

A Comparative Study Between the use of Temporalis Fascia and Fascia Lata as Graft During Tympanoplasty Performed in A Tertiary Care Centre

Rohan Vijay Gupta¹, Shreeya Vinay Kulkarni^{2*}, Kiran Burse³, Chaitanya Bharadwaj⁴, Vandana Sancheti⁵ and Rushika Patel⁶

¹Former PG Resident, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India

²Professor, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India; kshreeya@gmail.com

³Professor and Head, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India

⁴Associate Professor, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India

⁵Senior Resident, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India

⁶Assistant Professor, Department of ENT, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik - 422003, Maharashtra, India

Abstract

Background: Chronic suppurative otitis media is a common otological condition in India causing hearing loss for which patients seek advice from an otolaryngologist. The perforation seen in chronic suppurative otitis media may be the only sequel remaining when the pathological process in middle ear cleft has healed. Tympanoplasty, the procedure for repairing the perforations of the pars tensa, can be done using a variety of graft materials. In this study two different types of graft materials, fascia lata and temporalis fascia, which can be used in tympanoplasty will be studied. The study will help to know which is better in terms of graft uptake as well as improvement in hearing. This will help in a better understanding of which grafts can be used in tympanoplasty in the future. **Aims and Objectives:** To compare hearing gain and graft uptake rate between temporalis fascia and fascia lata in tympanoplasty and to study the postoperative morbidity/complications associated with the 2 modalities. **Materials and Methodology:** The study was conducted on 42 patients divided in 2 groups of 21 each. The 1st group underwent tympanoplasty type 1 by endomeatal approach using fascia lata graft and the 2nd group by a post aural approach using temporalis fascia graft. Regular follow ups and otoscopic examination was done on the patients to check the graft uptake. Pure tone audiometry was done after a minimum period of 2 months post-surgery and was compared with the preoperative audiometry to assess the hearing improvement in hearing. **Results and Conclusions:** This study compared both temporalis fascia and fascia lata as graft materials used in tympanoplasty. Graft uptake results and gain in hearing were better with temporalis fascia as compared to fascia lata. Temporalis fascia was also associated with lesser post-operative complications. So this study finds that tympanoplasty done by postaural technique using temporalis fascia is better in terms of graft uptake, hearing improvement and postoperative complications when compared to tympanoplasty done by fascia lata.

Keywords: Endomeatal, Fascia Lata, Postaural, Temporalis Fascia, Tympanoplasty

1. Introduction

The function of the middle ear is to transmit the sound from air of external ear to the fluid of internal ear which is accomplished by tympanic membrane and ossicular chain composed of malleus, incus and stapes¹.

Chronic Suppurative Otitis Media (CSOM) is one of the common otological conditions in India causing hearing loss. It 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)¹.

It is one of the most common ear diseases encountered in developing countries due to poor socioeconomic status, frequent upper respiratory tract infection, lack of health education, unhygienic habits and poor nutrition. Perforation in tympanic membrane is most commonly caused by middle ear infection, trauma and less commonly iatrogenic¹. Majority of perforations due to infections are small and heal spontaneously; however, recurrent infections impair the regenerative process and result in a chronic perforation. It is a major cause of deafness in India². A conservative estimate of the number of people in the world suffering from CSOM is over 20 million^{3,4}.

As per WHO, the prevalence of CSOM among the Indian population is approximately 2% which is comparatively higher than the prevalence found in developed countries like the prevalence of USA and UK where the prevalence is <1%⁴.

The perforation seen in Chronic Suppurative Otitis Media may be the only sequelae remaining when the pathological process in the middle ear cleft has healed⁵. It exposes the middle ear mucosa to exogenous sources of infection and also produces conductive hearing loss⁶.

Tympanoplasty is done to reconstruct the tympanic membrane and to improve hearing. Tympanic membrane perforations can be successfully repaired using a variety of graft materials⁷. The grafts used to reconstruct the tympanic membrane include homograft, heterograft, xenograft, autograft and isograft⁸. The varied autografts used are skin, perichondrium, vein, temporalis fascia, dura and cartilage⁹⁻¹².

In selection of a graft tissue, the factors considered include its biological properties, probability of survival, its adequacy in size and ease of procurement¹³. Temporalis fascia is the most widely used material for closure of tympanic membrane perforation¹⁴.

