Ossicular chain dislocation with normal hearing

Allison R. Holzapfel, MD; C.Y. Joseph Chang, MD; Kevin D. Pereira, MD

Abstract
We report a unique case of an ossicular chain injury in a young man. Despite the fact that the patient’s incus was dislocated into the external auditory canal while remaining attached to the stapes, his hearing was not affected and remained nearly normal. We discuss the patient’s presenting features and our diagnostic and management strategy in this case.

Introduction
Ossicular chain injury can occur in association with temporal bone fractures. The most common types of ossicular injury in these cases are dislocation of the incudostapedial joint, fracture of the stapes, and subluxation of the stapes footplate. These ossicular disruptions usually result in a persistent conductive hearing loss in the affected ear.

We report a unique case in which the incus was dislocated into the external auditory canal while remaining attached to the stapes. Despite the injury, the patient’s hearing remained nearly normal.

Case report
A 27-year-old man presented to the emergency room following a motor vehicle collision in which he experienced a closed head injury. The patient complained of decreased hearing in the right ear and episodes of vertigo.

The head and neck examination revealed the presence of blood in both external auditory canals, right postauricular ecchymosis (Battle’s sign), right conjunctival hemorrhage, periorbital swelling, and right facial nerve paralysis (House grade VI). The tympanic membranes could not be visualized. The initial audiogram demonstrated a moderate-to-severe conductive hearing loss in both ears. Electroneurography demonstrated a 100% reduction of the compound action potential amplitude. Computed tomography (CT) of the temporal bones detected bilateral longitudinal temporal bone fractures. The patient refused facial nerve decompression surgery, and so he was treated with oral steroids.

The patient did not regain any of his facial nerve function. He returned with right-sided otorrhea and was found to have a polypoid mass coming through the tympanic membrane. The mass was bony hard on palpation. High-resolution CT of the right temporal bone revealed a dislocation of the right incus, with the body in the external auditory canal but with the lenticular process still attached to the stapes head (figure 1). The malleus did not appear to be displaced. An audiogram reflected a very minimal conductive hearing loss in the right ear (figure 2, A).

In view of the attachment of the displaced incus to the stapes, a transcanal approach to the middle ear was not possible. Instead, a transmastoid transfacial recess (posterior tympanotomy) approach was used to separate the incudostapedial joint with an argon laser prior to incus removal. The ossicular chain reconstruction involved placing the resculpted incus body between the long process of the malleus and the stapes capitulum. The posterior tympanic membrane perforation was repaired via the medial underlay technique with temporalis fascia. The postoperative period was uneventful, and an audiogram 2 months after surgery demonstrated only a minimal conductive hearing loss in the right ear (figure 2, B).

Discussion
Temporal bone fractures can cause numerous sequelae, including facial nerve injury, cerebrospinal fluid otorrhea, vestibular dysfunction, sensorineural hearing loss, and damage to the sound conducting system. Persistent conductive hearing loss develops in 15 to 20% of patients who sustain a temporal bone fracture.1-2 The most common finding in such ossicular injuries is incudostapedial joint separation, which occurs in 53 to 82% of cases.1-3 Other types of injury include incudomalleolar joint separation, dislocation of the incus, dislocation of the incudomallear complex, and fracture of the stapes. Fracture of the malleus or incus is uncommon.4 High-resolution CT of the temporal bone can further elucidate the nature of...
the ossicular injury prior to intervention, but it is not always necessary.

Ossicular injury is usually suspected when a significant conductive hearing loss persists 6 to 8 weeks after injury.\(^1\,^2\) The exact nature of the ossicular pathology is usually determined at the time of middle ear exploration. In our patient, we observed no significant conductive hearing loss despite the displacement of the ossicle into the external ear canal. Surgical intervention was planned to treat the recurrent otorrhea that had occurred secondary to the presence of the ossicle in the canal. CT confirmed that the ear canal mass was indeed the displaced incus body and that the incudostapedial joint was still intact. A standard transcanal procedure was not possible because the middle ear could not have been accessed without first removing the incus. In order to prevent trauma to the inner ear, the

Figure 1. Axial (A) and coronal (B) CTs of the right temporal bone show the incus body in the external auditory canal.

Figure 2. Pre- (A) and postoperative (B) audiograms show no significant conductive hearing loss at either evaluation.
incudostapedial joint needed to be separated through a posterior tympanotomy prior to removal of the incus. The ossicular chain was then reconstructed with an incus interposition between the stapes and malleus.

To the best of our knowledge, only 1 other case of normal hearing in a patient with an incudomalleolar joint disruption and dislocation of the incus body into the external auditory canal has been reported.³ However, no audiometric information or clinical information regarding treatment was included in that report.

Hearing results after ossiculoplasty in patients with ossicular fractures have been good. Wennmo and Spandow found an air-bone gap of 20 dB or less in 89% of patients and 10 dB or less in 67% of patients over a minimum follow-up of 3 years.⁶ In a literature review, Hughes reported that bone-to-bone ossicular reconstruction by experienced otologists can provide good long-term results even in high-risk ears.⁷ At 5 years, two-thirds of cases showed closure of the air-bone gap to within 15 dB. Hughes also found that other materials, such as hydroxyapatite and porous polyethylene, provide similar results in low-risk ears.

References