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Editorial

Bonebridge a New Alternative of Hearing Rehabilitation for Patients with Single Sided Deafness or with Conductive or Mixed Hearing Loss

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For many years patients with unilateral profound sensorineural hearing loss, who underwent radical mastoidectomy or had middle ear malformations, had few auditory rehabilitation options. Only the BAHA (Bone Anchored Hearing Aid) was a viable hearing aid for the treatment of all these diseases. In recent years, some new implantable prostheses anchored to the temporal bone were developed to treat these diseases: BAHA (CochlearTM), PONTO (Oticon MedicalTM), Alpha Hearing System (SophonoTM), Bonebridge (MED TLE) and BAHA Attract (CochlearTM). We can divide them into percutaneous bone transmission hearing aids (BAHA and PONTO) and subcutaneous (Alpha Hearing System, Bonebridge and BAHA Attract [1-4].

The percutaneous transmission devices consist of a fixed element of titanium, screw and a sound processor. Titanium device is implanted in the patient's skull bone and connected to a percutaneous pillar and the sound processor. The sound processor converts acoustic energy into vibration that is transmitted through the piece of titanium to the skull, and then directly to the cochlea [1,4]. These devices are widely used in the world, but there are risks of complications related to the device and the surgery [2,4].

The most common complications are related to problems of soft tissues and failure of osseointegration. The failure of osseointegration is more common in children [1]. The complication rates with BAHA are between 23% and 33%, mainly for minor skin infections around the abutment. In a series of 63 patients submitted to BAHA, 33% had skin infection, 17% thickening of the skin around the abutment and 2% device failure. Over a period of 20 years study including 602 BAHA implants, a group reported an overall complication rate of 23.9% and a revision surgery rate of 12. 1% [1-5]. Thus, patients need to have a commitment to life with the care of the skin where the device was placed.

The Ponto system is different from the BAHA system mainly by the presence of a longer abutment that does not require removal of the muscles and subcutaneous tissue that is needed for the BAHA procedure. Both have similar audiological results [3].

Subcutaneous bone transmission systems are not osseointegrated to the temporal bone, preserving the patient's skin, avoiding local infection problems and the need for further skin care. The hearing gain of these prostheses is very similar to the other prostheses, with a slightly worse results in the high frequencies due to the attenuation of the skin [5,6]. The Bonebridge works differently from Alpha Hearing System and BAHA Attract [1,4-7].

The Alpha Hearing System and BAHA Attract conduct the sound through a titanium plate which is fixed under the skin through surgery, differing only in size and shape from each other. The Alpha Hearing System has two interconnected plates while the BAHA Attract has only a single board. The external processor has a magnet that connects with the board and transmits the sound vibrating on it. Despite the aesthetic and functional benefits, the problem with this type of device is skin friction generated by the powerful magnet that is necessary to transfer the sound vibration to the skull efficiently. This can cause discomfort to the patient, difficulty vascularization and local skin irritation and in some cases, discourage the use of the prosthesis [4,5,7].

The Bonebridge is a device consisting of an audio processor (external) and a bone conduction implant (BCI). Unlike the percutaneous implants, the sound received by the processor is transmitted transcutaneously to BCI through an electromagnetic field. BCI consists of a receiver coil, a transducer and a demodulator. The receiver receives the signal, sends via the demodulator, and then, the transducer converts sound energy into vibration. The sound signal is well received by the cochlea by conducting the temporal bone, as well as the BAHA and point. The use of transcutaneous electromagnetic transmission eliminates the need for the screw, and thus eliminates the possibility of wound complications over time, and is aesthetically better for the patients [5,6].

The transducer component of the BCI is relatively big, with a thickness of 8.7 mm; therefore, an area of the skull is required with a thickness of more than 8.7 mm. This area is carefully selected in computed tomography in the preoperative period, and is usually in the mastoid region. Once the BCI is mounted and fixed, the wound is closed. The device can be activated two weeks later. This is much earlier than the BAHA implant osseointegration since it is not necessary for the transmission of the bone conduction signal in the Bonebridge [6].

The biggest benefit of Bonebridge is the facility to be placed either

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on the mastoid or in the squamous portion of the temporal bone. The surgeon has the freedom to choose the best site for placing the apparatus through a software studying the thickness of the temporal bone and compared with the thickness of the device through the images of computed tomography of the patient [5,6]. Moreover, there are materials which allow insertion of the prosthesis even in temporal bones of smaller thickness, which make the Bonebrigade an interesting alternative as a means of hearing rehabilitation.

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