

Evaluation of graft uptake in underlay myringoplasty using dry and wet temporalis fascia graft

Md Hasanul Haque, AHM Zahurul Huq, Nigar Sultana, Tanvir Ahmed, Abirvab Naha, Md Abdur Razzak, Mohammad Jahidur Rahman Khan, Md Jaber Al Sayied

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Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka (MHH, AHMZ, TA, AN); Directorate General of Health Services, Dhaka (NS); Shaheed Tajuddin Ahmad Medical College, Gazipur (MAR); Department of Microbiology, Shaheed Suhrawardy Medical College, Dhaka (MJR), Mugda Medical College & Hospital, Dhaka (JAS)

For Correspondence:

Dr. Md. Hasanul Haque
Email: hasanul.nipun@gmail.com

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Abstract

Chronic otitis media (COM) is a vital cause of deafness worldwide. Myringoplasty is one of the best treatment options for COM (inactive mucosal variety). Temporalis Fascia is the most favored grafting material among various autografts, which can be used as dry or wet depending upon the Surgeon's choice. The main focus of this study is to compare the graft uptake rate by using dry and wet temporalis fascia by underlay technique. This cross-sectional comparative study was directed from January 2018 to June 2019 at the Department of Otolaryngology-Head & Neck Surgery of BSMMU, Dhaka. All consecutive cases of COM (inactive mucosal) who underwent surgery were randomly assigned either into the dry (Group-A) or wet temporalis fascia group (Group-B). At 12 weeks follow-up, the density of graft failure (4.4% vs. 8.8%) and retraction pocket (0% vs. 2.2%) were higher in the wet procedure. However anterior blunting (2.2% vs. 2.2%) were the same in both procedures, and medialization (2.2% vs. 0%) were more in the dry procedure. Air Bone Gap (ABG) improved significantly in both groups following operation but reduced in Group-A more significantly than Group-B. On the other hand, there was no remarkable difference in successful graft uptake between the groups (Dry group-91.12% vs. wet group-84.44%, $p>0.05$). No graft material is superior to others in terms of graft uptake.

Introduction

Chronic otitis media (COM) defines a permanent defect of the tympanic membrane (TM), either pars tensa or pars flaccida or both with or without discharge. It may be due to the sequel of acute otitis media, otitis media with effusion, negative middle ear pressure, trauma, or iatrogenic.¹ COM is the most common ear disease in developing countries like Bangladesh due to poverty-stricken socioeconomic conditions, lack of health awareness, less nutritious food, living in the slum area, and unhygienic social habits.² The prevalence of COM is 6.2% in Bangladesh which is the vital cause of deafness.² The types of perforation depend on the size and shape of the perforation and involvement of the margin.³

Management options for COM remain medical management, surgery, hearing aid, or no treatment based on its classification.¹ However, in the modern world, myringoplasty is a well-accepted surgery for

inactive mucosal COM (dry perforation).⁴ The term myringoplasty implies repairing of tympanic membrane alone without ossicular reconstruction.⁵ During the evolution of Myringoplasty, choosing an appropriate graft material was very difficult, which, nowadays, is also in an argument.

Various autologous grafts like temporalis fascia, perichondrium, vein wall, cartilage, fat, and fascia lata are randomly used in reconstructing TM perforation. Graft uptake rate and hearing improvement vary by using those graft materials. However, due to the anatomical location of Temporalis Fascia, semi-transparency, elasticity, viability, graft harvesting and preparation time, and finally, graft taken rate and hearing improvement, it is the most favored graft among the Otolologists. The effective graft taken rate by Temporalis Fascia is approximately 90-95% in primary Tympanoplasties.³ Graft failures are due to infection, graft displacement, autolysis, hematoma, improper placement, and Eustachian tube dysfunction. Some otologists

place temporalis fascia in the wet form; on the other hand, another group places it when it becomes dry.

