Case Report
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Two Cases of Earmold Foreign Bodies in Middle Ear and Eustachian Tube

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보청기 귓본 제작 시 발생한 중이와 이관의 이물 2예

김동국[1] · 김윤중[1] · 최영석[1] · 남동우[2]

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Foreign bodies in the external auditory canal (EAC) are frequently encountered by otolaryngologists and emergency care physicians. Earmold impression is the first step in fabricating a hearing aid and requires silicone injection into the EAC. Therefore, careful evaluation is essential regarding the presence of any tympanic perforation or EAC abnormalities prior to making an earmold impression. We encountered two cases of foreign bodies in the ear during taking earmold impression at a local hearing aid center. In one case, silicone earmold impression material had migrated through a tympanic membrane perforation into the middle ear, whereas in the other it had extended into the Eustachian tube. Both patients underwent surgical removal of the foreign body. Based on these cases, we emphasize that thorough physical examination by an otolaryngologist should precede any application of hearing aid, especially in patients with preexisting tympanic perforation or history of ear surgery.
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Keywords Ear mold; Eustachian tube; Foreign body; Hearing aid; Tympanic perforation.

Introduction

Foreign bodies in the middle ear are uncommon in otolaryngologic practice. Foreign bodies in the external auditory canal (EAC) can often be readily removed with suction or microforceps, whereas those in the middle ear cavity are often difficult to remove because of procedural pain and the risk of injury to adjacent structures.[1)]

Middle ear foreign bodies can arise from various causes. Examples include ear impression taking without adequate otologic evaluation in patients with chronic otitis media and tympanic membrane perforation and entry of a tympanostomy tube into the middle ear cavity after an excessively large myringotomy during tube placement. In particular, if silicone ear impression material enters the middle ear, it may disrupt the ossicles and ossicular joints and may cause hearing loss or dizziness through complications such as perilymph leakage. In most cases, complications occur because an ear impression is taken without prior examination of the tympanic membrane and EAC by an otolaryngologist.[2)]

Several cases of middle ear foreign bodies caused by ear impression taking have been reported internationally, but reports in the Korean literature remain rare. Herein, we report two cases of foreign bodies involving the middle ear and Eustachian tube that occurred during ear impression taking for

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hearing aid fabrication in patients with tympanic membrane perforations and were removed surgically, together with a review of the literature.

Cases

Case 1

A 57-year-old man presented to our hospital 3 days after the onset of right-sided otalgia, tinnitus, and aural fullness that developed while silicone ear impression material was being injected into his EAC at a hearing aid center. He had been followed at an otolaryngology clinic for chronic right otitis media for several years. During hearing aid fabrication, the ear impression was taken at the hearing aid center without examination of the tympanic membrane by an otolaryngologist or a hearing aid prescription. His medical history was otherwise unremarkable except for diabetes mellitus and hyperlipidemia.

Physical examination revealed a right tympanic membrane perforation and otorrhea. A green foreign body presumed to be silicone, which had entered through the perforation, was observed in the middle ear cavity. Pure-tone audiometry showed a threshold of 75 dB in the right ear (bone-conduction threshold, 45 dB) and 35 dB in the left ear (bone-conduction threshold, 25 dB) (Fig. 1). The patient reported otalgia, tinnitus, and aural fullness but denied dizziness.

At the initial visit, we attempted to remove the presumed silicone foreign body from the right middle ear cavity in the outpatient clinic using microforceps and suction. However, removal was difficult because the foreign body filled most of the middle ear cavity visible through the tympanic membrane perforation. In addition, the patient experienced severe pain during the attempted removal. Given the risk of further injury to the middle ear structures, we decided on surgical removal under general anesthesia. Surgery was performed on day 7 after symptom onset.

Preoperative temporal bone CT demonstrated hyperattenuating foreign material within the right middle ear cavity. The status of the ossicles could not be clearly assessed (Fig. 2).

