

# A Study of Etiopathogenesis of Middle Ear Granulations in COM and Their Management

Sahil Kapoor<sup>1\*</sup>, Probal Chatterji<sup>2</sup>

<sup>1</sup>PG Resident (Illrd Year), <sup>2</sup>Professor and Head,  
Department of ENT & HNS, TMMC & RC, Moradabad, Uttar Pradesh, India.

## ABSTRACT

**Objective:** The purpose of this study was to evaluate the etiopathogenesis of middle ear granulations in cases of COM and their management.

**Materials and Methods:** A prospective study was conducted on 100 patients over a period of 12 months. Patients clinically diagnosed as COM and operated, with the findings of granulations in middle ear were included in this study. Each of these patients was subjected to complete history and thorough ENT examination after taking proper written informed consent. Clinical and laboratory data from the study was recorded as per the proforma.

**Results:** Analysis of data revealed that maximum cases were found in the second or third decade of life with a male preponderance. Rural patients were 75% as compared to those from urban background 25%. Mucosal type of COM was found in 69% patients and squamous type in 31% patients. Maximum patients presented with history of discharge since 5-10 years, mostly mucopurulent type of discharge. Granulations were found to be present at more than one site in middle ear in most of the patients. Incus was the most commonly involved ossicle. Conservative management included chemical cautery and aural toilet followed with antibiotics with topical steroid

therapy. Surgical management included tympanoplasty with cortical mastoidectomy, atticotomy with canal wall reconstruction and MRM. Recurrence of granulations was seen in most cases of MRM which were managed by chemical cautery. Failures in cases of tympanoplasty with cortical mastoidectomy and atticotomy with canal wall reconstruction was managed by revision surgery or chemical cautery as per requirement.

**Keywords:** COM, Aural Granulations, Complications.

## \*Correspondence to:

**Dr. Sahil Kapoor,**  
PG Resident (Illrd Year),  
Department of ENT & HNS,  
TMMC & RC, Moradabad, Uttar Pradesh, India.

## Article History:

Received: 03-02-2018, Revised: 01-03-2018, Accepted: 29-03-2018

Access this article online	
Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.2.065	

## INTRODUCTION

Auditory sensation is one of the vital sensations to humans like vision. So when such a great sensation is lost, life naturally loses its charm. Infections of the middle ear may result in permanent perforation of the tympanic membrane leading to variable degree of hearing loss.

Perforation of the Ear drum, ear discharge or otorrhoea and hearing loss of more than three months duration is characteristic of COM. The pathogenesis of COM remains poorly understood and is a global health burden.

It occurs as a complication of acute otitis media, a common condition with an alarming propensity to become chronic in developing settings due to various factors, including inadequate treatment, frequent upper respiratory tract infections, nasal disease, poor living conditions with poor access to medical care, poor housing, hygiene and nutrition. COM has been classified into mucosal or tubotympanic type and squamous or atticotympanic type depending upon the site of perforation, its potential to produce complication and diversity in pathological process.<sup>1,2</sup>

The most prominent pathological feature of COM is the presence of different degrees of granulation tissues.<sup>3,4</sup> Development of granulation tissue in the middle ear cavity is a generalized response to injury/inflammation and chronic otomastoiditis.<sup>5</sup>

Thus ears with chronic perforations with or without cholesteatoma which discharge chronically are the ideal setting for granulation formation in middle ear.<sup>6</sup> Areas of inflamed mucosa may ulcerate with proliferation of blood vessels, fibroblasts and inflammatory cells leading to formation of granulation tissue.

The granulation tissue may not only be present in the tympanic cavity, but also in the entire middle ear cleft. Thus simple closure of the perforation in COM without surgical removal of infected mucosa and granulation tissue is fraught with failure to control the disease.

Granulations present in the oval window, round window, posterior mesotympanum, attic etc. and may present considerable difficulties in surgical removal and are left behind many a times resulting in failure of surgeries.

This requires deft surgical maneuvers and/or assistance with otoendoscope for successful outcome. Clearing of granulations and restoring the patency of the aditus, thus providing a reservoir of air to prevent retraction of the neotympanum is also the key to a good surgical result.<sup>7-10</sup> Thus a study on the aetiopathogenesis and the various modalities of management of granulations in middle ear in cases of chronic middle ear disease with or without cholesteatoma was done.

This study proposes to give us an insight into how COM with aural granulations may be best managed to attain a disease free ear along with improved hearing.

### MATERIALS AND METHODS

A prospective study was conducted in the department of Otorhinolaryngology at Teerthankar Mahaveer University, Moradabad over a period of 12 months. Patients with granulations in middle ear in cases of COM who underwent surgery were included in the study.

