

Comparative Study Between Temporalis Fascia And Tragal Perichondrium In Myringoplasty

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Abstract:

Introduction: The perforation of the tympanic membrane may be traumatic in origin or due to chronic suppurative otitis media. If the perforation fails to heal spontaneously or by conservative therapy, they require surgical closure. The repaired perforation restores the vibratory area of the tympanic membrane and affords round window protection, thus improves hearing. Hence surgery is the mainstay of the treatment. It can be done by myringoplasty or type 1 tympanoplasty. Biological graft materials acts as a scaffold of tissue matrix when applied to seal the perforation. Some of the commonly used autologous graft materials include vein, fat, fascia lata, temporalis fascia, perichondrium and cartilage.^{1,2} However, due to its anatomical proximity, translucency and suppleness, temporalis fascia and tragal perichondrium are the two most preferred grafting materials of the contemporary otologist.³

Objectives Of The Study: A prospective randomized study has been done with a sample size of 60 patients to evaluate the efficacy of graft materials. We are evaluating the underlay myringoplasty using the graft materials as tragal perichondrium and temporalis fascia by the criteria of graft uptake rate, hearing improvement and complications at the donor site as a result of harvesting the graft.

Materials And Methods: Patients with tubotympanic type of chronic suppurative otitis media were selected from all patients attending to the ENT department of Gandhi Hospital, Secunderabad between July 2014 to March 2016. This study includes 60 patients out of which 30 were subjected to myringoplasty with temporalis fascia and remaining 30 to myringoplasty with tragal perichondrium. In all patients, discharging ears and associated nasal pathologies were excluded. The comparative study was done on following parameters- graft uptake, audiological outcome, donor site complications and any late complications such as re-perforation, retraction, worsening of hearing and adhesions.

Results: Our study included a follow up of post operative cases for 1 year 8 months. Out of 60 cases operated, 11 cases didn't come for follow up. Hence they were excluded. The remaining 49 cases were, 25 temporalis fascia group and 24 tragal cartilage group. The youngest patient in our group was 13 years while the oldest was 56 years old. The overall male : female ratio was 27:22. The patients who underwent temporalis fascia grafting, 86.73% had a gain of 15dB while 13.7% had a gain of > 15 dB. Of the patients underwent tragal perichondrium grafting 50% had a gain of 15 dB while 10% had a gain of >15dB. The graft uptake rate was 85.7% for both temporalis fascia as well as tragal perichondrium. 4% of the patients of the temporalis fascia group had seroma and 4% had persistent pain. Residual perforation was seen in 3 patients of temporalis fascia group and 4 patients of tragal perichondrium group. 1 case of each group showed canal stenosis.

Keywords: Temporalis fascia, Tragal perichondrium, myringoplasty

I. Introduction

Permanent perforation of the tympanic membrane resulting as sequelae of chronic suppurative otitis media is a major cause of deafness. Controversies range about every step of the operation from the incision to the material used for packing. A great deal of experimental work is being done often with contradictory results. The first known attempt to close a perforation of tympanic membrane to improve hearing was made by Marcus Banzer⁴ in 1640 using prosthesis made of pig's bladder. Since then various graft materials like pig's bladder, Thiersch skin graft, Split-skin graft, Pedicle graft from ear canal skin, temporalis fascia graft, Vein graft, Sclera, Corneal graft, tympanic membrane homograft and perichondrium have been used for closure of the perforated tympanic membrane. Various autografts have been used for repair of the tympanic membrane perforation like full thickness skin graft, Pedicled skin grafts (Frenckner 1955)⁵, split skin graft (Wullestein⁶ 1952 and Zollner^{7,8} 1953), vein graft (Shea⁹ 1960), Fascia grafts (Heermann¹⁰ 1960) and Perichondrium (Jansen 1963¹¹ and Goodhill¹² 1967). Each of these grafts material has its advantages and disadvantages over each other.

The surgical repair of permanent perforations of the tympanic membrane was first described as a "myringoplasty" by Berthold¹³ in 1878. He placed a plaster against the tympanic membrane for three days to

remove the epithelium, and then applied a thick skin graft. The concept of onlaymyringoplasty was introduced by Berthold in 1878 using a skin graft while underlay myringoplast was introduced by John J. Shea and Tabb H.G in 1960¹⁴ using a vein graft.

