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A comparative study on the nasal endoscopic findings in patients with chronic otitis media

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ABSTRACT

Background: Nasal and/or sinus disease may well contribute to the development of middle ear disease. In this study, the nasal endoscopic findings in patients with chronic otitis media (COM) compared with a group of people who do not have any otologic relevant disease to evaluate the association of anatomical variations with COM.
Methods: A descriptive comparative study was done. A detailed history, clinical examination and diagnostic nasal endoscopy (DNE) had been done. DNE analysis include eustachian tube blockage, adenoid hypertrophy and inferior turbinate hypertrophy. The results were statistically analysed.
Results: Total 108 cases (45 males and 63 females of age 31.17±14.50 years) and in the control group (48 males and 60 females of average age was 36.06±14.32 years) were included in the study. Most of the COM patients (66.7%) had multiple abnormalities of sinonasal regions compared to controls. Findings of DNE like eustachian tube blockage (p value=0.003), adenoid hypertrophy (p value=0.028) and inferior turbinate hypertrophy (p value=0.035) were significantly associated with chronic otitis media.
Conclusions: Nasopharyngeal pathology causing eustachian tube dysfunction, has higher prevalence among chronic otitis media patients. So early recognition by diagnostic nasal endoscopy is warranted especially when surgery is considered for the comprehensive management of this overwhelming and enigmatic disease.

Keywords: Chronic otitis media, Nasopharyngeal pathology, Nasal endoscopy, Inferior turbinate hypertrophy, Adenoid hypertrophy

INTRODUCTION

Otitis media (OM) has been one of the most prevalent diseases in the world, affecting both children and adults. According to Sade et al, chronic otitis media (COM) affects 0.5 to 30% of individuals in any community and over 20 million people suffer from this condition worldwide.[1,2] The disease often begins in childhood as a spontaneous tympanic membrane perforation following an acute infection of the middle ear, known as acute otitis media (AOM), or as a sequel of less severe forms of otitis media (E.g. secretory OM).[3-7] The infection may occur during the first 6 years of a child's life having a peak incidence around 2 years of age.[8] The point in time when AOM becomes chronic is still controversial. Chronic ear discharge through a perforated tympanic membrane, for periods from 6 weeks to 3 months, despite the medical treatment is referred to as chronic suppurative otitis media and is usually associated with COM.[9]

Eustachian tube (ET) dysfunction is more common in patients with COM than in normal population.[10] It is not known however, if the ET dysfunction is the initiating factor in COM or whether it is a result of COM. The nose

and middle ear cleft are covered by respiratory mucosa and the anatomic continuity between these two cavities is established through the ET. The diseases of the nose and paranasal sinuses (PNS) can thus influence the middle ear condition.[11] Sinonasal causes of ET dysfunction include upper respiratory tract infection, sinusitis, allergic rhinitis, adenoid hypertrophy, and nasopharyngeal mass causing mechanical obstruction, nasal polyp, nasal septal deviation and cleft palate. Patients having COM secondary to nasal or PNS pathology need to have both problems addressed. Those who need surgery on the ear should have nasal and PNS problems attended to first, if an ear operation is to be successful.[12] Although most of the literature refers to sinusitis and upper respiratory tract as an etiological factor for COM. This study was aimed to compare the nasal endoscopic findings in patients with COM with that of control group who do not have any otologic relevant disease.

METHODS

Study design and setting

A descriptive comparative study was done on patients with COM attending the E.N.T department at Amala Institute of Medical Sciences, Thrissur, Kerala, India during the period of 2014 to 2015. Patients with history of previous nasal surgery and acute infection of nose and PNS were excluded from the study. Age and sex matched volunteers who were outpatients of ENT department with no ear pathology were selected as the control group. An informed consent was obtained from the patients before the start of study and the protocol was approved by the Institutional Ethical Committee.

Study procedure

A detailed history was taken from all patients. ENT examination along with systemic and general examination was carried out to determine the role of nasal pathology. The diagnosis of COM was made by history, otoscopy, microscopic ear examination, and appropriate audiometric assessment. Otoscopic findings may reveal tympanic membrane (TM) perforation with or without otorrhoea, tympanosclerosis, polypoid middle ear mucosa, or severe tympanic membrane retraction with or without cholesteatoma.

