

EFFECTS OF ALLERGIC RHINITIS ON MIDDLE EAR VENTILATION: A TYMPANOMETRIC STUDY

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Abstract:

Background: Allergic rhinitis is a global health problem. There are so many comorbidities associated with allergic rhinitis like asthma, sinusitis, sleep disorders, dental occlusion, otitis media. Allergic rhinitis patients often suffer from ear problems like itching in ears, ear fullness, decreased hearing. So we decided to do study of eustachian tube function by tympanometry in patients of allergic rhinitis. And tried to find out whether eustachian tube function improves after medical treatment of allergic rhinitis.

Material & Methods: Total 104 patients were studied Impedance audiometry was done before start of medical treatment and repeated after 4 weeks of medical treatment

Results: We studied total 104 patients i.e. 208 ears. Before starting medical treatment tympanograms obtained which showed impaired eustachian tube function in 144 ears (69.24%). After 4 weeks of medical treatment abnormal tympanogram count reduced to 84 ears (40.39%). (Table 3). Chi square test applied, showed p value highly significant (<0.001).

Conclusion: In our experience medical treatment for allergic rhinitis significantly improves tubal function and middle ear ventilation. Allergic rhinitis patients have higher degree of eustachian tube dysfunction due to both obstruction and allergy. So by treating it we not only relieve patient's nasal complaints but also prevent middle ear hypoventilation and sufferings.

Keywords: Allergic rhinitis, Tympanometry, Eustachian tube, Otitis media with effusion.

Introduction:

Allergic rhinitis is a global health problem. Worldwide prevalence of allergic rhinitis range from 0.8 to 39.7% with UK having a high prevalence (>20%).¹ The Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 updated document estimates that there are 500 million subjects in this world who suffer with allergic rhinitis (AR).² In India, The International Study for Asthma and Allergies in Childhood (ISAAC) phase I revealed that 12.5% children in the 6-7 year age-group and 18.6% in the 13-14

year age-group had allergic rhinitis.³

The best etiological risk factor for allergic rhinitis is family history of allergy.¹ Genes involved in atopy include loci on 5_q, 11_q, 12_q.¹ Environmental factors like lifestyle changes, smoking, increased exposure to allergen, pollution and irritants, dietary modifications responsible for increased incidence of allergy.¹

There are so many comorbidities associated with allergic rhinitis like asthma, sinusitis, sleep disorders, dental occlusion, otitis

media.¹ Studies of the pathogenesis of otitis media have identified interactions among infection, allergic reactions, and eustachian tube dysfunction. Nasal inflammation due to allergen challenge results in classic signs and symptoms of allergic rhinitis and eustachian tube dysfunction. Eustachian tube dysfunction leads to increased negative pressure in the middle ear and improper ventilation.⁴

Allergic rhinitis patients often suffer from ear problems like itching in ears, ear fullness, decreased hearing. So we decided to do study of eustachian tube function by tympanometry in patients of allergic rhinitis. And tried to find out whether eustachian tube function improves after medical treatment of allergic rhinitis.

AIMS:

1. To study condition of middle ear by tympanometry in allergic rhinitis patients.
2. To know the effects of medical treatment in allergic rhinitis on eustachian tube function.

Material And Methods:

Study design: This was prospective observational study.

Ethical approval: The protocol for this study was approved by college ethics committee, and all patients gave their informed consent.

Sample size: Total 104 patients were studied.

Inclusion criteria: Patients suffering from allergic rhinitis, diagnosed clinically of all age groups.

Exclusion criteria: Patients who had taken any medical treatment 6 weeks before were excluded in study. Patients having perforation in tympanic membrane.

Place of research: Carried out in tertiary care hospital in rural part Maharashtra.

Methodology:

Detail history of symptoms with its duration and characteristics was taken. Thorough clinical examination including general and systemic examination along with detailed ENT examination was carried out. If any specific ear finding seen like otitis media with effusion then otoendoscopy done and findings recorded. Impedance audiometry was done before start of medical treatment

and repeated after 4 weeks of medical treatment. Medical treatment consists of oral antihistaminic, nasal decongestants and steroid nasal sprays to all patients. Tympanograms were classified as described by Jerger.⁵

Statistical analysis: The statistical analysis was done using chi square test for the present study. Data was presented in percentage.

Results:

We studied total 104 patients. Maximum patients were in age group 10 to 20 years. But all age groups were affected (table 1). Among these 65 (62.5%) were males and 39 (37.5%) were females.(table 2) We studied total 104 patient's i.e.208 ears. Before starting medical treatment tympanograms obtained which showed normal tympanograms type A (figure 1) in 64 ears (30.76%) and impaired eustachian tube function i.e. abnormal tympanogram in 144 ears (69.24%). After 4 weeks of medical treatment abnormal tympanogram count reduced to 84 ears (40.39%) (Table3). Chi square test applied, showed p value highly significant (<0.001).

Table 1:
Age wise distribution of cases (n=104)

Age (years)	No. of patients	Percentage
10 to 20	30	28.85%
21 to 30	25	24.04%
31 to 40	22	21.15%
41 to 50	12	11.54%
51 to 60	15	14.42%

Table 2:
Gender wise distribution of cases.(n=104)

Gender	No.of patients	Percentage
Male	65	62.5%
Female	39	37.5%

Among 144 ears having abnormal tympanograms, 14 ears (9.72%) had type B tympanograms (figure2) suggestive of otitis media with effusion, 130 ears (90.28%) had had type C tympanograms (figure3) suggestive of high prevalence of negative middle ear pressure in allergic rhinitis patients (Table 4).

