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## Ossicular Status in Patient of Chronic Otitis Media Undergoing Surgical Intervention

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### ABSTRACT

Chronic otitis media is a longstanding infection of middle ear cleft having permanent perforation in the tympanic membrane with or without discharge. COM, is broadly divided into 2 types-mucosal (also known as tubotympanic) and squamous (also known as atticofurcal), both may lead to erosion of the ossicular chain. Pathologies that interrupt the ossicular chain result in large hearing losses. This study was conducted in patients with COM undergoing surgery. The study group includes 60 patients with COM (mucosal and squamous type) (unilateral and bilateral), who presented to the ENT department at a tertiary care center in Central India over a period of 18 months from November 2019 to April 2021, who underwent surgical exploration of middle ear with or without mastoid, for the eradication of disease. All patients were counseled about the study and consent was taken by the patient for including in the study and publication. From the observation and results obtained from this study, we concluded that ossicular erosion was found to be more common in cases of squamous type, than in mucosal type of COM. Handle of malleus erosion was found to be most common finding in mucosal type of disease. Complete incus erosion was the most common finding in squamous type of disease.

## INTRODUCTION

Chronic Otitis Media (COM) is persistent inflammation of the middle ear cavity. Over 2-6 weeks of recurrent or persistent ear discharge (otorrhea) through a permanent perforation in the tympanic membrane is characteristic of COM. Typical findings may also include thickened granular middle ear mucosa, mucosal polyps and cholesteatoma within the middle ear. COM is differentiated from chronic otitis media with effusion, in which there is an intact tympanic membrane with fluid in the middle ear but no active infection<sup>[1]</sup>. COM refers to intractable pathology of greater than 3 months duration within the middle-ear cavity with a permanent tympanic membrane defect. Poor living conditions, overcrowding, frequent upper respiratory tract infections poor hygiene and nutrition have been suggested as the basis for the widespread prevalence of COM in developing countries<sup>[2]</sup>. Therefore it has been observed that the disease is more prevalent in lower socioeconomic groups. The World Health Organization (WHO) estimated that 65-330 million people worldwide are affected by COM, of whom 50% suffer from hearing impairment and approximately 28 000 deaths per annum are attributable to the complications of COM<sup>[3]</sup>. COM, is broadly divided into 2 types-mucosal (also known as tubotympanic) and squamous (also known as atticotympanic), both may lead to erosion of the ossicular chain. Pathologies that interrupt the ossicular chain result in large hearing losses. A maximum of 60 dB of hearing loss can occur in complete destruction of ossicles. It is believed that the propensity for ossicular destruction is much greater in cases of squamous COM, due to the presence of cholesteatoma and/or granulations<sup>[2]</sup>, however, the involvement of ossicles is also seen in mucosal types which is mainly manifested with hearing loss, which may be due to perforation in the tympanic membrane or ossicular chain erosion/fixation.

Mechanism of ossicular erosion in non cholesteatoma middle ear disease is overproduction of cytokines tumor necrosis factor (TNF) alpha, interleukin 2, fibroblast growth factor and platelet derived growth factor, which promotes hyper vascularization, osteoblast activation and bone resorption causing ossicular damage<sup>[4]</sup>. High resolution three-dimensional computed tomography can help define the middle ear and identify ossicular erosion and discontinuity, however this is not a routine investigation and only reserved for squamous disease and also this investigation is not available everywhere. As the main stay of treatment is to remove the disease, to avoid complications and surgical correction of tympanic membrane and ossicles to restore hearing loss so we should have some basic knowledge about the disease process since the pathological process of involvement of ossicular chain is different in both the

type of disease. The challenge of hearing improvement depends on proper ossicular reconstruction and its long-term stability. Hence this study is indented to identify about the pattern of ossicular erosion in both the type of disease so we can plan various surgical approaches and also various graft materials which can be used for ossicular reconstruction as the challenge of hearing improvement depends on proper ossicular reconstruction and its long-term stability.

