



# STATUS OF MASTOID ANTRUM AND EUSTACHIAN TUBE IN CASES OF LARGE, SUBTOTAL PERFORATIONS AND POSTERIOSUPERIOR RETRACTION POCKETS (PSRP)

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## Abstract:

### ● Introduction:

Chronic Otitis Media (COM) is now synonymous with Chronic Suppurative Otitis Media (CSOM), which is not actively used since COM is seldom associated with "the collecting of pus."<sup>[1]</sup> Acute suppuration of ear which transcends the period of 6 weeks is considered to be COM which suggests an abnormality of the ear drum. <sup>[2]</sup>

With a prevalence incidence of 1%, Eustachian tube dysfunction is amongst the most important factors in the development of COM.<sup>[4]</sup> Recently, mastoid air cells has been acknowledged as an essential compounding factor for the pathogenesis of the middle ear disease. Since Eustachian tube, mastoid air cell system and nasopharyngeal mass like adenoids can play an pivotal role in causation and persistence of COM , the current study is taken upon to observe the status of Eustachian tube, mastoid air cells system, nasopharynx in general and adenoids in particular in patients of COM.

- **Objectives** To study the status of Mastoid antrum on surgical exploration, status of eustachian tube and nasopharynx for adenoids in patients of Large, Subtotal perforation and posterosuperior retraction pockets

## Methodology

All the selected patients of large, subtotal perforation and PSRP in the age bracket of 15-60 years and satisfying the inclusion criteria will be considered and accrued in this study. We plan to look at a sample size of 60 patients (60 Ears). Diagnostic nasal video endoscopy (DNVE) to get insight into Eustachian tube function, size and grade of adenoids by grading system given by Cassano et al and Pure tone audiometry by ALPS AD 2000 to know the type and amount of hearing loss will be carried out. Status of mastoid antrum, extent of the disease, status of ossicles and associated abnormalities of temporal bone along with any other incidental finding will be noted intra-operatively.

**EXPECTED RESULT:** The data will be tabulated, analyzed statistically and will be discussed in the context of existing research.

- **Conclusion :** The purpose of the present study is to help the surgeon have a better insight on the status of mastoid antrum, eustachian tube in cases of large and subtotal perforation and posterosuperior retraction pocket (PSRP) and nasopharynx in general with significance to adenoids in patients of COM in rural area.

**Keywords:** mastoid antrum, eustachian tube, subtotal perforations, large perforations, posterosuperior retraction pockets (PSRP), adenoid hypertrophy, nasopharynx

## INTRODUCTION:

Otitis media (OM) is a constellation inflammatory disease afflicting the middle ear cleft. OM is broadly divided into two subtypes, acute and chronic.<sup>[1]</sup> AOM is defined as instantaneous emergence onset of infection accompanied with one or more signs of acute illness of middle ear such as inflammation, ear pain, irritability, otorrhea or/and fever.<sup>[2]</sup> Occasionally even with adequate antimicrobial therapy, the disease may fester to chronic suppurative Otitis Media (CSOM) characterized by persevering otorrhea from the middle ear surpassing a term of 6 weeks associated with a persistent perforated tympanic membrane.<sup>[3]</sup>

‘Chronic suppurative otitis media’ (CSOM), being no longer in vogue and is replaced by the term chronic otitis media (COM).<sup>[4]</sup> The implication of otorrhoea as a compelling cause of infirmity was recognized by Hippocrates in 460 BC who considered it secondary to ‘suppuration of brain’<sup>[5]</sup>.