Table 3:
Tympanometry in allergic rhinitis patients (n=208 ears i.e.104 patients)

	Normal Tympanograms Type A	Abnormal Tympanograms Type B&C
Before medical treatment	64 (30.76%)	144 (69.24%)
4 weeks after medical treatment	124 (59.61%)	84 (40.39%)

Chi square value=33.784, d.f.=1,p value (<0.001) highly significant.

Table 4:
Abnormal tympanograms in allergic rhinitis patients

	Type C Tympanograms	Type B tympanograms
Before medical treatment (n=144)	130 (90.28%)	14 (9.72%)
4 weeks after medical treatment (n=84)	78 (92.86%)	06 (7.14%)

Fig 1: Type A tympanogram

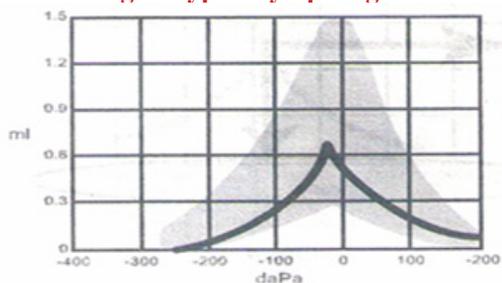


Fig 2: Type B tympanogram

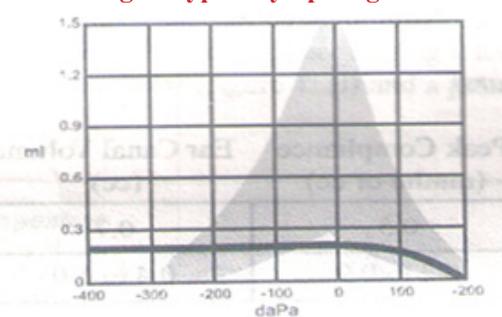


Fig: 3 Type C tympanogram

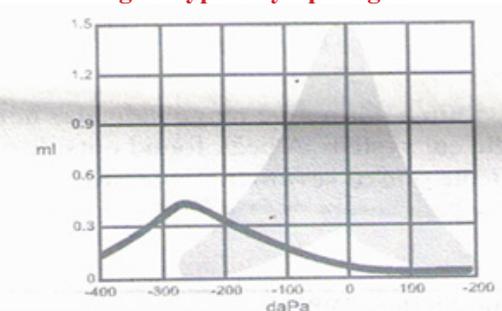


Fig 4: Otitis media with effusion



Discussion:

Allergic rhinitis is an IgE-mediated type 1 hypersensitivity response of nasal mucosa to normally innocuous proteins with resultant inflammation⁵. There is association between allergic rhinitis and a variety of comorbid conditions including malocclusion, chronic otitis media, conjunctivitis, sinusitis, asthma.⁶

There are several explanations to account for the eustachian tube dysfunction associated with nasal diseases

1. Mechanical obstruction of eustachian tube orifice may occur due to nasal mass.⁷
2. Increased secretions from seromucous glands in the pharyngeal portion of eustachian tube may accumulate and block the tube.⁸
3. Lymphatic stasis due to edema of the submucosa of the tube resulting in compromise of the lumen may produce eustachian tube dysfunction.⁹
4. Further increase in hydrostatic pressure result in the accumulation of middle ear fluid by transudative process.¹⁰
5. Tubal dysfunction may be related to deficiency of surfactant that is thought to facilitate tubal opening. It has been postulated that this material is inactivated by inflammation.¹¹

So it was interesting to know the condition of eustachian tube in allergic rhinitis patients.

We studied total 104 patients of allergic rhinitis who were not taking medical treatment since 6 weeks. We found eustachian tube function was impaired in 144 of ears (69.24%). Among these 144 ears, 14 were suffering from otitis media with effusion (figure 4) 4 weeks after medical treatment tympanometry showed marked improvement in eustachian tube function. And ears having abnormal tympanograms count reduced to 84 ears (40.39%).

These results are comparable with study done by Knight LC, et al in 1992¹². They recorded middle ear pressure in 396 ears of seasonal allergic rhinitis patients. Evidence of eustachian tube dysfunction was found in 24% of subjects. Again increased duration of exposure to pollen over a further 2 weeks increased incidence of eustachian tube dysfunction to 48%.

Conclusion:

Otitis media is often caused by chronic tubal dysfunction secondary to nasal pathology. Allergic rhinitis patients have higher degree of eustachian tube dysfunction due to both obstruction and allergy. In our experience medical treatment for allergic rhinitis significantly improves tubal function and middle ear ventilation. A long standing improvement of eustachian tube function is mandatory to prevent and treat middle ear inflammatory diseases. Keeping in mind what is well known in medicine, "Prevention is the best therapy", in case of otitis media we should first treat the cause (nasal pathology) and then the effect (middle ear impairment). So by treating it we not only relieve patient's nasal complaints but also prevent middle ear hypoventilation and sufferings.

Conflict of interest: Nil

Financial support: Nil

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