Outcome of type-1 tympanoplasty

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ABSTRACT

Objective: The outcome of 97 patients who underwent tympanoplasty type-1 surgery by different ear, nose and throat surgeons was evaluated.

Methods: This retrospective study was carried out from the records pertaining to all patients who had tympanoplasty type-1 at King Fahd Specialist Hospital, Buraidah, Al-Qassim, Kingdom of Saudi Arabia, during the years April 1995 through to April 2000. Specific criterias were setup for selecting all the patients involved and excluding others. Thus 97 ears were selected in this study. The factors presumed to influence the outcome included age, sex, nationality, affected ear, middle ear status at surgery, perforation size and surgical approach and techniques chosen by different surgeons. These data was collected in a set out proformae and tables and analyzed and discussed.

Results: The patients age ranged from 11-45 years with a mean of 26.3, standard deviation 7.6 in all selected patients and also in the successful group. Very few children from age of 11-16 were involved. The male female ratio was 1:1.4 in the total selected group and 1:1.6 in the successful group. The success rate was 80% in males and 87.7% in females (p value 0.301). The results obtained showed no significant difference due to these factors except the permeatal approach ($p<0.045$) as compared to endaural approach. In this series the overall graft success rate was 84.5% in the total of 97 patients selected for the study.

Conclusions: The overall success rate coincided with published literature from elsewhere. The factors presumed to influence the outcome of tympanoplasty type-1 surgery showed no significant difference, except the permeatal approach as compared to endaural approaches.

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The history of tympanoplasty is well over a century but it was marred with complications in early days. Never the less, the real advance was made in the early 1950's and 1960's with the advent of antibiotics, operating microscopes, temporalis fasciae and other materials.[1-3] By definition, tympanoplasty type-1, in distinction to simple myringoplasty where the middle ear was unexposed, involved reconstruction of the tympanic membrane perforation over the intact and mobile ossicles through exploratory tympanotomy as classified by Wullstien.[3] The objectives of this operation were to waterproof the middle ear, prevent recurrent infections and improve hearing. Currently it is one of the popular operations in the ear, nose and throat (ENT) units all over the world with underlay technique and temporalis fascia.[4,5] Therefore, in our endeavor to achieve better results, the present study aims to analyze the outcome of these operations in the ENT Department at King Fahd Specialist Hospital (KFSH), Al-Qassim, Kingdom of Saudi Arabia (KSA) and discuss the various factors which might have influenced it.

Methods. A retrospective study was carried out for 241 operation records of tympanoplasty type-1 during the years April 1995 through to April 2000, at KFSH, Al-Qassim, KSA. All these patients had this surgery under general anesthesia, through different approaches

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and techniques, by different ENT consultants and specialists using temporalis fascia as the only grafting material. The patients with incomplete and missing files and the ears with other types of tympanoplasty or cholesteatoma were excluded. All the patients followed up for more than 2 months were included. The ears selected were dry for at least one month prior to surgery and they all had preoperative pure tone audiograms and clinically normal eustachian tube function. Thus only 97 ears were selected in this study while 144 ears were excluded in failing to fulfill all the above mentioned criterias. Those ears with intact tympanic membrane and clinical improvement of hearing were considered successful while the others with residual defects, infections or any other complication at the end of 2 months to 2 years follow-up were categorized as failure. All these data and the factors presumed to influence results were detailed in a setup proformae, tables and histograms and the results were analyzed using statistical package for social sciences (version 10.0.1 for Windows). Appropriate statistical tests were used to calculate the graft success rates and the results were considered statistically significant when p value ≤ 0.05.

Results. The age range was 11-45 years with a mean of 26.3 and standard deviation (SD) of 7.6 in all operated group. Also in the successful group, the age range remained the same with the mean age of 26.7 and SD of 7.7 (**Table 1**). The age distribution histogram of the 97 patients who underwent type-1 tympanoplasty, illustrated the range and frequency of all the ages involved more clearly (**Figure 1**). The male : female ratio was 40:57 in the overall operated group and 32:50 in the successful group. The females had a higher success rate (87.7%) than males (80%), with p value of 0.301 (**Table 2**). The success rate was 83.5% among the 91 Saudi patients while all the 6 non-Saudi patients had successful grafts (100%). The p values for the non-Saudis were ignored due to their small number (**Table 2**). Both the right and left ears were equally affected (49% and 51%) and had nearly similar success rates (83.3% and 85.7%). The middle ear status at surgery whether wet (6.2%) or dry (93.8%) also showed similar results of graft success (83.3% and 84.6%). Also the success rates and the p values for perforation sizes, surgical approaches and techniques of different surgeons were detailed in **Table 2**. The number of patients subjected to 'thru and thru' technique and those with 'small size' perforations (2 patients each) were small and thus their p values were omitted. None of the factors mentioned above revealed any statistical significant difference except permeatal approach ($p<0.045$), in relation to endaural approach. Among the successful graft group, 39 (47.6%) ears were followed up for 2 months, 30 (36.6%) ears were followed up for 2-12 months and only 13 (5.9%) ears for more than one year.

