■ ORIGINAL ARTICLE

Quality of Life of Patients With BAHA

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Objective: The aim of this study is to quantify changes in quality of life due to the use of BAHA.
Patients and method: Twenty-eight patients were included. The instrument used to quantify the change in quality of life was the Glasgow Benefit Inventory and a questionnaire including 2 open questions, BAHA use, change in tinnitus, and postoperative pain.
Results: The average total benefit score with the Glasgow Benefit Inventory was 38, and the general, social, and physical score were 54, 10, and 1, respectively. There was no significant association between preoperative hearing, aetiology or type of hearing loss, and quality of life. Tinnitus rate went from 37.5% to 20.8% following BAHA; this difference is significant.
Conclusions: Our results show that the use of BAHA is associated with a great improvement in quality of life. Also, they show that its use has a positive effect upon tinnitus.

Key words: BAHA. Quality of life. Glasgow Benefit Inventory. Tinnitus.

Calidad de vida de los pacientes con BAHA

Objetivo: El objetivo de este estudio es cuantificar los cambios en la calidad de vida en los pacientes con implantes osteointegrados (BAHA).
Pacientes y método: Se incluyó a 28 pacientes. El instrumento empleado para medir la calidad de vida fue el Glasgow Benefit Inventory y un cuestionario con 2 preguntas abiertas, uso del BAHA, modificación de los acufenos y dolor postoperatorio.
Resultados: La puntuación media del Glasgow Benefit Inventory total fue 38, y en las subescalas general, social y física, 54, 10 y 1, respectivamente. No se encontró relación significativa entre el grado de audición preoperatorio, la etiología o el tipo de hipoacusia y la calidad de vida. La tasa de acufenos disminuyó del 37,5 al 20,8% tras la colocación del BAHA, con diferencias significativas.
Conclusiones: Nuestros resultados muestran que el uso del BAHA se asocia a una gran mejoría en la calidad de vida. Asimismo, muestran que su uso tiene un efecto positivo en los acufenos.

Palabras clave: BAHA. Calidad de vida. Glasgow Benefit Inventory. Acufenos.

INTRODUCTION

Since Hakansson et al developed the placement of sound processors with the aid of osteointegrated implants in the eighties, some 15 000 devices have been placed throughout the world. This system is known as a BAHA (bone anchored hearing aid) and utilizes Branemark system implants in combination with a sound processor to improve hearing thanks to sound conduction through bone. To install the BAHA, a small titanium implant is placed in the temporal bone behind the earlobe. This implant is integrated into the bone and provides better hearing, verbal intelligibility in silent and noisy backgrounds, sound quality, and comfort than the conventional bone conduction device.[1]

The BAHA indications include congenital malformations of the external and middle ear, chronic otitis media, otosclerosis, and as an alternative if the patient cannot use conventional audiphones. It is also indicated in patients with unilateral cophosis that have hearing in the contralateral ear with an average air conduction of <20 dB. In these patients the BAHA does not improve sound localization, but it reduces screen effect and raises verbal intelligibility in noisy environments.[2]

Due to the fact that the placement of the BAHA requires a surgical procedure and because of the economic cost of the system, as well as the fact in various studies it is shown that in operations intended to improve hearing there is no significant relation between the audiological results and the quality of life results than could be expected, the importance of said quality of life results is always greater. This justifies the growing number of studies published about this subject. Various instruments exist to measure quality of life results

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after the adaptation of a hearing aid, and the instrument selected is essential in obtaining a greater amount of clinically useful and valid information.

The purposes of this study are: to evaluate if the BAHA improves the patients' quality of life, if there are differences in the results according to the indication of the BAHA or the aetiology of hypoacusis and if the use of the BAHA modifies pre-operative tinnitus.

PATIENTS AND METHOD

Twenty-eight (28) patients were included in the study implanted between June 2004 and June 2006 at our centre. Of these, 64% were women and 36% men, with a mean (interval) age of 48 (12-73) years. The mean air conduction for the frequencies of 500, 1000, and 2000 Hz was 72 (46-106) dB. The mean bone conduction for the 500, 1000, and 2000 Hz frequencies was 35 dB, with 48% of the patients having an average ≥30 dB. Half were implanted on the right side. One of them (bilateral atresia of the external auditory canal) received 2 BAHA. Out of all the patients, 3 (10.8%) were previous wearers of a bone conduction prosthesis: in 1 of the cases placed on a headband, in another on eyeglasses and in the third an Audiant mastoid implant was used.

The instrument used to measure the quality of life was the Glasgow Benefit Inventory (GBI), a questionnaire comprising 18 items measuring the changes in health distinguishing 3 fields, general, physical, and social health, and thus present 3 subscales. Of the 18 questions, 12 are related to general health, 3 to physical health, and 3 to social health. Each question has a score that oscillates between 1 and 5, with better results giving a greater score, and thus a total score that oscillates between 18 and 90 points, even though the numeric result is transformed to an average (which oscillates between –100 and + 100) that permits the comparison of results between sub-groups, as well as with other otorhinolaryngological procedures evaluated with this same scale.[3]

A questionnaire with 2 open questions was also used: "What is it that you like most about the BAHA?" and "What is it that you like least about the BAHA?." It also asked about the use of the BAHA (hours/day and days/week), the presence of tinnitus before, and after the placement of the BAHA (yes/no), pain with the BAHA (yes/no/sometimes), and if the patient would recommend it to another person (yes/no).

