admittance measurements whether possible.

1. Weber central. Rinne positive (R) and (L).

2. Weber (L). Rinne positive (R) and Rinne negative (L). Right normal or sensorineural loss in the left.

3. Weber (R). Rinne positive (R) and Rinne positive (L). Normal or mainly sensorineural loss, probably greater on the left or with a slight conductive element on the right.

4. Weber (R). Rinne negative (R) and (L). Bilateral conductive hearing losses. Probably greater on the right but could be sensorineural loss in the left (i.e., false negative Rinne; see above).

5. Weber (R). Rinne positive (R and (L). False negative Rinne (see above) due to a severe sensorineural or mixed loss on the left and a relatively normal cochlea on the right.

Note: With long-standing sensorineural hearing loss, the Rinne test is generally normal. The Weber response may be central, not strictly unilateral.