

A Study on Various Factors Associated with the Etiopathogenesis of Squamous Chronic Otitis Media: A Cross-Sectional Study.

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Type of Article- Research Protocol

Conflict of Interest-None

Funding- None

Abstract:

Background: The etiopathogenesis of COM is multifactorial, which includes Eustachian tube dysfunction (mechanical obstruction or functional), the mastoid air cell system and other factors like KornerSeptum (because of the attic blockage). Only few studies have been done related to the etiopathogenesis of squamous type of otitis media. Atticoantral disease, the old terminology were used in most of the studies related to COM. Now the terminology has changed with inclusion of inactive squamous type in atticoantral disease. Hence this study focuses to determine the preventable cause of squamous COM and also help in preventing the recurrence of the disease. By addressing the etiopathogenesis, it also gives better surgical outcome.

Objectives:

- To study the association between etiopathogenesis like Eustachian tube dysfunction, and squamous COM
- To study the association between etiopathogenesis like mastoid pneumatisation and squamous COM
- To study the association between other factors like presence of korner septum with Squamous COM.

Methodology: A prospective, observational study will be conducted at Department of E.N.T, AVBRH Sawangiwardha. during a period of November 2020 to November 2023. A sample size of 31, within 18 -70 years age with squamous COM (active and inactive type, involving pars-flaccida or par-stensa (usually postero-superior quadrant) will be included for the research, after "Institutional ethics committee" approval. Findings obtained will be

entered in proforma meant for the study. Informed consent will also be obtained.

Results: The observations obtained will be analyzed statistically and will be discussed in light of literature available.

Conclusion: This study will help the clinicians for better understanding of the various factors which are associated with the etiopathogenesis of squamous type of COM. Also will help to target the preventable cause like hearing loss by doing interventions at the earliest.

Keywords: Chronicotitismedia, squamousotitismedia, Eustachiantubedysfunction, Mastoid pneumatisation, korners septum.

INTRODUCTION:

Squamous COM(according to the Browning classification) are of two types: inactive (squamous) CoM- pars tensa/flaccida retraction, which can become involved, with retained debris. And active (squamous) CoM - pars flaccida/tensa retraction, with squamous type epithelial debris and inflamed middle ear mucosa with pus.(1)

The etiology of middle ear disease is multifactorial, ET dysfunction being the most important factor causing middle ear disease. Nasal pathologies such as DNS, hypertrophy of adenoids, allergic rhinitis (uncontrolled) all these can lead to Et dysfunction, which can result in CoM.(2) ET dysfunction can result from mechanical obstruction or functional (3). Children with otitis media with effusion, as well as healthy children, active tubal function has been found to be poor. ET opening dysfunction or muscular opening hypo function in children is considered to be a primary endogenous etiologic factor for chronic otitis media. Cholesteatoma(acquired) are found to occur as a result of : ET(functional) obstruction, middle ear pressure being highly negative, atelectasis of TM, the posterosuperior or attic portion retraction of the TM, and Otitis media(adhesive). (4)

Another factor is Temporal bone pneumatisation, an significant contributor to the middle ear inflammatory diseases pathophysiology. In a study it was found that poor mastoid air cell pneumatisation can result in SOM in adults(5). In order to examine the connection between middle ear diseases numerous studies have been carried out. It has been documented that the magnitude of retraction of tympanic membrane has been shown to have relation with mastoid pneumatisation and cholesteatoma are found to be more common in poorly pneumatized mastoids. One study have found cholesteatoma occurs even in well – pneumatized mastoids(6). Also among primary sclerosis or secondary sclerosis, that cause cholesteatoma is still unknown. Due to new bone formation secondary sclerosis are present in most cases of COM.(7)

Other factors like kórner's septum (KS), a developmental remnant between the mastoid and temporal squama, (Petro squamosal suture persistence)

. This is an important anatomic handicap, as it causes attic blockage and causes COM. (8)

Only few studies have been done related to the etiopathogenesis of squamous type of otitis media. Atticoantral disease, the old terminology were used in most of the studies related to COM. Now the terminology has changed, as inactive squamous otitis were not included in atticoantral diseases. Hence we are undertaking this study to find out various factors associated with etiopathogenesis of squamous chronic otitis media so that we can target on

the preventable complications like hearing loss by doing interventions at the earliest.

Aim: To determine various factors associated with the etiopathogenesis of squamous chronic otitis media.

Objectives:

1. To study the association between etiopathogenesis of squamous chronic otitis media with Eustachian tube function
2. To study the association between mastoid pneumatization and squamous chronic otitis media
3. To study the association between other factors like presence of Kerner septum and squamous chronic otitis media formation

RATIONALE

1. Change in the terminology to COM, with inclusion of inactive form in atticointral disease, there is a need for studies related to the etiopathogenesis of the COM both squamous and mucosal type.