## MATERIALS AND METHODS

This was a retrospective study, carried out in the department of ENT, at a tertiary care center in Central India. The study group included 60 patients with COM (mucosal and squamous) (unilateral or bilateral) disease i.e. patients presenting with COM who underwent surgical exploration of middle ear or mastoid over a period of 18 months from November 2019 to April 2021. All patients were counseled about the study and consent was taken by the patient for including in the study and publication. All patients had been preoperatively evaluated by otoscopy or examination under microscope and by plain X-ray mastoid bilateral oblique schuller's view/ HRCT temporal bone. The cases with previous history of ear surgery, having malignancy of middle ear and suffering of otitis externa or congenital ear disease were excluded from study. After taking written consent patient were subjected to surgical exploration after getting fitness for surgery. A clinical proforma was filled up for each patient, incorporating details regarding particulars of patient, history, clinical examination and investigation. Assessment of hearing status was done by pure tone audiometry prior to surgery. All patients underwent either tympanoplasty alone or with mastoid exploration and the type of surgery were determined intra operatively. The intra operative findings such as type and extent of disease, ossicular erosion and reconstruction if done were studied during surgery. Statistical analysis was performed. This study was approved by Institutional ethics committee.

## RESULTS AND DISCUSSIONS

A total of 60 cases were selected for this study and divided into 'mucosal and 'squamous' type of disease. (Table 1) shows distribution of COM patients according to type of disease, in which 60% of the patients were of mucosal type of disease and 40% had squamous type of disease. (Table 2) shows Various ossicular involvement among COM mucosal and COM squamous patients. Out of the 60 cases of Chronic otitis media in our study, 40% were male and 60% were female. Our findings are in concordance with the results of kaur *et al.*<sup>[5]</sup>, in which out of 100 cases 65% were female and 35% were males. Similar results were found in Varshney *et al.*<sup>[6]</sup> and Khan *et al.* where the female

preponderance was observed, 52% and 58% respectively. However, male preponderance was observed in some studies-Rout *et al.* (60%)<sup>[7]</sup>, Gupta mittal *et al.* (59%)<sup>[8]</sup>, Salem Muftah *et al.* (54.9%), Ujawala lokhade *et al.* (57.27%)<sup>[9]</sup>, Ihsan *et al.* (54.1%), Alabassi *et al.* (54.1%)<sup>[10]</sup>. Equal distribution of disease in males and females was also observed in some studies like Rev bras otorhinolaryngol *et al.*<sup>[11]</sup>, Sharma Shetty *et al.*

Our finding are in concordance with the findings of Rev bras otorhinolaryngol<sup>[11]</sup> age range of 4-49 years with mean age of 26.3 years, Rout *et al.*<sup>[7]</sup> showed age range of 10-60 years with mean age of 24 years. Similarly Varshney *et al.*<sup>[6]</sup> had a mean age group of 29.72+-13.09 (range 16-70 years) and kaur *et al.*<sup>[5]</sup> showed mean age of 28.72+-8.68 with age range of 10-40 years. Most of the studies such as Santoshi Kumar *et al.* showed a mean of 32.9 years with a age group of 1-53 years, Ujawala Lokhande *et al.*<sup>[9]</sup> had a mean age of 48.1 years with a age range of 1-70 years. Gupta Mittal *et al.*<sup>[8]</sup> had a mean age of 36.59 years with a age group of 1-70 years. Some studies in which the study individuals were of lower age group Salem Muftah *et al.* 6-14 years with the age group of had a mean age of 10 years, Parvez *et al.*<sup>[12]</sup> had a mean age of 6.1 years with the age range of 1-20 years, Similarly Garud *et al.* had a mean age of 8.5 years with a age range of 6-15 years.