In this study two different types of graft materials, fascia lata and temporalis fascia, have been studied. The study will be of help to identify which of the grafts used is better in terms of graft uptake as well as improvement in hearing. This will help a better understanding of grafts which can be used in tympanoplasty in the future.

2. Aim and Objectives

To compare hearing gain and graft uptake rate between temporalis fascia graft and fascia lata graft in tympanoplasty. And to study the postoperative morbidity complications associated with the 2 modalities.

3. Materials and Methodology

This was a comparative interventional study carried out in the Department of ENT at Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre Nashik, Maharashtra, India from September 2017 to September 2019. A total of 42 patients were enrolled for this study after fulfilling the inclusion and exclusion criteria and after taking a written informed consent under institutional ethical committee guidelines. Patients were divided into two groups according to the surgery they underwent Group-A being 21 patients undergoing tympanoplasty type 1 using temporalis fascia graft and group-B being 21 patients who underwent tympanoplasty type 1 using fascia lata graft.

4. Eligibility Criteria

4.1 Inclusion Criteria

- Chronic Suppurative Otitis Media of safe or tubotympanic type having small, moderate, large, subtotal perforation of the tympanic membrane.
- Conductive hearing loss.
- Age above 18 years of both the genders.

4.2 Exclusion Criteria

- Patients having active ear discharge.
- Patients with sensorineural hearing loss.
- Patients having unsafe or atticoantral disease or Cholesteatoma.

All patients fulfilling above inclusion and exclusion criteria were studied for post-operative improvement in hearing by comparison between pre-op and post-op Pure Tone Audiometry (PTA) and post-operative graft take up.

4.3 Operative Procedure

Patients underwent tympanoplasty type 1 surgery under local anesthesia or general anesthesia. Patients in whom fascia lata was used, endomeatal approach was taken and patients in whom temporalis fascia was used, postaural approach was taken. Temporal fascia was taken by the conventional method while fascia lata was taken by a small 1-2 cm incision on the anterolateral aspect of thigh.

For patients undergoing tympanoplasty by postaural approach (temporalis fascia).

Postauricular wilde’s incision was taken. Temporalis fascia graft was harvested from the same incision. Periosteum covering the mastoid was elevated and posterior meatotomy was done. The tympanic membrane was examined and the margins of perforation was freshened up. Vascular strip incision was taken and tympanomeatal was elevated. Ossicular status and continuity was checked. Temporalis fascia graft was placed medial to the remnant of tympanic membrane, after placing gelfoam in the middle ear. The tympanomeatal flap was repositioned back and the external auditory canal was also filled with gelfoam. Periosteum and skin was sutured and mastoid dressing was given.

Among patients tympanoplasty by endomeatal approach, Fascia lata graft was harvested from the lower 1/3rd of lateral aspect of thigh, approximately 10 cms

above the knee joint. The incision was closed in two layers. Pressure dressing was given over it. Otomicroscopically the tympanic membrane was examined and the margins of the perforation were freshened up. Vascular strip incision was taken 6 mm away from the annulus and the tympanomeatal was elevated. Ossicular chain was inspected and its continuity was checked. The middle ear was filled with gelfoam and fascia lata graft was put medial to the remnant of tympanic membrane. The tympanomeatal flap is repositioned back and external ear was also filled with gelfoam.

Patients were asked to report to the health care centre for any complaints post-surgery. Otoscopic examination was done in follow up and the newly placed graft was examined. Pure tone audiometry was done after 8 weeks of the surgery and its results were compared with the preoperative audiometry to assess the improvement in hearing.

The operative site was examined for scarring after 8 weeks and was graded as minimal scar - a barely visible scar, evident scar – a visible scar, significant scar - poorly cosmetic readily visible scar.

The data obtained was subjected to statistical analysis. Quantitative variables were compared using mean values and qualitative variables using proportions. Significance level was fixed at $P \leq 0.05$.

