

Original article

Correlation between chronic suppurative otitis media with nasal Polyposis and paranasal sinus pathology

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Abstract

Introduction: Chronic suppurative Otitis Media (CSOM) is the chronic inflammation of the middle ear (ME) cleft mucosa. Middle ear cleft constitutes Eustachian tube, tympanic cavity, attic, aditus, antrum and the mastoid air cells which are in continuity with the epithelium of nose and nasopharynx through Eustachian tube (ET). Since the mucosa of the nose & paranasal sinuses are continuous with the mucosa of the middle ear cleft, pathologies in the sinonasal region can influence the normal health of the middle ear & mastoid. Chronic infections of the nose and paranasal sinuses (PNS) can involve the Eustachian tube leading to its dysfunction. The present study was undertaken to evaluate the prevalence of sinonasal pathology in CSOM patients and its correlation with CSOM.

Methodology: Patients aged more than ten years of both sexes having Chronic suppurative otitis media, tubotympanic and atticointral types of all stages were enrolled into the study. This study was designed as a cross sectional study to evaluate the correlation between chronic suppurative otitis media and sinonasal pathology eg. Chronic rhinosinusitis, Allergic rhinosinusitis, Benign nasopharyngeal masses.

Results& conclusion: Chronic sinonasal disease such as Chronic rhinosinusitis, Allergic rhinosinusitis, Hypertrophied adenoids, Tubal tonsils and Nasal Polyps are the most important causative factors in case of persistent Chronic suppurative otitis media. A detailed evaluation of the diseases of nose and paranasal sinuses in all patients of Chronic suppurative otitis media is necessary in comprehensive management of the ear disease. On the basis of these results we recommend evaluation and treatment of sinonasal disease before surgical treatment of ear disease is undertaken for fruitful postoperative results.

Keywords: CSOM, Nasal polyp, Paranasal sinus

Introduction

Chronic suppurative Otitis Media (CSOM) is the chronic inflammation of the middle ear (ME) cleft mucosa which is characterized by irreversible changes in it with a history of ear discharge for more than three months through a permanent tympanic membrane defect ⁽¹⁾. Middle ear cleft constitutes Eustachian tube, tympanic cavity, attic, aditus, antrum and the mastoid air cells which are in continuity with the epithelium of nose and nasopharynx through Eustachian tube (ET). Since the mucosa of the nose & paranasal sinuses are continuous with the mucosa of the middle ear cleft, pathologies in the sinonasal region can influence the normal health of the middle ear & mastoid. The pathogenesis of CSOM has been related to the presence of prior or concurrent nasal disease. Chronic infections of the nose and paranasal sinuses (PNS) can involve the Eustachian tube leading to its dysfunction ⁽²⁾. Other pathologies such as allergic rhinitis, nasal polyposis and nasopharyngeal pathologies like

adenoids & tumours can cause chronic obstruction of ET leading to CSOM⁽³⁾. Patients who have CSOM secondary to nasal and/or PNS pathology need to have both problems addressed. Those who need ear surgery should have nasal and PNS problems attended to first, if an ear operation is to be successful.

The present study was undertaken to evaluate the prevalence of sinonasal pathology in CSOM patients and its correlation with CSOM .

Aims & Objectives

- 1) To study the correlation between Chronic suppurative otitis media (CSOM) with Nasal and Paranasal sinus pathology in terms of etiopathology & bacteriology.
- 2) To analyze whether the nasal and paranasal sinus pathologies are focus of infection for Chronic suppurative otitis media (CSOM).

Materials and Methods

Source of Data: The present study was conducted in Department of E.N.T. in a tertiary care centre from September 2013 to September 2015.

Method of collection of data : One hundred and fifteen patients with chronic suppurative otitis media, of both tubotympanic and atticofacial types attending the ENT OPD in the Government Medical College, fulfilling the following criteria were selected randomly for the study.

Inclusion criteria

Patients of both sexes and aged more than 10 years presenting with :

1. Chronic Suppurative otitis media -Atticofacial type
2. Chronic Suppurative otitis media-Tubotympanic type

Exclusion criteria

1. Age < 10 years.
2. Patients with congenital craniofacial anomalies .
3. Patients having fungal otitis externa and effusion.
4. Patients with traumatic tympanic membrane perforations.
5. Patients with acute infections of nose & paranasal sinuses.
6. Patients with sinonasal malignancies.
7. Patients with associated medical comorbidities like diabetes mellitus immunocompromised states and diagnosed cases of ciliary dyskinesia.