2. This study would help in targeting the preventable cause of squamous type of COM and also for preventing the recurrence of the disease.

3. By addressing the conditions related to the etiopathogenesis of COM will give a better surgical outcome.

MATERIAL AND METHODS:

Study Design- Prospective Observational Study-Cross Sectional Study

Duration of Study- 2020-2022

Sample size: The sample size is calculated based on the parent article: Role of ET Dysfunction and primary sclerotic mastoid pneumatization pattern in aetiology of squamous COM: A Correlative study by Dr. S. Jain et al. Indian J Otolaryngol Head Neck Surg. 2019 Nov. in which the sample population n=52 using the formula for sample size population for cross sectional study which is $4PQ/d^2$.

Where P in this case is the proportion of individual with Eustachian tube dysfunction among those with squamous COM that is 24 out of 52 patients. Absolute precision fixed at 10 percent and with 95% confidence the minimum sample size is calculated to be 31

Inclusion Criteria:

- Patients with Chronic otitis media (squamous) type
- Age group: 18 to 70 yrs
- Both males and females
- Patients giving consent to undergo CT scan and DNE.

Exclusion Criteria:

- Patients with tubotympanic (mucosal) type of COM
- Patients with totally adhesive tympanic membranes
- Patients below 18 yrs and above 70 yrs of age.

- Suspicion of ear pathology to be malignant.
- Congenitally diseased ear
- Old operated cases

Place of Study-Dept. of ENT Acharya Vinoba Bhave Rural Hospital (AVBRH), Datta Meghe Institute of Medical Sciences (DMIMS), Sawangi (Meghe), Wardha.

Ethics approval-Ethical clearance from the Institutional Ethical Committee will be taken before enrolling patient for the research.

Enrollment-

- Patients will be selected as participants according to the inclusion criteria.
- Every patient will be explained the type of the study and written /verbal/informed consent will be taken.
- A detailed history with thorough ENT examination as per the proforma enclosed, from the individual patient selected with inclusion and exclusion criteria . Photographic documentation of some interesting cases . Examination of ear with otoscope and otomicroscope will be done to confirm the findings.

Intervention-

- In each case Diagnostic Nasal Endoscopy would be performed to detect the functional or mechanical ET dysfunction. The 30° rigid Karl Storz nasal endoscope of 4 mm diameter will be used.
- In each case Radiological studies will be conducted - High Resolution Computed Tomography (HRCT) Scan ,to study the details of the air cells, the extent of the disease involving the air cells and antrum and also to search for kornor septum.

Expected Results:

The Expected Outcome of this study will be the significant association between various etiopathogenesis like Eustachian tube dysfunction, mastoid pneumatisation and other factors like presence of kornor septum with Squamous type of COM formation.

DISCUSSION:

Chronic Otitis Media (COM):-

COM is a chronic inflammation of the middle ear and mastoid cavity with recurrent ear discharge or otorrhea through a TM perforation. The disease usually begins in childhood as a result of AOM or secretory OM. It is said to be chronic if active disease persists for more than 3 months.

It is a persistent defect of the pars tensa /flaccida, mostly due to AOM, negative Pressure in the middle ear or OM with effusion. It is the most important preventable cause of hearing in developing country. COM is divided into five types according to Browning classification- Healed COM: TM loses its transparency and becomes thinned out. There will not be any perforation or retraction. Inactive (mucosal) COM :there will be permanent perforation of the

pars tensa which is not marginal without causing inflammation of mucosa of middle ear. Inactive (squamous) chronic otitis media: retraction of either pars tensa or pars flaccida or both, which can turn into active, with retained debris. Active (mucosal) chronic otitis media: there will be permanent defect in tensa which is not marginal, this will expose the middle ear to repeated infections from external ear causing discharge (pus). Active (squamous) chronic otitis media: the retraction of the pars flaccida or tensa, with epithelial debris of squamous type and is associated with inflammation and formation of purulent discharge.(1)

INACTIVE SQUAMOUS COM

According to Browning classification, is retraction of the pars flaccida or tensa (usually postero-superior) with retained debris can become active. A retraction pocket, consists of an invagination of a part of the TM into the middle ear space due to negative pressure in the middle ear, and may be fixed when it is adherent to the structures in the middle ear or free when it can move medially or laterally depending on the state of middle ear inflation. The middle ear mucosa will be replaced by keratinizing squamous epithelium without of keratin debris accumulation(1)

Pars Flaccida: TOS classification

1. Pars flaccida minimally retracted but adherent to malleus
2. Retraction adherent to neck of malleus
3. Partial erosion of scutum
4. Complete erosion of scutum

Pars tensa: Sade's Classification

1. Retracted TM not in contact with incus
2. Retraction with contact onto incus
3. Middle ear atelectasia, retracted TM in contact with promontory but moves with siegalization
4. Adhesive otitis media, TM plastered to promontory.