Each of these patients was subjected to complete history and thorough ENT examination and pertinent audiological and radiological investigations after taking informed consent. Clinical and laboratory data from the study was recorded as per the pro forma.

#### Inclusion Criteria

- All cases of ear diseases with finding of granulations in middle ear with COM
- Patients of both sexes in all age groups were considered.
- Voluntary participation in the study

#### Exclusion Criteria

- Patient with bleeding diathesis.
- Patients with malignancy of ear.
- Patient unable to report for follow up.

### RESULTS AND DISCUSSION

The data collected was assessed to determine the aetiopathogenesis of granulations in middle ear.

#### Age Distribution

In the current study, the age group most commonly affected was between 16-25 years followed by 26-35 years, 36-45 years, 0-15

years and 45 years and above. This was similar to the findings by Varshney et al,<sup>11</sup> who also concluded that the most commonly affected age group was between 16 and 25 years. Similar findings were also reported by Shreshtha et al,<sup>12</sup> Singh et al,<sup>13</sup> and Ajalloueyan,<sup>14</sup> The early presentation may be due to increased awareness to health issues and difficulty in hearing affecting performance at school or work efficiency. This probably led the patients to seek early medical intervention.

#### Sex Distribution

The sex distribution of COM with granulation of the middle ear in the present study was 57.0% in males and 43.0% in females. This shows sex incidence of COM to be greater in males with male: female ratio as 1.3:1 which was similar to the findings by Baig et al,<sup>15</sup> Males more likely suffer from acute otitis media and seem to have a higher preponderance for otogenic complications compared with females.<sup>16,17</sup> However, different findings were reported by Varshney et al,<sup>11</sup> who found that the ratio of male to female patients was 1.00:1.08.

#### Rural: Urban Distribution

COM is particularly common in developing countries like India, especially in rural areas with low socioeconomic status and low literacy rates. Other contributing socioeconomic factors are ignorance, poverty, overcrowding, poor personal hygiene, malnutrition, bathing in open ponds and lack of access to medical help. Hence, illiterate patients in rural areas are particularly vulnerable to COM and its complications.<sup>18</sup>

#### Discharge

In our study, 25.0% patients presented with a duration of discharge between 0-5 years, 5-10 years in 38.0% patients, 10-15 in 16.0% patients and more than 15 years duration of discharge among 21.0% patients.

In a study by Varshney et al,<sup>11</sup> the duration of ear discharge ranged from 6 months to 50 years (mean duration 11.30 years). Thirty-nine cases (26.00%) had duration of ear discharge between 10 to 15 years. The duration of disease in unsafe cases was generally seen to be longer. This particular finding may be a result of conversion of safe type of disease into unsafe disease over time.<sup>19</sup> Most of the patients had mucopurulent type of discharge (68%) followed by mucoid (26%) and purulent type (6%).

