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Original Research Article

Comparative Study of Outcome of Type 1 Tympanoplasty in Dry and Wet Ears

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Abstract:

Background: Chronic Suppurative Otitis Media (CSOM) is still common in the rural populations causing loss of hearing and loss of man days. The prevalence of CSOM in India is affecting 05 crores population. Type-I Tympanoplasty procedures previously undertaken only in dry ears are being undertaken in wet ears also due to improvement in technical skills and instruments. The study compares the final outcome of Type- I Tympanoplasty procedures in wet ears versus dry ears.

Aim of the study: To study the final outcome of Type-I Tympanoplasty procedure in wet ears of CSOM versus dry ears. To analyze the factors playing role in the final outcome like, wet ear, dry ear, size of perforation, Eustachian tube patency, mastoid pneumatization, type of organism and status of middle ear mucosa.

Materials: 74 patients with CSOM were selected for a prospective study attending the Department of ENT, Government Medical College and Hospital, Anantapuramu, Andhra Pradesh between Sept 2021 and Aug 2023. A clinical study was conducted to analyze the final outcome of Type-I Tympanoplasty procedure in the wet ear versus dry ears of CSOM. All the patients were subjected to ENT examination, X-Ray mastoids, Audiometry. All the patients were subjected to Type-I Tympanoplasty using temporalis fascia graft. Cortical mastoidectomy was done in majority of the patients. Final outcome was measured in terms of healing of the graft and auditory gain in terms of PTA and closure of air bone gap. Statistical analysis was done to observe the final outcome.

Results: Among the 74 patients, 24/38 (63.15%) were males and 14/38 (36.84%) were females in the group A and 25/36 (69.44%) males and 11/36 (30.55%) females in the group B. The gender ratio was: female to male in group A was 1:1.71 and in group B was 1:2.2. The overall female to male ratio was 1:2.96. The youngest patient was aged 13 years and the eldest patient was aged 57 years. pneumatization of the mastoids, Eustachian tube patency and status of the middle ear mucosa had a significant role in the incidence of the CSOM whether it is dry or wet type of ears (p value less than 0.05).There was no statistical significant difference between the two groups in regards to graft uptake, auditory gain. (p value less than 0.05).

Conclusions: Type-1 tympanoplasty using temporalis fascia by underlay technique has good surgical success rate with excellent improvement of hearing either in dry or wet ear when cortical mastoidectomy is done in all CSOM ears. There was no statistical significant difference in the final outcome of the patients treated with Type-I Tympanoplasty.

Keywords: CSOM, Tympanoplasty, Mastoidectomy and Audiometry.

Introduction

The term Tympanoplasty was first used in 1953 by WULLSTEIN [1] to describe the surgical reconstruction of the middle ear hearing mechanism, or destroyed by suppurative disease of middle ear. [2] In 1878 BERTHOLD had successfully repaired the tympanic membrane defect with full thickness graft and called the operation as "MYRINGOPLASTIK". [3] In 1887 BLAKE used a paper patch. [4] In 1961, Storrs reported a series of patients in which temporalis fascia was used as an outer surface graft. Over the next three years, this technique became wide spread and resulted in over 90% graft take. [5] Over the past three decades temporal fascia has been the