The statistical analysis of the data obtained was performed using the SPSS 11.0 system with a non-parametric test for the comparison of results.

RESULTS

Of the 28 patients included, 27 are current wearers of the BAHA, though one of them, due to a problem of severe osteoporosis, experienced the falling out of the implant. Of the total, 25 patients (response rate 89%) answered the GBI questionnaire and 24 (86%) answered the open questionnaire. The average total GBI score was 38, and in the general, social and physical subscales were 54, 10, and 1, respectively. The general GBI results are summarized by aetiology of hypoacusis in Table 1 and the answers to the open questionnaire, in Table 2. The average usage (hours per day) of the BAHA by the patients was 12, with 87% of the patients using it at least 8 h/day, while the average days per week of use was 6.6 days, with 79% of the patients utilizing it 7 days a week, and the rest, 5. With regard to pain, 4.2% reported always having it and 16.7%, sometimes. In addition, the possible relationship between tinnitus before and after the placement of the BAHA was evaluated against quality of life, without significant findings. A full 100% of the patients answered that yes, they would recommend the BAHA.

No relation was found between the pre-operative degree of hearing and the quality of life. In addition, the quality of life results were compared according to the aetiology of hypoacusis (COM, CCOM, malformations, etc) and the indication of the BAHA (type of hypoacusis), but there were

Table 1. Results of Glasgow Benefit Inventory in Function of the Aetiology of Hypoacusis*

		n (%)	*Total Score*	*General Subscale*	*Social Subscale*	*Physical Subscale*
THA or MHA	COM	8 (32)	47	66	10	8
	CCOM	9 (36)	36	51	4	5
	Malformation†	2 (8)	33	49	0	0
	IQx (paraganglioma)	2 (8)	44	53	49	0
	Otosclerosis	1 (4)	44	75	0	–33
	Subtotal	22 (88)	41	58	10	4
Cophosis	Degenerative cochleopathy	2 (8)	18	27	16	–16
	Trauma	1 (4)	16	29	0	–16
	Subtotal	3 (12)	17	28	11	–16
	Total	25 (100)	38	54	10	1

*EAC indicates external auditory canal; MHA, mixed hypoacusis; MHA, transmission hypoacusis; COM, chronic otitis media; CCOM, cholesteatoma chronic otitis media.
†Malformation: EAC bilateral atresia and EAC microtia with agenesis of the right ear and EAC stenosis of the left ear.

Tabla 2. Answers to the Open Questionnaire*

		What S/He Likes Most…	*What S/He Likes Least…*
THA or MHA	1	Able to hear and more comfortable than glasses	Screw infection sometimes
	2	Able to hear and understand people	Air or rain
	3	Able to hear	Nothing
	4	Able to hear	Air and wind. A lot of noise
	5	Able to hear	Sticks to the telephone
	6	Able to hear	Fear of it falling out
	7	Able to hear when talked to	Hurts sometimes
	8	Able to hear	Pain
	9	Able to hear	Scab
	10	Able to hear	Discomfort
	11	Able to hear and relate with people	Background noise, echo
	12	Able to hear and work	Hurts
	13	Comfort	Echo
	14	Able to hear the television better. Also Able to talk with people	Uncomfortable to wear it
	15	Able to hear	Noise (air generates a lot of noise)
	16	Comfort	Noise
	17	Able to hear	Uncomfortable to wear it
	18	Able to hear when talking to people with noise	Uncomfortable to wear it
	19	Able to hear	It can be seen
	20	Able to hear. TV. People	Uncomfortable to wear it
	21	Able to hear and work in what one wants	It can be seen
Cophosis	22	To talk with people and watch TV	Catches hair
	23	Improvement in work. Hears	Wearing it hurts
	24	Able to hear people better. Able to hear the television better. It helps with driving	It can be seen. Rustle of hair and eyeglasses

*MHA indicates mixed hypoacusis; THA, transmission hypoacusis.

no significant differences, though with a tendency for patients with a greater degree of hypoacusis (bilateral hypoacusis or with contralateral cophosis) to present a greater score in the quality of life scale.

In terms of the presence of tinnitus before and after surgery, up to 37.5% had it before and 20.8%, after; which is a statistically significant difference ($P<.05$).

DISCUSSION

Our results clearly show that the use of the BAHA is related to an improvement in the quality of life, as is also noted in other studies.[4-9] The average total score obtained in our study was 38, which compares positively with the results obtained in another study very similar to Arunachalam et al (Table 3). All our patients obtained scores greater than 25 in the general subscale, and in almost all of them the total score figures were >20.

