ISSN 2996-5942

PATHOLOGY AND LABORATORY MEDICINE

Open Journal

Openventio PUBLISHERS

Original Research

The Efficacy of Open Mastoidectomy *Versus* Mastoidectomy with Temporalis Fascia Flap Obliteration

Shamsul Hadi, MPhil, CHR, CHPE, MBBS[1*]; Hafiza M. Shahzadi, MPhil, BDS[2]; Fazal Hanan, MPhil, MBBS[1]; Sania Bibi, MPhil, MBBS[1]; Mohammad A. Shah, MBBS[3]; Fouzia Rauf, FCPS, MBBS[2]

[1]*Department of Pathology, Saidu Group of Teaching Hospital (SGTH), Swat, Khyber Pakhtunkhwa, Pakistan*
[2]*Department of Pathology, Peshawar Medical College, Peshawar, Khyber Pakhtunkhwa, Pakistan*
[3]*Department of Health, Peshawar, Khyber Pakhtunkhwa, Pakistan*

[*]***Corresponding author***
Shamsul Hadi, MBBS, MPhil
Senior Medical Officer, Saidu Group of Teaching Hospital, Swat, Khyber Pakhtunkhwa, Pakistan; E-mail: srgshams82@gmail.com

Article information
Received: January 27th, 2022; **Revised:** February 23rd, 2022; **Accepted:** March 18th, 2022; **Published:** March 21st, 2022

Cite this article
Hadi S, Shahzadi HM, Hannan F, Bibi S, Shah MA, Rauf F. The efficacy of open mastoidectomy *versus* mastoidectomy with temporalis fascia flap obliteration. *Pathol Lab Med Open J.* 2022; 4(1): 1-5. doi: 10.17140/PLMOJ-4-111

ABSTRACT

Objective
To compare the efficacy of open mastoidectomy *versus* mastoidectomy with temporalis fascia flap obliteration in achieving post-operative dry ear chronic suppurative otitis media (CSOM) is a perforated tympanic membrane with persistent drainage of pus from the middle ear lasting more than 2-weeks. The global burden of illness from CSOM is estimated to involve about 65 to 330 million individuals with draining ears, 60% of them suffer from significant hearing impairment. Ninety (90) percent of burden is borne by developing countries, in Southeast Asia, the Western region of Africa. CSOM can occur with or without cholesteatoma, and the clinical history of both conditions can be very similar. The treatment plan for cholesteatoma always includes tympanomastoid surgery with medical treatment as an adjunct. The treatment plan for cholesteatoma always includes tympanomastoid surgery. After mastoidectomy the otologists facing mastoid cavity related problems such as otorrhoea, hearing loss. A variety of techniques have been proposed to perform obliteration.

Methods

Study design
Randomized Controlled Trial.

Setting
Department of ear, nose, and throat (ENT), Head & Neck Surgery, Saidu Group of Teaching Hospital, Swat, Khyber Pakhtunkhwa, Pakistan.

Duration of study
From Jan, 2019 to 17 July, 2021.

Sample size
Randomly assigned patients with evidence of atticoantral disease to two groups, 47 in each group. After canal wall down mastoidectomy in Group A cavity left without obliteration, in Group B a superior based vascularized temporalis facial flap was used to obliterate the resultant mastoid cavity and they were followed up to 8-weeks.

Results
As per efficacy of both groups is concerned, in Group A, 34 (36.17%) patients had achieved post-operative dryness on 8th week of mastoidectomy whereas in Group B, 40 (42.55%) patients achieved post-operative dryness of ear on 8th week subject to mastoidectomy with temporalis fascia flap obliteration. (p value=0.130).

Conclusion
Patients who underwent mastoidectomy with temporalis fascia flap obliteration yielded better results in comparison to patients who underwent open mastoidectomy. Further the common organism were found in our region *Staph Aureus* and *Bacteriodes* and *Proteus mirabilis*.

Keywords
Chronic suppurative otitis media (CSOM); Mastoidectomy; Ear, nose, and throat (ENT).

