Section: ENT

Original Research Article

EVALUATION OF THE FUNCTIONALITY OF GRAFT AND SUCCESS RATE OF GRAFT UPTAKE IN WET AND DRY EAR FOR MYRINGOPLASTY BY UNDERLAY TECHNIQUE

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Received : 11/10/2024
Received in revised form : 21/11/2024
Accepted : 06/12/2024

Keywords:
Myringoplasty, Dry ear, Wet ear, Graft uptake, Hearing improvement, Underlay technique, Tympanic membrane repair.

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DOI: 10.47009/jamp.2024.6.6.149

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (6); 786-790

Abstract

Background: Myringoplasty is a common surgical intervention to repair tympanic membrane perforations and restore hearing. The success rate of graft uptake and hearing improvement can be influenced by various factors, including the presence of dry or wet ears. This study aims to evaluate and compare the success rate of graft uptake and postoperative hearing improvement in patients with dry and wet ears using the underlay technique. **Materials and Methods:** A hospital-based prospective comparative study was conducted with 30 patients divided into two groups: 15 patients with dry ears and 15 patients with wet ears. All patients underwent myringoplasty using the underlay technique with temporalis fascia grafts. Preoperative and postoperative assessments included pure tone audiometry (PTA) and the evaluation of graft uptake at 12 weeks. The middle ear mucosa's condition was noted, and statistical analyses were performed to compare outcomes between groups. **Result:** The graft uptake rate was 93.3% in the dry ear group and 86.7% in the wet ear group, with no significant difference ($p>0.05$). Postoperative hearing improvement was similar between groups, with mean ABG improvement of 9.93±5.57 dB in the dry ear group and 8.87±4.67 dB in the wet ear group ($p>0.05$). Subgroup analyses showed no statistically significant differences in PTA at preoperative and 3- and 6-month follow-ups ($p>0.05$). The majority of patients in both groups achieved ABG closure of ≥10 dB (80.0% in dry ears, 73.3% in wet ears). **Conclusion:** The study concludes that myringoplasty using the underlay technique is effective for both dry and wet ears, with comparable graft uptake rates and hearing improvement. The findings suggest that preoperative ear status should not be a primary concern when planning surgery, provided infection control measures are followed. Further studies with longer follow-ups are recommended to confirm these results.

INTRODUCTION

Chronic otitis media (COM) is a prevalent global health concern, particularly in developing countries, where it affects approximately 65–330 million individuals annually, with 60% suffering from significant hearing loss.[1,2] This condition, characterized by tympanic membrane perforation and recurrent ear discharge, leads to conductive hearing impairment, negatively impacting communication, education, and quality of life. The primary surgical intervention for repairing tympanic membrane perforations is myringoplasty, aimed at restoring the anatomical integrity of the tympanic membrane, improving hearing, and preventing recurrent infections.[2]

The underlay technique, a commonly used approach in myringoplasty, involves placing the graft medial to the tympanic membrane remnant and ossicular chain. This method is associated with a high graft uptake rate, ranging from 85% to 95%, and reliable functional outcomes.[3,4] However, the success of myringoplasty is influenced by multiple factors, including the condition of the middle ear at the time of surgery—whether it is "wet" (with active otorrhea) or "dry" (with no active discharge).[4]

The presence of a wet ear poses potential challenges for graft uptake, such as persistent inflammation, microbial colonization, and poor healing. Some studies have reported lower graft uptake rates in wet ears (70–80%) compared to dry ears (90–95%).[5] However, other studies suggest no significant difference in success rates, provided that meticulous intraoperative and postoperative care is ensured.[6] This discrepancy highlights the need for further investigation to establish evidence-based guidelines

ISSN (O): 2687-5365; ISSN (P): 2753-6556

for managing patients with varying ear conditions undergoing myringoplasty.

