

# Minimal invasive surgery can cause devastating complications

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## Abstract

To perform surgery with a minimally invasive procedure is preferred during daily practices. With the endoscope development in otology, a direct view of ossicles or lesions in the tympanic cavity without disturbing the mastoid becomes possible. Accompanied by a growing number of endoscopic surgeries, the complications were more commonly seen due to certain drawbacks, like single-hand practices and loss of three-dimensional images[1]. Rarely, to our knowledge, dislocated stapes protrudes into the vestibule cavity during endoscopic surgery, which results in profound hearing loss and vertigo.

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## Key Points:

1. Endoscope surgery quickly developed in otology, but pitfalls emerge.
2. Lost of the depth perception during surgery can lead to severe complications.
3. Stapes punched in to vestibule cavity caused total hearing loss.
4. Persist to paroxysmal vertigo were developed due to the free-flow stapes.
5. Vestibular function recovered after removed the stapes from vestibule cavity.

## Report of a case

A woman in her 50s presented to our clinic with compliance of purulent in the right ear and vertigo. Detailed medical history was documented. After decades of ear suppuration, the patient had endoscopic tympanoplasty and ossicular chain reconstruction surgery on the right ear two years ago. Severe hearing loss and vertigo hit her the first-day post-surgery. After a month of treatment, she was discharged from the hospital with alleviative vertigo but a complete hearing loss in the right ear. According to the patient, her vertigo improved during the past 2 years, and only rapidly turning her head caused paroxysmal feelings of loss in orientation or floating.

Thorough evaluations were performed before the patient admit into our department. First of all, during the physical examinations, we observed cholesteatoma in the narrowed external canal as well as the scarred tympanic membrane (Fig 1A). Then, the pure-tone audiometry indicated the total sensorineural hearing loss in the right ear (Fig 1B). Furthermore, we evaluated the vestibular function of the patient. We performed

the Vestibular Activities and Participation questionnaire for her. From “unable to do” with 4 points to “none” with 0 points, we accessed 12 different activities during her daily life. She scored sixteen points that positional changes attributed more to her difficulties. In laboratory tests, her vestibular performance was generally acceptable, and the videonystagmography (VNG) and sensory organization test (SOT) were relatively normal. A 100% decrease in the right ear in the caloric test while assessing the lateral semicircular canal may be attributed to the thickened and scarring tympanic membrane (Fig 1C). Besides, breaks in sound conduction in this patient and worse corporation lead to a minimal response in the VEMP test that aims to reflect the function of otolith organs. Thus, we performed ocular-counter text (OCR) to evaluate the reflex of VOR from utricular maculae (Fig 1C) and subjective visual vertical test (SVV) to assess the cognitive and perception of vestibular organs. Our results indicated normal or compensated otolithic results in both tests. A high-resolution CT scan was applied to determine the reason for vertigo and purulence. Stenosis with cholesteatoma was found in the external ear canal (Fig 1D). However, looking into the reconstructed ossicular chain, we found that the stapes with the prosthesis on top were dislocated into the vestibule cavity (Fig 1E). These may explain the patient’s paroxysmal vertigo and persistent hearing loss after surgery. We further took an MRI scan, which indicated the falling stapes didn’t cause fibrosis in the inner ear (Fig 1F).

We first removed the cholesteatoma and adhesion in the external canal during the surgery. Then, we found and removed the free cartilage slice (Fig 2B), and the prosthesis (Fig 2C) after elevating the tympanomeatal flap to access the tympanic cavity. The capitulum stapedius was free flow in the oral window (Fig 2D). Then we smoothly picked up the stapes from the vestibule cavity (Fig 2E). We used fascia and sponges to reseat the oral window (Fig 2F). On the first day post-surgery, the patient felt “released”. At the same time, rotating heads no longer introduce vertigo. 2 months post-surgery, the patient described her paroxysmal vertigo improved significantly during her visit. We performed the Vestibular Activities and Participation questionnaire again. Compared to 16 points pre-surgery, the patient scored 0 points by then.

## Discussion

We present an unusual case of displaced stapes in the vestibule, which induced vertigo and significant hearing loss. Several papers reported vertigo related to the damage to the stapediostapedial junction [2, 3]. Traumatic injury on the ossicular chain or prosthesis displaced into the vestibule manifests as positional vertigo and hearing loss [4-6]. Our reported case may be due to the problematic length of the reconstructed ossicular chain. In this case, the repaired tympanic membrane pressed the overlong chain, creating stapediostapedial luxation and stapes dislocation.

The free-flowed stapes in the vestibule cavity explained paroxysmal vertigo. Inertial stapes are relative to fast flow endolymph when the patient shakes her head, which causes benign paroxysmal positional vertigo (BPPV)-like symptoms. According to our OCR and SVV results, the function of vestibular organs was compensated after the initial trauma, which allowed the patient to practice normally in daily life. In addition, the stapes that caused slight fibrosis after two years may contribute to minimal mesenchymal tissue within the inner ear to develop adhesion. Thus, earlier identification and timely action are the keys to saving patients from persistent vertigo and irreversible hearing loss if any similar complication happens.

In recent years, endoscopic ear surgery is gaining popularity and expanding the indications in otological fields [1]. As an invaluable tool, the endoscope is a good starting point for junior doctors. However, with a long learning curve, this less invasive operation has certain pitfalls. First, due to the bi-dimensional view, inexperienced doctors lose depth perception, which may be attributed to the wrong length of the reconstructed ossicular. Besides, the operation of scope and instruments with single-hand may rub the narrow canal, which causes further stenosis. In this case, surgeons need more practice and gentle manipulation during the endoscopic surgery to prevent complications.

## Ethics issues

The experimental procedures in our study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Reporting guidelines of case reports in China were followed in our study.

## Reference:

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