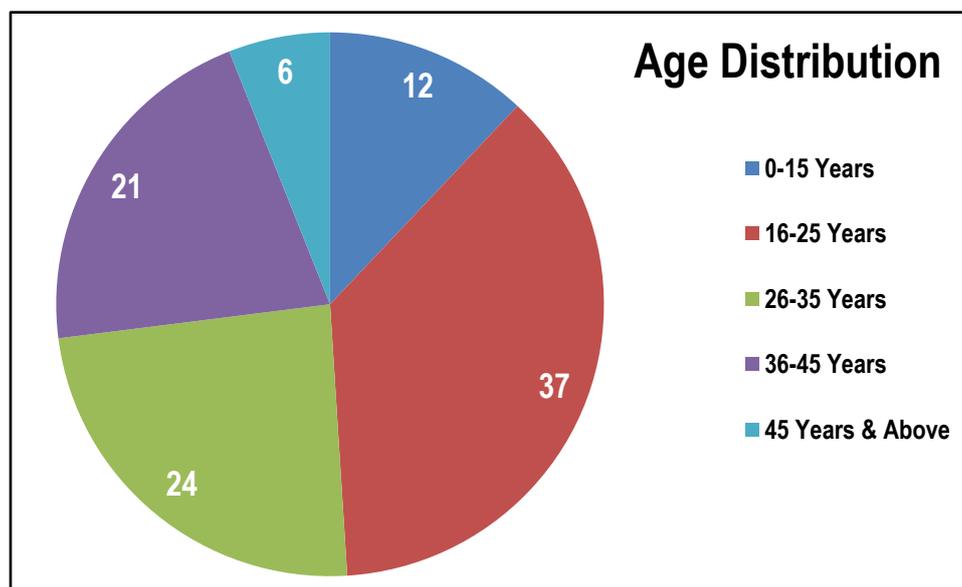


Fig 1: Distribution of the Study Population According to Age Groups

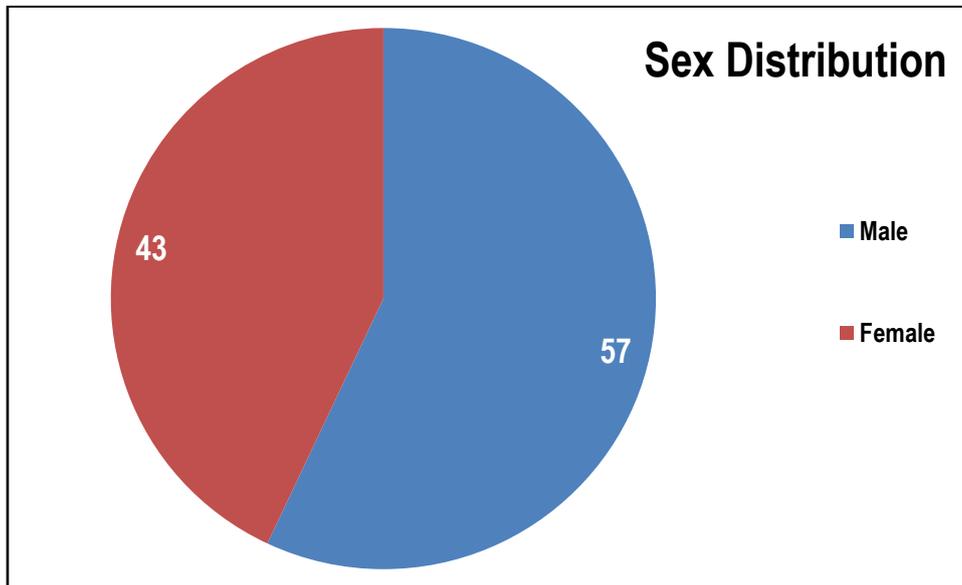


Fig 2: Distribution of The Study Population According To Gender

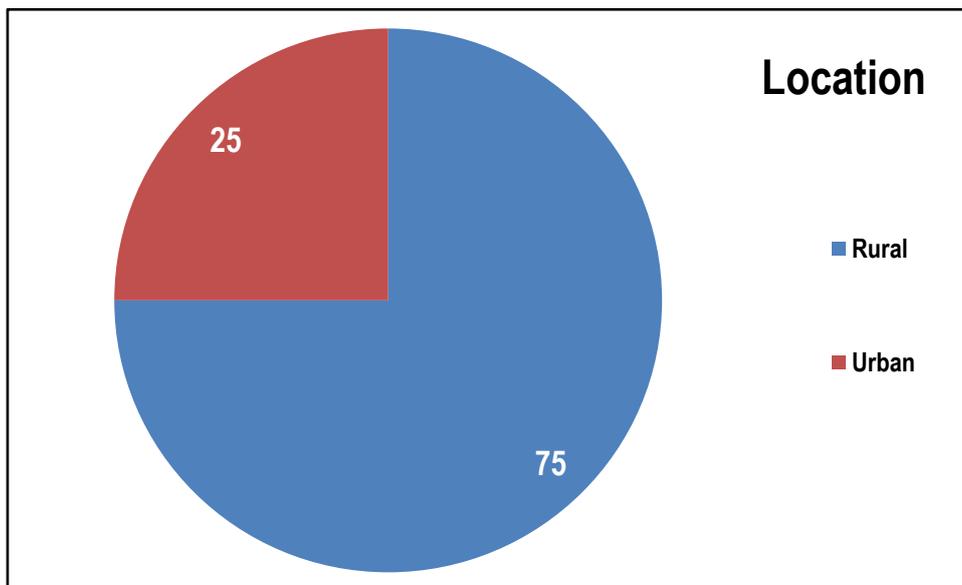


Figure 3: Distribution of the Study Population According to Residence.

