Transitioning from Cochlear™ Baha® to bilateral Cochlear™ Osia®: two case reports

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ABSTRACT

Background: Bone conduction implants are essential devices for enhancing auditory perception in patients with conductive or mixed hearing loss, particularly when conventional hearing aids fail to meet their needs. The advancement of bone conduction technology has led to improved patient outcomes and quality of life.

Case Presentation: This case series presents two case reports detailing the transition from unilateral BAHA Attract® and bilateral BAHA Connect® systems to bilateral Osia® implants. These transitions address the significant limitations of traditional BAHA systems, such as skin complications and sound attenuation. The transition involved careful planning and assessment, ensuring that the new Osia® implants were suitable for their individual auditory profiles. Post-implantation evaluations indicated a marked improvement in auditory performance and overall satisfaction.

Conclusion: The case reports demonstrate the superior performance of Osia® implants, highlighting their potential to reduce complications and significantly improve auditory outcomes. These findings also demonstrate the clinical benefits and growing relevance of transitioning from BAHA to Osia® systems for patients with complex auditory needs.

Keywords: Hearing loss, conductive, bone conduction, bone conduction hearing aid, Osia, Baha.

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Background

Bone conduction is a better option to improve hearing loss when ear canal pathology interferes with the use of conventional hearing aids [1]. Bone conduction hearing implants are commonly used to treat conductive or mixed hearing loss as well as single-sided deafness, especially in cases where the patient is unable to use a conventional hearing aid [2]. Several bone conduction devices are available on the market so far [1]. The evolution of cochlear implant technology has significantly improved the auditory experiences and quality of life for individuals with severe to profound hearing loss [2,3]. Among the various systems, Baha the Osseointegrated Steady-State Implant (Osia) Cochlear™ Osia® System has emerged as the new bone-conduction implant that enables patients to undergo Magnetic resonance imaging (MRI) at 3.0 Tesla (T) [4] The Osia® system has a fitting range of up to 55 dB HL, making the indication range similar to using the bone-anchored hearing aid (Baha®) 5 power sound processor on Baha Attract® [2]. The Baha Attract® system, which utilizes magnetic attraction to secure the external sound processor, and the Baha Connect® system, which uses a percutaneous abutment, have both been widely adopted due to their distinct advantages. The decision to transition from a unilateral Baha system to a bilateral Osia® system is driven by the need for lifelong daily hygienic care, high risk of local complications like infections, skin overgrowth, and improved auditory outcomes, particularly in complex listening environments [5]. However, the advent of the Osia® system, which offers a piezoelectric-based transducer for more efficient sound transmission, has prompted many patients and clinicians to consider transitioning from Baha to Osia® [6]. This transition can be approached either sequentially or simultaneously, each method having its unique benefits and challenges.

Objectives

There is a paucity of detailed case reports that outline the practical aspects and outcomes of the transition procedures. In this article, we aim to fill this gap by presenting two detailed case reports of patients who transitioned from unilateral Baha Attract® and bilateral Baha Connect® to bilateral Osia® implants. These case reports will contribute valuable information to the growing body of literature on cochlear implants, offering practical guidance for

optimizing patient outcomes through advanced auditory technologies.

Case Presentation

Case 1: Unilateral attract to simultaneous bilateral Osia®

Bilateral external auditory canal (EAC) atresia is a rare congenital condition characterized by the closure of the ear canal, often resulting in conductive hearing loss due to malformations in the outer and middle ear structures. Conductive hearing loss occurs when sound waves are obstructed from reaching the inner ear. This case report presents a 16-year-old male patient with bilateral EAC atresia, total on the left side, and hypoplastic middle ear with dysplastic ossicles. The patient had been using a unilateral Attract system for several years but experienced issues with magnetic retention, prompting the decision to undergo simultaneous bilateral Osia® OSI200 implantation.