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a perforated tympanic membrane with persistent drainage of pus from the middle ear lasting more than 2-weeks.[1,2] The global burden of illness from CSOM estimated to involve about 65 to 330 million individuals with draining ears, 60% of them were suffers from significant hearing impairment. Ninety (90) percent of burden is borne by developing countries, in Southeast Asia, the Western region of Africa. CSOM can occur with or without cholesteatoma, and the clinical history of both conditions can be very similar. The treatment plan for cholesteatoma always includes tympanomastoid surgery with medical treatment as an adjunct.[3-5]

The yearly incidence of CSOM, to be 39 cases per 100,000 persons in children and adolescents aged 15-years and younger. In Britain, 0.9% of children and 0.5% of adults have CSOM. In Israel, only 0.039% of children are affected. Other populations at increased risk include children from Guam, Hong Kong, South Africa, and the Solomon Islands.[6-12]

The anatomy and function of the eustachain tube play a significant role in the increased risk. The eustachain tube is wider and more open in these populations than in others, thus placing them at increased risk for nasal reflux of bacteria common to acute otitis media and recurrent acute otitis media and leading to more frequent development of CSOM.[13-17]

Certain population subsets are at increased risk for developing CSOM. The Native American and Eskimo populations demonstrate an increased risk of infection. Eight percent of Native Americans and up to 12% of Eskimos are affected by CSOM.[18,19]

The prevalence of CSOM appears to be distributed equally between males and females. Exact prevalence in different age groups is unknown; however, some studies estimate the yearly incidence of CSOM to be 39 cases per 100,000 in children and adolescents aged 15-years and younger.[20]

MATERIALS AND METHODS

Study Design

Randomized Control Trial.

Setting

Department of ear, nose, and throat (ENT) and Head and Neck Surgery, Saidu Group of Teaching Hospital, Swat, Khyber Pakhtunkhwa, Pakistan.

Duration of Study

From January, 2019 to July, 2021.

Sample Size

Sample size was calculated by using World Health Organization (WHO) calculator with following parameters. Level of significance 5%, Power of test 80%, P1=90% and P2=70%.

Sample size, N=94

Group A=Patients undergoes mastoidectomy.
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

Sampling Technique

Non-probability consecutive sampling (Block randomization).

Sample Selection

Inclusion criteria: 1. Patient suffering from chronic suppurative otitis media, atticoantral (Squamous) disease; 2. Underwent radical and modified radical mastoidectomy; 3. Age gender is 15-years and less than 60-years; 4. Complete removal of cholesteatoma and granulations during surgery.

Exclusion criteria: 1. Patient having an intracranial complication of chronic suppurative otitis media; 2. Patient having facial nerve palsy and granulation arising from facial nerve; 3. Mastoidectomy performed for conditions other than chronic suppurative otitis media.

Data Collection

Patients fulfilling the inclusion criteria and scheduled for mastoidectomy were selected from the Department of ENT, Head and Neck Surgery, Saidu Teaching Hospital, Swat, Khyber Pakhtunkhwa, Pakistan. Patient's demographic data along with registration number was entered on the proforma. After the informed consent, explaining procedures, its benefits and complications to the patients and then was randomly assigned into two groups based on lottery method. Group A will undergo open mastoidectomy and Group B will undergo mastoidectomy with temporalis fascia flap obliteration. Follow-up was done after a 8-weeks interval.

From both groups the pus were collected from the affected ears, through standard aseptic technique. The collected pus samples were placed in an aerobic jar and transported within one hour to the pathology Department of SMC/Saidu Group of Teaching Hospital (SGTH) for routine microbiological culture and identification.

Subjective assessment was done by finding out from patients about the absence or presence of discharge and objective assessment was done by microscopy to assess the presence or absence of discharge in the operated ear.

Data was collected by the author and an experienced consultant who have performed all the procedures.

All the data was recorded on the proforma and subjected to analysis to measure the objectives.

Openventio PUBLISHERS

Data Analysis

Data was entered and analysed in statistical package for the social sciences (SPSS) version 20. Categorical variables like gender were described in frequency and percentages. Quantitative variables like age were described in mean+standard deviation. Chi-square (χ^2) test was used to determine the difference in proportion in two groups and $p<0.05$ was considered significant.

RESULTS

Age distribution, in Group A, 15 (15.95%) patients recorded in the 15-30-years age group. In age group 31-45-years, 15 (15.95%) patients were recorded whereas 17 (18.08%) patients were recorded in age group of 46-60-years. In the same manner, in Group B, 15 (15.95%) patients were recorded in the 15-30-years age group. In age group 31-45-years, 15 (15.95%) patients were recorded whereas 17 (18.08%) patients were recorded in age group of 46-60-years (Table 1).

Table 1. *Age Wise Distribution in Both Groups (N=94)*

Age Group	Group A	Group B	Total
15-30-years	15 (15.95%)	15 (15.95%)	30 (31.91%)
31-45-years	15 (15.95%)	15 (15.95%)	30 (31.91%)
46-60-years	17 (18.08%)	17 (18.08%)	34 (36.17%)
Total	47 (50%)	47 (50%)	94 (100%)

Group A=Patients undergoes mastoidectomy
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

We collected different types of microorganisms and found that *Staphylococcus aureus*, *Proteus mirabilis*, *Bacteriodes* were the most prevalent bacteria while *Acinetobacter boumenii* and *Pseudomonas aeruginosa* species were also causing CSOM (Table 2).

