

Research Article

Observational study of tympanic membrane changes in allergic rhinitis

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ABSTRACT

Background: Allergic rhinitis (AR) is a common condition affecting 20-30% of the population. This condition affects not only the nose but also the sinuses and ears in many ways. Many studies are there worldwide implicating AR as a cause of serous otitis media. But only few studies have actually studied the tympanic membrane (TM) changes observed in patients with allergic rhinitis. The aim of this study is to document the TM changes observed in patients with AR and to correlate them with the duration of symptoms and also influence of prior treatment of AR on the TM changes observed.

Methods: A total of 111 patients and so 222 ears were studied. A detailed history of the duration of symptoms and any prior treatment for AR was recorded. The TM changes seen were classified and recorded. The duration of disease and treatment were taken as grouping variables and the tympanic membrane changes were ranked and used as testing variable. The results were statistically analyzed using non- parametric test, Kruskal – Wallis test.

Results: There was no statistically significant correlation between duration of AR and the TM changes observed. However there was a significantly less number of patients with TM retraction observed in the patients who had taken prior treatment compared to those patients who had taken no prior treatment.

Conclusions: It is concluded that institution of early treatment may prevent development of Eustachian tube dysfunction and TM changes in patients with AR.

Keywords: Allergic rhinitis, Tympanic membrane, Retraction of pars tensa, Retraction of pars flaccida, Eustachian tube dysfunction, Serous otitis media

INTRODUCTION

Approximately 20% to 30% of total population suffers from at least one type of allergic diseases in India. A study carried, over 30 years ago in Delhi reported around 10% allergic rhinitis and 1% asthma in 1964.¹ There after later studies have reported that 20% to 30% of the population suffer from allergic rhinitis and of that 15% develop asthma.

Approximately 20% of adults and children have seasonal or perennial allergic rhinitis.² Despite its prevalence, the

condition is often treated inadequately and becomes chronic. A chronic state of nasal inflammation and obstruction develops, frequently leading to more serious complications in both the upper and the lower airways and the middle ear.³

The eustachian tube provides an anatomic communication between the nasopharynx and the middle ear and is in a unique position to cause changes in the middle ear secondary to reactions in the nose.

Upper respiratory tract allergy may cause some intrinsic and extrinsic mechanical obstruction in patients who have

normal eustachian tube function, but their normal active opening mechanism (tensor veli palatini muscle pull) overcomes the obstruction.

Patients who have functional obstruction due to poor muscular opening are at greatest risk for sufficient mechanical obstruction to give rise to middle ear disease.⁴

Even if eustachian tube obstruction is minimal, patients with allergic rhinitis may have symptoms of eustachian tube dysfunction, such as popping and snapping sounds in the ear. These symptoms may be aggravated during airplane travel. Many of these patients experience these symptoms and continue to have more problems, such as hearing loss, ear discomfort, tinnitus, and rarely vertigo, during the worst periods of their allergic rhinitis.

There are many studies implicating nasal allergy as a cause of Eustachian dysfunction, and middle ear diseases like acute otitis media, otitis media with effusion (OME).^{3,5,6}

Hence it is possible that in patients with nasal allergy whether they have ear symptoms or not there may be some Eustachian dysfunction, middle ear disease or tympanic membrane (TM) changes. Especially because patients with allergic rhinitis do have episodes of increase in symptoms and these periods may compromise the Eustachian tube function and hence the middle ear and tympanic membrane.

Hence the tympanic membrane changes observed in patients with allergic rhinitis may reflect these episodes of Eustachian dysfunction and compromise of the middle ear. There are many studies from various countries implicating allergic rhinitis as a cause of Eustachian tube dysfunction and otitis media.³⁻⁶ There is a study of Eustachian tube function in adults with intact tympanic membrane from Brazil.⁷

In this study allergy is considered as one of the causes of Eustachian dysfunction in patients with intact tympanic membrane.

However not many studies are there which document the various tympanic membrane changes observed in cases of allergic rhinitis or correlating the duration of allergic symptoms and its treatment with these changes. Hence the objective of this study is to observe the tympanic membrane changes in patients with allergic rhinitis and correlate it with the duration of disease and treatment.

Aims and objectives

The aim of this study is to find

- Any tympanic membrane (TM) changes observed in patients with allergic rhinitis (AR) and to document them.

- To correlate these changes to the duration of symptoms of allergic rhinitis
- To find if prior treatment for allergic rhinitis had any correlation with these TM changes.

METHODS

This is a cross-sectional study approved by institutional ethics committee vide no 7/IEC No: 2/ May 2014. A total of 111 patients attending the ENT OPD of this institution and diagnosed as having allergic rhinitis based on the following criteria were included in the study. Criteria for diagnosis of allergic rhinitis used in this study (inclusion criteria).

