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Analysis of chemosensory function in patients with chronic Eustachian tube dysfunction prior to and after balloon dilatation

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ABSTRACT

Objective: Eustachian tube dysfunction (ETD) affects approximately 1% of adults in the general population. Non treated Eustachian tube dysfunction can result in chronic middle ear diseases, which have been shown to significantly affect taste sensitivity. A promising treatment is balloon dilatation of the Eustachian tube. The primary aim of the present study was to investigate whether individuals with ETD had impairment in chemosensory functions, and the changes of the chemosensory function after balloon dilatation of the Eustachian tube.

Methods: 26 patients (17 female, 9 male) (=56 ears) suffering from ETD with a mean age of 39 ± 15 years were included in the present study. 20 patients (76%) returned to be evaluated at the follow up (=40 ears) 51 \pm 22 days after balloon dilatation. For pre- and post operation, gustatory function was measured with a lateralized gustatory test with the taste strips and olfactory function was tested by means of the Sniffin' Sticks test battery (threshold, discrimination and identification (ID)).

Results: Patients' baseline taste function (summed taste score 9.8 ± 3.5 (mean \pm SD)) was significantly impaired compared to normative data (summed taste score 12.4 ± 2.3 ; $p = 0.002$). After balloon dilatation of the Eustachian tube, the taste function remained stable (summed taste score 9.4 ± 4.3 ; $p = 0.814$). Olfactory function (odor ID, summed score (TDI)) improved postoperatively (TDI 32.4 ± 3.6) compared to pre-operative scores (TDI 33.6 ± 4.0 ; $p = 0.012$), but not to a clinically relevant extent.

Conclusion: This study suggests, that patients suffering from ETD exhibit reduced taste scores. Balloon dilatation of the Eustachian tube does not seem to influence gustatory function, but olfactory function showed improvement.

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1. Introduction

The Eustachian tube traverses posteriorly linking the back of the nasopharynx to the middle ear and allows pressure to equalize between the middle ear and the pharynx through passive or active processes. Additionally, it protects middle ear

from nasopharynx fluids and clears out middle ear secretions. Eustachian tube dysfunction (ETD) is a diagnosis given when the function of the Eustachian tube is incorrectly working. ETD is a common disorder with approximately 1% of adults being diagnosed [1], of which, females ranging from 20 to 40 years of age being the most affected group [2].

In 2009, balloon dilatation of the Eustachian tube was introduced as a therapeutic option for ETD [3–6]. Untreated ETD can potentially lead to the development of a negative pressure within the middle ear, transudation of fluid and a proinflammatory response [3] and may result in complications like chronic middle ear diseases, e.g. otitis media with effusion or even cholesteatoma. Research in children and adults has shown that up to 70% of patients undergoing tympanoplasty for chronic otitis media are affected by ETD [7].

Chronic inflammation of the middle ear in turn has been shown to cause histopathological changes including functional damage of the chorda tympani [8,9]. This nerve, passing through the middle ear, carries taste fibres, which innervate the ipsilateral side of the anterior two-thirds of the tongue. Consequently, studies have shown that chronic otitis media with or without cholesteatoma may lead to a significant decrease in taste function on the side of the affected ear [10–14]. As ETD may lead to chronic middle ear diseases and potentially result in an altered ipsilateral taste sensation, this study aimed to investigate chemosensory function in patients suffering from ETD. Additionally, another aim of the study was to analyze the possible influence of balloon dilatation on chemosensory function.

2. Material and methods

This prospective study was performed at the Department of Otorhinolaryngology—Head and Neck Surgery, University Hospital of the Philipps-Universität Marburg after being approved by the local ethics committee (number 26/15), and was conducted according to the Declaration of Helsinki. Detailed information about the study was given to patients and written informed consents were obtained.

2.1. Patients

28 patients (10 male, 18 female) with a mean age of 39 years ± 15 years (ranging from 18 to 69 years), who were going to have Eustachian tube surgery, were screened for inclusion. 26 patients were enrolled in the study. Two patients were excluded, since they had cholesteatoma. All patients were affected by ETD and planned to undergo balloon dilatation of the Eustachian tube. ETD diagnosis was confirmed by typical subjective symptoms [aural fullness (with or without otalgia), muffled hearing and tinnitus] and several objective tests [audiometry, tympanometry and tubomanometry (see Section 2.2 for more details)] [15]. Prior to participation, all patients underwent nasal endoscopy and a detailed medical history was collected.

Exclusion criteria for participation included documented pre-existing gustatory/olfactory dysfunction, presence of nasal polyps, previous ear surgery, chronic otitis media mesotympanalis et epitympanalis, neurologic/psychiatric diseases (e.g., Parkinson's disease, depression), endocrine diseases (e.g., diabetes mellitus), head trauma, upper airway infection within the past 3 weeks, and a current history of smoking more than 10 cigarettes per day.

2.2. Diagnosis of Eustachian tube dysfunction

Tympanogram was evaluated according to Jerger (Types A, B and C) [16]. Eustachian tube function was measured by means of tubomanometry (Spiggle and Theiss Overath, Germany) according to Esteve [15]. From a variable pressure curve different scores were calculated at different pressures (30, 40, 50 mbar), and the R-score was used to evaluate Eustachian tube functionality. This R-score describes the time until the Eustachian tube opens, a R score higher than 1 is considered pathologic [17] (see Fig. 1).

Furthermore impedance audiometry and valsalva maneuver under otomicroscopy control was performed and subjective ability to carry out valsalva maneuver respectively clicking sound when swallowing (toynbee maneuver) was asked and recorded.

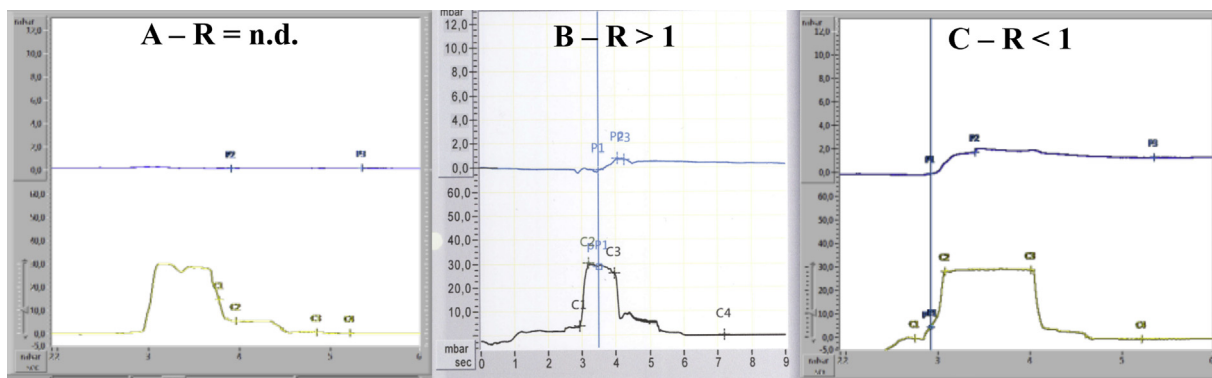


Fig. 1. Overview of possible results in tubomanometry.

Overview of the possible results in tubomanometry: definition of determination of R-Score is described in the text. No reaction of middle ear pressure following the nasopharynx change in A (no R-score; 0 points); delayed opening and pressure curve in the middle ear in B (R-score > 1 ; 1 point); synchronous pressure changes in middle ear and nasopharynx in C (R-score < 1 ; 2 points).

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