



# Ossicular Integrity in Chronic Otitis Media (Mucosal Type): A Surgical Review

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Ann Otol Neurotol ISO 2019;2:41–42

## Abstract

Ossicular discontinuity usually cannot be determined unless an operation is performed. However, the predictive value of preoperative audiological factors in diagnosing incudal necrosis in patients with chronic otitis media (COM) – mucosal type is reasonably accurate. Ossiculoplasty was performed with autologous incus, and audiometric assessment was done to compare the hearing improvement postoperatively.

## Keywords

- ▶ chronic otitis media
- ▶ ossiculoplasty
- ▶ autologous incus
- ▶ audiogram

## Introduction

Between 40% and 90% of tympanoplasties require middle ear ossicular chain reconstruction.<sup>1</sup> Ossicular reconstruction was first performed in the 1950s. In cases with intact stapes but defective incus and/or malleus, type II and III tympanoplasties were the choice of ossiculoplasty according to the Wullstein classification in 1956.<sup>1,2</sup> Ossicular discontinuity usually cannot be determined unless an operation is performed.

## Objective

To determine the predictive value of preoperative audiological factors in diagnosing incudal necrosis in patients with chronic otitis media (COM)—mucosal type.

## Materials and Methods

### Study Design

A retrospective clinical study of 20 patients who underwent ossicular reconstruction with autologous incus over a period of 2 years was performed.

The following inclusion and exclusion criteria were used.

**Inclusion criteria:** Patients in the age group of 12 to 60 years diagnosed to have chronic suppurative otitis media—tubo tympanic disease quiescent stage/inactive stage (unilateral/bilateral) were included in the study. Patients with conductive hearing loss, along with good cochlear reserve and good Eustachian tube function as evidenced by diagnostic nasal endoscopy were included.

**Exclusion criteria:** Patients with chronic otitis media—squamosal type, were excluded from the study. Patients with sensorineural and mixed hearing loss were also excluded from the study. Patients with congenital anomalies of the ear and systemic diseases such as diabetes mellitus and renal failure were not included. Patients who underwent revision surgeries were also excluded.

The pure-tone audiograms of the patients whose incudostapedial joint was found to be eroded on table were analyzed, and the relevance of pure-tone average (PTA) as a predictor of incudostapedial joint necrosis was assessed.

### Surgical Technique

The surgeries were done under local/general anesthesia by postaural/endaural approach by a single surgeon.

The incus was removed and sculpted to a suitable size and shape to fit between the stapes head and malleus handle and to come in contact with the tympanic membrane. An acetabulum was created to accept the stapes capitulum and a notch in the short process to engage the neck of the malleus. Tympanic membrane grafting was done by the underlay technique using temporalis fascia graft. Single-stage ossicular reconstruction was performed (▶ **Fig. 1**).

All patients were followed up at 1, 3, and 6 months. Audiometric analysis was done preoperatively, at 3 months and at 6 months after surgery. Preoperative PTA was calculated using frequencies of 500, 1,000, and 2,000 Hz. The air–bone gaps were calculated based on the comparison of preoperative and postoperative averages of the three speech frequencies. Comparisons were made between the preoperative and

received  
June 13, 2019  
accepted  
June 17, 2019

DOI <https://doi.org/10.1055/s-0039-1693833>  
ISSN 2581-9607

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postoperative audiograms with respect to PTAs, air–bone gaps, and closure of air–bone gaps. The American Academy of Otolaryngology–Head and Neck Surgery guidelines define a postoperative ABG of 20 dB or less as a successful hearing result.<sup>3</sup>

## Results and Analysis

The study comprised 11 females and 9 males. In the incus refashioning group the youngest patient was aged 17 years and the oldest patient was aged 55 years. Majority of the patients fell into the 31 to 40 years age group. The mean age was 36.65 years. Among the 20 patients, 12 patients were operated on the right side and 8 patients were operated on the left side.

The mean preoperative PTA was 52.38 dB HL, the minimum value being 45dB HL and the maximum value being 64 dB HL.

## Discussion

In surgery for chronic otitis media, the reconstruction of the ossicular chain and successful physiological and functional results with long-term stability are still a challenge even for experienced otologists.<sup>4,5</sup> Usually the incus is removed and interposed after it has been sculpted to a suitable size and shape. The simplicity and practicality of using autograft in ossicular reconstruction has continued to hold attention of otologists over the years. Ease of preparation and excellent biocompatibility are major advantages apart from good sound conduction.<sup>6</sup>

However, ossicular discontinuity is identified only if the discontinuity of the ossicular chain is confirmed at the time of operation. If preoperative information can be used to determine whether or not the ossicular chain is intact, the patient can be better informed and the surgeon can be better prepared before surgery.<sup>7</sup>

In this study series, the mean preoperative PTA was found to be 52.38 dB HL. The values ranged from 45 dB HL to 64 dB HL. Complete disruption of the ossicular chain can result in a 60 dB hearing loss.<sup>8</sup> In COM, malleus is found to be the most resistant ossicle, the handle of malleus being the most commonly necrosed part of the malleus. Incus is found to be the most common ossicle to get necrosed in cases of COM. The commonest defect was erosion of the lenticular process, followed by the long process.<sup>9</sup> Kartush found erosion of long process of incus with an intact malleus handle and stapes superstructure as the most common defect.<sup>10</sup> However, Jeng<sup>7</sup> et al found that, perforation of the tympanic membrane with an edge adherent to the promontory occurred significantly more frequently in patients with ossicular discontinuity ( $p = 0.004$ ) than in those with intact ossicular chains. Surprisingly, an air–bone gap was not significantly correlated with ossicular discontinuity.

## Conclusion

Incus necrosis is best predicted by the presence of moderate to moderately severe hearing loss (45–70 dB HL). Knowledge

of this information preoperatively can influence surgical decision making and preparedness regarding ossiculoplasty and patient consent.<sup>11</sup>



Fig. 1 Image showing the incus being refashioned.

## Conflict of Interest

None declared.

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