BAHA IN REHABILITATION OF PATIENTS WITH MIXED HEARING LOSS

Gayane Sargsyan[1], Vigen Bakhshinyan[2], Arthur Shukuryan[2]

[1] YSMU, ENT-Department, Armenia
[2] National Research Center for Audiology and Hearing Rehabilitation in Moscow, Russia

Corresponding author: Gayane Sargsyan, YSMU, ENT-Department, Armenia, e-mail: gajane.sargsian@yahoo.de

Abstract

Bone-anchored hearing aid (BAHA) is a hearing aid that takes advantage of bone conduction. One of the indication of Baha prosthetics is mixed hearing loss, in case of which conventional hearing aid or the operation of the ear will not give wishful result. For patients with mixed hearing loss, the Baha must not only bypass the conductive element to the hearing loss it must also compensate for the sensorineural part of the hearing loss.

Background

Since Tjellstrom et al. first reported implantation of bone-anchored hearing aid (BAHA) devices in 1981, thousands of patients worldwide have benefited from this treatment. There are three main indications for Baha: conductive hearing loss, single sided deafness, and (SSD)mixed hearing loss.

Conductive hearing loss is the result of sound waves being blocked from reaching the inner ear. Common causes of a conductive hearing loss include: (1) Atresia – congenital malformation of the outer ear and/or an occluded middle ear; (2) Otosclerosis – a disease of the bone that in particular affects the footplate of the oval window; (3) Chronic otitis media; chronic ear infections leading to permanent damage to the middle ear; (4) Syndromes such as Treacher Collins, Goldenhaar and Down syndrome where a conductive hearing loss is often part of the syndrome. Traditional air conduction devices are generally not effective for treating conductive losses. The amplification level needed to push sound through the middle ear often results in significant problems with feedback and distortion. Baha provides a means of bypassing the conductive element of the hearing loss and stimulating the cochlea directly with bone conduction.

Patients with unilateral deafness – SSD – can experience communication difficulties despite the presence of normal hearing in one ear. The biggest problems are encountered when the hearing in their good ear is masked by ambient sounds such as multiple talkers, street sounds or other background noise. This effect is exacerbated if the speaker of interest is positioned on the side of the deaf ear or when a room's surfaces reverberate. Unfortunately the most common Treatment for SSD is no treatment at all. Clients that are very handicapped by single sided deafness are generally given a CROS aid, a bilateral hearing aid that routes the sound from the deaf side to the hearing ear. The problem with this solution is that the hearing ear is occluded. Baha has been proven to provide significant benefits to this patient group, lifting the head shadow effect and improving speech understanding in noise.

In case of mixed hearing loss the patient has both a conductive and a sensorineural hearing loss. This patient group is often treated with conventional hearing aids. There are two main reasons why some of these patients may be better served with a Baha: (1) The conductive element; as a rule of thumb one can say that, the larger the conductive element of a mixed hearing loss, the more benefit the patient will get from a Baha. Studies have shown that patients with a conductive loss of 30dB or more will have better results with a Baha than with a conventional hearing aid. (2) Otologic problems like running ears may make it impossible for the patient to use conventional hearing aids.

Material and methods

Our aim was to use Baha for patients with mixed hearing loss, who can not be operated (from the medical point

Table 1. Pre- aided with Baha Headband hearing test result for frecuencies from 500 to 4000 Hz.

Frequency (Hz)	Air conduction (dB)	Bone conduction (dB)	Air bone gap (dB)
500	55–75	20–35	35–40
1000	55–80	25–35	35–50
2000	65–85	25–35	40–50
3000	65–90	30–40	35–50
4000	65–85	30–40	35–45

Table 2. Mean sound-field hearing thresholds for unaided and aided with Baha Headband.

Frequency(Hz)	Soundfield audiometry with pure tones (dB)	
	Unaided	Aided with Baha Headband
500	60–75	35–45
1000	60–75	35–40
2000	65–80	35–45
3000	70–85	45–55
4000	70–90	40–55

of view and according to the preferences of the patients) as well as for patients who were not satiesfied with wearing the conventional hearing aid. We examined 6 patients with bilateral mixed hearing loss in medical center "Nairi". The mean age of the patients at the time of experiment was 41.5. The methods of the examination were microotoscopy, pure tone audiometry, and immittance audiometry (in subjects that had intact tympanic membrane). Candidates for BAHA underwent a conventional audiogram to detect air und bone conduction thresholds at 500,1000, 2000, 3000 and 4000 Hz, as well as speech discrimination and speech reception threshold. All further exams were performed in a free field with and without the BAHA device in order to measure hearing gain. We used a soft elastic headband to place the BAHA over the mastoid process of the effected side.

Based on the result of the examination the diagnosis of 2 patients was mixed type of otosclerosis (AC=70–80 dB, 35–40 dB), 3 patients were diagnosed with state after radical operation (AC=75–90 dB, 35–40 dB) on one side, on the other side with chronic mesoepitympanitis (AC=60–70 dB, 25–35 dB). 1 patient's diagnosis was bilateral mesotympanitis (AC=55–65 dB, 20–30 dB) (Table 1).

The patients were suggested Baha hearing aid implantation. Baha test with headband was made in free sound field.

Results

The results of Baha test were positive, with audiometry results yielding 35–55 dB (Table 2) in average in free sound field. Implantation of Baha hearing aid is planned to make.

Conclusions

All patients demonstrated a significant improvement with BAHA headband test.

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