Auris Nasus Larynx xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl

Pediatric type 1 cartilage tympanoplasty outcomes: A comparison of short and long term hearing results

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ARTICLE INFO

Article history:
Received 24 July 2017
Accepted 6 November 2017
Available online xxx

Keywords:
Pediatric
Tympanoplasty
Cartilage
Hearing

ABSTRACT

Objective: Tympanoplasty is a commonly used procedure in children as in adults. The purposes of this study were to evaluate and report the long term results of type 1 cartilage tympanoplasty in pediatric population. Short term and long term hearing outcomes were compared according to age and perforation location.

Methods: We retrospectively evaluated a total of 76 of 93 patients who had regularly come to visits (38 male and 38 female) with chronic otitis media (COM) and who were younger than 16 years (range, 9–16 years) and underwent a primary type 1 tympanoplasty in tertiary medical center. We divided our population into 2 groups; a younger group (age <12 years) and an older group (age ≥12 years). Age, gender, follow-up time, prior to surgery and at postoperative 6th and minimum 48th month follow-up pure tone audiometry (PTA) thresholds and if any residual perforation were noted.

Results: Successful closure occurred 74 in 76 patients and success rate was 97,03%. The mean 6th month follow-up bone conduction threshold values were 7,61 ± 3,89 and 6,89 ± 6,28 <12 years old and ≥12 years old children, respectively. The mean 48th month follow-up bone conduction threshold values were 6,93 ± 4,00 and 7,12 ± 6,40, <12 years old and ≥12 years old children, respectively. The mean 6th month follow-up air conduction threshold values were 23,75 ± 8,38 and 24,73 ± 10,41 <12 years old and ≥12 years old children, respectively. The mean 48th month follow-up air conduction threshold values were 17,15 ± 6,04 and 20,30 ± 10,30, <12 years old and ≥12 years old children, respectively. Among all children; preoperative mean air conduction differed significantly from postoperative 6th and 48th month follow-up mean air conduction thresholds ($p < 0.001$). They had significant improvement in their ABG compared with their preoperative ABG scores. In addition according to groups, there was no significantly difference between pre and postoperative ABG improvement in both 6th and 48th month follow-up between <12 years old and ≥12 years old patient group.

Conclusion: In pediatric patients type 1 tympanoplasty with cartilage graft, gives statistically significant success in long term follow up. Long term hearing results of primary type 1 cartilage tympanoplasty is seem to be better than short term hearing results as well. We consider that cartilage graft could be the best graft material for pediatric tympanoplasty for long term success.

1. Introduction

Tympanoplasty was introduced in 1950s by Zollner and Wullstein [1,2]. For close tympanic membrane perforation numerous graft materials and methods have been used to since 1950. For tympanic membrane closure temporalis muscle

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https://doi.org/10.1016/j.anl.2017.11.002
0385-8146/

fascia, cartilage and perichondrium have been admitted as popular and safe graft metarials [3]. Cartilage is used frequently as a graft material, shown well tolerated by the middle ear and provided lasts in the long term period [4]. Either endoscopic or open microscopic approach can be used in each technique, although usually it is still being performed via microscopes rather than endoscopes. Tympanoplasty is a commonly used procedure in children as in adults. There have been lots of studies discussing the age effect on success rates of this procedure. However, ideal age is still debated when pediatric tympanoplasty should be done. Some authors suggested that pediatric tympanoplasty should be done in 8 years of age and older patients [5,6]. The other authors have advocated early surgery can be applied when appropriate conditions exist [7,8]. Because delayed surgery could be caused inner ear damage.

In our clinic, most of the time child's age is used to conclude the timing of surgery. Surgery will be offered after 8 years old. If there is no high-risk for cholesteatoma formation due to a marginal location or epithelium ingrowth tympanoplasty can be applied after 8 years old children. In these patients; eustachian tube function, adenoid hypertrophy and opposite ear status also affect the time of surgery and surgical outcome. In pediatric population; tympanic membrane closure may cause improvement of hearing level, provide language development, eradicate chronic middle ear infections and letting children to water activities with safety, in case of success repair.

