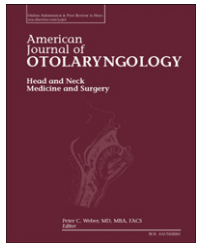
Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/amjoto



Trans-tympanic catheter insertion for treatment of patulous eustachian tube

Se-Joon Oh, MD[a], *Il-Woo Lee, MD, PhD*[b], *Eui-Kyung Goh, MD, PhD*[a], *Soo-Keun Kong, MD, PhD*[a,*]

[a] *Department of Otorhinolaryngology and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea*
[b] *Department of Otorhinolaryngology and Biomedical Research Institute, Yangsan Pusan National University Hospital, Yangsan, Republic of Korea*

ARTICLE INFO

Article history:
Received 8 May 2015

ABSTRACT

Objectives: To evaluate the safety and therapeutic efficacy of trans-tympanic catheter insertion (TCI) in patients with refractory patulous eustachian tube (PET).

Methods: TCI was attempted in thirty-six ears of twenty-nine patients with chronic PET refractory to conservative treatment. The catheter was inserted under local anesthesia in an operating room through the bony orifice of the eustachian tube (ET) to occlude the isthmus of the tube via a myringotomy site on the tympanic membrane. Patients were evaluated postoperatively by nasal endoscopy and by interview to document symptoms. Successful treatment was defined as complete relief or significant improvement plus satisfaction with treatment. Patients had no concurrent disease and did not undergo any additional surgical procedure.

Results: TCI was performed in all except one ear, in which it failed because of an abnormally narrow tympanic ET orifice. Follow-up durations ranged from 6 to 37 months, with an average of 19.3 months. Successful treatment of subjective autophony was achieved in twenty-nine (82.4%) of the thirty-five ears. Ventilation tube (VT) placement was performed in the two ears because of otitis media with effusion (OME) after TCI. In one ear, the inserted catheter was finally removed due to additional unilateral mastoiditis after VT extrusion.

Conclusion: TCI seems to be a minimally invasive and was used successfully to treat PET. The procedure had a good overall success rate and complications were rare in the long-term.

1. Introduction

The eustachian tube (ET) is a complex hourglass-shaped osseocartilaginous structure that connects the nasopharynx and protympanum of the middle ear cavity, and is associated with the ventilation and overall health of the middle ear [1]. The ET is normally closed but opens temporarily during swallowing or yawning [2]. Patulous eustachian tube (PET) is defined as an abnormal opening of the valve of the ET at rest and results in symptoms of autophony, aural fullness, and hearing one's own breathing sounds [3]. Patients with PET also suffer from vestibular symptoms and hearing loss because PET allows excessive pressure changes to occur in the middle ear that can be transmitted to the inner ear by ossicular movement [4]. A diagnosis of PET can usually be confirmed by visualizing outward movement of tympanic

* *Corresponding author at:* Department of Otorhinolaryngology and Biomedical Research Institute, Pusan National University School of Medicine, Pusan National University Hospital, 179 Gudeok-Ro, Seo-gu, Busan 602-739, Republic of Korea. Tel.: +82 51 240 7536; fax: +82 51 246 8668.
E-mail address: entkong@gmail.com (S.-K. Kong).

http://dx.doi.org/10.1016/j.amjoto.2015.07.003
0196-0709/

membrane during regular nasal expiration and inward movement during regular nasal inspiration [5]. These movements indicate abnormal patency of the ET and the ability of air to pass to and from the nasopharynx into the middle ear [6]. A number of medical and surgical options are available for patients with PET [7]. Conservative, nonsurgical methods are diverse and include weight gain, topical estrogen, and insufflation with boric or salicylic acid [8]. In addition, agents that cause swelling of mucosa at the pharyngeal orifice of the ET may be sprayed or instilled at this site. For those refractory to these conservative and medical methods, various surgical treatments may be considered, such as, injection of bulking agents, fat/cartilage plugging, ligation of the orifice, endoluminal cauterization, silicone plug insertion, and hamulotomy [2,7,9]. These methods can be classified by treatment principal as narrowing, closing, or obstructing PET. In this paper, we introduce a TCI technique based on PET obstruction. The catheter applied was modified to hang at the bony orifice of ET. Furthermore, the catheter was designed to be easily removed or replaced by a larger catheter. This study was undertaken to evaluate the safety and efficacy of TCI in patients with chronic PET.