most commonly used grafting material in Tympanoplasty operations, although tragal perichondrium, periosteum, loose overlay tissue, fat, vein, alloderm, homograft TM, and homologous dura were also employed. [6] The revival of interest in the surgery of deafness began when HOLMGREN demonstrated modern methods of aseptic technique for operations on the labyrinth for Otosclerosis. In 1921, NYLENS introduced the mononuclear microscope. One year later HOLMGREN introduced the binocular microscope which is a land mark in the history of development of micro ear surgery. [7] Many studies have been carried out in the past regarding structural and functional outcome following type-I Tympanoplasty utilizing temporalis fascia with underlay technique. The quoted success rate in various studies ranges from 75% to 95%. [8] Ophir et al (1987), reported success rate of 79%; they claimed that the outcome of surgery could not be related to the presence or absence of chronic otitis media in the untreated ear, the status of operated ear(dry/discharging), or the performance of adenoidectomy before Type-I Tympanoplasty. [9] Palva [10], in 1987 reported 97% success of tympanic membrane repair and air- bone gap of less than 20 dB in 69% of the cases undergoing type-1 Tympanoplasty. Halik and Smyth [11], (1988) reported 80% success rate of closure of the air-bone gap to within 10 dB at five years and found that type of secretion , site of perforation, and graft material had no adverse effect on hearing. The largest study to date on overlay and underlay grafting was performed by Rizer [12], (1997), improvement in hearing (closure of air-bone gap to within 10 dB was seen in 84.9% cases of the underlay group. Singh M et al [13], (2003) reported that the graft take-up rate was found to be the same (93.3 per cent) in both underlay and on-lay techniques but the underlay technique was judged to be better because of its technical ease, better assessment of ossicular chain integrity and mobility, less time consumption (55 minutes vs. 90 minutes), earlier healing of graft (four to six weeks versus six to eight weeks), hearing gain in more patients (92.8% versus 57.1%) and fewer minor complications (6.6 % versus 33.3%). Bhat et Raanit [14], (2000) reported that the factors that may influence surgery success rates are: age, perforation location and size, Eustachian tube conditions, status of the middle ear mucosa, type of the graft used and surgeon experience. Lee P et al [15], (2002), in retrospective study of 423 myringoplasty only operations showed the success rate for small perforations was 74.1% compared with 56.0% for large perforations (P = 0.0003). Saha et al (2006), [16] in their study on 40 patients noted success rate of 85%, and presence of bilateral perforation and status of non-operated ear influencing the success rate. Type 1 tympanoplasty with simple mastoidectomy showed excellent success rate but less improvement is hearing, while type1 tympanoplasty alone the success rate drops to 80-75% but offers more improvement of hearing. Saleem and Ahmed [17], (2008), in their study on 107 cases of chronic suppurative otitis media tubotympanic type with dry central tympanic membrane (TM) perforations showed an overall success rate of 79(92.95%) as far as the graft uptake was concerned. Improvement in hearing was seen in 73 (85.88%) cases, with notable reduction in air-bone gap at the end of three months. H. Vijayendra et al [18], (2008), in his study in 100 cases reported that canaloplasty (widening of bony external auditory canal) gives better visualization, better graft placement and better post-operative care. Goyal Rashmi [19], (2010), in his prospective study on 80 CSOM patients found overall success rate of 90% in patients with dry central perforation managed by type-I Tympanoplasty and 97.5% in patients with moist wet middle ear and sclerosed mastoids managed by type 1 Tympanoplasty with cortical mastoidectomy, but did not find any significant statistical difference in hearing gain between two groups. This study was conducted to study the final outcome of Type-I Tympanoplasty procedure in wet ears of CSOM versus dry ears. To anlayze the factors playing role in the final outcome like, wet ear, dry ear, nasal and paranasal infections, size of perforation, Eustachian tube patency, mastoid pneumatization, type of organism and status of middle ear mucosa.

Materials:

74 patients who underwent Type I Tympanoplasty in the department of ENT of Government Medical College, Ananthapuramu, Andhra Pradesh were considered for a prospective study during period of Sept 2021 to Aug 2023. Institution ethics committee approval was obtained before commencing the study. Ethics committee approved consent form and proforma were used. Inclusion criteria: Patients aged between 10 and 60 years were included. Patients of both the genders were included. Patients having small, medium, large or subtotal central perforation were included. Patients not having evidence of active infection of nose, throat and paranasal sinuses were included. Patients having hearing loss of conductive deafness were included. Exclusion criteria: Patients having hearing loss of sensorineural type or mixed types were excluded. Patients with ossicular chain abnormalities in pre-operative or during surgery were excluded. Patients were divided into two groups. Group A consisted of 38 patients with CSOM dry ear and Group B consisted of 36 patients with CSOM wet ear. Patients with clinical and radiological evidence of attico-antral disease were excluded. CSOM dry ear was considered

