

A Study of the Association of Smoking with Mucosal Type of Chronic Otitis Media and its Surgical Outcome.

laichika Sethi¹, Probal Chatterji²

¹Post Graduate, Department of ENT, Teerthanker Mahaveer Medical College, TMU, Moradabad.

²Professor & HOD, Department of ENT, Teerthanker Mahaveer Medical College, TMU, Moradabad.

Received: March 2020

Accepted: March 2020

ABSTRACT

Background: The term chronic suppurative otitis media is defined as long standing inflammation of the middle ear cleft. This region has high rate of smokers due to unregulated sale of tobacco products which may have direct impact on the incidence of tubotympanic type of chronic otitis media and its treatment outcome. Aim and objectives: This study was done to find the correlation between smoking and its effect on chronic otitis media as well as the success of graft uptake following surgery. **Methods:** This prospective randomized controlled clinical study was carried out to assess the effect of smoking on mucosal type of chronic otitis media and its surgical outcome among the patients visiting the ENT department at Teerthanker Mahaveer Medical College and Research Centre, Moradabad. The study was conducted during the period of one year and the patients were followed at 1 month, 3 months and 6 months post-operative period. **Results:** The study population consisted of 70 (70.0%) males and 30 (30.0% females). The mean age of the non-smokers was 28.26±8.84 years and smokers was 29.88±7.31 years. The hearing loss at 3 and 6 months post-operatively was significantly higher among smokers. The mean post-operative air gap gain was significantly more among non-smokers compared to smokers. Graft failure among smokers was significantly higher than non-smokers. **Conclusion:** Smoking is a significant hazard factor influencing the outcome of tympanoplasty and successful graft uptake. That is the reason we should encourage patients to stop smoking in pre and post-operative period to have better results.

Keywords: CSOM, Smoking.

INTRODUCTION

The term “chronic suppurative otitis media” (CSOM) is defined as long standing inflammation of the middle ear cleft and presents with recurring discharging from the ear or otorrhoea through a tympanic membrane perforation.^[1] It has been traditionally divided into tubotympanic and atticointral types.

The term “CSOM” has been in use for decades but over the past few years researchers have realised that chronic inflammation and changes within the middle ear cleft may not always be associated with a perforated eardrum. Hence, a relatively newer term “chronic otitis media” (COM) has been coined to encompass the varied pathologies seen as a result of chronic middle ear inflammation. COM was previously considered to be a direct result of acute otitis media. It is now suggested that although COM can certainly be precipitated by an acute infection with or without tympanic membrane perforation, it may occur without episodes of acute otitis media as well.^[1]

Mucosal type of COM, which was classified under the older nomenclature as “tubotympanic type of CSOM”, is a condition where the disease is

primarily confined to mucosa of the middle ear. It is typically characterised by non-offensive ear discharge which is profuse, mucoid or mucopurulent. It is usually associated with a mild to moderate degree of conductive hearing loss. Perforation is nearly always central and involves the pars tensa. Risk of complications is much lower in this condition compared to the squamous type of COM.^[2]

Combination of aural toileting along with administration of topical antimicrobial drops is the treatment of choice in the active stage of mucosal type of COM. Oral or systemic antibiotics are not usually required because topical anti-infection agents can accomplish significantly more tissue concentrations combining with aural toilet than systemic antibiotics (100-1000 times higher). Tympanic membrane repair is advised to close the chronic perforation after the active COM infection has been treated.^[3] The procedure can be done alone or in combination with a simple mastoidectomy.

Cigarette smoking is rampant in our society and it has been proved beyond doubt that it has a number of unwanted effects on the whole aero-digestive tract, the most feared being its role in the causation of cancers. Among the other notable effects, its ability to alter the mucociliary transport mechanism of the upper airway leading to increased susceptibility for upper airway infections has also been studied in great depth.^[4] But its exact role in the pathogenesis of COM and its surgical outcome, which is intricately linked to the altered physiology

Name & Address of Corresponding Author

Dr Probal Chatterji
Professor & HOD, Department of ENT,
Teerthanker Mahaveer Medical College,
TMU,
Moradabad.

of the upper airway has been a subject of very little research till date. Only a few studies have looked into this aspect of the deleterious effects of smoking with infrequent references in the literature.