Sample size: sample size was calculated based on the proportion of chronic suppurative otitis media in India as determined by WHO. Using estimation method with allowable error and level of significance (α) 5%, the inflated sample size was determined as one hundred and fifteen.

Data Analysis and Interpretation

Data was entered into Microsoft Excel (Windows 7; Version 2007) and analysis was done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 18.0; SPSS Inc. Chicago). Descriptive statistics such as frequencies and percentages .were calculated for categorical variables and Mean, Standard deviation (SD) and Range for continuous variables were determined. Simple and Multiple bar charts and pie charts were used for visual representation of the analyzed data.

Methodology

Patients aged more than ten years of both sexes having Chronic suppurative otitis media, tubotympanic and atticointral types of all stages were enrolled into the study. An informed written consent was signed by all patients and by parents in case of minors after being informed about the study objectives. This study was designed as a cross sectional study to evaluate the correlation between chronic suppurative otitis media and sinonasal pathology eg. Chronic rhinosinusitis, Allergic rhinosinusitis, Benign nasopharyngeal masses. The institutional ethics committee approval was taken before starting the study.

A predesigned proforma was filled for each patient documenting age, sex, address and clinical information including chief complaints, duration of symptoms, predisposing factors and any previous history of treatment. All patients were subjected to detailed examination which included general physical examination, careful examination of ear, nose and throat. Otolaryngoscopic, microscopic examination of tympanic membrane findings and tuning fork tests were performed. A detailed nose and paranasal sinus examination was done. All cases were subjected for routine blood and urine investigations which included complete haemogram and absolute eosinophil count. In patients with active CSOM which showed presence of discharge, the discharge was sent for culture. The discharge from ear was collected using thin sterile cotton wool micro-swabs with full aseptic precautions using a microscope. This swab was immediately sent to the microbiology laboratory for culture. Pure tone Audiometry (PTA) was also taken in all patients. Radiological imaging techniques like high resolution computed tomography (HRCT) of temporal bones and computed tomography (CT) of paranasal sinuses were used to detect sinonasal pathology and to determine its extent. A rigid diagnostic nasal endoscopy (DNE) was performed in all patients to evaluate the presence or absence of sinonasal pathology. During DNE, abnormal nasal and nasopharyngeal secretions were collected using thin sterile cotton wool micro-swabs with full aseptic precautions and immediately sent for culture.

Technique of Diagnostic Nasal Endoscopy

At the beginning the patients were explained about the procedure to be performed. For topical anaesthesia a mixture of 4% Lignocaine with adrenaline in 1:10000 concentrations was prepared. Topical anaesthesia was achieved by placing three cotton pledgets soaked in above mixture in the nasal cavity for minimum period of 20 minutes. Then the patient was made to lie down in supine position with his head turned slightly towards the-examiner.

Patient was instructed not to move his head suddenly during the procedure and to inform if he experiences pain. A 30 degree rigid Nasal endoscope was used. The endoscope was passed through the nasal cavity in three different passes as follows:

1. First pass: the endoscope was passed along the floor of the nasal cavity between the inferior turbinate and septum. in this pass the nasopharynx, nasopharyngeal ends of ET and inferior meatus were examined in detail.
2. Second pass: The second pass is between medial surface of middle turbinate and septum to examine the sphenoidal recess and roof of nasal cavity.
3. Third pass : The endoscope was passed between the middle turbinate and lateral wall to examine the middle meatus in detail. Various anatomical variations like concha bullosa, paradoxical middle turbinate, medially rotated uncinate process/double middle turbinate, accessory maxillary ostia can be recognised during this pass.

All the positive findings like deviated nasal septum, presence of mucopurulent discharge, mucoid discharge, polypoidal change in nasal mucosa, presence of supratubal or infratubal mucopurulent or mucoid stream were noted. Presences of hypertrophied adenoid or tubal tonsils, status of nasopharyngeal end of ET were noted & all the findings were entered in the predesigned proforma for all the patients.

