A new Cochlear™ Osia® OSI200 Implant in Spain – a case report

Nowy typ implantu Cochlear™ Osia® OSI200 w Hiszpanii – opis przypadku

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ABSTRACT:
Introduction: Hearing rehabilitation after bilateral conductive deafness for middle ear atresia has different options. Osia® OSI200 implant is a new type of implantable bone conduction hearing aid with a new technology that offers both acoustic and aesthetic advantages.

Case report: In this paper, we report the first case of a Cochlear Osia® OSI200 implanted in Spain in a 44-year-old patient. He was affected by a bilateral conductive hearing loss due to a congenital bilateral ear malformation. Ear canal atresia and pinna malformation were noted on the left side as well as ossicular chain malformation on the right side. The surgical technique is described and the results are satisfying.

KEYWORDS: bone conduction hearing aid, Cochlear Osia® OSI200, hearing loss

CASE PRESENTATION

A 44-year-old man with Klippel Feil syndrome had a malformation of the head and neck and a congenital bilateral hearing loss due to bilateral ear malformation (Fig. 1.).

The clinical examination noted a skinny right ear canal with a deep stenosis, a minor aplasia of the left pinna with major atresia of the homolateral ear canal. Temporal bone computed tomography (CT) scan showed an asymmetry of the skull base with, on the left side, a narrow mastoid, poor pneumatization and atresia of the external ear canal and middle ear. Contralateral mastoid process was better pneumatized.

Tonal and vocal audiometry tests showed a severe air conduction hearing loss in the left ear (70 dBs) and mild on the right side (45 dBs loss) (Fig. 2.).
The patient had been checked with a Baha-type Bone Vibrator to test the suitability of bone conduction prostheses. Being very positive, he decided to intervene with the Osia® OSI200.

The surgical kit consists of OSI200 Implant, OSI200 Implant template, BI300 Implant, drills and non-magnetic plugs and replacement magnets.

The Osia® System [2] comprises an external and internal (implanted) component:

- The Osia® OSI200 Implant connected to BI300 Implant which osseointegrates with the bone;
- A sound processor which picks up the sound from the environment and sends the information to the implant via transcutaneous inductive link.

During surgery the OSI200 Implant template was used to plan the correct position and was marked on the skin. The location of the BI300 Implant was marked using the hole of the actuator area of the OSI200 Implant template and a hypodermic needle inserted down to the bone with marking ink. Soft tissue thickness was measured using a thin hypodermic needle, a clamp and a ruler before local anesthesia injection. Inferior post-auricular incision with extension was done. The coil pocket was created by making an incision down and through the periosteum for a tighter fit of the periosteum over the implant. The periosteum around the BI300 Implant location was cleared away using a small cruciate incision. A drill indicator and abundant irrigation were used during the drilling procedures. Drilling was done at an angle perpendicular to the bone surface with up and down movement to ensure that irrigation reaches the tip of the drill. Coolant was applied to facilitate the osseointegration process. With the drill indicator in place, the implant was inserted at an angle perpendicular to the bone surface, without coolant, until the first threads of the implant were well within the bone (two rotations). Once in the bone, we continued placement with irrigation until the Osscora surgical set stopped automatically and beeped.

Then, we placed the centre of the actuator on top of the BI300 Implant and hand-tightened the fixation screw with a screwdriver, while maintaining the actuator with our fingers, avoiding the contact of the actuator with the bone. We sutured the skin and soft tissue in two separate layers and applied a pressure dressing for 24 hours.

During the post-operative period, we did not detect any complication. One week after surgery, the wound was clean and we removed sutures. One month later, the sound processor was programmed by the audiologist and new audiometry tests were done (Fig. 5.).

There was a significant acoustic improvement and the patient was satisfied with the aesthetic and functional benefits of the implant (Fig. 5.).

DISCUSSION

Bone conduction devices can be divided into two groups: extrinsic devices and surgically implanted devices. Surgically implanted
Bone conduction devices are designed to convert acoustic sound waves into mechanical vibration, which is conducted to the inner ear via direct contact with the skull. Broadly, we can classify them into percutaneous and transcutaneous devices depending on the presence or absence of a skin-penetrating abutment. The transcutaneous implants can be distinguished into two categories: active and passive implants. Passive transcutaneous devices are made of an implanted part of the device in direct connection with the skull and a separate, external portion maintained in place magnetically which drives vibration through the skin to the implanted device. In a passive system, vibration is generated at the level of the external processor, and vibrations are transmitted through the skin to the implanted device. Active transcutaneous devices are equipped with an external microphone and processor which send electronic signals to an implanted, vibrating device in direct contact with the skull. With an active system, the external processor is static and drives electronic signals. Vibration begins at the level of the implanted device only. Therefore, active transcutaneous bone conduction devices were designed to maximize the benefits (good signal transmission) of percutaneous and passive transcutaneous devices while avoiding skin complications (adverse skin reactions, device extrusion, and the need for revision surgery) and soft tissue signal attenuation. The Osia® system and the Bonebridge® are examples of this type. The Osia® system was introduced in the United States in 2019. This is the world’s first osseointegrated steady-state implant that uses digital piezoelectric stimulation to bypass non-functional areas of the natural hearing system and send sound directly to the cochlea. This piezoelectric stimulation is a major advantage of this implant and gives more power in high frequencies as compared to other bone conduction devices [1, 2].

The National Institute for Health and Care Excellence (NICE) guidelines recommend unilateral cochlear implantation as an option for patients with severe to profound deafness who do not receive adequate or cannot be helped with acoustic hearing aids [3]. However, the choice of the type of implant depends on many factors. Each patient has unique needs which are related to the degree and type of hearing impairment, anatomy, vocational or educational needs, and personal preferences [1]. Our patient was using a soft band hearing aid before deciding to be implanted. After explanation of the benefits and disadvantages of different types of bone conduction devices, our patient chose Cochlear Osia® implant and argued that he was interested in the lightness, esthetic aspects of the device as well as the possibility to adjust the sound processor easily from a compatible smartphone or Apple Watch®. In a recent review study, significant improvement in the quality of life (QoL) was reported on in implanted adults. They showed significantly higher QoL than their non-implanted (hearing-aided) peers. Most of the QoL improvement of cochlear implant was highlighted within the first 4 months following surgery, with the gain sustained for at least 6 years later [4].

Bone conduction devices provide the patient with a conductive hearing loss with the ability to hear without occlusion or irritation of
transcutaneous device, is associated with signal attenuation due to signal loss during transmission through the skin and soft tissues. This attenuation is most apparent at high frequencies [1]. With a comparable mechanism as the Bonebridge®, Osia® implant is a recently introduced active transcutaneous device which takes advantage of new electronic signal transmission, optimizes bone conduction efficiency, and reduces the incidence of skin complications [1, 7]. In our patient, the outcomes were higher than expected.

CONCLUSION

Hearing rehabilitation of conductive hearing loss in patients with bilateral ear canal atresia includes the use of bone conduction aids as the first option. Conventional hearing aids are not indicated. Several bone conduction devices are available on the market to date. Among these, the cochlear Cochlear Osia® implant has shown better outcomes and offers both acoustic and aesthetic advantages. Nevertheless, other classic devices such as Bonebridge®, BAHA Attract®, and PONTO®, remain of great interest.
References