Temporalis fascia:

Temporalis fascia was first used in myringoplasty by Ortegtran(1958-59), Heerman (1961) and Storrs (1961). It is most commonly used autogenous material. It is preferred for various reasons:

1. It is easy to harvest.
2. It can be used as onlay, intermediate or underlay graft.
3. For primary operation, there are no size limitations.
4. Fascia is quite similar to tympanic membrane with low basal metabolic rate.
5. For reconstruction of the tympanic cavity and ear canal, fascia is the only suitable autogenous material, because of its size.

Tragal perichondrium:

Tragal perichondrium was introduced into myringoplasty by Victor Goodhill et al (1964), after being used in stapedectomy as an oval window graft for some years before that. Like temporalis fascia, tragal perichondrium has several advantages:

1. It is easily accessible.
2. It is a mesodermal graft.
3. It has a good chance of postoperative survival.
4. It has a conical contour.
5. It is sufficiently large for myringoplasty of a total perforation.

II. Materials And Methods

Patients with tubotympanic type of chronic suppurative otitis media were selected from all patients attending to the ENT department of Gandhi Hospital, Secunderabad between July 2014 to March 2016. This prospective study with randomization includes 60 patients out of which 30 were subjected to myringoplasty with temporalis fascia and remaining 30 to myringoplasty with tragal perichondrium. The comparative study was done on the following parameters:

1. **Graft uptake**
2. **Donor site complications**
3. **Audiological outcome**
 - Closure of A-B gap
 - SN hearing loss
4. **Late complications**
 - Re-perforation
 - Retraction
 - Adhesions
 - Worsening of A-B gap

Method of collection of data:

Cases selected for the study were subjected to detailed history taking and clinical examination of ear, nose and throat with special reference to the ear. An otoscopic examination followed by ear under microscope for knowing the size and site of perforation. Pictures taken for documentation. Hearing status assessed using pure tone audiometry in the frequencies of 500, 1k, 2k and 4k and documented. Septic foci in the nose and throat were treated prior to surgery. Routine hematological and radiological examination done for all cases.

Inclusion criteria:

1. Chronic suppurative otitis media, inactive mucosal type with central perforation.
2. Patients both male and female between age group 13 to 56 years.
3. Pure tone average between 20 -45 dB hearing loss.
4. Ear to be operated should be dry for at least 4 weeks prior to surgery.
5. Eustachian tube function normal.

Exclusion criteria:

1. Active discharging ear.
2. Sensorineural hearing loss.

3. Bilateral ear disease.
4. Associated factors like uncontrolled hypertension, diabetes and sever anemia.

Patient is selected randomly for underlay myringoplasty by using temporalis fascia or tragal perichondrium. All cases were done through post aural approach with wilde's post aural incision. Graft harvested either temporalis fascia or tragal perichondrium. Tragal perichondrium can be obtained as a partial graft (hemi graft), either from the posterior tragal surface, or from the anterior tragal surface, or the entire tragal cartilage maybe removed and both perichondrial surfaces used in continuity as a total graft.

Follow up:

followed up after one month , third month and sixth month. At follow up, patient evaluated with otoscopic examination to determine the condition of the graft, pure tone audiometry done in the frequencies of 500Hz, 1kHz, 2, and 4. A-B gap closure is assessed. Results are compared from two groups with photo documentation. Subjective hearing assessment is also done.

III. Observations and results:

Our study includes follow up of post operative cases for 1 year 8 months. Out of 60 cases operated 11 cases didn't come for follow up. Hence they were excluded. The remaining 49 cases came for follow up were included in the study. The distribution of cases is as follows, 25 temporalis fascia group and 24 tragal perichondrium group.

