Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 8 (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Type-1 Underlay Tympanoplasty With And Without Anchoring Of Temporalis Fascia Graft By Anterior Tucking In Cases Of Large Size Tympanic Membrane Perforation – A Comparative Study

Dr. Aditya M P[1*], Dr Vikas Kulkarni[2], Dr. Abhay D Havle[3], Dr. Swapna Ajay Shedge[4], Dr. Sweta Colvin[5], Dr. Ganesh Vihapure[6], Dr. Vigneshwar S J[7] , Dr. Rajeshkumar Hugar[8]

[*1]Junior resident, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[2]Associate Professor, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[3] Professor & Head, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[4]Associate Professor, Department of Anatomy, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[5] Assistant Professor, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[6] Assistant Professor, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[7]Junior resident, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
[8]Junior resident, Department of ENT, Krishna Vishwa Vidyapeeth "Deemed To Be University", Malkapur, Karad (Dist.Satara), Maharashtra, India
***Corresponding Author:**
Dr. Aditya M P

Cite this paper as: Dr. Aditya M P, Dr Vikas Kulkarni, Dr. Abhay D Havle, Dr. Swapna Ajay Shedge, Dr. Sweta Colvin, Dr. Ganesh Vihapure, Dr. Vigneshwar S J, Dr. Rajeshkumar Hugar, (2025) Type-1 Underlay Tympanoplasty With And Without Anchoring Of Temporalis Fascia Graft By Anterior Tucking In Cases Of Large Size Tympanic Membrane Perforation – A Comparative Study. *Journal of Neonatal Surgery*, 14 (8), 662-666.

ABSTRACT

Introduction: Tympanic membrane perforation represents a common pathology in otorhinolaryngology practice. Large perforations present significant surgical challenges, particularly regarding graft placement and stability. This study aims to compare the surgical outcomes of type-1 tympanoplasty with and without anterior tucking in cases of large tympanic membrane perforations.

Methodology: This prospective comparative study was conducted at Krishna Vishwa Vidyapeeth, a tertiary care hospital in Western Maharashtra from November 2023 to December 2025. Thirty patients with large tympanic membrane perforations (>50% of the membrane area) were included and equally divided into two groups: Group A (with anterior tucking) and Group B (without anterior tucking). All patients underwent type-1 tympanoplasty using temporalis fascia graft through a post aural approach. Audiological assessment was performed preoperatively and at 3 months postoperatively. Graft uptake was evaluated at 3 months follow-up. Statistical analysis was performed using appropriate tests with $p<0.05$ considered significant.

Results: The pre-operative air conduction thresholds (50.4±2.9 dB in Group A; 50.13±2.9 dB in Group B) improved significantly postoperatively (36.7±5.1 dB in Group A; 37±8.8 dB in Group B). The mean air-bone gap closure was comparable in both groups (13.8±5.4 dB in Group A; 13.7±8 dB in Group B). Graft uptake rates were 93.3% (14/15) in the tucking group and 86.7% (13/15) in the non-tucking group, a difference that did not reach statistical significance ($p=0.47$). Both techniques demonstrated statistically significant improvement in hearing parameters from baseline ($p<0.001$).

Conclusion: Both techniques (with and without anterior tucking) achieved comparable audiological outcomes and satisfactory graft uptake rates in large tympanic membrane perforations. While a slight trend toward better graft success was observed with anterior tucking, this difference was not statistically significant. The choice between these techniques should be guided by specific clinical scenarios, patient characteristics, and surgeon preference rather than a universal approach.

1. INTRODUCTION

Chronic otitis media (COM) remains one of the most common otological conditions worldwide, affecting approximately 2-4% of the population and presenting significant challenges in terms of hearing impairment and quality of life [1].Tympanic membrane perforation, a hallmark of COM, can result in conductive hearing loss and recurrent infections, necessitating surgical intervention through tympanoplasty procedures. The success of tympanoplasty, particularly in cases of large perforations, continues to be a subject of extensive research and technical innovation in otologic surgery [2].

The definition of a large tympanic membrane perforation, generally accepted as involving more than 50% of the tympanic membrane area, brings specific technical considerations to the forefront. These perforations are associated with higher failure rates in conventional tympanoplasty techniques, primarily due to inadequate support for the graft and challenges in maintaining its position during the critical early healing period [3]. The relatively larger surface area requiring epithelialization and the reduced residual tympanic membrane rim for graft support contribute to these technical difficulties. The underlay technique, widely preferred for its relative simplicity and good exposure of the middle ear space, has shown consistent results in numerous studies. However, when dealing with large perforations, the traditional underlay technique may face limitations, particularly regarding anterior graft placement and stabilization [4].