Table 2. *Different Microorganism Isolated from Ear Discharge*

Microbes	Percentage
Staph. aureus	35%
Bacteriodes spp.	20%
Proteus mirabilis	15%
Peptococcus spp.	10%
E. coli	5%
Strep. pyogenes	3%
Strep pneumonia	2%
Other microorganisms	10%

In gender wise distribution, 28 (29.78%) patients were recorded as male while 19 (20.21%) patients were recorded as Females. In the same manner, in Group B, 26 (27.65%) patients were recorded as Males while 21 (22.34%) were recorded as females. (Table 3).

Table 3. *Gender Wise Distribution in Both Groups (N=94)*

Age Group	Group A	Group B	Total
Male	28 (29.78%)	26 (27.65%)	54 (57.44%)
Female	19 (20.21%)	21 (22.34%)	40 (42.55%)
Total	47 (50%)	47 (50%)	94 (100%)

Group A=Patients undergoes mastoidectomy
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

As per efficacy of both groups is concerned, in Group A, 34 (36.17%) patients had achieved post-operative dryness on 8th week of mastoidectomy whereas in Group B, 40 (42.55%) patients achieved post-operative dryness of ear on 8th week subject to mastoidectomy with temporalis fascia flap obliteration (p=0.130) (Table 4).

Table 4. *Efficacy of Both Groups (N=94)*

Efficacy	Groups		Total	*p*-value
	Group A	Group B		
Yes	34 (36.17%)	40 (42.55%)	74 (78.72%)	0.130
No	13 (13.82%)	07 (7.44%)	20 (21.27%)	
Total	47 (50%)	47 (50%)	94 (100%)	

Group A=Patients undergoes mastoidectomy.
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

Stratification of efficacy of mastoidectomy *versus* mastoidectomy with temporalis fascia flap obliteration with respect to gender and age is recorded at Tables 5 and 6 respectively.

Table 5. *Stratification of Efficacy with Gender (N=94)*

Gender	Efficacy	Group A	Group B	*p*-value
Male	Yes	21 (22.34%)	17 (18.08%)	0.978
	No	06 (6.38%)	04 (4.25%)	
Female	Yes	13 (13.82%)	23 (24.46%)	0.055
	No	07 (7.44%)	03 (3.19%)	

Group A=Patients undergoes mastoidectomy.
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

Table 6. *Stratification of Efficacy with Age (N=94)*

Age Group	Efficacy	Group A	Group B	*p*-value
15-30-years	Yes	11 (11.70%)	12 (12.7%)	0.665
	No	04 (4.25%)	03 (3.19%)	
31-45-years	Yes	11 (11.70%)	13 (13.8%)	0.361
	No	04 (4.25%)	02 (2.12%)	
46-60-years	Yes	12 (12.7%)	15 (15.95%)	0.203
	No	05 (5.31%)	02 (2.12%)	

Group A=Patients undergoes mastoidectomy.
Group B=Patients undergoes mastoidectomy with temporalis fascia flap obliteration.

DISCUSSION

CSOM was more prevalent in children and young adults than in

elders. The same study was reported by different countries like India, Africa and Pakistan.[1] Allots of reasons can explain the above situation in children because the eustachain tubes in children are shorter, narrower and more horizontal than in adults.[2,3]

The most prevalent microbes were found in our study as shown in Table 2 *Staph. aureus, Bacteriodes* and *Proteus mirabilis* as well as other microorganisms the above finding were also shown by many clinician and researchers.[20,22-24]

McKenzie et al[24] well-demonstrated evidence of chronic suppurative otitis in a skull found in Norfolk, UK, which is thought to be from the Anglo-Saxon period. Radiologic changes in the mastoid caused by previous infection have been seen in a number of specimens, including 417 temporal bones from South Dakota Indian burials and 15 prehistoric Iranian temporal bones.[25,26]

As per age distributions, the generally success rate of tympano-plasty, with or without mastoidectomy, in the management of chronic paediatric otitis media, was high and did not depend on patient age, the status of the contralateral ear, the inclusion or absence of surgical mastoidectomy, or the method of mastoidectomy.[27] Our study also shows that there was no difference in age. *Tympano plasty*, with or without mastoidectomy, is highly effective for treatment of chronic otitis media in children.[27-29]

In gender wise distribution, patients undergoes mastoidectomy with temporalis fascia flap obliteration females who have comparatively better results than males for unknown reason. May be the female are more sensitive and hygenic compared with males (Table 3).

