MODIFICATIONS OF ABLB AND STENGER TESTS FOR EQUAL BILATERAL HEARING LOSS (ONE EAR-CONDUCTIVE LOSS; OTHER EAR—SENSORY NEURAL HEARING LOSS OR FUNCTIONAL HEARING LOSS) CASES

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ABLB (Alternate binaural loudness balance) and stenger tests are frequently administered in Audiology Clinics for finding recruitment and functional hearing loss in unilateral hearing loss cases respectively. The tests as described by Fowler (1928) and Stenger (Newby 1965) require that the patient should have unilateral hearing loss or he should present a picture of one relatively normal ear and the other ear with some degree of impairment (Sensory neural loss in the case of ABLB). Hence, these tests are considered not useful to cases having bilateral equal hearing loss at all frequencies. But these tests can be modified to cases having equal bilateral hearing loss with one ear conductive loss and the other ear with sensory neural loss or functional loss. In other words, if the ear contralateral to the conductive loss ear is suspected to have Meniere's disease or functional hearing loss, these tests can be modified and be administered. Conductive loss may be present due to atresia or otitismedia or other causes. This paper explains how these tests can be modified to suit such cases.

ABLB

Let us consider a hypothetical case. Let BC threshold of the conductive loss ear (Rt) at 2 KC/S be 10 dB HL and AC threshold of the sensoryneural (Lt) loss ear at 2 KC/S be 50 HB HL.

Instruction to the patient

'You are going to hear tones in both ears alternately. You are required to match the loudness of the tone in the Lt ear with the tone in the Rt ear. Hold the Rt hand at a constant level and vary the height of the Lt hand above or below the Rt hand depending on whether the tone in the Lt ear is louder or weaker than the tone in the Rt ear. If the two tones are heard equal in loudness, hold the hands at equal levels'.

Control settings for Beltone 15 CX Audiometer

Control	*Position*
	(Lower frequencies are not used to avoid occlusion effect.)
'Channel 2 input'	2000 or 4000 C/S
'Output'	'IBC—2L'
'Freq'	Same frequency used in 'channel 2'
'Power Selector' switch	'Auto'
'Channel 1 loss' attenuator	20 dBHL (10 dBSL)
'Channel 2 loss' attenuator	odBHL

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Procedure

After these settings, set the 'tone' switch at continuously 'on' position, As the tone automatically alternates between the ears, adjust the intensity of the 'channel 2 loss' attenuator (which controls the tone going through the earphone (Blue) kept on the Lt ear of the subject) until the subject indicates that the two tones are equal in loudness. Note down the intensity of the AC tone (Dial reading of 'channel 2 loss' attenuator—Let this be X). Then set the dial of the 'channel 1 loss' attenuator (which controls the BC tone reaching the cochlea of the conductive loss ear) at 50 (or 60) dB HL and vary the intensity of the AC tone until the subject indicates that the tones (AC and BC) are equal in loudness. Note down the dial reading of 'channel 2 loss' attenuator. Let this be Y. Calculate interaural intensity difference at 10 dBSL and at 50 (or 60) dBHL of BC tone, i.e , Internaural intensity diff. at 10 dBHL of BC tone at the point of equal loudness=X -20 (20=10 dBSL). Interaural intensity diff. at 50 (or 60) dBHL of BC tone at the point of equal loudness=Y-50 (or 60).

Recruitment may be said to be present if the internal intensity diff. at 50 dB HL (or 60) of BC tone is less than the interaural intensity diff. at 10 dB SL of BC tone by 20 dB or more.

Discussion

According to (Fowler 1928; Tillman, 1969) recruitment is present if the interaural intensity difference at the point of equal loudness is less than the interaural intensity difference at threshold by more than 10 dB. Here, in this modified method interaural intensity difference at 10 dB SL of BC tone is considered instead of at threshold. This is because of the fact that AC and BC tones may not be heard equal in loudness when they are presented at equal sensation levels even in normals. This discrepancy has been noticed (see the data). Ten normal hearing subjects were asked to balance AC and BC tones for equal loudness at 10,20,30,40 and 50 dB SLS. This discrepancy, if not taken into account, may affect the interpretation of the test results. Hence, in order to take into account of the discrepancy, interaural intensity difference at 10 dBSL of BC tone instead of at TH is suggested. To avoid false positives a 20 dB limit has been recommended, instead of 10 dB limit, for the interpretation of test results. This modified test is useful even in the case of bilateral unequal hearing loss provided one ear has conductive loss.

Limitation

If the AC loss of the test ear (Contralateral to conductive loss ear) exceeds 50 dB HL the test cannot be administered because of lateralization (Studebaker, 1964).

