Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Otolaryngology

Hearing Outcome of Type 1 Tympanoplasty with Cartilage-Perichondrium Graft in comparison with Temporalis Fascia Graft

Dr. Md. Mahmudur Rahman[1*], Dr. Md. Amzad Hossain[2], Dr. Shihab Uddin[3], Dr. Syed Imtiaj Uddin[4], Dr. Maruf Mohammad[5], Dr. Muhiuddin Maruf[6], Dr. Foyezur Rahman[7], Dr. Runa Akhter Dola[8], Dr. Md. Saiful Islam Sakil[9], Dr. Khandaker Md. Shahidullah[10]

[1]Assistant Surgeon, Department of Otolaryngology & Head- Neck Surgery, 250 Bed General Hospital, Munshiganj, Bangladesh
[2]Outdoor Medical Officer, Department of Otolaryngology & Head- Neck Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh
[3]Assistant Registrar, Department of Otolaryngology & Head- Neck Surgery, Mymensingh Medical College, Hospital, Mymensingh, Bangladesh
[4]Assistant Registrar, Department of Otolaryngology & Head- Neck Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh
[5]Registrar, Department of Otolaryngology & Head- Neck Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh
[6]OSD, DGHS, Department of Otolaryngology & Head- Neck Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh
[7]Medical Officer, Upazilla Health Complex, Homna, Cumilla, Bangladesh
[8]Junior Consultant, OSD, Director General of Health Services, Mohakhali, Dhaka, Bangladesh
[9]Resident Surgeon, Department of Otolaryngology & Head- Neck Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh
[10]Assistant Registrar, Department of Otolaryngology & Head- Neck Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh

DOI: https://doi.org/10.36347/sjams.2025.v13i02.008 | **Received:** 22.12.2024 | **Accepted:** 27.01.2025 | **Published:** 03.02.2025

***Corresponding author:** Dr. Md. Mahmudur Rahman
Assistant Surgeon, Department of Otolaryngology & Head- Neck Surgery, 250 Bed General Hospital, Munshiganj, Bangladesh.
Email: raahman.mahmud@gmail.com

Abstract **Original Research Article**

Background: Chronic otitis media (COM) is characterized by recurrent ear discharge and hearing loss secondary to tympanic membrane perforation. Type 1 tympanoplasty is the reconstruction of a perforated tympanic membrane with an intact and mobile ossicular chain. Among various autologous graft materials, temporalis fascia and tragal cartilage are commonly used. ***Objectives:*** The study determined to compare the hearing outcomes between tragal cartilage-perichondrium graft and temporalis fascia graft in type 1 tympanoplasty. ***Methodology:*** A quasi-experimental study included 60 cases of inactive chronic otitis media which was carried out in a tertiary care center. They were allocated into two groups of 30 patients each and were subjected to tympanoplasty using either tragal cartilage-perichondrium (group A) or temporalis fascia graft (group B) from 1st July 2022 to 30th June 2023. ***Results:*** In both groups, there was a statistically significant improvement in terms of mean air conduction threshold and a decrease in mean ABG postoperatively. The PTA changes in terms of success (P>0.05) showed no statistically significant difference between the groups. ***Conclusion:*** Both temporalis fascia and tragal cartilage-perichondrium are suitable graft materials for type 1 tympanoplasty and hearing gain through the tragal cartilage-perichondrium graft was better than the temporalis fascia.
Keywords: Cartilage, Fascia, Graft, Tympanoplasty, Air-bone gap, Hearing gain.

INTRODUCTION

Hearing is a fundamental need of the human body and one of the most important basic senses among the five. Deafness and hearing impairment have become an alarming global issue; in 2024, WHO predicted that nearly 2.5 billion people will have some degree of hearing impairment by 2050 [1]. In Bangladesh, approximately 6.2% of the population suffers from hearing disabilities [2]. Middle ear infections, excessive noise, inappropriate use of certain drugs, problems during childbirth, and vaccine-preventable infections are some of the most prominent preventable causes of hearing impairment in low and middle-income countries. Some studies revealed the incidence of otitis is almost 80% in children who experience at least one episode of acute otitis media within their third birthday and 40% of children face six or more recurrences by the age of seven years [3]. Chronic Otitis Media (COM) is the most familiar health issue that creates long-term incurable problems like perforation in the eardrum or middle-ear