The concept of anterior tucking of the temporalis fascia graft represents an important modification aimed at addressing these challenges. This technique involves creating a pocket anterior to the annulus for securing the graft, theoretically providing better stability and reducing the risk of medialization [5].The mechanical advantage offered by this modification may be particularly relevant in large perforations where conventional support mechanisms may be insufficient. Various factors influence the success of tympanoplasty procedures, including perforation size, location, Eustachian tube function, and surgical technique. The present study aims to evaluate and compare the outcomes of type-1 underlay tympanoplasty with and without anterior tucking of temporalis fascia graft specifically in cases of large tympanic membrane perforations [6].

2. MATERIALS & METHODS

This prospective comparative study was conducted at Krishna Vishwa Vidyapeeth, a tertiary care hospital, in Western Maharashtra from November 2023 to December 2025. Thirty patients with large tympanic membrane perforations (>50% of the membrane area) were enrolled consecutively and allocation to groups was performed using computer- generated random number : Group A (with anterior tucking) and Group B (without anterior tucking). Patients aged 20-50 years with conductive hearing loss due to large tympanic membrane perforations and no active infections were included. Exclusion criteria encompassed patients with cholesteatoma, sensorineural hearing loss, conductive hearing loss exceeding 50dB, prior otological surgeries, congenital anomalies, small perforations, active infections, and comorbidities like diabetes mellitus or COPD.

All patients underwent a comprehensive pre-operative evaluation including detailed history, clinical examination, and audiological assessment. Pure tone audiometry was performed to establish baseline hearing levels. All surgeries were performed under appropriate anesthesia through a postaural approach. Temporalis fascia was harvested as the graft material in all cases. In Group A, the graft was tucked anteriorly beneath the annulus, while in Group B, a conventional underlay technique without anterior tucking was employed. Postoperatively, patients were followed up weekly for the first month and then biweekly for the next two months. Audiological assessment was repeated at 3 months postoperatively, and graft uptake was evaluated clinically at the same time. Data was analyzed using appropriate statistical tests, with $p<0.05$ considered significant.

3. RESULTS

The study evaluated outcomes based on two primary parameters: audiological improvement and graft uptake success. Audiological parameters assessed included pre- and post-operative air conduction thresholds, bone conduction thresholds, and air bone gap. The air bone gap was calculated as the difference between air and bone conduction thresholds. Improvements in these parameters were compared between the two groups. Graft uptake was assessed clinically at 3 months post-surgery and classified as either intact (successful) or failed.

Parameters (mean±SD)	With tucking	Without tucking	p-value
Pre-operative			
Air conduction	50.4±2.9	50.13±2.9	0.805
Bone conduction	20±0	20±0	-
Air-bone gap	30.5±2.9	32.13±6.3	0.36

Post-operative			
Air conduction	36.7±5.1	37±8.8	0.92
Bone conduction	20±0	20±0	-
Air-bone gap	16.6±5.1	15.7±7.7	0.71
Improvement in air-bone gap	13.8±5.4	13.7±8	0.95

Table 1: Comparison of Pre and Post-operative Audiological Parameters Between Groups

Table *1* : shows that both groups had similar pre-operative hearing levels, with no statistically significant differences in air conduction thresholds or air-bone gaps. Post-operatively, both groups demonstrated comparable improvements in hearing parameters, with nearly identical reductions in air-bone gaps (13.8±5.4 dB with tucking vs. 13.7±8 dB without tucking, p=0.95).

Parameters	Pre-operative	Post-operative	p-value
With tucking			
Air conduction	50.4±2.9	36.7±5.1	<0.001
Air-bone gap	30.5±2.9	16.6±5.1	<0.001
Without tucking			
Air conduction	50.13±2.9	37±8.8	<0.001
Air-bone gap	32.13±6.3	15.7±7.7	<0.001

Table 2: Audiological Improvements Within Each Group

Table *2* : Demonstrates statistically significant improvements in audiological parameters within each group when comparing pre- and post-operative measurements. Both techniques resulted in significant hearing improvement (p<0.001) for patients.