Under general anesthesia, a tympanomeatal flap was elevated through a postauricular approach, and the tympanic cavity was opened. Intraoperatively, the presumed silicone foreign body filled the EAC and middle ear space and extended as far as the tympanic orifice of the Eustachian tube (Fig. 3). The malleus was surrounded by granulation tissue related to the preexisting chronic otitis media and showed erosive changes. It was therefore removed during surgery. Incudostapedial discontinuity was also observed, with the presumed silicone foreign body extending into the intervening space. The disconnected incus was subsequently removed. The facial nerve was confirmed to be intact. Using a surgical pick, suction, and a dissector, the presumed silicone foreign body was dissected free from the surrounding tissues and removed, and the middle ear was carefully inspected to confirm that no residual foreign body remained. The chorda tympani nerve was sacrificed to facilitate safe removal of the foreign

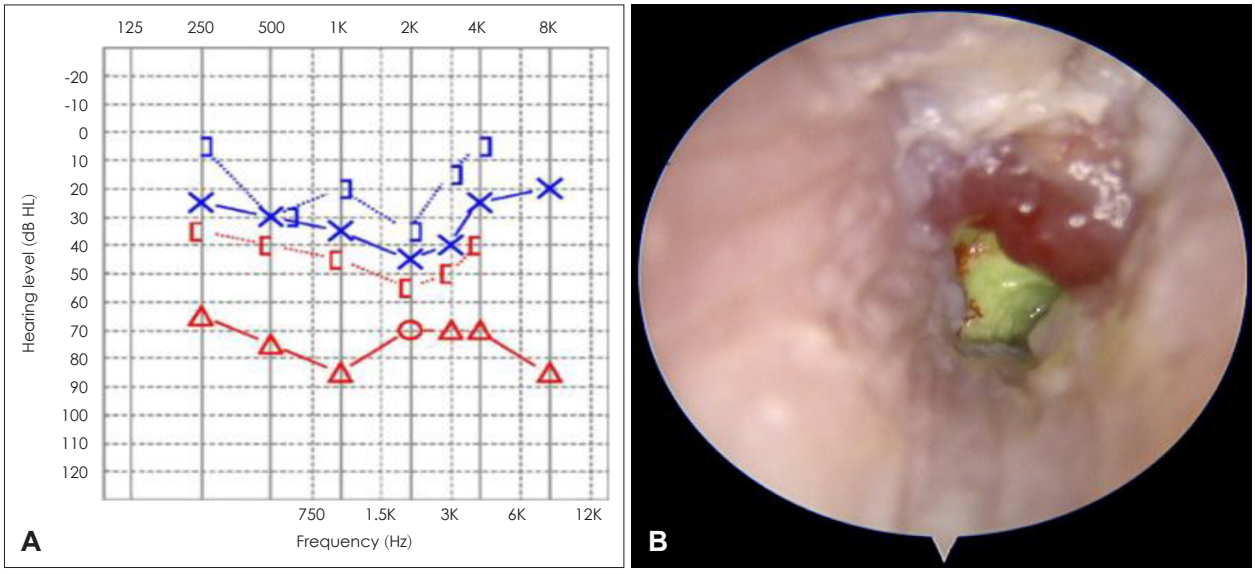


Fig. 1. Preoperative status of case 1. A: Preoperative pure-tone audiometry demonstrated a hearing threshold of 75 dB in the right ear (bone-conduction threshold, 45 dB) and 35 dB in the left ear (bone-conduction threshold, 25 dB). B: Otoscopic examination of the right tympanic membrane at presentation revealed a silicone foreign body obstructing the tympanic membrane.

body. Canal wall-up mastoidectomy and tympanoplasty were performed for the preexisting chronic right otitis media, and the tympanic membrane was reconstructed with temporalis fascia using the underlay technique. The EAC was then packed, and the operation was completed.