5. Results

In our study out of 42 patients 34 (81%) were females and 8 (19%) were males (Table 1). In both the interventional

Table 1. Demographic and clinical data

Data	Value
Number of patients	42
Mean age at surgery (range)	38.11 years (18-70 years)
Sex ratio: male/female	1:4.25
Type of cases	
Large central perforation	9(21.4%)
Moderate central perforation	23(54.8%)
Small central perforation	10(23.8%)

groups (temporalis fascia graft and fascia lata graft) there were 17 females (81%) and 4 males (19%). The youngest patient in our study was 18 years old while the oldest was 70 years old. Maximum number of patients, 16, were in the age group of 15-29 years (Figure 1). However gender and age didn't affect the study results.

Out of the 42 patients 15 were of right CSOM safe and 27 of left CSOM safe. In fascia lata group right CSOM patients were 7 and left CSOM patients were 14 while in temporalis fascia group right CSOM patients were 8 and

left CSOM pts were 13. Majority of patients, 23(54%) had moderate central perforations (Table 1).

The success rate of temporalis fascia graft and fascia lata graft was 90.5% and 76.2% respectively (Table 2). This difference between the two groups was statistically not significant.

Out of the 21 pts in temporalis fascia group mean pre-operative hearing was 25.57 dB (± 9.03) and post-operative hearing was 11.57dB (± 5.38) while in the fascia lata group the pre-operative hearing was 24.62 dB (± 7.65) and post-operative hearing was 12.857 dB (± 5.20). (Figure 3).

Table 2. Comparison of graft uptake rate among group A and B study subjects (CSOM patients)

Success Rate	Group A Temporalis Fascia Graft N (%)	Group B Fascia Lata Graft N (%)	Total N (%)
Success	19(90.5%)	16(76.2%)	35(83.3%)
Failure	2(9.5%)	5(23.8%)	7(16.7%)
Total	21(100.0%)	21(100.0%)	42(100.0%)
Chi Square Value	1.543		
Significance 'P' Value	0.214(NS)		

Table 3. Comparison of PTA between pre-operative and post-operative among group A and B study subjects (CSOM patients)

GROUPS	Pre Operative PTA (dB)	Post Operative PTA (dB)	Mean Difference	Paired Student 't' Test Value	Significance 'P' Value
	Mean \pm SD	Mean \pm SD			
Group A Temporalis Fascia Graft	25.571 \pm 9.03	11.571 \pm 5.38	14.00	7.133	0.001(HS)
Group B Fascia Lata Graft	24.619 \pm 7.65	12.857 \pm 5.20	11.7	6.982	0.001(HS)

Table 4. Comparison of gain in hearing among group A and B study subjects (CSOM patients)

	Gain in PTA	Mean % Gain in PTA
	Mean \pm SD	
Group A Temporalis Fascia Graft	14.000 \pm 8.99	54.0%
Group B Fascia Lata Graft	11.667 \pm 7.75	47.39 %
Student 't' Test Value	0.900	
Significance 'p' Value	0.373(NS)	

