Diagnostics Testing PT II

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Air conduction testing is done using inserts or supra-aural headphones. Inserts have a 75dB interaural attenuation for frequencies 250-1000 Hz and 50 dB interaural attenuation for frequencies above that. Air conduction testing should start with the better ear first at 30dB and if there is no response, go up 15dB until there is a response using the down 10, up 5 method until there is a 50% response. Testing should follow 1000 ,2000 ,3000, 4000, 6000, 8000, 1000 (retest), 500 and 250 Hz, and if there is a 20dB difference between octaves the interoctaves should be tested (750 and 1500 Hz).

Air conduction masking is conducted when the signal presented to the test ear is audible by the cochlea of the non-test ear. You need to mask for air conduction when the AC TE – AC NTE $\geq$ 40dB. The effective masking noise/level is determined using the AC NTE + MEMC (10dB) + SF (10dB). In order to find the true threshold of the test ear you present the calculated noise level to the non-test ear and present the stimulus tone to the test ear, if the first presentation is audible – this is their true threshold and no need to increase masking levels. If they do not response, you would raise the tone in 5dB steps until they do respond and then you would raise the masking noise by 10dB step and then present the tone again and if they response you would increase the masking noise another 10dB step and if they response 2x, that is the true threshold.

To calculate PTA you use the thresholds of three frequencies of 500, 1000, and 2000 if the adjacent thresholds are within 5dB of each other. If they are greater than 5dB from each other, you use the two best frequencies → these are the frequencies that have the best thresholds.

Bone conduction testing bypasses the outer and middle ear by directly stimulating the cochlea through vibrations to determine the site of lesion/HL. The testing begins by placing the bone vibrator on the poorer ear and testing frequencies 1,2,3,4, 500 and 250, in that order. At each frequency you should start with the better AC threshold at that frequency – does not matter which ear.

Bone conduction masking is done when there is a 12dB gap between the bone conduction and air conduction threshold, because we cannot determine which cochlea is responding. If it seems that both ears need masking, check to see if one ear bone conduction thresholds change by

15dB so that we can be confident that the bone conduction change is corresponding to the other ear, if it is a 10dB or less change, mask the other ear as well.

The occlusion effect can occur when you occlude the non-test ear with the headphones when masking for bone conduction. If there is an occlusion effect you may be increasing the intensity of the bone conduction signal due to osseotympanic bone conduction where sound is not able to escape. We need to find out how much stronger the signal is made due to occlusion at 250, 500 and 1000 Hz to make sure we do not under-mask (this is why we add noise to account for OE). To test for occlusion effect, we test bone conduction at 250, 500 and 1000 Hz with headphones on the NTE (same set up as bone conduction testing) and the degree to which your bone conduction values have improved is the occlusion effect. Another method is using to average values of 30dB for 250Hz, 20dB for 500Hz and 10dB for 1000Hz (use this when BC values are at -10dB).

Overmasking occurs when the masking noise crosses over to the test ear. This happens when the effective masking level – IA is greater than the BC of the TE or the unmasked BC of any ear. The IA for headphones is 40dB and for inserts it is 70dB. If there is crossover, use inserts or mark unmasked level with asterisk and right CNT (masking dilemma).

Cross over is when the signal crosses over to the opposite cochlea and it becomes a clinical issue when cross hearing occurs. Cross hearing occurs when the intensity of a sound is loud enough so that the sound crosses from one side of the head and it is heard in the other ear. Cross over occurs through bone conduction to the cochlea of the opposite ear because the bone conduction vibrator stimulates both ears equally so there is no interaural attenuation for bone conduction.

We test speech recognition threshold to see at what intensity an individual is able to recognize a spondee word. SRT is used to check agreement with pure tone findings, and if SRT is better than PTA it could be due to a functional hearing loss. The pure tone agreement should be 12dB or less when the difference between 500 Hz and 1000Hz is within 20dB. If SRT is worse than PTA it means there is poor speech recognition which could be a result of a retrocochlear pathology, or language/cognitive issues. The threshold is obtained at the lowest intensity that the person gets three words correct. Masking for SRT is done when the SRT – IA is greater than

any NTE BC, and the effective masking levels for SRT is calculated by the NTE SRT + MEM (15) + SF (10).

Speech recognition score aids in the diagnosis of a retrocochlear pathology and allows clinicians to know if someone will benefit from a hearing aid. Masking for SRS is determined prior to testing when the presentation level (PL) – 40 is greater than any AC/BC threshold of the NTE. Presentation level of SRS word lists (NU-6 or W-22) is SRT + 35 for a flat HL or 40dB for a sloping HL. Poor SRS scores and an asymmetrical score is indicative of a retrocochlear pathology, and poorer scores at an increased intensity is a sign of retrocochlear pathology. If SRS scores are less than 80%, you may need to repeat the test at more than one SL.

Rollover index (RI) is indicated by (PB max - PB min)/PB max and a RI greater than 0.45 on the W22 word list of a 0.25 on the NU6 wordlist is indicative of a retrocochlear pathology. The PB max is the maximum SRS on the PIPB function graph and the PB min is the lowest SRS obtained at intensity levels higher than where the PB max is obtained.