Original Article

One- versus two-session treatment in type IV tympanoplasty

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ABSTRACT

Objectives: In this study, we aimed to compare hearing results, cholesteatoma recurrence, and costs of one- versus two-session treatment in patients undergoing type IV tympanoplasty.

Patients and Methods: Between June 2013 and August 2015, a total of 37 patients (20 females, 17 males; mean age 32.5±13.5 years; range, 20 to 48 years) who were operated for chronic otitis media with cholesteatoma were included. Hearing reconstruction was done in one session in 19 patients (Group 1) and in two sessions in 18 patients (Group 2). All patients underwent type IV tympanoplasty with closed cavity.

Results: The mean age was 40.4±10.7 years and 26.5±12.4 years in Group 1 and Group 2, respectively. Recovery of hearing in Group 2 was significantly better than in Group 1 (p=0.001). The mean length of hospitalization was 6.8±2.6 days in Group 1 and 14.6±3.2 days in Group 2. In Group 1, cholesteatoma recurrence was found in two patients during diffusion-weighted magnetic resonance imaging. In the second-look operations, cholesteatoma recurrence was found in four patients in Group 2. Total cost of surgery and care was significantly higher in Group 2 than in Group 1 (p=0.001).

Conclusion: According to our study results, two-session operation seems to be more beneficial with successful hearing restoration without additional costs.

Keywords: Second-look, cholesteatoma, tympanoplasty.

Surgical approach in cholesteatoma is divided into two categories: canal wall-up (CWU) technique, wherein the external ear canal is preserved, and canal wall-down (CWD) technique, wherein the external ear canal is lowered. The CWD technique is different from radical mastoidectomy in that it involves the reconstruction of hearing and the generation of middle ear space.[1] Recurrence is less in CWD technique than in CWU technique; however, the former requires more postoperative care and cavity cleaning, as it involves the generation of a mastoid cavity. Due to these problems, canal wall reconstruction (CWR) was suggested for CWD-applied ears.[2,3] However, as there is a closed cavity in CWR- or CWU-applied patients, the risk of recurrence increases and, due to the increased risk, a second-look surgery may be necessary. When the surgeon considers such a possibility during surgery, reconstruction of the hearing may be postponed to the second operation.[4]

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In the present study, we aimed to compare hearing results, cholesteatoma recurrence, and costs of one- versus two-session treatment in patients undergoing type IV tympanoplasty due to chronic otitis media with cholesteatoma.

PATIENTS AND METHODS

This prospective study included a total of 37 patients (20 females, 17 males; mean age 32.5±13.5 years; range, 20 to 48 years) who were operated for chronic otitis media with cholesteatoma between June 2013 and August 2015 were included. Only the patients who underwent type IV tympanoplasty were included in the study. Pediatric patients, pregnant women, lactating patients, diabetic patients, patients with circulatory disorders, and revision operations were excluded from the study. A written informed consent was obtained from each patient. The study protocol was approved by the İzmir Katip Çelebi University Faculty of Medicine Ethics Committee (2013/92). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Preoperatively, computed tomography (CT) (Aquilion 64; Toshiba Medical Systems, Tochigi, Japan) scans were performed using 0.6-mm contiguous sections through the temporal bone. Computed tomography was taken in the axial and coronal planes. The axial plane was defined as a line from the inferior orbital rim to the external auditory meatus, and the possible pathologies were assessed.

Hearing reconstruction was done in the same session with CWU or CWR techniques in 19 patients (Group 1) and in two sessions in 18 patients (Group 2). The mean interval between the first and second sessions was 7.2 (range, 6 to 9) months in Group 2.

Destruction of all ossicular chain was performed in all patients, and type IV tympanoplasty according to the Wullstein classification[5] was applied to all patients. A titanium ossicular prosthesis (Ariel, Kurz, Dusslingen, Germany) was used to reconstruct the hearing.

The air bone gap (ABG) gains at 500, 1,000, 2,000, 3,000, and 4,000 Hz in audiogram were compared before the first operation and six months after the final operation. After surgery, the patients with an ABG value under 10 dB were considered having complete recovery. An ABG value between 10 dB and 19 dB indicated partial recovery, and that of over 20 dB indicated no recovery. Patients with no recovery were rehabilitated with hearing devices.

The total amount of time spent for surgery and outpatient controls until complete recovery was used to calculate the cost of the treatment.

During the initial operation, cholesteatoma was identified with direct inspection under high magnification using the operation microscope and was eradicated by otoendoscopy. In Group 1, all patients underwent magnetic resonance imaging (MRI) using a 1.5 Tesla (Achieva; Philips Medical Systems, Best, Netherlands) to evaluate the risk of cholesteatoma recurrence at one year after the initial operation. In Group 2, we recorded the frequency of cholesteatoma recurrence in the second-look operation.

Statistical analysis

Statistical analysis was performed using the IBM SPSS for Windows version 20.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD) or number and frequency. Numerical and categorical data were analyzed using the Student t-test and chi-square test. A p value of <0.05 was considered statistically significant.

RESULTS

There was no statistically significant difference between two groups in terms of age and sex ($p>0.05$). The mean hospitalization length was 6.8±2.6 days in Group 1 and 14.6±3.2 days in Group 2. In Group 1, the CWU technique was applied to 15 patients and CWR technique to four patients, whereas in Group 2, the CWU technique was applied to 14 patients and CWR technique to four patients. There was no statistically significant difference between two groups in terms of the operation technique ($p>0.05$).

