

# Scala tympani drill-out technique for oval window atresia with malformed facial nerve: A report of three cases

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Received 19 November 2015; revised 20 January 2016; accepted 20 January 2016

## Abstract

**Objective:** To report a scala tympani drill-out technique for managing malformed facial nerve covering the entire oval window (OW).

**Methods:** Data from three cases with OW atresia, malformed stapes and abnormal facial nerve courses were reported, in which a scala tympani drill-out technique was employed with a TORP between the tympanic membrane and scala tympani fenestration for hearing reconstruction.

**Results:** Air conduction hearing improved in two of the three cases following surgery. In the third case, there was no improvement in air conduction hearing following a canal wall up mastoidectomy and tympanoplasty. There were no vertigo, tinnitus or sensorineural hearing loss in the three cases.

**Conclusion:** The scala tympani drill-out technique, which is basically fenestration at the initial part of the basal turn, provides a choice in hearing reconstruction when the OW is completely covered by abarrently coursed facial nerve.

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**Keywords:** Oval window; Facial nerve; Malformation; Scala tympani; Fenestration

## 1. Introduction

In some rare cases of congenital aplasia of the OW, malformed stapes and abnormal facial nerve locations covering the OW present a challenge to reconstruction of the ossicular chain to improve hearing. Such malformations are typically accompanied by conductive hearing loss, normal external ear canal and normal size middle ear cavity. The semicircular canal drill-out technique may be a treatment option, but the hearing outcomes are not always satisfactory (Su et al., 2014). Sterkers and Sterkers (1988) reported a vestibular drilling technique above the facial nerve at the usual location of the

Fallopian canal. Plester (1971) reported the promontorial window technique and the prosthesis was inserted into the vestibular scala. Vibrant Soundbridge (VSB) implantation on the round window is a new technique and may be a good choice (Ahrsdoerfer, 1980; AlDagna et al., 2014; Zernotti et al., 2013). In this paper, we report three cases in which the scala tympani drill-out technique was used. Details of this technique are introduced and discussed.

## 2. Materials and methods

### Cases data

Table 1 lists the information of the three patients with bilatearl conductive hearing loss, normal external ear canals and tympanic membranes treated from July 2014 through August 2015. Pre- and post-operative air bone-gap (AB-gap) and AB-gap closure were recorded in accordance to the 1995

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Peer review under responsibility of PLA General Hospital Department of Otolaryngology Head and Neck Surgery.

Table 1  
Patient profiles.

Case	Sex	Age	Side	CT findings	Operative findings	Surgical treatment	AB-gap		Testing time	
							Pre	Post		
1	M	11	L	Atresia of OW; Malformed stapes; Facial nerve located at the inferior border of the OW niche;	Osseous mass of stapes superstructure; horizontal facial nerve without bone canal cover the OW	Tympanoplasty with TORP implantation	45	15	30	3 months
2	M	8	R	Mastoiditis; Absence of stapes; Facial nerve located at the inferior border of the OW niche;	Absence of stapes superstructure; Horizontal facial nerve without bone canal cover the OW	Canal wall up mastoidectomy; tympanoplasty with TORP implantation	40	35	5	3 months
3	F	10	R	Atresia of OW; Malformed stapes; Facial nerve located at the inferior border of the OW niche;	Osseous mass of stapes superstructure; Horizontal facial nerve without bone canal cover the OW	Tympanoplasty With TORP implantation	55	20	25	4 months

guidelines by the [Committee on Hearing and Equilibrium \(1995\)](#).

Pre-operative coronal high resolution CT (HRCT) (Fig. 1A) showed the OW niche tapering to a “V” shaped central depression (yellow arrowhead) and the facial nerve (Fig. 1A & B, black arrowhead) located at the inferior border of OW atresia. The malformed stapes superstructure (Fig. 1C, red arrowhead) was seen over the exposed facial nerve. Scala tympani drill-out (Fig. 1C, white arrowhead) was located anterior-inferior to the round window membrane (Fig. 1B, blue arrowhead) and covered by a fascia graft (Fig. 1D, white dotted arrowhead), and a TORP (Fig. 1E: long white arrowhead) implanted between the tympanic membrane and the

fenestration. Post-operative CT imaging (Fig. 1F) displayed the TORP in touch with the scala of tympani. Air conduction hearing was improved to 30 dBHL at 3 months after surgery (Fig. 4A) and has remained so at this writing. There was no vertigo, tinnitus or sensorineural hearing loss.

