Göteborg, 2024

Objective and subjective outcomes from bone conduction hearing devices

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i föreläsningssal HC2, Hörsalsvägen 14, Chalmers, den 24 maj, klockan 13.00

av Ann-Charlotte Persson

Fakultetsopponent:
Torbjörn Ledin, Professor,
Linköpings Universitet, Sverige

Avhandlingen baseras på följande delarbeten

I. Persson AC, Reinfeldt S, Håkansson B, Rigato C, Fredén Jansson KJ, Eeg-Olofsson M. Three-Year Follow-Up with the Bone Conduction Implant. Audiol Neurootol. 2020;25(5):263-275. doi: 10.1159/000506588.

II. Persson AC, Håkansson B, Caveramma Mechanda M, Bill Hodgetts W, Fredén Jansson KJ, Eeg-Olofsson M, Reinfeldt S. A novel method for objective in-situ measurement of audibility in bone conduction hearing devices - a pilot study using a skin drive BCD. Int J Audiol. 2023 Apr;62(4):357-361. doi: 10.1080/14992027.2022.2041739.

III. Persson A, Håkansson B, Fredén Jansson K-J, Reinfeldt S, Eeg-Olofsson M. Objective verification of audibility in bone conduction devices. International Journal of Audiology. https://doi.org/10.1080/14992027.2024.2335511.

IV. Persson A, Eeg-Olofsson M, Sadeghi A, Lepp M. Patients' experiences of an active transcutaneous implant: The Bone Conduction Implant. *Submitted to Speech, Language and Hearing.*

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Objective and subjective outcomes from bone conduction hearing devices

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Avdelningen för Öron-, näs- och halssjukdomar, Institutionen för kliniska vetenskaper, Sahlgrenska akademin, Göteborgs universitet, Sverige, 2024.

Abstract

Bone conduction hearing devices are generally the best treatment for patients with conductive or mixed hearing loss, or single-sided deafness, who cannot use conventional hearing aids. The aim of this thesis was to explore patients' audibility and experiences of using an active transcutaneous bone conduction device and to develop a new method for objective verification of audibility in patients using bone conduction devices. In **Study I**, the results from the three-year follow-up showed that the Bone Conduction Implant (BCI) generally resulted in the same or better improvement in audiometric results compared to the reference device (Ponto Pro Power on softband) and the unaided situation. In both audiometric measurement and quality of life questionnaires, the BCI and the reference device showed significantly better results compared to the unaided situation. The nasal sound pressure measurements were stable over time, and there were no adverse skin complications due to the magnetic force. **Studies II** and **III** contain results from the development and testing of a new method to objectively measure audibility with a skin microphone placed on the forehead. The results show that the method can be used for measuring audibility and can also be used for hearing aid adjustments in patients with different types of bone conduction devices. In **Study IV**, a qualitative approach was used to get a deeper understanding of patients' experiences of using and living with the BCI. The data collection consisted of in-depth interviews, which were analysed according to the phenomenographic approach. The analysis resulted in four different themes, which were further represented through three or four categories. The overall results showed that the BCI can be an effective and safe treatment for patients with conductive or mild to moderate mixed hearing loss. Furthermore, in the interviews, the BCI users stated that the audio processor is easy to use and handle. This new method, which relies on a skin microphone, can be used to measure individual dynamic range and audibility in patients who use bone conduction devices. The skin microphone can also be used to detect and improve a poor fitting.

Keywords: Bone conduction, Bone conduction devices, Hearing rehabilitation, Objective measurements, Skin microphone, Questionnaires, Audiological research.

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