Diagnostic nasal endoscopy (DNE) using 4 mm 0^0 rigid scope was done in all patients. It was done to identify any disease in the nose, PNS and nasopharynx. Furthermore, to know the condition of septum, turbinate, osteomeatal complex, to look for anatomic variants and also to evaluate the condition of the pharyngeal end of ET.

Statistical analysis

The obtained data was checked for completeness and clarity and then entered into the computer and analysis was done using Statistical package for social sciences Programme (SPSS, v16, IBM, United States). Chi – square test was carried out. $p<0.05$ was used to draw out significant conclusion.

Sample size

Sample size was calculated using the formula.[13]

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2}{d^2} 2pq$$

P_1=0.33
P_2=0.165
P=0.247
Power ($Z\beta$)=0.842
$Z_{\alpha/2}$=1.96

Using the above equation, sample size, n=107. A significance level of 95% was assumed for all analysis.

RESULTS

Total 108 cases (45 males, 63 females), the mean age was 31.17±14.50 years and in the control group (48 males, 60 females), the average age was 36.06±14.32 years were included in the study. Majority of COM patients (31.5%) and controls (26.8%) were in the age range of 21–30 years (Table 1). There was no statistically significant difference between the groups in terms of age (p=0.117). The female–to-male ratio was 1.3:1 in cases and 1.4:1 in controls and the difference was not statistically significant.

Table 1: Age distribution.

Age in years	Group			
	Control		Case	
	Frequency	Percentage (%)	Frequency	Percentage (%)
11-20	17	15.7	26	24.1
21-30	29	26.8	34	31.5
31-40	21	19.4	25	23.1
41-50	23	21.3	10	9.3
51-60	10	9.3	6	5.6
>60	8	7.4	7	6.5
Total	108	100.0	108	100.0

Chi- square p=0.117, statistically not significant.

Table 2: The characteristics of patients with chronic otitis media compared with control group.

Symptoms	Case	Control	P value
	Frequency (%)	Frequency (%)	
Ear discharge	100/108 (92.5)	0/108	0.0001
Hearing loss	59/108 (54.6)	0/108	0.0001
Otalgia	22/108 (20.3)	0/108	0.0001
Fullness	38/108 (35.1)	0/108	0.0001
Vertigo	6/108 (5.5)	0/108	0.004
Tinnitus	4/108 (3.7)	0/108	0.018
Nasal obstruction	28/108 (25.9)	7/108 (6.4)	0.0001
Nasal discharge	28/108 (25.9)	10/108 (9.2)	0.001
Sneezing	44/108 (40.7)	13/108 (12.0)	0.0001
Headache	15/108 (13.8)	5/108 (4.6)	0.019
PND	16/108 (14.8)	15/108 (13.8)	0.846
Hyposmia	6/108 (5.5)	3/108 (2.7)	0.303
Snoring	16/108 (14.8)	8/108 (7.4)	0.083

PND: Postnasal discharge

Table 3: Comparison of nasal endoscopic findings among cases and controls.

DNE findings	Case	Control	P value
	Frequency (%)	Frequency (%)	
DNS	57/108 (52.7)	53/108 (49.1)	0.586
Adenoid hypertrophy	20/108 (18.5)	9/108 (8.3)	0.028
ET block	26/108 (24.1)	10/108 (9.3)	0.003
ITH	31/108 (28.7)	18/108 (16.7)	0.035
MTH	8/108 (7.4)	11/108 (10.1)	0.471
Paradoxical MT	16/108 (14.8)	17/108 (15.7)	0.850
Medialised uncinate	15/108 (13.9)	16/108 (14.8)	0.846
Accessory ostium	14/108 (12.9)	18/108 (16.7)	0.444
Sinusitis	12/108 (11.1)	14/108 (12.9)	0.676
Polyp	8/108 (7.4)	5/108 (4.6)	0.391
Prominent bulla	5/108 (4.6)	7/108 (6.4)	0.552
Prominent agger	3/108 (2.7)	2/108 (1.7)	0.0650
Hypoplastic uncinate	2/108 (1.8)	1/108 (0.92)	0.557

DNE: Diagnostic nasal endoscopy, DNS: Deviated nasal septum, ITH: Inferior turbinate hypertrophy, MTH: Middle turbinate hypertrophy.