Upon examination, the patient exhibited total bony atresia on the left side and a hypoplastic middle ear with dysplastic ossicles bilaterally. Imaging studies, including Computed tomography (CT) scans, revealed the extent of bony atresia and middle ear abnormalities. Audiometric evaluation, including pure-tone audiometry, confirmed severe conductive hearing loss in both ears, consistent with the anatomical findings.

Given the patient's dissatisfaction with the unilateral Attract system and the limitations it imposed, the decision was made to proceed with bilateral Osia® OSI200 implantation. The surgery was performed without any complications, except for some retention issues at the beginning of switch-ON (Figure 1). Thereafter, the patient was responding well to the implant.

After 3 weeks, the Osia® implant was activated, allowing for bilateral use. Post-operative follow-up which was typically 4 weeks after switch-ON included regular audiometric assessments and device programming adjustments. Thereafter, the patient was requested for further follow-ups every 6 months. The patient reported significant improvement in hearing ability and overall quality of life. Subjectively, the recipient showed great satisfaction after the switch on and better active lifestyle has been reported by the recipient during his 6 months follow-ups.

Case 2: Bilateral connect to sequential bilateral Osia®

Congenital atresia, also known as aural atresia, is a congenital malformation of the EAC, characterized by partial or complete absence of the EAC. This condition can significantly impair auditory function and is frequently associated with microtia, which involves malformation or hypoplasia of the auricle [7]. This case report details a 13-year-old male with bilateral congenital atresia who experienced significant complications with traditional bone-anchored hearing aids (Bahas) (BA400), and successfully transitioned to the Osia® 2 bone conduction system.

The patient presented with bilateral hearing loss and chronic skin irritation related to BA400 device. He reported discomfort and infection around the implant sites, which impaired his auditory function and overall quality of life. The physical examination revealed malformed external ear structures consistent with congenital atresia. There was notable skin irritation and infection around the BA400 implants, but no additional craniofacial anomalies were observed. The patient informed undergoing initial management involving bilateral Connect (BA400) implantation on November 22, 2013 at another center, which provided some hearing improvement but led to persistent skin complications and recurrent infections. Upon thorough examination, the patient was diagnosed with bilateral congenital atresia with complications related to BA400 devices.

Following this, the right-sided BA400 was removed and replaced with an Osia® 2 System on January 27, 2022, at our hospital. Subsequently, the left-sided BA400 was also removed, and the second Osia® (OSI200) device was implanted sequentially on December 14, 2022, also at our hospital. This sequence of interventions was aimed at resolving the skin issues associated with the BA400 and improving auditory outcomes with the advanced Osia® technology (Figure 2).

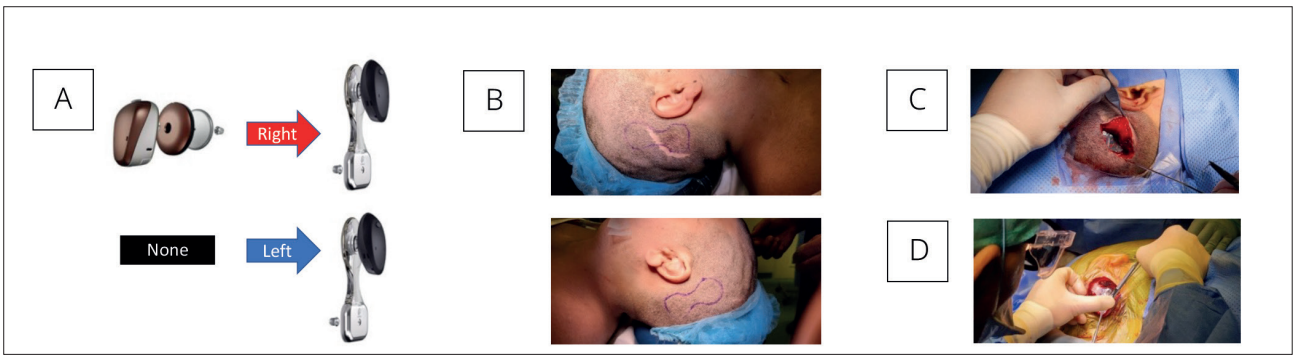

Figure 1. *(A) Hearing aid simultaneous implantation. Some steps of implantation: (B) Planning the incision, (C) Pocket creation and removal of Baha Attract®, (D) Fixation of the implant on the bone.*