The application of for tympanoplasty has been very useful in the past in spite of the comparatively worse vibration characteristics of the rigid material. These findings are according to our own experiences with autologous cartilaginous transplant for the treatment of COSM and retraction cholesteatoma.[27-29]

As per efficacy of both groups is concerned, in Group A, 36.17% patients had achieved post-operative dryness on 8th week of mastoidectomy whereas in Group B, 42.55% patients achieved post-operative dryness of ear on 8th week subject to mastoidectomy with temporalis fascia flap obliteration. The same results are also shown by other surgeons and clinicians, p=0.130.[30,31]

Efficacy wise the patients undergoing mastoidectomy with temporalis fascia flap obliteration were better than undergoing mastoidectomy for CSOM. On relating average hearing improvement post-operatively with eustachain tube function in the ears with cured flap i.e. was 50%. It was detected that in ears with normal eustachain tube function post-operative hearing increase was 55% whereas in ears with eustachain tube dysfunction post-operative hearing gain (Table 4).

Globally, there was increase awareness about the significant morbidity of ear discharge. The fatten recognition of the role of mastoid obliteration in success of post-operative dry ear has significant management implications. Our study has furnished valuable information in this regard and will help to improve the existing situation with a positive influence on the overall outcome of management.

CONCLUSION

Our study proved that patients who underwent mastoidectomy with temporalis fascia flap obliteration yielded better results in comparison to patients who underwent open mastoidectomy. Further the common organism were found in our region Staph Aureus and Bacteriodes and Proteus mirabilis. More studied required to further evaluate these patients in prospective study.

FUNDING

There is no financial support.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. Poorley VK, Lyer A. Study of bacterial flora in chronic otitis media and itsclinical significance. *Indian J Otolaryngol Head and Neck Surg.* 2002; 54: 91-95. doi: 10.1007/BF02968724

2. Mansoor T, Mussani MA, Khalid G, Kumal M. Pseudomonas aeruginosa in Chronic Otitis media: Sensitivity spectrum against various antibiotics in Karachi. *J Ayub Med Coll Abbottabad.* 2009; 21(2): 120-123.

3. Mawson S, Pollack M. Special role of Pseudomonas aeruginosa in chronic otitis media. *Ann Otol Rhinol Laryngol Head and Neck Surg.* 1988; 97(Suppl 130): 10-13. 46: 488-497.

4. Meyerhoff WL, Kim CS, Paparella MM. Pathology of chronic otitis media. *Ann Otol Rhinol Laryngol.* 1978; 87(6 Pt 1): 749-760. doi: 10.1177/000348947808700602

5. Kenna MA. Microbiology of chronic suppurative otitis media. *Ann Otol RhinolLaryngol.* 1988; 97(suppl 131): 9-10.

6. Kenna MA. Etiology and pathogenesis of chronic suppurative otitis media. *Ann Otol Rhino Laryngol.* 1988; 97(Suppl 131): 16-17.

7. Kim JB, Park DC, Cha CI, Yeo SG. Relationship between pediatric obesity and otitis media with effusion. *Arch Otolaryngol Head Neck Surg.* 2007; 133(4): 379-382. doi: 10.1001/archotol.133.4.379

8. Jones LL, Hassanien A, Cook DG, Britton J, Leonardi-Bee J. Parental smoking and the risk of middle ear disease in children: A systematic review and meta-analysis. *Arch PediatrAdolesc Med.* 2012; 166(1): 18-27. doi: 10.1001/archpediatrics.2011.158

9. Greenberg D, Hoffman S, Leibovitz E, Dagan R. Acute otitis media in children: Association with day care centers - antibacterial resistance, treatment, and prevention. *Paediatr Drugs.* 2008; 10(2):

75-83. doi: 10.2165/00148581-200810020-00002

10. de Miguel Martinez I, Macias AR. Serous otitis media in children: implication of Alloiococcusotitidis. *Otol Neurotol.* 2008; 29(4): 526-530. doi: 10.1097/MAO.0b013e318170b5f8

11. Harimaya A, Takada R, Hendolin PH, et al. High incidence of Alloiococcusotitidis in children with otitis media, despite treatment with antibiotics. *J ClinMicrobiol.* 2006; 44(3) :946-949. doi: 10.1128/JCM.44.3.946-949.2006

12. Wright D, Safranek S. Treatment of otitis media with perforated tympanic membrane. *Am Fam Physician.* 2009; 79(8): 650-654.

