



# Gastroesophageal Reflux Disease in Patients with Eustachian Tube Catarrh

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## ABSTRACT

**Background:** Eustachian tube catarrh could be due to laryngopharyngeal reflux besides other causes.

**Objectives:** To assess gastroesophageal reflux disease (GERD) in patients with Eustachian tube catarrh and the effect of proton pump inhibitors on symptoms of Eustachian tube disease.

**Methodology:** A total of 50 patients were selected with symptoms of Eustachian tube catarrh and evaluated prospectively in the ENT Outpatient Department of the Pondicherry Institute of Medical Sciences, Puducherry.

**Results:** The group consisted of 15 (30%) males and 35 (70%) females. The largest group was of the age of 45 years and above (44%). The most common symptom of Eustachian tube catarrh was itching (84%), followed by otalgia (76%) and popping sensation on swallowing (74%). On otoscopic examination, the commonest grade of tympanic membrane retraction was grade I (57%), on tympanometry 90% of cases had middle ear pressure in range -100 to +100. The middle compliance ranged from 0.5 to 1.75 (normal) in 86% of the cases. The tympanometric curve was type A (normal) in 78% of the cases and type C in 8% of the cases. At the end of 4 and 8 weeks, the response of treatment to proton pump inhibitors was significantly higher ( $z = 3.53$ ,  $p < 0.05$ ) in the studied group.

**Conclusion:** Laryngopharyngeal reflux (LPR) could be an important etiological factor in Eustachian tube catarrh. The treatment, with proton pump inhibitors, of Eustachian tube catarrh with no local identifiable cause, could be very useful to this subset of patients.

**Keywords:** Eustachian tube catarrh, Gastroesophageal reflux, Laryngopharyngeal reflux, Proton pump inhibitors.

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## INTRODUCTION

Eustachian tube patency and its proper functioning are highly essential for the normal maintenance of middle ear function. Obstruction of the Eustachian tube will result in negative pressure in the tympanum and lead to retraction, effusion and other complications.

Eustachian tube has at least three important functions with respect to the middle ear: Ventilation or pressure regulation of the middle ear, clearance or drainage of middle ear secretions into the nasopharynx and protection from nasopharyngeal secretions and sound pressure. The ventilator function is important since a malfunctioning Eustachian tube hampers the function of tympanum and leads to middle ear effusion.

Malfunctioning of eustachian tube opening could be due to laryngopharyngeal reflux (LPR) besides other causes. Previous studies have established that LPR may cause inflammation of the nasopharyngeal end of Eustachian tube and result in Eustachian tube catarrh. This study evaluates gastroesophageal reflux disease (GERD) in patients with Eustachian tube catarrh.

## MATERIALS AND METHODS

A hospital-based prospective study was carried out to assess GERD in patients with Eustachian tube catarrh and to know the effect of proton pump inhibitors on symptoms of Eustachian tube disease in the tertiary care hospital.

A total of 50 patients were selected with purposive sampling and informed consent was obtained from each participant before including in the study, symptoms of Eustachian tube catarrh and effect of proton pump inhibitor evaluated prospectively in the period of 18 months from May 2005 to September 2006 in the ENT Outpatient Department of the Pondicherry Institute of Medical Sciences, Puducherry.

## Inclusion Criteria

Adult patients (more than 18 years of age) with two or more symptoms of tubal occlusion, such as otalgia, hearing loss, itching of the ears, popping sensation on swallowing, tinnitus, giddiness, and willing to participate.

**Exclusion Criteria**

*Patient with Tympanic Membrane Perforation*

Eustachian tube dysfunction due to local cause, such as upper respiratory tract infection and allergy, and not willing to participate.