There was higher involvement of patient belonging to upper lower and lower socioeconomic group in Garud *et al.* (37.5%) and 34.37% respectively and Gupta Mittal *et al.*<sup>[8]</sup> 25.20% and 52.84% respectively. This study was in concordance with Albassi *et al.*<sup>[10]</sup> in which out of 120 patients 100 (83.3%)patient belonging to urban area and 20(16.6%) belonging to rural area. However, Gupta Mittal *et al.*<sup>[8]</sup>, Parvez *et al.*<sup>[12]</sup>, Goyal, kaur *et al.*<sup>[5]</sup> study showed more patients belonging to rural areas with 65.04%, 94.5% and 73.6% respectively. Our study was in concordance with Kaur, Goyal, kaur *et al.*<sup>[5]</sup> where there was unilateral involvement in a greater number of cases in both type of disease. Albassi *et al.*<sup>[10]</sup> showed similar results with a greater number of cases with unilateral involvement, however the study did not mention the laterality with reference to type of disease. The results of Varshney *et al.*<sup>[6]</sup> showed duration of ear discharge range from 6 months to 50 years, with 39 cases having duration between 10 and 15 yrs, in mucosal type of disease, 26 cases had duration of discharge from 1-5 years, while 17 squamous cases had duration from 10-15 years. Our study was in concordance with Varshney *et al.*<sup>[6]</sup> in which there was 60% of patients with mucosal type of disease and 40% were of squamous. However, many studies showed much higher patients with mucosal type of disease Kaur *et al.*<sup>[5]</sup> study showed 91% of

individuals were of mucosal disease and 9% were of squamous disease, Garud *et al.* study showed 87.5% of patients with mucosal disease and rest were of squamous disease, Gupta Mittal *et al.*<sup>[8]</sup> study showed 89.4% of patients with mucosal disease and rest were of squamous disease, Sharma Shetty *et al.* study showed 79.06% of patients with mucosal disease and rest were of squamous disease, Basak *et al.*

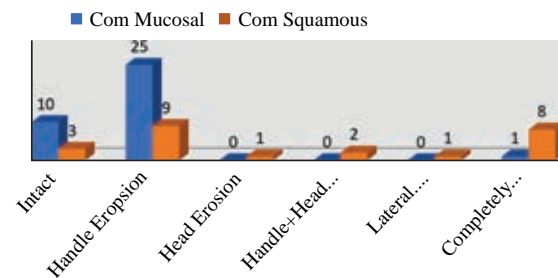


Fig. 1: Comparison of Malleus pathology among COM Mucosal and COM Squamous

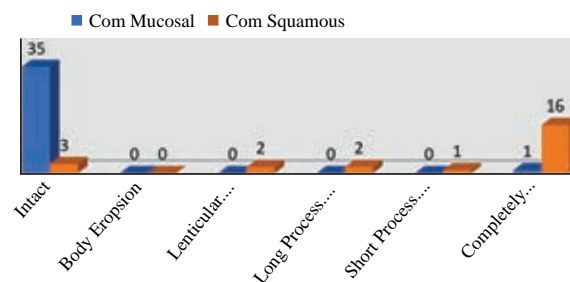


Fig. 2: Comparison of Incus pathology among COM Mucosal and COM Squamous

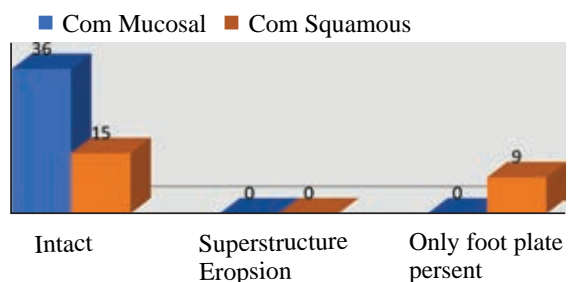


Fig. 3: Comparison of Stapes pathology among COM Mucosal and COM Squamous

study showed 86.02% of patients with mucosal disease and rest were of squamous disease.