COM is classified pathologically as active, inactive and healed<sup>[6]</sup> and is the most frequent chronic infectious diseases globally affecting the paediatric age group. Its incidence varies from 0.5-2% in developed countries while in developing country like ours, the range is as high as 3-57%. In India, the incidence rate is 30% with a prevalence of 16/1000 population in urban and 46/1000 among the countryside.<sup>[7,8]</sup>

Age, bacterial and viral exposure, seasonal and environmental variables, maternal smoking, overcrowding, genetic predisposition, innate and adaptive immune status, and hypertrophied adenoids are all factors that contribute to otitis media.<sup>[9]</sup>

Reduced hearing is the most dreaded sequelae of CSOM leading to a negative impact on a child's scholastic and behavioural growth.<sup>[10]</sup>

The Eustachian tube is a thin tube that runs from the posterior end of the nose to the middle ear. It is normally closed, but when we swallow, yawn, or chew, it opens. It serves three primary purposes: i) protects the middle ear from nasopharyngeal infections; ii) ventilates the middle ear iii) drains the fluids from the middle ear. Eustachian tube dysfunction, defined as poor dilatory function creating secondary ear disease due to mechanical blockage or functional reasons, is one of the main determinants for the pathogenesis of COM, with a prevalence rate of 1% [4].<sup>[6]</sup>

The mastoid air cell system has recently been cited as a significant component in the inflammatory pathogenesis of the middle ear. The **mastoid antrum** (Tympanic antrum) is an air filled space (~1 cm) in the temporal bone lies posterior to the middle ear and is connected to it by the aditus ad antrum, lined by flat cuboidal epithelium, which lies in continuity with that of the middle ear leading to its constant involvement with COM.<sup>[8]</sup>

Since the Eustachian tube, mastoid air cell system, and nasopharyngeal mass such as adenoids can play a significant role in the aetiology and persistence of COM, the objective of this research is to look into

the condition of the Eustachian tube, mastoid air cell system, nasopharynx in general, and adenoids in particular in patients of COM.

## **Background/rationale:**

There is a need to establish successful relation between mastoid air cell system, eustachian tube, and nasopharyngeal mass like adenoids as it can play a vice role in causation of COM due their proximity and continuity of the mucosal mattress. The current study is thus undertaken to examine the status of mastoid antrum, Eustachian tube, nasopharynx in general and adenoids in particular in patients of COM.

## **AIM AND OBJECTIVES**

### **AIM**

To study the status of mastoid antrum, eustachian tube function and adenoid size in cases of Large, Subtotal perforations and posterosuperior retraction pockets (PSRP)

### **Objectives:**

- 1) To study the status of Mastoid antrum on surgical exploration in patients of Large, Subtotal perforation and posterosuperior retraction pockets
- 2) To analyse the eustachian tube function by diagnostic nasal video endoscopy in patients of large, subtotal perforation and posterosuperior retraction pockets
- 3) To study and grade adenoids by diagnostic nasal endoscopy (DNE) in patients of large, subtotal perforation and posterosuperior retraction pockets
- 4) To correlate status of mastoid antrum, eustachian tube function and grade of adenoid enlargement with large, subtotal perforation and posterior superior retraction pockets

### **Methods:**

Study design: Observational cross-sectional study

Study Setting: All the patients with large, subtotal perforation and posterosuperior retraction pockets visiting outpatient department [OPD], Inpatient department [IPD] of ENT In AVBRH between 2019-22 will be studied .

### Study setup:

All the patients with COM visiting outpatient department [OPD], Inpatient department [IPD] of ENT in AVBRH will be studied.

### Study size:

60 patients. (60 Ears)

1. 20 patients- large perforation
2. 20 patients- subtotal perforation
3. 20 patients- posterosuperior retraction pocket

## **PARTICIPANTS:**

### **INCLUSION CRITERIA**

- All patients of COM with large, subtotal perforation between the age group of 15-60 years
- Any gender
- Squamosal COM with Posterosuperior retraction pockets with/without cholesteatoma

### **EXCLUSION CRITERIA**

- All the patients of otitis media above 60 years and below 15 years of age.
- Known immunodeficiency disorder.
- Patients with SNHL
- Craniofacial anomalies.

## **Methodology:**

All the selected patients of large, subtotal perforation and PSRP in the age bracket of 15-60 years and satisfying the inclusion criteria will be considered and accrued in this study. We plan to look at a sample size of 60 patients (60 Ears).