Must have

- Presence of any 2 or more of the following symptoms- bouts of sneezing, nasal block, rhinorrhea, nasal itching, post nasal drip, hyposmia / anosmia
- And Presence of any 2 or more of the following symptoms- itching and watering of eyes,itching of palate following or associated with sneezing, ear block
- And Presence of specific trigger factors like dust, smoke, pollen etc for the above symptoms as noted from history
- And Pale bluish gray, boggy nasal mucosa on anterior rhinoscopy and diagnostic nasal endoscopy
- And /Or Nasal discharge (mucoïd / serous), turbinate hypertrophy, polyps or polypoidal mucosa on anterior rhinoscopy and diagnostic nasal endoscopy.

May/ may not be present

Sleep disturbance, Impairment of daily activities, leisure, and/or sport, Impairment of school or work were noted down in the history but not considered mandatory for inclusion. Presence of other clinical features like nasal crease or allergic shiners were not considered mandatory for inclusion but their presence was noted as additional features.

Exclusion criteria

- All patients with any ear disease dating prior to the onset of symptoms of allergic rhinitis.
- All patients with history of any previous ear or nose surgery.
- All patients with gross deviation of nasal septum on examination.
- All patients with tympanic membrane perforation and ear discharge were excluded from the study.

The duration of the symptoms and treatment history at presentation were noted. On the day of presentation the tympanic membrane of all patients included in the study were examined using otoendoscopy and findings

recorded as normal tympanic membrane, retraction of tympanic membrane with grade (pars tensa and pars flaccida), tympanosclerosis and features suggestive of SOM.

The duration of disease and treatment were taken as grouping variables and the tympanic membrane changes were ranked and used as testing variable. The results were statistically analyzed using non-parametric test, Kruskal- Wallis H test. Statistical significance was analyzed between the duration of symptoms of AR and the tympanic membrane changes and between the presence or absence of prior treatment and tympanic membrane changes and reported.

RESULTS

The sex distribution is shown in Figure 1. Among the 111 patients studied 45 were males and 66 were females.

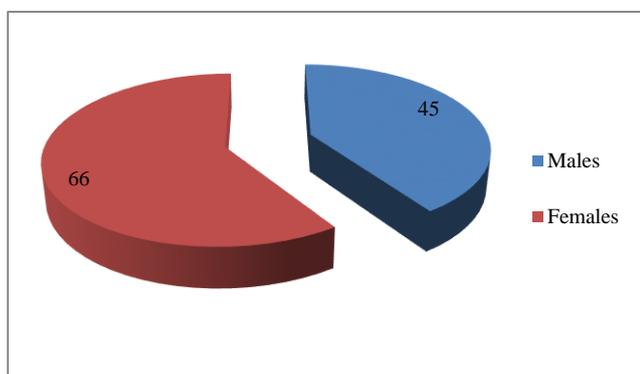


Figure 1: Sex distribution.

The age distribution of the patients studied is shown in Table 1. The youngest patient included in the study was 8yrs old female with allergic rhinitis of 6 months duration with no history of any previous treatment.

Table 1: Age distribution.

Age group	Number of patients
0-15 years	11
16-30 years	50
31-45 years	33
46-60 years	12
61-75 years	5

She had normal tympanic membrane on both sides (B/L). The oldest patient was 76 years old male with allergic rhinitis for more than 1year with no treatment. He had B/L grade I retraction of pars tensa.

The findings of TM along with the number of ears are shown in Figure 2. It was observed from the results that maximum number of patients had grade 1 pars tensa retraction or normal tympanic membrane. In 9 ears there were grade 3 retractions, of which 2 patients had B/L

grade 3 retractions. One patient had B/L grade 4 retractions. A total of 4 ears were found to have pars flaccida retraction, of which one patient had B/L pars flaccida retraction. No patients with features suggestive of OME were found in this study. 2 patients (3 ears) were found to have tympanosclerotic patch in the tympanic membrane.

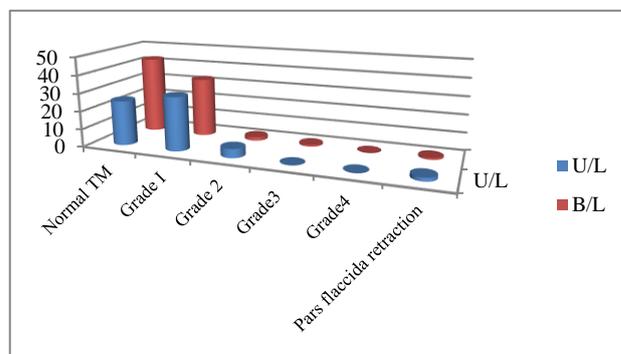


Figure 2: TM findings and number of ears.

Among the patients studied, 77 patients had symptoms of allergic rhinitis persisting for more than 1 year. 19 patients had duration of symptoms for 6-12 months and 15 patients had duration of symptoms for a period less than 6 months. The duration of symptoms with number of patients is depicted in Figure 3.