The data has been analysed as follows:

Table -1 Age Distribution

Years	Group 1		Group 2	
	Temporalis Fascia		Tragal Perichondrium	
	Total Number	%	Total Number	%
13-20	11	44	9	37.5
21-30	9	36	10	41.66
31-40	3	12	2	8.33
>40	2	8	3	12.5
TOTAL	25	100	24	100

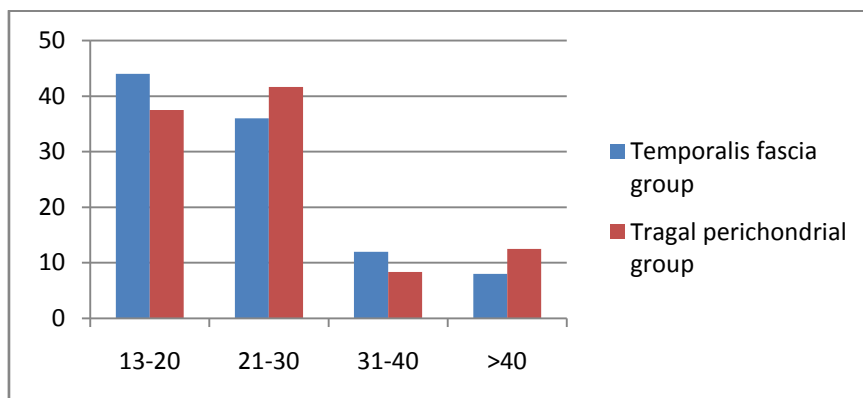


Fig 1 .Line diagram showing age distribution in both the groups.

The youngest patient in our study was 13 years old while the oldest patient was 56 years old. The average incidence was 24 years for temporalis fascia group and 26 years for tragal perichondrium group.

Table 2 Sex Distribution

YEARS	Group 1		Group 2	
	Temporalis Fascia		Tragal Perichondrium	
	Total Number	%	Total Number	%
Male	13	52	14	58.33
Female	12	48	10	41.66
Total	25	100	24	100

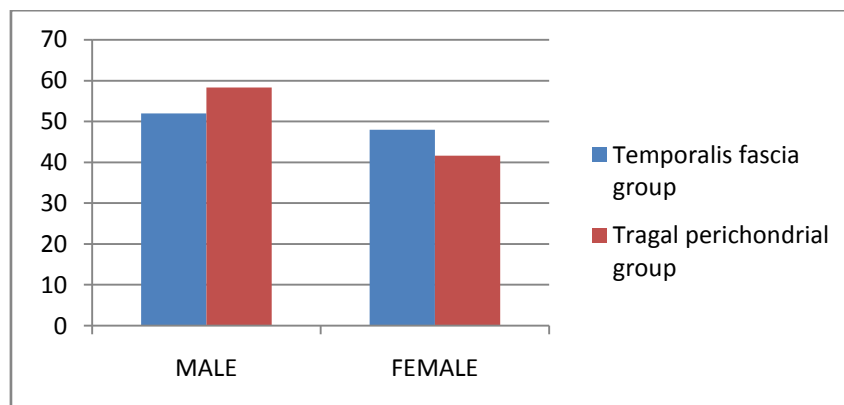


Fig 2 showing sex distribution

The overall male to female ratio was 27:22. Among the patients undergoing temporalis fascia grafting, 52% were males and 48% females. Among the patients undergoing tragal perichondrium grafting, 58.33% males and 41.66% females.

Table 3 Duration Of Disease

YEARS	Group 1		Group 2	
	Temporalis Fascia		Tragal Perichondrium	
	Total Number	%	Total Number	%
Upto 5	13	52	11	45.88
>5 Years	12	48	13	54.12
TOTAL	25	100	24	100

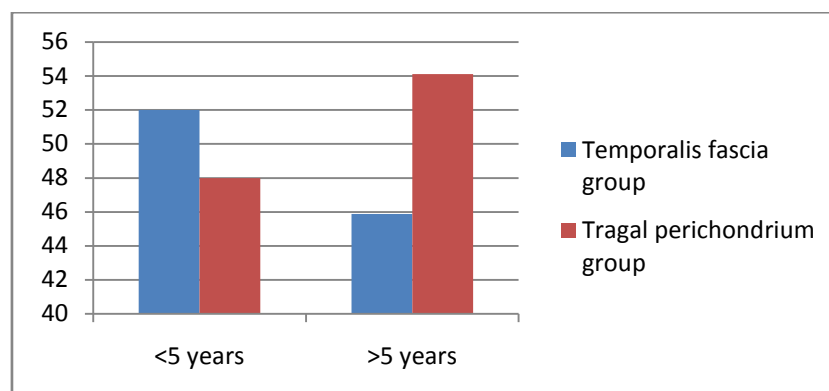


Fig 3 showing duration of disease in both groups.