In squamous type of disease out of 24 patients, 9 patients had all the three ossicles involved. Two patients had normal ossicular chain, malleus and incus involvement was seen in 10 cases, Two cases had isolated handle of malleus involvement and incus was found completely eroded on 1 case. In Rout *et al.*<sup>[7]</sup> July 2014 study it was found that out of 200 patients of COM, 126 were having normal

**Table 1: Distribution of COM patients according to type of disease**

Chronic Otitis Media (COM)	Number	Percentage
Chronic Otitis Media Tubotympani (COM Mucosal)	36	60.0
Chronic Otitis Media Atticoantral (COM Squamous)	24	40.0
Total	60	100.0

**Table 2: Ossicular involvement among COM Mucosal and COM Squamous Patients.**

Ossicular Status	COM Mucosal	COM Squamous
Malleus Involvement	26	21
Incus Involvement	1	21
Stapes Involvement	0	9
Chi Square Value	22.46	
Significance p-value	0.001(HS)	

ossicular chain, that is 63%. Rest 37% had some amount of ossicular pathology. In Varshney *et al.*<sup>[6]</sup> out of 150 cases of both the type of disease incus was found the commonly involved ossicle, in which out of 90 cases of mucosal disease, 7 had incus involvement, 2 had malleus involvement and 1 had stapes superstructure involvement. In 60 cases of squamous type of disease 27 had malleus involvement, 51 had incus involvement and 31 had superstructure involvement. In Sharma Shetty *et al.*, out of 86 patients in which 18 were of squamous type of disease and rest were of mucosal, ossicular necrosis was found in 30 cases (all cases of squamous and 15 cases of mucosal type). Most common ossicle involved was whole of incus followed by long process of incus and lenticular process of incus. Khan *et al.* in their study of 150 cases found lenticular erosion in 53 cases, malleus handle erosion and flattening in 26 cases and stapes superstructure loss in 15 cases.

Sharma *et al.*<sup>[13]</sup> noted ossicular involvement in 48 cases out of 50 cases of squamous type of disease. Most commonly involved was incus 94% followed by malleus 54% and stapes 34%. Haider *et al.*<sup>[14]</sup> and Varshney *et al.*<sup>[6]</sup> showed maximum number of cases with intact malleus in mucosal and squamous type of disease, It was followed by handle of malleus erosion in mucosal type of disease. Thangraj *et al.*<sup>[15]</sup> and Sharma *et al.*<sup>[13]</sup> studies 50 cases each with squamous type of disease with handle erosion was most common finding in former study while intact malleus was found in most cases in the later one. Haider *et al.*<sup>[14]</sup> and Varshney *et al.*<sup>[6]</sup> showed maximum number of cases with intact incus in mucosal type of disease. In squamous type of disease there were more number of cases with long process and lenticular process erosion in the former study, the later study showed similar number of cases with long process erosion and complete erosion of ossicle with later being more. Tangraj *et al.*<sup>[15]</sup> and Sharma *et al.*<sup>[13]</sup> studies 50 cases each with squamous type of disease with long process erosion was most common finding in both the studies. Haider *et al.*<sup>[14]</sup> and Varshney *et al.*<sup>[6]</sup> showed maximum number of cases with intact stapes in mucosal type of disease, however there were some cases with involvement of superstructure erosion. In squamous type of disease there were a greater number of cases

with superstructure erosion in both the studies. Thangraj *et al.*<sup>[15]</sup> and Sharma *et al.*<sup>[13]</sup> studies 50 cases each with squamous type of disease with more number of cases with superstructure erosion in the former study however the latter study had 66% of cases with intact stapes.