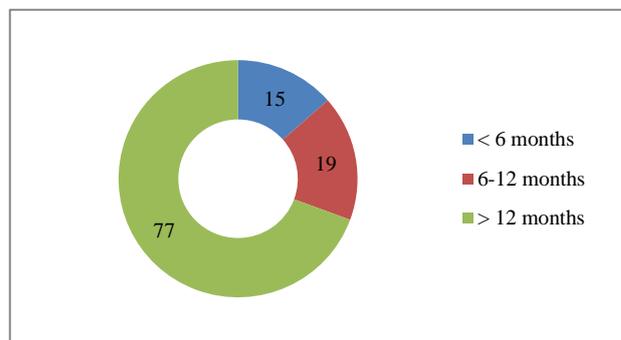


Figure 3: Duration of symptoms of AR with number of patients.

A total of 41 patients had taken no prior treatment. 70 patients had taken treatment in the form of anti-histamines, leukotriene antagonists, mast cell stabilizers and steroid nasal sprays. For statistical analysis, each ear finding was taken into consideration separately and ranked. Statistical analysis of the results was done using Non- parametric analysis, Kruskal – Wallis test comparing the duration of symptoms with the grade of retraction seen in each ear. No statistically significant correlation was found between the duration of symptoms of allergic rhinitis and tympanic membrane changes (p>0.05). However there was a statistically significant correlation between the presence or absence of prior treatment and tympanic membrane changes observed (p<0.05).

DISCUSSION

From the results it can be noted that more number of female patients have reported with AR in this study. However an earlier study from Haryana, India shows the incidence of AR to be more in males.⁸ The maximum incidence of AR is noted in the age group 16-30 yrs which correlates with the age incidence seen in the same study.⁸ There are many studies implicating nasal allergy as a cause of Eustachian dysfunction, and middle ear diseases like acute otitis media, otitis media with effusion (OME) but none of these studies have included TM retraction as a factor.^{3,5,6}

However there is one study from Harvard medical school, which says the presence of AR increases the odds of otitis media with effusion, Eustachian tube dysfunction and tympanic membrane retraction in children more than 6 yrs old.⁹ No further reference could be found in the literature where tympanic membrane retraction is studied in correlation with allergic rhinitis.

The present study shows no statistically significant correlation between the duration of symptoms of AR and the retraction or other changes noted in the tympanic membrane. A study published in American journal of otolaryngology showed that the prevalence of AR in children with OME (28.4%) and control subjects (24.1%) did not differ significantly.⁶

These 2 groups also showed no differences in total eosinophil count and serum and middle ear effusion IgE concentration. Abnormalities in eustachian tube function were the same in patients with AR and controls. However this study did not document TM retraction as a factor. Though allergic rhinitis is accepted as one of the leading causes of ET dysfunction and OME in many studies none of these studies include TM retraction as feature associated with AR.^{3-6,9}

Since Eustachian tube dysfunction will lead to negative middle ear pressure, TM retraction can develop in these patients. The reason for not seeing a statistically significant correlation between duration of symptoms and TM retraction may be due to the fact that these patients may have compromised ET function and thus retraction of TM only during exacerbation of symptoms and not as a persistent feature. Whether the TM retraction observed during the study is a temporary or permanent phenomenon is beyond the scope of this study.

In the present study, there is a statistically significant difference in the presence of TM retraction between treatment and no treatment group. In the study by Philip Fireman MD, it is stated that if allergic rhinitis is documented in association with OME, management of the allergic rhinitis includes antihistamine therapy and avoidance of offending allergens.⁴ If these are not effective, intranasal corticosteroids, intranasal cromolyn, and allergen immunotherapy may be considered.

However, no double-blind, placebo-controlled trials have documented improvement in the course of OM or OME with the treatment of allergic rhinitis in children. A study from Kuppam India concludes that anti-allergic medications have a protective influence on middle ear pressure.¹⁰

A small study investigated the prevention of eustachian tube obstruction by pretreatment with an antihistamine plus decongestant in a group of subjects who were ragweed-sensitive and who underwent nasal provocation.¹¹ Hence it can be implied that treating allergic rhinitis will reduce the inflammation of upper airway and ET and thus help in maintaining the ME pressure. This may prevent the development of negative middle ear pressure and TM retraction.

CONCLUSION

Allergic rhinitis is a common condition which is frequently neglected by both the patients and the doctors. It is predominantly diagnosed by detailed history and laboratory investigations are mandatory when specific treatment is planned. Allergic rhinitis can induce inflammatory changes in the nose, sinuses, eustachian tube & middle ear. Asthma, urticaria and angioedema are recognized co morbid conditions.

There are patients who have ear symptoms occasionally and though examination of ear in patients with AR is a routine practice in ENT, documentation and correlation of these findings with AR is not very frequent. From this study it can be said that patients may have episodes of increase in the inflammation caused by AR and this may compromise the Eustachian function and middle ear. Since these may be transient there was no significant correlation between duration of illness and TM changes. But repeated and serial recording of these TM changes will be required to say conclusively that duration does not actually influence the TM changes observed. However the significant correlation between prior treatment and TM changes reveal that with treatment of AR the inflammation developing in the Eustachian tube and middle ear and thus TM changes can be prevented. Hence it is recommended that the documentation of all ENT findings in all patients with AR should be made a regular practice. Treatment should be started early in all patients with AR and its importance in prevention of development of complications and consequences of AR should be impressed upon the patients.

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