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Assessment of the success rates and clinical outcomes following myringoplasty in subjects of age less than 15 years and improvement by pure tone audiometry

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Abstract---Background: While performing myringoplasty in pediatric age group, confrontations are different consideration that in adults. The surgical treatment of perforated drum in children has always been controversial. This controversy is certainly enhanced by variable success rates mentioned in literature. Aim: The present study was aimed at assessing the success rates and clinical outcomes following Myringoplasty in subjects of age less than 15 years and improvement by Pure Tone Audiometry. Methods: In of 42 children aged upto 15 years, under general anesthesia, Underlay technique was used either through post aural or endomeatal route. Follow up was done biweekly for first week, weekly upto 6 weeks and then after 3 months and 6 months. Dry mopping of external auditory canal was done. The outcome of myringoplasty was judged by two criteria, the graft take up and audiological result. Results: Mean AB Gap closure=10.5. 31 patient 62% showed AB gap closure within 10 dB. AB gap closure within 10-20 dB was achieved in 17 cases 34% and within 20-25 dB in 2 cases 4%. Mean age was 9.7 years. 34 cases (68%) were male and 16 cases (32%) were female. 25 cases (50%) were from average socio-economic group, while 12 cases (24% and 13 cases (26%) were each

from poor and good socio-economic group. Majority of perforations were inferior, 23 cases (46%) followed by anterior, 18 cases 36% 9 cases (18%) were suffering from tonsillitis and 9 cases 18% had adenotonsillitis. Sinusitis was observed in 11 cases 22% and allergy in 5 cases 10% most of these pathologies were in combination. Mean AB Gap closure=10.5. 31 patient 62% showed AB gap closure within 10 dB. AB gap closure within 10-20 dB was achieved in 17 cases 34% and within 20-25 dB in 2 cases 4%. Conclusion: The improved audiological results in anatomically successful cases are associated with highly probable return to normal function. This study shows that Myringoplasty is valid treatment modality for tympanic membrane perforation in paediatric age group less than 15 years.

Keywords---air bone gap, ear membrane, membrane perforation, myringoplasty, pure tone audiometry.

Introduction

Myringoplasty by definition is the procedure to restore the integrity of the membrane of the ear drum. This is today an established procedure, yet several aspects regarding its timing and choice of optimal material and factors influencing the short-term and long-term results, having been subject of controversies. While performing myringoplasty in pediatric age group, confrontations are different consideration than in adults. The surgical treatment of perforated drum in children has always been controversial. This controversy is certainly enhanced by variable success rates mentioned in literature due to large differences in selection criteria, definition of success and length of follow-up.¹ Tympanic membrane perforation occurs due to extension of infection from nose, sinuses and nasopharynx through the Eustachian tubes presenting as acute infections which may (a) resolve completely, (b) result in chronic perforation producing permanent hearing loss and source of recurrent infection, (c) partially resolve and cause chronic silent disease with bilateral hearing loss and cholesteatoma and hence resulting in significant communication disabilities.²

Various published series of cases support conflicting opinions about the indications, patient selection, timing and technique of surgery. Failure rate found very high for young children mainly due to factors including –(i) higher incidence of upper respiratory tract infections (ii) unpredictable Eustachian tube functions (iii) immature immunity (iv) difficult surgical anatomy, (v) adenoidal hyperplasia, so they recommend delaying the procedure until certain age.³ Packer et al., (1982) conducted a comparative study comprising of 1065 operations using three techniques for myringoplasty, overlay temporalis fascia with success rate of 88% underlay temporalis fascia with 82% success and underlay homograft Dura-matter with success rate of 93%. Duramater was considered better grafting material than temporalis fascia because of easy handling, availability of large pieces, instant availability, shorter incision, better hearing results with marginally higher success rate.⁴

Ghosh & Dubey 1991 reported the results of paediatric myringoplasty. 32 ears of 20 patients between the ages of 5 and 12 years were included in this study, who underwent myringoplasty and were followed up for 3 months to 1 year post operatively. Successful take of the graft was 60% in patients of 5 to 8 years age group and 72.7% percent in 9 to 12 years age group. Post-operative air conduction was elevated upto 10dB level in all the successful ears. The authors have opined that in pediatric patients, the tympanic membrane perforation should be repaired to reduce the enormous degree of morbidity and economic and social disability which affect so many hundred thousands of people.⁵ The present study was aimed at assessing the success rates and clinical outcomes following Myringoplasty in subjects of age less than 15 years and improvement by Pure Tone Audiometry. The study also aimed to assess the success rate change by allergy, sinusitis, tonsillitis, and adenoiditis.