Case 2 presented with mastoiditis and no stapes. The facial nerve (Fig. 2A and B, black arrowhead) was completely exposed and entirely obliterated the oval window. Canal wall up mastoidectomy was completed, followed by fenestration of the scala tympani at a location anterior-superior to the round window membrane (Fig. 2A, white arrowhead). The TORP was implanted between the tympanic membrane and fenestration. Fig. 2D shows the TORP column base in touch with

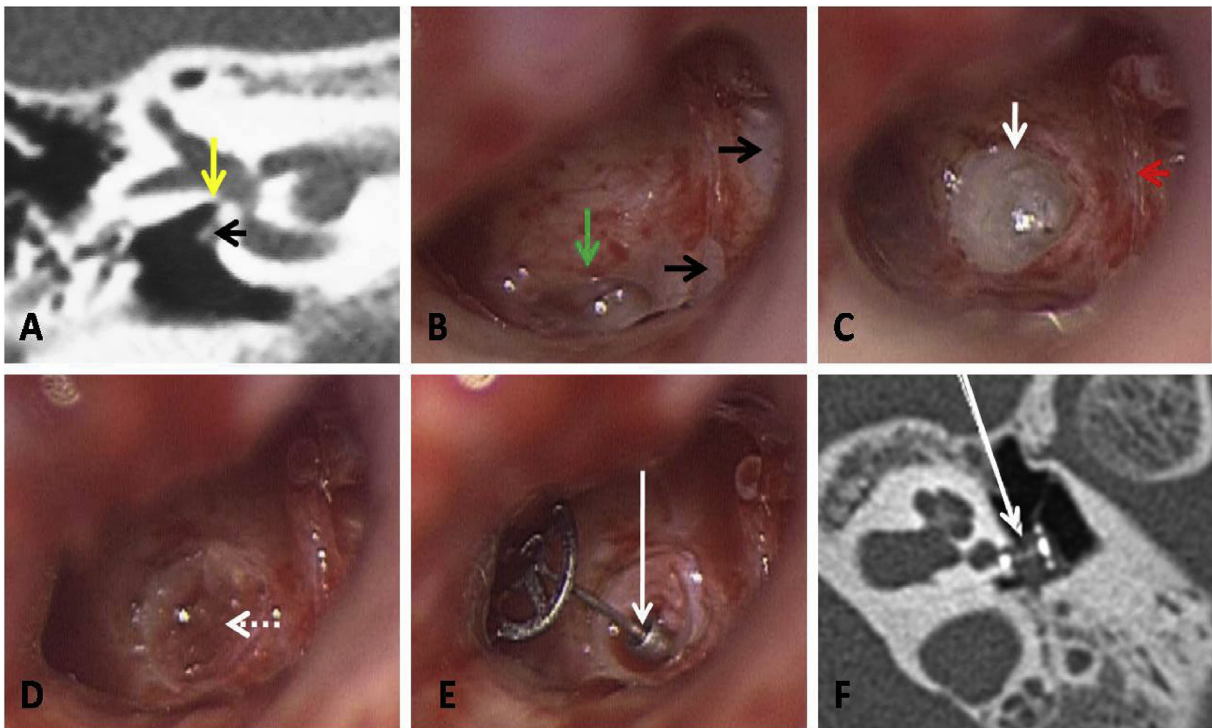


Fig. 1. Images from Case 1 A. yellow arrowhead: atresia of OW; black arrowhead: facial nerve; B. blue arrowhead: round window niche; black arrowhead: facial nerve; C. short white arrowhead: fenestra of scala tympani drilled-out; red arrowhead: malformed stapes superstructure; D. white dotted arrowhead: fascia on the bottom of fenestra; E&F. long white arrowhead: TORP.

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