Stenger test

The test is based on the principle that when two tones of same frequency but of different intensity are presented to both ears of a normal hearing or equal bilateral hearing loss person, the tone will be heard only in the ear receiving the louder tone.

Let us consider a hypothetical case having conductive loss in one ear (Rt) and functional hearing loss in the other ear (Lt). Let AC threshold of the Lt ear at 2KC/S be 50 dB and BC threshold of Rt ear at 2 KC/S be 10 dB.

Instruction to the patient

'You are going to hear tones in one of the ears. If you hear the tone in the Lt ear raise the Lt hand and if you hear the tone in the Rt ear raise your Rt hand. As long as you hear the tone keep the hand raised'.

Control settings for Beltone 15 CX Audiometer—(Carver 1965)

Control	*Positions*
'Channel 2 input'	2000 or 4000 cps
'Output'	'IBC—**2L'**
'Power Selector' switch	'Man'
'Tone interrupter' switch	'off'
'Frequency'	Same frequency used **in** 'channel 2'
'Channel 1 loss' attenuator	**15 dB (5 dBSL)**
'Channel 2 loss' attenuator	**O dBHL**

Procedure

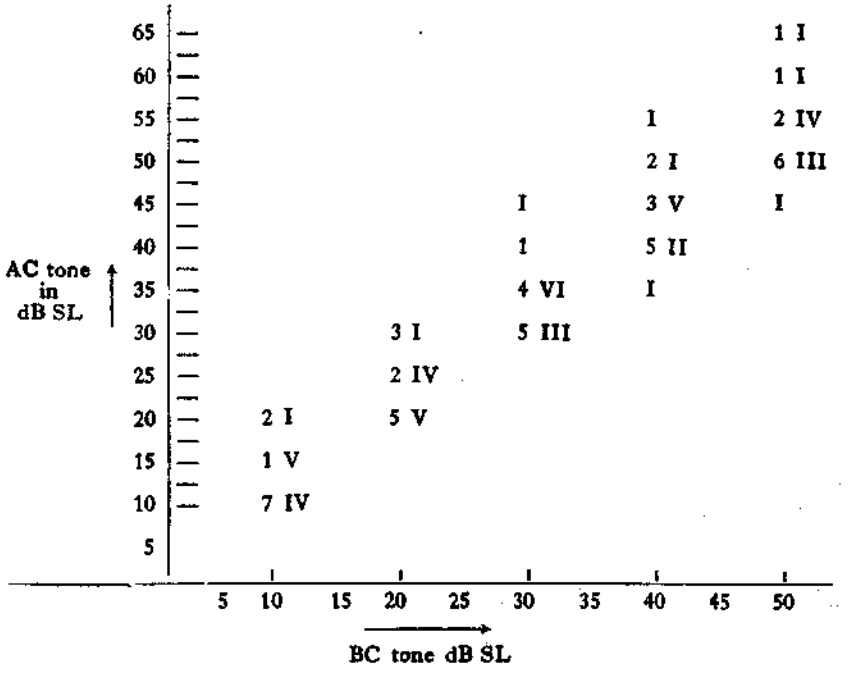
After these settings, the 'tone' switch position should be kept at continuously 'ON'. The level of 'channel 2 loss' attenuator which controls the AC tone in the left ear should be gradually increased upto 40 dB HL (10 dB below the predetermined threshold of suspected ear). Now, the tester can expect three types of responses viz., the subject may 1. Lower his right hand to indicate that he does not hear the tone at all (No response). 2. Keep on raising the right hand indicating that he hears the tone only in the right ear. 3. Raise the left hand instead of right hand to indicate that he hears the tone in left ear.

If the subject demonstrates 2nd response the tester should cut off the tone (BC tone) in the right ear (i.e., by setting the 'Tone', switch **'off'** at position). *(Note:* when the 'tone' switch is at 'off' position the tone in the Blue Earphone will be still present) without the subject's knowledge. Now, if the subject drops his right hand the test can be considered negative. On the other hand, if the subject still holds the right hand raised the test can be considered positive meaning that he has unilateral functional hearing loss (left). Responses 1 and 2 clearly indicate functional hearing loss.

Note: It is suggested that the level of 'channel 2 loss' attenuator which controls the AC tone in the left ear should be gradually increased upto 40 dB HL

(a high level!). Such a high level is suggested because of the fact that BC tone at X dB SL may be slightly louder than AC tone at X dB SL.

Data showing the relation between AC and BC tones for equal loudness.
Arabic numerals represent number of subjects for 2 kcps tone.
Roman numerals represent number of subjects for 4 kcps tone.



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