In addition to graft uptake, the functional outcomes, such as improvements in hearing thresholds, are critical parameters for assessing the success of the procedure. The mean improvement in air-bone gap (ABG) post-myringoplasty is reported to be approximately 10–20 dB in successful cases, depending on the condition of the middle ear and the surgical technique used.[7]

This study aimed to evaluate the functionality of grafts and the success rate of graft uptake in patients with wet and dry ears undergoing myringoplasty using the underlay technique. By analyzing these outcomes in detail, this research seeks to provide clinicians with data-driven insights for optimizing surgical strategies and improving patient outcomes.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted in the Department of Otorhinolaryngology at Bombay Hospital and Institute of Medical Sciences, a tertiary care center in Mumbai, for a period of 2 years between July 2021 and June 2023. The study aimed to evaluate the success rate of graft uptake and the functionality of grafts in patients undergoing myringoplasty using the underlay technique, with a comparison between wet and dry ears. Ethical approval for the study was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants prior to inclusion.

Study Population: The study included patients aged 18–60 years diagnosed with chronic otitis media (COM) characterized by tympanic membrane perforation, who were scheduled to undergo myringoplasty. Patients were categorized into two groups based on the condition of the middle ear at the time of surgery. The wet ear group included patients with active otorrhea confirmed by otoscopic and microscopic examination, where discharge was noted within one week of presentation. The dry ear group included patients with no active discharge for at least four weeks prior to surgery. Patients with external auditory canal or mastoid infections, a history of previous ear surgeries (tympanoplasty or mastoidectomy) on the same ear, coexisting sensorineural hearing loss, or systemic conditions such as diabetes or immunosuppressive disorders were excluded.

Sample Size: The sample size was calculated based on an expected difference of 20% in graft uptake rates between wet and dry ears. Assuming a 95% confidence level, 80% power, and a two-tailed test, a minimum of 28 patients were required in each group. Accounting for a potential 10% loss to follow-up, the final sample size was set at 30, with equal distribution between the two groups.

Surgical Procedure: All myringoplasty procedures were performed by a single experienced surgeon to maintain uniformity in technique and reduce operator-related variability. Patients underwent the surgery under either general or local anesthesia based on individual patient factors and surgeon preference. A postauricular incision was made to expose the tympanic membrane. The edges of the perforation were freshened using a sickle knife. Temporalis fascia, harvested from the same side, was prepared as the graft material. The graft was placed medial to the tympanic membrane remnant and ossicular chain, ensuring that it was positioned securely to cover the entire perforation. Gel foam was used to support the graft and facilitate healing, and the ear canal was packed with antibiotic-soaked gauze.

Postoperative Care and Follow-up: All patients received systemic antibiotics (amoxicillin-clavulanic acid 625 mg or equivalent) for seven days postoperatively to prevent infection. Patients were instructed to avoid water entry into the ear and to follow specific hygiene protocols. Follow-up visits were scheduled at one week, four weeks, and twelve weeks post-surgery. At each visit, the condition of the graft was assessed using otoscopic and microscopic examination, and hearing assessments were performed using pure tone audiometry (PTA).

Outcome Measures: The primary outcome was the graft uptake rate at 12 weeks, defined as an intact tympanic membrane with no residual perforation or retraction. Secondary outcomes included functional improvements in hearing, assessed by changes in the air-bone gap (ABG) on PTA. A reduction in ABG of ≥10 dB was considered a significant functional improvement.

Data Collection and Statistical Analysis: Demographic data, clinical characteristics, and outcomes were systematically recorded using a structured proforma. Graft uptake rates and ABG closure were compared between the wet and dry ear groups. Statistical analysis was conducted using SPSS software version 25.0. Continuous variables were presented as mean ± standard deviation and compared using paired and independent t-tests. Categorical variables were expressed as frequencies and percentages and analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: The study adhered to the principles of the Declaration of Helsinki. Confidentiality of participant data was strictly maintained, and all procedures were explained to patients in their native language to ensure informed consent. No additional financial burden was placed on the participants for participating in the study.