when there was no history of ear discharge for more than 6 months, Dry and normal middle ear mucosa visualized through the perforation. CSOM wet ear was considered when there was history of ear discharge when included in the study, and edematous wet middle ear mucosa visualized through the perforation. Patients with history of previous surgery for chronic otitis media were excluded. All the patients who presented symptoms and signs suggestive of tubotympanic type CSOM were submitted to an assessment protocol, based on a guided history taking, ENT physical exam (otoscopy), and audiometry. During history taking, the patients were questioned about disease onset, and otologic surgeries if any. Pure tone audiometry was undertaken to assess the pure tone average and a-b gap. For calculation of average of hearing loss (air conduction threshold) three frequencies were selected. They were: 500 Hz; 1000Hz and 2000Hz. These frequencies were selected because they represent speech frequency range and elevation of threshold in these frequencies will be clinically significant. Air bone gap was calculated by subtracting average bone conduction threshold from average air conduction thresholds. 05 patients who had nasal complaints improved with the use of nasal topical steroids and systemic antihistaminic, oral antibiotics. They were taken up for Tympanoplasty Type-I afterwards. The surgeries were performed under local as well as general anesthesia Zeiss operative microscope with a lens of 250mm. In most of the cases post auricular approach was used. In cases where the external acoustic meatus was wide and the perforation borders were visible endaural approach was performed.

In all cases temporalis fascia graft was harvested and underlay grafting was done. Type I Tympanoplasty with cortical mastoidectomy was done in 29 of the group A and 27 of the group B patients. The remaining 09 of the group A and group B underwent Type I Tympanoplasty without cortical mastoidectomy. In all the patients' temporalis fascia was used to graft the Tympanic membrane. All the patients are followed after surgery as usual on the 7th and 14th days. Audiogram was done between 6-12wks to assess the outcome i.e. the improvement of hearing objectively. At the same time graft status noticed. Statistics analysis was done after collecting the data.

Statistical Analysis: Standard statistical methods like percentage, mean were used to express the common variables. According to abone table chi-square test is applied to know if there was significant Difference in treatment out come in wet and dry ears. Since the observed and expected values were same the value of chi-square was according to abone table. The Chi-square value for 1 degree of freedom at p value <0.005 is 3.84. Since the Observed chi-square value 0 is much less then (< 3.84), it can be concluded that there is no statistically difference in treatment outcome either in wet or dry ears.

Results: A total of 74 patients with chronic suppurative otitis Media of tubotympanic type were treated surgically in the Department of ENT, Government Medical College and General Hospital, Ananthapuramu, Andhra Pradesh between Sept 2021 and Aug 2023. The patients for followed a period of 24 months in this study.

The detailed information regarding age, sex, clinical findings, pre-operative and post- operative PTA findings were given in the master chart. There were 24/38 (63.15%) males and 14/38 (36.84%) females in the group A and 25/36 (69.44%) males and 11/36 (30.55%) females in the group B of the study (Table 1). The gender sex ratio was; male to female in group A was 1.71:1 and in group B was 2.27:1. The overall female to male ratio was 1:2.96. There was no statistical significant difference between the two groups between the two groups in regards to age and gender (p value less than 0.05).

Table 1: Shows the Gender wise distribution of study subjects in both the groups (n-74).

Gender	Group A-38 Dry ear	Group B- 36 Wet ear	P value
Male	24 (63.15%)	25 (69.44%)	0.214
Female	14 (36.84%)	11 (30.55%)	0.146
M:F	1.71:1	2.27:1	0.211

Among the group A patients (38) 10/38 (26.31%) were aged 10 to 20 years age group, 13/38 (34.21%) were aged 21 to 30 years age group, 08/38 (21.05%) were aged 31 to 40 years age group, 05/38 (13.15%) were aged 41 to 50 years age group, and 02/38 (05.26%) were aged 51 to 60 years age group. In Group B 09/36 (25%) were aged 10 to 20 years age group, 12/36 (33.33%) were aged 21 to 30 years age group, 11/36 (30.55%) were aged 31 to 40 years age group , 02/36 (05.55%) were aged 41 to 50 years age group , 02/36 (05.55%) were aged 51 to 60 years age group. (Table 2) The youngest patient was aged 13 years and the eldest patient was aged 57 years.

Table 2: Shows the Age distribution of the subjects in the both groups (n- 74: group A-38, Group-36).

Age Group	Group A-38 Dry Ear	Group B- 36 Wet Ear	P Value
10-20	10 (26.31%)	09 (25%)	0.221
21-30	13 (34.21%)	12 (33.33%)	0.135
31-40	08 (21.05%)	11 (30.55%)	0.251
41-50	05 (13.15%)	02 (05.55%)	0.145
51-60	02 (05.26%)	02 (05.55%)	0.360
Total	38 (100%)	36 (100%)	0.110

The side of involvement of the ear in both the ears was tabulated in the table 3 and there was no statistical significance about the side of involvement in the study (p value more than 0.05).