Out of 25 cases with temporalis fascia graft the duration of disease is upto 5 years in 52% and more than 5 years in 48% and out of 24 cases with tragal perichondrial graft the duration of disease upto 5 years is 45.88% and more than 5 years is 54.12%.

Table 4: Site Of Tympanic Membrane Perforation

QUADRANT OF TM	Group 1		Group 2	
	Temporalis Fascia		Tragal Perichondrium	
	Total Number	%	Total Number	%
Anterior	10	40	09	37.5
Posterior	01	04	03	12.5
Both	14	56	12	50
Total	25	100	24	100

Table 5: Pre Operative Air – Bone Gap

Pure Tone Average (Db)	GROUP 1		Group 2	
	Temporalis fascia		Tragal perichondrium	
	Total number	%	Total number	%
20-25	8	32	07	26.2
26-30	9	36	11	45.8
>30	8	32	06	25

The patients who underwent temporalis fascia grafting, 32% had air bone gap of 25dB while 36% had A-B gap of 30dB and 32% had gap of more than 30dB. The patients who underwent tragalperichondrial grafting, 29.2% had 25 dB while 45.8% had a gap of 30 dB and 25 % had more than 30dB.

Table 6: Post Operative Air-Bone Gap

Air –Bone Gap Closure	Group 1		Group 2	
	Temporalis Fascia		Tragal Perichondrium	
	Total Number	%	Total Number	%
<10	14	63.6	15	75
10 – 15	05	22.7	03	15
>15	03	13.7	02	10
TOTAL	22	100	20	100

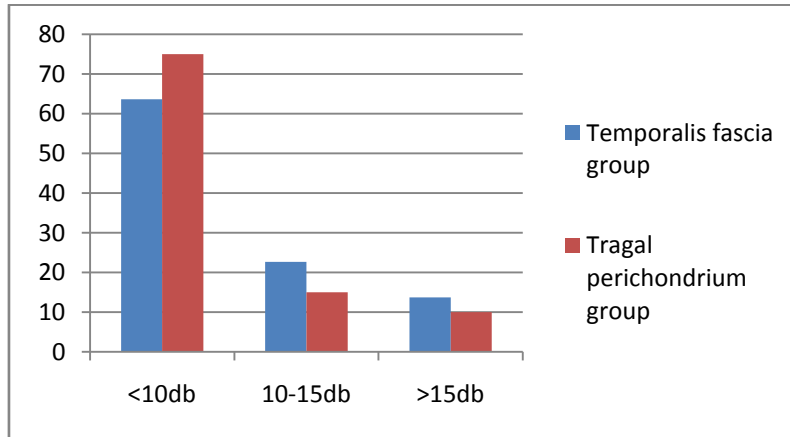


Fig 4 showing post operative air bone gap in both the groups.

The patients who underwent temporalis fascia grafting, 86.13% had a gain of 15dB while 13.7% a gain of >15dB. Of the patients underwent tragalperichondrial grafting 90% had a gain of 15db while 10% had a gain of >15dB.

Table 7 Post Operative Graft Status

Graft Status	Group 1		Group 2	
	Temporalis fascia		Tragal perichondrium	
	Total number	%	Total number	%
Normal	21	84	20	83.33
Retracted	01	04	0	0
Persistent Perforation	03	12	04	16.66

The graft uptake rate was 85.7% for both temporalis fascia as well as tragal perichondrium.

