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Intermediate outcomes of a transcutaneous bone conduction hearing device in a paediatric population

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ABSTRACT

Objective: The aim of this study was to review the outcomes of Bone Anchored Hearing Aid (BAHA®) Attract implantation in a cohort of paediatric patients.
Methods: Prospective data collection and case review were undertaken in a paediatric tertiary referral centre. We have included patients under the age of 16 years with unilateral or bilateral hearing loss that met the criteria for BAHA® Attract implantation. The main outcome measures were surgical complications and Patient Reported Outcomes including the 'Speech, Spatial and Qualities of Hearing scale' (SSQ-12) and 'Qualitative Feedback for BAHA® 5 Hearing Aids'.
Results: Twenty-five paediatric patients were implanted with the BAHA® Attract between June 2014 and July 2016. Nine of them had a conversion from a percutaneous Bone Conduction Hearing Device (BCHD). Four children had minor skin problems that settled with conservative measures. Two children with a previous percutaneous BCHD developed skin dehiscence over the magnet after conversion to the transcutaneous version. The SSQ-12 was completed by 6 children and an improvement of 22% was noted between the unaided and aided condition. The patients and their parents were generally satisfied with the BAHA® Attract.
Conclusions: The BAHA® Attract offers a good solution for hearing rehabilitation in appropriately selected and counseled patients. The complication rate was low for primary surgery but higher in cases of conversion from a percutaneous device. Large, prospective data is needed to evaluate the relative risks and benefits of this BCHD.

1. Introduction

The Cochlear Bone Anchored Hearing Aid (BAHA®) Attract was launched in 2013 by the Cochlear Bone Anchored Solutions AB, Mölnlycke, Sweden. More than 200 patients have been implanted to date [1]. Its main advantage over other skin-penetrating devices is that it is low maintenance and is associated with fewer and less severe skin complications. On the other hand, the sound amplification is less, especially in the high frequencies due to the skin attenuation between the implanted magnet and the external sound processor [2]. In our unit, an increase in requests has been noted from patients and parents wishing to switch from a percutaneous bone conduction hearing device (BCHD) to the new transcutaneous one. This study aims to present our preliminary results of these conversions and our overall experience on this transcutaneous BCHD in the paediatric population. It did not require Institutional Review Board approval as it was a departmental service evaluation project. The care provided did not deviate from standard practice at any point.

2. Methods

Data has been collected prospectively and medical notes of children implanted with a Cochlear BAHA® Attract in a tertiary referral centre between June 2014 and July 2016, were analysed. The operations were either performed or directly supervised by a single surgeon (senior author), using the same surgical technique. In particular, we assessed for otological and audiological indications, complications and outcomes of two questionnaires:

A] The validated Speech, Spatial and Qualities of Hearing scale (SSQ-12), which is a self-report test of auditory disability and

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represents a short version of the SSQ-49 [3]. It was designed to measure hearing disabilities across different listening situations. The differences between the aided and unaided situations were evaluated for each subscale.

B] The non-validated "Qualitative Feedback for BAHA® 5 Hearing Aids" (see Appendix A), which was designed in our department and was aimed at collective qualitative data by those patients who had an upgrade from the BAHA® 4 to BAHA® 5 sound processor. The objective of this short questionnaire was to receive feedback on the characteristics and performance of the new sound processor and how it compared to the previous one.

Finally, any comments from the patients and their parents were actively sought and presented in this study.

3. Results

Twenty-five children (11 females, 14 males, mean age: 9.8 years, age range: 4–16 years) that were implanted with a BAHA® Attract between June 2014 and July 2016 were identified and included in this study. Their demographics, diagnoses and audiological indications are included in Table 1. Nine children (36%) had a conversion from a percutaneous BCHD to the transcutaneous BAHA® Attract due to skin-related problems. Four children (16%) had simultaneous bilateral implantation. The mean surgery time for those who had a primary unilateral BAHA® Attract was 60 min (range 45–76 min) and for those who had simultaneous bilateral implantation, it was 104 min. For those who had a conversion to a BAHA® Attract, the mean surgery time was 63 min. We excluded the time taken for additional procedures including tooth extraction, insertion or removal of prosthetic ear (Vistafix®), examination under anaesthetic of the ear and mastoid exploration, which were undertaken in 6 cases.