It is interesting to compare our results with those obtained in other similar studies evaluating the quality of life obtained with other operations also intended to improve hearing, such as cochlear implants or a stapedectomy. As can be seen in Table 3, the scores obtained in our study are comparable to those obtained by other authors in both types of operations.

Evaluating the open questionnaire, the patients in general affirm that what they like best about wearing the BAHA is simply that they hear, for one purpose or another, conversations with people or watching television. As to what they like least, the answers are more diverse; for some it is the discomfort at the time of putting it in; for others, the annoyance of wearing it and in some cases the problem of the quantity of extra noise they perceive with the BAHA, in noisy settings, as well as by the rustle of their hair or the wind. In addition, other comments from patients, not directly reflected in the questionnaire, coincide in that better results are obtained in person to person conversation, with worse results in more demanding group conversation situations

Table 3. Comparison of Quality of Life Results With Those Obtained in Other Studies and With Other Operations

	Total Score	*General Subscale*	*Social Subscale*	*Physical Subscale*
BAHA (current series)	38	54	10	1
BAHA (Arunchalam et al)	31	37	24	14
BAHA (McLarnon et al)	333			
Cochlear implant (Castro et al, 2005)[15]	41	57	17	4
Stapedectomy (Subramaniam et al, 2006)	29	41	3	5
Stapedectomy (Robinson et al, 1996)	34			
Cochlear implant (Robinson et al, 1996) (unicanal/multicanal)	23/40			

where the patients continue having difficulties, even though in a lower grade than before the placement of the BAHA, which concurs with other previous studies.[5,10] Other data that supports this is the comparison of the score obtained in question 4 ("Since your operation do you feel more or less uncomfortable with a group of people?") with that of question 6 ("Since your operation do you find dealing with other people easier or more difficult?"): the score is somewhat greater for question 6 (4.32 opposed to 4.76), which reflects a greater improvement in dealing with other people in general with respect to group conversation situations.

The favourable results obtained as to the use of the BAHA, with 100% of the patients using the BAHA less than 6 h/day (average, 11.8), are also comparable with those obtained by other authors, and moreover the fact that all the patients would recommend the use of the BAHA to another person is very significant.

The absence of significant differences in the quality of life results according to the aetiology of hypoacusis could be explained by an insufficient number of patients in some of the groups. The patients with COM showed a tendency to present better scores than the rest (Table 1). These results are comparable to those of the study by McLarnon et al,[11] in which the benefits obtained were compared according to the indication of the BAHA in 69 patients using the GBI. In that study, the patients with a congenital malformation were those who obtained the highest total score (45), as opposed to those obtained by the patients operated on for an acoustic neurinoma (24), open tympanoplasty (29.9), active chronic otitis media (36.7), or otosclerosis (27.7). It should be pointed out that the patients with COM were those who obtained the highest scores in the physical health subscale of our study, which would positively correlate with the reduction of otorrhea episodes.

The absence of differences in the quality of life results according to the indication of the BAHA is interesting, not only between all the groups, but also between the patients with unilateral cophosis and the rest, since the manner of functioning of the BAHA in these patients is very different. This could be due to the scant number of patients in this group, since the "yes" scores showed a notable difference (total, 17 and 40; general subscale, 27, and 57).

It should be pointed out that there was a significant difference between the patients that had tinnitus before and after the surgery (37.5% and 20.8%; $P<.05$). This correlates positively with the data produced by a study from Holgers et al[12] from 2002, in which, based on masking therapy for patients with tinnitus, the possible benefits of a bone sound stimulator were evaluated for these patients. To that end a bone sound stimulator was placed in 8 patients previously implanted with a BAHA and who reported tinnitus of different degrees; later the frequency of the patients' tinnitus was evaluated as was the minimum decibel level required to achieve masking for both air and bone conduction.

In addition a subjective evaluation of the improvement related to the use of the bone sound stimulator was carried out. The study concludes that the bone sound transmitted has the same potential to mask tinnitus as the sound transmitted by air conduction and that, in the patients with transmission or mixed hypoacusis, a sound amplification mechanism is necessary as well as the sound masking stimulus, which indicates that a sound generator connected to the BAHA could be beneficial for some patients that already wear one.

CONCLUSIONS

In short, for patients in whom the therapeutic procedures are not aiming at improving survival, as in the case of the patients operated on with the objective of giving them better hearing, the quality of life results become essential, especially if in various studies it is shown that no there is not a significant relationship between the audiological results and the quality of life results as could be expected.[13,14] This fact emphasizes the necessity of carrying out a valuation not only of objective measures of hearing, but also of the quality of life perceived by the patient through questionnaires for the purpose of this proposal. Our study, with a high answer rate (89%) that lends validity to the obtained results, shows a significant improvement in the quality of life of the patients that receive a BAHA, information which is of great utility at the time of giving pre-operative advice to the patients in clinical daily practice.

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