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Research Article

Study of various grafts in closure of tympanic membrane perforation

Dr. Bhoopendra Singh[1], Dr. Neetu bala[2], Dr.Naveen kumar[2], Prof Dr. J.P. Purohit[3]
[1]Junior resident, Deptt. Of E.N.T.& Head Neck Surgery,MLB Medical College,Jhansi (U.P.) India
[2]Senior resident, Deptt. Of E.N.T.& Head Neck Surgery,MLB Medical College, Jhansi (U.P.), India
[3]H.O.D, Deptt. Of E.N.T.& Head Neck Surgery, MLB Medical College, Jhansi (U.P.) India

***Corresponding author**
Dr. Bhoopendra Singh
Email: bhoopimedico@gmail.com

Abstract: This study was conducted to evaluate the success rate of various graft in closure of tympanic membrane perforation, improvement in hearing ,to make ear dry and trouble free and to decide best graft for closure of tympanic membrane perforation. This study was counducted on total 40 cases having 46 diseased ear i.e safe type CSOM, using various grafts with underlay technique and anterior tucking in type -1 tympanoplasty. Results shows graft success rate maximum with temporalis fascia 94.5% and tragal perichondrium 90%.Vein graft 66.6% and fascia lata 83.3% show lower success rate. It was concluded that various autografts used in tympanoplasty achieved comparable graft take up and hearing improvement. Success rate depends on size and site of perforation, technique, and surgeon skill.
Keywords: Csom(Safe Type), Autografts Temporal Fascia, Fascia Lata, Vein Graft, Tragal Perichondrium, Tympanoplasty.

INTROD UCTION

The function of the middle ear is to transmit the sound pressure from air of external ear to the fluid of internal ear, is accomplish by tympanic membrane and ossicular chain composed of malleus, incus and stapes. Chronic suppurative otitis media is defined as a chronic infection of the mucosa lining the middle ear cleft. There are two types of chronic suppurative otitis media: 1. Tubotympanic disease (safe type), 2. Atticoantral disease (unsafe type).

It is one of the most common ear diseases encountered in developing countries due to poor socioeconomic status, lack of health education, unhygienic habits and poor nutrition. Perforation in tympanic membrane are most commonly caused by middle ear infections,trauma and less commonly iatrogenic. The type of perforation classified on the basis of size ,shape and involvement of margin. It is a commonest cause of deafness in india.

Now Tympanoplasty is an established surgery for csom (safe type). Autografts used for tympanoplasty are temporal fascia, fascia lata, tragal perichondrium and vein graft. Temporalis fascia is the most preferred grafting materials due to anatomical proximity, low BMR ,Thin and translucent.Sucessful closure of tympanic membrane perforation with temporalis fascia is anticipated approximately 90-95%.failure of grafts are due to graft displacement, improper placement, autolysis, infection, hemorrhage and Eustachian tube dysfuncyion.

Keeping all these factors in mind, the present comparative study of different graft material, i.e. temporalis fascia, fascia lata,vein graft and tragal perichondrium in underlay tympanoplasty was undertaken to evaluate the postoperative graft take up and hearing improvement.

MATERIAL AND METHOD

The study was carried out in 40 patients having 46 diseased ears selected from ENT OPD. Otoscopy and otomicroscopic examinations were carried out prior to the study for selection of patients having safe type of perforation. Audiometry and radiological examinations were also done.

A prospective study was carried out from December, 2012 to September 2014. Type I tympanoplasty by underlay technique (post aural approach) was done for all cases using autograft.

The following were the various graft materials used for the comparative study-

Temporalis fascia,
Tragal perichondrium graft,
Vein graft,
Fascia lata graft.

Only those cases were selected preferably which were dry for at least 4 weeks before surgery and had age above 10 years and below 60 yrs.

Exclusion Criteria

- Patients having active discharge.
- Patients having any ossicular dysfunction.
- Patients with sensorineural hearing loss.
- Patients having unsafe or atticoanral disease
- Patients with complications of csom, any external ear pathology, sinonasal pathology.

Clinical investigations-Routine investigations such as CBC, RBS, BT, CT, routine and microscopic examination of urine was done in every case.

Otoscopy and otomicroscopy, TFT,PTA and radiological examination were done prior to surgery.

OBSERVATIONS AND RESULTS

The primary aim of the study was to compare the success rate of different graft material in term of graft take up and hearing improvement. For the purpose of analysis, we selected 40 cases, were divided in to four groups according to graft material used for Tympanoplasty using Randomization method. Maximum number of patients (16) in this series was in the age group of 21-30 years (40%).