infections [4]. It can be influenced by poor living standards, overcrowding, lack of personal hygiene, malnutrition, smoking, lack of health education, bottle feeding in the supine position, repeated upper respiratory tract infection of viral origin, and lack of access to the healthcare system and described as a community health problem in developing countries like Bangladesh [5,2]. Tympanoplasty is a potential surgical procedure for patients with Chronic Otitis Media (COM) and involves restoration of the physiological structure of the middle ear and prevention of COM by dry ear [6]. Type-1 Tympanoplasty with cartilage-perichondrium is a surgical method of repairing perforated eardrum. People excluded from other causes of ear diseases can benefit from the procedure and the success rate is reported 77.8% in Pakistan [7]. On the contrary, tympanoplasty with the placement of a graft in the eardrum provides a foundation for new tissue growth and reports a 91.6% success rate in India (Ali Kouhi, 2018). The postoperative dimensions of temporal fascia are unpredictable, whereas, cartilage, has a constant shape, is firmer than fascia, and does not contain fibrous tissue so postoperative dimensions are predictable [9]. Cartilage shield graft is preferred in cases of large perforation, revision surgery, tympanosclerosis, tympanic membrane atelectasis, and Eustachian tube dysfunctions but due to its thick and rigid structure, cartilage can affect the pliability of the tympanic membrane and result in inferior hearing outcome. Cartilage with perichondrium on the other hand overcomes the shrinking problem of temporalis fascia graft in large and subtotal perforation. The study aimed to assess the Hearing outcome of Type 1 Tympanoplasty with Cartilage-Perichondrium Graft and Temporalis Fascia Graft and compare the surgical outcome in terms of graft uptake rate and hearing improvement at the end of 8 weeks after surgery.

METHODOLOGY

A year long Quasi-Experimental study on hearing outcomes took place in the department of Otolaryngology and Head-Neck Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka in the timeline of July 2022 to June 2023. A sum of 60 patients with inactive mucosal COM admitted to the Department of Otolaryngology and Head-Neck Surgery for operation were enrolled in this study by maintaining all ethical considerations. Patients were allocated into two groups. Group A (patients who were subjected to tympanoplasty with tragal cartilage) and Group B (patients who were subjected to tympanoplasty with temporalis fascia). All cases were operated under local or general anesthesia in SSMCMH. 30 patients from Group A underwent tympanoplasty with tragal cartilage and the rest of the 30 patients from Group B underwent tympanoplasty with temporalis fascia through a postural or permeatal approach. Postoperative follow-up was done at the end of the end of 1st week, 2nd week, 4th week, and two months. A consecutive sampling technique was followed for sample collection and a pre-tested structured data collection sheet was prepared by reviewing previous studies on the problem of interest in patients with study-specific inclusion and exclusion criteria.

Inclusion criteria

- Age - patients from 15–55 years
- Gender–both male and female
- Inactive mucosal COM with central perforation
- Inactive mucosal COM with pure conductive hearing loss in PTA with patent ET

Exclusion criteria

- Patients below 15 years and above 55 years
- COM with attic perforation, ossicular discontinuity or disruption
- Those having sensorineural hearing loss or mixed hearing loss
- PTA threshold average more than 55 dB
- History of Previous ear surgery
- Uncontrolled systemic diseases (eg – DM, HTN)

The data were calculated in an Excel spreadsheet and statistical analyses were carried out by using the Statistical Package for Social Science version (22.0) for analysis. P-value<0.05 is considered statistically significant for this study and study variables were analyzed using descriptive statistics.

RESULTS

Table I: Distribution of the study subjects according to age in two groups (N=60)

Age (years)	Temporalis fascia	Cartilage	p-value
15-24 Yrs.	6 (20.0)	4 (13.3)	0.630
25-34 Yrs.	11 (36.7)	11 (36.7)	
35-44 Yrs.	11 (36.7)	10 (33.3)	
45–55 Yrs.	2 (6.7)	5 (16.7)	
Mean ± SD	28.93 ± 8.74	31.23 ± 9.17	0.324

Table I shows the age distribution of the study subjects in two groups. The mean age of the temporalis fascia group was 28.93 ± 8.74 years and the cartilage group was 31.23 ± 9.17 years. There was no significant difference in age between the two groups.

