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An Advantage of Bone Conduction Devices Is That There Will Not Be Feedback—True or False?

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Bone-conduction hearing devices connected to skin-penetrating abutments (e.g., Oticon Medical Ponto, Cochlear BAHA) can certainly generate feedback. As expected, feedback becomes increasingly concerning with worsening degrees of cochlear hearing loss. However, the mechanisms contributing to feedback in bone-conduction hearing devices differ slightly from those in air-conduction hearing aids.

First, vibrations generated by the device can radiate as air-conducted sounds, which may re-enter the microphone ports of the device. This is what occurs when feedback is triggered by a hat or another object covering the bone conduction device. The second mechanism is less intuitive. When wearing a bone-conduction hearing device on a skin-penetrating abutment, its vibrations are transmitted to the skull. In response, the skull vibrates, delivering these vibrations to the inner ear. However, the skull vibrations are also transmitted outward, through the head. The vibrating skull causes the tissues and skin covering the head to emit acoustic signals, which can radiate as air-conducted sounds. This phenomenon is particularly pronounced in cases of mixed hearing loss. These skin-based acoustic emissions can then re-enter the microphone ports of the device, leading to the familiar feedback loop. Our team at the University of Alberta have developed a prototype microphone capable of measuring these skin-based acoustic emissions. This tool aims to assess the output of bone conduction hearing devices in situ by analyzing these emissions, an approach analogous to real-ear measurements (Hodgetts et al., 2018).

These feedback mechanisms also apply to bone-conduction hearing devices worn on non-surgical attachments, such as soft elastic headbands or adhesives. Whether feedback can occur for devices connected to active transcutaneous bone conduction hearing implants- such as the Cochlear Osia, Med-El Bonebridge, and Oticon Medical Sentio- is less clear. In my practice at iRSM, I currently have a small number of active transcutaneous device users. While anecdotal and requiring further research, I have observed feedback in one active transcutaneous device user. This feedback likely arises from the second mechanism described above. As the field continues to investigate the fitting range of active transcutaneous devices, further exploration of feedback in these types of implants is warranted.

References

Hodgetts, W. E., Scott, D., Maas, P., & Westover, L. (2018). Development of a novel bone conduction verification tool using a surface microphone: Validation with percutaneous bone

conduction users. *Ear and Hearing*, *39*(6), 1157–1164. https://doi.org/10.1097/AUD.0000000000000572