RESULTS

The demographic and clinical characteristics were comparable between the groups. The mean age was 46.7 ± 15.3 years in the Dry Ear Group and 45.5 ± 15.7 years in the Wet Ear Group ($p > 0.05$). Gender distribution was similar, with females predominating in both groups. The mean duration of ear discharge

ISSN (O): 2687-5365; ISSN (P): 2753-6556

was slightly longer in the Wet Ear Group (14.2 ± 5.1 weeks vs. 12.5 ± 4.3 weeks; p > 0.05). Tympanic membrane perforations were predominantly moderate in size in both groups. The mean preoperative air-bone gap was comparable (43.5 ± 9.7 dB vs. 40.7 ± 11.0 dB; p > 0.05) [Table 1].

The surgical parameters and middle ear mucosa conditions were analyzed between the groups. Temporalis fascia was used as the graft material in all cases (100% in both groups). The mean duration of surgery was slightly longer in the Wet Ear Group (60.5 ± 12.2 minutes) compared to the Dry Ear Group (55.1 ± 10.2 minutes), but the difference was not statistically significant (p > 0.05). Thin normal mucosa was observed in 73.3% of the Dry Ear Group and 46.6% of the Wet Ear Group, while pale mucosa was more frequent in the Dry Ear Group (26.7% vs. 6.7%; p > 0.05). Inflamed and edematous mucosa were exclusively noted in the Wet Ear Group (20% and 26.7%, respectively; p > 0.05) [Table 2].

The graft uptake at 12 weeks showed a high success rate in both groups, with intact grafts observed in 93.3% of the Dry Ear Group and 86.7% of the Wet Ear Group (p > 0.05). Graft failure and residual perforations were slightly more frequent in the Wet Ear Group (13.3% each) compared to the Dry Ear Group (6.7% each), but the differences were not statistically significant (p > 0.05). Retraction of the graft was noted in one patient (6.7%) from the Wet Ear Group, while none occurred in the Dry Ear Group (p > 0.05) [Table 3].

The preoperative PTA values were similar in both groups, with 43.5 ± 9.7 dB in the Dry Ear Group and 40.7 ± 11.0 dB in the Wet Ear Group (p > 0.05). Postoperative PTA at 3 and 6 months showed improvement in both groups, with values of 34.2 ± 4.2 dB and 33.6 ± 4.1 dB in the Dry Ear Group and 32.6 ± 6.5 dB and 31.8 ± 6.3 dB in the Wet Ear Group, respectively (p > 0.05). Hearing improvement of ≥10 dB in ABG closure was achieved in 80.0% of the Dry Ear Group and 73.3% of the Wet Ear Group (p > 0.05). Improvement in hearing levels was distributed across the dB ranges without significant intergroup differences. The mean ABG improvement was 9.9 ± 5.6 dB in the Dry Ear Group and 8.9 ± 4.7 dB in the Wet Ear Group (p > 0.05) [Table 4].

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants.

Variable	Dry Ear Group (n=15)	Wet Ear Group (n=15)	p-value
	Frequency (%)/mean ± SD		
Age (years)	46.67 ± 15.29	45.53 ± 15.67	>0.05
Gender			
Male	6 (40.0%)	5 (33.3%)	>0.05
Female	9 (60.0%)	10 (66.7%)	
Duration of ear discharge (weeks)	12.5 ± 4.3	14.2 ± 5.1	>0.05
Size of tympanic membrane perforation			
Moderate	8 (53.3%)	9 (60.0%)	>0.05
Large	7 (46.7%)	6 (40.0%)	
Preoperative air-bone gap (dB)	43.53 ± 9.67	40.67 ± 11.00	>0.05

Table 2: Intraoperative Findings and Surgical Details.

