BONE-ANCHORED HEARING AIDS (BAHA)
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Definition

- BAHA devices stimulate hearing via vibration of the skull (bone conduction, BC) that produces sound by vibrating in turn the hair cells of the inner ear.

- They utilise a screw inserted into the skull.

- An electronic vibrator is mounted on the screw, containing a microphone, processor and electromagnetic driver, either percutaneous (through the skin) or transtutaneous (intact skin, magnetic stabilisation).
BAHA
Used when AC aids are not viable

- Atresia
- Narrow / Stenosis / Subluxing concha
- Feedback howl
- Perspiration / Otitis Externa / Myringitis
- Excessive / Hard cerumen
- Mastication / Aid occlusion discomfort
- Manual disability
- Cosmesis

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Baha System basics

Components of the Baha System:

1. **Titanium implant** placed in the bone just behind the ear

2. **External Sound Processor** which connects to the implant via an abutment

Overall plan of the Cochlear BAHA system (original percutaneous device).
Cochlear Ltd transcutaneous (intact skin) and percutaneous (through the skin) BAHA devices.
BAHA implant, original percutaneous device. The aid functions via a titanium screw inserted through the skin into the temporal bone, to stimulate the cochlea via skull vibration.
The Attract model is based on magnetic attraction to maintain position, but loses power compared with the percutaneous models and may cause pressure discomfort.

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Cochlear BAHA Attract device, designed to avoid the percutaneous abutment.
Candidacy: BAHAs or other bone-conduction (BC) implants are used for a variety of hearing losses when air conduction (AC) aids are less applicable.
Baha Candidacy
Conductive Hearing Loss

Common aetiologies of conductive component:

- Chronic otitis media/CSOM (chronic suppurative otitis media)
- Aural Atresia
- Cholesteatoma
- Otosclerosis

BAHA application to conductive losses. If the EAC is intolerant of an AC aid, BC devices are effective alternatives.
When is Baha the best solution?

- Air bone gap ≥ 30 dB*
- Patients that underperform with a conventional hearing aid, when they meet the audiological criteria.

* The air bone gap measured as the average gap between the air and bone conduction threshold at 500, 1000, 2000 and 3000 Hz

EAC suitability aside, when major conductive losses are present, the BC aids perform better than the AC option as the BC device does not employ the major amplification that is needed to overcome the conductive component.
When is Baha the best solution?

- Air bone gap ≥ 30 dB*
- Sensorineural component < 65 dB** (in mixed HL)
- Patients that underperform with a conventional hearing aid, when they meet the audiological criteria

* The air bone gap measured as the average gap between the air and bone conduction threshold at 500, 1000, 2000 and 3000 Hz
** The average sensorineural loss at 500, 1000, 2000 and 3000 Hz

Advanced mixed sensorineural and conductive losses frequently respond poorly to AC aiding. BC implants bypass the conductive problem, but the sensorineural thresholds must be adequate, < 40 db.
Single sided sensorineural deafness (SND), is common, often sudden and profound. If the contralateral hearing is normal, BC implants can overcome “head shadow”.

Possible causes

- Acoustic neuroma/vestibular schwannoma
- Sudden deafness
- Meniere’s disease leading to deafness
Prior to surgery, a Softband trial is used to demonstrate function. In children, the skull is thick enough for a BAHA at 5-7 years, depending on the case.
Lateral view of the Softband aid used in a microtia/EAC atresia child. These are used until the child’s growth permits BAHA implantation (5 yrs+).

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Original percutaneous abutment appearance with surrounding thinned and hairless skin. The Attract system avoids the percutaneous screw.
Detail of a percutaneous abutment. Hygiene is essential, skin reactions are common if this is neglected.
Percutaneous model, external processor in situ.
A BAHA used in conjunction with a bone anchored ear prosthesis for combined functional and cosmetic purposes in a severe microtia case.
Percutaneous BAHA pedestal incur a significant complication risk, and require meticulous hygiene. Transcutaneous (intact skin) ATTRACT models are preferable.
BONE ANCHORED HEARING AIDS

Summary

- Valuable for severe deformity
- Useful in profound single sided deafness
- Transcutaneous models preferred