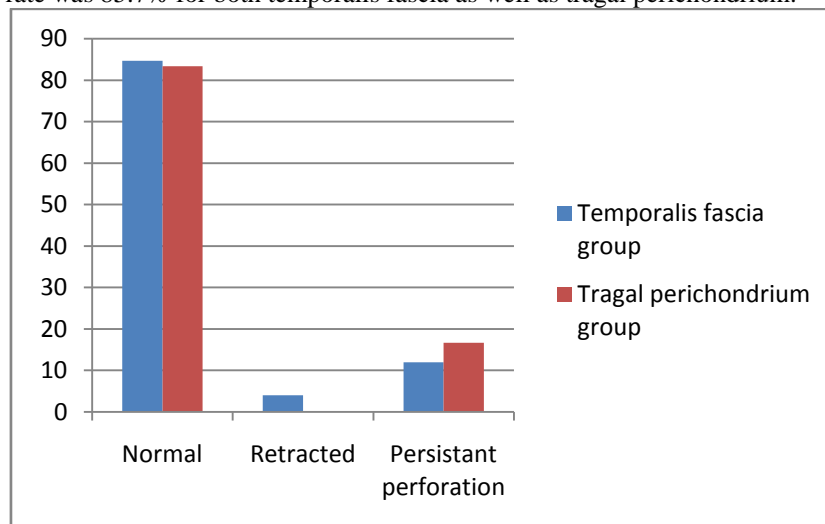


Fig 5 showing post operative graft status.

Table 8: Donor Site Complications

Complication	Group 1		Group 2	
	Temporalis fascia		Tragal perichondrium	
	Total number	%	Total number	%
Seroma	01	4	0	0
Persistent Pain	01	4	0	0
Hematoma	01	4	0	0
Dehiscence	0	0	0	0
Wound Sepsis	0	0	0	0

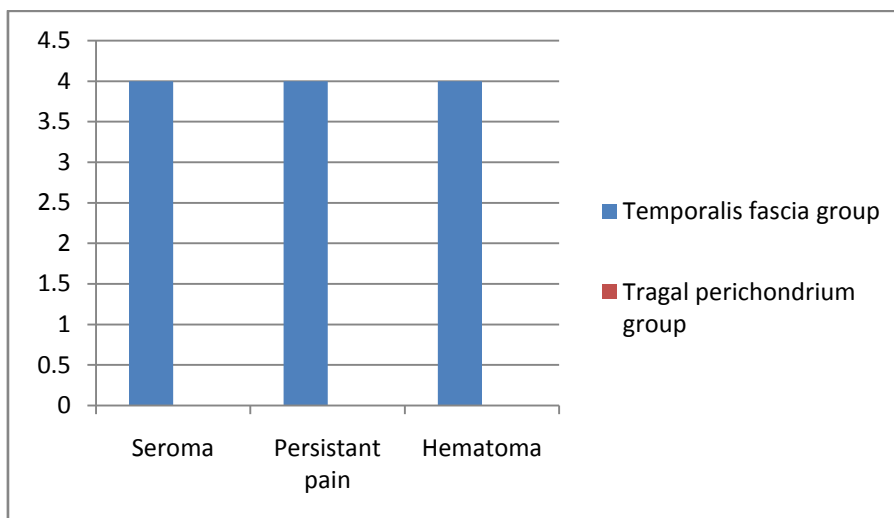


Fig 6 showing donor site complications in both groups.

Table 9: Long Term Complications

Complications	Temporalis Fascia Group	TragalPerichondrial Group
Residual Perforation	3	4
Canal Stenosis	1	1

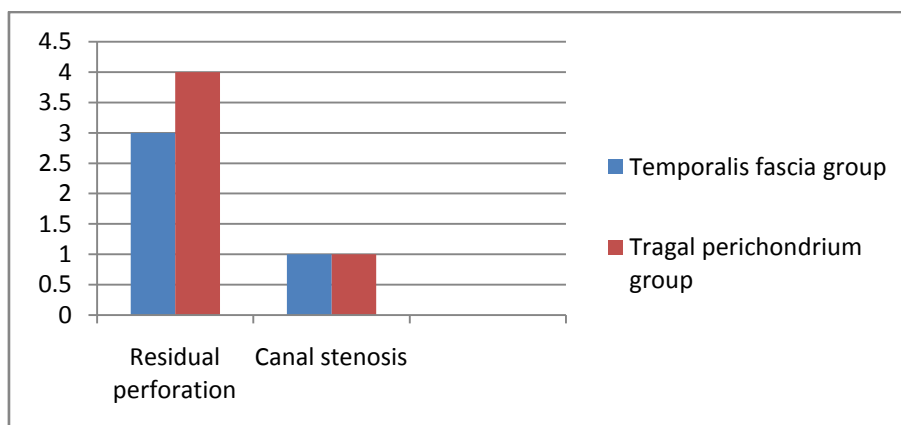


Fig 7 showing long term complications.

