Evolution of hearing aid devices and new prospects

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Hearing enables communication, listening, and understanding of our surroundings. This sense is essential for social interaction and good performance in several day-to-day activities, whereby is essential for a good quality of life.

In 2024, the World Health Organization made a statement reporting that more than 5% of the world's population -approximately 430 million people- experience significantly loss of hearing that requires rehabilitation, including 34 million children. By 2050, this number is expected to exceed 700 million people, equating to one in ten people. This highlights the importance of addressing hearing loss, as many causes are preventable. This article focuses on the relevance of hearing aid devices.

The design and manufacture of hearing aid devices align with the specific pathologies, available resources, public health strategies, and technological advancements. In today's world, where should the hearing aid devices industries direct their efforts? What therapeutic directions still need to be explored? To answer these questions, we must examine the history of hearing aid devices over the decades to understand their evolution and propose a way forward for improved outcomes.

According to the audiologist Juan Carlos Olmo Cordero, "The history of hearing devices must be divided into five eras: the acoustic, the coal, the bulb, the transistor, and the digital era." (2) He classifies these periods based on the technology used in hearing devices, which have evolved from rudimentary instruments like ear trumpets to sophisticated electronic devices. Initially, hearing aids were large and highly visible, primarily designed to amplify sound reaching the external ear. Over time, they became more compact design allowing for placement in the external auditory canal, thereby improving functionality and expanding the potential user base. Recently, more invasive yet effective options have been developed.

In the journal "Cirugía Otorrinolaringológica y Cervicofacial", Doctor E. Truy published an article discussing invasive prostheses available including cochlear implants, auditory brainstem implants, auditory osseointegrated implants, and middle ear implants (3). Cochlear implants consist of two components: an external sound processor and an internal implant. The external vocal processor captures sound via a microphone, processes it, and converts it into electrical signals.

The surgically placed implant component receives these signals through an antenna and contains electrodes that stimulate the auditory nerve. While cochlear implants do not restore normal hearing, however, they enable people with severe hearing loss to perceive sounds and understand speech. Auditory brainstem implants function similarly but stimulate the cochlear nucleus in the brainstem rather than the cochlea.

They were originally developed for cases involving auditory nerve tumors or conditions that made cochlear implantation unviable due to damage in auditory nerves. Auditory osseointegrated implants transmit sound vibrations directly to the cranial bone, which is then passed to the internal ear bypassing the external and middle ear, making them useful in cases of conductive hearing loss and unilateral hearing loss. Middle ear implants, like the other devices mentioned, are permanently placed with a surgical procedure.

The evolution of hearing aid devices reflects not only technological advances but also a commitment to enhancing the quality of life for those with hearing loss. From acoustic ear trumpets to complex cochlear implants, each development era has responded to the changing needs of the patients and the technical challenges of the time. However, innovation in design and functionality alone is insufficient, ensuring accessibility and providing support throughout the adaptation process and emotional backing for users and families, is equally crucial.

As the number of individuals experiencing hearing loss continues to rise, the future of these hearing-aid devices depends not only on technological innovations but also a holistic approach that encompasses education, public health, and equitable distribution. Only through this comprehensive approach can we fulfill the true purpose of these instruments: to help people restore their ability to communicate and engage with the world around them.