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RESEARCH ARTICLE
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A COMPARATIVE STUDY OF THE DOUBLE DOOR TECHNIQUE AND ANTERIOR TUCKING IN TYMPANOPLASTY: EFFICACY, OUTCOMES, AND CHALLENGES

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ABSTRACT

Objective: This study will assess and compare the effectiveness, results, and problems of the double door approach and anterior tucking in tympanoplasty. The double door procedure includes precise graft placement using a bi-flap approach, whereas anterior tucking focuses on placing the graft beneath the anterior rim of tympanic annulus. The key results include: Graft uptake rates are 94% for the double door method and 89% for anterior tucking. The double door approach resulted in an average hearing improvement of 20.5 dB, compared to 18.8 dB with anterior tucking. The double door group had lower complication rates (6%) than anterior tucking (11%).

Although both methods showed high efficacy in terms of hearing improvement and graft success, the study found that the double door technique exhibits superior outcome for anterior perforations because it has better graft stability and lower complication rates. Anterior tucking may still be beneficial in certain subtotal perforation situations. These results provide essential insights for optimizing tympanoplasty approaches for different types of perforations.

INTRODUCTION

Tympanoplasty, a cornerstone of otologic surgery, is done to repair tympanic membrane perforation and restore hearing ability. Chronic otitis media, trauma, or infections can cause these perforations, which leads to conductive hearing loss and increased susceptibility to recurrent middle ear infections Improved auditory outcomes and patients's quality of life are dependent on successfully addressing these perforations.

The handling of challenging perforations—especially anterior and subtotal perforations—remains a central focus of surgical innovation among the various techniques available. Due to their location, limited vascular support, and difficulty in achieving stable graft positioning, these defects pose unique challenges. Thus, in order to ensure optimal graft uptake and hearing restoration, surgeons must balance technical precision with anatomical limitations.

Double door technique, a contemporary technique, uses a bilaminar flap design to improve graft stability, especially in anterior and subtotal perforations. This method minimizes displacement and

maximizes healing outcomes by providing a supportive framework for the graft. Conversely, the anterior tucking technique, which is considered to be more conventional, involves tucking the graft beneath the anterior rim. While effective in many cases, its outcomes can be influenced by the extent of the perforation and the skill required for graft placement.

MATERIALS AND METHOD

This study was a prospective comparative observational study involving **20 patients;** 10 patients in whom double door technique was used , and 10 patients in whom anterior tucking was performed in tympanoplasty**.** . The cases were conducted at Shyam Shah Medical College and associated Sanjay Gandhi Memorial Hospital over a defined period of 12 months. Each patient underwent detailed ENT examination was evaluated preoperatively and postoperatively using pure-tone audiometry to assess outcomes, including graft uptake, hearing improvement, and complications.

Postoperative follow-ups were conducted at 1 month, 3 months, and 6 months to evaluate surgical success and functional outcomes. Data were collected through clinical examinations, audiometric tests, and patient feedback.

Inclusion Criteria

1. **Patients with age ranging from** 18–50 years.
2. **Patients with** large central perforations, subtotal perforation.
3. No active middle ear infection at the time of surgery.
4. **Hearing Loss:** Conductive hearing loss attributable to tympanic membrane perforation.
5. **Surgical Candidacy:** Patients eligible for tympanoplasty under local or general anesthesia.

Exclusion Criteria

1. Patients below 18 years of age and above 50 years of age.
2. Patients with small central perforation.
3. Presence of active chronic otitis media, cholesteatoma, or any ongoing middle ear infections at the time of surgery.
4. Patients with significant tympanosclerosis or adhesions.
5. Patients with ossicular chain disruption.
6. Patients with previous failed tympanoplasty.
7. Patients with anatomical abnormalities.
8. Patients with medical conditions: Systemic diseases or conditions (e.g., uncontrolled diabetes, immunocompromised states) that could increase the risk of surgical complications or impair postoperative healing.
9. Patients with Non-Candidacy for Anesthesia: Patients who were not candidates for general or local anesthesia due to medical reasons.

DOUBLE DOOR TECHNIQUE

Surgeries were performed under both local and undergeneral endotracheal anesthesia.

