

Technical Paper

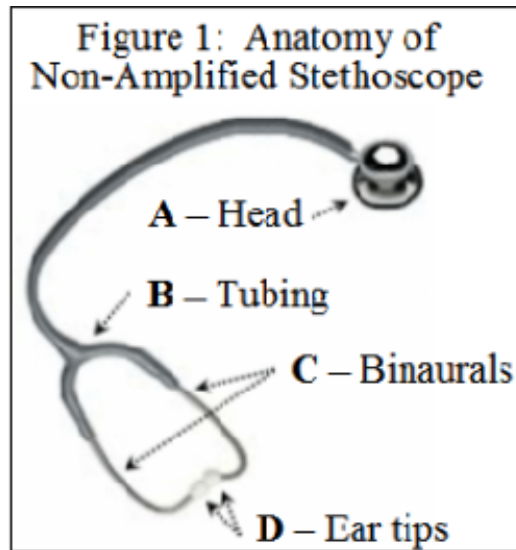
Stethoscope Use without Behind-The-Ear
Hearing-Aid Removal

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The purpose of this article is to detail the use of a stethoscope without removal of behind-the-ear (BTE) hearing aids. The stethoscope parts and earmold design are first described followed by design specifics and optional alterations.

Stethoscope Anatomy

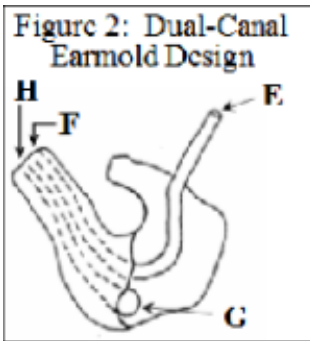
Figure 1 displays the parts of a non-amplified stethoscope. The head (A) is connected to tubing (B) that attaches the binaural (C) to the ear tips (D). The binaural, which gives the stethoscope its typical shape, is an inflexible hollow tube that transmits sound or data from the tubing to the ear.



Amplified stethoscopes (sample not displayed) include electronic components that are typically embedded into the head, tubing or tubing-binaural.

Dual-Canal Earmold Design

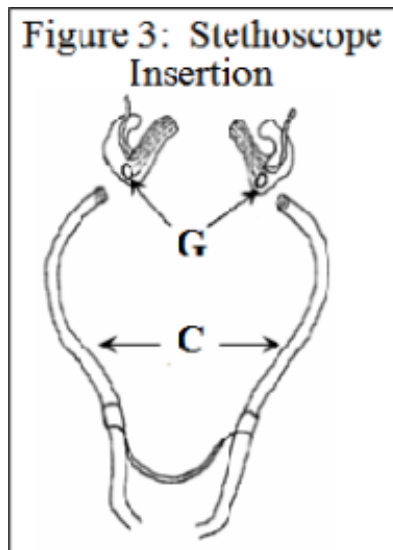
Figure 2 displays a dual-canal earmold for a BTE hearing aid. The tubing (E) connects the hearing aid to the earmold, which transmits sound via the earmold's main canal (or sound bore, E to F). This main canal is the primary canal through which amplified sound from the hearing aid is passed. A second canal (or vent, G to H) parallels the first. This is normally added to relieve ear canal pressure or to allow low frequency sounds into the ear for individuals who are able to hear these.



For some users, a cap (not shown) is placed in the second canal to prevent feedback. This cap is also referenced in the "Earmold Adaptations" section below.

Stethoscope Use

Figure 3 demonstrates the stethoscope insertion (C) into the second canal (G) with the permanent removal of the stethoscope tips (not shown). This design permits stethoscope usage without hearing aid removal.

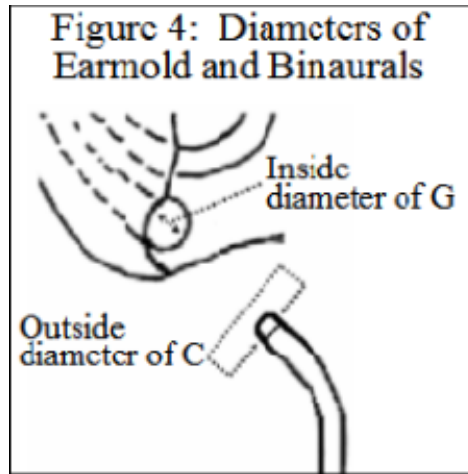


Design Specifics

The second canal's design and diameter is now discussed.

