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Tympanoplasty outcomes in elderly patients

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ABSTRACT

Objective: To investigate the outcomes of tympanoplasty in elderly (≥60 years) compared with young patients (18–59 years).
Materials and methods: Patients who had been performed type I tympanoplasty between 2009 and 2012 were retrospectively analyzed. Preoperative and postoperative audiological results and the graft success of 42 older patients were compared with those of 72 younger ones.
Results: The mean preoperative air conduction levels were statistically significantly higher in older group (57.4 ± 16.8 dB) than younger group (37.3 ± 10.3 dB) ($p < 0.001$). Preoperative bone conduction levels were statistically significantly higher in older group (28.5 ± 13.4 dB) than in the younger group (12.4 ± 4.8 dB) ($p < 0.001$). The mean preoperative and postoperative air-bone gaps were statistically significantly larger in the older group (28.5 ± 11.0 dB, 16.4 ± 9.0 dB) than in the younger group (24.9 ± 7.7 dB, 12.4 ± 8.0 dB respectively) ($p < 0.001$). The intragroup comparisons of preoperative and postoperative mean air-bone gaps revealed statistically significant improvements in both groups ($p < 0.001$ for both). Graft success rates and the mean hearing gains were not statistically significantly different between the groups ($p = 0.225$, $p = 0.786$ respectively).
Conclusion: Although preoperative and postoperative air and bone conduction levels were worse in the older group, graft take rates and postoperative hearing gain did not differ between the groups. If the physical status is stable tympanoplasty procedure can be recommended for elderly patients.

1. Introduction

The goals of tympanoplasty procedure are to obtain an intact tympanic membrane, to eradicate pathological tissues in the middle ear and mastoid and to reconstruct the sound transmission mechanism. With the advances in medicine the number of elderly is increasing and the geriatric age group becomes larger part of the population than ever before. It was reported that there was increasing demand for medical and surgical care from older people for ear problems [1]. In some studies, age was indicated as an important prognostic factor in tympanoplasty success [2–6]. Aoyagi et al. studied the impact of aging on hearing results and reported that the patients who underwent type III and IV tympanoplasty had poorer hearing outcomes than those with type I tympanoplasty with advanced age [7]. In contrast Adkins and White reported that age was not a significant factor in the success of tympanoplasty [8].

Most studies in the literature about tympanoplasty in elderly have been conducted in Japan [9–12] which has one of the highest longevity rates in the world [10]. However there has not been sufficient research into the risks and benefits of tympanoplasty in elderly especially in developing countries. The aim of this study was to investigate the outcomes of tympanoplasty in patients older than 60 compared to younger patients.

2. Materials and methods

A retrospective analysis was made of patients who underwent type I tympanoplasty between 2009 and 2012 in our clinic. The local ethics committee approved the study (Ref. No: 28.6.2013, 0510-4261).

Patients younger than 18 years of age, with cholesteatoma or ossicular chain disintegration and who had perforations smaller than 50% were not included in the study. Patients to whom type I tympanoplasty had been performed, who had perforation ≥50%

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and who had a regular follow-up of at least 12 months were included in the study. A total of 114 patients met the inclusion criteria and were enrolled into the study. The outcomes of 42 of patients aged over 60 years were compared with those of 72 patients aged between 18 and 59 years. Preoperative hearing measurement by pure tone audiometry and temporal bone computed tomography imaging (CT) were applied to all patients. We did not perform the patch-test before the operation. Hematologic tests, electrocardiogram and chest radiography were also applied to all patients. Especially in the older group, a detailed examination was made to determine general health status before general anesthesia. The patients who regularly use anticoagulant and antithrombotic drugs were examined before the operation by cardiology or cardiovasculer doctors. If the cessation of these drugs had been told to cause serious morbidity by cardiology or cardiovasculer doctors, these patients were not included in the study. On the other hand if the cessation of these drugs for a while had been told to cause no drawbacks by the specialist, these drugs were stopped 1 week before the operation and started a few days after the operation. The age, gender, the side of the operated ear, type of tympanoplasty, status of the graft and pre- and postoperative audiological results were recorded. And type of tympanoplasty was noted according to the Wullstein classification [13].

All the operations were performed under general anesthesia. No premedication was used. Patients were monitored continuously with electrocardiogram, pulse oximetry, non-invasive arterial pressure, and end-tidal CO_2 ($EtCO_2$). Anesthesia was induced with IV propofol (2.5–3 mg/kg), fentanil 1 μg/kg and lidocaine 1 mg/kg. Rocuronium 0.6 mg/kg was administered for facilitation of tracheal intubation. Following tracheal intubation, anesthesia was maintained with desflurane 3–6% in 50% nitrous oxide in oxygen and remifentanil infusion.