The risk of airway infections is highest in active smokers of cigarettes & bidis. Also people exposed to side-stream smoke are at considerable risk. The overall risk is twice for smokers.^[5,6] In fact, passive smoking alone was evaluated to have caused 165,000 mortality in grown-ups and youngsters from lower respiratory tract contaminations in 2004.^[7] The relationship of respiratory disease in adolescents and parental smoking is alarming as it results in excess hospitalization.^[8]

As mentioned above, the unfavorable impacts of tobacco smoke on the mucociliary transport has been recognized for a very long while. It has been suggested that cigarette smoking might have a direct effect on pathogenesis of COM as well.^[9,10] Not only overt smoking, but passive smoking has also been identified as a risk factor for chronic ear disease in children as well as adults living in close proximity to smokers. In one multivariate analysis where other factors were controlled, the risk for passive smokers was increased when they were close to people who smoked up to 20 cigarettes a day.^[11] A large, more recent epidemiological study also noted a temporal decline in consultations for otitis media, which was attributed to an increase in smoke-free households.

A large number of known factors (e.g., eustachian tube function, middle ear mucosa condition, graft materials, perforation site, etc.) affect result of tympanoplasty surgery.^[12] Since this procedure is primarily aimed at restoring the physiology of the middle ear mechanism, it is very likely that smoking may have an effect on its outcome as well. Some reports have suggested that patient with active or passive smoking have less success rate of tympanoplasty because the mucociliary transport mechanism in these patients is compromised due to eustachian tube dysfunction. Patients without smoking habit had 94 percent improved hearing after tympanoplasty and 93 percent graft uptake. Those with smoking habit had a graft uptake of 68 percent with an upgraded hearing of 79 percent. The average increase in hearing among non-smokers was 20 dB and among smokers was 16 dB.^[13]

As per GATS 2 survey, the prevalence of current tobacco smokers in Uttar Pradesh was 13.5% with daily tobacco smokers being 10.1%, current cigarette smokers being 4.7% and bidi smokers being 11.3%.^[14] Singhal et al reported that the prevalence of CSOM in Bareilly (UP) was around 6.46% with tubotympanic type constituting majority 81.25% of cases.^[15]

This region has high rate of smokers due to unregulated sale of tobacco products which may have direct impact on the incidence of tubotympanic type of chronic otitis media and its treatment outcome. So, this study was done to find the

correlation between smoking and its effect on chronic otitis media as well as the success of graft uptake following surgery.

MATERIALS AND METHODS

This prospective clinical study was conducted in the ENT Department at Teerthanker Mahaveer Hospital and Research Centre, Moradabad after receiving clearance from Board of Studies and Ethical Committee.

Sample Size:

The study population has been calculated by using G-power software with 80% of the power and 5% of the significance level. The total sample size was determined to be 100 patients with COM. The sample was divided into 2 groups which consisted of 50 COM cases with history of smoking and 50 COM cases without history of smoking.

Study duration and study population:

The study was conducted during the period of one year and the follow ups were at 1 month, 3 months and 6 months post-operative period.

Inclusion criteria

- All cases of mucosal type of COM.
- Apparently healthy individuals of age group between 15-50 years with no other comorbidity.
- Voluntary participation in the study.

Exclusion criteria

- Patient with bleeding diathesis.
- Patient not giving consent or patient unable to report for follow up.
- Patients with squamosal type of COM.

Study procedure

After approval from the Institutional Ethical Committee, all patients were included as per inclusion and exclusion criteria. A detailed history, complete physical examination and routine & appropriate investigations were done for all patients. A detailed otoendoscopic examination and otomicroscopic examination of patient was done. PTA was done in every case. Mastoid X Ray (Schuller's view) of both sides was done in every case. HRCT scan was done in cases where indicated. Surgery was performed under general anaesthesia after proper consent. The results were recorded and evaluated depending on the graft take up and hearing gain at 1, 3 and 6-month follow-up.