The dry graft group suggests that it is easy to slide and place underneath the tympanomeatal flap. The graft uptake rate is better due to its low metabolic rate and rich collagen material. Whereas the wet graft group implies the opinion that wet graft has a higher number of fibroblast nuclei, is easy to place and dry fascia may devitalize after drying and may lose its contact surface when it is positioned in the moist atmosphere of the middle ear and ultimately leads to graft failure.³

Jiang and his team conducted a study and concluded that dry or wet graft did not hamper the graft uptake rate but using wet graft may reduce the time of surgery.⁵ On the other hand, Singh and his fellow researcher found graft uptake rate is 82% and 90% in dry and wet groups, respectively.⁶ Alkan et al. reported that graft uptake rate is 91.4% and 88.6% in wet and dry groups, respectively, and finally ended that dry or wet fascia does not hamper the success of Myringoplasty, but wet graft can reduce the time duration of surgery.⁷

Very few studies have been carried out worldwide, and no research in Bangladesh has been done comparing the success rate of graft uptake using dry and wet temporalis fascia. So, this study evaluated the success rate of graft uptake by using dry and wet Temporalis Fascia grafts. This analysis will help the Otolologist select the appropriate graft material for Myringoplasty.

Methods

This cross-sectional comparative study was performed from January 2018 to June 2019 in the Department of Otolaryngology-Head and Neck Surgery of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. A total of ninety patients (N=90) who fulfilled inclusion and exclusion criteria were selected. All consecutive cases of COM (inactive mucosal) underwent surgery in the Department of Otolaryngology-Head & neck surgery of BSMMU randomly grouped into Group- A and Group- B. Odd number of subjects were grouped into "Group A" (dry temporalis fascia group), and even number subjects were grouped into "Group B" (wet temporalis fascia group).

After getting permission from the Institutional Review Board of BSMMU, all cases diagnosed as Inactive Mucosal COM during admission at the Department of Otolaryngology-Head & neck surgery were thoroughly evaluated. Detail history was taken and clinical examinations were done to detect the size and site of tympanic membrane perforation and eliminate other ear defects. The size of perforations was classified as small (0-8mm²), medium (8.1-30mm²) and large (\geq 30.1mm²) [Calculated by the following formula- Area of perforation in mm²= 90×percentage perforation/100]¹⁸. Tympanometry and X-ray of the mastoid town's view and other investigations

for the general anesthesia were also done. After taking proper written informed consent from the patients who fulfilled the inclusion criteria, Myringoplasty was performed under general anesthesia. A post-auricular method with the underlay grafting technique of Temporalis Fascia was made in all subjects.

In the case of dry graft, after taking in the fascia, it was elicited to a thin constant layer and kept a few minutes over a hot water bowl until it became dry, whereas in the case of wet graft, soon after taking in the graft, it was dipped in normal saline containing bowl. In both groups, grafts were placed by the underlay technique. High-volume otologists from the Department of Otolaryngology-Head & Neck Surgery of BSMMU performed the operations.

After six weeks and 12 weeks of surgery, all patients were followed up to evaluate graft uptake. When there was no re-perforation, medialization, retraction pocket or anterior blunting of the tympanic membrane, they were declared successful graft uptake assessed by otomicroscopic examination.⁴

Statistical Package for Social Sciences (SPSS-22.0) software was used to analyze the numerical data and a predesigned data collection form was used for recording data. A comparison of the proportions was made with Chi-square tests. A p-value <.05 was considered statistically significant.

Results

Maximum 42.20% (19) in group A and 46.70% (21) in Group B were in the 18-28 years age group. In Group A, 28.90% (13), 17.80% (8), and 11.1% (5) patients were in the 29-39 years, 40-50, and 51-55 years age groups, respectively. In Group B, 26.70% (12), 17.80% (8), and 8.9% (4) were in the 29-39 years, 40-50, and 51-55 years age group, respectively. (Figure-1) In Group A, the mean age was 34.16(\pm 10.85) years and in Group B, 33.44(\pm 10.06) years; and among the total (90) number of patients, mean age was 33.80(\pm 10.41) years.

In Group A, 28 (62.22%) were male, and 17 (37.78%) were female, and in Group B, 26 (57.78%) and 19 (42.22%) were male and female, respectively. Among our 90 patients, 54 (60%) were male, and 36 (40%) were female. Between the groups, there was no significant difference in sex distribution of patients. Among our 90 patients, 31 (34.44%), 26 (28.89%), 16 (17.78%), and 17 (18.89%) patients had pond water, river water, tape, and tube well water bathing habit, respectively.

Among 90 cases, 33.33% and 44.44% had hearing impairment in Groups A and B, respectively. Tinnitus was present in 22.2% of patients in Group A and in 17.8% of patients in Group B. Distribution was statistically similar across the groups .