After DNE, CT scan of paranasal sinuses were ordered in all patients to study the radiological extent of disease and to correlate this with pathology in the ME.

A microscopic examination of the ear was done using the operating microscope. Discharge if present in the ear canal was sent for microbiological analysis using sterile cotton swabs. The TM was next inspected for pathology like retraction pockets and perforations. Granulations in the attic or posterior margin of the TM were looked for and studied. The ME mucosa through a perforation was evaluated for inflammatory changes.

Observation

In the present study, 115 cases of Chronic suppurative otitis media; 97 tubotympanic type and 39 Atticoantral type (total 136 ears) were studied and 21 patients had bilateral involvement. The aetiopathology of the ear disease was compared with the aetiopathology of the sinonasal diseases to find out direct correlation between CSOM and the sinonasal diseases. Following observations were made:

- Male to female ratio was 1.39:1.
- The age group with highest percentage of presentation of CSOM was 11-20 years.
- Out of total 115 CSOM cases, 92 (80%) patients belonged to low socioeconomic class.
- In the study, the incidence of Tubotympanic type was 97 (71.32%) and the incidence of Atticoantral type of CSOM was 39 (28.68%).
- In our study, out of 67 (49.26%) right ears; 48 (71.64%) had active stage of disease and out of 69 (50.74%) left ears; 53 (76.81%) had active disease.
- In the study. out of 48 right and 53 left aural bacterial swab cultures, 27 (58.25%) right ear swabs and 30 (56.80) left ear swabs revealed pure aerobic isolates and 18 (37.5%) right ear swabs and 19 (35.85%) left ear swabs had mixed aerobic and anaerobic isolates.
- Most common microorganisms being isolated were Staphylococcus aureus. Pseudomonas aeruginosa and Streptococcus spp. Peptostreptococcus and Bacteroides.
- In our study, we found that the prevalence rate of sinonasal disease was 59 (51.30%). These patients were having co-existing sinonasal disease and out of these 59 cases; 46 (77.97%) patient showed direct correlation with CSOM.
- In these 46 patients, 23 (50%) had chronic bacterial rhinosinusitis showing presence of common pathogens in corresponding aural and nasal swab cultures.
- 13(28.3%) patients had hypertrophied adenoids and tubal tonsils encroaching onto the ET orifice.
- In our study, we found that 11 (23.91%) patients had allergic rhinosinusitis with stream of mucoid discharge running over the ET orifice.
- In the present study, 3 (6.5%) patient showed presence of antrochoanal polyp associated with chronic rhinosinusitis which was encroaching onto the corresponding ET orifice and 4 (8.7%) had bilateral

ethmoidal polyposis along with allergic rhinosinusitis.

Discussion

The first step in the diagnosis of Chronic suppurative otitis media is to understand its underlying pathology and once underlying pathology is identified it is easy to offer treatment for the disease. Identification and understanding of nasopharyngeal and sinonasal pathology predisposing to chronic ear disease helps in successful management of the ear condition.

Keeping in view the importance of nasopharyngeal and sinonasal pathology in patients of CSOM; in the present study, 115 cases of Chronic suppurative otitis media; 97 Tubotympanic type and 39 Atticoantral type (total 136 ears) were studied. 21 patients had bilateral involvement. The aetiopathology of the ear disease was compared with co-existing sinonasal pathology to find out direct correlation between CSOM and sinonasal disease.

In our study, CSOM was more common in males (58.3%) as compared to females (41.7%). Male to female ratio was 1.39:1. An analogous conclusion has been made by other researchers such as Chandra & Mishra⁽⁴⁾, Mukherjee et al⁽⁵⁾ and Hossain et al⁽⁶⁾. The predominant cause of the disease in males was due to their outdoor working habits exposing them to contamination and contagion.

The age group with highest percentage of presentation of CSOM was 11-20 years. There were 35 (30.4%) patients in this age group. These findings were consistent with the findings of Shreshtha & Sinhal⁽⁷⁾ and Singh & Safaya⁽⁸⁾.

In the study sample of 115 CSOM cases, 92 (80%) patients belonged to low socioeconomic class. According to literature, the incidence of CSOM is higher in low socioeconomic class population due to poor hygienic living conditions and overcrowding⁽⁹⁾.

