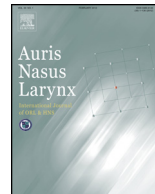




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Tubal function tests with optional myringotomy detect Eustachian tube closing failure in acquired pars flaccida retraction cholesteatoma

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ABSTRACT

Objective: To re-evaluate the incidence of Eustachian tube closing failure in acquired middle ear cholesteatoma.

Method: Thirty-one cases with acquired middle ear cholesteatoma who received surgery were enrolled. Presence of Eustachian tube closing failure was determined through two Eustachian tube function tests. First Step Tests: Test 1: Positive sniff test identified by retraction of the tympanic membrane upon sniffing was observed. Test 2: The pressure in the external auditory meatus was found to change synchronously with that of the nasopharynx during respiration or upon sniffing. Second step test: For cases with negative First Step Tests, myringotomy was performed and Test 2 was repeated.

Results: Test 1 was positive in six (19.4%) and Test 2 was initially positive in nine (29.0%) out of 31 cases. Twelve out of 31 cases (38.7%) were positive for either one of the tests. The remaining 19 cases with initial negative test results subsequently received myringotomy and were subjected to Test 2 again. Positive results were obtained in five (13.9%) additional cases, and a final total of 17 (54.8%) out of 31 cases were positive for Eustachian tube closing failure.

Conclusion: Sniff test with optional myringotomy may be useful for preoperative diagnosis of Eustachian tube closing failure.

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1. Introduction

Eustachian tube closing failure (including patulous Eustachian tube) proposed by Magnuson and his group [1,2] is now

considered one of the important risk factors for the pathogenesis and recurrence of middle ear cholesteatoma. Its incidence in acquired middle ear cholesteatoma has been reported to be as high as 25.7% and 27.4% by Kobayashi et al. and Ohta et al., respectively [3,4]. The incidence of Eustachian tube closing failure is much higher in cases with bilateral cholesteatoma [5]. These studies were made based on the incidence of habitual sniffing induced by aural discomfort found in this disorder. However, masking of the aural symptoms by hearing loss (masked patulous Eustachian tube) [6] can lead

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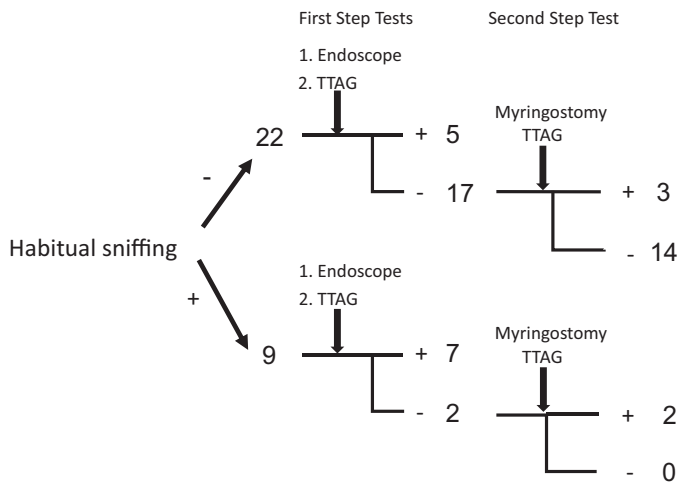


Fig. 1. Summary of Eustachian tube closing failure tests.

to a resultant termination of the sniffing habit. This implies that the real incidence of Eustachian tube closing failure may be even higher in cholesteatoma cases than reported. There are also cases where the tympanic membrane retracts without sniffing but by mere respiration. In consideration of the above factors, it is likely that the precedent studies have underestimated the incidence of Eustachian tube closing failure. In addition, Magnuson et al. indicated a very high incidence of Eustachian tube closing failure in retraction type middle ear diseases by using direct pressure measurement of the middle ear [1,2]. However, there have been no reported studies using a larger and consecutive cholesteatoma series that have addressed this issue. Therefore, this study was conducted to re-evaluate the incidence of Eustachian tube closing failure in pars flaccida type middle ear cholesteatoma through the use of Eustachian tube function tests including optional myringotomy.