A bacterial culture obtained at the initial outpatient visit grew *Pseudomonas aeruginosa*. For antibiotic treatment, the patient remained hospitalized for 7 days after surgery and received intravenous ceftazidime, a third-generation cephalosporin. He was subsequently discharged with oral trimethoprim/sulfamethoxazole. The EAC packing was removed 2 weeks after surgery, and the tympanic membrane was in good condition.

Nine months after the initial surgery, ossiculoplasty was performed, and a 0.5-mm-long titanium partial ossicular replacement prosthesis was inserted. Three months later, pure-tone audiometry showed a threshold of 60 dB in the right ear (bone-conduction threshold, 30 dB), indicating slight hearing improvement. The patient continues to be followed on an outpatient basis without complications (Fig. 3).

Case 2

A 53-year-old man presented to the emergency department on the same day because the ear impression material

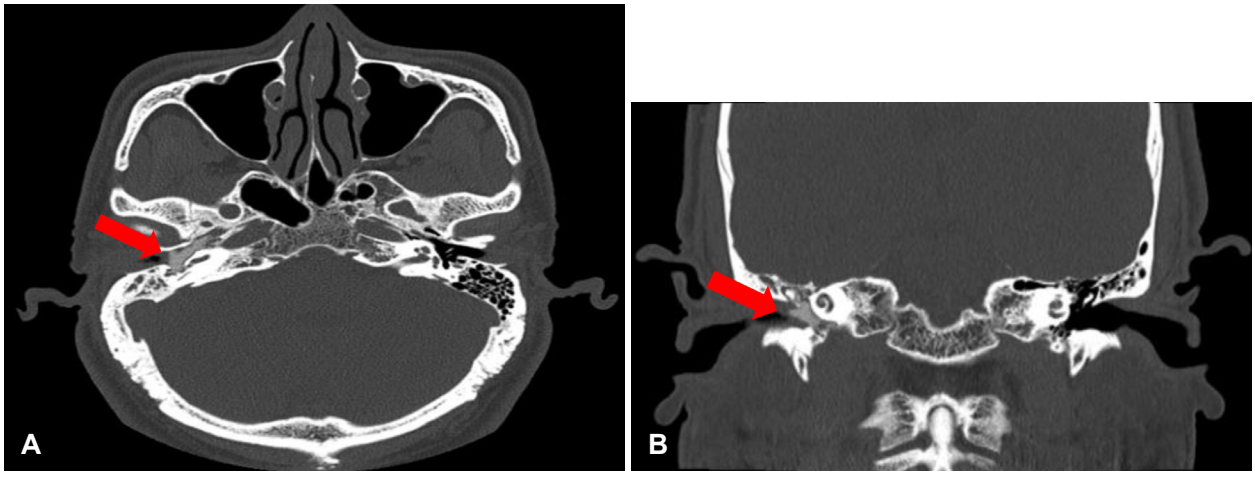


Fig. 2. Temporal bone CT images in the (A) axial and (B) coronal planes. The ossicular chain was poorly visualized, and a hyperdense lesion consistent with a silicone foreign body was identified within the middle ear cavity.