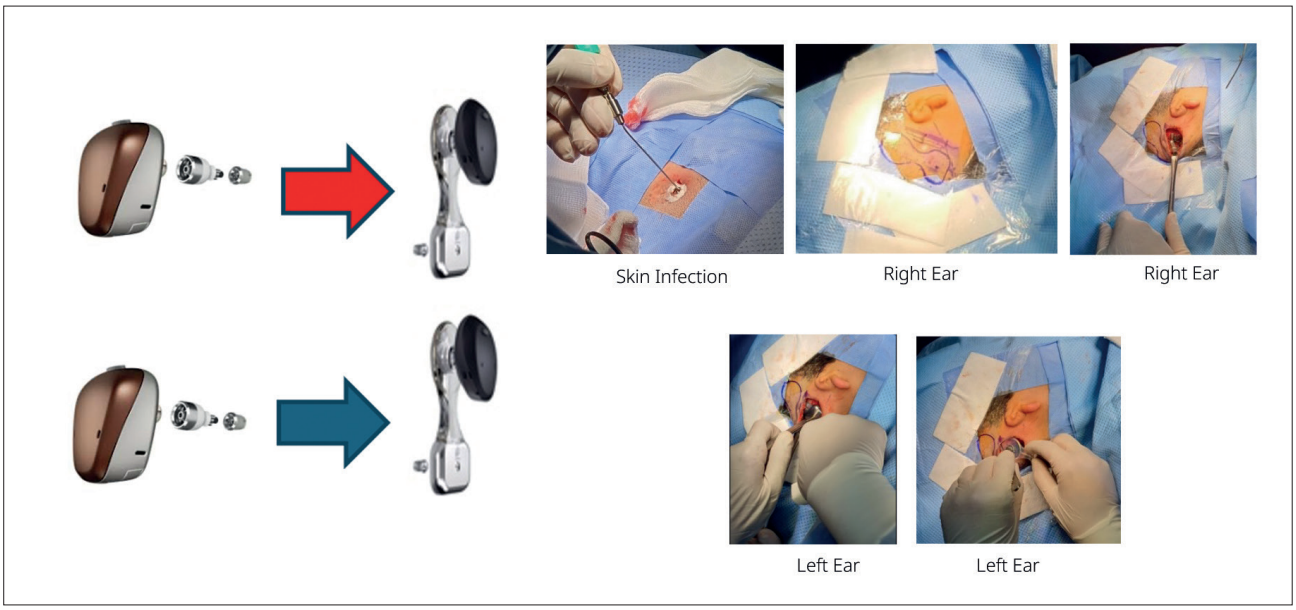

Figure 2. *Some steps of implantation: planning the incision, pocket creation, drilling of the site of the BI300 in the mastoid bone, fixation of the implant on the bone.*

Post-Osia® implantation, the patient reported significant improvement in auditory function and resolution of skin irritation. Follow-up audiometric evaluations confirmed enhanced hearing thresholds, and longer hours of usage of the Osia 2 sound processor were confirmed by data logging. Follow-up CT scans and audiometric tests showed proper placement and functioning of the Osia® devices. The Osia® system was well-tolerated, with no major adverse events reported.