Out of 90 study cases, 22 (24.44%) had anterior perforation, 19 (21.11%) had posterior perforation, and 49 (54.44%) had both

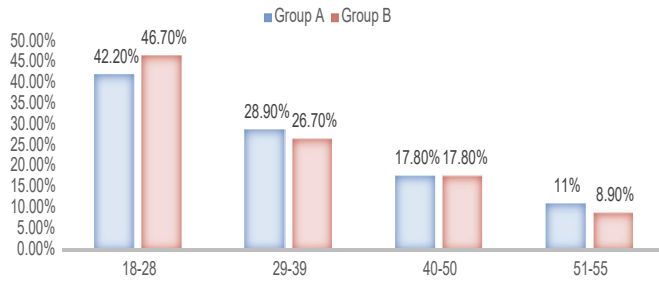


Figure 1: Age distribution of the subjects (N=90)

anterior and posterior perforation. No significant variation was there between the groups ($p > 0.05$).

After six weeks in Group A, one patient developed graft failure, and another had anterior blunting. No patients had developed retraction pocket and medialization. On the other hand, after six weeks, two patients of group B had developed graft failure, and one patient had anterior blunting. After six weeks, no patients had developed retraction pocket and medialization in Group B (Table-I).

In Group A, two patients and Group B, four patients had developed graft failure after 12 weeks. In Group A, one patient had developed anterior blunting, and one patient had developed medialization. No patient had developed a retraction pocket. On the other hand, after 12 weeks in Group B, 2 and 1 patients had developed retraction pocket and anterior blunting, respectively. No patients had developed medialization. (Table-II).

In Group A, the successful graft uptake rate was 91.12%, and in Group B successful graft uptake rate was 84.44%. Although the p-value is not statistically substantial, but the success rate was relatively high in Group A than in Group B. (Table-III).

| Table-I | | | | | |
|--|-----|------------------------|------------------------|----------------------|---------|
| Status of Tympanic Membrane after 6 weeks of operation in relation to types of graft that have been used (N=90). | | | | | |
| Status of TM after six weeks | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| Graft Failure | Yes | 1(2.22) | 2(4.44) | 3(3.33) | 0.557* |
| | No | 44(97.78) | 43(95.56) | 87(96.67) | |
| Retraction pocket | Yes | 0(0) | 0(0) | 0(0) | NA |
| | No | 45(100) | 45(100) | 90(100) | |
| Anterior Blunting | Yes | 1(2.22) | 1(2.22) | 2(4.44) | 1* |
| | No | 44(97.78) | 44(97.78) | 88(97.77) | |
| Medialization | Yes | 0(0) | 0(0) | 0(0) | NA |
| | No | 45(100) | 45(100) | 90(100) | |

*Chi-squared Test (χ^2) was performed to compare between two groups

Before surgery in both groups, most patients had type B Tympanogram. In Group A, type B Tympanogram was found in 95.55% of patients, and in group B, B type Tympanogram was found in 93.33% of patients. However, after 12 weeks of operation, A tympanogram was found in 91.12% of patients in Group A and 84.44% of patients in Group B. (Table-IV).

| Table-II | | | | | |
|---|-----|------------------------|------------------------|----------------------|---------|
| Status of Tympanic Membrane after 12 weeks of operation in relation to types of graft that have been used (N=90). | | | | | |
| Status of TM after 12 weeks | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| Graft failure | Yes | 2(4.44) | 4(8.88) | 6 (6.66) | 0.398* |
| | No | 43(95.56) | 41(91.12) | 84(93.34) | |
| Retraction pocket | Yes | 0(0) | 2(4.44) | 2(2.22) | NA |
| | No | 45(100) | 43(95.56) | 88(97.78) | |
| Anterior Blunting | Yes | 1(2.22) | 1(2.22) | 2(2.22) | 1* |
| | No | 44(97.78) | 44(97.78) | 88(97.78) | |
| Medialization | Yes | 1(2.22) | 0(0) | 1(1.11) | NA |
| | No | 44(97.78) | 45(100) | 89(98.89) | |

*Chi-squared Test (χ^2) was performed to compare between two groups

Successful graft uptake rate was statistically significantly ($p=0.036$) higher in young patients than relatively older patients. The successful graft uptake rate in 18-28 years, 29-39 years, 40-50 years, and 51-55 years age group were 95%, 92%, 75%, and 66.67%, respectively.