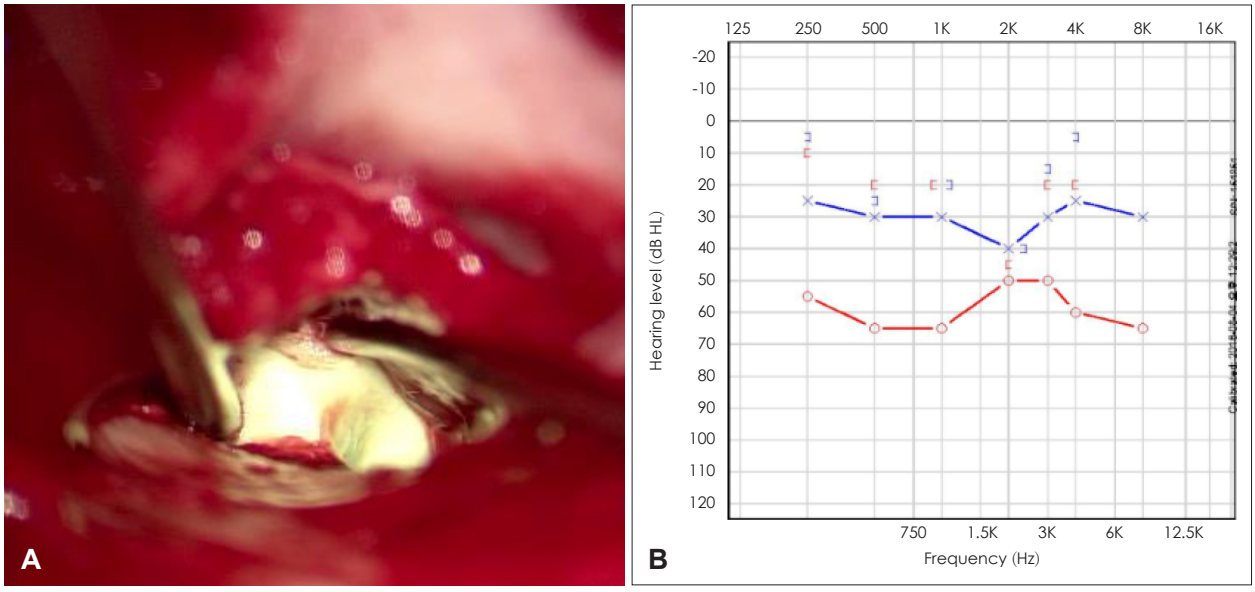


Fig. 3. Intraoperative & postoperative status of case 1. A: Intraoperative findings revealed a silicone foreign body within the middle ear cavity. B: Postoperative pure-tone audiometry following ossiculoplasty demonstrated improvement in hearing, with a hearing threshold of 60 dB and a bone-conduction threshold of 30 dB in the right ear.

could not be removed after ear impression taking at a hearing aid center without a prescription from an otolaryngologist. His medical history was unremarkable except for an atrial septal defect. He had a history of left chronic otitis media since childhood, with near-total hearing loss in that ear, and also had a history of sensorineural hearing loss in the right ear. History taking revealed that, despite the preexisting near-total hearing loss in the left ear, the patient subsequently underwent ear impression taking for hearing aid fabrication at a hearing aid center.

On physical examination, an atrophic tympanic membrane was noted in the right ear. The left ear showed a tympanic membrane perforation and a green foreign body presumed to be silicone within the middle ear cavity. Pure-tone audiometry showed a threshold of 40 dB in the right ear (bone-conduction threshold, 35 dB). In the left ear, the threshold at 250 Hz