Patients will be comprehensively and diligently examined as per the proforma enclosed and baseline investigations will be done. Specific investigations like examination of ear under microscope with help of KarlKaps D 35614 AsslarEuropastrasse to know more about perforation and retraction, diagnostic nasal video endoscopy (DNVE) to get insight into Eustachian tube function, size and grade of adenoids by grading system given by Cassano et al and Pure tone audiometry by ALPS AD 2000 to know the type and amount of hearing loss will be carried out. Status of mastoid antrum, extent of the disease, status of ossicles and associated abnormalities of temporal bone along with any other incidental finding will be noted intra-operatively.

A predesigned proforma will be used to record the above information obtained by clinical examination, specific investigations and surgical exploration. Photographic documentation will be done wherever necessary.

IEC: Clearance from the Ethical Committee will be obtained.

Statistical analysis:

Statistical analysis of the data obtained will be done by chi square test.

Scope:

Comprehensive and co relative study.

It may influence positively surgical approach to this entity

Limitation: Sample size.

### **Implication:**

- 1) This study may help in designing and developing protocol.
- 2) This study may bring precision in intervention.

### **EXPECTED OUTCOMES:**

A total of 60 patients of COM in the age group between 15-60 years and satisfying the inclusion criteria having all patients of COM with large, subtotal perforation, both genders and Squamosal COM with Posterosuperior retraction pockets with/without cholesteatoma will be considered and accrued in this study. The patients included in this study will be evaluated for their clinical findings of ear, nose and throat. Specific investigations like examination of ear under microscope with help of KarlKaps D 35614 AsslarEuropastrasse to know more about perforation and retraction, diagnostic nasal video endoscopy (DNVE) to get insight into Eustachian tube function, size and grade of adenoids by grading system given by Cassano et al and Pure tone audiometry by ALPS AD 2000 to know the type and amount of hearing loss will be carried out .Status of mastoid antrum, extent of the disease, status of ossicles and associated abnormalities of temporal bone along with any other incidental finding will be noted intra-operatively.

A predesigned proforma will be used to record the above information obtained by clinical examination, specific investigations and surgical exploration. Photographic documentation will be done wherever necessary.

## **Discussion:**

The tympanic membrane is one of the most important entities in determining the pathological disease of the ear as its study encompasses the study of the mastoid air cell system, the eustachian tube and even the embryogenesis of the ear i.e. the routes of aeration. There are various factors like ear infections in childhood to recurrent upper respiratory infections in adults that not only contribute to the formation of perforation or retraction pockets but also affect the outcome of an already formed one.

The WHO defines COM exceeding the period of six weeks of discharge <sup>[8]</sup> The infection usually occurs during the first six years of life, peaking around the age of two.

Study done by Lakshmi et al. and Shrestha et al showed a slight female preponderance. <sup>[12,13]</sup> Some studies have found males to have a higher and more recurrent episode of otitis media than females like Teele et al. and Agrawal et al. <sup>[14,15]</sup> in which males were 53.6% and females were 46.4%. Differences in sexual preponderance is incidental, and has no anatomical factors predisposing either sex to the development of CSOM.

The WHO study showed 7.8 % of Indians are evaluated to be suffering from chronic ear disease which is significantly higher than the incidence rate 1.8% of Western countries. In India, the incidence rate is 30% with a prevalence of 16/1000 population in urban and 46/1000 among the countryside. <sup>[7,8]</sup> Rural population is affected more than urban due a variety of reasons like illiteracy, lack of awareness, poor sanitation, lack of health facilities and difference in lifestyle like people in rural India are still taking bath in ponds, rivers and wash clothes and utensils in the same water. These factors can be attributed to higher incidence in rural areas.

According to the study by Shaheen et al., more than half of the study samples were from low income group where chronic otitis media was also more prevalent. It also showed that the children, who used to take bath in the pond or river water, were affected more by CSOM, which was statistically significant <sup>[16]</sup>.