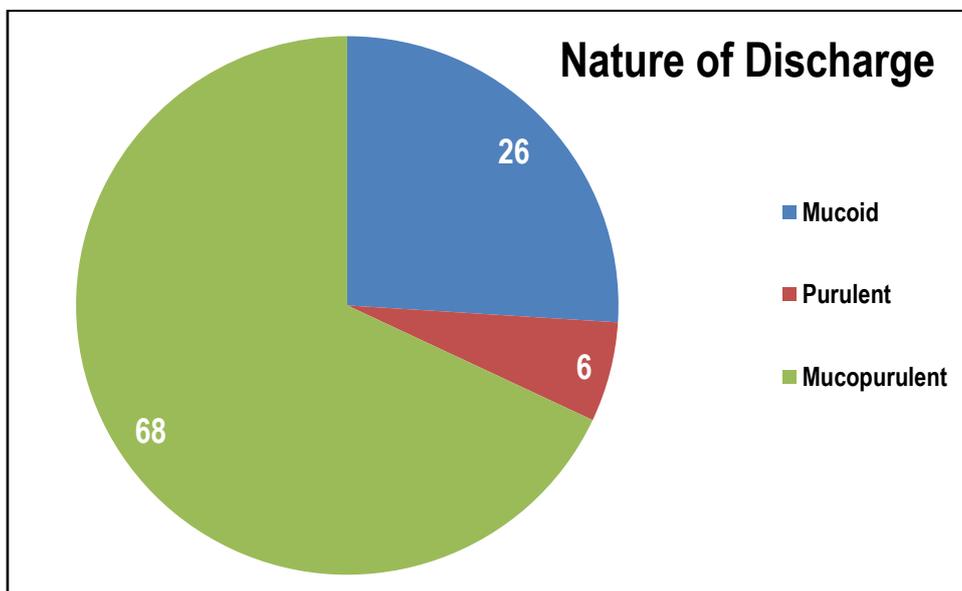


Figure 4: Distribution of the Study Population According to Nature of Discharge

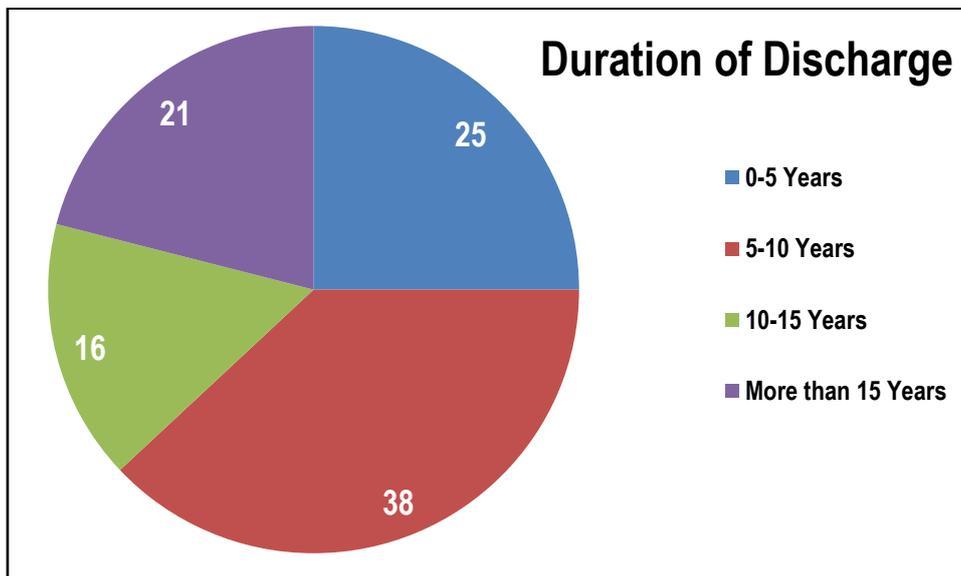


Figure 5: Distribution of the Study Population According to Duration of Discharge

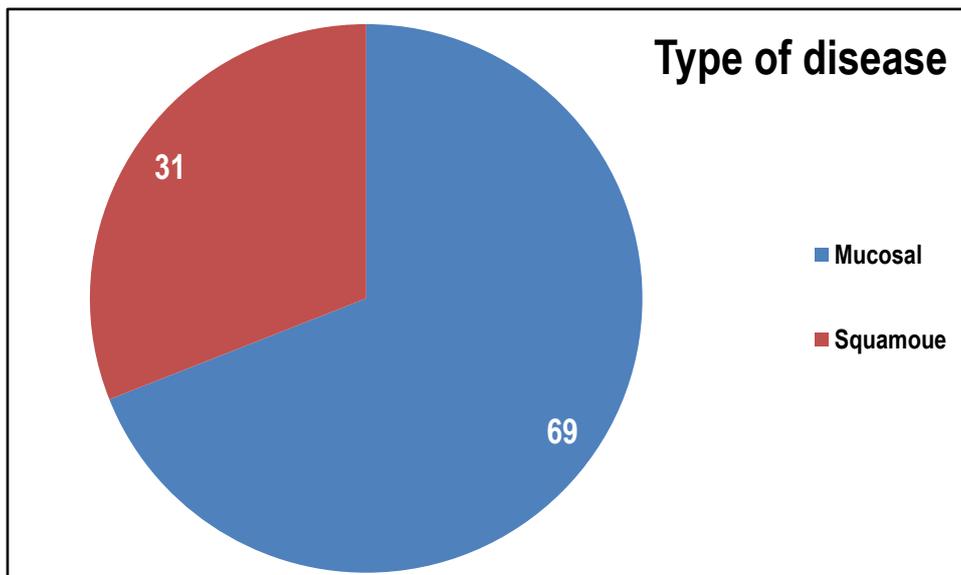


Figure 6: Distribution of the Study Population According to Type of Disease

#### Type of disease

In our study, mucosal disease was found among 69.0% patients followed by squamous disease in 31.0%.