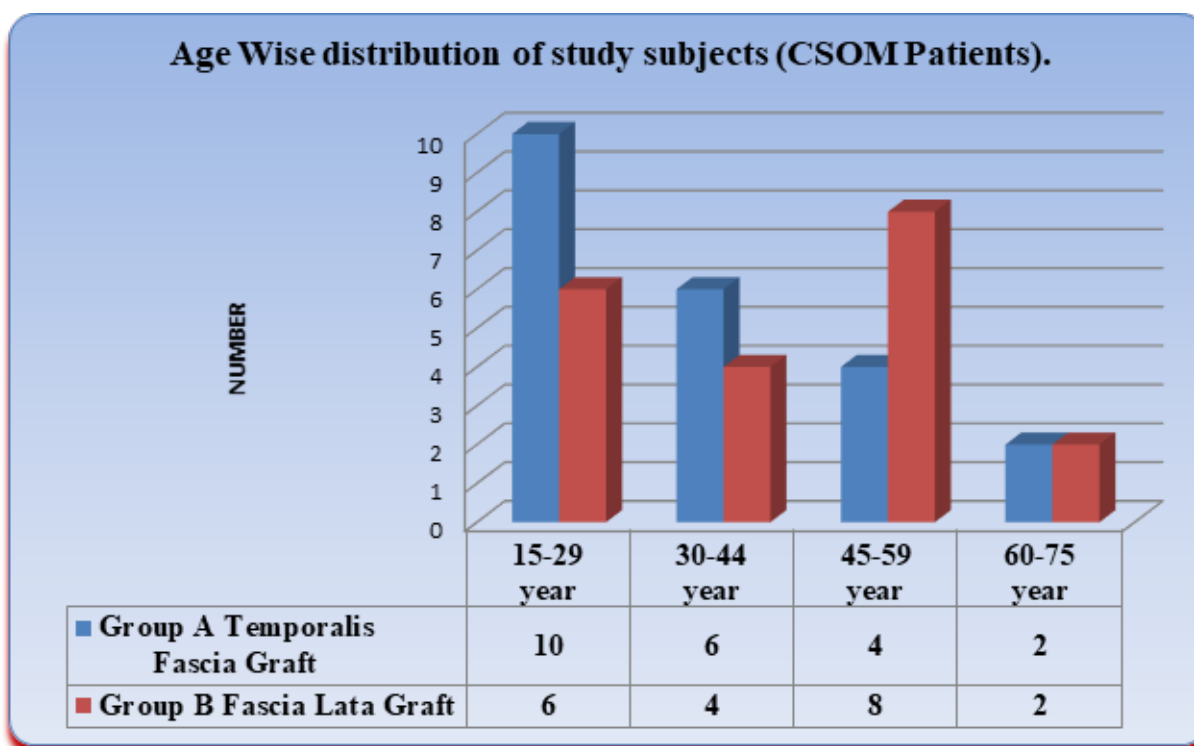


Figure 1. Age wise distribution of study subjects.

Mean gain in hearing in temporalis fascia is 14.00 dB (± 8.99) i.e. 54% while in fascia lata group it is 11.67dB (± 7.75) i.e. 47.39%. The functional gain in temporalis

fascia group was higher than the fascia lata group but was statistically non-significant ($p > 0.05$). (Table 4).

Surgical site was found healthy among all 21(100.0%) group A patients. while in group B patients, 17(81.0%) had

Table 5. Comparison of Surgical Site complications among group A and B study subjects (CSOM patients)

Surgical Site	Group A Temporalis Fascia Graft N (%)	Group B Fascia Lata Graft N (%)	Total N (%)
Healthy	21 (100.0%)	17 (80.9%)	38 (90.5%)
Complications	0 (0.0%)	4 (19.1%)	4 (9.5%)
Chi Square Value	4.42		
Significance 'P' Value	0.035(S)		

Table 6. Comparison of scar appearance among group A and B study subjects (CSOM patients)

Scar appearance	Group A Temporalis Fascia Graft N (%)	Group B Fascia Lata Graft N (%)	Total N (%)
Minimal Scar	21 (100.0%)	0 (0.0%)	21 (100.0%)
Evident Scar	0 (0.0%)	14 (66.7%)	14 (66.7%)
Significant Scar	0 (0.0%)	7 (33.3%)	7 (33.3%)
Total	21 (100.0%)	21 (100.0%)	42 (100.0%)
Chi Square Value	42.000		
Significance 'P' Value	0.001(HS)		

healthy surgical site, 4(19.1%) had complications. Among those who had complications, 1 had seroma (4.8%), 3 had wound gapping (14.3%). There was statistically significant difference found in status of Surgical Site among group A and B study subjects (Table 5).

There was minimal scar found among all group A patients while 14(66.7%) group B had evident scar and 7(33.3%) had significant scar. There was statistically

highly significant difference found in scar appearance among group A and B study subjects ($P = 0.001$) (Table 6).

6. Discussion

Tympanoplasty, the procedure for repairing the perforations of the pars tensa, can be done by the use of

various grafts materials and number of studies has been done for comparing different graft materials used for the same. Here we compared the use of temporalis fascia and fascia lata for tympanoplasty type 1.

6.1 Sex Distribution

In our study out of 42 patients 34 (81%) were females and 8 (19%) were males. In each group there were 17 females (81%) and 4 males (19%). Our study had female predominance while studies done by Verma S *et al.*¹⁴, Harkare VV *et al.*¹⁵, showed male predominance. However gender distribution didn't have any effect on the study results.

6.2 Age Distribution

Out of the 42 pts in the study the age of the patients varied between 18 to 70. Most of the patients, that is 16(38%), were in the age group of 15-29. And the mean age was 38.11 years. Similar findings were noted in the study of Sumeer Verma *et al.*¹⁴ in which maximum pts were between the age of 15-35 years.