3.1. Conversions to BAHA® attract

As mentioned above (1.3), 9 children had a conversion from a percutaneous BCHD to the transcutaneous BAHA® Attract. All had suffered persistent skin problems and were repeatedly prescribed courses of antibiotics (topical or oral) and/or had cauterization of granulation and overgrown skin with silver nitrate. Twenty-two visits were paid to our unit by these patients for skin-related problems; mainly skin infections and skin overgrowth around the abutment. We have discounted the visits to the patients' general practitioner or local health centre. One child had problems with a continually loose abutment and visited the clinic numerous times to have it tightened and finally needed general anaesthetic to replace it. Another child needed general anaesthetic for excision of skin overgrowth over the abutment. All the conversion cases were undertaken in two stages. The abutment was removed in the clinic and the surgery was undertaken 4–6 weeks later to allow the skin to heal over the puncture site.

3.2. Complications

Surgery-specific complications were observed in 6 children (24%), 4 of whom had previously had a BCHD. Two children (8%) complained of redness and tenderness at the BAHA® site. This settled with reduction of the magnet strength and advice to reduce the hours of usage per day with short rest periods of 10 min every 4 h if prolonged usage was required. Two children (8%), both diagnosed with Trisomy 21, developed small wound dehiscence (less than 5 mm) at the superior aspect of the implant site few weeks after surgery. These settled and healed with the use of topical antibiotic ointment and advice to reduce the hours of usage of the BAHA® or to use it on a headband until the wound completely healed. Finally, in two of the conversion cases, one with Branchio-Oto-Renal syndrome and one with bilateral microtia and EAC atresia, skin breakdown was noticed over the inferior edge of the implant magnet. Both had received the percutaneous device with a linear incision with skin thinning and had experienced protracted skin related problems prompting the decision to try and convert to transcutaneous BCHDs. In one of them, concomitant loss of the Vistafix fixture was noticed on the same side as the skin breakdown. They were both taken back to theaters for removal of the implanted magnet and simple closure of the dehisced skin. The sites are now well healed. No further implantation has been

Table 1
Characteristics of the patients implanted with a BAHA® Attract. BOR: Branchio-Oto-Renal, CHL: Conductive Hearing Loss, COM: Chronic Otitis Media, EAC: External Auditory Canal, F: Female, M: Male, SSD: Single Sided Deafness.

No	Gender	Age (years)	Diagnosis	Audiological indication
1	F	16	SSD	Unilateral profound HL
2	F	13	SSD	Unilateral profound HL
3	F	5	SSD	Unilateral profound HL
4	F	14	SSD	Unilateral profound HL
5	M	7	SSD	Unilateral profound HL
6	M	14	Trisomy 21, COM	Bilateral CHL
7	M	6	Trisomy 21, middle ear effusions	Bilateral CHL
8	F	15	Trisomy 21, middle ear effusions	Bilateral CHL
9	M	11	Trisomy 21, middle ear effusions	Bilateral CHL
10	M	10	Trisomy 21, middle ear effusions	Bilateral CHL
11	F	10	Trisomy 21, middle ear effusions	Bilateral CHL
12	M	14	Unilateral Microtia and EAC atresia	Unilateral CHL
13	M	8	Unilateral Microtia and EAC atresia	Unilateral CHL
14	F	14	Unilateral COM	Unilateral CHL
15	F	12	Bilateral COM	Bilateral CHL
16	M	5	Bilateral COM	Bilateral CHL
17	M	12	post- mastoidectomy	Unilateral CHL
18	M	10	post- mastoidectomy	Unilateral CHL
19	M	11	post- mastoidectomy	Bilateral CHL
20	M	7	Bilateral microtia and EAC atresia	Bilateral CHL
21	M	8	Bilateral EAC atresia	Bilateral CHL
22	F	6	BOR syndrome, bilateral anotia	Bilateral CHL
23	F	8	BOR syndrome, bilateral microtia	Bilateral CHL
24	M	6	Goldenhar syndrome, unilateral microtia	Unilateral CHL
25	F	4	Unilateral EAC stenosis	Unilateral CHL