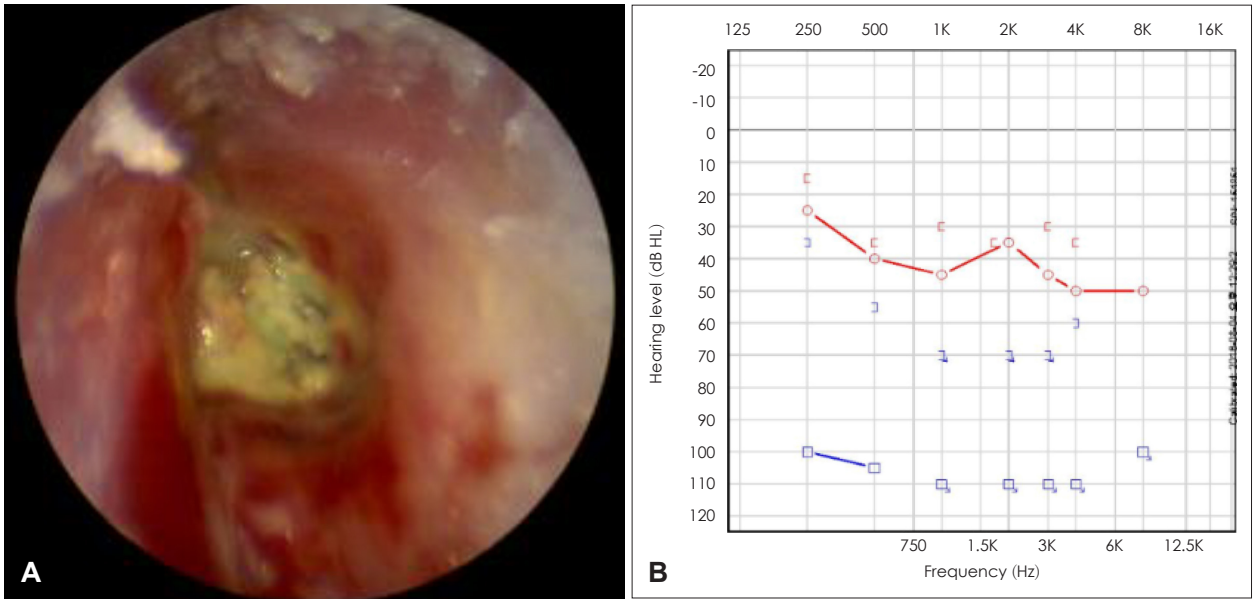


Fig. 4. Preoperative status of case 2. A: Otoscopic examination at presentation showed a green foreign body attached to the left tympanic membrane. B: Pure-tone audiometry demonstrated a hearing threshold of 40 dB in the right ear (bone-conduction threshold, 35 dB). In the left ear, thresholds were 100 dB at 250 Hz and 105 dB at 500 Hz, with no measurable bone-conduction response.

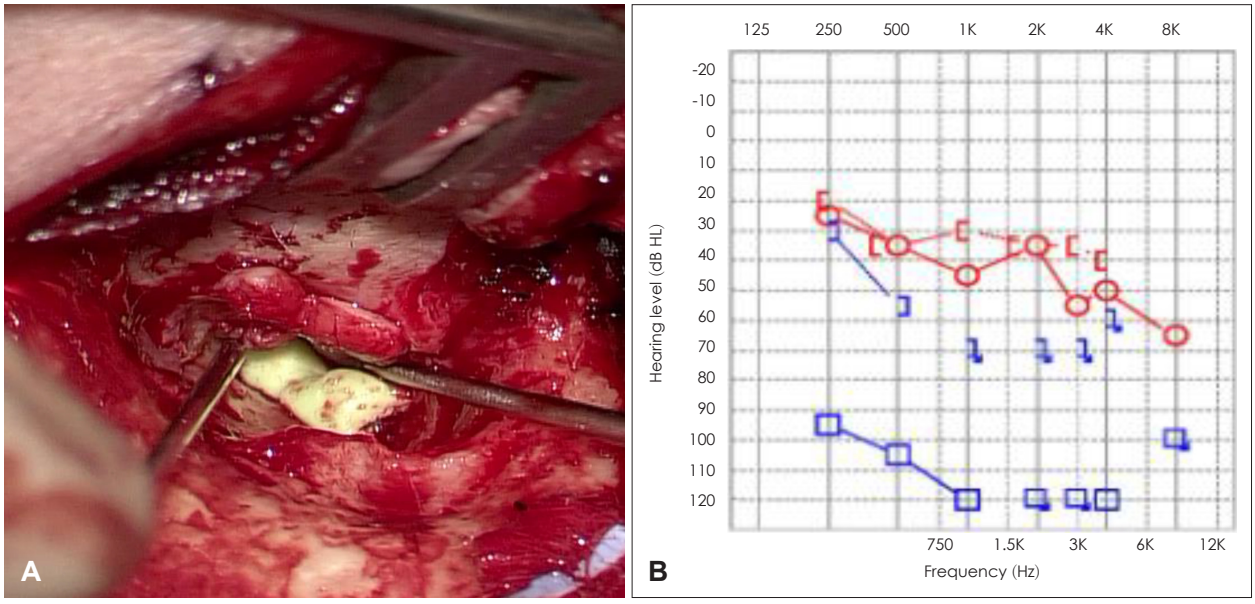


Fig. 5. Intraoperative & postoperative status of case 2. A: Intraoperative findings revealed a silicone foreign body encasing the ossicular chain. B: Pure-tone audiometry performed 3 months postoperatively showed no significant change compared with the preoperative hearing level.