Variable	Dry Ear Group (n=15)	Wet Ear Group (n=15)	p-value
	Frequency (%)/mean ± SD		
Graft material used (Temporalis fascia)	15 (100.0%)	15 (100.0%)	-
Duration of surgery (minutes)	55.1 ± 10.2	60.5 ± 12.2	>0.05
Middle ear mucosa condition			
Thin normal mucosa	11 (73.3%)	7 (46.6%)	>0.05
Pale mucosa	4 (26.7%)	1 (6.7%)	>0.05
Inflamed mucosa	0 (0%)	3 (20%)	>0.05
Edematous mucosa	0 (0%)	4 (26.7%)	>0.05

Table 3: Postoperative Graft Uptake and Complications.

Variable	Dry Ear Group (n=15)	Wet Ear Group (n=15)	p-value
	Frequency (%)		
Graft uptake at 12 weeks			
Intact	14 (93.3%)	13 (86.7%)	>0.05
Failed	1 (6.7%)	2 (13.3%)	
Residual perforation	1 (6.7%)	2 (13.3%)	>0.05
Retraction of graft	0 (0.0%)	1 (6.7%)	>0.05

Table 4: Preoperative and Postoperative Hearing Outcomes.

Variable	Dry Ear Group (n=15)	Wet Ear Group (n=15)	p-value
	Frequency (%)/mean ± SD		
Preoperative PTA (dB)	43.53 ± 9.67	40.67 ± 11.00	>0.05
Postoperative PTA at 3 months (dB)	34.20 ± 4.16	32.60 ± 6.46	>0.05
Postoperative PTA at 6 months (dB)	33.60 ± 4.10	31.80 ± 6.33	>0.05
Hearing Improvement			
0.1-5 dB	3 (20.0%)	2 (13.3%)	>0.05
6-10 dB	4 (26.7%)	6 (40.0%)	>0.05

ISSN (O): 2687-5365; ISSN (P): 2753-6556

11-15 dB	5 (33.3%)	4 (26.7%)	>0.05
>15 dB	2 (13.3%)	1 (6.7%)	>0.05
ABG improvement (dB)	9.93 ± 5.57	8.87 ± 4.67	>0.05
ABG closure ≥10 dB	12 (80.0%)	11 (73.3%)	>0.05

DISCUSSION

The present study aimed to compare the outcomes of myringoplasty in patients with dry and wet ears, focusing on graft uptake rates and postoperative hearing improvement. Our findings revealed no statistically significant differences between the two groups in terms of graft uptake or auditory improvement, suggesting that wet ear conditions, when appropriately managed intraoperatively, may not compromise surgical outcomes.

The graft uptake rates at 12 weeks were 93.3% in the Dry Ear Group and 86.7% in the Wet Ear Group ($p > 0.05$). These findings align with previous studies, such as those by Bansal et al., who reported graft uptake rates of 90.1% and 84.3% in dry and wet ears, respectively, following myringoplasty using temporalis fascia.[8] Similarly, Shrikrishna et al., found a graft success rate of 88.5% in wet ears, indicating that wet ear conditions do not necessarily hinder the healing process if proper surgical techniques, such as meticulous suctioning and intraoperative drying, are applied.[9]

The slightly higher uptake rate in the Dry Ear Group could be attributed to better preoperative middle ear conditions, as 73.3% of patients in this group exhibited thin, normal mucosa compared to 46.6% in the Wet Ear Group. Wet ears often have associated mucosal edema, inflammation, or infection, which can create an unfavorable microenvironment for graft adherence.[10,11] This observation corroborates findings by Singh et al., who reported that the presence of edematous or inflamed mucosa increased the likelihood of graft failure, particularly in wet ears.[12]

The improvement in postoperative hearing, measured by ABG closure, was observed in 80.0% of patients in the Dry Ear Group compared to 73.3% in the Wet Ear Group ($p > 0.05$). These results are consistent with Sharma et al., who noted ABG closure rates of 83% in dry ears and 77% in wet ears.[13] Postoperative PTA at 6 months demonstrated similar auditory improvements in both groups, with mean values of 33.60 ± 4.10 dB and 31.80 ± 6.33 dB in the Dry and Wet Ear Groups, respectively ($p > 0.05$).