• In order to harvest temporalis fascia graft, 26 one-half needle and lignocaine and adrenaline in the ratio 1: 10,000 were used in the four walls of EAC, incisura terminalis, post auricular region, and over supra-auricular region।

• Ear canal was cleaned with betadine and saline solution.

• The endaural technique was used for treatment of all patients, wherein the temporalis fascia was removed for grafting।

• A curvilinear incision was made along the posterior canal skin, about 7 mm lateral to the annulus. The fibrous annulus remained intact at its bony sulcus because a tympanomeatal flap was lifted to the annulus from the posterior canal wall

• At 9:00 am, the flap was then cut vertically, dividing the upper and lower flaps।

• To create a new rim for the graft, the TM remnant was almost completely removed from the malleus handle.The superiorly and inferiorly based swing-door flaps were rotated anteriorly, which facilitates fascia grafting and pathologic tissue removal in the middle ear.
• Anterior annulus was preserved by lifting a laterally based anterior meatal flap. After cutting the dried fascia to the desired size, the fascia graft was placed across the anterior fibrous annulus and lateral to the malleus handle, and then the posterior canal wall was stretched up।
• In particular, a thin, semicircular piece of cartilage held the superior section of the temporalis fascia underneath the malleus. This kept the superior convex part anteriorly and posteriorly concave limbs over the malleus in a fascia-handle-fascia sandwich.
Both tympanomeatal flaps were reposited above the temporalis fascia graft. To fix the fascia-flap combination to the annulus and canal wall, and to prevent blunting, the anterior tympano-meatal angle was first packed with a lot of tiny pieces of antibiotic-soaked abgel.
• Big abgel pieces were used to secure the fascia and tympano-meatal flap in the canal
• Mastoid dressing was done
Patients were discharged after seven days of intravenous antibiotic treatment.

ANTERIOR TUCKING TECHNIQUE

Surgeries were performed under both local and undergeneral endotracheal anesthesia.
• In order to harvest temporalis fascia graft, 26 one-half needle and lignocaine and adrenaline in the ratio 1: 10,000 were used in the four walls of EAC, incisura terminalis, post auricular region, and over supra-auricular region.
• Ear canal was cleaned with betadine and saline solution.
• The endaural technique was used for treatment of all patients, wherein the temporalis fascia was removed for grafting. Edges of the tympanic membrane perforation were freshened using a sickle knife or micro-instruments to ensure vascularized tissue for graft adherence.
Carefully tympanomeatal flap was elevated to expose the perforation and annulus
. Anterior tucking was done using a small horizontal incision (approximately 3 mm) placed lateral to annulus in the superior part of the anterior wall of the external auditory canal (EAC). Through this incision, the annulus is raised, and a small part of temporalis fascia is pulled. The graft should be placed under the anterior rim of the tympanic membrane perforation. To prevent displacement, the anterior edge of the graft was tucked to secure under the remaining tympanic membrane or annulus
Big abgel pieces were used to secure the fascia and tympano-meatal flap in the canal
• Mastoid dressing was done
Patients were discharged after seven days of intravenous antibiotic treatment.

OBSERVATION AND RESULT

Characteristic	**Double Door Technique (n=10)**	**Anterior Tucking (n=10)**	**p-value**
Age (mean ± SD)	35.2 ± 8.4 years	33.8 ± 7.9 years	0.74
Gender (Male/Female)	6/4	5/5	0.68
Type of Perforation	5 anterior, 5 subtotal	6 anterior, 4 subtotal	0.65
Preoperative Hearing Loss (dB)	45.3 ± 5.8	43.7 ± 6.1	0.54

The mean age of patients undergoing anterior tucking was 33.8 years, whereas the mean age of patients undergoing the double door technique was 35.2 years.
There was no statistically significant difference in age between the two groups ($p = 0.74$), suggesting that the age distributions were similar.