ACTIVE SQUAMOUS TYPE OF COM.

Squamous COM (cholesteatoma) is neither cholesterol crystal nor a tumour, its keratinizing stratified squamous epithelium in any part of temporal bone where its not usually present as in middle ear, mastoid, petrous apex (that are normally lined by the mucosa). Cholesteatoma divided into 2 types: congenital and acquired (further into primary and secondary cholesteatoma). Cholesteatoma is considered dangerous as it causes bony erosion that can lead to hearing loss, vestibular dysfunction, facial nerve paralysis and intracranial infections.

Congenital cholesteatoma: white mass present mostly in the anterosuperior quadrant of middle ear, intact TM

Primary cholesteatoma: Wittmaack's theory of retraction pocket being most accepted theory.

The obstruction of ET leads to negative pressure in the middle ear and retraction of TM. The most common route of primary cholesteatoma is through retraction pocket formation mainly in pars flaccida/attic/prussak's space followed by postero-superior quadrant of TM.

Secondary cholesteatoma: secondary to marginal or total perforation on the TM. This follows ASOM. According to Habermann's theory, the most common route is migration of

keratinizing stratified squamous epithelium of EAC through mainly posterosuperior marginal perforation of TM into middle ear.

Etiopathogenesis of chronic otitis media-

Eustachian tube- ET has been observed as the crucial etiopathogenesis of all types of OM. Two processes sustain pressure in middle ear: the exchange of middle ear mucosal gas and opening of the Eustachian tube to match pressure with that of the nasopharynx. Failure of any of the above functions can result in Otitis Media. ET dysfunction can be caused by anatomical obstruction or can be functional. Inflammation of Eustachian tube mucosa/extrinsic compression by tumour/large adenoids are the most frequently seen cause of anatomical obstruction. Functional obstruction include cleft palate or inadequate stiffness of Eustachian tube cartilaginous part often seen in infants and young children that can interfere with ET opening. In comparison with the adults children are more found to have more acute angle of ET, that can result in its dysfunction. Nasal pathologies like DNS, large adenoids, allergic rhinitis (uncontrolled) can also lead to COM (squamous type). Otitis media is present in most children with cleft palate. In cleft palate, the tensor vel palatini muscle lacks in its normal insertion into the soft palate, the Eustachian tube opening does not occur properly on swallowing.

Association of pneumatization with otitis media:

Cholesteatoma can be found in majority of ears with non-pneumatized mastoid air cell. Atelectasis and cholesteatoma are typically seen in temporal bones that are low pneumatized. There is a significant direct relation between ventilation of the middle ear and the mastoid pneumatization. After the development and maturation of air cell system, COM and its complications starts to develop. In the middle ear SOM can contribute to the development of negative gas balance, that can lead to TM retraction and even cholesteatoma formation in low pneumatized air cells. In ears with well-pneumatized mastoids, pars flaccida retraction is rarely seen and the role of pars flaccida tends to modify the middle ear cavity air volume for arranging the changes in pressure. (9)

Mastoid pneumatization

- 1) Sclerotic mastoid (absent pneumatization),
- 2) Diploic mastoid (partial pneumatization),
- 3) Pneumatic mastoid (complete pneumatization).
- 4) The bone marrow (in the diploic mastoid) and the dense bone (in the sclerotic mastoid) are not pneumatized. It consists of the mastoid antrum (being the largest), and numerous other air cells surrounding it. Until adulthood pneumatization of mastoid is incomplete, the majority of the process takes place in the first 5 years of life. Infancy and early childhood infections that occurs in this period are thought to resist the mastoid normal cellular development and thereby contribute to chronic diseases of the middle ear. On high resolution computed tomography (HRCT) used, since it displays the complete pneumatization with excellent resolution. (9)

Other factors which include Petrosquamous lamina (Korner's septum) a bony plate separating

the mastoid cells (at antrum). The persistence of KS in the temporal bone(adult) as compared to the pediatric.KS was seen in chronic otitis media squamosal disease ,in few studies (10).Another factor that can result in development of COM is middle ear ventilation blocked by anatomic obstruction. Studies on Chronic otitis media were reported by Jain et. al (11), Methwani et. al (12) and Singh et. al. (13). Few other related studies were reviewed (14,15).

CONCLUSION:

This study will help the clinicians for better understanding of the various factors which are associated with the etiopathogenesis of squamous type of COM. Also will help to target the preventable cause like hearing loss by doing interventions at the earliest.

