

## OBJECTIVE HEARING TESTS

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In the Danish State Hearing Rehabilitation Centre in Copenhagen about 36.000 hard-of-hearing persons have been examined in the course of the past 11 years; of those about 500 have been registered as simulants, these are usually school children, soldiers or insurance-cases.

Of the 6 sound-isolated rooms one is specially equipped for most of the relevant hearing tests, where every instrument is always ready for immediate use. To begin with we take a pure tone audiogram and see whether it corresponds to the speech reception threshold on either ear. If there is any discrepancy we continue with 2 objective pure tone tests and 2 objective speech tests all of them delivered monaurally through head-phones.

1. **The psycho-galvanic-skin-resistance reflex (PGSR)** is very useful but could not be elicited in 30% of the patients.

2. **The impedance test** has been improved for clinical use by the engineer of the hearing centre **S. Scott Nielsen** in collaboration with dr. **K. Terkildsen** who will read a paper at this congress about the further details. One has to bear in mind that the instrument registers the contractions of the intra-aural muscles and normally when one ear is stimulated by a tone with a loudness of 75 db the muscles in both ears react. Therefore we stimulate one ear and register the reaction in the contralateral ear and then the procedure is repeated vice versa.

If we get no musculereflexes by maximal sound stimuli of 110 db through the contralateral n. acusticus a tactile reflex may be elicited through the homolateral n. trigeminus which shows that the transmission mechanism of the middle ear is intact on the registering side while the hearing is poor on the stimulated side. If the reflexes through both nerves are absent the transmission mechanism in the registering ear is damaged.

3. **The delayed speech test** is used with a constant delay of 300 msec. while the intensity can be altered up to 100 db. Normally the speech of the patient begins to be influenced by a loudness of 60 db, but if he can continue to talk quite well at rising intensities, it is a good trick to ask him to whistle a melody.

4. **The Doerfler-Stewart test.** The idea is to disturb "the patient's mental yard stick" for what he should be able to hear by varying the intensity of white noise in the same head-phone. The white noise normally must be about 15 db louder than the speech in order to drown the words.

**Example:**

50 y. old man who has been exposed to an explosion 1 year ago with rupture of the right drum and now he claims compensation. He says, he is totally deaf in the right ear and has a severe hearing loss in the left ear so that he mostly has to rely on lipreading in communication. Otoscopy shows a scarred right drum and a normal left one.

First air conduction audiogram shows no hearing in right ear and a loss about 50-60 db in the left.

**Fig. 1**

| <b>otoscopy</b>   | <b>right<br/>scars</b> | <b>left<br/>normal</b> |
|-------------------|------------------------|------------------------|
| 1. air-conduction | > 110                  | 50-60 db               |
| speech            | > 110                  | 15 db                  |
| 2. air-conduction | > 110                  | 15 db                  |
| bone-conduction   | > 60                   | 15 db                  |
| P G S R           | no                     | no                     |
| Delayed Speech    | 85                     | 75 db                  |
| Impedance         | 95                     | > 110 db               |

The Speech reception threshold is beyond 110 db in the right and only 15 db in the left ear, and the patient then is warned to cooperate honestly in a second tone audiogram which now shows a considerable "improvement" in the left ear in correlation with the speech reception threshold.

The bone-conductor now is placed behind the right ear but even at intensities so loud that the tones must be heard in the left ear, he insists he hears nothing. Of course this is suspicious, and the problem only is to ascertain how much hearing he has in the right ear.

The psycho-galvanic-skin-resistance reflex cannot be established in this man due to his thick corium.

The delayed speech test shows effect in each ear separately about an intensity of 85—75 db.

Impedance test. On stimulation of the right ear with its scars an intensity of 95 db is necessary to elicit reflexes in the left ear, i.e. 20—25 db above normal threshold. On stimulation of the left ear it is impossible to elicit reflexes in the right ear, on account of stiffness in the middle ear mechanism explained by the visible scars. It was not necessary to put the Doerfler-Stewart test and the Stenger test into action in order to arrive at the conclusion.

**Conclusion:**

This patient is not deaf on his right ear nor hard of hearing in his left. It is stated subjectively and objectively that the hearing in the left ear is within normal limits. In his right ear the objective tests and the Otoscopy shows that he has a slight hearing loss of about 25 db caused by scar tissue and demonstrated by means of the delayed speech test and the impedance test.

## EXAMENS OBJECTIFS DE LA FONCTION AUDITIVE

Au Centre de Réhabilitation auditive de l'État danois à Copenhague il a été enregistré, au cours de onze années, environ 500 simulateurs sur 36.000 sujets au total. Tout d'abord on étudie, si l'audiogramme tonal du malade correspond bien avec le seuil auditif pour la parole. Si tel n'est pas le cas, et si d'ailleurs on suspecte le malade, on fait des examens objectifs de l'audition, parmi lesquels on a surtout du plaisir à employer l'épreuve de résistance cutanée psycho-galvanique et la mesure d'impédance, méthode par laquelle on peut déterminer la question de savoir si les réflexes musculaires intra-auraux ont lieu aux intensités ordinaires de 70—80 db.

Le test dit «delayed speech test» et le test de Doerfler-Stewart peuvent être considérés comme des épreuves auditives objectives, car la malade est privé du contrôle sur l'intensité de sa propre voix.

Dans l'exemple mentionné il s'agit d'un homme âgé de 50 ans qui a été exposé, il y a un an, à une catastrophe causée par une explosion, et qui demande maintenant des dommages-intérêts pour surdité tonale de l'oreille droite et quasi-surdité moyenne de l'oreille gauche; Les résultats d'examen se voient sur la fig. 1. Conclusion: le malade perçoit dans les limites du seuil auditif normal de l'oreille gauche. Quant à l'oreille droite il y a une réduction auditive d'environ 25 db causée probablement par des altérations cicatricielles (cfr. otoscopie) et constatée d'une part par des mesures d'impédance qui donnaient de la réaction à une intensité de 95 db dans l'oreille droite (normalement 70 db), d'autre part par le test dit «delayed speech test» qui a influé sur la parole du malade à une intensité de 85 db dans l'oreille droite (normalement 60 db).

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