Mastoidectomy is one of the most common otological operations performed today. Indications for mastoidectomy range from eradication of chronic infection to approaches for various neurotological procedures. Mastoidectomy was first described by Louis Petit in the 1700s, although the concept did not gain wider acceptance until 1958, the cortical mastoidectomy was popularized by William House. This procedure attempted to avoid the common problems with radical mastoidectomy. <sup>[17]</sup>

Myringoplasty is an operative procedure, in which the reconstructive procedure is limited to repair of tympanic membrane perforation. Implicit in the definition is that the ossicular chain is intact and mobile, and the middle ear is disease free. There are a number of studies in the literature highlighting the advantages and disadvantages of performing mastoidectomy in the surgical treatment of mucosal type of chronic otitis media.

Balyan et al in 1997 did a retrospective study of 323 patients to evaluate the role of mastoidectomy in non-cholesteatomatous CSOM. They observed no statistically significant difference in hearing outcome when mastoidectomy was done. Similarly Mishiro et al in 2001 reviewed 251 cases of non-cholesteatomatous chronic otitis media, and found no statistically significant difference between the two groups.<sup>[18]</sup>

Majority of the patients undergoing mastoid exploration studied by Solanki et al had the presence of granulation tissue in antrum as the most frequent intraoperative finding (55.07%). The incidence of cholesteatoma and both cholesteatoma and granulations together was (21.73%) and (23.18%) respectively. Azevado et al. suggested granulation (63%) to be more common than cholesteatoma (21%) in unsafe diseases.

In a study by Das et al, out of 50 cases, 18 (36%) each had cholesteatoma and granulation tissue whereas 14 (28%) had polyp in the middle ear and mastoid cavity per-operatively.

According to Sharma et al study among 100 patients, on otoscopy, perforation was seen in 80% cases, retraction pockets were seen in 20% cases which were most common in posterosuperior quadrant (PSRP). Large central perforations involving all the quadrants was seen in 50% cases, while 27% had subtotal perforations. COM cases with retraction pockets showed Granulations (50%) as the commonest findings followed by cholesteatoma (42.9%) in the antrum.

Middle ear ventilation is an important predictor of functional recovery after middle ear reconstruction. The precise role of mastoid aeration is unknown, but it serves as an air reservoir and a surge tank to reduce pressure function. Many researchers have looked into the pattern of pneumatisation. According to Wittmack's endodermal hypothesis, proper pneumatisation requires a healthy middle ear mucosa, which can be impeded by inflammation or tubal dysfunction, resulting in recurrent middle ear infections and diminished pneumatisation in newborns and children.

Sade found an 82.3 percent correlation between low or non-pneumatized mastoid and squamosal COM, whereas Gomaa et al found a 60.7 percent association.<sup>[4]</sup> Rei et al found well-pneumatized mastoid in 44%, sclerotic in 50% and diploic in remaining 6%. In a study conducted by Sunita et al, HRCT temporal bone revealed pneumatized mastoid in 33.3%, diploic in 3.7%, sclerosed in 53.7%.

Yoelekar and Dasgupta related the origin of chronic suppurative otitis media to sinonasal pathology based on physical examination and endoscopy. Out of the 200 patients in their study, 80% had deviated nasal septum and an overall improvement of ear disease was observed in 79.31% ears ( $P=0.00$ ) after septal correction.<sup>[19]</sup>

The Eustachian Tube (ET) and Mastoid Process (MP) are strongly linked to middle ear infections, with an incidence of approximately 1% among adults.<sup>[4]</sup>

The ET is an extension of the dorsal end of the first pharyngeal pouch, stretching from the nasopharynx to the anterior wall of the middle ear cleft (MEC), whereas the Mastoid process is formed from the second



branchial arch and forms the MEC's posterior wall. Both structures are vital in aeration and gas exchange in the ear, which is the most significant physiological requirement for normal middle ear function.

