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Evaluation of Type I Tympanoplasty in Children in Upper Egypt

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Abstract

Objective: This study was undertaken to evaluate the surgical outcome of type1 tympanoplasty in selected cases of children with tympanic membrane perforation and asses factors influencing their outcome.

Subjects and Method: The study includes a total of 82 children of age group 7 to 14 years who underwent type1 tympanoplasty in Aswan university hospital between January 2014 to August 2016 after approval from Aswan faculty of medicine ethics committee. The patients were divided into two groups, group I of 30 cases aged from 7 to 10 years and group II of 52 cases aged from 11 to 14. Patients with cholestatoma, ossicular chain pathology, previous tympanic surgery or Eustachian tube pathology were excluded from the study.

Results: In our study the overall success rate was 66 cases out of total of 82 cases (80%). The success rate was higher in group I (83.3%) than in group II (78.8%) but the difference was not statistically significant. In terms of prognostic factors, we observed a statistically significant association between the presence of a discharging ear and a poor outcome (P<0.001), also there was significant association between duration of discharge and poor results (P<0.01).

Conclusion: The age of the patients, size and site of perforation, prior adenoidectomy or adenotonsillectomy, do not significantly influence the post-operative outcome. Although tympanoplasty is less successful in bilateral perforation, but this is not of significant value.

Keywords: Children; Type 1 tympanoplasty

Abbreviations TM: Tympanic Membrane

Introduction

Timing of type I tympanoplasty in children with chronic suppurative otitis have been conflicting for many years. While Blanshard et al. [1], Gianoli et al. [2] and Mak et al. [3] prefer to perform surgery as soon as possible in order to prevent disease progression, ossicular chain erosion, cholesteatoma formation, avoid hearing loss in speech development period and allow swimming activities, Koch et al. [4] and Vrabec et al. [5] prefer to delay the operation because the high incidence of upper respiratory tract infections during childhood, unpredictable Eustachian tube function, immature immunity and possible spontaneous healing. The success rates of tympanoplasties in children reported in literature vary from 35% to 92% and 94% [6-9] Problems associated with auditory tube dysfunction and higher incidence of upper respiratory tract infections, may be a reason for poor tympanoplasty results in children than in adults [7]. Age is considered as a key prognostic factor in evaluation of tympanoplasty in children [8].

Subjects and Methods

This prospective study of type I tympanoplasty in children was conducted in the Department of Otorhinolaryngology, Aswan University hospital between January 2014 and August 2016.This study was undertaken to evaluate tympanoplasty in children to determine if the age of the child is a factor in the outcome of the surgery and to find other factors that may affect the results of the surgery. The study included 82 patients aged from 7 to 14 years. They were classified into two age groups: Group I: aged from 7 to 10 years old, the number of patients was thirty. Group II: aged from 11 to 14 years old, the number of patient was 52. Forty two were female and forty were male. The operated ear must be remained dry for at least 6 weeks before surgery. If both ears were perforated then the worse ear (audiologically) was operated first. Patients with upper respiratory tract infections were treated first to eradicate infections before the surgery.

Exclusion criteria

1. Presence of cholesteatoma
2. Ossicular chain pathology
3. Previous tympanic surgery
4. Eustachian tube malfunction.

Inclusion criteria

1. Patients between 7-14 years old
2. Dry uncomplicated pars-tensa perforation (no other middle ear abnormalities)
3. Dry ear for at least 6 weeks
4. Patent Eustachian tube

The condition of tympanic membrane was assessed by otoscopy one year post operatively.

The outcome of tympanoplasty was judged by graft take rate. Surgery was considered successful by when the tympanic membrane was found to be intact on patient review one year post operatively. The mean age was 10.86 years with a range of 7-14 years. The success rate of tympanoplasty with respect to different variables were analysed separately.

These variables include:

Age of patient:

Classified into 2 age groups:

1. 7-10 years.

2. 11-14 years.

Site of perforation:

Classified to:

1. Anterior perforation: when the perforation is anterior to the handle of malleus.

2. Posterior perforation: posterior to the handle of malleus.

3. Inferior perforation.

4. Subtotal perforation.

Size of perforation:

1. Perforations occupied half of the surface area of tympanic membrane or less.

2. Perforations occupied more than half of T.M.

3. Subtotal perforations.

Duration of discharges:

Patients were classified to:

Group I: Discharges lasting for a period up to 4 years.

Group II: More than 4 years.

Previous adenoidectomy or adenotonsillectomy:

Patients Classified into two groups:

Group I: With history of operation.

Group II: No history of operation.

Middle ear mucosa:

Patients classified into two groups:

Group I: Dry and healthy mucosa.

Group II: Unhealthy mucosa (wet or edematous middle ear mucosa).

Contra lateral ear condition:

Patients classified into two groups:

Group I: When perforation was bilateral.

Group II: When perforation was unilateral.