Materials and Methods

The present study was conducted in the department of ENT and Head and neck surgery Government Medical College And Associated Hospital Rajouri, Jammu And Kashmir UT from May 1st 2021 to 30th of April 2022. Children with perforation of the pars tensa of tympanic membrane, both male and female upto 15 years of age, attending the outpatient department were the subject matter of this study. Amongst 52 cases that were studied, 2 cases including one with ossicular chain disruption and the other with the glue in the middle ear, detected per operatively were excluded from the study.

Ears with healthy middle ear mucosa and freedom from discharge during the preceding six week were included in the study. Revision surgeries as well as ears with cholesteatoma, granulation or diffuse mucosal disease were not included in the study. Patients with bilateral perforation having active ear discharge of opposite ear were not operated till ear become dry. Nasal endoscopy was done prior to myringoplasty under anesthesia in the same sitting to look for adenoids and sinusitis. Detailed history was recorded as per following routine and as mentioned in the proforma. The history recording involved name, age, sex, side involved, socioeconomic status, family history, history of ear discharge, impaired hearing, history of headache, tinnitus, vertigo, history of nasal obstruction, nasal discharge, nasal allergy, sore throat, history of trauma, history of previous surgery on ear, and history of any other surgery.

Under general anesthesia, Underlay technique was used either through post aural or endomeatal route. Temporalis fascia, tragal perichondrium and conchal cartilage perichondrium were used as graft materials. Postoperatively, subjects were given antibiotic for a period of two weeks along with systemic and local decongestants. Stitches were removed after one week. Follow up was done biweekly for first week, weekly upto 6 weeks and then after 3 months and 6 months. Dry mopping of external auditory canal was done. The outcome of myringoplasty was judged by two criteria, the graft take up and audiological result. The graft take was assessed by otoscopic examination and was considered to have been achieved when graft was intact and in proper position at the annulus. Audio logic improvement was assessed by postoperative audiograms

done at 6 weeks and 6 months, showing improvement in hearing and air bone gap closure.

Results

This study consisted of 42 children aged upto 15 years admitted in the department of ENT and head and neck surgery, Medical College Jammu from 1st May 2002 to 30th of April 2003. Children with perforation of pars tensa of tympanic membrane were the subject matter of the study. Surgery was done on dry ears and revision surgeries and ears with cholesteatoma, granulation or diffuse mucosal disease were not included in the present study. Out of these 52 cases, 2 cases had to be excluded from the study, one with ossicular chain disruption and other with the glue in the middle ear, both detected per operatively. So ultimate analyses in this study was done for 50 cases (Table 1). Mean AB Gap closure=10.5. 31 patient 62% showed AB gap closure within 10 dB. AB gap closure within 10-20 dB was achieved in 17 cases 34% and within 20-25 dB in 2 cases 4%. Mean age was 9.7 years. 34 cases (68%) were male and 16 cases (32%) were female. 25 cases (50%) were from average socio-economic group, while 12 cases (24%) and 13 cases (26%) were each from poor and good socio-economic group. Majority of perforations were inferior, 23 cases (46%) followed by anterior, 18 cases 36% (Table 2). 9 cases (18%) were suffering from tonsillitis and 9 cases 18% had adenotonsillitis. Sinusitis was observed in 11 cases 22% and allergy in 5 cases 10% most of these pathologies were in combination (Table 4). Mean AB Gap closure=10.5. 31 patient 62% showed AB gap closure within 10 dB. AB gap closure within 10-20 dB was achieved in 17 cases 34% and within 20-25 dB in 2 cases 4% (Table 3 and 5).