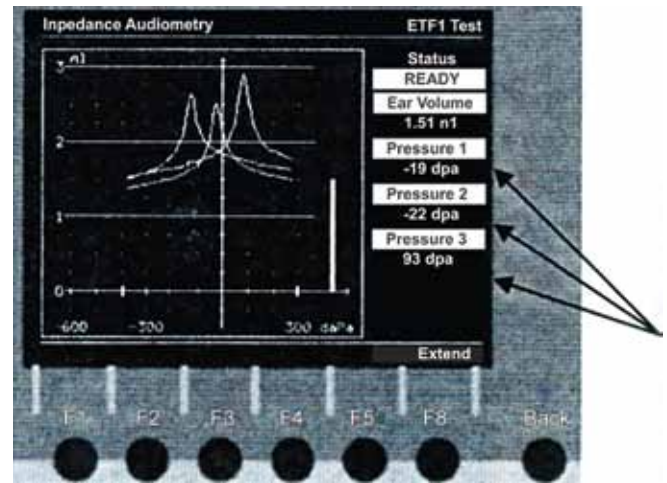
A detailed history, based on a predesigned and pretested questionnaire, was taken from the patients with particular attention to aural and GERD symptoms. If two or more symptoms (such as otalgia, hearing loss, itching of the ear, popping sensation on swallowing, tinnitus and giddiness) of Eustachian tube catarrh were present, the case was symptomatically diagnosed as Eustachian tube catarrh. Gastroesophageal reflux disease was established by any two symptoms, such as heartburn, water brash and belching. Informed consent was taken from all the patients.

Patients underwent ENT examination, impedance audiometry and Eustachian tube function test. None of the patients were subjected to upper gastrointestinal endoscopy as they were not willing for this procedure. All otoscopic examination was done using a Welch Allyn Pneumatic Otoscope. When necessary, cerumen was removed from the external auditory canal with a blunt Jobson-Horne probe or syringing with water at body temperature.

The tympanic membrane was examined otoscopically for presence of the following features: (1) Distortion of cone of light; (2) position of tympanic membrane and (3) decreased mobility. Laryngeal examination was performed by indirect laryngoscopy. Laryngeal changes with erythema of the posterior vocal folds and arytenoids area were termed as posterior laryngitis. Impedance audiometry was done using impedance audiometer (AudioTraveller AA222) (interacoustics) which combines a middle ear analyzer and clinical audiometer. Patients were seated and the hand pencil type probe was inserted in each ear. The following indices were measured—Static compliance, middle ear pressure, tympanogram shapes (Jerger). Following this, patients were subjected to Eustachian tube function test, used in patients with non-perforated drums. It is also known as the Williams’ test (Fig. 1). With the AA222, the test is semiautomatic and it suggests the operator how to operate and how to instruct the patient. Three tympanometric curves appear on the screen, which are produced at three different pressures: at baseline, on swallowing (Toynbee test) and on performing the Valsalva.

The three different pressures are also displayed. If the patient has a Eustachian tube dysfunction (ETD) the three pressures will vary only within +10 to -10 mm H<sub>2</sub>O of the value and this is labeled as Williams’ test negative.

The patients were examined by diagnostic nasal



**Fig. 1:** Eustachian tube function test. Change in peak pressure indicates functioning Eustachian tube

endoscopy under topical anesthesia to look for any local pathology in the nose or nasopharynx.

All patients of Eustachian tube catarrh with or without symptoms of GERD and with no other local symptoms, were treated.

Patients were followed up at an interval of 4 weeks to a maximum of 3 months with a repeat Eustachian tube test and were questioned regarding the spectrum of their symptoms. Statistical analysis was done using appropriate statistical method with the help of expert-like percentage, Z-test and so on.

**RESULTS**

The group consisted of 15 (30%) males and 35 (70%) females (Table 1). The majority were in the age groups of 45 years and above (44%) (Table 2). The most common symptom of Eustachian tube catarrh was itching (84%) followed by otalgia (76%) and popping sensation of swallowing (74%) (Graph 1). On otoscopic examination, the commonest grade of tympanic membrane retraction was grade I (57%) on tympanometry (Table 3), 90% of cases had middle ear pressure in range -100 to +100 (Table 4). The middle compliance ranged from 0.5 to 1.75

**Table 1:** Distribution according to sex

Sl. no.	Sex	Numbers	Percentage
1	Males	15	30
2	Females	35	70
Total		50	100

**Table 2:** Distribution according to age group

Sl. no.	Age	Numbers	Percentage
1	18–25	9	18
2	26–35	9	18
3	36–45	10	20
4	45 and above	22	44
Total		50	100



(normal) in 86% of the cases (Table 5). The tympanometric curve was type A (normal) in 78% of the cases and type C in 8% of the cases (Table 6). At the end of 4 and 8 weeks,

the response of treatment to proton pump inhibitors was evaluated that became significant ( $Z = 3.53, p < 0.05$ ) in the studied group (Graphs 2 and 3).