Statistical analysis

The information was entered into Microsoft Excel and the statistical analysis was conducted through SPSS version 21.0 of the statistical software. Quantitative (Numerical variables) were present in the form of mean and SD and Qualitative

(Categorical variables) has been present in the form of frequency and percentage. The statistical analysis was done and various statistical tools like Student T-test and Chi square test was applied. The p-value less than 0.05 was considered significant.

RESULTS

Table 1: Distribution of study population according to age and gender

Gender	Non-smoker	Smoker	Total
Age	28.26±8.84 (15-60)	29.88±7.31 (20-55)	29.07± (15-60)
Gender			
Male	36 (72.0%)	34 (68.0%)	70 (70.0%)
Female	14 (28.0%)	16 (32.0%)	30 (30.0%)

Table 2: Distribution of study population according to side affected

Side affected	Frequency	Percent
Bilateral	8	8.0%
Right	41	41.0%
Left	51	51.0%

Table 3: Distribution of study population according to surgery done

Surgery done	Frequency	Percent
Left Cortical mastoidectomy with tympanoplasty	17	17.0%
Left tympanoplasty	26	26.0%
Right Cortical mastoidectomy with tympanoplasty	14	14.0%
Right tympanoplasty	43	43.0%
Total	100	100.0%

Table 4: Comparison of mean hearing loss on Audiometry (in dB) preoperatively, 1 month post-operatively, 3 months post-operatively and 6 months post-operatively and mean air gap was compared between non-smokers and smokers

Tympanometry	Non-smoker	Smoker	Mean Difference	t-test value	p-value
	Mean±SD	Mean±SD			
Preoperative	53.16±8.58	52.76±9.47	0.40	0.221	0.825
1 month post-operatively	42.54±7.38	46.64±8.80	-4.10	-2.523	0.073
3 months post-operatively	31.98±6.11	39.76±8.29	-7.78	-5.343	0.001*
6 months post-operatively	19.58±5.00	29.52±7.72	6.91	-7.640	0.001*
Post-operative gain in air gap	33.58±5.25	23.24±3.95	10.34	11.133	<0.001*

Unpaired t-test * Significant difference

The study population consisted of 70 (70.0%) males and 30 (30.0% females). The mean age of the non-smokers was 28.26±8.84 years and smokers was 29.88±7.31 years. Majority of the study population

belonged to 26-35 years (50.0%) followed by 15-25 years (34.0%), 36-45 years (13.0%) and Above 45 years (3.0%). [Table 1]

Right side was affected in 51.0% patients followed by left side (41.0%) and bilateral (8.0%). [Table 2]

The various procedures that were required are summarised in [Table 3].

The mean hearing loss in dB preoperatively, 1 month post-operatively, 3 months post-operatively and 6 months post-operatively was compared using the unpaired t-test. The hearing loss at 3 and 6 months post-operatively was higher among smokers. [Table 4]

The mean post-operative air gap gain was compared between the two groups using the unpaired t-test. The mean post-operative air gap gain was more among non-smokers. [Table 5]

Using the chi-square method, the graft status distribution was compared between non-smokers and smokers. Graft failure among smokers was significantly higher than non-smokers. [Table 6]

Table 5: Comparison of mean post-operative gain in air-bone gap between non-smokers and smokers

Graft status	Non-smoker	Smoker
Failure	2 (4.0%)	22 (44.0%)
No failure	48 (96.0%)	28 (56.0%)

Chi-square value = 21.903, p-value < 0.001*

Table 6: Using the chi-square method, the graft status distribution was compared between non-smokers and smokers. Graft failure among smokers was significantly higher than non-smokers.