## CONCLUSION

According to results and observations in our study there was more number of cases with mucosal type of disease. It as found that there was female preponderance in patients with COM, with variety of patients in different age group, however most of them belonged to 21-40 years age group. Most of the patients belonged to lower middle class socioeconomic status which explains the disease etiopathology of poor living conditions and over crowding. Although there were more patients of COM residing in urban area but also significant number of patients with COM were found residing in rural area. This can be due to the fact hospital was located in the urban area and was assessable to rural population. Most of the COM patients had unilateral ear involvement which can be due to eustachian tube dysfunction or nasal pathologies like deviated nasal septum, rhino sinusitis, adenoid hypertrophy etc. However, the exact cause was not evaluated in this study which could be the limitation of this study. Most patients had a history of ear discharge less than or equal to 5 years in mucosal type of disease and since childhood in squamous type of disease which shows that the squamous type of disease had longer duration, although there was no statistical significant difference. In our study in which the aim was to find the ossicular pathology in patients with COM we can conclude that the handle of malleus erosion was the most common finding type of disease followed by intact incus in mucosal type of disease and completely eroded incus in squamous type of disease. All patients had intact stapes in mucosal type of disease, however superstructure erosion was seen in many cases in squamous type of disease. So, from the observation and results obtained from this study, we can conclude that there is positive correlation of ossicular involvement in both the type of disease, being higher in squamous disease than in mucosal type of disease. Studying the frequency and the extent of

ossicular chain destruction is important as it helps surgeon to predict preoperatively according to patients disease process and hence plan for ossicular reconstruction using appropriate material.

## REFERENCES

1. Slattery, W.H., 2003. Pathology and Clinical Course of Inflammatory Diseases of the Middle Ear. In: Glasscock-Shambaugh Surgery of the Ear., Glasscock, M., E.A.J. and Gulya, (Eds.), Reed Elsevier, New Delhi, pp: 428-429.
2. Mills, R.P., 1997. Management of chronic suppurative otitis media. In: Scott-Brown's Otolaryngology., Booth, J., B.A.G. and Kerr, (Eds.), Reed Educational and Professional Publishing, London, pp: 1-11.
3. Monasta, L., L. Ronfani, F. Marchetti, M. Montico and L.V. Brumatti *et al.* 2012. Burden of disease caused by otitis media: Systematic review and global estimates. Plos One., Vol. 7 .10.1371/journal.pone.0036226.
4. Verhoeff, M., E.L.V. Veen, M.M. Rovers, E.A.M. Sanders and A.G.M. Schilder, 2006. Chronic suppurative otitis media: A review. Int. J. Pediatr. Otorhinol., 70: 1-12.
5. Kaur, I., G.J. P and D. Singh, 2017. Prevalence of chronic suppurative otitis media in school going children of patiala district of Punjab, India. J. Evol. Med. Dent. Sci., 6: 5402-5407.
6. Varshney, S., A. Nangia, S.S. Bist, R.K. Singh, N. Gupta and S. Bhagat, 2010. Ossicular chain status in chronic suppurative otitis media in adults. Indian J. Otolaryngol. Head. Neck Surg., 62: 421-426.
7. Rout, M., K. Susritha, P. Das, B.S. Jyothi, D. Mohanty and V. Rao, 2014. Ossicular chain defects in safe type of chronic suppurative otitis media. Indian J. Otol., Vol. 20 .10.4103/0971-7749.136838.
8. Gupta, V.K., A. Mittal, L. Krishnan and V. Gajbe, 2004. Adsorption kinetics and column operations for the removal and recovery of malachite green from wastewater using bottom ash. Separation Purif. Technol., 40: 87-96.
9. IJCMAS., 2016. International journal of current microbiology and applied sciences., <https://journals.indexcopernicus.com/search/details?id=6455>.
10. JMMS., 2010. Journal of Medicine and Medical Sciences.
11. Rev, B., 2007. Otorrinolaringol.
12. Parvez, A., 2016. Community med public health.
13. Sharma, S., 2018. Ossicular involvement and types of pathology in chronic otitis media squamous active disease. Med. J. Pokhara Acad. Health Sci., 1: 45-48.
14. Sheikh, H.H.R., 2015. Ossicular chain erosion in chronic suppurative otitis media. otolaryngol., Vol. 5 .10.4172/2161-119x.1000203.
15. Thangaraj., 2001. Ossicular pathology in chronic suppurative otitis media.