| Table-III | | | | | |
|--|--|------------------------|------------------------|----------------------|---------|
| Successful graft uptake in Group A and Group B (After 12 weeks) (N=90) | | | | | |
| Graft uptake | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| Yes | | 41(91.12) | 38(84.44) | 79(87.78) | 0.315* |
| No | | 4(8.88) | 7(15.56) | 11(12.22) | |

*Chi-squared Test (χ^2) was performed to compare between two groups

In between two groups, the successful graft uptake rate in 18-28 years, 29-39 years, 40-50 years, and 51-55 years, age group were 18(40%) & 20(44.44%), 12(26.66%) & 11(24.44%), 7(15.55%) & 5(11.11%), 4(8.88%) & 2 (4.44%) in Group A and Group B respectively but not statistically significant. (Table-V).

In between two groups, the successful graft uptake in small, medium, and large size perforation were 11(24.44%) & 9(20%), 20(44.44%) & 19(42.22%), 10(22.22%) & 10(22.22%) in Group A and Group B respectively which is not statistically significant. (Table-VI).

Table-IV

| Tympanogram findings in Group A and Group B (N=90) | | | | | |
|--|--------|------------------------------|------------------------------|----------------------------|---------|
| Tympanogram | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| Before Operation | Type A | 0(0) | 0(0) | 0(0) | 0.645* |
| | Type B | 43(95.55) | 42(93.33) | 85(94.44) | |
| After operation | Type C | 2(4.44) | 3(6.66) | 5(5.55) | |
| | Type A | 41(91.12) | 38(84.44) | 79(87.78) | 0.334* |
| | Type B | 4(8.88) | 7(15.56) | 11(12.22) | |
| | Type C | 0 | 0 | 0 | |

*Chi-squared Test (χ^2) was performed to compare between two groups

Table-V

| Complete graft uptake in correspondence to the age of the subjects in between two Groups (N=90) | | | | | |
|---|-----|------------------------------|------------------------------|----------------------------|---------|
| Age of the subjects (years) | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| 18-28 | Yes | 18(40) | 20(44.44) | 38(44.22) | 0.942* |
| | No | 1(2.2) | 1(2.22) | 2(2.22) | |
| 29-39 | Yes | 12(26.66) | 11(24.44) | 22(24.44) | 0.952* |
| | No | 1(2.22) | 1(2.22) | 2(2.22) | |
| 40-50 | Yes | 7(15.55) | 5(11.11) | 12(13.33) | 0.248* |
| | No | 1(2.22) | 3(6.66) | 4(4.44) | |
| 51-55 | Yes | 4(8.88) | 2(4.44) | 6(6.66) | 0.342* |
| | No | 1(2.22) | 2(4.44) | 3(3.33) | |

*Chi-squared Test (χ^2) was performed to compare between two groups

Table-VI

| Successful graft uptake in correspondence to the size of perforation in between two groups (N=90) | | | | | |
|---|-----|------------------------------|------------------------------|----------------------------|---------|
| Size of the Perforation | | Group A (N=45) No. (%) | Group B (N=45) No. (%) | Total (N=90) No. (%) | p-value |
| Small(0-8mm2) | Yes | 11(24.44) | 9(20) | 20(22.22) | NA |
| | No | 0(0) | 1(2.22) | 2(1.11) | |
| Medium(8.1-30 mm2) | Yes | 20(44.44) | 19(42.22) | 39(43.33) | 0.971* |
| | No | 1(2.22) | 1(6.66) | 4(4.44) | |
| Large(\geq 30.1mm2) | Yes | 10(22.22) | 10(22.22) | 20(22.22) | 1 |
| | No | 3(6.66) | 3(6.66) | 6(6.66) | |

*Chi-squared Test (χ^2) was performed to compare between two groups

Discussion

Chronic otitis media (COM) is a significant ear problem worldwide in developing countries like Bangladesh. It is also a common cause of deafness in Bangladesh.⁸ Chronic otitis media (COM) can be classified into several groups. Inactive COM is one of them. In inactive mucosal COM, there is a permanent defect in the pars tensa, but the middle ear and mastoid mucosa are not inflamed. Myringoplasty operation can seal this perforation. Different autografts can be used for Myringoplasty. Temporalis Fascia is the most suitable grafting material for its anatomical proximity, thinness, and translucency.⁹ Some Otolologists favored it as dry form, whereas others liked it as wet form. This study explore and compare the success rate (graft uptake rate) using the underlay technique by dry and wet temporalis fascia graft. This cross-sectional comparative study was performed on patients admitted with COM (Inactive Mucosal) in the Department of Otolaryngology-HNS of BSMMU, Dhaka. A total of ninety subjects were subdivided into two groups. Group A and Group B were included in the study. Each Group had 45 cases.