was 100 dB and that at 500 Hz was 105 dB, with profound hearing loss on bone-conduction testing. These findings were unchanged before and after ear impression taking (Fig. 4). The patient denied aural fullness, otalgia, tinnitus, or dizziness, and no spontaneous nystagmus was observed. Temporal bone CT showed soft-tissue attenuation in the epitympanum but no other abnormalities.

Based on our experience with the first case, we recommended surgical removal under general anesthesia. However, because of the patient's personal circumstances, surgery was performed 14 days after the incident. As in the first case, a tympanomeatal flap was elevated via a postauricular approach, and the middle ear was entered. Intraoperatively, the presumed silicone foreign body had entered the middle ear cavity through the tympanic membrane perforation, and discontinuity of the incudostapedial joint was identified. Given the location and extent of the foreign body, removal of the malleus and incus was unavoidable for safe extraction (Fig. 5). The chorda tympani nerve was not identified during removal of the foreign body. However, the facial nerve remained intact. After confirming that no residual foreign body remained in the middle ear cavity, canal wall-up mastoidectomy and tympanoplasty were performed, and the tympanic membrane was reconstructed using temporalis fascia with the underlay technique. The EAC was then packed, and the operation was completed.

As in the previous case, the EAC packing was removed 2 weeks after surgery. The patient continues to be followed on an outpatient basis, with unchanged hearing and no complications (Fig. 5).

This study was approved by the Institutional Review Board of Chungbuk National University Hospital (IRB No. 2026-04-038), and informed consent was waived.

Discussion

As the older population has grown in recent years, demand for hearing aids has also increased.[3] Although ear impression taking is an early step in hearing aid fabrication, it is particularly important because a precise fit to the patient's EAC improves both the effectiveness of the hearing aid and patient compliance.

Silicone-based materials are commonly used to make ear impressions and are inserted into the EAC. In patients with a tympanic membrane perforation or chronic otitis media, and in those who have undergone canal wall-down mastoidectomy, the EAC must be thoroughly occluded with a cotton or foam otoblock. Particular caution is required when taking the impression because silicone impression material may enter the middle ear cavity through a tympanic membrane perforation. In patients with a history of canal wall-down mastoidectomy, silicone that hardens within the large mastoid cavity can be difficult to remove.

When hardened ear impression material is confined to the EAC, it can be removed relatively easily using a curette, bayonet forceps, suction, microforceps, or alligator forceps. However, removal in the outpatient setting is difficult if the material is firmly fixed in place or has entered the middle ear through a preexisting tympanic membrane perforation and hardened there. Chi, et al.[4] and Seo, et al.[5] similarly reported cases in which ear impression material that had entered the middle ear was surgically removed. Therefore, when retained ear impression material is identified in the EAC, the patient's otologic history, including tympanic membrane perforation and chronic otitis media, should be carefully reviewed before removal is attempted, and otoscopic and microscopic examinations should first be performed to determine whether the material has entered the middle ear through a preexisting tympanic membrane perforation.

When entry of ear impression material into the middle ear is suspected, CT should be considered to assess the location and extent of the foreign material and its relationship to surrounding structures. In particular, if the material is adherent to surrounding tissues or extends into the Eustachian tube, surgical removal under general anesthesia should be considered before attempting removal in the outpatient setting.

