

# Baha use in single-sided sensorineural deafness

This article presents the hearing difficulties reported by SSD clients, a short audiological explanation of these problems, an overview of available treatments, and clinical results using the Baha.

## Problems reported by clients with SSD

- In many studies<sup>(1)</sup>, patients with SSD rate their unaided hearing ability as poor or nil in indirect listening situations (e.g., at the dinner table or a business conference). Results are worsened if there is background noise, but even in quiet surroundings indirect listening can be troublesome<sup>(2)</sup>.
- Studies show that localization is virtually at a chance level in this patient group<sup>(3)</sup>. There are also problems reported for listening face-to-face and over a distance<sup>(2)</sup>.
- SSD clients typically rate their hearing as considerably worse than do normal hearing clients, which indicates that SSD results in a significant overall hearing problem<sup>(2)</sup>.

Audiologically these problems can be explained by the following causes:

- The head shadow effect, which refers to the attenuation of sound coming from the deaf side as the hearing ear is in shadow from the skull. The effect is largest in the higher frequencies and will significantly distort the speech spectrum.
- Loss of binaural summation and binaural squelch. In normal hearing, summation of sound from both ears will increase the signal. The auditory system can also use the difference in input from the two ears to cancel out noise and focus on the speech signal. This will lead to an increase of

the sound signal by 6-13 dB for the bilateral listener<sup>(2)</sup>.

- Loss of interaural cues. In persons with normal hearing, the time and intensity difference between sounds at the two ears are vital to localization.

## Available treatment options

- CROS aid  
In a CROS hearing aid, sound is picked up by a microphone on the deaf side and transferred to a hearing aid in the hearing ear. The biggest disadvantage of the CROS aid is the necessity of having an ear mould in the good ear<sup>(4)</sup>.
- Transcranial CROS  
This type of CROS consists of a high-powered, in-the-ear hearing aid placed on the deaf side as a means of stimulating the good ear transcranially using mechanical vibrations. With this solution there is limited control of the amount of sound transmitted transcranially as the physical fit can vary across ears. Both discomfort and feedback can occur in a number of patients with jaw movement.
- Baha  
When a client uses Baha, sound is transmitted to the hearing cochlea by transcranial stimulation. The transcranial attenuation of the signal will vary between clients and has to be taken into account when selecting the appropriate sound processor.

## Clinical results with Baha

- Several studies<sup>(5-7)</sup> have reported significant benefits with Baha when listening in noise compared to an unaided situation. When compared with a CROS aid, Baha achieved a better outcome. An average increase in speech recognition of 33% with the Baha compared to the unaided situation was reported by Kunst et al<sup>(8)</sup> in the situation with speech coming from the side of the poor ear.



- Several attempts have been made to evaluate if clients can achieve directional hearing with Baha. The outcome so far is that the clients will get an improved spatial awareness, but that localization remains at a chance level<sup>(4,9,10)</sup>.
- Studies using validated subjective benefit questionnaires on SSD subjects have shown higher levels of satisfaction with Baha than with a CROS aid<sup>(5,7)</sup>. In a recent study, 72% of the clients preferred the Baha to the unaided condition when speaking to a person in a group, 84% when talking to someone sitting on their impaired side, and 90% would recommend Baha to someone with a similar hearing loss<sup>(8)</sup>.

The clinical evidence and the reported problems indicate that SSD will significantly disable a client in a number of listening situations. Based on this, thoroughly exploring the difficulties and available treatments with clients seems to be a valid intervention. In this patient group, Baha is a proven treatment with excellent clinical and subjective results.



”Baha fitting led to significant improvements in 3 domains: ease of communication, background noise and reverberation<sup>(8)</sup>.”

## Articles on SSD

These are summaries of selected articles on SSD and different outcomes using Baha.

### Unilateral deafness after acoustic neuroma surgery: subjective hearing handicap and the effect of the bone anchored hearing aid<sup>(6)</sup>.

A study of 59 patients was made to evaluate the subjective hearing handicap after acoustic neuroma surgery and the effect of Baha.

#### Key statements:

- 98% of the patients thought they had a hearing handicap, 45% thought it was significant and 38% thought it was moderate.
- 5 out of 6 patients that previously used a CROS aid instead wanted treatment with the Baha after testing it.
- 25% of the patients that tested Baha decided to get the Baha.

### Bone anchored hearing aid in patients with acquired and congenital unilateral inner ear deafness (Baha CROS): clinical evaluation of 56 cases<sup>(8)</sup>.

The evaluation of audiological and subjective benefits of Baha in SSD where 56 patients with unilateral inner ear deafness were tested with audiometric and subjective measurements.

## Questions and answers

**Q** Is there any way of measuring the transcranial attenuation in a specific patient when fitting a Baha for SSD?

**A** In their study on transcranial attenuation in bone conduction audiometry<sup>(13)</sup> Nolan and Lyon measured the attenuation by placing a calibrated bone conductor first to the hearing side, and then to

the non-hearing side in unilaterally deaf subjects. The difference between the measured BC thresholds showed the transcranial attenuation. The amount of attenuation showed large variations both between individual patients and individual frequencies<sup>(13)</sup>.

Keep in mind that audiometry results may differ between test occasions so this may not be an exact measurement.

#### Key statements:

- Baha fitting led to significant perceived improvements on the three communication subscales of the APHAB questionnaire: ease of communication, background noise and reverberation.
- 90% would recommend the Baha to someone else with the same type of hearing loss, and 69% would still opt for the Baha if they had to finance the device themselves.

### The evidence base for the application of contralateral bone anchored hearing aids in acquired unilateral sensorineural hearing loss in adults<sup>(11)</sup>.

This article is a review of the available clinical evidence for Baha in SSD at the time of publication. Four individual papers were included in the review.

#### Key statements:

- Speech discrimination in noise abilities are improved with Baha over the CROS aid and unaided conditions.
- In all studies reviewed, patients are reported as wearing the devices throughout the day.
- The studies cited here do not provide robust evidence of the efficacy of Baha in the treatment of acquired unilateral SNHL. However, they demonstrate that after a head-band selection trial, there is subjective benefit of Baha over unaided and conventional CROS conditions.

### Intralabyrinthine schwannomas: symptoms and managements<sup>(12)</sup>.

This article describes the characteristic presentations and symptoms of intralabyrinthine schwannomas and outlines recommended treatment.

#### Key statements:

- In 68 cases, 93% had a hearing loss, 50% had tinnitus and 51% had vertigo.
- Patients with serviceable hearing should not be operated unless they have other severe symptoms.
- Implanting Baha can give patients a monaural pseudo-stereophonic hearing.

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