Discussion

Bone conduction implants have emerged as a viable treatment option for patients with single-sided deafness, and conductive or mixed hearing loss. The benefits of these devices in appropriately selected candidates are well-established. Nevertheless, the optimal surgical approach and device selection remain areas of ongoing investigation [5]. The surgically implanted system group of the bone conduction devices converts acoustic signals into mechanical vibrations transmitted directly to the inner ear via the skull and is further classified into percutaneous and transcutaneous devices based on the presence or absence of a skin-penetrating abutment. The traditional bone conduction implant with a percutaneous abutment has historically been the primary treatment modality for patients with significant sensorineural hearing loss [8]. Active transcutaneous bone conduction devices were engineered to optimize the advantages of both percutaneous and passive transcutaneous systems while mitigating the risks of skin complications and soft tissue-mediated signal attenuation. These devices incorporate an external processor and an implanted transducer coupled via magnetic coils. Signal transmission from the external to the internal component is achieved through electrical conduction. By generating mechanical forces directly within the implant, active systems circumvent the issue of skin-induced signal degradation, allowing for a significant reduction in magnetic coupling strength [1].

The new Cochlear™ Osia® OSI200 System (Cochlear Ltd., Sydney, Australia) is an active transcutaneous bone-anchored hearing device with a piezoelectric actuator fixed to an osseointegrated titanium implant (BI300) (Figure 3). The device is designed to aid hearing for those who have conductive, mixed, or single-sided sensorineural hearing loss with pure tone average bone conduction threshold better than or equal to 55 dB [6] and was the one that was evaluated in this case report.

The transition from unilateral or bilateral Baha devices to bilateral Osia® implants represents a significant advancement in the management of conductive hearing loss [2]. Multiple case studies have reported improved audiological outcomes and optimized signal transmissions [1].

As demonstrated in our case reports, this surgical intervention offers several advantages over traditional bone conduction implants. The elimination of percutaneous care, coupled with the reduced risk of local complications, substantially enhances patient quality of life. Additionally, the potential for improved auditory outcomes, particularly in complex listening environments, underscores the clinical significance of this technology [6].

Audiologically, both patients experienced notable improvements in hearing thresholds and speech perception following bilateral Osia® implantation (Figure 4). While extended follow-up is necessary to fully assess the long-term benefits, the initial results are encouraging. It is essential to emphasize that individual responses to implantation can vary, and factors such as the degree of hearing loss, anatomical considerations, and patient expectations play a crucial role in determining outcomes. Our cases