REFERENCES:

- [1] Browning GG, Saamil N Merchant, Gerad Kelly, Iian RC Swan, Richard Canter, William S Mckerrow. Chronic otitis media. In : Gleeson M, Browning GG, Burton MJ, Clarke R, Hibbert J, Jones NS, et al, editors. Scott-Brown's Otorhinolaryngology, Head and Neck surgery. 7th edition Great Britain. Edward Arnold (Publishers) Ltd. 2008: vol 3; p 3395-3445
- [2] Jain S, Singh P, Methwani D, Kalambe S. Role of Eustachian Dysfunction and Primary Sclerotic Mastoid Pneumatisation Pattern in Aetiology of Squamous Chronic Otitis Media: A Correlative Study. Indian Journal of Otolaryngology and Head & Neck Surgery. 2019 Nov 1;71(2):
- [3] delasCélulasMastoideas N, de FactoresAdquiridos R. Pneumatization of mastoid air cells: role of acquired factors. Int. J. Morphol. 2006;24(1):35-8.
- [4] Holmquist J, Bergström B. Eustachian tube function and size of the mastoid air cell system in middle ear surgery. Scandinavian audiology. 1977 Jan 1;6(2):87-9.
- [5] Sade J, Fuchs C. Secretory otitis media in adults: I. The role of mastoid pneumatization as a risk factor. Annals of Otolary, Rhinology & Laryngology. 1996 Aug;105(8):643-7.
- [6] Iqbal IZ, Watson C. A study of mastoid pneumatisation and the presence of cholesteatoma in 393 patients. The Journal of Laryngology & Otolary. 2016 Jan;130(1):66-8.
- [7] Lee DH, Jung MK, Yoo YH, Seo JH. Analysis of unilateral sclerotic temporal bone: how does the sclerosis change the mastoid pneumatization morphologically in the temporal bone?. Surgical and Radiologic Anatomy. 2008 May 1;30(3):221-7.
- [8] Göksu N, Kemaloglu YK, Köybasioglu A, Ileri F, Özbilen S, Akyildiz N. Clinical importance of the Korner's septum. American Journal of Otolary. 1997 May 1;18(3):304-6.
- [9] Sade J,AR Amos. The Eustachian tube chapter 24. Diseases Of Ear,6thedi. UK: Hodder Arnold:334.
- [10] Deekshith R, Somayaji KG. Korner's septum: An uncommon clinical entity. Archives of Medicine and Health Sciences. 2019 Jan 1;7(1):134.
- [11] Jain, S., P. Singh, D. Methwani, and S. Kalambe. "Role of Eustachian Dysfunction and Primary Sclerotic Mastoid Pneumatisation Pattern in Aetiology of Squamous Chronic Otitis Media: A Correlative Study." Indian Journal of Otolaryngology and Head and Neck Surgery 71 (2019): 1190–96. <https://doi.org/10.1007/s12070-018-1259-x>.
- [12] Methwani, D.A., and P.T. Deshmukh. "Comparative Study of Type I Tympanoplasty with or without Masteoidectomy in Tubotympanic Type of Chronic Suppurative Otitis Media Patients." Journal of DattaMeghe Institute of Medical Sciences University 12, no. 2 (2017): 85–88. https://doi.org/10.4103/jdmimsu.jdmimsu_8_16.
- [13] Singh, P., S. Jain, D. Methwani, S. Kalambe, D. Chandravanshi, S. Gaurkar, and P.T. Deshmukh. "Study of Correlation of Pre-Operative Findings with Intra-Operative Ossicular Status in Patients with Chronic Otitis Media." Iranian Journal of Otorhinolaryngology 30, no. 5 (2018): 273–81. <https://doi.org/10.22038/ijorl.2018.26795.1875>.

- [14] Jain, S., P.T. Deshmukh, P. Lakhotia, S. Kalambe, D. Chandravanshi, and M. Khatri. "Anatomical Study of the Facial Recess with Implications in Round Window Visibility for Cochlear Implantation: Personal Observations and Review of the Literature." *International Archives of Otorhinolaryngology* 23, no. 3 (2019): E281–91. <https://doi.org/10.1055/s-0038-1676100>.
- [15] Jain, S., S. Gaurkar, P.T. Deshmukh, M. Khatri, S. Kalambe, P. Lakhotia, D. Chandravanshi, and A. Disawal. "Applied Anatomy of Round Window and Adjacent Structures of Tympanum Related to Cochlear Implantation" *Brazilian Journal of Otorhinolaryngology* 85, no. 4 (2019): 435–46. <https://doi.org/10.1016/j.bjorl.2018.03.009>.