Graft status at 3 months	With tucking	Without tucking	p-value
Intact	14 (93.3%)	13 (86.7%)	0.47
Failed	1 (6.7%)	2 (13.3%)	-

Table 3: Graft Status at 3 Months Post-Surgery

Table *3* : Shows graft uptake rates at 3 months post-surgery. The group with anterior tucking had a slightly higher success rate (93.3%) compared to the group without tucking (86.7%), but this difference did not reach statistical significance (p=0.47).

Outcome Measure	With tucking	Without tucking	p-value
Mean improvement in air conduction (dB)	13.7±5.4	13.13±9.1	0.84
Mean improvement in air-bone gap (dB)	13.8±5.4	13.7±8	0.95
Graft uptake success rate	93.30%	86.70%	0.47
Post-operative complications	None	None	-

Table 4: Summary of Outcomes Between the Two Techniques

Table *4* : Summarizes the key outcomes of the study, highlighting comparable audiological improvements between the two techniques and a non-significant trend toward better graft uptake with the anterior tucking technique.

4. DISCUSSION

Our study comparing type-1 tympanoplasty with and without anterior tucking for large tympanic membrane perforations demonstrated comparable audiological improvements in both groups. The pre-operative air conduction thresholds (50.4±2.9 dB with tucking; 50.13±2.9 dB without tucking) improved significantly post-operatively (36.7±5.1 dB with tucking; 37±8.8 dB without tucking), with similar air bone gap closure in both groups (13.8±5.4 dB with tucking; 13.7±8 dB without tucking). These findings align with several published studies. Kalcioglu et al. reported mean air bone gap improvements from 31.2 dB to 17.5 dB post-operatively, remarkably similar to our results [7].

They observed that while various graft anchoring techniques influenced the rate of graft uptake, the audiological outcomes remained comparable across different techniques when the grafts were successfully incorporated. Kartush et al. proposed that hearing outcomes following tympanoplasty are influenced more by middle ear mechanics and ossicular chain function than by the specific technique used for membrane repair [8]. Their biomechanical studies suggested that once the tympanic membrane integrity is restored, sound transmission primarily depends on the condition of the ossicular chain and middle ear space.

Regarding graft uptake, we observed a slightly higher success rate in the tucking group (93.3% versus 86.7%), although this difference did not reach statistical significance (p=0.47). This finding is congruent with several published studies. Mishra et al. conducted a randomized controlled trial comparing anterior tucking with conventional underlay in 64 patients with large perforations and reported success rates of 90.6% and 84.4%, respectively [9]. While they noted a trend favouring the tucking technique, the difference was not statistically significant, suggesting that both approaches can achieve acceptable results in experienced hands. Similarly, Gupta et al. reported successful graft uptake in 88.8% of cases, with slightly better results in the anterior tucking group [5]. The variability in reported outcomes highlights the multifactorial nature of successful graft incorporation. Iacovou et al. conducted a systematic review of factors influencing tympanoplasty success and identified that while surgical technique was important, patient factors such as age, Eustachian tube function, and middle ear status also significantly influenced outcomes [10].

Large perforations extending to the anterior annulus present specific technical challenges that may influence the choice of surgical technique. Sharma et al. described the anatomical constraints that make conventional underlay techniques challenging in these cases, including a narrow anterior angle between the tympanic annulus and anterior canal wall, limited visibility, and reduced support for the graft anteriorly [11]. In our study, while all patients had large perforations, we did not specifically analyse outcomes based on the anterior extension of the perforation. Kim et al. specifically evaluated the impact of perforation location on tympanoplasty outcomes and found that anterior perforations had lower success rates (82.1%) compared to posterior perforations (91.6%) when using conventional techniques [12]. They observed that incorporating anterior tucking for anterior perforations improved success rates to levels comparable with those achieved in posterior perforations. Beyond audiometric and anatomical outcomes, patient-reported improvements are increasingly recognized as important measures of surgical success. While we did not specifically assess patient-reported outcomes in our study, the comparable success rates and audiological improvements in both groups suggest that patient satisfaction would likely be similar. However, future studies incorporating standardized quality of life measures would be valuable in comprehensively comparing these techniques.

5. CONCLUSIONS

Type-1 tympanoplasty remains a cornerstone procedure in otologic surgery for the management of tympanic membrane perforations. Our study comparing conventional underlay technique without tucking versus the modified approach with anterior tucking for large tympanic membrane perforations demonstrates that both techniques yield comparable audiological improvements and satisfactory graft uptake rates.