Table 10: Post Operative Subjective Hearing Assessment

Hearing Assessment	Group 1		Group 2	
	Temporalis fascia		Tragal perichondrium	
	Total number	%	Total number	%
Significant Improvement	16	64	16	66.66
Mild Improvement	06	24	4	16.66
No Change	03	12	4	16.66
Worsened	0		0	
Total	25		24	

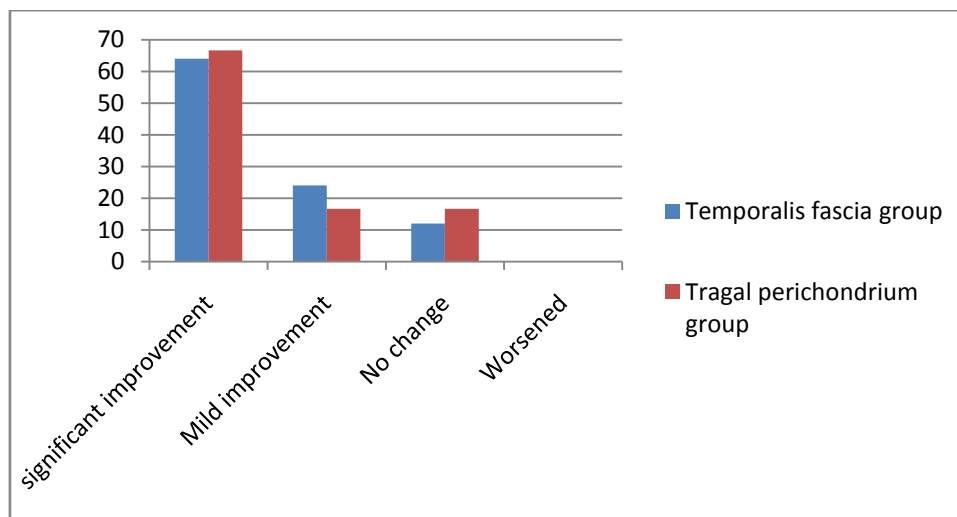


Fig 8 showing post operative subjective hearing assessment.

IV. Discussion

This prospective study comprises of 60 patients who were admitted in the department of ENT and Head and Neck Surgery, Gandhi Hospital, Secundrabad between July 2014 to March 2016. All patients were suffering from chronic suppurative otitis media. Each patient was subjected to a detailed examination of nose, para nasal sinuses and throat to rule out any focus of infection, which could influence the result of myringoplasty. Our study lost 11 cases due to irregular follow up or no follow up. Hence they were excluded. The remaining 49 cases is as follows; temporalis fascia group 25 and tragal perichondrium group 24.

The youngest patient in our study was 13 years old while the oldest patient was 56 year old. The average age incidence was 24.7 years for temporalis fascia cases and 30 years for tragal perichondrium. A study conducted by Jyothi dhabolka¹⁵ also corresponded with the same age groups. In the study conducted by Anand et al¹⁶ the average age was 26 years whereas the average age in our study was 27.2 years which is consistency with various study groups elsewhere.

The overall male to female ratio in our study was 52:48, temporalis fascia group male:female ratio 30:70, tragal perichondrium group has male:female ratio 60:40. Though the overall male:female ratio was consistent with other studies, the tragal perichondrium group in our study has more female preponderance.

The results of the success outcomes have been evaluated from the following criteria.

- Graft uptake
- Hearing result
- Donor site complications
- Other morbidity

The results were analysed as per the international convention in reporting audiological outcomes as proposed by America association of otolaryngology protocol.