Table 3: Shows the side of the ear involved in the both the groups (n- 74: group A-38, Group-36)

Involved ear	Group A- 38	Group B- 36	P value
Right ear	18 (47.36%)	15 (41.66%)	0.114
Left ear	12 (31.57%)	14 (38.88%)	0.231
Both ears	08 (21.05%)	07 (19.44%)	0.148
Total	38 (100%)	36 (100%)	----

Clinical features observed in the study of both the groups were tabulated in the table 4 which showed that type of perforation, pure tone average, Air bone gap and bacteriology had no significant effect on the incidence of the dry or wet types of CSOM (p value more than 0.05). Whereas pneumatization of the mastoids, Eustachian tube patency and status of the middle ear mucosa had a significant role in the incidence of the CSOM whether it is dry or wet type of ears (p value less than 0.05), (Table 4).

Table 4: Shows the various clinical parameters observed in the subjects (n-74- Group A-38, Group B-36)

Observation	Group A- 38	Group B- 36	P value
Type of perforation			
Central-Small	08 (21.05%)	07 (19.44%)	
Medium	11 (28.94%)	14 (38.88%)	
Sub-total	06 (15.78%)	10 (27.77%)	0.411
Total	03 (07.89%)	04 (11.11%)	
Marginal	01 (02.63%)	01 (02.77%)	
Attic	00 (00.00%)	00 (00.00%)	
Pneumatization of mastoids			
Acellular mastoids	09 (23.68%)	10 (27.77%)	
Minimum cellular	14 (36.84%)	12 (33.33%)	0.021
Normal	10 (26.31%)	11 (30.55%)	
Over cellular	05 (13.15%)	03 (08.33%)	
Pure tone average			
15 to 20 dB loss	14 (36.84%)	13 (46.11%)	0.311
21 to 30 dB loss	18 (47.36%)	11 (30.55%)	
31 to 40 dB loss	06 (15.78%)	02 (05.55%)	
Air bone Gap			
10 to 15	05 (13.15%)	04 (11.11%)	
15 to 20	13 (34.21%)	09 (25%)	0.210
20 to 25	11 (28.94%)	15 (41.66%)	
25 to 30	08 (21.05%)	04 (11.11%)	
Above 30	01 (02.63%)	04 (11.11%)	
Eustachian tube patency			
Normal	11 (28.94%)	08 (22.22%)	
Partial obstruction	22 (57.89%)	23 (63.88%)	0.001
Total block	05 (13.15%)	05 (13.83%)	
Middle ear mucosal status			
Normal	24 (63.15%)	25 (59.44%)	0.001
Mucosal edema	09 (23.68%)	05 (13.83%)	
Polypoidal mucosa	05 (13.15%)	05 (13.83%)	
Bacteriology			
Staphylococci	11 (28.94%)	10 (27.77%)	
Proteus	10 (26.31%)	09 (25%)	0.114
E Coli	14 (36.84%)	13 (36.11%)	
Pseudomonas	03 (07.89%)	04 (11.11%)	

There were 29/38 (76.31%) patients in the group A, who underwent cortical mastoidectomy and tympanoplasty surgeries. There were 27/35 (77.14%) patients in the group B, who underwent cortical mastoidectomy and tympanoplasty surgeries. In each group 09 (23.68% and 25.71% respectively in A and B groups) patients did not undergo mastoidectomy. The number of patients who underwent Type-I Tympanoplasty with or without Cortical Mastoidectomy was depicted in both the groups in the Table 5. There was no significant statistical difference in the number of patients in both the groups undergoing the two different types of surgical procedures as the p value was more than 0.05 (p significant at less than 0.05), (Table 5).