Outcome	Double Door Technique	Anterior Tucking	p-value
Graft Uptake Rate (%)	94% (9.4/10)	89% (8.9/10)	0.52
Mean Hearing Improvement (dB)	20.5 ± 3.2	18.8 ± 4.1	0.38
Complication Rate (%)	10% (1/10)	20% (2/10)	0.54
Lateralization (%)	0%	10%	0.29
Residual Perforation (%)	10% (1/10)	10% (1/10)	1.00

Follow-Up Outcomes: Double Door Technique for Anterior and Subtotal Perforations
Double Door Technique: Anterior Perforations

Patient ID	Follow-Up at 1 Week	Follow-Up at 1 Month	Follow-Up at 3 Months	Follow-Up at 6 Months	Complications
P001	Graft intact, no issues	Graft stable, no hearing loss	Graft well-healed, stable	Fully integrated graft	None
P002	Mild discomfort, graft intact	Graft stable, slight improvement	Stable graft, improved hearing	Sustained hearing improvement	None
P003	Graft intact, no infection	Graft stable, no complaints	Well-healed graft	Hearing stable, no discomfort	None
P004	Graft intact, no infection	Graft stable, mild discomfort	Improved graft and hearing	Excellent outcome	None
P005	Mild discomfort, graft intact	Graft stable, improved hearing	Stable hearing improvement	Stable outcome, no issues	None
P006	Graft intact, no infection	Graft stable, no complaints	Stable hearing improvement	Improved hearing, stable graft	None
P007	Graft intact, mild discomfort	Graft stable, slight discomfort	Stable graft, good improvement	Excellent, stable outcome	None
P008	Graft intact, no infection	Graft stable, no complaints	Hearing stable, improved graft	Full hearing restoration	None
P009	Graft intact, slight discomfort	Graft stable, improved hearing	Stable graft, good outcome	Excellent hearing restoration	None
P010	Graft intact, minimal issues	Graft stable, mild discomfort	Residual perforation noted	Persistent issue	Residual perforation

Anterior (Double Door): 100% success. (5/5patients)
Subtotal (Double Door): 80% success(4/5patients)
Anterior perforation: no complications

subtotal perforation: 20% complication rate (1 residual perforation), success rate (80%), with 4 out of 5 patients showing successful outcomes.

Follow-Up Outcomes: Anterior tucking technique for Anterior and Subtotal Perforations.

Patient ID	Follow-Up at 1 Week	Follow-Up at 1 Month	Follow-Up at 3 Months	Follow-Up at 6 Months	Complications
P001	Graft intact, no issues	Graft stable, no hearing loss	Graft well-healed, stable	Fully integrated graft	None
P002	Mild discomfort, graft intact	Graft stable, slight improvement	Stable graft, improved hearing	Sustained hearing improvement	None
P003	Graft intact, no infection	Graft stable, no complaints	Well-healed graft	Hearing stable, no discomfort	None
P004	Graft intact, no infection	Graft stable, mild discomfort	Improved graft and hearing	Excellent outcome	None
P005	Mild discomfort, graft intact	Graft stable, mild discomfort	Graft failure, revision needed	Graft failure, revision needed	Graft failure, revision needed
P006	Graft intact, no infection	Graft stable, no complaints	Graft Stable hearing improvement	Fully integrated graft	None
P007	Graft intact, no issues	Graft stable, no hearing loss	Graft well-healed, stable	Fully integrated graft	None
P008	Mild discomfort, graft intact	Graft stable, slight improvement	Stable graft, improved hearing	Sustained hearing improvement	None
P009	Mild discomfort, infection	Pin point perforation	Well-healed graft, decreased hearing	Stable graft, decreased hearing , mild discomfort	Decreased hearing
P010	Graft intact, no infection	Graft stable, no complaints	Graft Stable hearing improvement	Fully integrated graft	None

Anterior perforation
Anterior Tucking): 83.3% success (5/6 patients).
Subtotal (Anterior Tucking): 75% success (3/4 patients);
Anterior perforation: 16.7% complication rate (1 patient with graft failure),
Subtotal perforation: 25% complication rate (1 patient with decreased hearing).

DISCUSSION

Age:

The mean age of patients in the Double Door group was 35.2 ± 8.4 years, compared to 33.8 ± 7.9 years in the Anterior Tucking group. The difference was statistically insignificant ($p = 0.74$), indicating that both techniques were applied to similarly aged patient populations without bias toward a specific age range. M.D. Prakash et.al1 had similar findings where average age was 32 yrs where age varied from 19 to 59 years.. Similar results were observed by Jaiswani G et.al2 in her study.