Graft uptake:

The graft uptake rate in our study was 88% for in temporalis fascia and 83.33% for tragal perichondrium. Graft take-rate was slightly better for temporalis fascia than for tragal perichondrium. This marginal difference however is not significant. Various studies showed the graft uptake was in the range of 80% to 90%, for either temporalis fascia or tragalperichondrium. The present study graft uptake rates are reasonable compared to other studies.

Other studies described graft uptake rate as follows: Abraham Eviator¹⁷ noted that the graft take up rate with tragal perichondrium by underlay technique was 90.47%. T.S. Anand, Geeta Katuria, Sandeep kumar, Vikram Wadhwa and Tapaswini Pradhan¹⁶ reported 20 cases of Butterfly inlay tympanoplasty and graft take up rate of 90%. Goodhill¹² reported a success rate of 100% in cases of primary myringoplasty with tragal perichondrium. T.S. Anand et al observed a graft take up rate of 90% with hearing improvement of 85%. Quraishiet al¹⁸ reported a success rate of 94% in 32 cases of primary myringoplasty with tragal perichondrium.

Jyothi P. Dabholkar¹⁵, Krishna Vora, Abhiksikdar reported comparative study of underlay tympanoplasty with tragal perichondrium and temporalis fascia in a series of 50 cases with temporalis fascia and tragal perichondrium were 84% and 80% respectively.

Hearing results :

86.13% of patients who underwent temporalis fascia grafting had a A-B gap of 20 dB. 90% of patients who underwent tragal perichondrium grafting had an air bone gap of more than 20 dB. Taking air bone gap as the criteria, results are better with temporalis fascia grafting.

A study was conducted by John L. Dornhoffer¹⁹ from the university of Arkansas to study the hearing results using perichondrial grafts. Out of 22 patients who underwent the surgery, the graft was taken up in all patients and the average A-B gap was 6.8 dB in the post operative period.

Rizer reported a series of 551 cases of underlay myringoplasty with a success rate of 89% and an air bone gap <10 dB in 85%. Jyothi P. Dabhalkar reported hearing result in total 50 patients, temporalis fascia group improved in 76% while tragal perichondrium group achieved 75% hearing gain.

Jyothi P. Dabhalkar reported hearing result in total 50 patients, temporalis fascia group improved in 76% while tragal perichondrial group achieved 75% hearing gain.

In the study conducted by Alan Gibb using temporalis fascia as graft materials by underlay technique the percentage take rate was 87.5%. Strahan achieved graft uptake success rate of 87% by underlay method. The hearing restoration rate for temporalis fascia was 82% in the study conducted by R.W. Strahan, Paul H. Ward, Mario Acquarelli, Bruce Jaffe²⁰.

Zingade et al²¹ opined that myringoplasty using tragal perichondrium grafts by the endomeatal approach had better results (88%) when compared to the conventional method using temporalis fascia (84%)

Donor site complications:

One patient had persistent pain while chewing for 5 months in case of temporalis fascia group. One in each group noted seroma formation which subsided later. Hematoma noted in one patient of temporalis group, which was drained later. All are treated with analgesics and antibiotics.

Other morbidity:

External auditory stenosis noted in two cases who have undergone endomeatal approach.

Out of 49 cases, 2 patients developed otomycosis 2 -3 weeks post operatively. Anti fungal eardrops were given and graft was intact and taken up. 7 patients developed infection 2- 3 weeks post operatively. Swab culture was done. Antibiotics were prescribed.

Failures:

Out of 49 cases, 4 patients of tragal perichondrial group had persistent perforation. 3 patients of temporalis group had persistent perforation.

V. Conclusions

Myringoplasty is effective in tubotympanic disease for achieving dry ear as well as improvement of hearing. Taking post operative pure tone average as the criterion, tragal perichondrium gives better results than temporalis fascia. The results of myringoplasty with temporalis fascia were equal to that with tragal perichondrium, when graft uptake is concerned. Tragal perichondrium appears to be a better alternative to temporalis fascia as graft for myringoplasty, taking hearing improvement and graft uptake together. Temporalis fascia and tragal perichondrium are excellent graft material for closure of perforation of tympanic membrane and hearing improvement.

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