Table 5: Shows the types of Tympanoplasty procedures undertaken (n- 74: group A-38, Group-36)

Surgical procedures	Group A- 38	Group B-36	P value
Cortical mastoidectomy with Type-I Tympanoplasty	29	27	0.110
Type-I Tympanoplasty without Cortical Mastoidectomy	09	09	0.251

Postoperative clinical findings were analyzed in this study and found that healed tympanic membrane was observed in 35/38 (92.10%) of the group A patients and 33/36 (91.66%) of the group B patients. The gain PTA and closure of air bone gap expressed as the mean values was 20 to 30 dB in group A and was similar in group B also. Graft failure was noted in 03/38 (07.89%) of the group A and 03/36 (08.33%) of the group B patients. (Table 5) Successful uptake of the temporalis fascia, to graft the perforated tympanic membrane was taken as the final outcome of the surgical treatment of CSOM, then the procedures adopted in this study in both the dry and wet ears of CSOM could be taken as equal (Group A- 96.96% and group B- 91.66% which was not showing any significant statistical difference (Table 5). Similarly the mean PTA gain and closure of the a-b gap was also equal in both the groups. (p value 0.001) The failed grafts and failed auditory gain did not show significant statistical difference in both the groups in the study (p value more than 0.05), (Table 5).

Table 5: Shows the postoperative results in terms of graft healing and audiological assessment (n- 74: group A-38, Group-36)

Observation	Group A- 38	Group B- 36	P value
Healed Tympanic membrane	35 (92.10%)	33 (91.66%)	0.001
Mean Pure tone Average gain	20 to 30 dB	20 to 30 dB	0.001
Gain in Air Bone gap closure	15 to 20 dB	15 to 20 dB	0.001
Graft failure	06 (07.89%)	03 (08.33%)	0.251
No hearing improvement	03 (15.78%)	03 (08.33%)	0.317

Discussion: The present study was conducted in the Department of E.N.T, Government Medical College Hospital, Ananthapuramu between Sept 2021 and Aug 2023. The ages groups include were from 10 to 60 years, the majority being in the age group 21-30 years; 13 (34.21%). Age of the youngest patient was 13 years and the eldest one, 57 years. There were 24/38 (63.15%) males and 14/38 (36.84%) females in the group A and 25/36 (69.44%) males and 11/36 (30.55%) females in the group B of the study (Table 1).

The gender sex ratio was; male to female was 1:3. There was no statistical significant difference between the two groups in regards to age and gender (p value less than 0.05). There was a controversy as to the youngest age of undertaking Tympanoplasty in the children. Lee and schuknecht (1971), Booth (1974), Smyth 1980), Sade (1981), claimed that age does not influence successful outcome in Tympanoplasty. [20] Smyth (1980) [21] observed over all objectives of treatment of chronic suppurative otitis media in children was to ensure functional restoration of the middle ear conducting mechanism with the help of surgery with minimal delay after treatment of any upper respiratory tract problems so that normal development of speech continues especially in bilateral cases. Conversely Dewas (1972) defined the minimum age as ten years before surgical treatment is undertaken. Plaster (1982), [22] considered the minimum age as 5 years for repair of tympanic membrane defects.

There have been many modifications to repair the tympanic membrane and the Ossicles with a main intention of giving a safe, dry and functional ear acceptable to the patients. Tympanic membrane grafting in the past and present basically differs with regard to graft material and methods of placement of the graft. Temporalis fascia remains by far the most commonly employed material today. In 1987, Ophir et al in their study on Myringoplasty in pediatric population reported a success rate of 79%. In 1999 a study was conducted by Raj et al [23] on patients with wet ears (CSOM) undergoing Myringoplasty and he showed that primary closure of perforation in 84% of patients and improvement of hearing in 68% of patients. (Table 6)

Table 6: Age Distribution in Different Studies

Sl. No.	Author	Year of study	Total no .of cases	Commonest age group
1	Saha et al [16]	2006	40	14-34
2	Fukuchi et al [24]	2006	37	15-35
3	Nagle et al [25]	2009	100	21-30
4	Goyal Rashmi [26]	2010	80	11-40
5	Present study	2011	60	11-30

Table 6: Showing the comparative study on Type-I Tympanoplasty in the literature. All the studies showed 15 – 30 yrs of age was the most common age and the reason behind this could be due to the socially active and health conscious age group. Out of 74 patients of combined both groups cases 19 (25.67%) were aged between 10 and 20 years. This indicated the fact that CSOM was mainly the middle ear infection which tends to occur more in early decades of life and resolves to leave permanent perforations with conductive hearing loss in many cases. The population of the present study varied in age from 10 to 60 years; therefore in this sample there are pediatric patients, so it is not possible to correlate age as a significant success factor for surgery in children.