7. Distribution of Size of Perforations

The perforations included in the study were all central perforations of which maximum perforations were moderate central 23(54.8%), which was seen in the study conducted by Vivek V Harkare *et al.*¹⁵ and Verma S *et al.*¹⁴, the remaining perforations in our study were small central perforations 9 (21.4%) and large central perforations¹⁴(23.8%).

8. Preoperative Hearing Loss in Pure Tone Audiometry Air Bone Gap

The mean preoperative hearing (air bone gap) in temporalis fascia group was 25.571 ± 9.03 dB while in fascia lata group it was 24.619 ± 7.65 dB. Vivek V Harkare *et al.*¹⁵ also reported similar preop mean air bone gap of 24.15 ± 7.91 in temporalis fascia group and 24.45 ± 8.73 in fascia lata group.

9. Postoperative Hearing Loss in Pure Tone Audiometry (Air Bone Gap)

The mean postoperative hearing loss (air bone gap) in temporalis fascia group was 11.571 ± 5.38 dB while in fascia lata group it was 12.857 ± 5.20 dB. Vivek V Harkare *et al.*¹⁵ also reported similar post-op mean air bone gap of 10.3 ± 3.25 in temporalis fascia group and 12.35 ± 3.9 in fascia lata group.

10. Gain in Hearing in Pure Tone Audiogram

The post-operative gain in hearing (air bone gap) in temporalis fascia group was 14.000 ± 8.99 (54%) while in fascia lata group it was 11.667 ± 7.75 (47.39%). These results were similar to the study conducted by Vivek V Harkare *et al.*¹⁵ in which they had a mean gain in hearing for temporalis fascia of 14.15 ± 7.99 dB while in fascia lata they had a hearing gain of 12.10 ± 6.8 dB which is quite comparable to the results of our study. Landge SU *et al.*¹⁶ in their study observed a mean gain in hearing for temporalis fascia of 13.56 ± 5.79 dB while in fascia lata they had a hearing gain of 12.19 ± 4.75 dB. Kshitij Patil *et al.*¹⁷ observed in their study a mean gain for temporalis fascia of 9.36 dB and for fascia lata of 12.10 dB. In contrast to our study, Indorewala¹⁴ noted a higher gain of 15 dB for fascia lata and 17 dB for temporalis fascia.

11. Graft Success Rate

The success rate of our graft uptake with temporalis fascia (Group A) was 90.5% and with fascia lata (group B) was 76.2% with overall success rate of 83.3%. However, this difference in graft success was not significant statistically.

In a study by Gupta P *et al.*¹⁸ they found a successful take up rate of 92% for temporalis fascia which is higher than our study and 75% for fascia lata which is less than our study. Kshitij Patil *et al.*¹⁷ in their study had a graft take up rate of 86.67% with temporalis fascia which was lower than our study and 85% for fascia lata which was greater than our study. Indorewala S. *et al.*¹⁹ compared outcome of temporalis fascia with that of fascia lata and found a successful take up rate of 89.19% for temporalis



Figure 3. Post operative scar.