**Table 3:** Distribution according to grade of retraction of tympanic membrane on examination

Sl. no.	Grades	Numbers	Percentage
1	Normal	6	6
2	I	57	57
3	II	27	27
4	III	8	8
5	IV	2	2
Total		100	100

**Table 5:** Distribution according to middle ear compliance

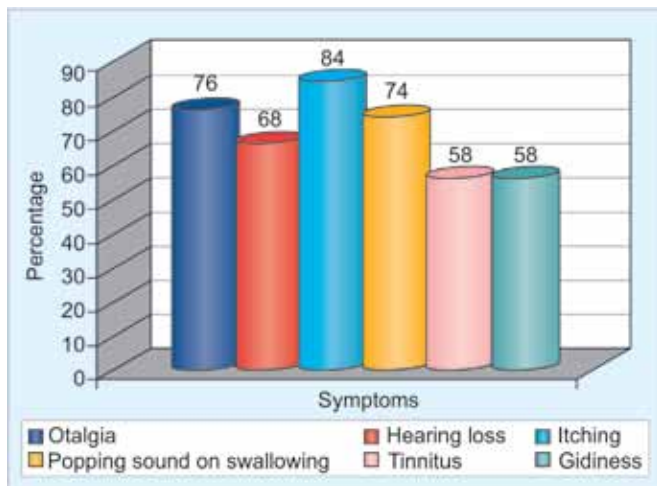
Sl. no.	Compliance	Numbers	Percentage
1	0.5–1.75 (normal)	86	86
2	< 0.5	12	12
3	> 1.75	2	2
Total		100	100

**Table 4:** Distribution according to middle ear pressure

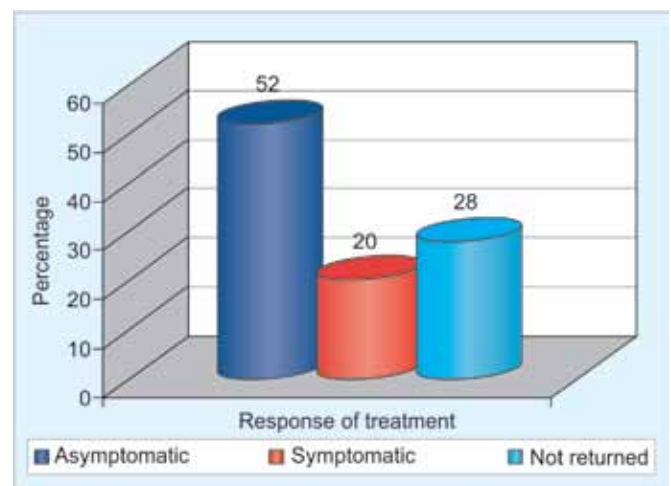
Sl. no.	Middle ear pressure	Numbers	Percentage
1	100 to +100 (normal)	90	90
2	≤ 100	8	8
3	≥ 100	2	2
Total		100	100

**Table 6:** Distribution according to tympanometric curve

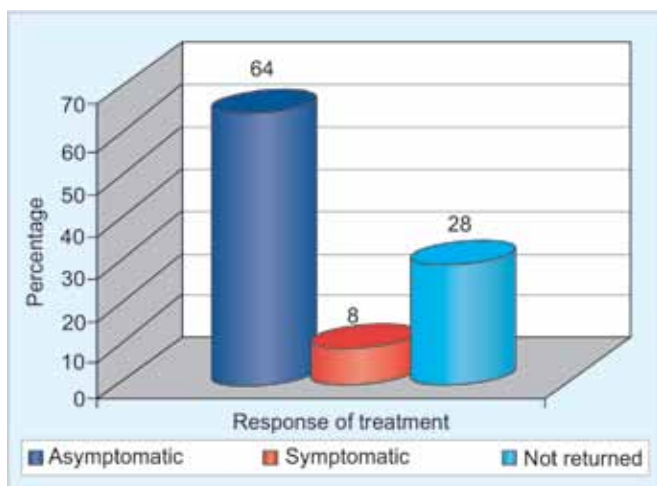
Sl. no.	Compliance	Numbers	Percentage
1	Type A (Normal)	78	78
2	Type As	12	12
3	Type C	8	8
4	Type AD	2	2
Total		100	100