In our study, 97 (71.32%) ears had tubotympanic type and 39 (28.68%) ears had atticoantral type of CSOM. These findings were consistent with the findings of Saurabh V, Ashutosh N et al⁽¹⁰⁾ who reported similar proportion of tubotympanic and atticoantral types in their study. In our study, out of 115 cases, 46 (40.01%) had right ear involvement, 48 (41.73%) had left ear involvement and 21 (18.26%) had bilateral disease. Therefore, total ears examined were 136.

In our study, out of 67 (49.26%) right ears; 48 (71.64%) had active stage of disease and out of 69 (50.74%) left ears; 53 (76.81%) had active disease i.e. ear discharge was present at the time of examination. 16 (23.88%) on right side and 12 (17.40%) on left side had inactive stage of disease i.e. no ear discharge during last six months. 3 (4.48%) on right side and 4 (5.79%) on left side had quiescent stage of disease i.e. intermittent history of ear discharge but at the time of examination there was no ear discharge. In the study, out of 48 right and 53 left aural bacterial swab cultures, 27 (56.25%) right ear swabs and 30 (56.60%) left ear swabs revealed multiple pure aerobic microorganisms. Amongst the polybacterial culture, pure aerobic organisms were isolated the most common being *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Streptococcus* spp. The combination of mixed aerobic and anaerobic microorganisms like *Peptostreptococcus*, *Bacteroides*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Streptococcus* spp. was noted in 18 (37.5%) right ear swabs and 19 (35.85%) left ear swabs. 1 (2.08%) had *Mycobacterium tuberculosis* as isolate in right ear swab. Others include *Proteus*, *E. coli*, *Klebsiella*, *Enterobacter* and non-fermenting gram negative bacteria. Poorey & Iyer⁽¹¹⁾ and Kumar et al⁽¹²⁾ investigations also showed a lesser number of mixed isolates. A lesser number of polymicrobial isolates could perhaps be due to the changing pattern of the process of the disease, the increasing

trend of using combined antimicrobials and some other unidentified factors that needs to be sought out by further research. In our study, no growth was seen in 2 (4.16%) right ear swabs and 4 (7.55%) left ear swabs. The reason for no growth could be due to the fact that patients must have sought medical advice from primary care physicians.

In this study, we wanted to ascertain the role of sinonasal disease in the pathogenesis of chronic suppurative otitis media. Diagnostic nasal endoscopy revealed that 35 (30.43%) had septal deviation, 12 (10.43%) had spur, 4 (3.47%) had paradoxical middle turbinate, 45 (39.13%) had mucopurulent discharge in middle meatus; out of which 10 (21.74%) were bilateral. 19 (16.52%) had mucoid discharge in middle meatus; out of which 5 (26.32%) were bilateral, 5 (4.34%) had ethmoidal polyposis, 3 (2.61%) had antrochoanal polyps and 17 (14.78%) had hypertrophied adenoid and tubal tonsils. These findings were consistent with findings noted by Sankaranarayanan G et al⁽¹³⁾ and Prem Pal Singh et al⁽¹⁴⁾.

In our study, we found that the prevalence of coexisting sinonasal disease was 59 (51.30%). These patients were having co-existing sinonasal disease and out of these 59 cases; 46 (77.97%) patients showed direct correlation with CSOM. In these 46 patients, 23 (50%) had chronic bacterial rhinosinusitis and we noticed a stream of mucopus running over nasopharyngeal ET orifice. The culture report of these nasal swabs revealed presence of same pathogenic isolates as that in the corresponding affected ears. The most common aerobic isolates were *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Streptococcus* spp. Among anaerobes; *peptostreptococcus* and *bacteroides* were the commonest isolates.

