Indian Journal Of Otology
Vol. 16, Sep.-Dec. 2010. P.3-4

Masking in Audiometry

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The sound presented to the specific ear is heard by the same ear but sometime it is heard by the opposite ear this is termed as *crosshearing* for example if left ear hearing is normal that is bone conduction around 5-10 dB and right ear is total deaf and the threshold of air conduction is around 60 dB above which the sound presented will be heard by the opposite (better) ear. This actually results by signal transferred to better ear this is termed as *signalcrossover* and the amount of energy lost by sound reaching from test ear to the non test ear is termed *interaural attenuation (IA).*1 which is different for different frequencies and is higher at higher frequencies.Level of masking depends upon the bone conduction of better ear. One must remember that this inter aural attenuation is for air conduction only which is different for head phones and insert phones .In india usualy head phone are available for masking since inter aural attenuation is more with insert phones because high level of sound that is more than 60 db is required for shift to other side Bone conduction vibrator stimulates both cochlea simultaneously and regularly.2 To prevent this signal cross over for non test ear we have to use masking which may be broadband/narrowband depending upon the requirement. Masking helps by shifting the sensitivity of the cochlea of non test ear to prevent it from hearing the signal delivered to test (poor) ear. In routine audiometry initially we do air conduction followed by bone conduction but once masking is required we have to repeat the test and do the bone conduction first, as explained you earlier that by the bone vibrator both the cochlea are stimulated simultaneously but for air conduction sound has to travel across the head by bone conduction.3,4 (Studebaker 1962). To prevent this cross over we have to assess the interaural attenuation which is usually 40db2 (Martin 1980) but must be finalized for every patient and at all frequencies in all cases. The interaural attenuation of bone conduction is between 0 to 15 db (Silverman, S.A.Gelfand). 5 at 2000 Hz and 6, 4000 Hz(Silverman, S.A.Gelfand) Masking used in audiometry is different what is used for tinnitus. To mask the tinnitus, sound is presented in the affected ear while in audiometry the masking (noise) is provided in the non test ear. The masking noise is provided by air conduction no matter weather we are testing for air conduction or bone conduction.Most of the audiometer provide Frequecy modulation of masking noise with specific frequency of pure tone Some patients get confused by masking especially in children in these cases interrupted pure tone provided to test ear may solve the problem. Narrow bone masking is used for pure tone and broadband or speech noise masking is a better choice for speech audiometry. Bone conduction threshold should be tested with masking when air bone gap is more then 10dB. It never means that bone conduction should be tested first rather retested

with masking after routine audiometry. 7 We must keep in mind that there is cross over of signal in central auditory pathways also, hence whenever masking is provided in one ear it affects the better ear also, usually 5dB to 10dB threshold shift is noted in better ear that's why masking should be provided at least 5dB higher then the tone presented in the test ear . To confirm appropriate masking the masking noise level is reduced by 5dB which results in tone to be heard again in the better ear. One must remember that just adequate masking is of utmost importance neither low level masking nor high level masking is justified both will provide false results. The over masking will result in cross over of noise and resultant will be high level of threshold due to masking of the tones, hence adequate masking is 5dB above the tone it can mask but masking more then to 10 dB will result in central masking and threshold shift.8 Masking will result in tone decay in cases of patients without threshold adaptation hence SISI scores may be higher with masking then without masking.9

When ever testing the bone conduction with masking, initially bone conduction threshold should be rechecked with placing the headphone as for masking without giving masking noise this will determine *occlusion effect* this difference is added to level of masking. One must remember that while doing bone conduction placing the headphone over both the ear should not be placed especially with audio cup which leads to occlusions effect providing false results. Audio cup are no substitute of sound proof room for prediction of adequate level of bone conduction threshold..

One must remember that noise is termed as an unwanted sound which is usually not pleasent and results in an early fatigue this is more true with elderly, sick head injury and brain damage patients, may not be disturbing but certainly noise is not acceptable by children.

It is must to find out *plateau* which is a range of masking levels in which there is no increase in theshold shift of the test ear. Our goal is to select a signal that will provide the larger shift in threshold with the least noise.9

1-Chaiklin JB. Interaural attenuation and cross-hearing in air-conduction audiometry. J Aud Res 1967. 7, 413-424.

2-Paul R, Kileny, Tresa A, Zwolan, Diognostic and rehabilitative audiology in editor Charles W. Cummings, Paul W. Flint, Lee A. Harker, Bruce H. Haughay, Mark A. Richardson, K. Thomas Robbins, David E. Schuller, J. Regan Thomas, in Cummings Otolaryngology Head and Neck Surgery 4th ed. 2005 "ELSEVIER MOSBY" Philadelphia, pennsylvania19106, page 3486-3487.

3-Studebaker, GA. Clinical masking of the non-test ear. J speech Hear Dis 1967. 32, 360-367

4-Martin FN. The masking plateau revisited. Ear Hear 1980. 1, 112-116

5-Silman S, Silverman CA. Auditory Diagnosis: principles and Applications. San Diego: Academic press1991.

6-Stanley A Gelfand Essentials of Audiology 2nd international edition 2007. Thieme Medical Publisher New York page.290-317

7-Goldstein BA New men CW: clinical masking: a decision making process. In Katz J, editor: Hand book of clinical audiology, ed3, Baltimore, 1985 Williams and Wilkins.170-201

8-Hood JD; the principles and practice of bone conduction audiometry, Laryngoscope 1960, 70:1211.9Killion MC, Wilber LA, Gudmundsen GI: Insert earphones for more interaural attenuation, Hear Instr 1985, 36:34.

9-Priede VM, Coles RRA. Masking of the non-test ear in tone decay, Bekesy audiometry and SISI test. J Laryngol Otol 1975. 89, 227-236