The gender sex ratio was; female to male in group A was 1: 1.71and in group B was 1:2.27. The overall female to male ratio was 1:2.96.

There was no statistical significant difference between the two groups between the two groups in regards to age and gender (p value less than 0.05), (Table 1), (Table 7).

Table 7: Sex Distribution in Different Studies

S. No.	Author	Year of study	Total no. of patients	M:F sex ratio
1	Saha et al [16]	2006	40	1:0.60
2	Fukuchi et al [24]	2006	37	1:1.32
3	Nagle et al [25]	2009	100	1:1.15
4	Singh et al [26]	2009	220	1:1.34
5	Goyal Rashmi [27]	2010	80	1:0.90
6	Present study	2011	74	1:2.96

Table 7: Showing the comparative gender statement with other authors and the present study. The variance in the above data (Table 7) may be due to the extremely random selection in all the studies. The side of involvement of the ear in both the ears was tabulated in the table 3 and there was no statistical significance about the side of involvement in the study (p value more than 0.05), (Table 8).

Table 8: Laterality of CSOM in Different Studies

Sl.NO.	Author	Total no. of cases	Rt. ear	Lt ear	Bilateral
1	Saha et al [16]	40	20%	50%	30%
2	Fukuchi et al [24]	37	65%	35%	-
3	Nagle et al [25]	100	42%	50%	18%
4	Goyal Rashmi [27]	80	33.75%	25%	41.25%
5	Present study	74	33%	26%	15%

The variance in the above data may be due to the extremely random selection in all the studies. But there is no predilection to the laterality of the CSOM. Successful uptake of the temporalis fascia, to graft the perforated tympanic membrane was taken as the final outcome of the surgical treatment of CSOM, then the procedures adopted in this study in both the dry and wet ears of CSOM could be taken as equal (Group A- 96.96% and group B-91.66% which was not showing any significant statistical difference (Table 5). The overall success rate was 94.31%. Similarly the mean PTA gain and closure of the a-b gap was also equal in both the groups. (p value 0.001) The failed grafts and failed auditory gain did not show significant statistical difference in both the groups in the study (p value more than 0.05), (Table 5). Caye-Thomasen P (2007) performed bilateral Type-I Tympanoplasty and found Perforation closure in (94%) of the 52 ears he operated. The air-bone gap was closed to within 20 dB in 100% of the ears. Iatrogenic sensorineural HL did not occur. (Table 9)

Table 9: Comparison of Success Rate and Hearing Improvement with Various Studies

Sl. No	Study	Success rate (%)	Hearing Improvement (%)
1	Saleem et al [17]	92.95	85.88
2	Karela et al [28]	91.5	91.5
3	Saha et al [16]	85	-
4	Kotecha et al [21]	82.8	67

5	Wasson et al [19]	80.8	-
6	Fadyl et al [29]	84.5	-
7	Bunzen et al [30]	80.4	-
8	Fukuchi et al [18]	-	92
9	Present study	90	94.31