Sex

Maximum number of patients were male i.e. (65%) and male : female ratio in the present series was approximately2 : 1as shown in table-2.

Criteria for small perforation is occupying the one–fourth of TM or limited to one quadrant of TM, Medium size occupying two-fourth of TM or limited to any two quadrants of TM , and large perforation occupying more than two-fourth area of TM or more than two quadrants of TM.

Medium size central perforation was found in most of the cases (55.0%). But small and large perforations were also included in the present series.

Assessment Of Hearing

Tuning fork tests were conducted in all cases. Rinne's test was found to be negative in affected ear and ABC was found to be normal. A pure tone audiometry (PTA) was carried out in all cases. The table -5 shows an average degree of hearing loss in three speech frequencies 500, 1000 and 2000 HTZ.

From the table-5, it is apparent that majority of cases (34) had a conductive hearing loss between 21-50 dB. Only 3 cases had a conductive hearing loss of more than 50 dB.

Table 6 Showing the type of hearing loss in which 30 patients have totally conductive type between 0-40 db.,& between 41 -50 db 1 pt have conductive and 6 patients have mixed hearing loss. Above 50 db all 3 patients had mixed hearing loss.

In Table 7 20 patients of conductive hearing loss &3 patients of mixed hearing loss show flat type of audiogram. 2 Patients of conductive &1 patients of mixed hearing loss show zigzag type audiogram with maximum HL at low frequency& 4 Patients of conductive & 2 patients of mixed HL show zigzag type audiogram with max HL at mid frequency. 5 patients of conductive & 3 patients of mixed HL show zigzag type with max HL at high frequency.

During operation four types of graft materials were used. Out of forty cases, temporal fascia graft was used in 18 cases. Tragal perichondrium graft was used in 10 cases. Vein graft (mainly from cubital vein) was used in 6 cases and in remaining 6 cases fascia lata was used. It is shown in table-8.

Table-9 show the cases 32 in which we fresh margin and remove a layer, In 6 cases scraping under surface of perforation done,and in 2 cases no freshening of margin.

1. Take-up rate of temporal fascia graft :

Out of total 18 cases in which temporal fascia graft was used, only one cases (5.5%) showed the signs of failure. Rest of the 17 cases (94.5%) was successful cases with no complication as show in table -11.

2. Take-up rate of Tragal Perichondrium graft :

In total 10 cases, 9 (90%) cases were successful with no signs of any residual defect. One cases (10%) showed signs of failure as shown in table-13.

3.Take-up rate of vein graft.

From total six (6) cases, there was one failure (16.6%), one case was partially successful (16.6%) and remaining four cases (66.6%) were successful as indicated in table -13.

4. Take up rate of fascia lata Graft :

Out of total 6 cases, five cases (83.3%) were successful and one case (16.66%) was a failure as shown in table-14.

During the study of 40 patients temporalis fascia graft was used in 18 patients (45%) and the graft was taken up successfully in 17 patients (94.5%) and failure in 1 patient(5.5%). Tragal perichondrium used in 10 patients (25%) and graft was taken up by 9 patients (90%) successfully and failure in 1 patient (10%). Vein graft was used in 6 patients (15%) and taken up successfully in 4 patients (66.6%), partially successful in 1 patient (16.6%) and failure in 1 patient (16.6%). Fascia lata was also used in 6 patients (15%) and graft was taken up 5 patients (83.3%) and failure in 1 patient (16.6%). In temporalis fascia graft, the functional improvement upto the desired level, out of 17 cases,

were seen in 14 (82.35%) cases with 23.52% excellent and 58.82% good hearing. Only in 3 cases (17.64%) hearing did not improved up to the mark. These cases had a pre-operative hearing loss of 40 dB or more where an associated ossicular involvement was ruled out by EUM

Table 15 show the use of Thick graft (Thick fascia)in 7 case &functional improvement of hearing in 5patients (71%) and use of Thin graft (Thin fascia) in 10 cases and improvement of hearing in 9 patients (90%).We used Temporalis fascia in total 17 cases and functional improvement in 14 cases(82.35%).

In tragal perichondrium graft, the functional improvement to the desired level was seen in 88.88% cases with 22.22 % excellent and 66.66% good hearing. Only in 1 case (11.11%) hearing did not improve up to the desired level. In vein graft, 3 cases (60.00%) showed desired improvement whereas 2 (40.00%) cases did not improve up to the level. In fascia lata ,the functional improvement to the desired level was seen in 60% cases and in 40% it was not up to the mark.