In the present study, cholesteatoma was found among 31.0% of the patients. Similarly the prevalence of cholesteatoma was 36 % in the study by Majeed et al.<sup>20</sup> The presence of middle ear cholesteatomas in patients with chronic otitis media results in a higher morbidity and mortality because of the erosion power of these epithelial growths.<sup>21</sup>

#### Granulations

Granulations involving the attic were seen in 36% patients. Promontory involvement was seen in 12.0% patients. Granulations arising from facial nerve sheath was seen in 8.0% patients and aditus granulations extending up to middle ear were seen in 34.0% patients.

Granulations involving the oval window were seen in 27% cases and round window in 24% cases. Granulations at more than one site were seen in 46% patients. Malleus was found to be intact in 83.0%, absent in 2.0% cases and involved in 15.0% cases. Incus was found to be intact in 46.0%, absent in 16.0% cases and

involved in 38.0% cases. Stapes was found to be intact in 73.0% cases, absent in 2.0% cases and involved in 25.0% cases.

Granulations involving mastoid antrum & air cell system were found in 91.0% patients.

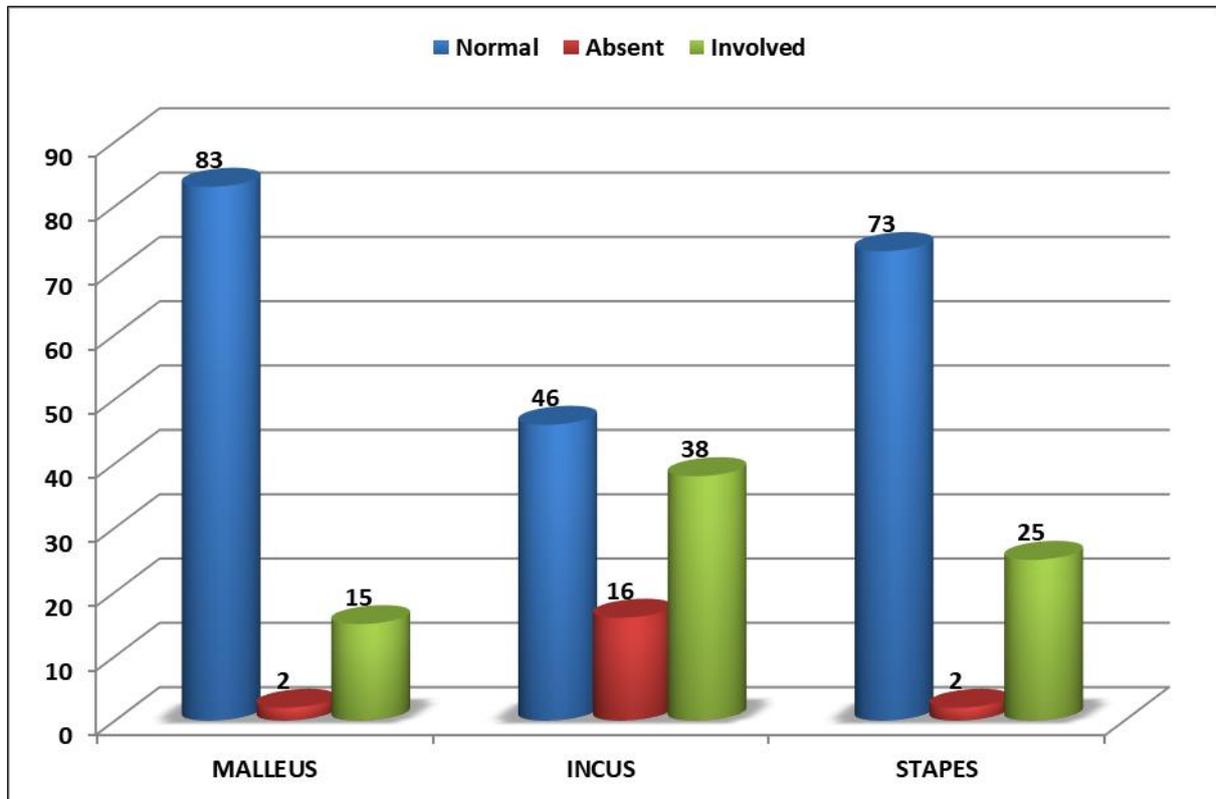
#### Treatment and Follow up

Patients who were unfit for surgery or refused for it were managed conservatively. Conservative management included aural toilet followed with antibiotics and topical steroids or evaluation under microscope with chemical cautery. Aural toilet followed with antibiotics with steroid was done in 8.0% patients, Evaluation under microscope with chemical cautery was done in 8.0% patients.

