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A technique for concurrent procedure of mastoid obliteration and meatoplasty after canal wall down mastoidectomy

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ABSTRACT

Objective: To present a simple technique for concurrent procedure of mastoid obliteration and meatoplasty after canal wall down mastoidectomy, and to assess the efficacy and the surgical results of this technique.

Methods: Retrospective clinical study of a consecutive series of procedures from 2004 to 2008. One hundred thirteen patients undergone canal wall down mastoidectomy with tympanoplasty and concurrent procedure of mastoid obliteration and meatoplasty that uses an anteriorly based musculoperiosteal flap and a horizontal skin incision on the concha were included. Preoperative diagnoses were classified into cholesteatoma, adhesive otitis media, and chronic suppurative otitis media. The mean duration of follow-up was 38 months, with a range of 12–75 months. We analyzed control of suppuration and creation of a dry mastoid cavity according to the Merchant's grading system for evaluation of the efficacy of this technique, and hearing outcome. We evaluated postoperative complications including development of recurrent or residual cholesteatomas and duration of the mastoid cavity achieving a complete healing.

Results: Seventy-two patients had cholesteatoma, whereas 27 patients had adhesive otitis media and 14 patients had chronic suppurative otitis media. Eighty-three percent of all patients, in 86% of patients with cholesteatoma, in 78% of patients with adhesive otitis media, and in 78% of patients with chronic suppurative otitis media were achieved a dry and self-cleaning mastoid and complete control of infection. Duration of the mastoid cavity achieving a dry and self-cleaning mastoid ranged from 4 weeks to 24 weeks and the mean time of the complete epithelialization was 11.1 ± 4.6 weeks. The average ABGs were 32.4 ± 13.8 dB preoperatively and 23 ± 13.2 dB postoperatively. There were 5 patients with failure of control of infection postoperatively and 3 patients of recidivistic cholesteatoma.

Conclusion: The efficacy of our technique to make a dry and healthy mastoid cavity after a canal wall down mastoidectomy is satisfactory, and the rate of complication is acceptably low. We believe that our technique could be a convenient method to prevent cavity problems after canal wall down mastoidectomy.

1. Introduction

The goals of surgery for chronic ear disease are to achieve a safe and dry ear by eradication of disease and to restore functional anatomy. Mastoidectomy associated with tympanoplasty is commonly used as a method for surgical treatment, which is divided basically into techniques for preserving the posterior ear canal wall or not. Canal wall down mastoidectomy has several advantages such as increased exposure and access to the mesotympanum and epitympanum, which allows eradication of disease and postoperative observation. However, the potential problems such as chronic ear discharge, dizziness with water exposure and the need for regular care of the mastoid cavity often occur [1]. Various techniques have been used to minimize these potential problems including complete removal of the disease, wide saucerization, elimination of the irregularity within the mastoid cavity, and lowering the facial ridge. Obliteration of the mastoid cavity and meatoplasty are additionally important procedures performed at the end of the mastoidectomy to minimize the potential problems by decreasing the size of the mastoid cavity, and providing ventilation and easy access for postoperative cleaning the mastoid cavity, respectively. Diverse techniques have been introduced, but usually these procedures are performed as independent processes [2–4]. So, the external

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Table 1
Grading system to assess control of infection after tympanomastoid surgery [6].

Grade 0	No episode of otorrhea, and no pus or granulation tissue on otologic exam
Grade 1	One episode of otorrhea of <2 weeks' duration in 3-month period or no otorrhea but a subjective feeling of wetness in the ear
Grade 2	More than one episode of otorrhea in 3-month period, or an episode of otorrhea lasting more than 2 weeks, or otologic exam showing localized granulation tissue/pus that was promptly cured with antibiotics drops, curettage, or silver nitrate cautery
Grade 3	Constant purulent otorrhea on a daily basis, or otologic exam showing extensive granulation tissue, or need for a revision procedure to control infection

auditory canal sometimes has an unnatural connection to the mastoid cavity which may lead to a hidden area from examination or irregularity of the mastoid cavity.

In the present report, we describe a simple technique for concurrent procedure of mastoid obliteration and meatoplasty that uses an anteriorly based musculoperiosteal flap and a horizontal skin incision on the concha. We assess the surgical results and the efficacy of this technique, and comment on some technical details.

