Abstract

Purpose. The aim of this study was to illustrate the different imaging features of middle and inner ear implants, brainstem implants and inferior colliculus implants.

Materials and methods. We retrospectively reviewed the computed tomography (CT) images of 468 patients with congenital or acquired transmissive or neurosensory hearing loss who underwent surgery. The implants examined were: 22 Vibrant Soundbridge implants, 5 at the long limb of the incus and 17 at the round window, 350 cochlear implants, 95 brainstem implants and 1 implant at the inferior colliculus. All patients underwent a postoperative CT scan (single or multislice scanner) and/or a Dentomaxillofacial cone-beam CT scan (CBCT) (axial and multiplanar reconstruction), and/or a plain-film radiography to visualise the correct position of the implant.

Results. The CBCT scan depicts Vibrant site of implant better than plain-film radiography, with a lower radiation dose compared to CT. For cochlear implants, a single plain radiograph in the Stenvers projection can directly visualise the correct position of the implant. All patients with brainstem or inferior colliculus implants underwent postoperative CT to exclude complications and the assess correct implantation, but the follow-up of these implants can be performed by plain radiography alone.

Conclusions. CT and CBCT scans are reliable and relatively fast methods for precisely determining the location of middle ear implants. CBCT is preferable to CT because of the lower radiation dose administered; a single plain-film radiograph is enough to visualise and follow-up cochlear, brainstem and inferior colliculus implants.
Keywords Bionic ear · Implant · Computed tomography · Cone-beam computed tomography

Introduction

Deafness is a condition that has significantly increased in recent years: about one quarter of the people affected suffer from severe hearing loss, regardless of age. Nonetheless, the incidence among the elderly population is the highest, given that over 60% of people aged 70 and older have a hearing loss of at least 25 decibels, whereas 30% of them have such a marked hearing loss that it considerably compromises their ability to communicate.

In younger patients, hearing loss (hypoacusis) needs to be identified early to effectively intervene and improve the quality of social relations. In order to identify the appropriate therapy, knowledge is required regarding aetiology (genetic or acquired hypoacusis), time of onset (pre- or postnatal, pre- or postverbal), site (uni- or bilateral, symmetrical or not) and type of hypoacusis (transmissive, neurosensory, mixed) [1–3].

Moderate to severe hypoacusis is treated with the application of electromagnetic prosthetic implants, known as "bionic ear", which are capable of directly stimulating the healthy anatomical structures of the auditory canal, thus compensating for the nonfunctioning structures that impede transmission of audio messages. Radiological techniques for assessing correct implant positioning require the use of ionising radiation, as the devices are currently a contraindication for the use of magnetic resonance imaging.

The aim of the study was to identify the best radiological technique to use in the postoperative follow-up of patients with a bionic ear, taking into consideration diagnostic capabilities and radiation dose administered, particularly as these patients may be young adults or children.

Materials and methods

Between January 1993 and June 2006, we assessed 468 patients (mean age 34 years, range 3 months to 77 years) suffering from transmissive or neurosensory hypoacusis who...