

Technical note

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. Practising clinicians are likely to favour the method that they are familiar with, yet scientific data comparing widely used procedures are sparse. Familiarity also implies skill. Hence, clinicians are most likely to achieve satisfactory results with their favourite 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 document aims to describe a single method for each test (Rinne and Weber) which is simple and convenient to carry out in a typical clinical environment and which has support from some (but not all) practising clinicians. Two basic aspects of the method were chosen partly from pragmatic considerations: to use a loudness comparison method for the Rinne test and to use a 512 Hz fork. It was considered that the attendant advantages, in terms of ambient acoustical requirements, outweighed the possible greater accuracy obtained by using the threshold comparison method or by using a 256 Hz fork. Implicit in this choice was the acknowledgement that tuning-forks provide only an initial indication of the type of hearing loss and are no substitute for properly conducted pure-tone audiometry with masking.

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 pre-

ferable to carry out the Weber test first, as prior knowledge of the Weber test results may reduce the likelihood of missing a 'false negative Rinne' (see below). A moderately quiet room is required, as excessive ambient noise will influence the results. This procedure assumes that the clinician has already obtained an assessment of the overall severity of the hearing loss by conversing with the patient.

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 tine to minimise distortion products. A gentle tap is usually sufficient.

The Weber test

Procedure

Presentation: Strike the fork and place the base on the vertex. Alternative locations are the bridge of the nose, upper incisors 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

loss. 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

a-c presentation: Strike the fork and hold it with the axis joining the tips of the tines in line with the axis of the external ear canal for 2 s. The nearest tine should be approximately 2.5 cm from the entrance to the ear canal.

b-c 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 there for about 2 s, applying counter-pressure to the opposite side of the head with the other hand.

Patient response: The patient should be asked first if he can hear the tuning fork by a-c. He should respond verbally rather than nodding, although a different procedure can be adopted, for example with children. During or after the b-c presentation, the patient must judge whether the tone 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 positive, which is the result obtained from normal ears and the vast majority of cases with a sensorineural loss. When b-c is louder than 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 predominantly on the test side due to the b-c stimulus being cross-heard by the better cochlea on the non-test side. This latter situation is referred to as a 'false Rinne negative' and can be

distinguished from a genuine negative result on the basis of the Weber test described above. See examples 4 and 5.

Note: Masking of the non-test ear, for example with a Barany box or by tragal rubbing, may be used to prevent cross-hearing but is difficult to interpret accurately due to either over- or under-masking. The test is *not* a substitute for correctly performed audiometry using the plateau-seeking masking method. Care should be taken with the use of a Barany box due to the high sound levels generated.

Examples

Note that these interpretations are not precise and refer to tuning-fork tests without masking. They must be supplemented by pure-tone audiometry with adequate masking plus oto-admittance measurements whenever possible.

1. Weber central. Rinne positive (R) and (L). Either bilateral normal or bilateral mainly symmetrical sensorineural

2. Weber (L). Rinne positive (R) and Rinne negative (L). Right normal or sensorineural. Left conductive.

3. Weber (R). Rinne positive (R) and Rinne positive (L). Normal or mainly sensorineural losses, 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 right but could be sensorineural loss in left (i.e. false negative Rinne; see above).

5. Weber (R). Rinne positive (R) and Rinne negative (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 in one ear, the Weber response may be central, not lateralised.