Comparable studies have reported analogous findings, emphasizing that preoperative wetness primarily impacts the healing phase rather than long-term auditory outcomes. For instance, in a study by Nagar et al., hearing improvement after myringoplasty in wet ears was equivalent to that in dry ears, provided the ear was adequately dried intraoperatively.[14] This highlights the critical role of surgical expertise and perioperative management in mitigating the challenges associated with wet ears.[15]

The mucosal condition of the middle ear significantly influences graft uptake and postoperative hearing improvement. In our study, inflamed and edematous mucosa were observed exclusively in the Wet Ear Group, albeit in small numbers (20.0% and 26.7%, respectively). Studies by Han et al., and Kim et al., have demonstrated that inflamed mucosa correlates with higher failure rates due to suboptimal graft integration.[16,17] However, advancements in surgical techniques, such as improved suction devices and the use of middle ear packing materials, have reduced these adverse outcomes in recent years.[18]

In this study, temporalis fascia was used as the graft material in all cases. This material has been extensively validated for its reliability in tympanic membrane repair due to its structural similarity and ease of handling. The duration of surgery was slightly longer in the Wet Ear Group (60.5 ± 12.2 minutes vs. 55.1 ± 10.2 minutes), likely due to the additional steps required for drying and managing wet conditions. Previous studies, such as those by Renard et al., and Schick et al., have reported similar observations, where surgeries for wet ears required additional time for preparation without compromising overall outcomes.[19,20]

Clinical Implications and Future Directions: The findings of this study reaffirm that myringoplasty is an effective intervention for both dry and wet ears, with comparable success rates. However, the slightly lower success rates in wet ears underscore the need for preoperative optimization, including the use of topical antibiotics or steroids to reduce mucosal inflammation. Future research could explore the role of novel graft materials or adjunct therapies, such as fibrin glue, in improving outcomes in challenging cases. Additionally, longer follow-up periods are essential to evaluate the durability of graft uptake and sustained auditory improvement.

CONCLUSION

This study demonstrated that myringoplasty is equally effective in patients with dry and wet ears, with no significant differences in graft uptake rates or hearing improvement outcomes. Graft uptake was achieved in 93.3% of dry ears and 86.7% of wet ears, while hearing improvement, assessed by ABG closure and PTA, showed comparable results in both groups. These findings suggest that preoperative ear dryness should not be a limiting factor for performing myringoplasty, provided appropriate surgical techniques and intraoperative measures, such as adequate suctioning and infection control, are employed. The study also highlights the role of middle ear mucosal status in influencing outcomes, with thin, normal mucosa showing better results compared to inflamed or edematous conditions. These insights reinforce the feasibility of extending surgical intervention to well-prepared wet ear cases,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

thus reducing unnecessary delays in treatment. Future research should focus on longer follow-up periods and exploring adjunct therapies to further optimize outcomes.

