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Invited Paper

Closure of the ear canal opening and its effects on hearing tests

K. Gyo, T. Maetani, Matsuyama; Japan

Objective: Three issues concerning closure of the ear canal opening were investigated.

- 1) What kind of sound is heard by closure of the ear canal opening?
- 2) How far the sound is emitted to the ear canal during testing of bone conduction hearing? Is this affected by wearing an air-conduction receiver?
- 3) Does wearing an air-conduction receiver affect on the results of tinnitus match test?

Methods:

- 1) This study was conducted in 5 male volunteers. They were asked to express quality of sound heard by closure of the ear canal opening with a finger or by pouring water into the ear canal. Comparative sound was provided from the other side of the ear.
- 2) Twenty-two ears of 11 normal male volunteers were the subjects of this study. Effects of wearing an air-conduction receiver on emitted sound in the ear canal during bone-conduction testing were investigated.
- 3) This study was undergone in 25 patients suffering from unilateral tinnitus. Pitch match and loudness balance tests were performed by presenting comparative sounds to the uninvolved ear, with and without wearing an air-conduction receiver on the involved ear.

Results:

- 1) Sealing with a finger or water caused a tinnitus-like sound with an intensity of 17.2 ± 4.5 dB and 9.4 ± 2.2 dB, respectively. Both procedures induced sound similar to 125 Hz band-pass noise.
- 2) When a bone conduction receiver on the forehead is activated, sound pressure recorded in the ear canal was larger by wearing an air-conduction receiver by 17.9 ± 4.9 dB at 0.8 kHz, although it decreased at 2-4 kHz.
- 3) Pitch of the tinnitus was differently perceived by wearing the receiver in 9 of 25 patients (36%), while that of loudness in 15 patients (60%).

Conclusion: Closure of the ear canal opening affect variously on auditory testings. Therefore, careful attention should be paid in evaluating the results with closure of the ear canal.