

Imaging Case of the Month

Isolated Traumatic Fracture of the Malleus Handle Causing Hearing Fluctuation

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Introduction: Handle of malleus fracture is a rare condition with <100 cases having been reported. The clinical presentation is conductive hearing loss following a history of trauma, typically, during manipulation of the external auditory canal. The diagnosis of the condition is clinical and radiological. The options for treatment are either a hearing aid or ossiculoplasty. We describe an isolated case of malleus handle fracture after trauma associated with manipulation of the external auditory canal.

Case report: A 56-year-old female, reported a right ear trauma. She suffered immediate otalgia, hearing loss and nonpulsatile tinnitus. An indistinct umbo was identified on endoscopic inspection and a hypermobile right tympanic membrane during Valsalva. Clinical testing of hearing revealed a mild-to-moderate conductive hearing loss. Computed Tomography scan revealed a fracture of the right malleus handle. A

decision for surgical treatment was made based on continuing symptomatology as well as audiology and CT findings. A tragal composite cartilage graft was harvested and placed over the remaining superior part of the malleus and under the inferior fragment of the malleus attached to the tympanic membrane. The patient had immediate improvement of fluctuating hearing loss and tinnitus in the postoperative period.

Conclusion: A fracture of the malleus handle should be included in the etiologies of conductive hearing loss after trauma. A careful history, thorough otology examination, and a meticulous analysis of the CT will usually confirm this rare condition and exclude other ossicular abnormalities.

Key Words: Bone fractures—Conductive hearing loss—Ear ossicles—Malleus.

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Handle of malleus fracture is a rare condition with <100 cases having been reported (1,2). The clinical presentation is conductive hearing loss following a history of trauma, typically, during manipulation of the external auditory canal (1,3). Symptoms include sudden otalgia, mild hearing loss, hearing loss fluctuation, ear fullness, and a clicking sensation. High-frequency tinnitus may be present, either intermittently or continuously (3,4).

The diagnosis of the condition is clinical and radiological. The clinical diagnosis is based on history, otoscopy, audiometry, and tympanometry. The audiogram findings are conductive hearing loss with air-bone gap larger at high frequencies and hypermobility in the tympanometry (5). A computed tomography (CT) may detect these fractures provided there is a displacement or rotation of the fractured fragment (1).

The options for treatment are either a hearing aid or ossiculoplasty (3). This paper describes an isolated case of malleus handle fracture after trauma associated with manipulation of the external auditory canal.

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CASE REPORT

A 56-year-old female, with no previous otologic history, reported a right ear trauma one month prior to the appointment. She was scratching her ear using a cotton bud when a friend bumped her elbow. She suffered immediate otalgia, hearing loss and nonpulsatile tinnitus. For the subsequent weeks prior to surgery, her symptoms included persisting tinnitus and fluctuating hearing loss which caused the patient significant distress.

On examination, she had an indistinct umbo on endoscopic inspection (Fig. 1A). During Valsalva testing, she had a hypermobile right tympanic membrane. Clinical testing of hearing revealed a mild-to-moderate conductive hearing loss. The rest of her otological examination was unremarkable.

An audiogram (Fig. 2A) and a CT (Fig. 1B) were performed. The audiogram confirmed a mild-to-moderate conductive hearing loss and the CT scan revealed a fracture of the right malleus handle without any other abnormality.

After informed discussion with the patient, a decision to operate was made based on continuing symptomatology as well as audiology and CT findings.

The procedure was performed endoscopically under general anesthesia with the patient in 10° of reverse

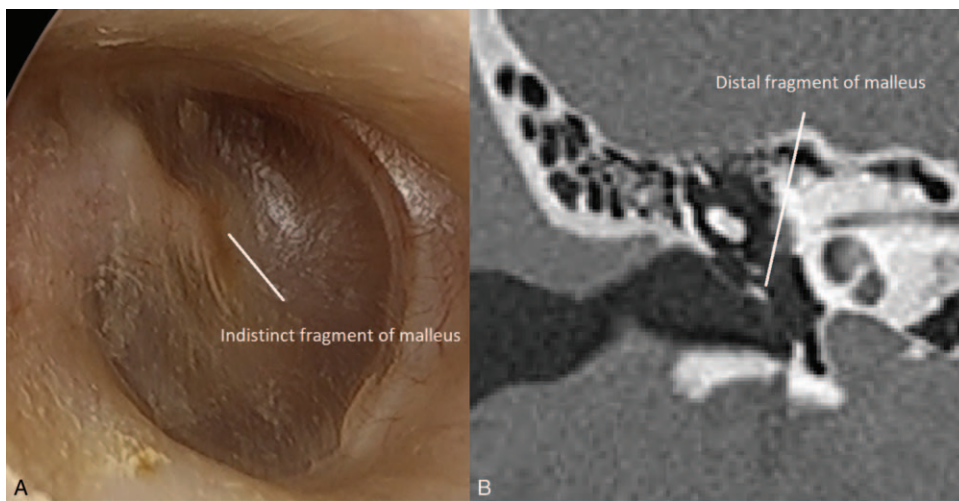


FIG. 1. (A) Preoperative image of the right external auditory canal revealing an indistinct fragment of the malleus handle; (B) Malleus handle fracture. Coronal CT scan of the right temporal bone demonstrates the right malleus handle fracture. CT indicates computed tomography.

