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Role of Endoscopy in Round Window Identification during Cochlear Implant

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Authors' contributions

This work was carried out in collaboration among all authors. Author AF designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors FE and MHH managed the analyses of the study. Author YA managed the literature searches. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aim: To access the usage of the endoscopy in round window (RW) orientation during cochlear implant (CI).
Methodology: This was a retrospective case series study done in Otolaryngology Department, Tanta University, Egypt in 2018 and 2019. Inclusion criterion was all cases with CI surgery in which the endoscopy was used to locate the round window (RW) when this was difficult through the transmastoid approach.
Results: The total cohort consisted of 13 CI patients in which endoscopy was used. Age mean was 35.5 years. Situations necessitating the usage of endoscope were: 6/13 with cochlear rotation, 4/13 with very narrow mastoid cavity, and 3/13 with narrow facial recess. By using the endoscope, the RW was fully visualized in all patients and CI insertion done through it.
Conclusion: The endoscopy was of great value in some difficult CI cases.

Keywords: Cochlear implant; endoscopic ear surgery; round window orientation; rotated cochlea.

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1. INTRODUCTION

During cochlear implant (CI), mastoidectomy with facial recess approach is the gold standard approach [1]. The limitation of such approach includes the difficulty in round window orientation in some cases for example narrowed posterior tympanotomy or contacted mastoid [2,3].

The otoendoscopy is an outstanding tool which provides the ability to see around the corners with better exposure, higher magnification, and potentially avoid complications [4,5].

The endoscopy can be used during cochlear implant and provides the following pros: better visualization of the round window; ensuring proper placement of the CI electrodes in the cochlea; and providing the ability to see around the corners [6–8].

The aim of this study was to solve the problem of difficulty to locate the RW after standard posterior tympanotomy by using the endoscopy.

2. MATERIALS AND METHODS

This was a retrospective case series study for CI candidates between 2018 and 2019. Inclusion criterion was all cases with CI surgery in which the endoscopy was used to locate the RW when this was difficult after posterior tympanotomy.

After posterior tympanotomy, for all cases with difficult RW visibility, a rigid 0-degree endoscope (2.7 mm wide, 18 cm in length) (Karl Storz Company, Tuttlingen, Germany) connected to video recording system with a high-definition camera (Karl Storz company, Tuttlingen, Germany) was used to evaluate the RW. (Fig. 1)

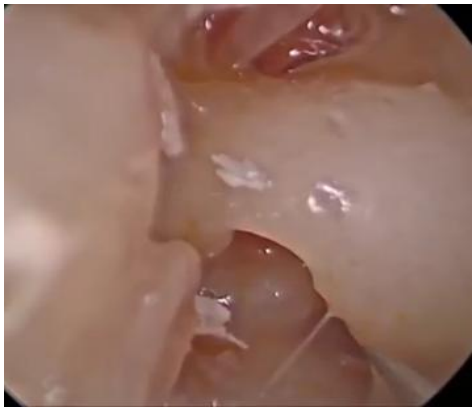

Fig. 1. Round window visibility using the endoscope

Statistics were performed using STATA version 13 (Stata Corp. 2013. Stata Statistical Software: Release 13. College Station, Texas).

3. RESULTS

3.1 Demographic Data

The total cohort consisted of 13 CI patients (7 right-sided, and 6 left-sided) in which the endoscopy was used. There were 7 males and 6 females with a mean age of 35.5 years. (Table 1).

Table 1. Demographic data in our study

		Number of patients
Ear implanted	Right	7
	Left	6
Sex	Male	7
	Female	6

3.2 Intraoperative Indications for Endoscopic Usage

In our study, 6 (46%) patients had rotated cochlea, 4 (31%) patients had contracted mastoids, and 3 (23%) patients had narrow posterior tympanotomy. (Table 2).

Table 2. Intraoperative indications for endoscopic usage

Indications	Number of patients
Rotated cochlea	6
Contracted mastoids	4
Narrow posterior tympanotomy	3

As regard the 6 patients with rotated cochlea; in 4 patients, the RW was partially visible and in 2 patients, the RW was completely invisible. While in 4 patients with contracted mastoids, there was sclerotic mastoid with overhanging sigmoid sinus and low seat dural, and the RW was completely invisible. In 3 patients, the facial recess was very narrow and the RW was completely invisible.

3.3 CI Device Used

There were two manufacture devices used: a) Cochlear™ Nucleus®, Sydney, Australia and b) Med-EL, Innabruck, Austria. Cochlear Nucleus was used in 10 (77%) patients. While Med-EL devices were used in 3 (23%) patients.

3.4 Middle Ear Finding During Endoscopic Approach

Upon using the endoscope, the RW was fully visualized in all patients and the RW insertion was achieved.

4. DISCUSION

In cases with difficult RW identification after posterior tympanotomy, we found that this problem can be solved using the endoscopy. Anatomical variations of the mastoid pneumatization, facial nerve location, and cochlear rotation, may hinder RW visibility after posterior tympanotomy.

4.1 Intraoperative Indications for Endoscopic Usage

Contracted Mastoid: In our study there were 4 patients with contracted mastoid. This was predictable from the preoperative CT and confirmed intraoperatively. By using the endoscopy, the RW was clearly visible. In another study, they reported the same with difficulty visualizing the RW in cases with sclerotic mastoid. Hence, they recommended usage of an alternative surgical approaches [3,9].

Narrow posterior tympanotomy: In our study, there were 3 cases with narrow facial recess. Over the literatures, there are great anatomical variations of facial and chorda tympani nerves [10]. To see the RW in such cases, scarification of the chorda tympani may be needed, otherwise an alternative approach has to be used [11].

Rotated cochlea: In our study, the most common anatomical finding was cochlear rotation in 6 cases. Lloyd et al. [12] and Al-Muhaimeed HS et al. [13] were the leader to draw attention towards rotated cochlea by measuring the cochlear basal turn angle.

Study limitations: Two limitations to this study were its retrospective nature, and lack of control group for comparison.

5. CONCLUSION

The endoscopy was of great value in RW orientation in certain difficult CI cases.

CONSENT

All authors declare that a written informed consent was obtained from the patients for this study. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

The study gained Ethical Committee approval from School of Medicine, Tanta University, Egypt. The number is 32897.After ethical committee approval, this study included 13 patients.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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