CASE STUDY

Osteoporosis and Complications in Hearing Implants. Analysis of Two Cases

Osteoporosis y complicaciones en implantes auditivos. Análisis de 2 casos

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Clinical Case

Case 1

We present the case of a premature female patient, carrier of profound bilateral congenital sensorineural hearing loss. At 16 months a Nucleus Contour Advance was implanted in the right ear using posterior tympanotomy with opening of the facial recess and minimum drilling of the back wall of the external auditory canal (EAC). At the second year of evolution cholesteatoma became evident in the EAC, entering the mastoid bone through its posterior wall. The patient was operated on again, cleaning mastoid cavity and reinforcing the back wall of the EAC with cartilage from the tragus. She was admitted to the hospital at 5 months’ postoperative for metabolic decompensation; the diagnosis was nephropathy with loss of potassium and calcium and secondary osteoporosis (Bartter syndrome). After 2 years of follow-up and treatment of her nephropathy, there has been no recurrence of cholesteatoma.

Case 2

This was a premature female patient with association of CHARGE syndrome and severe bilateral mixed congenital hearing loss, equipped with hearing aids. When she was 4 years old, she developed bilateral tympanic atelectasis, which was resolved with reinforcement tympanoplasty and bilateral T tubes. She progressed with frequent bouts of otorhea, so a 3-mm osseointegrated Baha Flange Fixture St was implanted in 2 stages in the left ear at the age of 6. After 6 months for osteointegration, the bone conduction vibrator was put into place. Following 8 months of use and after a blow to the skull, extrusion of the titanium screw occurred. The dormant screw, which had 1 year and 2 months of osseointegration, was then used. Spontaneously, a new extrusion occurred after 1 year of use. She was assessed by an endocrinologist, who diagnosed protein malnutrition and osteoporosis, in the context of a mother that was a vegetarian and a naturopathic paediatrician. Protein reinforcement and decalcification treatment were administered for 2 years before attempting the use of the Baha® again; this is still not complete at the present time.

Discussion

Between 3% and 6% of implantable auditory prostheses (IAP) can present complications such as extrusion. This condition reaches 0.1% in cochlear implants and from 5% to 30% in Baha®. Among the causes of extrusion, osteointegration failure is notable. Children constitute the subgroup with greatest loss of implants due to their thin skull with lesser bone content. Prematurity, craniofacial dysmorphisms, the


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use of corticoids, parenteral nutrition, and prolonged stays in intensive care units (ICU) affect the bone structure and aggravate the problem.\textsuperscript{3}

Petrus temporal bone computed tomography (PTBCT) shows the anatomy of the ear to be operated, but gives no indication of bone mineral density (BMD). Up to 40% loss of density can exist without any evidence on the PTBCT.

The BMD varies with age, so it is difficult to establish in paediatric cases. There are various techniques to measure it and the method of choice is dual energy X-ray absorptiometry (DXA, or DEXA, the anagram in English) because of its reproducibility, quickness, and low radiation exposure. However, this test ignores bone thickness (which varies in all dimensions during growth), underestimates BMD in short patients and lacks reference values for specific populations such as infants and ethnic groups. The DXA can be difficult to perform in younger infants and, consequently, its use is recommended from the age of 1 year.

Osteoporosis in children is defined as a loss of bone mass and deterioration of the bone microstructure, with a BMD Z-score less than 2 standard deviations associated with antecedents of fractures.\textsuperscript{4} It should be remembered that up to 88% of osteoporosis cases are incorrectly diagnosed if the DXA is not interpreted by trained professionals.\textsuperscript{5}

Considering all this, especially with younger infants, it is essential to use biochemical parameters such as alkaline phosphatase, calcium, phosphorous, parathormone, and vitamin D,\textsuperscript{3} which assess the metabolic characteristics of bone interpreted according to age and sex.

Given that the accretion of nutrients such as calcium and phosphorous mainly occurs in the third trimester of intrauterine life, osteoporosis is a condition present in practically all premature babies. In these cases, a serial control of biochemical parameters and prevention of osteoporosis through fortified milk and vitamin supplements are recommended.\textsuperscript{3}

Analysing the BMD in children that are candidates for IAP becomes even more important due to the greater incidence of osteoporosis in patients with antecedents of prematurity, craniofacial malformations, and prolonged hospital stays in the ICU. Osteoporosis can remain undetected in clinical findings and in imaging results, making it necessary to be on the watch for it. It is essential to have a detailed clinical history that allows the search for risk factors and to investigate vitamin supplementation. Biochemical assessment should be requested early, ideally at the third month after birth, to initiate treatment of osteoporosis before surgery for an implantable prosthesis.

Management should be multidisciplinary, among the otorhinolaryngologist, the paediatrician, and the child endocrinologist, to prevent these complications.

In the case of older children, the possible presence of osteoporosis should always be investigated when there are bone complications in the prosthesis.

Conflict of Interests

The authors have no conflicts of interest to declare.

References