**Jacob Sadé** in his remarkable work describes the MEC as “miniature lung” with an air filled space that acquires gas "inhalation" through the auditory tube.<sup>[4]</sup>

Quareberg in 1981, exhibited the role of enlarged adenoids causing otitis media in children. Recurrent otitis media is seldom associated with adenoid hypertrophy which mechanically blocks the eustachian tube.<sup>[13]</sup>

Because the Eustachian tube, mastoid air cell system, and nasopharyngeal mass such as adenoids can all play a role in the onset and progression of COM, the current study will examine the condition of the Eustachian tube, mastoid air cell system, nasopharynx in general, and adenoids in particular in COM patients.

## References:

1. Dickson G. (2014). Acute otitis media *Prim Care* 41 11–18 10.1016/j.pop.2013.10.002 . [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
2. Klein, J. O. (1994). Otitis media. *Clinical Infectious Diseases*, 94(19): 823-832.
3. Wintermeyer S. M., Nahata M. C. (1994). Chronic suppurative otitis media *Ann Pharmacother* 28 1089–1099 . [[PubMed](#)] [[Google Scholar](#)]
4. Sadé J, Ar A. Middle ear and auditory tube: middle ear clearance, gas exchange, and pressure regulation. *Otolaryngol Head Neck Surg.* 1997;116(4):499-524. doi:10.1016/s0194-5998(97)70302-4
5. Daly KA, Hunter LL, Levine SC, Lindgren BR, Giebink GS. 1998. Relationships between otitis media sequelae and age. *Laryngoscope*108 (9): 1306-131
6. Yeo SG, Park DC, Hong SM, Cha CI, Kim MG. 2007. Bacteriology of chronic suppurative otitis media-a multicentre study. *ActaOtolaryngol*127:1062–1067
7. Kenna M. 1988. Etiology and pathogenesis of chronic suppurative otitis media. *Arch Otolaryngol Head and Neck Surg* 97 (2): 16-17.
8. Acuin J. 2004. Chronic Suppurative Otitis Media. Burden of Illness and Management Options. Geneva: World Health Organization
9. Aarhus L., Tambs K., Kvestad E., Engdahl B. (2015). Childhood otitis media: a cohort study with 30-year follow-up of hearing (The HUNT Study) *Ear Hear* 36 302–308

10. Khairi Md Daud M., Noor R. M., Rahman N. A., Sidek D. S., Mohamad A. (2010). The effect of mild hearing loss on academic performance in primary school children *Int J Pediatr Otorhinolaryngol* 74 67–70  
10.1016/j.ijporl.2009.10.013 .
11. John AF. Chronic otitis media: diagnosis and treatment. *Med Clin North America* 1991;75:1277–1291.
12. Lakshmi K, Prakash M, Anuradha S, Swathi G (2013) Bacteriological profile and their antibiotic susceptibility pattern of cases of chronic suppurative otitis media. *Asian J Pharm Clin Res* 6(7):210–212
13. Shrestha BL, Amatya RCM, Shrestha I, Ghosh I (2012) Microbiological profile of chronic suppurative otitis media. *Nepal J ENT Head Neck Surg* 2(2):6–7
14. Teele DW, Klein JO, Rosner B (1989) Epidemiology of otitis media during the first seven years of life in children in greater Boston: a prospective, cohort study. *J Infect Dis* 160(1):83–94
15. Agrawal A, Kumar D, Goyal A, Goyal S, Singh N, Khandelwal G (2013) Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge. *Indian J Otol* 19(1):5
16. Shaheen MM, Raquib A, Ahmad SM (2012) Chronic suppurative otitis media and its association with socio-economic factors among rural primary school children of Bangladesh. *Indian J Otolaryngol Head Neck Surg* 64(1):36–41
17. Martin MS. Mastoid Surgery, in Myers Otolaryngology Head and Neck Surgery, Ch 115. 2nd ed. Elsevier, ISBN-13: 9781416024453. 2008:7–30.
18. Mishiro Y, Sakagami M, Takahashi Y. Tympanoplasty with and without mastoidectomy for non-cholesteatomatous chronic otitis media. *Eur Arch Otorhinolaryngol*. 2001;258:13–15
19. Yeolekar AM, Dasgupta K S. Otitis media: Does the onus lie on sinonasal pathology?. *Indian J Otol* 2011;17:8-11