Discussion

The present study was aimed to assess the success rate of Myringoplasty in children aged less than 15 years, the audiological improvement and effect of associated pathologies on uptake of graft. Myringoplasty was done in 52 cases. Preoperative, ossicular chain disruption in one cases.no 11 and glue in middle ear in one cases.no 15 was detected. These two cases were excluded from study so final analysis was done for 50 cases. Overall success rate in our study was 82% after 6 months. Out of 50 cases, 45 cases 90% were in the age group of 6-15 years whereas 5 cases, 10% were less than 5 years. Bluestone et al⁶ 1979 studied 45 cases from age group of 2-16 years. Raine & Singh⁷ 1980 studied 99 cases from age group of 7-16 years. Pignataro 2001, studied 41 children from 8-14 years with average age of 10.8 years.

Age wise success in our study was 77% 23/30 in children less than 10 years whereas it was 90% 18/20 above 10 years. Comparison of success rate of both groups did not reveal statistically significant difference (P Value 0.475). Hence age was not a major factor influencing the success rate of Myringoplasty in children. This is in accordance with Caylan⁸ 1998 who achieved success rate of 84.6% in younger age groups 5-10 years and 79.1% in elder age group 11-16 years whereas, Pignattaro⁹ 2001 achieved success rate of 86.6% in age less than 10 years and 76.9% in elder age group. This difference with Pignataro's study may be

because of the fact that his series included children above 8 years whereas we had patients of age even below 5 years.

In our study 34 cases 68% were male and 16 cases 32% were female with success rate of 82% (28/34) and 81% (13/16) respectively. Thus, patients who opted for surgery in our series had male predominance. Kessler et al¹⁰ 1994 did 183 Myringoplasty in children, out of which 105 were male and 78 were female. Caylan⁸ 1998 reported equal cases of both sexes. Success rate in our series are comparable with these studies who reported no effect of sex on outcome. 76% of the cases in our study were with above average socioeconomic status. Chopra & Grover¹¹ 1999 series had 74% of poor to average socio-economic status patients whereas in our study, cases operated were average and above 76%. It is probably because of ignorance, illiteracy and financial constraints that low socio-economic group opted less often for surgery. Right ear was involved in 26 52% cases, while left ear was affected in 24 case 48%. Success rate in right ear was 81% (21/26) whereas this was 83% 20/24) in left ear. Hence side of perforation did not influence the result of surgery.

In the present study, out of 50 cases, 27 cases 54% had normal opposite ear, 15 cases 30% had dry central perforation of contralateral ear; and 8 cases 16% had discharging central perforation on opposite side. The surgical success rate was 89% (23/7) in patient with normal contralateral ear while it was 78% (18/23) in cases of contralateral perforation (both dry and discharging). Success rate was 86% (13/15) for contralateral dry perforation and 63% (5/8) for contralateral discharging perforation. Contralateral discharging ear was a major factor resulting in failure of procedure (P Value 01). In this respect our study conforms well with Pignataro et al. 2001 who achieved success rate of 89.2% in normal contralateral ear and 61.5% in contralateral perforations. Kessler et al. 1994¹⁰, in his study of 183 patients concluded that status of contralateral ear was found to have no statistical value for predicting short term surgical success. 23 perforations in this study were in inferior quadrant with success rate of 91% (21/23) whereas 18 interior quadrant perforations had success rate of 78% (14/18). All the posterior perforations healed (100%) whereas 5 subtotal perforations had success rate of 40% (2/5). Lesser success rate in anterior quadrant perforations in our study is supported by study of Halik et al¹² 1987 which attributes limited vascular supply of anterior part of drum to graft failure. Sade 1981 attributes it to technical difficulty in repairing anterior perforations. Graft may retract away from the undersurface of annulus in the Eustachian tube orifice if not packed properly with gel foam.