Therefore, we propose that ascending retrograde spread of these microorganisms to the middle ear via the Eustachian tube leads to CSOM. The presence of mucopus on the ET orifice may cause inflammatory oedema of the ET mucosa leading to its dysfunction. The prevalence of sinusitis in present study was similar to that reported by Yeolekar et al⁽²⁵⁾ - 13.5%. Gopalakrishnan and Kumar⁽¹⁵⁾ also reported sinusitis as a coexisting septic focus in CSOM patients. Fujita et al⁽¹⁶⁾ reported in their study that 78% patients had abnormal sinuses and rhinosinusitis was present in 48% of cases of refractory otitis media and concluded that in cases of chronic otitis media refractory to treatment the main focus of pathology/infection is in the paranasal sinuses. In 1989 Bluestone and his colleagues⁽¹⁷⁾ studied 40 patients of chronic otitis media and found Eustachian tube dysfunction to be the reason for the persistence of the disease. He concluded that diseases of the sinuses as the main cause for Eustachian tube dysfunction. M Miura and H Takashi⁽¹⁸⁾ studied the influence of upper respiratory infection including rhinosinusitis on tubal compliance in children and adolescents with chronic otitis media and they concluded that 72% of patients with refractory tubal compliance due to chronicity of upper respiratory infection including rhinosinusitis lead to persistence of otitis media.

The role of nasopharyngeal pathology like hypertrophied adenoids and tubal tonsils was also investigated. In our study, 17 patients had hypertrophied adenoids and tubal tonsils. In 13 (28.3%) patients, these masses were encroaching onto the ET orifice leading to its blockage and hence dysfunction. A properly functioning Eustachian tube is essential for normal middle ear functioning. Ruokonen J, Sandelin K et al⁽¹⁹⁾ proposed that the adenoid tissue may play an important role in the aetiology of chronic otitis media and the infected adenoid may be the direct source of the primary infection or continuous microbial irritation in the nasopharynx may indirectly be the cause of chronic otitis media as persistent infection and oedema maintain chronic dysfunction of the Eustachian tube. Saafan ME, Ibrahim WS, Tomoum MO⁽²⁰⁾ also found that the size of the adenoid is not the main determinant factor in pathogenesis of chronic otitis media but the degree of

bacterial colonization is much more important and they concluded that hypertrophied adenoids in chronic otitis media may act as a reservoir of chronic infection rather than causing mechanical Eustachian tube obstruction.

Our study also concurs with the above study.

In our study, 11 (23.91%) patients had allergic rhinosinusitis with a stream of allergic mucin running over the ET orifice. In recent years, there is growing data to suggest the correlation between allergic rhinosinusitis and chronic suppurative otitis media. Lily H et al⁽²¹⁾ demonstrated that the allergic inflammation in allergic rhinosinusitis patients with chronic otitis media occurs on both sides of the Eustachian tube, in both the middle ear and the nasopharynx. Nematl S, Asgarl E. et al⁽²²⁾ studied 62 patients at CSOM for the presence of allergic rhinitis and found that there was a significant difference in the prevalence of allergic rhinitis in CSOM patients compared to the control group. Bozkuset al⁽²³⁾ demonstrated that the role of sinonasal abnormalities and allergic rhinitis in the pathogenesis of chronic otitis media is prevalent.

In the present study, 3 (6.5%) patients showed presence at antrochoanal polyp associated with chronic rhinosinusitis which was encroaching on to the corresponding ET orifice and 4 (8.7%) had bilateral ethmoidal polyposis along With allergic rhinosinusitis. Sadie G. Zafar A at al⁽²⁴⁾ studied 70 patients of bilateral nasal polyposis and evaluated Eustachian tube function to look for signs of otitis media and they found that 50% of the patients revealed signs of chronic otitis media and hence they concluded that frequency of otitis media in patients of nasal polypi was quite high and nasal problems leads to development of ear diseases.

Chronic sinonasal disease is a major factor contributing to ear diseases. The Eustachian tube possesses manifold functions facilitates the communication of the middle ear cavity with the nasopharynx, nasal cavity, nasal mucosa and indirectly also with the paranasal sinuses and plays an important role in the disorders of the middle ear.

Conclusion

Chronic sinonasal disease such as Chronic rhinosinusitis, Allergic rhinosinusitis, Hypertrophied adenoids, Tubal tonsils and Nasal Polyps are the most important causative factors in case of persistent Chronic suppurative otitis media. A detailed evaluation of the diseases of nose and paranasal sinuses in all patients of Chronic suppurative otitis media is necessary in comprehensive management of the ear disease. On the basis of these results we recommend evaluation and treatment of sinonasal disease before surgical treatment of ear disease is undertaken for fruitful postoperative results.

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