All the operations were performed by experienced attending surgeons listed above (S.D., E.E.C., R.C.). Postauricular incision was used in all cases. Mastoidectomy was performed according to CT and microscopic findings. Temporal muscle fascia and tragal cartilage were used as a graft material. The fascia graft was placed under the drum remnant under the annulus and lateral to the malleus handle (underlay technique). The graft material was supported by gelfoam medially and laterally. The tragal cartilage was harvested and it was used without thinning. The pericondrium of the cartilage was peeled at the convex side. A cartilage strip was removed at the middle portion of the cartilage, to fit the cartilage graft to the manibrium of the malleus. The composite condropericondrial island graft was placed with over- and underlay technique over the malleus under the drum remnant under the annulus. The graft material was supported by gelfoam medially and laterally. Cartilage graft was used for the subtotal perforations, revision cases and for the patients who had tympanosclerosis.

The patients were examined at postoperative first and second weeks then at postoperative 1st, 3rd, 6th, and 12th months. Audiograms were obtained 1, 3, 6, and 12 months after the operation and annually thereafter. Comparison was made of the audiograms obtained before surgery and 1 year after surgery. The intact tympanic membrane without otorrhea was accepted as graft success.

The two groups were compared in respect of preoperative air and bone conduction thresholds, pre-postoperative air bone gap (ABG), hearing gain and graft success rates.

2.1. Statistical analysis

For statistical analysis, SPSS for Windows Version 21.0 program was used. Numerical variables were expressed as mean ± standard deviation and median (minimum–maximum) values. For categorical variables, the number and percentage were used. Whether or not there was a difference between two groups in terms of numerical variables was investigated by *t*-test if parametric test hypotheses were met. Whether or not there was a difference between two groups in terms of categorical variables were investigated with Chi square test. Pre- and postoperative air, bone and hearing gain measurements in terms of intra-group and inter-group differences were evaluated with variance analysis for repeated measurements. For categorical variables the differences in time were examined by the McNemar test. A value of $p < 0.05$ was considered as statistically significant.

3. Results

In the older group, the preoperative mean air conduction threshold was 57.4 ± 16.8 dB and mean bone conduction threshold was 28.5 ± 13.4 dB. The postoperative mean air conduction threshold was 43.5 ± 17.7 dB and mean bone conduction threshold was 27.4 ± 13.5 dB. The preoperative mean ABG was 28.5 ± 11.0 dB, postoperative mean ABG was 16.4 ± 9.0 dB and postoperative gain was 12.1 ± 9.0 dB. In 54.8% of patients postoperative gain was higher than 10 dB. The graft success rate was 83.3%. Mastoidectomy was performed in 20 patients (47.6%) (Tables 1–4).

In the younger group the preoperative mean air conduction threshold was 37.3 ± 10.3 dB and mean bone conduction threshold was 12.4 ± 4.8 dB. The postoperative mean air conduction threshold was 23.0 ± 10.4 dB and mean bone conduction threshold was 10.5 ± 4.7 dB. The preoperative ABG was 24.9 ± 7.7 dB, and postoperative ABG was 12.4 ± 8.0 dB, with a postoperative gain of 12.6 ± 7.3 dB. In the 67.1% of the patients in the younger group postoperative gain was higher than 10 dB. The graft success rate was 91.7%. Mastoidectomy was performed in 29 patients (40.3%) (Tables 1–4).

Gender rates were similar in both groups ($p = 0.570$). Age was statistically significantly higher in the older group than in the younger group ($p < 0.001$). No statistically significant difference was determined in the graft success rates of the older (83.3%) and the younger groups (91.7%) ($p = 0.225$). Cartilage graft was used in 54.8% of patients in older group and in 47.2% of patients in younger group and the difference was not statistically significant ($p = 0.560$). Tympanosclerosis was seen in 16.7% (7 patients) of patients in older group and in 8.3% (6 patients) in younger group and the difference was not statistically significant ($p = 0.225$).

Table 1
Demographic characteristics of the patients.

	Older group ($n = 42$)	Younger group ($n = 72$)	*p*
Age	63.3 ± 4.0	34.1 ± 1.9	**<0.001**
Gender (F/M)	22/20 (52.4%/47.6%)	43/29 (59.7%/40.3%)	0.570
Graft (intact/perforated)	35/7 (83.3%/16.7%)	66/6 (91.7%/8.3%)	0.225
Graft type (fascia/cartilage)	19/23 (45.2%/54.8%)	38/34 (52.8%/47.2%)	0.560
Side (right/left)	27/15 (64.3%/35.7%)	34/38 (47.2%/52.8%)	0.117
Mastoidectomy	20 (47.6%)	29 (40.3%)	0.570

The numbers in bold are statistically significant.

Table 2
Air conduction levels.

	Older group ($n = 42$)	Younger group ($n = 72$)	Intergroup comparison *p*
Preoperative (dB)	57.4 ± 16.8	37.3 ± 10.3	**<0.001**
Postoperative (dB)	43.5 ± 17.7	23.0 ± 10.4	**<0.001**
Intragroup *p*	**<0.001**	**<0.001**	

The numbers in bold are statistically significant.

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