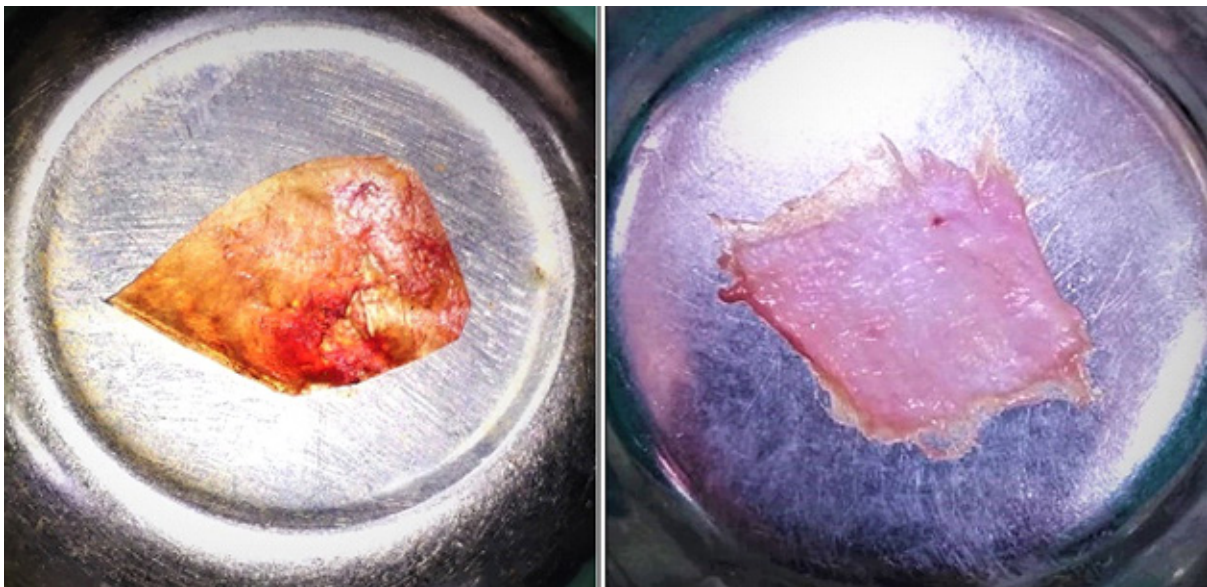


Figure 4. Harvested temporalis fascia and fascia lata.

fascia and 96% for fascia lata. The results of fascia lata in this study are higher than our study while that of temporalis fascia is nearly similar to our study. Vivek V Harkare *et al.*¹⁵ achieved a successful graft take-up

rate of 85% for temporalis fascia and 95% for fascia lata which is contradictory to our study. Landge SU *et al.*¹⁶ had a success rate of 86% with temporalis fascia and 80% with fascia lata graft. Verma S *et al.*¹⁴ had a

success rate of 96% in temporal fascia and 92% in fascia lata. This difference in the graft success rate can be due to difference in sample size of the different studies and the subjective differences.

All the 21 patients of temporalis fascia group had minimal postoperative scar at the site of postaural incision which was barely visible, while all 21 patients of fascia lata group had scarring in the lateral aspect of thigh. 14 patients had evident scar and 7 pts had a significant scar.

While comparing the postoperative surgical site morbidity it was found that none of the patients of temporalis fascia group had any post-operative surgical site morbidity (0%). However, among the fascia lata group, 3 patients had postoperative wound gaping (14.3%) and 1 patient developed postoperative seroma (4.8%) with over all surgical site complication in fascia lata group of 19.1%.

It was also observed that fascia lata was thicker as compared to temporalis fascia and was easier to manipulate in the middle ear. The temporalis fascia is preferably kept after drying in the middle ear however there was no such need fascia lata and it can be placed as wet graft.

12. Conclusion

From this study we conclude that tympanoplasty is a procedure providing the patients of chronic suppurative otitis media of tubotympanic type with repair of perforation and improvement in hearing. Temporalis fascia and fascia lata both can be used as a graft material for repair of the tympanic membrane with comparable results. But in our study we observed that tympanoplasty type 1 done by postaural approach using temporalis fascia as a graft material had better graft uptake and a slightly better gain in hearing with minimal postoperative complications and surgical site morbidity, making it the better choice of graft material which can be used for tympanoplasty type 1.