13. Patel JA, Nair S, Revai K, Grady J, Chonmaitree T. Nasopharyngeal acute phase cytokines in viral upper respiratory infection: Impact on acute otitis media in children. *Pediatr Infect Dis J.* 2009; 28(11): 1002-1007. doi: 10.1097/INF.0b013e3181aa5b13

14. Broides A, Dagan R, Greenberg D, Givon-Lavi N, Leibovitz E. Acute otitis media caused by Moraxella catarrhalis: epidemiologic and clinical characteristics. *Clin Infect Dis.* 2009; 49(11): 1641-1647. doi: 10.1086/647933

15. Skovbjerg S, Roos K, Nowrouzian F, et al. High cytokine levels in perforated acute otitis media exudates containing live bacteria. *Clin Microbiol Infect.* 2010; 16(9): 1382-1388. doi: 10.1111/j.1469-0691.2010.03083.x

16. Rosch JW. Promises and pitfalls of live attenuated pneumococcal vaccines. *Hum Vaccin Immunother.* 2014; 10(10): 3000-3003. doi: 10.4161/21645515.2014.970496

17. Yilmaz T, Ceylan M, Akyon Y, et al. Helicobacter pylori: A possible association with otitis media with effusion. *Otolaryngol Head Neck Surg.* 2006; 134(5): 772-777. doi: 10.1016/j.otohns.2006.02.002

18. Tauriainen S, Oikarinen S, Taimen K, et al. Temporal relationship between human parechovirus 1 infection and otitis media in young children. *J Infect Dis.* 2008; 198(1): 35-40. doi: 10.1086/588677

19. Elden LM, Coyte PC. Socioeconomic impact of otitis media in North America. *J Otolaryngol.* 1998; 27 Suppl 2: 9-16.

20. Shyamla R, Reddy SP. The study of bacteriological agents of chronic suppurative otitis media-aerobic culture and evaluation. *J Microbiol Biotechnol Res.* 2012; 2: 152-162.

21. Wanna GB, Dharamsi LM, Moss JR, Bennett ML, Thompson RC, Haynes DS. Contemporary management of intracranial complications of otitis media. *Otol Neurotol.* 2010; 31(1): 111-117. doi: 10.1097/MAO.0b013e3181c2a0a8

22. Singh AH, Basu R, Venkatesh A. Aerobic bacteriology of chronic suppurative otitis media in rajahmundry. *Biol Med.* 2012; 4: 73-79.

23. Nikakhlagh S, Khosravi AD, Fazlopour A, Safarzadeh M, Rashidi N. Microbiologic findings in patients with chronic suppurative otitis media. *J Med Sci.* 2008; 8: 503-506.

24. McKenzie W, Brothwell D. Disease in the ear. *Disease in Antiquity.* 1967; 464-473.

25. Yates PD, Flood LM, Banerjee A, Clifford A. CT scanning of middle ear cholesteatoma: What does the surgeon want to know? *Br J Radiol.* 2002; 75: 847-852. doi: 10.1259/bjr.75.898.750847

26. De Foer B, Vercruysse JP, Spaepen M, et al. Diffusion-weighted magnetic resonance imaging of the temporal bone. *Neuroradiology.* 2010; 52(9): 785-807. doi: 10.1007/s00234-010-0742-1

27. Green JD Jr, Shelton C, Brackmann DE. Iatrogenic facial nerve injury during otologic surgery. *Laryngoscope.* 1994; 104(8 Pt 1): 922-926. doi: 10.1288/00005537-199408000-00002

28. Jensen RG, Koch A, Homoe P. The risk of hearing loss in a population with a high prevalence of chronic suppurative otitis media. *Int J Pediatr Otorhinolaryngol.* 2013; 77(9): 1530-1535. doi: 10.1016/j.ijporl.2013.06.025

29. Yoon TH, Park SK, Kim JY, Pae KH, Ahn JH. Tympanoplasty, with or without mastoidectomy, is highly effective for treatment of chronic otitis media in children. *Acta Oto-Laryngologica.* 2007; sup(558): 44–48. doi: 10.1080/03655230701624855

30. Lierle DM. Standard classification for surgery of chronic ear infection. *Arch Otolaryngol.* 1965; 81: 204-205. doi: 10.1001/archotol.1965.00750050211018

31. Matsuda Y, Kurita T, Ueda Y, Ito S, Nakashima T. Effect of tympanic membrane perforation on middle-ear sound transmission. *J Laryngol Otol.* 2009; (31): 81-89. doi: 10.1017/S0022215109005155