Statistical Analysis

Collected data were analyzed using Statistical Package for the Social Science (Version 21.0 SPSS Inc. Chicago, IL). Frequencies were calculated for qualitative data and appropriate tests of significance were used to show statistical differences and p value was considered significant if <0.05.

Results

Although higher rate of surgical failure was observed in anterior perforations, no statistical correlation was found (Table 1). Higher rate of failure was observed in subtotal perforation but differences between the three sizes and success rates were not statistically significant (Table 2). Higher rate of failure with long duration of ear discharge which is statistically significant (Table 3). As regard previous adenoidectomy, the difference between two groups were not statistically significant (Table 4). Higher rate of failure in cases of wet middle ear mucosa which is statistically significant (Table 5). As regard the condition of contralateral ear if it was normal or perforated the difference between two groups were not statistically significant (Table 6). As regard the age of each group the relation were not statistically significant (Table 7).

Perforation site	Number of cases	Successful cases %	P value
Anterior	12	9 (75%)	
Posterior	16	14 (87%)	
inferior	12	10 (83%)	
Subtotal	42	33 (78.6%)	N.S

Table 1: The results of operations in relation to the site of perforation.

Size	Number of cases	Successful cases %	P value
≤ ½ of T.M	14	13 (92.9%)	
>1/2 of T.M	25	20 (80%)	
Subtotal	43	33 (78.6%)	N.S

Table 2: The results of operations in relation to size of perforation.

Size	Number of cases	Successful cases %	P value
≤ 4 years	62	55 (89%)	
<4 years	20	11 (55%)	** P<0.01

Table 3: Relation between success rates and duration of discharge.

Previous operation	Number of cases	Successful cases %	P value
Yes	39	32 (82%)	
No	43	34 (79%)	N.S

Table 4: Relation between the results and previous adenoidectomy and adenotonsillectomy.

State of middle ear	Number of cases	Successful cases %	P value
Dry mucosa	73	63 (88.5)	
Wet mucosa	9	3 (33.3)	<0.001

Table 5: Relation between the results and condition of middle ear mucosa.

Perforation side	Number of cases	Successful cases %	P value
Bilateral	47	36 (76.6%)	
Unilateral	35	30 (85.8%)	N.S

Table 6: Relation between the results and perforation side (contra lateral ear).

Age (years)	Number of cases	Successful cases %	P value
7-10 years	30	25 (83.3%)	
11-14 years	52	41 (78.8%)	N.S

Table 7: Relation between the results and age of patients.

Discussion

The decision as to whether to proceed with tympanoplasty in children with tympanic membrane perforation or to postpone surgery until the child is older may present a different challenge to otolaryngologist. Closure of perforation may result in better hearing, fewer ear infections and elimination of the need to take water precautions.

The disparity of surgical outcome in pediatric tympanoplasty is generally attributed to different selection criteria and definitions of success and lenth of follow up [9]. A number of studies have included patients with a variety of middle ear diseases , such as cholesteatoms or ossicular erosions [10] and although most authors judged the rate of success on the basis of anatomical results, Bluestone et al. [11] considered the post-operative recurrence of negative middle ear pressure or serous effusion as a surgical failure. Another cause of surgical disparity is the difference of age groups, some authors stared with 2 years old patients [11]. Others started with 8 years old patients [9].

In the present study, the outcome of tympanoplasty in children is examined as regard to the benefits offered to the children as a result of the surgery that may have impact on their quality of life. Specifically, the success of tympanoplasty in achieving its objectives of improved hearing, decreased frequency of ear infections and enhanced participation in activities previously refrained from on account of the perforation, for example swimming is evaluated. In this study we examined, the outcomes in two age groups from 7 to 10 years and from 11 to 14 years. At age of 7 two important changes occurs to improve ventilatory function of the Eustachian tube. The tensor palatini muscle mass increases, as does the size of tubal cartilage [12]. The cut-off point between the two age groups was used because the frequency of upper respiratory infections is higher in children aged less than 10 years [9]. The upper limit of age groups was 14 years old [13,14]. The overall success rate in our series was 80.5 percent (66/88). Of those with taken graft 64 out of 66 has perfect graft at follow-up. These results are in line with data reported in the literature [4,14-16]. Two cases of 66 successful case (approximately 3%) experienced secondary complications in the form of blunting of the anterior angle and tympanic membrane retraction. Ten of our sixteen failures occurred within the first 6 months, in agreement with the data reported by Tos et al. [17]. They suggested that early reperforation after tympanoplasty caused by bad surgical technique, inflamed middle ear mucosa or post-operative infections. The reasons for late reperforation are less clear may be attributed to a new event or a persistent underlying tubotympanic disease. In terms of prognostic factors, we observed a satisfactory significant association between the presence of a discharging ear and a poor anatomical outcome (P<0.001). In a series of 188 children. Denoyelle et al. [16] found that inflammatory changes within the middle ear mucosa independently influenced the risk of an abnormal post-operative tympanic membrane and suggested that such cases should be treated using more resistant graft material such as autologaus cartilage. On the other hand, in a series of 51 pediatric myringoplasty cases Caylon et al. [15] found that the success rate in dry ears was lower than in discharging ears and assumed that it may be due to a possible decrease in the vascularity of middle ear mucosa. Our results are concordant with data reported in the literature [18].