13. References

- Chadha SK, Sayal A, Malhotra V, Agarwal AK. Prevalence of preventable ear disorders in over 15 000 schoolchildren in northern India. *The Journal of Laryngology & Otology*. 2013 Jan; 127(1): 28-32.
- Varshney S. Deafness in India. *Indian journal of otology*. Apr 1, 2016; 22(2): 73.
- Muqtadir F, Rahul S. A study of hearing improvement gained after tympanoplasty using various methods in cases of CSOM. *Int J Otorhinolaryngol Head Neck Surg*. 2018 Jan; 4(1):107-11. <https://doi.org/10.18203/issn.2454-5929.ijohns20174682>.
- Merchant SN, McKenna MJ, Rosowski JJ. Current status and future challenges of tympanoplasty. *Ear Arch Otorhinolaryngol*. 1998; 225:221-8. PMID: 9638462. <https://doi.org/10.1007/s004050050047>.
- Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, Sharma N. Microbiology of chronic suppurative otitis media in a tertiary care setup of Uttarakhand state, India. *North American journal of medical Sciences*. Apr 2013; 5(4): 282.
- Lieu JE, Kenna M, Anne S, Davidson L. Hearing loss in children: a review. *JAMA*. Dec 1 2020; 324(21): 2195-205.
- James AL. Endoscope or microscope-guided pediatric tympanoplasty? Comparison of grafting technique and outcome. *The Laryngoscope*. Nov 2017; 127(11): 2659-64.
- Bedri EH, Korra B, Redleaf M, Worku A. Double-layer tympanic membrane graft in type I tympanoplasty. *Annals of Otology, Rhinology & Laryngology*. Sept 2019; 128(9): 795-801.
- Jaiswal RK, Chettri ST, Shah SP, Karki S, Sah BP, Paudell D. Comparison of outcomes of palisade cartilage with temporalis fascia following tympanoplasty at a tertiary care centre in Nepal. *Int J Otorhinolaryngol Head Neck Surg*. 2016 Oct; 2(4):224. <https://doi.org/10.18203/issn.2454-5929.ijohns20163470>.
- Heermann J, Jr, Heermann H, Kopstein E. Fascia and cartilage palisade tympanoplasty: Nine years' experience. *Arch Otolaryngol*. 1970; 91(3):228-41. PMID: 4905504. <https://doi.org/10.1001/archotol.1970.00770040334004>.
- Couloigner V, Baculard F, El Bakkouri W, Viala P, Francois M, Narcy P. Inlay butterfly cartilage tympanoplasty in children. *Otol Neurotol*. 2005; 26:247-51. PMID: 15793413. <https://doi.org/10.1097/00129492-200503000-00020>.
- Gerber MJ, Mason JC, Lambert PR. Hearing results after primary cartilage tympanoplasty. *Laryngoscope*. 2000; 110:1994-9. PMID: 11129007. <https://doi.org/10.1097/00005537-200012000-00002>.
- Murugendrappa MA, Siddappa PN, Shambulinggowda A, Basavaraj GP. Comparative study of two different myringoplasty techniques in mucosal type of chronic otitis media. *J Clin Diagn Res*. 2016; 10(2):1-3. PMID: 27042491 PMID: PMC4800556. <https://doi.org/10.7860/JCDR/2016/16843.7194>.
- Verma S, Arora A, Narvey VP. Comparison of conventional temporalis fascia myringoplasty with fascia lata myringoplasty among patients with hearing loss. *Int J*

- Otorhinolaryngol Head Neck Surg. 2019 Jul; 5(4):926–31. <https://doi.org/10.18203/issn.2454-5929.ijohns20192706>.
15. Harkare VV, Mishra RK, Deosthale NV, Khadakkar SP, Dhoke PR, Dhote K, Kamal N, Reddy ST. A comparative study of different tissues used for tympanic membrane grafting. *Journal of Evolution of Medical and Dental Sciences*. 2013 Oct; 2(41):7834–40.
 16. Landge SU, Jatale PV, Kirdak V, Chintale S, Shaikh K. Comparative study of temporalis fascia graft, tragal cartilage graft and fascia lata in tubotympanic type of CSOM. *MedPulse International Journal of ENT*. 2019 Jan; 9(1):37–40. <https://doi.org/10.26611/1016919>.
 17. Patil K, Baisakhiya N, Deshmukh PT. Evaluation of different graft material in type 1 tympanoplasty. *Indian J Otol*. 2014; 20:106–14. <https://doi.org/10.4103/0971-7749.136844>.
 18. Gupta P, Prajapati BJ, Gupta MY, Mehta R, Sinha V. Different types of graft materials in type I tympanoplasty. *Indian J Otol*. 2007; 13:9–11.
 19. Indorewala S. A study on dimensional stability of the free fascia grafts, 2004 Mar; 114(3):543–7. PMID: 15091232. <https://doi.org/10.1097/00005537-200403000-00029>.

How to cite this article: Gupta RV, Kulkarni SV, Burse K, Bharadwaj C, Sancheti V and Patel R. A Comparative Study Between the use of Temporalis Fascia and Fascia Lata as Graft During Tympanoplasty Performed in A Tertiary Care Centre. *MVP J. Med. Sci.* 2020; 7(2): 141-150.