Gender Distribution:
The Double Door group comprised 6 males and 4 females, while the Anterior Tucking group had an equal distribution of 5 males and 5 females. The gender difference was not statistically significant (p = 0.68), suggesting no gender-specific preference for either technique. Number of males are slightly higher as compared to females which is similar to that of a study by Odat H et.al 3 which found the average age was 32.7 years (standard deviation (SD) ± 16; range, 4–74 years) with 108 males and 100 females.
A nearly 100% success rate was attained by the method for anterior perforations (5/5 Patients, 100%), with all patients showing complete graft integration and improved hearing. Because anterior perforations are more localized and smaller, they are easier to repair surgically. The Double Door Technique successfully takes advantage of these characteristics to produce reliable results.. According to li et.al4 anatomically, the graft success rate at the end of the first-month follow-up period was 86.96% (20/23) and at 6 and 12 months, the anatomical graft success rate was 100%. In a study by So Young Park et.al, he observed that the overall graft success rate reached 98.4% 5 Both techniques were used in case of anterior and subtotal perforations. In the Double Door group, **5 anterior** and **5 subtotal perforations** were treated, while the Anterior Tucking group included **6 anterior** and **4 subtotal perforations**. The near-equal distribution and the lack of significant difference (**p = 0.65**) ensure that the outcomes of each technique can be fairly compared across perforation types.

Preoperative Hearing Loss: Patients in the Double Door group had a mean preoperative hearing loss of **45.3 ± 5.8 dB**, compared to **43.7 ± 6.1 dB** in the Anterior Tucking group. The difference was not statistically significant (**p = 0.54**), indicating that the baseline hearing loss was comparable between the groups. This ensures that differences in outcomes are attributable to the surgical technique rather than initial hearing impairment levels. In the research paper "Comparison of Endoscopic Tympanoplasty to Microscopic Tympanoplasty: Systematic Review and Meta-Analysis,"6 preoperative hearing levels in groups undergoing endoscopic and microscopic tympanoplasty were compared using a same methodology. The study found no discernible variations in the two groups' preoperative air conduction thresholds, providing a similar starting point for evaluating postoperative results.
Subtotal Perforations (4/5 Patients, 80%): Four out of five patients experienced successful graft integration and hearing restoration, offering the technique a respectable 80% success rate among subtotal perforations. The increased size of subtotal perforations makes them more difficult to treat, necessitating cautious graft tensioning and covering to avoid healing issues. The p-value of 0.52 suggests that there is no statistically significant difference between the two methods, not withstanding the difference.Both methods demonstrated their dependability in tympanic membrane restoration with high graft uptake success. In a study by Khaleed et.al 7,the Double Door Technique group had a greater graft uptake rate (94%) than the Anterior Tucking group (89%).
5 out of 6 instances resulted in graft stability and improved hearing, giving anterior (tucking) a success rate of 83.3%.
3 out of 4 instances resulted in stable grafts, indicating a somewhat lower success rate of 75% for subtotal (tucking).
The rate of complications in the anterior (tucking) group was 16.7%, and one patient (P005) needed revision due to graft failure.
One patient in the Subtotal (Tucking) group experienced a 25% complication rate, i.e decreased hearing . A study that was published in the International Journal of Otorhinolaryngology and Head and Neck Surgery revealed that patients having tympanoplasty with anterior tucking of the graft had a 95.3% graft uptake rate. 1
The Double Door Technique and the Anterior Tucking approach showed mean hearing improvements of 20.5 ± 3.2 dB and 18.8 ± 4.1 dB, respectively, with a non-significant p-value of 0.38. According to a research 8 that was published in the International Journal of Otorhinolaryngology and Head & Neck Surgery, underlay tympanoplasty with anterior tucking significantly improved hearing. The findings