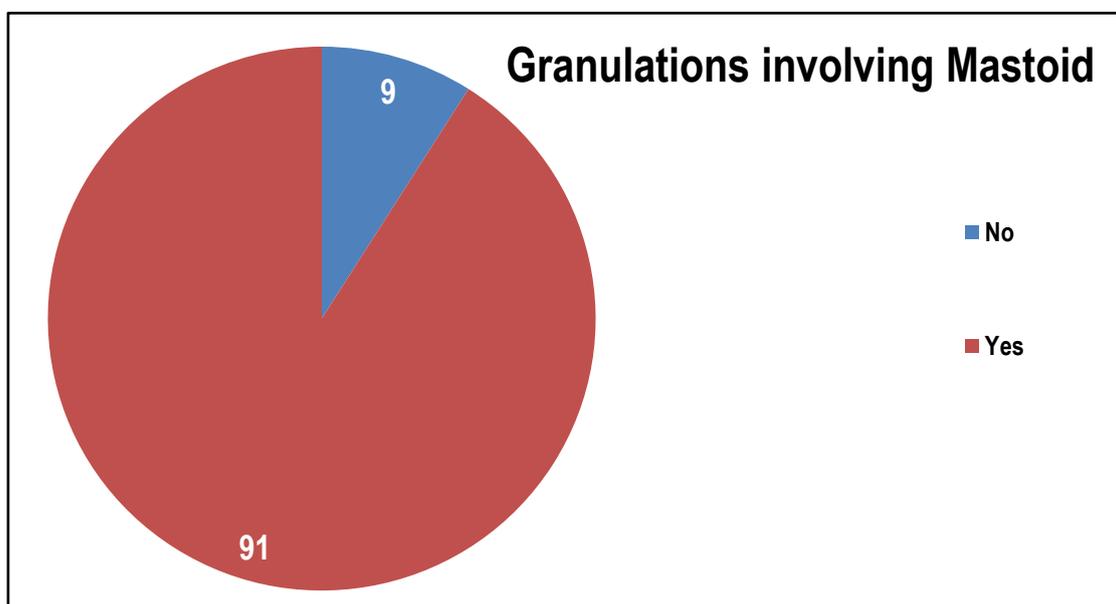
Surgical management included tympanoplasty with cortical mastoidectomy, atticotomy with canal wall reconstruction and modified radical mastoidectomy. The choice of treatment depended upon the type of disease and the intraoperative findings. Tympanoplasty with cortical mastoidectomy was done in 48.0% patients. Atticotomy with canal wall reconstruction was done in 4.0% patients and modified radical mastoidectomy was done in 32.0% patients.

**Table 1: Site of involvement of granulations**

OTHER	Frequency	Percent
Attic	36	36.0%
Promontory	12	12.0%
Facial nerve	8	8.0%
Aditus	34	34.0%
Oval window niche	27	27.0%
Round window niche	24	24.0%
More than one site	46	46.0%