Graft status	Non-smoker	Smoker	Total
Failure	2	22	24
	4.0%	44.0%	24.0%
No failure	48	28	76
	96.0%	56.0%	76.0%
Total	50	50	100
	100.0%	100.0%	100.0%

Chi-square value = 21.930, p-value < 0.001*

Chi-square test * Significant difference

DISCUSSION

Chronic otitis media (COM) is still very common in developing countries such as India. There are many prognostic factors involved in surgical success and tympanoplasty outcome such as low socioeconomic history, age, comorbidity, surgical ability, ET dysfunction and exposure to tobacco smoke.^[3]

COM accounts for morbidity in about 5 percent of the total population. ENT surgeons can profoundly change the patient's lifestyle by performing a corrective surgery for chronic otitis media. The medical management can only reduce the severity of the symptoms.

The age range of the present study population was between 15-50 years in our present study. In Chauhan and Vishwakarma's study,^[16] most patients were between 10-30 years of age. In another study done by Mushi et al,^[17] they found that the third and

fourth decades of life constituted most number of patients.

In our study, there were a total of 70 (70.0 percent) males and 30 (30.0 percent) females including both groups in the study population. The ratio of the male to female of our study was 2.3:1. In their study, Chauhan and Vishwakarma¹⁶ had a male to female ratio of 1:1.1 that was not consistent with our study. Gaur et al,^[18] found that relative to those who did not use tobacco, tobacco users had a significantly higher risk of both middle ear and inner ear diseases with poor post-surgical results in the smoking population. This is in accordance with our observation.

In our study, the post-operative gain in air gap among non-smokers was significantly more than smokers which were quite similar to the studies by Jain et al,^[19] where the mean postoperative gain in air-bone gap among smokers (9.34±6.70 dB) was less compared to non-smokers (12.00±9.50dB) and that was statistically significant. Similarly, Swain et al,^[7] also found an average gain in non-smokers of 20 dB and 16 dB in smokers.

Our study had similarity to the study done by Swain et al,^[13] which showed that there was worse outcome of postoperative tympanoplasty among smokers in comparison to non-smokers. Becvarovski et al,^[20] and Srinivas et al,^[21] also found significant difference between ossicular defects and intact ossicles with respect to pure tone audiometry and ABG scores (P = 0.001) in smokers versus non-smokers. The similar results were also shown in the study by Cruickshanks et al,^[22] after accounting for other risk factors like age, gender etc.

The analysis of the present research showed failure of graft uptake was more among smokers (44.0%) compared to non-smokers (4.0%). This was same as the study conducted by Swain et al,^[13] which showed that graft uptake was 93% and hearing improvement was 94% among non-smokers whereas graft uptake was 68% and improved hearing was only 79% in smokers which was statistically significant. Kaylie et al,^[23] in their study found that smokers have significantly worse chronic disease and hearing outcome as compared to non-smokers.

Smoking causes change in quality, quantity as well as destruction of ciliary function in the middle ear cavity. Vascular supply to the graft may have been effected by the potential vasoconstrictor effects of nicotine. Hence, these factors may have increased the chance of failure significantly in smoking group.^[19]

CONCLUSION

In conclusion, our study demonstrated that surgical outcome was better in non-smoker patients as compared to smokers. Smoking is a significant hazard factor influencing the outcome of tympanoplasty and successful graft uptake. That is the reason we should encourage patients to stop

smoking in pre and post-operative period to have better results.