2. Materials and methods

2.1. *Patients*

This retrospective study was performed after obtaining approval from the Pusan National University Hospital Institutional Review Board. A review was conducted on patients who underwent TCI endoscopically to the bony orifice of ET between March 2009 and February 2014. Inclusion criteria were based on the presence of three characteristic aural symptoms (autophony, aural fullness, and audition of loud breathing sounds) and verification of synchronous medial and lateral movements of the tympanic membrane coincident with forced breathing or sniffing. Unsuccessful conservative treatment with saline nasal irrigation and an anticholinergic nasal spray for at least 6 months was stipulated before surgical intervention. Patients who had undergone any other surgical procedure related to PET were excluded. Postoperative symptom improvement was assessed using the autophony scoring system adapted by Poe [10]. Scores were allocated as follows: 1) complete relief; 2) significant improvement, satisfied; 3) significant improvement, dissatisfied; 4) unchanged; or 5) worse. All 29 patients were reevaluated every 6 months postoperatively, and the scoring system was used routinely at all reevaluations. If a patient could not visit on a scheduled follow-up visit a telephone interview was conducted. Patients underwent audiometry and tympanometry as a part of their workup. All the patients were informed about alternative treatments and of the risks and benefits of this surgery, and all provided written informed consent.

2.2. *Surgical technique*

Surgery was performed in an operating room under local anesthesia with the patient lying in supine position. The ear was prepared and draped in the normal sterile fashion. A tympanomeatal 1% xylocaine plus 1/100,000 epinephrine block was administered. To design the catheter which would be inserted, we cut in half the length on one end to 4–5 mm. Next, we adapted two methods, spreading both arms to make the 'Y' shape in first 10 cases or suturing after folding it to the negative side in next 25 cases (Fig. 1). The length of the catheter was 20–22 mm, and thus, it covered the distance from the isthmus to the bony orifice of the ET (this was confirmed by preoperative temporal bone computed tomography (CT)). The length from the isthmus to the bony orifice of ET was variable, but most of the length of the catheter was approximately 20–22 mm. In addition, the length in the male had a longer trend than that in the female, so 22 mm length was applied to the male patients, and 20 mm to the female patients generally. The diameter and length of catheter which were used for plugging the ET were divided into 18 gauge catheter (length 20 mm), 20 gauge catheter (length 20 mm), and 22 gauge catheter. We decided to insert the thinnest catheter possible that eliminated autophonia. In addition, the catheter was filled with bone-wax. Under microscopic view, myringotomy was performed at the anterosuperior portion of the tympanic membrane. Then the bony orifice of ET was visualized using a 30-degree, 2.7-mm endoscope (Fig. 2). The preformed catheter was passed through the myringotomy site and placed into the bony orifice of the ET. The catheter could be placed under the microscopic view and then its placement was confirmed with the endoscope. The patient was then raised and asked whether symptoms had subsided. The catheter was changed to a larger one (from 22 to 20 or 18 gauge) according to patient satisfaction with symptom improvement. After that, the disappearance of medial and lateral movements of tympanic membrane coincident with forced breathing and sniffing was checked by endoscopy. The procedure was completed when the patient was satisfied with the improvement achieved. A patch was applied to myringotomy site to aid tympanic membrane healing. Patients were discharged from hospital on the day of surgery.

3. Results

TCI was performed in 35 ears of 29 patients (16 males and 13 females). We could not insert catheter in one patient due to an abnormally narrow tympanic orifice of the ET. Seven patients had bilateral PET and 21 unilateral PET (right side 13 ears, left side 8 ears). The average duration of preoperative autophony symptoms was 8.7 years (range 1.5–19 years), and average follow-up duration was 19.3 months (range 6–37 months). 18 gauge catheters were used in 9 ears, a 20 gauge catheter in 14 ears and a 22 gauge in 11 ears, and because 4 patients (4 ears) could not visit our clinic, they conducted telephone interview.

All patients experienced immediate and complete relief of autophony postoperatively with good middle ear aeration (Fig. 3). Five ears (3 ears in 18 gauge, 1 ear in 20 gauge, 1 ear in 22 gauge) developed OME after TCI. Three ears resolved OME spontaneously, and another two underwent VT insertion for one year, and there showed no recurrence after extrusion. An 18