The underlay technique was used in our study. Post aural approach was used in 35 cases 70% with success rate of 83% (29/35) and trans canal approach in 15 cases 30% with success rate of 80% (12/15). There was statistically no difference in success rate in both groups in our study. Although Chopra & Grover 1999, in a study of 30 children aged upto 14 years showed 83.34% graft take with post aural approach and 75% with endomeatal approach because of better exposure in post aural approach. Similar results were shown by Kock & Friedman et al¹³ 1989 in a study of Children aged 2 to 17 years. Graft material used was temporalis fascia in 34 cases (68%) with success rate 82% (28/34). Tragal perichondrium was used in 15 cases (30%) with success rate of 80% (12/15) and conchal cartilage

perichondrium in 1 case *2%), which was successful. Thus in our study both materials produced identical results. As per Friedberg % Gillis, 1980¹⁴, perichondrium material handles quite well and does not require dehydration and is stored in physiological saline solution.

In our study postoperative air bone gap closure was within 10 dB in 31 patients 65% and b/w 10-20 dB in 16 cases 33% and b/w 20-25 dB in one case 2%. This is comparable with Denoyelle 1999 who reported AB gap closure within 10 dB in 67.5% cases whereas AB gap closure within 10 dB was achieved in 56% by Lau & Tos 1986.¹⁵ Higher success rates was reported by Halick & Smyth 1987 up to 78% and AB gap closure within 10 dB. No sensorineural deafness was observed post operatively. In our study, 23 patients were without associated pathology, 9 (18%) cases of tonsillitis, 9(18) cases of adenotonsillitis, 11 cases of sinusitis and 5 cases of allergy. 5 cases were treated by adenotonsillectomy and 4 cases by tonsillectomy. Graft take was 80% (4/5) in patients treated by adenotonsillectomy where it was 75% (3/4) in cases who did not undergo adenotonsillectomy. Success rate in patients who underwent tonsillectomy was 75% (3/4) as compared to 80% (4/5) in cases who were not treated previously by tonsillectomy. Our study did not show significant higher graft take up rates in the present study, residual perforations where mostly anterior (5/9) 56% followed by inferior (3/9) 33% and posterior (1/9) 11%.

Conclusions

The present study assessed 50 cases of Myringoplasty in children and following conclusions were made. Success rate of Myringoplasty in children aged less than 15 years achieved in our study was 82%. Factors with no effect on results were age, sex or patient, side of perforation, surgical approach and graft material. Perforations in anterior part of tympanic membrane had marginally lower success rate. Contralateral ear pathology especially discharging ear was a significant factor resulting in failure of Myringoplasty. Adenotonsillectomy and tonsillectomy did not improve the success rate of the procedure. Tympanosclerosis of tympanic membrane did not adversely affect the success rate. The improved audiological results in anatomically successful cases are associated with highly probable return to normal function. This study shows that Myringoplasty is valid treatment modality for tympanic membrane perforation in paediatric age group less than 15 years.

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Tables

Table 1
Demographics of the study participants

		Result					
		Total		Failure		Success	
		No of cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Age in years	5	05	10	1	20	4	80
	6-10	25	50	6	24	19	76
	11-15	20	40	2	10	18	90
Sex	Male	34	68	6	19	28	81
	Female	16	32	3	18	13	82
Socio-economical status	Poor	12	24				
	Averag	25	50				

	e						
	Good	13	26				

Table 2
Size of perforation in the study participants

Site	No of cases	Percentage (%)	Result			
			Failure		Success	
			Cases	Percentage (%)	Cases	Percentage (%)
Inferior	23	46	2	9	21	91
Anterior	18	36	4	22	1	78
Posterior	04	8	0	0	4	100
Sub Total	05	10	3	60	2	40

Table 3
Preoperative Air Bone Gap in the study participants following Shambaugh's classification

AB Gap	No of Cases	Percentage
20dB	17	34
20-30dB	31	62
31-45dB	02	04
46-60dB	0	0

Table 4
Associated Pathology in the study subjects

Associated pathology	No of cases	Percentage (%)
Chronic Tonsillitis	9	18
Adentonsillitis	9	18
Sinusitis	11	22
Allergy	05	10
No pathology	23	46

Table 5
AB Gap closure in the study subjects

<10dB	31	62
10-20dB	17	34
20-25 dB	02	04