REFERENCES

1. Scott Brown's Otolaryngology. 6th edition. In: David A. Adams and Michael J. Chinnamond, editors. Oxford: Butterworth-Heinemann 1997;6:67-9.
2. Kumar N, Chilke D, Puttewar MP. Clinical Profile of Tubotympanic CSOM and Its Management With Special Reference to Site and Size of Tympanic Membrane Perforation, Eustachian Tube Function and Three Flap Tympanoplasty. Indian J Otolaryngol Head Neck Surg. 2012;64(1):5-12.
3. Mittal R, Lisi CV, Gerring R, Mittal J, Mathee K, Narasimhan G, Azad RK, et al. Current concepts in the pathogenesis and treatment of chronic suppurative otitis media. J Med Microbiol. 2015;64(10):1103-16.
4. Mehta H, Nazzal K, Sadikot RT. Cigarette smoking and innate immunity. Inflamm Res 2008;57:497e503.
5. Trosini-Desert V, Germaud P, Dautzenberg B. Tobacco smoke and risk of bacterial infection. Rev Mal Respir. 2004;21:539-47.
6. Bagaikar J, Demuth DR, Scott DA. Tobacco use increases susceptibility to bacterial infection. TobInduc Dis. 2008;4:12.
7. Oberg M, Jaakkola MS, Woodward A, Peruga A, Prüss-Ustün A. Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. Lancet. 2011;377:139-46.
8. Peat JK, Keena V, Harakeh Z, Marks G. Parental smoking and respiratory infections in children. Paediatr Respir Rev. 2001;2:207-13.
9. Maunders H, Patwardhan S, Phillips J, Clack A, Richter A. Human bronchial epithelial cell transcriptome: gene expression changes following acute exposure to whole cigarette smoke in vitro. Am J Physiol Lung Cell Mol Physiol 2007;292:L1248-56.
10. Feldman C, Anderson R. Cigarette smoking and mechanisms of susceptibility to infections of the respiratory tract and other organ systems. Journal of Infection. 2013;67:169-84.
11. Bhutta MF. Epidemiology and pathogenesis of otitis media: construction of a phenotype landscape. Audiol Neurootol. 2014;19:210-223.
12. Samiullah, Chandra K. Tympanoplasty: Role of Eustachian tube function and middle ear mucosa. Asian J Ear Nose Throat. 2005;3:41-2.
13. Swain SK, Samal R, Pani SK. Effect of smoking on outcome of tympanoplasty. Indian J Otol. 2011;17:120-2.
14. Chattopadhyay PK. Evaluation of Symptoms in Cases of Otitis Media - A Clinical Study. Asian J. Med. Res. 2019;8(2):EN01-EN03.
15. Singhal A, Agrawal P, Agrawal VK. Prevalence and determinants of chronic suppurative otitis media in school going children in Bareilly (Uttar Pradesh). Int J Otorhinolaryngol Head Neck Surg. 2018;4:348-51.
16. Chauhan VM, Vishwakarma R. Endoscopic Ear Surgery- A Study of 50 Cases. Acta Scientific Otolaryngology. 2019;1:1:02-11.
17. Mushi MF, Mwalutende AE, Gilyoma JM, Chalya PL, Seni J, Mirambo MM, et al. Predictors of disease complications and treatment outcome among patients with chronic suppurative otitis media attending a tertiary hospital, Mwanza Tanzania. BMC Ear Nose Throat Disord. 2016;16:1.
18. Gaur K, Kasliwal N, Gupta R. Association of smoking or tobacco use with ear diseases among men: a retrospective study. TobInduc Dis. 2012;10(1):4.
19. Jain L, Qureshi S, Maurya A, Jadia S, Jain M. Smoking and its influence on success of tympanoplasty: A prospective study. Indian J Otol. 2016;22:28-30.

20. Becvarovski Z, Kartush JM. Smoking and tympanoplasty: Implications for prognosis and middle ear risk index(MERI). *Laryngoscope* 2011;3:1806-11.
21. Srinivas C, Kulkarni NH, Bhardwaj NS, Kottaram PJ, Kumar SH, Mahesh V. Factors influencing ossicular status in mucosal chronic otitis media – An observational study. *Indian J Otol*2014;20:16-9.
22. Cruickshanks KJ, Klein R, Klein BE, Wiley TL, Nondahl DM, Tweed TS: Cigarette smoking and hearing loss: the epidemiology of hearing loss study. *JAMA* 1998, 279:1715-1719.
23. Kaylie DM, Bennett ML, Davis B, Jackson CG. Effects of smoking on otologic surgery outcomes. *Laryngoscope* 2009;119:1384-90.

Copyright: © Annals of International Medical and Dental Research. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Sethi I, Chatterji P. A Study of the Association of Smoking with Mucosal Type of Chronic Otitis Media and its Surgical Outcome. *Ann. Int. Med. Den. Res.* 2020; 6(3):EN07-EN11.

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