2. Patients and methods

Thirty-one cases of primary acquired middle ear cholesteatoma (pars flaccida type) were included from February 2011 to April 2015 at Tohoku University Hospital and Sen-En Rifu Otolologic Surgery Center. These cases comprised 13 men

and 18 women, ranging from 16 to 82 years of age, with a mean age of 50.9 years. A questionnaire was administered regarding aural symptoms (autophony of voice or breathing sounds and aural fullness) and habitual sniffing to alleviate aural symptoms. Sniffing for nasal diseases such as allergic rhinitis and chronic sinusitis was carefully excluded. The tympanic membrane of each patient was examined under the endoscope on bilateral sides of the ear. The movement of tympanic membrane upon respiration, the retraction of the tympanic membrane, and the presence of middle ear effusion if any, were recorded.

Presence of Eustachian tube closing failure was determined through two Eustachian tube function tests, one of which was conditionally repeated a second time (Fig. 1).

First Step Tests: Eustachian tube closing failure was diagnosed by either one of the following tests. Test 1: Positive sniff test identified by retraction of the tympanic membrane upon sniffing observed under the endoscope. Test 2: Synchronized pressure change found in the external auditory meatus and the nasal cavity/nasopharynx during respiration, or creation of a negative pressure in response to sniffing seen in the external auditory meatus. These tests were performed by a dual pressure measurement system in the tubotympano-aero-dynamic graphy (TTAG) mode [7] of a commercially available ET function apparatus (JK05A; Rion, Tokyo, Japan). A catheter with a rubber cuff was inserted into the nasal cavity. The pressure values in the external auditory canal (EAC) and that of nasal cavity/nasopharynx were recorded continuously. The pressure change in the EAC reflects tympanic cavity pressure. Synchronous changes in pressure in the EAC and nasal cavity/nasopharynx during breathing or sniffing were defined as positive TTAG findings [8] (Fig. 2).

Second Step Test: For cases with initial negative First step tests results, myringotomy (using myringotomy knife or laser) was performed and Test 2 was repeated. Myringotomy was usually performed toward to cholesteatoma patients as postoperative drainage. If positive result was now obtained, the subject was diagnosed with presence of Eustachian tube closing failure.

In performing the sniff test, patients were instructed to narrow the contralateral nostril with a finger and to perform

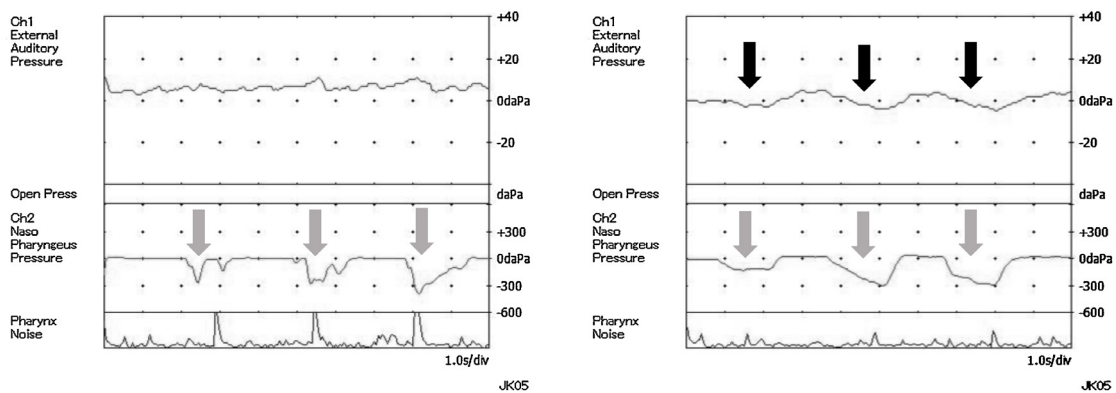


Fig. 2. An example of a sniff test performed by tubotympano-aero-dynamic graphy (TTAG). Negative (left) and positive result (right). Upper trace shows pressure in the external auditory meatus and the lower trace corresponds to that of the nasal cavity/nasopharynx. Positive result is defined as external auditory pressure changes (upper right: black arrows) that are synchronized with that of the nasal cavity/nasopharynx (lower right: gray arrows).

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