Discussion. The success rate of tympanoplasty type-1, reported in literature considering various factors, ranged between 80 - 91% depending on follow up period.[6] The overall success rate in our series was 84.5 %, in par with the above mentioned world literature and with locally published series from the KSA.[7] Considering the factors influencing the outcome, the age factor did not affect the success rates as noted in comparing the parameters detailed for the 2 groups in **Table 1**. From the age distribution histogram of the operated patients (**Figure 1**) it was noted that only few children aged11-16 years were operated in our series. Tympanoplasty in children was not favored because many tympanic membrane perforations heal spontaneously and generally children are more prone to recurrent upper respiratory tract infections in addition to the difficulties to waterproof the ears postoperatively. However, tympanoplasty in children has always been a controversial subject since many authors feel that many developmental processes in children constitute an unfavorable prognostic factor to success of the procedure.[8] But others found tympanoplasty in children quite successful.[9-12]

In our series, the factors such as sex, nationality, the affected ear and the middle ear status at surgery, similar to other authors' results,[13-15] did not influence the overall success rates. Comparing the graft success rates of subtotal perforation (84.1%), with that of moderate sized perforation (92.3%), there was no statistical significant difference ($p=0.391$). It was noted that the smaller the perforation, the better the chances of success; but the graft success rates and p values were invalid in smaller defects due to a small number of patients. The technique of choice in our series was the popular underlay type for the 89 patients (91.8%) and the success rate achieved was 85.4% This technique is the standard practice worldwide and the results achieved were quite satisfactory compared to the large series in world literature. In the other 2 techniques of " thru and thru" and "overlay" with 2 patients (2.1%) and 6 patients (6.2%), the success rates and the p values were invalidated due to the small number of patients involved.

On the other hand, most of the surgeons involved preferred the endaural approach (61.9%) followed by permeatal (24.7%) and lastly postaural (13.4%) approaches. Despite the relative small numbers, permeatal approach had statistical significant p value ($p <0.045$) compared to endaural approach. Also it had a higher success rate (95.8%) than both endaural (78.3%) and postaural (92.3%) approaches. This approach merited the advantages of easier access to the middle ear, less bleeding, little scaring, time saving and less subjected to infections. Therefore, it has always been the author's approach of choice and achieved the best results, as 23 out of the 24 patients were successful (95.8%). The technical difficulties working through a narrow external auditory canal, as others may argue, can be overcome by training and practice. The temporalis fascia can easily be harvested through a separate scalp incision in the hair-bearing area above the auricle with hardly any scar. The postoperative wound infection was

Figure 1 - Age distribution of the 97 patients with type-1 tympanoplasty.

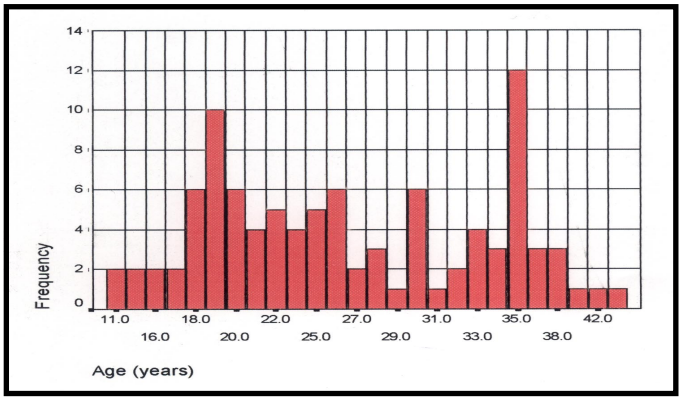

Table 1 - The mean age and range in type-1 tympanoplasty.

Parameter	Age (all operated group) N=97	Age (successful group) N=82
Mean	26.3	26.7
Standard deviation	7.6	7.7
Minimum	11	11
Maximum	45	45

Table 2 - Factors influencing the graft outcome in tympanoplasty type-1.

Factors	Overall n of cases (N=97) n (%)	Graft success (N=82) n (%)	Graft success rate %	p value
Sex				
Female	57 (58.8)	50 (61)	87	0.301
Male	40 (41.2)	32 (39)	80	
M:F	1: 1.425	1: 1.563		
Nationality				
Saudi	91 (93.8)	76 (92.7)	83.5	0.354‡
Non-Saudi	6 (6.2)	6 (7.3)	100	
Affected ear				
Right	48 (49.5)	40 (48.8)	83.3	0.746
Left	49 (50.5)	42 (51.2)	85.7	
Middle ear status at surgery				
Dry	91 (93.8)	77 (93.9)	84.6	0.646‡
Wet	6 (6.2)	5 (6.1)	83.3	
Perforated size*				
Subtotal	82 (84.5)	69 (84.2)	84.1	0.391‡
Moderate	13 (13.4)	12 (14.6)	92.3	
Small†	2 (2.1)	1 (1.2)	50	
Surgical approach				
Endaural	60 (61.9)	47 (57.3)	78.3	0.229‡
Postaural	13 (13.4)	12 (14.6)	92.3	0.586‡
Permeatal	24 (24.7)	23 (28.1)	95.8	<0.045‡
Technique				
Underlay	89 (91.7)	76 (92.7)	85.4	0.359‡
Overlay†	6 (6.2)	4 (4.9)	66.7	
Thru and thru†	2 (2.1)	2 (2.4)	100	
Surgeons				
Dr. A	37 (38.2)	33 (40.2)	89.2	0.295‡
Dr. B	33 (34)	27 (33)	81.8	0.615‡
Others	27 (27.8)	22 (26.8)	81.5	0.302‡

* - subtotal >50%, moderate = 30-50%, small <30%, † - invalid P-value due to small number of patients, ‡ - Fisher exact: 1 tailed p-value

the most frequent cause for the graft failure. Hence, it was important to take up measures to prevent catarrhal infections, appropriate wound dressing, keeping the ear dry before and after surgery and antibiotics therapy. However, as the compliance of patients for follow-up fell to one third after the first year, it was difficult to evaluate the long term results.

In conclusion, the temporalis fascia graft take up rate was not affected significantly by different factors pertaining the patient nor by the surgical techniques. However, in the suitable cases the author recommends the permeatal approach with underlay technique as it was proved to be of significant value compared to endaural approach.

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