According to Kuppuswami socioeconomic status scale, majority of cases with COM were from lower middle class (64.8%), followed by upper middle class (22.2%) and upper class (12.96%). The commonest ear disease was COM, mucosal type in 88 patients (81.5%), followed by squamous type in 20 (18.5%) patients. Among the cases with COM, 75% had unilateral ear involvement and 25% had bilateral disease. Of the 135 diseased ears evaluated, majority 42 (31.1%) showed large central perforation in TM, followed by medium sized perforation in 32 (23.7%) ears. Attic perforation with cholesteatoma was seen in 12 (8.9%) whereas postero-superior quadrant retraction pocket with foul smelling discharge was found in 11 (8.1%) ears. The middle ear mucosal status was assessed by otomicroscopy in 112 ears with central perforations. The middle ear mucosa was normal in 57.1%, congested/inflamed in 34.8% and oedematous/ polypoidal in 8% of ears with central perforation.

The characteristics of patients with COM as compared with the control group (Table 2). The most common symptoms reported were ear discharge (92.5%), hearing loss (54.6%), allergic symptoms like recurrent sneezing (40.7%) and fullness of ears (35.1%) in the cases whereas postnasal discharge, PND (13.8%) was the most common symptom in the control group. When both groups were compared with respect to reported symptoms, a statistically significant difference was found as for nasal obstruction (p=0.0001), nasal discharge (p=0.001), sneezing (p=0.0001) and headache (p=0.019).

In this study, diagnostic nasal endoscopy was abnormal in majority of cases (86.1%) and controls (88%) and the difference was not statistically significant. However, majority of COM patients (66.7%) had multiple abnormalities in sinonasal and nasopharyngeal regions

compared to controls, where single and multiple pathologies were found in almost equal distribution.

Deviated nasal septum (DNS) was found to be the most common amongst the anatomical variations in cases (52.7%) and controls (49.1%). This was followed by other abnormalities like inferior turbinate hypertrophy (28.7%), ET blockage (24.1%) were evidenced by oedematous and inflamed mucosa over pharyngeal ET orifice and adenoid hypertrophy (18.5%) in cases whereas, the other anatomical variations in controls were inferior turbinate hypertrophy, accessory ostia (16.7%), paradoxically bent middle turbinate (15.7%) and medialised uncinate (14.8%).

Diagnostic nasal endoscopic findings in COM patients were depicted in figure 1 and 2. When the COM patients and the control groups were compared for diagnostic nasal endoscopic findings (Table 3), a statistically significant difference was detected among incidences of ET blockage (p=0.003), adenoid hypertrophy (p=0.028) and inferior tubinate hypertrophy (p=0.035).

DISCUSSION

More than half of the cases (55.6%) in our study were within the age range of 11–30 years. This supports the view that the high prevalence of COM is evident in the younger age group. Moreover, this is similar to findings by other researchers.[14,15] Other workers like Shrestha et al Karkiet et al.[16,17] Poorey and Iyer also found maximum prevalence of CSOM in the younger age group.[18] In our study, though there is an increase in female occurrence, this data is not statistically significant. This is in contrast to other studies that found a male predominance.[19-23] While a national study on hearing in the United Kingdom found no gender difference.[24]

Many investigators have revealed the role of upper respiratory tract abnormalities as causative factors for ET obstruction in the etiopathogenesis of COM. This study evaluated the relationship between COM and sinonasal abnormalities and demonstrates the vital role of diagnostic nasal endoscopy in the objective assessment and definitive management of COM patients.