Patient age

Patients age has generally been considered as influencing surgical outcome, but the data reported in the literature are equivocal. Rozendorn et al. [19] reported that age under 9 years is associated with significantly higher rates of persistant and recurrent perforations. Vrabec et al. [5] found better success rate with advancing age. Pignataro et al. [9] and Denoyelle et al. [16] had reported no significant correlation between age and surgical outcome. Ribeiro et al. [7] reported that, a tympanic membrane perforation can be closed at any age and there was no age limit below which perforation should not be closed. Kumar et al. [20] in a retrospected study published 2010 reported the results of 132 tympanoplasties performed in children ranging from 6-15 years, no statistical significant difference between age and successful result were found. On the other hand, Gupta and Mishra [8], Lin and Messner [21] and Yung et al. [22] reported that age is a key prognostic factor in evaluation for tympanoplasty in children. The former results may be due to the lower incidence of upper air way infections and better Eustachain tube function in later age and the relative immaturity of immune system in younger children. We found no statistical difference in the success rate between our two age groups (83.3%) in the younger age group and (78.8%) in older group. This result is concordant with the findings of Pignataro et al. [9] and Chandrasekhar et al. [12]. This may have been due to the fact that our patients were aged from 7 to 14 years and were thus probably unaffected by inefficient tube function observed in children under the

age of seven [23], Duval et al. [24] reported that children younger than 4 years of age had the worst outcome after tympanoplasty.

Site of perforation

The site of perforation did not statistically affect the outcome in our series as has been previously reported by others [4,9,15,16]. They suggested that, surgical outcome of pediatric tympanoplasty was not affected by the site or the size of perforation. However, our findings of higher rate of surgical failure in patients with anterior perforation, supports the data reported by Halik and Smyth [25]. This may be due to more limited vascularization of the anterior part of the ear drum [26].

Role of adenoidecomy

Giandoli et al. [27] found significantly higher tympanoplasty success rates in patients treated with adenotonsillectomy or adenoidectomy, but a retrospective study by Vartiainen and Vartiainen [28] on 60 pediatric patients treated with type I tympanoplasty showed that all of the failures occurred in patients who had previously under gone adenoidectomy or adenotonsillectomy. Salviz et al. [29] reported that presence of adenoid hypertrophy was associated with low success rates. We did not find any statistically significant difference between patients who had or had not undergone previous adenoidectomy, a result that agrees with those published by most authors [5,9,15]. Ribeiro et al. [7] reported that a previous adenoidectomy in patients older than 10 years seem to be an independent predictor of functional success.

Perforation side

The success rate was 85.8 % in our cases with monolateral disease and 76.6% percent in those with bilateral perforations without any statistically significant difference between both. The same results was reported by Pignataro et al. [9] and Salviz et al. [29]. The discrepancy between our results and those of Denoyelle et al. [16] and Kessler et al. [30] who found that a pathological contralateral ear independently influences the risk of an abnormal post-operative tympanic membrane, seems to be related to the fact that our cases did not show any inflammatory changes in the contralateral ear [31].

Perforation size

Although the higher rate of failure in cases with subtotal perforation (78.6%) success rate compared with cases of small perforation (80%) success rate and 92.9% in case where the perforation occupying less than 0.5 of the tympanic membrane, yet, there was no significant difference between different sizes and success rates. This result is in line with the findings of Lee et al. [32] found the success rate for small perforation as 74.1% compared with 56% for large perforation. On the other hand, Bajaj et al. [31] found that cases with near total perforation had poor surgical results.

Duration of discharges

Duration of ear discharge varied from one year to 7 years. Analysis of success rates in relation to the duration of ear discharge, revealed that success rates were lower in cases with longer duration of discharge and the relation was statistically significant ($p<0.01$). These data were also in line with data reported by Bajaj et al. [31]. This may have been due to the fact that longer duration of discharges means long duration of middle ear pathology and mucosal changes that affect the result of operation.

Conclusion

This study shows that type I tympanoplasty in children is a valid treatment modality for tympanic membrane perforation in children from seven years old. The success rate of tympanoplasty is nearly equal to a widely accepted rate in adults of 80%. Status of the middle ear and duration of discharges significantly affecting the surgical outcome. The age of the patients, size and site of perforation, prior adenoidectomy or adenotonsillectomy, did not significantly influence the post-operative outcome.

Trial Registration

IRCTN ISRCTN73824458. Retrospectively registered 28 September 2014.

Ethical Approval and Consent to Participate

Approval from Aswan faculty of medicine ethics committee.

Author Contributions

The corresponding author responsible for collection and analysis of data also about operative data and follow up of the patients. The second author responsible the tables and statistical analysis.

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To my colleagues

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