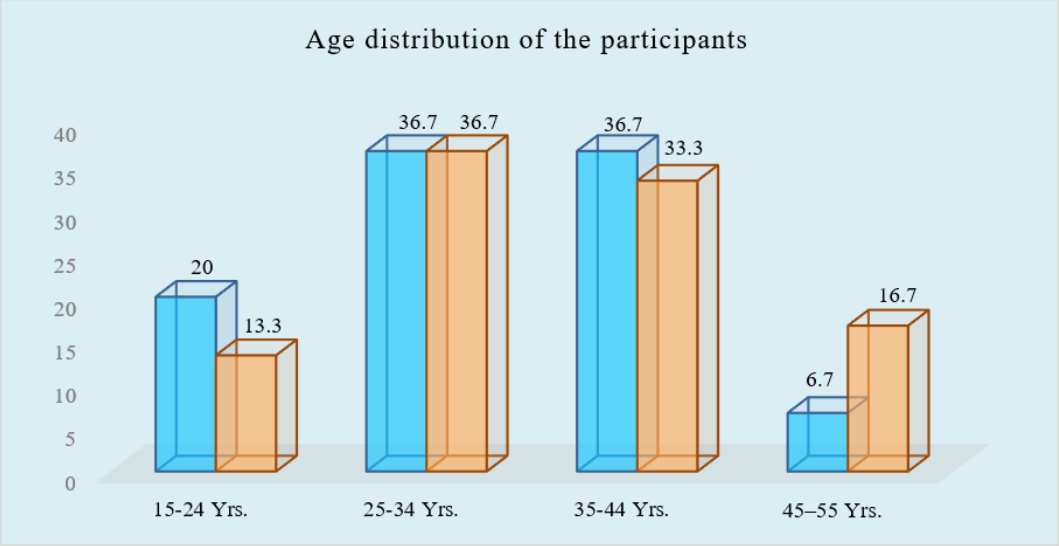

Figure I: Column chart showed age wise patients' distribution (N=60)

Table II: Distribution of the study subjects according to gender in two groups (n=60)

Gender	Temporalis fascia	Cartilage	p-value
Male	12 (40.0)	14 (46.7)	0.602
Female	18 (60.0)	16 (53.3)	

Table II shows the gender distribution of the study subjects in two groups. Female predominance was observed in both groups. There was no significant difference in gender between the two groups.

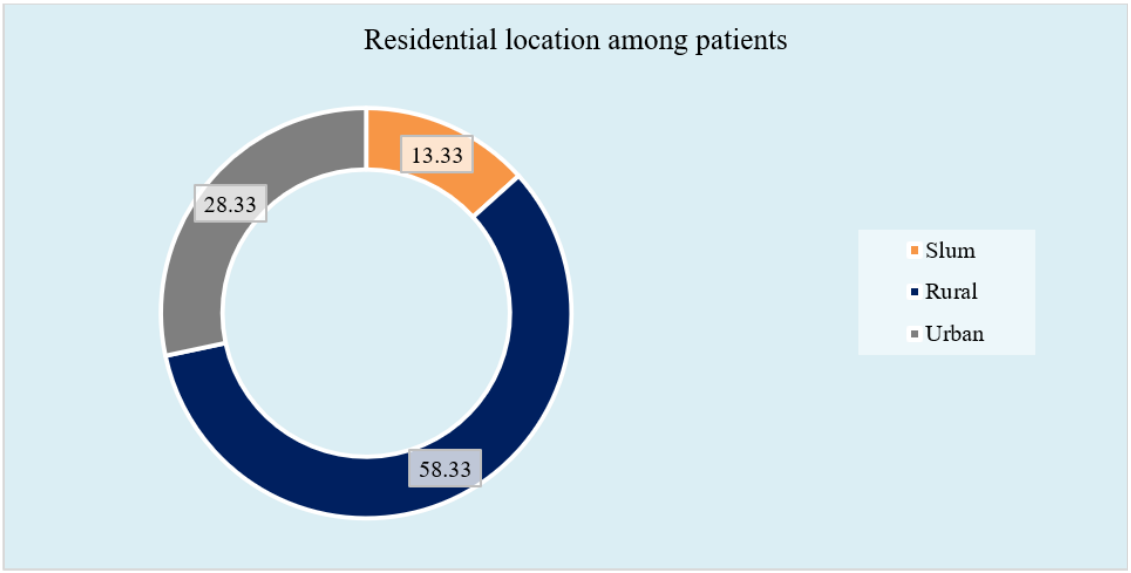

Figure II: Ring chart showed distribution of patients by residential location (N=60)