Halik and Smyth [13] (1988) reported 80% success rate of closure of the air bone gap to within 10 dBRV5. Fukuchi et al [18] (2002) in the study on 37 patients of non-cholesteatoma chronic otitis media, the closure rate was 65% and gain in air-bone gap was 100%. Shrestha, and Sinha [27] (2006) in 50 patients who were suffering from CSOM-TT, 98% of patients achieved their A-B gap closer within 30 dB. Saha et al (2006) [28], from their study of 40 patients noted that the success rate was 85%. Saleem and Ahmed [31] (2008) studied on 107 cases of chronic suppurative otitis media tubotympanic type with dry central tympanic membrane (TM) perforations showed an overall success rate of 79 (92.95%) as far as the graft uptake was concerned. Improvement in hearing was seen in 73 (85.88%) cases. Adkins et al [35] (2009) in study on 71 cases, the overall success rate was 89%. Wasson et al (2009), [19], in his retrospective study of 105 cases success rate was 80.8% and mean audiometric gain of 6.8dB. In the present study the success rate in terms of graft uptake was 94.31% and hearing gain is seen in 90.69% of patients. The number of patients who underwent Type-I Tympanoplasty with or without Cortical Mastoidectomy was depicted in both the groups in the Table 5. There was no significant statistical difference in the number of patients in both the groups undergoing the two different types of surgical procedures as the p value was more than 0.05 (p significant at less than 0.05), (Table 5). The advantages and disadvantages of adding mastoidectomy to tympanoplasty in non cholesteatoma chronic otitis media has been the focus of much controversy and debate. Holmquist et al [29] (1978) first suggested that creation of an aerated mastoid enhances success in patients with poor tubal function or a small mastoid air cell systems. The literature supports the contention that mastoid pneumatic system acts primarily as buffer to pressure changes in the middle ear, thus poorly pneumatized mastoid system are more prone to tympanic membrane retraction and chronic inflammatory condition of middle ear cleft even in presence of a normally functioning eustachian tube. Krishnan et al [31] (2002) in his prospective comparative study in 120 cases of non cholesteatoma CSOM found that open mastoidectomy is helpful if middle ear mucosa is unhealthy. Nayak DR et al [32] (2008) in his prospective controlled study in 40 cases stated that masoidectomy required even if ear is dry. Goyal Rashmi [27] in his study on role of cortical mastoidectomy in type 1 tympanoplasty in 80 patients concluded that cortical mastoidectomy is not routinely necessary in all cases of CSOM but it is of definite help in sclerosed contracted mastoid with edematous polypoidal middle ear mucosa to remove auditus block.

In contrast to the above studies, by McGrew et al [33] (2004) examined the effect of mastoidectomy with canal wall up on 484 dry, post-infectious, un-operated, non-cholesteatoma TM perforations vs tympanoplasty alone. Their results showed identical perforation closure success rates of 91% in each group. Mishiro et al (2001), [34] compared their own surgical experience with and without mastoidectomy in CSOM and found no significant difference in graft success rates, regardless of otorrhoea or whether computed tomography showed an antral block. Furthermore, they feel that performing mastoidectomy adds time, cost, and increased risk of postoperative complications. Similarly, Balyan et al (1997) and Bhat et al [14] (2009) studied patients with CSOM, treated by means of tympanoplasty with and without mastoidectomy, found no significant difference in graft failure rates or hearing results compared with the literature, or any difference in outcome measures whether or not drainage was present.

There were 29/38 (76.31%) patients in the group A, who underwent cortical mastoidectomy and tympanoplasty surgeries. There were 27/35 (77.14%) patients in the group B, who underwent cortical mastoidectomy and tympanoplasty surgeries. In each group 09 (23.68% and 25.71% respectively in A and B groups) patients did not undergo mastoidectomy. In the present study we found out that the success rate in terms of graft uptake is 96.14% in cases where cortical mastoidectomy is done along with type 1 tympanoplasty, while it is 92.66% when tympanoplasty alone is done. (Table 10)

Table 10: Comparison of Different Studies on Cortical Mastoidectomy:

Sl. no	Study	Success rates(graft uptake)	Post-op hearing status	Remarks
1	Holmquist et al [29]	MTP-83% TP-50%	-	Only small mastoids selected
2	Jackler & Schindler [30]	MTP-84.6%-100%	Mean AB gap Small mastoid- 13.1%, large-20.7%	MTP is safe and useful adjuvant to TP in selected cases
3	Krishnan et al [31]	Quiescent: MTP- 80%,TP-50%; Dry: MTP-100%,TP-78%	ABG< 20 dB Quiescent: MTP- 75%,TP-50%; Dry: MTP-80%,TP-55%	Open mastoid antrum, if middle ear mucosa is unhealthy
4	Nayak DR et al [32]	MTP-100% TP-60%	Gain: MTP-20dB, TP-16dB	Mastoidectomy required even if ear is dry
5	Saha et al [16]	MTP-100% TP-75-80%	-	-
6	Goyal Rashmi[27]	MTP-97.5% TP-90%	-	-
7	Present study	MTP-96.14% TP-92.66%	-	-

MTP- mastoidectomy with tympanopalsty type 1, TP- type 1 tympanoplasty.

Conclusions

Type-1 tympanoplasty using temporalis fascia by underlay technique has good surgical success rate with excellent improvement of hearing either in dry or wet ear when cortical mastoidectomy is done in all CSOM ears. There was no statistical significant difference in the final outcome of the patients treated with Type-I Tympanoplasty.

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