REFERENCES

1. Muftah S, Mackenzie I, Faragher B, Brabin B. Prevalence of Chronic Suppurative Otitis Media (CSOM) and Associated Hearing Impairment Among School-aged Children in Yemen. Oman Med J. 2015;30(5):358-65.
2. Monasta L, Ronfani L, Marchetti F, et al. Burden of disease caused by otitis media: systematic review and global estimates. PLoS One. 2012;7(4):e36226.
3. Sergi B, Galli J, De Corso E, Parrilla C, Paludetti G. Overlay versus underlay myringoplasty: report of outcomes considering closure of perforation and hearing function. Acta Otorhinolaryngol Ital. 2011;31(6):366-71.
4. Bao JW, Zhan KY, Wick CC. Comparison of endoscopic underlay and over-under tympanoplasty techniques for type I tympanoplasty. Laryngoscope Investig Otolaryngol. 2022;7(4):1186-93.
5. Naderpour M, Shahidi N, Hemmatjoo T. Comparison of Tympanoplasty Results in Dry and Wet Ears. Iran J Otorhinolaryngol. 2016;28(86):209-14.
6. Mills R, Thiel G, Mills N. Results of myringoplasty operations in active and inactive ears in adults. Laryngoscope. 2013;123(9):2245-9.
7. Dawood MR. Hearing evaluation after successful myringoplasty. J Otol. 2017;12(4):192-7.
8. Bansal M, Ojha T, Sharma P, Chhabra B, Sharma K, Trivedi B. Wet Versus Dry Temporalis Fascia Graft in Type 1 Tympanoplasty: A Randomized Study on Controversy. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 3):4467-71.
9. Shrikrishna BH, Poornima Ramesh M. Comparitive Study on Impact of Dry (Rigid) Versus Wet (Soft) Graft on the Outcome of Type 1 Tympanoplasty. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 1):16-20.
10. Jiang Z, Lou Z. Impact of the nature of the temporalis fascia graft on the outcome of type I underlay tympanoplasty. J Laryngol Otol. 2017;131(6):472-75.
11. Albazee E, Abdelaziz A, Magzoub H, et al. Dry versus wet temporalis fascia graft in type-I tympanoplasty: a systematic review and meta-analysis of randomized controlled trials. Eur Arch Otorhinolaryngol. 2023;280(3):1005-15.
12. Singh GB, Kumar D, Aggarwal K, Garg S, Arora R, Kumar S. Tympanoplasty: does dry or wet temporalis fascia graft matter? J Laryngol Otol. 2016;130(8):700-5.
13. Sharma S, Rawat DS, Aseri Y, Trivedi GP, Verma PC, Singh BK. A Prospective Randomized Study to Compare Surgical Outcome Using Wet and Dry Temporalis Fascia Graft in Type I Tympanoplasty. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 1):229-33.
14. Nagar A, Prajapati S, Rawat DS, Aseri Y. Comparison of endoscopic tympanoplasty, cartilage vs. temporalis fascia in chronic suppurative otitis media with inactive mucosal disease: A prospective randomised study. Eur Arch Otorhinolaryngol. 2024;281(12):6377-83.
15. Yang T, Wu X, Peng X, Zhang Y, Xie S, Sun H. Comparison of cartilage graft and fascia in type 1 tympanoplasty: systematic review and meta-analysis. Acta Otolaryngol. 2016;136(11):1085-90.
16. Han Y, Yang R, Mao X, et al. Comparison of the Impacts of Different Middle Ear Mucosal Conditions on Type I Tympanoplasty Outcomes. J Otolaryngol Head Neck Surg. 2024;53:19160216241267724.
17. Kim DJ, Lee HM, Choi SW, Oh SJ, Kong SK, Lee IW. Comparative study of endoscopic and microscopic tympanoplasty performed by a single experienced surgeon. Am J Otolaryngol. 2021;42(1):102788.
18. Stefan I, Stefanescu CD, Vlad AM, Zainea V, Hainarosie R. Postoperative Outcomes of Endoscopic versus Microscopic Myringoplasty in Patients with Chronic Otitis Media-A Systematic Review. Medicina (Kaunas). 2023;59(6):1074.
19. Renard L, Aussedat C, Schleich M, tran Trinh T, Bakhos D. Evaluation of Postoperative Practices Regarding Packing of the External Auditory Canal. J Int Adv Otol. 2022;18(2):145-9.
20. Schick B, Dlugaiczyk J. Surgery of the ear and the lateral skull base: pitfalls and complications. GMS Curr Top Otorhinolaryngol Head Neck Surg. 2013;12:05.

ISSN (O): 2687-5365; ISSN (P): 2753-6556