The improvement in hearing in Group 2 was significantly better than in Group 1 ($p=0.001$). The ABG values are shown in Table 1. In Group 1, 9/15 patients who showed no improvement were rehabilitated with a hearing device. However, the remaining six patients in Group 1 who showed no improvement did not accept the use of hearing devices as they

Table 1. Air bone gap values in different Hz

	500 Hz	1,000 Hz	2,000 Hz	3,000 Hz	4,000 Hz
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Group 1					
Preoperative mean ABG	17.3±8.2	26.1±6.4	34.9±5.2	38.1±5.6	36.0±7.4
Postoperative mean ABG	16.5±7.8	24.6±8.5	32.4±6.4	33.2±9.6	36.3±8.7
Group 2					
Preoperative mean ABG	30.1±6.7	40.5±8.1	38.3±5.2	42.1±6.1	40.4±8.2
Postoperative mean ABG	14.6±7.2	17.7±9.6	16.5±7.8	20.9±5.3	23.1±6.4

Hz: Hertz; SD: Standard deviation; ABG: Air bone gap.

could hear well with their healthy ear. In Group 2, only one third of patients who showed no improvement was rehabilitated with a hearing device, and the remaining two patients did not accept the use of a hearing device.

In Group 1, cholesteatoma recurrence was detected in two patients (10.5%) during diffusion-weighted MRI, which was performed approximately after 13.5 months (range, 13 to 16 months), and these patients were reoperated. In the second-look operations, cholesteatoma recurrence was detected in four patients (22.2%).

There was a statistically significant difference between two groups in terms of cost of surgery and postoperative care with both being higher for Group 2 (p=0.001; Table 2).

DISCUSSION

Treatment of cholesteatoma is still difficult and a matter of debate. While major advancements in the field of ear surgery have been achieved in the past two to three decades, the choice of technique to be used in treating cholesteatoma is not clear, yet. Currently, there are two main surgical approaches for the treatment of cholesteatoma. In the first one, cholesteatoma is completely removed with an open technique (radical mastoidectomy and CWD tympanoplasty), and in the second one, the removal of cholesteatoma with closed technique (CWU) tympanoplasty is performed.[6]

A closed cavity has several advantages, such as the protection of the middle ear and external auditory canal volume, obvious protection of

Table 2. Clinic data of patients

	Group 1		Group 2	
	n	Mean±SD	n	Mean±SD
Age (year)		40.42+10.65		26.5+12.35
Gender				
Female	11		12	
Male	8		6	
Recovery				
Complete recovery	0		4	
Partial recovery	4		11	
No improvement	15		3	
Recurrent cholesteatoma	2		4	
Average cost without hearing aids ($)	824		1441	

SD: Standard deviation.

hearing, simpler hearing reconstruction, and allows activities such as water sports. However, as residual cholesteatoma often persists with limited surgery, closed follow-up and even second-look operations may be necessary.[7]

Wilson et al.[8] applied CWU mastoidectomy in one session in 156 patients and, in long-term outcomes, 64% of patients had an ABG of <20 dB. In another study of Tos and Lau[9] with a mean follow-up of 9.3 years, CWU mastoidectomy was performed in one session and 50% of patients had an ABG of <20 dB.

Walker et al.[10] performed posterior wall reconstruction in 285 patients and, in 253 of them, they performed a second-look operation. The authors observed recurrent cholesteatoma in seven patients. In the patients who underwent a second-look operation, the mean preoperative ABG was 28 dB, and the mean postoperative ABG was 23 dB. Based on these results, the authors proposed that posterior wall reconstruction had slight benefits. Qotb et al.[11] applied CWD mastoidectomy with reconstruction in one session with 71 ears and they observed significant correlation between grades of improvement and preoperative and postoperative ABG. In the aforementioned study, the recurrence rate was 4.2%.

In addition, in a study of Kim et al.[12] including 73 patients, hearing reconstructions which were applied in one session or in two sessions to two groups of patients including patients who underwent CWU mastoidectomy and CWD mastoidectomy were evaluated. There was no significant difference in the hearing values between the CWU patients. However, in CWD patients, hearing gain was significantly better with two sessions than one-session treatment. Similarly, in our study, the improvement of hearing gain was statistically significantly better for the two-session technique.

Furthermore, Wilson et al.[8] observed cholesteatoma recurrence in 51/144 (35%) CWU mastoidectomy patients during a second-look operation. In our study, cholesteatoma recurrence was observed in six patients (16.26%), four of which were discovered during a second-look operation.

Moreover, in the present study, we found that hearing reconstruction during cholesteatoma surgery in the second session had significantly more benefits compared to a single-session reconstruction. However, it is also evident that a second operation increased hospitalization and treatment costs. Conversely, the lack of a significant benefit after hearing reconstruction in one session may cause additional costs to the patient for hearing rehabilitation (i.e., hearing aids).

In conclusion, second-look operation provides better prospects for the diagnosis and treatment of recurrent cholesteatoma. In addition, there is a superior hearing gain after a second-look operation, compared to a single-session operation. We believe that the surgeon should perform reconstruction of hearing in cholesteatoma surgery for the follow-up patients during a second-look operation.

Declaration of conflicting interests

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