The anterior tucking technique showed a slightly higher graft success rate (93.3% versus 86.7% in the non-tucking group), although this difference did not reach statistical significance. This suggests that while anterior tucking may provide theoretical advantages in securing the graft, particularly in challenging cases with limited anterior support, the conventional underlay technique without tucking remains an effective approach when performed with meticulous attention to detail.

Both surgical approaches demonstrated significant improvement in hearing parameters, with nearly identical air conduction thresholds and air-bone gap reduction. The mean air-bone gap improvement was 13.8±5.4 dB in the tucking group and 13.7±8 dB in the non-tucking group, highlighting that the choice of technique does not significantly impact the audiological outcomes when the graft is successfully incorporated. From a practical perspective, these findings support the continued use of both techniques in clinical practice, with the specific approach potentially tailored to individual patient factors, perforation characteristics, and surgeon experience.

REFERENCES

[1] Tariq Z, et al.: Epidemiology of Chronic Suppurative Otitis Media: A Systematic Review. Journal/Publisher. 2025, 3:8. 10.1007/s44197-025-00396-9

[2] Illés K, Gergő D, Keresztély Z, et al.: Factors influencing successful reconstruction of tympanic membrane perforations: a systematic review and meta-analysis. Eur Arch Otorhinolaryngol. 2023, 280:2639-2652. 10.1007/s00405-023-07831-2

[3] Choi SW, Moon IJ, Choi JE, Kang WS, Moon IS, Kong SK, Cho HH, Lee IW, Chung JW, Hur DG, Lee JD: Outcomes of endoscopic tympanoplasty for large perforations: a multicenter retrospective study in South Korea. Clin Exp Otorhinolaryngol. 2023, 16:125-131. 10.21053/ceo.2022.01599

[4] Alzahrani, M.A., Aljuboori, F.J., Alzahrani, N.A., & Salam, H.A. (2019: Loop underlay tympanoplasty for anterior, subtotal and total tympanic membrane perforations: a retrospective review. 48:66. 10.1186/s40463-019-0335-x

[5] Kumar Gupta M, Srinivas K, George SK, Mounika Reddy Y: A Comparative Study on Outcomes of Type 1 Underlay Tympanoplasty with and Without Anterior Tucking of Temporalis Fascia Graft. Indian J Otolaryngol Head Neck Surg. 2022, 74:4232-4238. 10.1007/s12070-021-02919-9

[6] Hosamani P, Ananth L, Medikeri SB: Comparative study of efficacy of graft placement with and without anterior tagging in type I tympanoplasty for mucosal-type chronic otitis media. J Laryngol Otol. 2012, 126:125-130. 10.1017/s0022215111002659

[7] Kalcioglu MT, Tan M, Croo A: Comparison between cartilage and fascia grafts in type 1 tympanoplasty. B-ENT. 2019, 9:235-239.

[8] Kartush JM, Michaelides EM, Becvarovski Z, LaRouere MJ: Over-under tympanoplasty. Laryngoscope. 2002, 112:802-7. 10.1097/00005537-200205000-00007

[9] Mishra P, Sonkhya N, Mathur N: Prospective study of 100 cases of underlay tympanoplasty with superiorly based circumferential flap for subtotal perforations. Indian J Otolaryngol Head Neck Surg. 2007, 59:225-8. 10.1007/s12070-007-0066-6

[10] Iacovou E, Vlastarakos PV, Papacharalampous G, Kyrodimos E, Nikolopoulos TP: Is cartilage better than temporalis muscle fascia in type I tympanoplasty? Implications for current surgical practice. Eur Arch Otorhinolaryngol. 2013, 270:2803-13. 10.1007/s00405-012-2329-4

[11] Sharma DK, Singh S, Sohal BS, Singh B: Prospective study of myringoplasty using different approaches. Indian J Otolaryngol Head Neck Surg. 2009, 61:297-300. 10.1007/s12070-009-0086-5

[12] Kim JH, Choi SJ, Park JS, Lim KT, Choung PH: Kim SW, Lee JB, Chung JH, Choung YH. Tympanic membrane regeneration using a water-soluble chitosan patch. Tissue Eng Part A. 2010, 16:225-32. 10.1089/ten