**Figure 7: Distribution Of Granulations Involving Ossicles**



**Figure 8: Distribution Of Granulations Involving Mastoid Air Cell System**

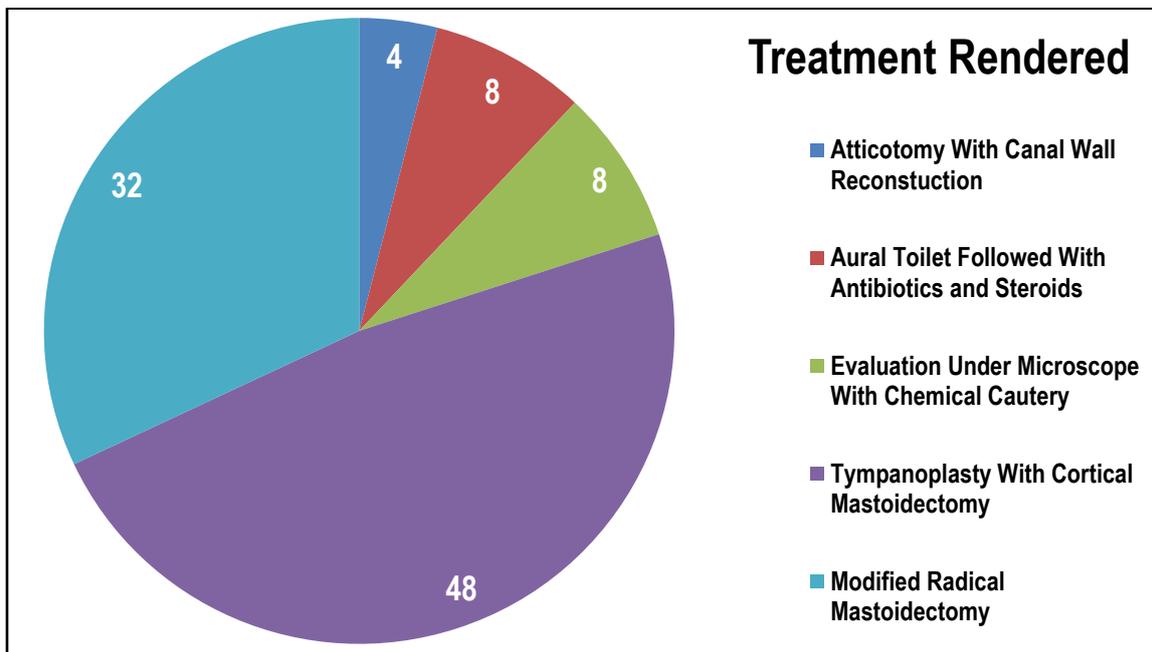


Figure 9: Distribution Of Treatment Rendered

Table 2: Results On Follow-Up Of Patients Among The Study Population

Treatment	Failure	Management On Follow Up
Evaluation under microscope with chemical cautery	8	3 Tympanoplasty with cortical mastoidectomy in 2 cases Repeat of chemical cautery with topical therapy in 1 case
Aural toilet followed with antibiotics with steroid	8	2 Tympanoplasty with cortical mastoidectomy in 2 cases
Tympanoplasty with cortical mastoidectomy	48	7 Modified radical mastoidectomy in 5 cases Chemical cautery with topical therapy in 2 cases
Atticotomy with canal wall reconstruction	4	2 Modified radical mastoidectomy
Modified radical mastoidectomy	32	8 Chemical cautery with topical therapy

Our study showed that failure was seen in 3 cases treated by evaluation under microscope with chemical cautery which were managed by tympanoplasty with cortical mastoidectomy in 2 cases and chemical cautery with topical therapy in 1 case. Failure was seen in 2 cases treated by aural toilet followed with antibiotics with steroid which were managed by tympanoplasty with cortical mastoidectomy in both cases. Failure in cases of conservative approach was seen due to recurrent infection from contamination of the ear from the outside environment or due to residual underlying disease in patients who were immune-compromised or in patients who took incomplete treatment.

Failure was seen in 7 cases treated by tympanoplasty with cortical mastoidectomy which were managed by modified radical mastoidectomy in 5 cases and chemical cautery with topical therapy in 2 cases. Failure was seen in 2 case of atticotomy with canal wall reconstruction which were managed by modified radical mastoidectomy. Failure was seen in 8 cases treated by modified radical mastoidectomy which were managed by chemical cautery with topical therapy.

No surgeon, however experienced, escapes complications. Recurrence of granulation tissue after surgical procedures needs to be addressed. Very limited literature is available for surgical management of granulations in middle ear cleft. Complete

removal of the disease along with middle ear granulations is of utmost importance in order to give the patient a dry ear with serviceable hearing.

**CONCLUSION**

COM is commonly associated with poor socio-economic status or poverty related conditions such as malnutrition, overcrowding, substandard hygiene, frequent URTI and under resourced health care. Improvement of quality of life, early recognition and treatment is recommended in limiting disease burden.

Granulations in middle ear are not only associated with cholesteatoma but can also be seen in cases of mucosal type of COM. Intraoperatively, granulations are more florid in recently achieved dry ears or actively discharging ears compared to those ears which are dry for a long time prior to surgery.

The recurrences were most probably due to poor postoperative self-care, poor hygiene and carelessness on part of the patient.

It is important for the ear surgeons to realize that inflammatory changes and granulations described in this study are present not only in the tympanic cavity, but in the entire middle ear cleft including the mastoid antrum and various air cell tracts of the temporal bone. Thus, simple closure of a perforation in active mucosal COM without surgical removal of infected mucosa and

granulation tissue from the mastoid is fraught with failure to control the disease. There is an urgent need to focus research studies in the area of granulation in cases of COM, which will open up avenues to design novel therapeutic studies against granulations, its management and prevent its complications.