While multiple studies have evaluated age effect on success rate of tympanoplasty, in our knowledge there is no study has specifically evaluated early and late post term hearing result outcomes in children. Our study has longer follow-up periods and larger patient population compared with the other studies in the literature. The purposes of this study were to evaluate and report the long term results of the type 1 cartilage tympanoplasty in pediatric population and investigate the concerns as mentioned above. Short term and long term hearing outcomes were compared according to age and perforation location as well.

2. Methods

Children with COM (chronic otitis media) who underwent type 1 tympanoplasty in tertiary medical center between January 2008 and June 2013 were evaluated retrospectively.

2.1. Participants

We retrospectively evaluated a total of 76 of 93 patients who had regularly come to visits (38 male and 38 female) with chronic otitis media (COM) and who were younger than 16 years (range, 9–16 years) and underwent a primary type 1 tympanoplasty in tertiary medical center. All datas were obtained from patient's folders and hospital information system. We selected our patients according to the following inclusion criteria: (1) patients younger than 16 years, (2) patients who underwent type 1 tympanoplasty procedure due to COM, (3) patients who had 48 months or longer postoperative follow-up results (4) only type 1 tympanoplasty cases in which the ossicular chain was intact and no mastoid surgery was performed were included. We excluded from the study all patients with cholesteatoma and who underwent mastoidectomy or who had ossicular chain problems. 76 patients were included in this study who had exact datas such as PTA (pure tone audiometry), follow-up findings, and endoscopic records. Seventeen patients were excluded due to lack of follow-up. Patients those followed regularly and PTA was measured at 6th and minimum 48th-month follow-up were included in this study.

The mean age was 12,68 years. We divided our population into 2 groups according to the expected eustachian tube maturity; a younger group (age <12 years; n = 22) and an older group (age ≥12 years; n = 54) because the rate of upper airway infection is considered higher in the first group. Surgery was performed under general anesthesia in all patients. Perforations were divided into three categories; anterior, posterior and central. Moreover the side of perforation was observed and noted. Characteristics of study patients who underwent type 1 tympanoplasty shown in Table 1.

2.2. Pure-tone audiometry (PTA)

PTA was measured prior to surgery and at postoperative 6th and minimum 48th month follow-up. Standard PTA (Interacoustic AC-40, Middelfart, Denmark, headphone: TDH39) was performed before and after the surgery for the frequencies of 500, 1000, 2000 and 4000 Hz. Pre and postoperative pure tone audiometry thresholds at 0.5, 1, 2, 4 kHz were noted. The air-bone gap was calculated in both preoperative and postoperative PTA.

2.3. Surgical technique

All procedure was performed under a surgical microscope (Möller-Wedel Optical®; Hamburg, Germany) by the senior surgeons. Following patient preparation, 2% lidocaine and 1:80000 epinephrine were used for the infiltration of the canal skin and meatal surface of the tragus and postauricular incision region. A postauricular incision was made, and then anteriorly

Table 1
Characteristics of study patients who underwent type 1 tympanoplasty.

	Age <12 years	Age ≥12 years
	n = 22	n = 54
Age (mean)	10 (9–11)	14 (12–16)
Gender		
Male	8	30
Female	14	24
Follow-up (months)	64 (48–90)	82 (48–114)
Graft failure	0	2 (3,7%)
Perforation location		
Anterior	6 (22,27%)	14 (25,92%)
Posterior	6 (27,27%)	14 (25,92%)
Central	10 (45,45%)	26 (48,14%)
Perforation side of ear		
Right	6	38
Left	16	16

ABG, air bone gap.

Please cite this article in press as: Kaya I, et al. Pediatric type 1 cartilage tympanoplasty outcomes: A comparison of short and long term hearing results. Auris Nasus Larynx (2017), https://doi.org/10.1016/j.anl.2017.11.002