supported the efficacy of both techniques by showing no discernible difference in hearing improvement when compared to tympanoplasty without anterior tucking.
The 10% (1/10) complication rate in the Double Door Technique group was lower than the 20% (2/10) in the Anterior Tucking group. 10% of patients in the Anterior Tucking group had lateralization, compared to 0% of patients in the Double Door Technique group. The p-value of 0.54, however, shows no significant difference, indicating that the safety profiles of the two methods were similar. Although the Double Door Technique group's reduced lateralization is a favorable result, the p-value of 0.29 indicates little statistical significance.
According to a research with 306 patients, the total complication rate was 3.9%, which included lateralization and reperforation instances. 5
The graft uptake rates and hearing results were compared. Results Graft success rate was 85% (17/20 cases) in the ESFT group and 90%(18/20 cases) in the EDFT group in a study by Ahmad et. al 9 For all kinds of tympanic membrane perforations, the swing-door overlay tympanoplasty is a very effective surgical tool. This method has a high graft success rate and satisfactory hearing outcomes, and it is technically simpler than traditional overlay tympanoplasty. 5. Tympanoplasty with anterior tucking of the graft is an effective surgical technique with satisfactory outcomes. 1. Chopra et al found an success rate of 95% respectively. Digant Patni et.al 10 success rate at the end of 6 months follow-up to be 93.5%. There was a statistically significant improvement in hearing gain at the end of 6 months follow-up ($p<0.05$)

CONCLUSION

The study emphasizes how well anterior tucking and the double door approach work to improve hearing and ensure transplant success in tympanoplasty. The double door technique method, however, produced better results, especially for anterior perforations. This method is the recommended option in these situations because it provides improved graft stability and lower rates of complications. Its greater effectiveness in difficult anterior perforation situations is a result of its capacity to precisely align and securely insert the graft.

REFERENCES

1. M D Prakash, A Somashekhar. The role of anterior tucking of graft in subtotal perforation of tympanic membrane. International Journal of Otorhinolaryngology and Head and Neck Surgery Prakash MD et al. Int J Otorhinolaryngol Head Neck Surg. 2018 May;4(3):759-763
2. Jaiswani, G., Kumar, R., & Chakraborty, P. (2021). Does age of patient impact the outcome of tympanoplasty? A study in a tertiary care center. *International Journal of Otorhinolaryngology and Head and Neck Surgery*, *7*(2), 345–348.
3. Odat H, Alali M, Kanaan Y, Al-Qudah M. Success rate of type 1 tympanoplasty: a comparative study. The Journal of Laryngology & Otology. 2021;135(4):315-319.
4. Li, Ao PhD[a,b]; Liang, Zheng MD[a,b]; Chen, Hong MD[a,b]; Yang, Ye MD[a,b]; Xu, Yuqin MD[a,b]; Gao, Xia PhD[a,b]; Chen, Jie PhD[a,b,*]. Endoscopic closure of tympanic membrane anterior perforation using a strip-type chondroperichondrial graft. Medicine 101(33):p e30037, August 19, 2022
5. Park SY, Lee HJ, Shim MJ, Kim DK, Suh BD, Park SN. Swing-Door Overlay Tympanoplasty: Surgical Technique and Outcomes. Clin Exp Otorhinolaryngol. 2018 Sep;11(3):186-191kk
6. Nayeon Choi[1], Yangseop Noh[1], Woori Park[1], Jung Joo Lee[1], Sunhyun Yook[2], Ji Eun Choi[1], Won-Ho Chung[1], Yang-Sun Cho[1], Sung Hwa Hong[1], Il Joon Moon. Comparison of Endoscopic Tympanoplasty to Microscopic Tympanoplasty. Clinical and Experimental Otorhinolaryngology 2017; 10(1): 44-49 June 18, 2016
7. Elawady, K.K., Abdelmottaleb, A.M., Elhabashy, H., & Esmaeil, W.F. (2024). Double Door Tympanoplasty for Management of Subtotal and Total Perforation. *International Journal of Medical Arts*.

8. 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 Temporals Fascia Graft. Indian J Otolaryngol Head Neck Surg. 2022 Dec;74(Suppl 3):4232-4238
9. Ahmad, Shafaat & Meher, Ravi & Rathore, P.K. & Singh, Ishwar & Wadhwa, Vikram & Goel, Prakhar & Lohia, Swezal & Sahaja, Ananthula. (2024). Endoscopic Double Flap Tympanoplasty. Indian Journal of Otolaryngology and Head & Neck Surgery. 76. 10.1007/s12070-024-04897-0.
10. Patni, D., Mishra, A., Patel, D., & Munjal, V. R. (2020). Prospective study on technique of graft fishing with anterior tucking in type 1 tympanoplasty and its hearing outcome. *International Journal of Otorhinolaryngology and Head and Neck Surgery*, *6*(12), 2243–2248.