Table-1: Showing the age distribution of cases.

Age group (years)	No. of patients	Percentages
10 – 20	12	30%
21 – 30	16	40%
31 – 40	8	20%
41 – 50	2	5%
50 – 60	2	5%

Table-2: Showing the sex distribution of cases.

Age group (years)	**No. of patients**	**Percentages**
Male	26	65%
Female	14	35%
Total	40	100.0

Table-3: Showing the size of perforation and their percentage.

Area	**No. of patients**	**Percentages**
Small	7	17.5
Medium	22	55.0
Large	11	27.5
Total	40	100.0

Table-4:Showing The Position Of Perforation And Percentage-

Shape &Position	**No.Of Patients**	**Percentge**
Central	23	57.5%
Posterior	6	15%
Anterior	2	5%
Marginal	3	7.5%
Kidney Shape	3	7.5%
Subtotal	3	7.5%

Table-5 : Showing assessment of hearing.

Hearing loss (dB)	**No. of cases**	**Percentages**
0-10	-	-
11-20	3	7.5
21-30	7	17.5
31-40	20	50.0
41-50	7	17.5
> 50	3	7.5
Total	40	100.0

Table-6 : Showing Type of hearing loss.

Hearing loss	Conductive type	Mixed type
0-40 db	30	-
41-50db	1	6
>50 db	-	3

Table-7 : Showing Audiogram Pattern of hearing loss.

Graph H L	Conductive	Mixed
Flat type	20	3
Zigzag type with Maximum HL at LOW	2	1
MID	4	2
HIGH	5	3

Table-8: Showing various graft materials used.

Graft materials	**No. of cases**	**Percentage**
Temporal fascia	18	45%
Tragal perichondrium	10	25%
Vein graft	6	15%
Fascia lata	6	15%
Total	40	100.00

Table-9: show the freshening of margin of perforation

Margin of perforation	Cases	Percentage
Freshening &removal of layer	32	80%
Scraping under surface of Perforation	6	15%
No freshening	2	5%

Table 10: Take-up rate of different grafts:

Grafts	**No. Of Patients**	**Successful**	**Graft Faliure/ Partial**
Tempora lfascia	18	17	1
Tragl Perichondrium	10	9	1
Vein Graft	6	4	2
Fascia Lata	6	5	1
Total	40	35	5
	100	87.5%	12.5%

Table-11: Showing take-up rate of temporal fascia graft.

Graft take up	**No. of cases**	**Percentage**
Successful	17	94.5
Partially successful	-	-
Failure	1	5.5
Total	18	100.00

Table-12: Showing take-up rate of Tragal perichondrium graft.

Graft take up	**No. of cases**	**Percentage**
Successful	9	90.0
Partially successful	-	-
Failure	1	10.0
Total	10	100.0

Table-13 : Showing take up rate of vein graft.

Graft take up	No. of cases	Percentage
Successful	4	66.6%
Partially successful	1	16.6%
Failure	1	16.6%
Total	6	100.0

Table-14 : Showing take up rate of fascia lata graft :

Graft take up	No. of cases	Percentage
Successful	5	83.3%
Partially successful	-	-
Failure	1	16.6%
Total	6	100.0

Table-15: Functional improvement of hearing vs Thickness of graft

Graft thickness	Case	Functional improvement	Percentage
Thick graft	7	5	71%
Thin graft	10	9	90%
Total	17	14	82.35%

DISCUSSION

The main aim of utilizing different autografts in the study was to evaluate and compare the anatomic and functional results of various autografts. In present study ,we compared 4 different grafts temporalis fascia ,tragal perichondrium, veingraft and fascia lata.

The results were compared with the other studies and discussed as follows.

Table 1 showing Forty case, ranging from 11 to 60 years of age of either sexes, with dry tubotympanic type of
perforation underwent myringoplasty using four types of graft materials. Maximum cases16 (40%) were in the age group of 21-30 years. The mean age of all the cases together is 28.2yrs with a median age of 29 years. Similar findings were noted in the study of Singh et al [1] Vineeta et al [2] and Loy et al [3].,in which the mean age of was 28.9 years and in the study of dornhoffer et al [4]. in which the mean age was 28 years. Probably this is the age for jobs and also of marriage which compel the patients for reconstructive surgery.