Table III: Pre and postoperative Pure Tone Audiometry-Air Bone gap (N=60)

Pre & Post Op ABG and Gain	Temporalis fascia	Cartilage	p-value
Preoperative PTA-AB Gap (dB)	26.27 ± 7.21	32.03 ± 6.44	0.002
Postoperative PTA-AB Gap (dB)	18.52 ± 6.02	21.41 ± 4.93	0.047
ABG gain (dB)	7.74 ± 5.81	10.62 ± 4.56	0.037

Table III shows pre & postoperative PTA-AB Gap and ABG gain in two groups. ABG gain was significantly higher in the Cartilage group.

Table IV: Graft taken in two groups at 1 months (N=60)

Graft take	Temporalis fascia	Cartilage	p-value
Complete	29 (98.0)	28 (93.3)	1.000
Failure	01 (3.3)	02 (6.7)	
Residual pin point	0	1 (3.3)	1.000
Residual small	1 (3.3)	1 (3.3)	1.000

Table V: Graft taken in two groups at 2 months (n=60)

Graft take	Temporalis fascia	Cartilage	p-value
Complete	27 (90.0)	28 (93.3)	1.000
Failure	03 (10.0)	02 (6.7)	
Residual pin point	2 (6.7)	1 (3.3)	1.000
Residual small	1 (3.3)	1 (3.3)	1.000

Table VII: Postoperative complications of the study subjects in two groups (n=60)

Complication	Temporalis fascia	Cartilage	p-value
Otorrhoea	2 (6.7)	2 (6.7)	1.000
Wound infection	1 (3.3)	1 (3.3)	1.000
Perichondritis	0	1 (3.3)	1.000

Table VII shows the postoperative complications of the study subjects in two groups. Otorrhorea was found in 02 (6.7%) cases in both groups. Wound infection was found in 01 (3.3%) cases in both the temporalis fascia group and cartilage group. Perichondritis was observed in 01 (3.3%) case only in the cartilage group. Here P value was not significant.

DISCUSSIONS

Chronic Otitis Media is associated with tympanic membrane rupture and/or changes in the ossicular chain due to fixation or erosion caused by the chronic inflammatory process causes some degree of hearing loss in patients [10]. In patients with chronic otitis media, tympanoplasty is the most potential therapy to close the air-bone gap to within 20 dB HL in 7/10 and prevent hearing disabilities [11]. This study focuses on the hearing outcome and audiological gain when using tragal cartilage-perichondrium grafts in type 1 tympanoplasty compared with temporalis fascia grafts in patients suffering from inactive mucosal otitis media, also to evaluate the results of the study and to compare with similarly published studies. The study observed the mean age of the participants in the temporalis fascia group was 28.93 ± 8.74 years and the cartilage group was 31.23 ± 9.17 years. The majority (46%) of the participants belong to the 21-40 years of age group. A study conducted in North Ethiopia shows that most patients who suffer from COM are between the ages of 15-29 years [12]. Likewise, Swapna *et al.*, 2020 reported 49.6% of patients in an Indian study of the 20-29 age group about chronic otitis media which partially agrees with our study [13]. On the contrary, A Bangladeshi study in 2016 shares contradictory results stating the majority of the patients belong to the 11-20 years age group [14]. This study can be described as a female-dominated study with 56.67% of female participants in both groups and the male-female ratio here was 1:1.3. Although there is no significant difference in gender; a researcher reported that females were affected 1.8 times more commonly than males with COM [15]. Distribution of respondents by residential location showed that 58.33% of the patients came from rural areas, 28.33% from urban and 13.33% from slum areas. Mahfuz S. *et al.*, 2016 share similar findings with 75% of rural patients of COM in Bangladesh [14]. The objective assessment of hearing improvement was done by calculating the closure of the air-bone gap postoperatively in both groups. Both Group A or the temporal fascia group and Group B or the cartilage group showed significancy in the post-operative AB gap closure in two months with a p-value of 0.047 in 95% confidential intervals. Mean hearing gain was higher in the tragal cartilage group which yields 10.62 ± 4.56 dB while the temporalis fascia group had a mean hearing gain of only 7.74 ± 5.81 dB at the end of 2nd month. ABG gain was significantly higher in the cartilage group. This is in agreement with the study of Khan *et al.*, 2015 showed the overall success rate for primary cartilage tympanoplasty is higher when using cartilage than with temporalis fascia grafting [16]. The debate on tympanic membrane perforation closure can be concluded that both the temporalis fascia and tragal cartilage with perichondrium are acceptable graft materials for successful closure. The overall graft uptake and hearing improvement were better with cartilage than with temporalis fascia [17]. Out of 60 cases, 55 cases resulted in successful graft uptake. Grafting became a failure in 3.3% of cases in the temporalis fascia group and 6.7% of cases in the cartilage group at the end of 1st month. But after 02 months it was 10% in the temporalis fascia group and 6.7% cases in the cartilage group. One of them had re-perforation following allergic rhinitis and upper