2. Patients and methods

The medical records of patients who undergone canal wall down mastoidectomy with tympanoplasty for treatment of chronic otitis media between March 2004 and December 2008 with a minimum postoperative follow-up of 12 months were reviewed. All the operations included a concurrent procedure of mastoid cavity obliteration and meatoplasty that uses an anteriorly based musculoperiosteal flap. Preoperative diagnoses were classified into cholesteatoma, adhesive otitis media, and chronic suppurative otitis media according to the main clinical expressions and histopathologic characteristics. Adhesive otitis media was diagnosed when the tympanic membrane is adherent to the promontory and the mucosal surfaces are not present [5]. We analyzed control of suppuration and creation of a dry mastoid cavity according to the Merchant's grading system for evaluation of the efficacy of this technique (Table 1) [6]. We regarded Grade 0 as complete control of infection and completion of a dry and self-cleaning mastoid cavity, and Grade 3 as a failure of control of infection, meanwhile Grade 1 or 2 as a partial control of infection. Duration of the mastoid cavity achieving a complete healing was evaluated in the patients of Grade 0. Audiometric analysis was performed using the average of the hearing threshold at 500, 1000, 2000, and 3000 Hz preoperatively and 12 months after the operation. We evaluated postoperative complications including development of recurrent or residual cholesteatomas and a status of the tympanic membrane graft. Statistical analysis for association of preoperative diagnosis with final grade and previous operation with final grade was performed. We used chi-square test using SPSS 17.0 (SPSS Inc., Chicago, IL). The threshold for statistical significance was set at $p < 0.05$.

3. Surgical technique

The usual postauricular skin incision is made 10 mm posteriorly to the postauricular crease. The anteriorly based musculoperiosteal flap which is tailored to large size is made according to Palva's method (Fig. 1A) [7]. The canal skin incision is made on the posterior canal wall 3 mm lateral to the tympanic annulus from 7 o'clock to 2 o'clock (left ear), or from 10 o'clock to 5 o'clock (right ear). The tympanomeatal flap is elevated and the middle ear cavity is exposed. The deep temporalis muscle fascia is dissected from the underlying temporalis muscle using the iris scissors, and harvested as much as possible for tympanoplasty and covering the mastoid cavity. Complete eradication of the middle ear and mastoid disease is performed using the method of canal wall down mastoidectomy.

The auricle is reflected anteriorly and the perichondrium of the conchal cartilage is dissected from the overlying soft tissue using the iris scissors. The conchal cartilage with perichondrium is harvested and used as a material for obliteration of the mastoid cavity. The cartilage of the inferior portion of the ear canal is removed to widen the ear canal additionally [8]. The anteriorly based musculoperiosteal flap is divided into two parts, namely a superior and an inferior flap (Fig. 1B). The dividing incision line may be modified more superiorly or inferiorly depending on the shape of the mastoid cavity. Next, the conchal skin incision is made horizontally at 3 o'clock (left ear) or 9 o'clock (right ear) after reposition of the auricle (Fig. 1C). This incision is extended medially using the metzenbaum scissors to cross the canal skin incision which is made previously. Consequently, two conchal flaps composed with the musculoperiosteal flap and the posterior canal skin are made. The superior conchal flap is folded upward and sutured to the soft tissue medial side of the flap with 3-0 vicryl. Performing this procedure, it is important to cover the exposed raw surface of the conchal cartilage completely with soft tissue to prevent the occurrence of the cartilage infection. Next, the inferior conchal flap is pulled downward and sutured to the soft tissue medial side of the flap using the same suture material. The superior musculoperiosteal flap is situated at the sinodural angle and the inferior musculoperiosteal flap is situated at the retrofacial and the mastoid tip area (Fig. 1D). The conchal cartilage is split into pieces and used as materials for obliteration. The exposed mastoid bone and the soft tissue of the musculoperiosteal flap are covered with the deep temporalis muscle fascia while the tympanoplasty using the fasica is performed. Ossicular chain reconstruction was performed in patients had relatively well aerated, healthy mucosa lining the tympanic cavity and intact mobile stapes. The patient who had adhesive otitis media, missing stapes, or severe hearing loss had not undergone ossicular chain reconstruction. Every patient underwent ossicular chain reconstruction by partial ossicular replacement with Polycel® (Medtronic Xomed, Jacksonville, FL, USA). The mastoid cavity is packed with Gelfoam and the postauricular incision is closed in a two-layer fashion with 3-0 vicryl and 5-0 nylon. The mastoid packing is removed 2 weeks postoperatively. The patient is examined every week for 4 weeks postoperatively and then 2nd, 3rd, 6th, 12th month. The frequency of follow-up visits depends on the amount of epithelialization of the mastoid cavity. Following the healing period, a yearly visit is recommended to all the patients.

4. Results

During the study period, 113 patients who treated with canal wall down mastoidectomy and concurrent procedure of mastoid obliteration and meatoplasty were included within the boundary of the study. There were 53 female and 60 male patients and the patients' ages ranged from 8 to 77 years with a mean age of 47 years. Fifty-eight left-sided procedures and 55 right-sided procedures were performed. The mean duration of follow-up was 38 months, with a range of 12–75 months. There was no perforation of the tympanic membrane postoperatively. Eighty procedures were primary and 33 procedures were revisions. Previous operations were 28 cases of canal wall up mastoidectomy,