trendelenburg. The external right auditory canal and tragus were infiltrated with 1% ropivacaine and 1:50000 adrenaline. A tympanomeatal flap was raised and the distal fragment of the malleus handle was identified (Fig. 3A). The fragment of the malleus handle and umbo were scored on its medial aspect with a sharp hook to allow a graft to adhere.

A tragal composite cartilage graft was harvested leaving the thin posterior perichondrium adherent to the cartilage. The graft was shaped as required and placed over the remaining superior part of the malleus and under the inferior fragment of the malleus attached to the tympanic membrane (Fig. 3B).

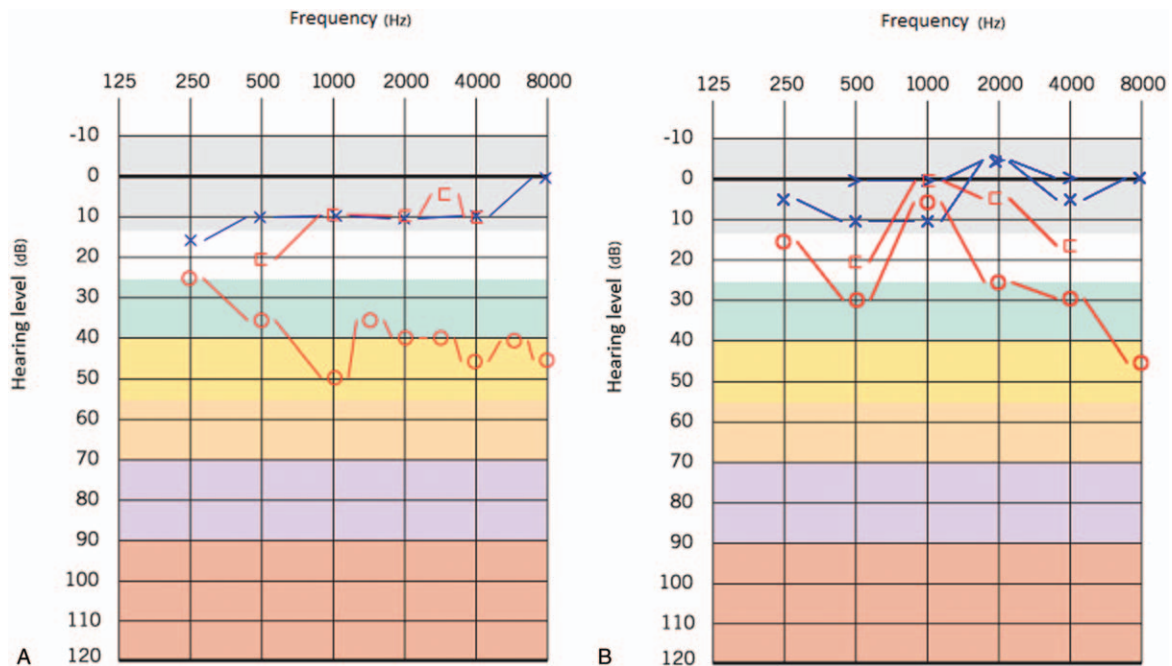


FIG. 2. (A) Preoperative audiogram. Mild-to moderate conductive hearing loss; (B) Postoperative audiogram. Audiogram at 4 weeks after surgery demonstrating improvement of conductive hearing loss at low frequencies.