Among 90 study cases, 40 (44.44%) cases had an age between 18-28 years, and 25 (27.78%) patients had an age between 29-39 years, 16 (17.78%) patients had an age between 40-50 years and only 9 (10%) patients had an age between 51-55 years. There was no major difference in age distribution between the groups ($p=0.969$). Das and co-researcher also found the maximum number of patients in the 21-30 years age group in their study regarding myringoplasty.¹⁰ During the study, inactive COM was found more common in the male than the female population. Among the patients, 60% were male and 40% were female. A study by Aich and associates found similar results in their case study.¹¹ In their study, the percentage of male patients was 56%, and the percentage of female patients was 46%.

During the study, 57 (63.33%) patients had a history of bathing in pond water and river water. Moreover, 36.67% of patients had bathed in tube-well water or tap water. So, the incidence of COM was found more common in patients using the pond and river water for their bath. This finding is similar to the discovery of Islam and his colleagues.¹² Their study also found that the condition was more common in those who had a bath in the pond or river water.

Among the cases, 24.44% had anterior perforation, 21.11% had posterior perforation, and 54.44% cases had both anterior and posterior perforation. So, maximum patients had both perforations. There was no gross difference in the types of perforation ($p=0.720$) between the groups. Jaiswani and co-researcher also found similar results in their study.¹³ In their study, a maximum (66.25%) of patients had both anterior and posterior perforation, 16.25% of patients had anterior perforation, and 17.5% had posterior perforation.

Among 90 patients, 47.78% had medium size, 23.33% had a small size, and 28.89% had large perforation. In total, 46.7% and 48.9% of Group A and Group B patients had medium-sized perforation, respectively. Small size perforation was present in 24.4% and 22.2% of patients in Group A and Group B, respectively. Large perforation was found in 28.9% of groups A and B patients. Between groups, there was no noteworthy ($p>0.965$) difference in perforation size. In our study, graft uptake was better in small-sized perforations than in medium and large-sized perforations but not statistically significant. A study conducted by Sarkar also found similar results in their research.¹⁴ Among their 60 cases, a maximum of 25 (41.67%) had medium size perforation, 13 (21.67%) had small size perforation, and 22 (36.67%) patients had large perforation, and graft uptake was better in small size perforation.

A total of 6 patients had graft failure after 12 weeks of surgery. Among them, two (2) were in group A, and four (4) were in group B. Retraction pocket had developed in 2 patients from Group- B. Anterior blunting in 2 patients, one from each Group. One patient developed Medialization from Group-A. The final success rate of Group A was 91.12% and Group B was 84.44%. From this result, we can comment on the outcome of Group A that these patients might be better than Group B patients. This finding is similar to the discovery of Loock and co-researcher.¹⁵ Their study found that the successful graft uptake rate in the dry graft group was 89% and 84% in another group. Aslan also found a similar result. However, Alkan found that the rate of successful graft uptake is 88.6% and 91.4% in the dry and wet groups, respectively.

Before the operation, the mean ABG was 24.33(± 4.24) dB in Group A and 24.96(± 3.61) dB in Group B. After the operation, the mean ABG was 12.96 ± 2.91 dB in Group A and 16.67 ± 3.79 dB in Group B. After the operation, the mean air-bone gap was significantly (p -value < 0.001) reduced in both groups. In between the groups, the mean Air Bone Gap (ABG) relatively decreased more in Group A than in Group B (p -value < 0.001). A study conducted by El-sheikh also found similar results in his research.¹⁶ In his analysis, the mean ABG before the operation was 25 ± 10.2 and became 13.5 ± 7.3 dB after the operation. This finding is similar to this study.