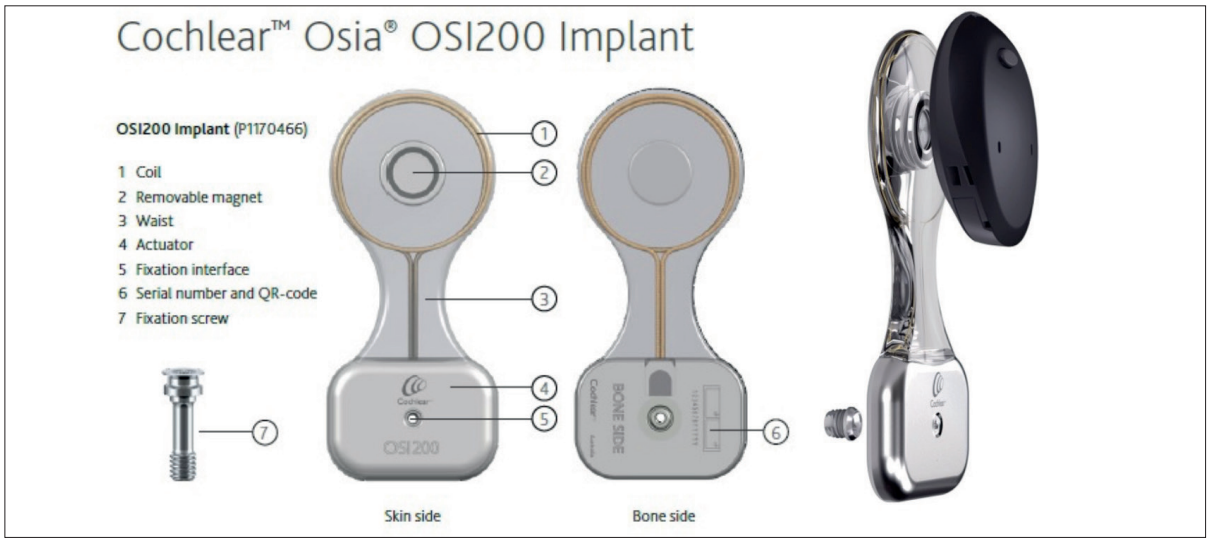

Figure 3. *The bone conductive Cochlear™ Osia® implant.*

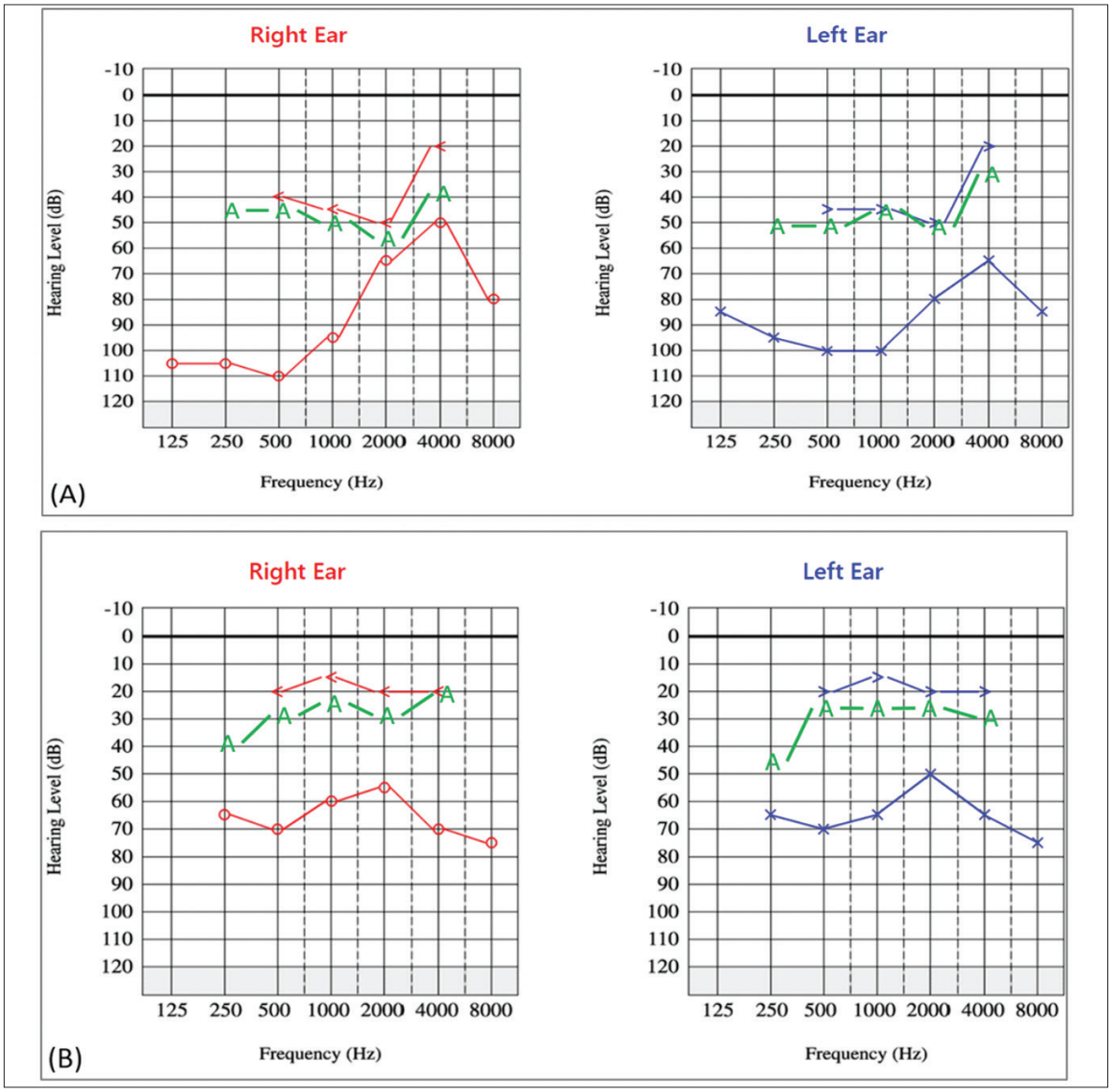

Figure 4. *Graphs showing unaided and aided hearing thresholds for (A) Attract to Osia patient and (B) Connect to Osia patient. Symbol A represents aided thresholds.*

illustrate the feasibility of both approaches, with successful outcomes achieved in both patients.

In both cases, the decision to transition to Osia® implants was based on specific patient challenges and was supported by clinical and economic considerations. In the first case, the patient had difficulties with retention and eventual non-use of the BAHA Attract® system, necessitating a more reliable solution. The second patient, who had received the BAHA Connect® system in the USA, faced recurrent skin infections upon returning to Kuwait, likely due to the stark contrast in climate between the two regions. These complications around the implant site significantly affected the patient's experience and prompted the transition to the Osia® system. The success of these cases highlights the importance of careful patient selection, ensuring that the Osia® system is the most suitable choice based on individual, clinical, and environmental factors. From an economic perspective, the Osia® system is fully reimbursed bilaterally for Kuwaiti nationals under the Ministry of Health, making this transition financially viable. Additionally, both patients demonstrated substantial improvements in their quality of life after the implantation, with follow-up visits now limited to routine monitoring. No further medical treatments or interventions have been necessary, which further supports the cost-effectiveness of the decision.

While these case reports provide valuable insights, it is important to acknowledge their limitations. The small sample size precludes definitive conclusions regarding the optimal implantation approach or the long-term efficacy of Osia® implants. Further research with larger cohorts is warranted to establish evidence-based guidelines for patient selection and surgical management.

Conclusion