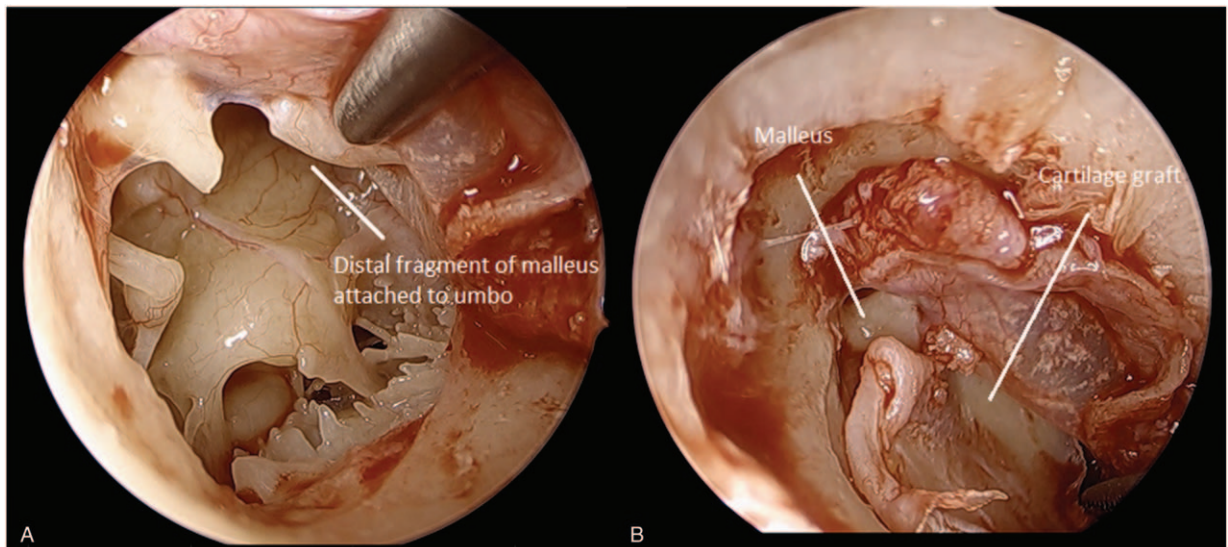


FIG. 3. (A) Intraoperative image. Endoscopic image of the malleus handle fracture with the fragment of malleus handle attached to umbo; (B) Intraoperative image. Endoscopic image displaying the composite cartilage graft being placed on the remaining part of the malleus handle.

The patient had immediate improvement of fluctuating hearing loss and tinnitus in the postoperative period. Audiogram at 4 weeks after surgery demonstrated significant early closure of the air bone gap at low frequencies (Fig. 2B).

DISCUSSION

An isolated malleus handle fracture can be easily misdiagnosed and overlooked due to its subtle appearance upon physical examination, as well as similarities to symptoms and clinical findings with other ossicular chain fractures (2,5). The tympanic membrane often naturally heals and is intact during physical inspection (4). The most commonly reported cause of the condition is a quick removal of a finger from the external auditory canal, especially when the ear canal is wet. The rapid movement provokes a sudden negative pressure in the external ear canal, causing a fracture (4,5).

Otomicroscopy may reveal a fracture line, with pneumatic otoscopy helping to demonstrate hypermobility of the distal fragment of the malleus (2). A Valsalva maneuver may reveal the dis-jugated movement between the two parts of the malleus (2,3,4). Another helpful diagnostic tool is a laser-Doppler vibrometry, which reveals an increased umbo velocity (3,5).

CT plays an important role in diagnosis, as it may not only confirm the separate malleus fragment, but it also excludes other associated ossicular injury. However, the CT findings can easily be overlooked. Usually, the longitudinal axis of the malleus demonstrates the displacement of proximal and distal fragment of the malleus handle with lateralization of the inferior segment and medialization of the superior segment (2).

In cases where conductive hearing loss, hearing loss fluctuation and aural fullness are troubling, a hearing aid as well as surgery are options to be discussed with the patient (5). Even though many techniques have been performed to improve hearing threshold, there is no standard procedure that is recommended.

Spontaneous improvement of hearing can be observed in a patient who chooses conservative management (5); however, patients with persistent symptoms may benefit from surgical repair (3). Ossicular reconstruction may be performed with an autologous incus, partial ossicular replacement prosthesis (PORP) or a total ossicular replacement prosthesis (TORP) depending on the ossicular configuration (3). Some surgeons opt to stabilize the fracture interpositioning with bone chips or cartilage, others choose to reconstruct the malleus handle with hydroxyapatite (3,4). Tan et al (1) reported a case in which the fractured malleus was stabilized with hydroxyapatite bone cement. There was closure of the air-bone gap, except beyond 4000 Hz, in the postoperative audiogram. Hydroxyapatite bone cement has shown positive results in other cases with improvement of postoperative audiometry (2).

A unique repair using containment of the fracture with a small piece of titanium mesh filled with bone fragments and fixed with Tissucol (Baxter Healthcare, Deerfield, IL) has also been described. Symptoms and hearing fully recovered postoperatively (4). Another surgeon repaired the malleus fracture by removing the incus and placing a PORP between the stapes head and the tympanic membrane. Postoperatively, patient reported resolutions of her symptoms and significant improvement of the air-bone gap in the audiogram (5). In the case presented, due to the

relatively long intact proximal handle of the malleus still available, a composite cartilage graft was interposed between the malleus and the TM.

CONCLUSION

A fracture of the malleus handle should be included in the etiologies of conductive hearing loss after trauma. A careful history, thorough otology examination, and a meticulous analysis of the CT will usually confirm this rare condition and exclude other ossicular abnormalities.

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