COM is characterized by persistent or recurrent middle ear (ME) discharge through an existing tympanic membrane perforation which may worsen with recurrent respiratory infections.[25] Bacteria can get into the ME via the external auditory canal through a perforated TM or following a persistent upper respiratory infection with insufflations of microbial agent via the pharyngeal part of the ET.[24] In our study, patients presented with combinations of symptoms. Almost all the COM patients had complaints of otorrhoea (92.5%). Decreased hearing was present in 54.6%, fullness of ears in 35.1%. Associated allergic symptoms like recurrent sneezing (40.7%), nasal obstruction and nasal discharge (25.9%) were seen in COM patients with a statistically significant difference for nasal obstruction, nasal discharge, sneezing and headache ($p<0.05$) when compared with the control group. Bakhshaee et al, established the role of allergic rhinitis in chronic suppurative otitis media.[26]

In this study, the diagnostic nasal endoscopy was done for all patient which revealed abnormalities in majority of cases (86.1%) and controls (88%). The difference was not statistically significant. However, there was significantly higher prevalence of multiple pathologies in COM patients compared to controls. Deviated nasal septum was found to be the most common amongst the anatomical variations in cases (52.7%) and controls (49.1%). This was followed by other abnormalities like inferior turbinate hypertrophy (28.7%), ET blockage (24.1%) as evidenced by oedematous and inflamed mucosa over pharyngeal ET orifice and adenoid hypertrophy (18.5%) in cases whereas, in controls inferior turbinate hypertrophy, accessory ostia (16.7%), paradoxically bent middle turbinate (15.7%) and medialised uncinate (14.8%) were the common variants next to DNS.

Several studies have proposed deviated nasal septum as a predisposing factor for COM. Van-Cauwenberge et al demonstrated that increase in nasal resistance leads to higher static middle ear, and closing pressures of the ET with resultant formation of mucosal edema and finally Eustachian tube dysfunction.[27] Gutierrez-Marcos showed that obstructive septal deviation induces ET dysfunction.[28]

In our study, ET blockage was found to be significantly associated with abnormal middle ear mucosa as evidenced by inflamed or polypoidal middle ear mucosa seen in 66.7% of cases with blocked nasopharyngeal ET orifice (p=0.014). Bluestone et al, found that ET dysfunction was found to be the reason for persistence of the disease.[29] Further concluded that the diseases of the sinuses as the main cause rather than adenoid in adolescents and adults for ET block.

Statistically significant difference was detected among incidences of ET blockage, adenoid hypertrophy and inferior turbinate hypertrophy between two groups in this study. Honjo and Kuzata has studied cases of refractory otitis media after evaluating the various parameters including the ET function and found that 48% of the cases had refractive ear disease due to sinusitis and 78% had abnormal sinuses and concluded that in cases of COM refractory to treatment the main focus of pathology/ infection is in sinuses.[30]

In the present study, adenoid hypertrophy which might result in ET dysfunction was statistically significantly higher than those of the control group. Adenoid tissue causes nasal stuffiness and constricts nasopharyngeal isthmus. During swallowing, initially positive pressure in this closed system is followed by negative pressure. These pressure variations increase negative pressure inside middle ear leading to retraction of the tympanic

membrane, and this viscious cycle repeats itself.[27] For ages, adenoid vegetation has been recognized as an important factor in the pathogenesis of COM with effusion.[31]

In addition to the significant occurrence of inferior turbinate hypertrophy (ITH) with COM, there was significant relation between ipsilateral turbinate hypertrophy and the side of ear involvement was evidenced (Fisher p=0.002). Other anatomical variations of osteomeatal complex like middle turbinate hypertrophy/concha bullosa, paradoxical middle turbinate, medialised uncinate, accessory ostium, prominent bulla ethmoidalis, prominent agger nasi and hypoplastic uncinate did not show any relation to the development of COM in our study.

CONCLUSION

When chronic otitis media patients and the control groups were compared for diagnostic nasal endoscopic findings, statistically significant difference was found among incidences of ET blockage, adenoid hypertrophy and inferior turbinate hypertrophy. This study indicates that nasopharyngeal pathology causing eustachian tube dysfunction, has higher prevalence among chronic otitis media patients and early recognition of this by diagnostic nasal endoscopy is warranted especially when surgery is considered for the comprehensive management of this overwhelming and enigmatic disease**.**

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