Complications that may occur during removal of a middle ear foreign body include injury to the EAC and tympanic membrane, damage to the ossicles and oval window, and acute or chronic otitis media. These complications may result in hearing deterioration and dizziness.[6] Therefore, forceful attempts to remove a middle ear foreign body in the outpatient setting should be avoided. Thompson, et al.[7] reported an increased complication rate among patients referred to a tertiary care center after unsuccessful attempts to remove EAC foreign bodies and emphasized that a specialist should first assess the need for surgery under general anesthesia before removal is attempted in a primary care setting. CT also provides important information for determining the need for surgery under general anesthesia and selecting an appropriate surgical approach.[8] Early removal by an experienced otolaryngologist is advisable whenever possible. Surgical re-

moval under general anesthesia may be preferable to repeated outpatient removal attempts, particularly when the risk of complications is high or entry into the middle ear is suspected.[9,10]

When symptoms such as hearing loss, otalgia, and dizziness are present, surgical removal under general anesthesia should be considered first. The surgical approach should be determined according to the location and extent of the foreign body. An endaural approach may be used when access through the tympanic membrane is possible and the foreign body can be readily removed. In other situations, removal may be achieved through a postauricular approach with a limited atticotomy. If removal remains difficult with these approaches, mastoidectomy may be performed.[11]

Foreign bodies located near the Eustachian tube may cause long-term Eustachian tube dysfunction and affect middle ear pathophysiology, thereby increasing the risk of tympanic membrane retraction, chronic otitis media, and cholesteatoma. Therefore, early removal is important.[12] In both patients, the overall contour of the incudostapedial joint was preserved, but the joint was discontinuous, with presumed silicone material extending into the intervening space. These findings suggest that the presumed silicone material may have contributed to or aggravated disruption of the ossicular chain. Therefore, when ear impression material enters the middle ear, early removal is important to minimize ossicular dislocation and injury. During surgery, the ossicular chain should first be identified, with particular attention to the position of the stapes, and preserved. Special care should be taken to prevent permanent inner ear injury caused by stapes dislocation during foreign body removal.

Appropriate evaluation and involvement by an otolaryngologist in hearing aid prescription and management are important to minimize complications that may arise during hearing aid fabrication. In particular, patients with a history of tympanic membrane perforation, chronic otitis media, or middle ear surgery may be at increased risk of complications during ear impression taking. Therefore, the EAC and tympanic membrane should be carefully examined before the procedure to confirm that ear impression taking is safe.[13] The present cases likewise involved complications that occurred after silicone ear impression material was injected without adequate evaluation of the tympanic membrane.

The second case, in particular, illustrates the important role of otolaryngologists in hearing aid prescription and management. The patient had previously received otolaryngologic care at our institution for left-sided chronic otitis media and hearing loss. At that time, we explained that the severity of hearing loss in his left ear made meaningful audiologic benefit from a hearing aid unlikely and did not recommend hearing aid use in that ear. Nevertheless, the patient subsequently visited a hearing aid center and underwent ear impression taking, resulting in a silicone foreign body in the middle ear. This case suggests that when a hearing aid is fabricated without an otologic examination and audiologic evaluation, preventable complications may occur despite the limited potential audiologic benefit.

In conclusion, these cases highlight the importance of evaluation by an otolaryngologist before ear impression taking and the need for particular caution in patients with a tympanic membrane perforation or a history of middle ear surgery. When ear impression material is retained as a foreign body in the middle ear, prompt evaluation by an otolaryngologist and early appropriate treatment, including surgery under general anesthesia, are important to prevent further complications.

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Generative AI was used for English translation. The final version was reviewed and approved by the authors and the Editorial Office, and the authors retain final responsibility for the content.

Bilingual Publication

This article is available in both Korean and English.

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Author Contribution

Conceptualization: Yoon Joong Kim, Young Seok Choi. Investigation: Dong Kook Kim, Dong Woo Nam. Project administration: Yoon Joong Kim. Supervision: Yoon Joong Kim, Young Seok Choi. Visualization: Dong Kook Kim. Writing—original draft: Dong Kook Kim, Dong Woo Nam. Writing—review & editing: Dong Kook Kim, Yoon Joong Kim.

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