respiratory tract infection. The cartilage graft showed better graft uptake compared to the temporalis fascia graft in the postoperative period, though this was not statistically significant; p-value>0.05. Likewise, Tan *et al.*, 2016 reported that cartilage (90.80%) has a significant closure rate compared with temporalis fascia (88.00%) [18]. Some other research also agrees with much potential closure rate of cartilage-perichondrium Graft tympanoplasty than temporal fascia tympanoplasty because of its resisting deformation nature from pressure variation [19,20]. This study measured postoperative complication rates where an insignificant result (p>0.05) was found in both groups.

LIMITATION

A comparisonal study requires a large study population from multiple sites to propose more accurate results which is the basic limitation of this study. Long-term follow-up with extended time intervals can be more acceptable method for this study.

CONCLUSION

Both cartilage and fascia showed good clinical outcomes in terms of anatomic success and hearing results and can be safely used in the reconstruction of tympanic membrane perforations as graft materials in type I tympanoplasty. Although both these graft materials can be effectively used for tympanic membrane reconstruction, hearing improvement was better with tragal cartilage. Improvement of AB gap after type I cartilage tympanoplasty was statistically significant. Graft uptake in tragal cartilage tympanoplasty was almost equivalent to temporalis fascia tympanoplasty. As a graft material tragal cartilage is better than temporalis fascia for hearing improvement in type-I tympanoplasty in inactive mucosal type of chronic otitis media.

