Bone anchored hearing aid in patients with unilateral hearing loss

Question at issue:
Is bone anchored hearing aid system better than contralateral routing of signals or no hearing device in patients with profound unilateral hearing loss with regard to speech recognition, hearing threshold, sound localization, and quality of life?

PICO

P = Adults and children with unilateral deafness (or hearing loss) and normal hearing on the other side

I1 = BAHA
C1 = CROS (Contralateral routing of signals)

I2 = BAHA
C2 = No hearing device

I3 = CROS
C3 = No hearing device

O = Speech recognition, Hearing threshold, Sound localization, Quality of Life

Summary of the health technology assessment:

Method and patient category:
Profound unilateral hearing loss is a permanent sensorineural hearing deficit in one ear. The patients experience impaired ability in speech recognition and sound localisation. Current rehabilitation is the hearing aid solution with contralateral routing of signals from the deaf side to the normal hearing ear (CROS). In recent years, the bone anchored hearing aid (BAHA) has been advocated as an advantageous alternative.

Level of evidence:

Speech recognition
The systematic literature search identified one randomised, controlled trial (RCT) and two non-randomised, controlled cohort studies reporting the effect on speech recognition with BAHA and CROS. All studies had serious limitations in study quality and external validity. No differences were observed when BAHA, CROS or no hearing aid were compared with each another.

The level of evidence according to the GRADE system for BAHA being superior to CROS or no hearing device for unilateral profound hearing loss regarding the outcome subjective benefit is very low (GRADE ⊕).

Sound localisation
The same three studies as above also reported the effect on the ability to localise sound. No differences were observed when BAHA, CROS or no hearing aid were compared with each another.

The level of evidence according to the GRADE system for BAHA being superior to CROS or no hearing device for unilateral profound hearing loss regarding the outcomes sound localisation is very low (GRADE ⊕).
**Quality of Life (Subjective experience)**
The systematic literature search identified four studies that reported the subjective experience of BAHA or CROS devices. One was a randomised, controlled trial and three were non-randomised, controlled cohort-studies. All studies had serious limitations in the study quality and uncertain external validity. No differences in the subjective appreciation were observed when BAHA, CROS or no hearing aid were compared with each other. The level of evidence according to the GRADE system for BAHA being superior to CROS or no hearing device for unilateral profound hearing loss regarding the outcome subjective benefit is very low (GRADE ⊕).

**Side effects and complications:**
Early complications, such as necrosis of the skin around the implant, occurred in less than 1% of the patients after implantation of a BAHA (regardless of the indication). Late complications with skin reactions around the implant have been reported in 3 – 30% of BAHA patients. The frequencies of loss of osseointegration or implant failure have varied between 1 – 14%, and the need of revision surgery has been reported to occur in up to 22% of all patients.

**Ethical aspects:**
Should an expensive technique be offered when the level of evidence of an advantageous effect of BAHA on important outcomes is so low?

**Economical aspects**
The annual cost of a structured rehabilitation program for profound unilateral hearing loss during the first four years is estimated to be up to 400 000 SEK if all patients receive CROS. If all patients are treated with BAHA the corresponding cost is estimated to be up to 3 000 000 SEK.

**Concluding remarks**
The level of evidence for a beneficial effect of bone anchored hearing aid to improve speech recognition, sound localization, and quality of life in patients with unilateral hearing loss is very low (GRADE ⊕).

On behalf of the Regional HTA Centre, Region Västra Götaland in Sweden
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