This study reveals that the graft uptake rate was significantly (p -value < 0.05) higher among the patients aged between 18-28 and 29-39 years. In the 18-28 years age group, the success rate was 95% and in 29-39 years was 92%. So, in both groups, the success rate was above 90%. However, the success rate dramatically decreased with age. In the 40-50 years age group, the success rate was 75%, and in the 51-55 years age group, the success rate was 66.67%. These findings are similar to the investigation of Jaiswani and his colleague.¹³ Their study found successful graft uptake after Myringoplasty operation in 100% of patients in 21-30 years and 31-40 years age group. At the same time, the success rate was only 66.7% in the 41-50

years age group. Long-lasting inflammation and accompanying systemic diseases like DM and hypertension may be a possible cause of this relatively low graft uptake in elderly patients.¹⁷

Therefore, it can be said that dry and wet graft myringoplasty can improve patients' condition significantly. Nevertheless, dry graft might have a relatively better outcome in myringoplasty by wet graft.

There were a few limitations of this research, such as the small sample size, operations were not performed in a single hand, the Surgeon himself did not do follow-up, and long-duration follow-ups were not performed.

Conclusion

Considering the non-significant difference of graft uptake among the groups, it can be concluded that no graft material is superior to others, but hearing improvement is better in the dry fascia group.

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Conflict of Interest

The Authors declared no conflict of interest.

References

1. Browning GG. Aetiopathology of inflammatory conditions of the external and middle ear. *Scott-Brown's Otolaryngology*. 1997 ;3:15-28
2. Tarafder KH, Akhtar N, Zaman MM, Rasel MA, Bhuiyan MR, Datta PG. Disabling hearing impairment in the Bangladeshi population. *The Journal of Laryngology & Otology*. 2015;129(2):126-35.
3. Singh B, Baka N, Kumar N, Purohit JP. Study of various grafts in closure of tympanic membrane perforation. *Scholars Journal of Applied Medical Sciences*. 2015;3(3G):1509-15.
4. Islah SA, Palliyalipadi TB. Evaluation of graft uptake in type 1 tympanoplasty with dry and wet temporalis fascia graft. *JEMDS*. 2016;5(104):7684-9.

6. Singh GB, Kumar D, Aggarwal K, Garg S, Arora R, Kumar S. Tympanoplasty: does dry or wet temporalis fascia graft matter?. *The Journal of Laryngology & Otology*. 2016; 130(8): 700-5.
 7. Alkan S, Baylançecek S, Sözen E, Başak T, Dadaş B. Effect of the Use of Dry (Rigid) or Wet (Soft) Temporal Fascia Graft on Tympanoplasty. *Journal of Otolaryngology-Head & Neck Surgery*. 2009;38(1).
 8. Hossain MA, Sarker MZ, Bhuiyan MA, Alam KN, Al Harun MA, Hanif MA. Results of Tympanomastoid surgery in CSOM with Cholesteatoma (Attico-Antral Variety)-A study of 30 cases. *Bangladesh Journal of Otorhinolaryngology*. 2014;20(1):20-6.
 9. Singh BJ, Sengupta A, Das SK, Ghosh D, Basak B. A comparative study of different graft materials used in Myringoplasty. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2009;61(2):131-4.
 10. Das A, Sen B, Ghosh D, Sengupta A. Myringoplasty: impact of size and site of perforation on the success rate. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2015;67(2):185-9
 11. Aich ML, Alam AK, Chandra Talukder D, Al Harun A, Abdullah M. Outcome of Myringoplasty. *Bangladesh Journal of Otorhinolaryngology*. 2009;15(2):40-4.
 12. Islam MR, Taous A, Hossain MM, Ekramuddaula AF, Islam MS. Comparative study of tubotympanic and atticoantral variety of chronic suppurative otitis media. *Bangladesh Journal of Otorhinolaryngology*. 2010;16(2): 113-9.
 13. Jaiswani G, Kumar R. Impact of age on outcome of type 1 Tympanoplasty. *Otolaryngology Online Journal*. 2014;4(4):129-34.
 14. Sarker MZ, Ahmed M, Patwary K, Islam R, Joarder AH. Factors affecting the surgical outcome of Myringoplasty. *Bangladesh Journal of Otorhinolaryngology*. 2011; 17(2):82-7.
 15. Loock JW, Naude N. A randomized controlled trial comparing fresh, dried, and dried-then-rehydrated temporalis fascia in Myringoplasty. *Clinical Otolaryngology*. 2008;33(2):97-101.
 16. El-Sheikh MM. Evaluation of hearing the outcome of tympanoplasty using cartilage graft versus temporalis fascia graft. *The Egyptian Journal of Otolaryngology*. 2019;35(1):1.
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