REFERENCES

1. A M Aneesa, A. P. (2019). Outcome of Type 1 Tympanoplasty with Cartilage-perichondrium Graft in Comparison with Temporalis Fascia. *International Journal of Scientific Study, 6*(10), 62-67. Retrieved from ijss-sn.com/uploads/2/0/1/5/20153321/12_ijss_jan_oa12_-_2019.pdf
2. Aaran Lewis, B. V. (2021). Success rates in restoring hearing loss in patients with chronic otitis media: A systematic review. *Laryngoscope Investig Otolaryngol., 6*(3), 522–530. doi:10.1002/lio2.576
3. Abdurahaman Seid, F. D. (2013). Bacterial otitis media in all age group of patients seen at Dessie referral hospital, North East Ethiopia. *Egyptian Journal of Ear, Nose, Throat and Allied Sciences, 14*(2), 73-78. doi:https://doi.org/10.1016/j.ejenta.2013.02.005
4. Ali Kouhi, M. T. (2018). Results of Type I Tympanoplasty Using Fascia with or without Cartilage Reinforcement: 10 Years' Experience. *Iran J Otorhinolaryngol., 30*(97), 103–106. Retrieved from pmc.ncbi.nlm.nih.gov/articles/PMC5866489/pdf/ijo-30-103.pdf
5. Bijan Basak, G. C. (2014). Demographic profile of CSOM in a rural tertiary care hospital. *IOSR Journal of Pharmacy (IOSRPHR), 4*(6), 43-46. doi:10.9790/3013-040601043046
6. Deepika Verma, R. A. (2023). Comparative Study Between Hearing Outcome Of Temporalis Fascia Versus Tragal Cartilage Graft In Type 1 Tympanoplasty. *Journal Of Cardiovascular Disease Research, 14*(1), 0976-2833. Retrieved From jcdronline.org/admin/Uploads/Files/63d4e1f5365d57.43615730.pdf
7. Dr. Swapna U.P., D. S. (2020). Effectiveness of underlay myringoplasty in inactive mucosal chronic otitis media; a prospective study. *Med Res Rev., 8*(6), 398-03. doi:https://doi.org/10.17511/ijmrr.2020.i06.04
8. Estimates, B. o. (2012). Lorenzo Monasta, Luca Ronfani, Federico Marchetti, Marcella Montico, Liza Vecchi Brumatti, Alessandro Bavcar, Domenico Grasso, Chiara Barbiero, Giorgio Tamburlini. *PLoS One., 7*(4), e36226. doi:10.1371/journal.pone.0036226
9. Fazal I Wahid, S. R. (2019). Tympanoplasty Type-I using tragal perichondrium graft: Our experience. *Pak J Med Sci., 35*(4), 1076–1080. doi: 10.12669/pjms.35.4.421
10. Gaurav Chhabra, A. K. (2018). Comparative study of temporalis fascia graft versus cartilage shield tympanoplasty. *International Journal of Otorhinolaryngology and Head and Neck Surgery, 4*(4), 951-955. doi:https://doi.org/10.18203/issn.2454-5929.ijohns20182019
11. Howard E. LeWine, M. (2024, May). Chronic otitis media, cholesteatoma, and mastoiditis. Harvard Health Publishing. Retrieved from health.harvard.edu/a_to_z/chronic-otitis-media-cholesteatoma-and-mastoiditis-a-to-z
12. K Gyo, N. Y. (1990). Chronic otitis media and tympanoplasty in aged patients. *Auris Nasus Larynx., 17*(3), 141-8. doi:10.1016/s0385-8146(12)80074-5
13. M M Khan, S. R. (2015). Comparative study of sliced tragal cartilage and temporalis fascia in type I tympanoplasty. *J Laryngol Otol., 129*(1), 16-22. doi:10.1017/S0022215114003132
14. Md Mazharul Shaheen, A. R. (2012). Prevalence and associated socio-demographic factors of chronic suppurative otitis media among rural primary school children of Bangladesh. *Int J Pediatr Otorhinolaryngol., 76*(8), 1201-4. doi:10.1016/j.ijporl.2012.05.006
15. Md. Sirajul Islam Mahfuz, K. A. (2016). Prevalence

of Chronic Suppurative Otitis Media in Out Patient Department (OPD) in a District Level 250 Bedded General Hospital, Gopalganj, Bangladesh. *Bangladesh J Otorhinolaryngol., 22*(2), 102-109.

16. Organization, W. H. (2024, February). Deafness and hearing loss. Retrieved from www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss
17. OVAKINPELU, Y. E. (2008). Challenges in management of chronic suppurative otitis media in a developing country. *The Journal of Laryngology & Otology*, *122*, 16– 20. doi:10.1017/S0022215107008377
18. Pradeep Kumar Muniasamy, D. G. (2020). A comparative study of post-operative outcomes in type 1 tympanoplasty using tragal chondroperichondrial shield graft and temporalis fascia graft. *International Journal of Otorhinolaryngology and Head and Neck Surgery, 6*(5), 867–873. doi:https://doi.org/10.18203/issn.2454-5929.ijohns20201676
19. Sady Selaimen da Costa, L. P. (2009). Sensorineural hearing loss in patients with chronic otitis media. *Eur Arch Otorhinolaryngol., 266*(2), 221-4. doi:10.1007/s00405-008-0739-0
20. Tan H. E., P. L. (2016). Type I Tympanoplasty Meta-Analysis: A Single Variable Analysis. *Otology & Neurotology, 37*(7), 838–846.