Table 2 show the ratio between male(65%)and female(35%) was 2:1 Similar findings were noted in the study of Dornhoffer et al [4] in which tragal perichondrium tympanoplasties were performed on 55% males and 45% on females patients. In the study of Strahan *et al*., [5] 62% were males and 38% were females%),Similar finding were found in Rao et al.[6] and Vijaya et al [7] study. Because Male is the chief earning member of family and they go to outside for work so they want to become fit for work.

In Table 3 twenty two (55%) cases there was a medium sized central perforation, Occupying two-fourth or any two quadrants of tympanic membrane. 11 cases (27.5%) had large, Occupying two-fourth or any two quadrants of tympanic membrane and only 7 cases (17.5%) had small central perforation, Occupying one-fourth area of tympanic membrane or limited to one quadrant of tympanic membrane.Similar selection criteria regarding the size of perforation was used in the study of Indorewala et al [8] and Roychaudhari et al [9]. In ASOM mostly perforation occurs in posteriosuperior quadrants of TM which was spontaneously healed in 80% cases and in remaining 20% cases have perforation due to contact area and necrosis of TM in central where the minimum space between TM and promontory.

Table no. 14,The success rate of tragal perichondrium graft in our study was 90% which was comparable with Singh et al [1] (90%), Sperm et al [10] (92%) Gupta et al [11] (91%), Lackany et al [12] (92%), and higher than study of Dornhoffer et al [4] (85%) and Dabholkar et al [13] (80%). The overall functional improvement to desired level was seen in 66.66% cases which is comparable with study of singh et al [1] (55.5%) but it is less than strahan et al[5] (90%),

The success rate of vein graft in our study was (66.6%) which was comparable with study of Shea JJ.(Vein graft closure of eardrum perforations. J Laryngol Otol. 1960;74:358–62.) [14]

Table 14, show the success rate of Fascia lata graft in our study which was 83.3% which is comparable with Patil et al [15] (85%) (Indianjotol.org.sep 30 2014. IP 106.78.50.204) and

higher than Gupta et al [11] (75%) ,and lower than study of Indorewala et al [8] (96%). Functional improvement to desired level was seen in 60% cases (the closure of ABG within 0-20 db) and in 40% it is not upto level, which was nearly comparable with study of Gupta and Mishra et al [16].

In our study the most common cause of chronic otitis media is infection followed by trauma ,which is similar to Rizer et al [17] and Raj et al [18] Maximum number of cases (20, 50%) had hearing loss from 30-40 dB.10 cases (25%) had hearing loss of more than 40 dB and 10 cases (25%) had hearing loss of less than 30 dB.The large perforations had a mean AC threshold of 32 db,BC of 12 db and mean ABG of 20db. Moderate size perforation had a mean AC threshold of 28 db. BC of 10 db and mean ABG of 18 db.Our results are comparable with study conducted by dornhoffer et al [4] and singh et al [1] study.

When study of success rate of temporal fascia graft in closure of tympanic membrane perforation (94.5%)was done in our study, Table no. 13, which was comparable with Herman and Tang study [19] (95.3%) Mathai study [20] (95%) and Singh et al [1] (95%)and study conducted by Indorewala [8] (95%),and study conducted by Gupta et al [11](95%)

Functional improvement in temporalis fascia graft in which 14 cases (82.33%) showed improvement upto the desired level (air bone gap closure up to 20 db), which was comparable with Strahan et al [5] (82%) Dornhoffer et al [4] (77%) Dabholkar et al [13](75%).The success rate of temporalis fascia grafting depends on technique,surgeon skill, anterior tucking of graft and blunting of to anterior recess angle and thicknes of graft.

CONCLUSION

The incidence of disease was higher in cases of illiterates and low socio-economic status. Type of hearing loss has direct effect on functional improvement after surgery. A definite relationship exists between the success rate in myringoplasty and the reparative materials used, not only to its type but also to the techniques used and applications. Results are affected by the size and site of perforation and also by the presence of infection. The Temporal fascia graft have high success rate and hearing restoration in primary tympanoplasty, temporalis fascia remains the gold standered and most popular grafting materials for its unique qualities like low metabolic rate, hence less oxygen requirement, more ischemic tolerability, resistant to infection, easily obtained in ample amount in same incision site. Tragal perichondrium was more successful in case of large perforations Eustachian tube dysfunction and revision tympanoplasty. Incidence of healing problems (blunting, lateral healing) were minimum with temporal fascia. Vein graft was more successful in small perforations. It has contractability nature ,less resistant to infection and less tolerable to ischemia so failure in larger perforation.

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