Medical and surgical options are limited, with side effects and risks, and sometimes are not successful in eliminating disease. Topical antibiotics, which are the first-line therapy of choice, are limited only to those that are not potentially ototoxic. Additionally, surgery carries the risks of worsening hearing, as well as the potential for damage to the facial nerve and resulting facial nerve paresis. Early intervention in cases of granulations in middle ear in COM will also help in achieving better results.

## REFERENCES

1. Bluestone CD, Klein JO. Chronic suppurative media. *Pediatr Review* 1999; 20(8): 277-9.
2. Browning GG, Aetiopathology of inflammatory conditions of the external and middle ear. In: Booth JB, Kerr AG, editors. *Scott-Brown's Otolaryngology*. 6th ed. Vol 3. London: Reed Educational and Professional publishing Ltd; 1997:p.1-37.
3. Paparella MM, Schachern PA, Yoon TH, Abdelhammid MM, Sahni R and da Costa SS: Otopathologic correlates of the continuum of otitis media. *Ann Otol Rhinol Laryngol* 1990(Suppl)148:17-22.
4. da Costa SS, Paparella MM, Schachern PA, Yoon TH and Kimberley BP: Temporal bone histopathology in chronically infected ears with intact and perforated tympanic membranes. *Laryngoscope* 1992;102:1229-36.
5. Swartz J, Harnsberger H. *Imaging of the temporal bone*. Georg Thieme V2erlag. ISBN:0865777004.
6. Cummings otolaryngology 5Th edition volume 2 Chapter 139: pp1969-1971.
7. Mills RP. Management of chronic suppurative otitis media. In: Booth JB, Kerr AG, editors. *Scott-Brown's Otolaryngology*. 6th ed. Vol 3. London: Reed Educational and Professional publishing Ltd; 1997: p. 1-11.
8. Browning GG. The unsafeness of safe ears. *JvLaryngol Otol* 1984; 98:23-6.
9. Shreshtha S, Sinha BK. Hearing results after myringoplasty. *Kathmandu Univ Med J* 2006; 4(4): 455-9.
10. Singh RK, Safaya A. Middle ear hearing restoration using autologous cartilage graft in canal wall down mastoidectomy. *Ind J Otol* 2005; 11:10-4.
11. Varshney S, Nangia A, Bist SS, Singh RK, Gupta N, Bhagat S. Ossicular Chain Status in Chronic Suppurative Otitis Media in Adults. *Indian J Otolaryngol Head Neck Surg*. 2010;62(4):421-6.
12. Shreshtha S, Sinha BK. Hearing results after myringoplasty. *Kathmandu Univ Med J* 2006;4(4):455-9.
13. Singh RK, Safaya A. Middle ear hearing restoration using autologous cartilage graft in canal wall down mastoidectomy. *Indian J Otol* 2005;11:10-14.
14. Ajalloueyan M. Experience with surgical management of cholesteatomas. *Arch Otolaryngol Head Neck Surg* 2006;132:931-3.
15. Baig MM, Ajmal M, Saeed I, Fatima S. Prevalence of Cholesteatoma and its Complications in Patients of Chronic Suppurative Otitis Media. *Journal of Rawalpindi Medical College (JRMC)*; 2011;15(1):16-7.
16. Vos C, Gersdorff M, Gerard JM. Prognostic factors in ossiculoplasty. *Otol Neurotol* 2007;28(1):61-7.
17. Marfani MS, Magsi PB, Thaheem K. Ossicular damage in chronic suppurative otitis media—study of 100 cases. *Pak J Otolaryngol* 2005;21(1):9-11.
18. Vikram BK, Khaja N, Udayashankar SG, Venkatesha BK, Manjunath D. Clinico-epidemiological study of complicated and uncomplicated chronic suppurative otitis media. *J Laryngol Otol*. 2008;122(5):442-6.
19. El-Sayed Y. Bone conduction impairment in uncomplicated chronic suppurative otitis media. *Am J Otolaryngol* 1998;19(3):149-53.
20. Majeed J, Sudarshan Reddy L. Role of CT Mastoids in the Diagnosis and Surgical Management of Chronic Inflammatory Ear Diseases. *Indian J Otolaryngol Head Neck Surg*. 2017;69(1):113-20.
21. Sadé J, Halevy A. The etiology of bone destruction in chronic otitis media. *J Laryngol Otol*. 1974;88:139-43.

**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This 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.

**Cite this article as:** Sahil Kapoor, Probal Chatterji. A Study of Etiopathogenesis of Middle Ear Granulations in COM and Their Management. *Int J Med Res Prof*. 2018 Mar; 4(2):280-86. DOI:10.21276/ijmrp.2018.4.2.065