The transition from unilateral Baha devices to bilateral Osia® implants represents a promising therapeutic option for individuals with conductive hearing loss. The case studies presented herein highlight the potential benefits of this approach, including improved hearing outcomes and enhanced quality of life. As technology continues to evolve, it is anticipated that Osia® implants will play an increasingly important role in the management of hearing loss.

What is new?

Bone conduction implants are crucial for enhancing hearing in patients with conductive or mixed hearing loss, particularly when conventional hearing aids are ineffective. This case series presents two case reports detailing the transition from unilateral BAHA Attract® and bilateral BAHA Connect® systems to bilateral Osia® implants. The findings demonstrate the clinical benefits and growing relevance of transitioning from BAHA to Osia® systems for patients with complex auditory needs.

List of Abbreviations

CT	Computed tomography
EAC	External auditory canal
MRI	Magnetic resonance imaging

Conflicts of interest

The author declares no conflict of interest regarding the publication of this case report.

Funding

None.

Consent for publication

Patients being minors, informed consent was obtained from their parent and/or legal guardian.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Summary of the case 1

1	Patient (gender, age)	16-year-old male
2	Final diagnosis	Severe conductive hearing loss in both ears
3	Symptoms	Total bony atresia on the left side and a hypoplastic middle ear with dysplastic ossicles bilaterally.
4	Medications	Surgery for simultaneous bilateral Osia® OSI200 implantation
5	Clinical procedure	Simultaneous bilateral Osia® OSI200 implantation
6	Specialty	Audiology

Summary of the case 2

1	Patient (gender, age)	13-year-old male
2	Final diagnosis	Bilateral congenital atresia
3	Symptoms	Bilateral hearing loss and chronic skin irritation related to BA400 device, implant site infection
4	Medications	Surgery for sequential bilateral Osia® OSI200 implantation
5	Clinical procedure	Sequential bilateral Osia® OSI200 implantation
6	Specialty	Audiology