To include a second canal into the BTE earmold, one needs to select the "Select-a-Vent" (SAV) option on the manufacturer's earmold specification form. When a SAV is ordered, a second canal (G to H) is drilled as shown in Figure 2.

Figure 4 illustrates the "inside diameter" of the SAV and the "outside diameter" of the binaural with the ear tips (D in Figure 1) removed. These diameter measurements are important because the binaural outside diameter size must be equal to or slightly smaller than the SAV inside diameter size.



Note that the SAV inside diameter is earmold-size dependent. Smaller earmolds generally have smaller inside diameters while larger earmolds have larger inside diameters. The outside diameter of the binaural is also manufacturer-dependent.

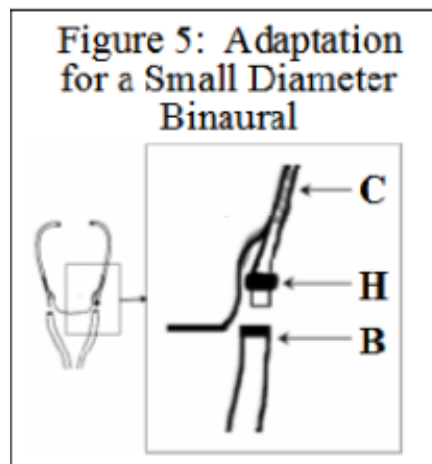
Use of calipers is helpful to determine diameter measurements. Inquiries about diameters from both the earmold and stethoscope manufacturer may be required.

The author's binaural (from a typical \$20.00 stethoscope) has an outside diameter of 0.48 cm. The author's earmold has a SAV canal inside diameter of 0.50 cm. The earmold and stethoscope diameters were obtained from the manufacturers.

Optional Binaural Adaptation

The outside diameter of some binaurals (Figure 3, C) may be too large to fit into the inside diameter of an earmold (Figure 3, G). One solution is to carefully widen the inside diameter of the SAV (Figure 4, G) with a standard drill bit. Another solution is to purchase a binaural with a smaller outside diameter and to insert this new, smaller binaural into the stethoscope tubing.

The outside diameter of the new, smaller binaural can be enlarged by one method as shown in Figure 5. A band of epoxy (H) can be circumferentially applied around the tube ends of the new, smaller binaural to increase its diameter.



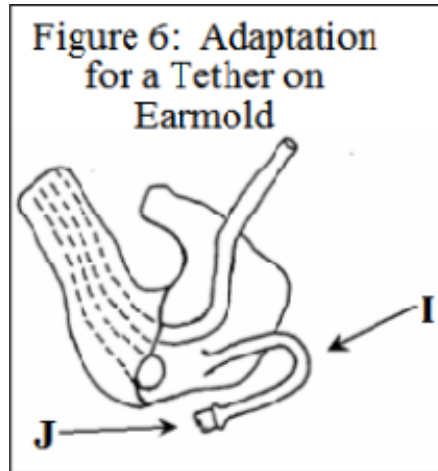
The result will be a properly sized binaural that fits into the earmold's SAV (Figure 4). The author borrowed non-amplified stethoscopes from people with normal hearing to determine which binaural would work best and

then purchased only the binaural from the manufacturer. The author has noted no appreciable degradation in sound quality because of a smaller diameter binaural.

Optional Earmold Adaptations

As mentioned above, the inside diameter of the SAV (Figure 4, G) can be carefully widened with a standard drill bit to accommodate larger sized binaurals.

Individuals with severe hearing loss do not have SAVs in their earmolds due to the problem of acoustic feedback. As shown in Figure 6, a tether (I) can be added to the earmold to permit cap (J) insertion and removal. The author's first and only attempt to self-manufacture a tether-cap combination failed because the epoxy did not adhere well. Further, the tether caught frequently on hair and other objects.



Summary

The purpose of this article was to detail the use of a stethoscope without removal of the behind-the-ear (BTE) hearing aids. BTE hearing aid users are instructed to obtain the diameters of the canal and the binaural before ordering or modifying the earmold and stethoscope.

This is only one method by which to use the stethoscope. Other methods can be utilized as needs arise.

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