**Graph 1:** Distribution according to symptoms of Eustachian tube catarrh



**Graph 2:** Distribution according to response of treatment at the end of 4 weeks



**Graph 3:** Distribution according to response of treatment at the end of 8 weeks

**DISCUSSION**

Eustachian tube is named after Bartolomeo Eustachio. It connects the tympanic cavity and the nasopharynx. Gastroesophageal reflux disease is defined as chronic symptoms due to mucosal damage caused by the reflux of gastric contents into the esophagus. The classical symptoms of GERD are heartburn, regurgitation, chest pain, dysphagia, odynophagia, nausea, dyspepsia, bloating, belching, indigestion, water brash and hiccups.<sup>1</sup> The suspected or proven extraesophageal manifestations of GERD are depicted in Table 7.<sup>2</sup>

Hawkins<sup>3</sup> has termed LPR as a modern day ‘great masquerader’ and has stated that it is a new term given to gastroesophageal reflux leading to atypical symptoms in the upper aerodigestive tract.<sup>3</sup>

**Table 7:** Suspected or proven extraesophageal manifestations of GERD<sup>2</sup>

ENT	Pulmonary
Pharyngitis	Asthma
Otitis	Cough
Sinusitis	Idiopathic pulmonary fibrosis
Vocal cord granulomas	Chronic bronchitis
Subglottic stenosis	Pneumonia
Laryngitis	
Hoarseness/voice changes	Miscellaneous
Globus	Chest pain
Laryngeal cancer	Sleep apnea
Cough	Dental erosions

The term LPR denotes gastroesophageal reflux that reaches above the esophageal sphincter. The mechanism of the otolaryngological manifestations of GERD is most likely the result of intermittent nocturnal gastroesophageal reflux and contact of upper airway structures with refluxate. Upper esophageal sphincter pressures are lower at night, enhancing the opportunity of refluxate to cross this barrier and other protective or neutralizing mechanisms (cough, salivation) are also suppressed at night. Thus, many of the ENT manifestations of gastroesophageal reflux may depend to a large extent on the nocturnal reflux.<sup>2</sup>

Ulualp et al<sup>4</sup> have done a study to determine the prevalence and the characteristics of pharyngeal acid reflux events in single and multiple otolaryngological disorders. The authors hypothesize that the presence of posterior laryngitis may be an indicator of a causal role for gastroesophageal reflux in other aerodigestive tract lesions, such as chronic rhinosinusitis, vocal cord nodule and laryngotracheal stenosis.<sup>4</sup>

Issing et al<sup>5</sup> did a study in 40 patients to determine the incidence of gastroenterological disease in patients complaining of upper aerodigestive, pulmonary, laryngeal, pharyngeal and oral symptoms. They showed that in many patients suffering from the above-mentioned otolaryngological symptoms, occult gastroesophageal disease was present.

Koufman<sup>6</sup> did a clinical investigation of 225 patients to establish occult (silent) gastroesophageal reflux. GERD is an etiological factor in the development of many inflammatory and neoplastic disorders of the upper aerodigestive tract.<sup>6</sup>

Catalano et al<sup>7</sup> have done a study in a group of 110 patients with persistent upper respiratory symptoms and no suspicion of GERD symptoms to determine the prevalence of erosive and nonerosive esophagitis. They concluded that these patients had a higher prevalence of esophagitis as compared with group of similar age. They suggested that in patients with chronic upper respiratory symptoms, there is coexisting occult gastroesophageal

reflux and the approach to each patient should be individualized. In patients with atypical symptoms or warning symptoms of dysphagia, odynophagia or weight loss, early diagnostic evaluation is suggested. Diagnostic evaluation should begin with endoscopy followed by ambulatory pH monitoring especially in patients with negative findings or persistent upper respiratory symptoms recalcitrant to therapy.

The therapeutic approaches to otolaryngological disorders associated with gastroesophageal reflux include lifestyle modifications, acid suppression therapy and surgical therapy.

Several studies report a decrease in distal esophageal acid exposure with the elevation of head-end of the bed, decreased fat intake, decreased smoking, avoiding recumbence for up to 3 hours postprandially.<sup>8</sup>

Steward et al<sup>9</sup> have done a study to determine the efficacy of proton pump inhibitors for chronic laryngopharyngitis treated with lifestyle modification. Their study suggests that this significantly improves the symptoms attributable to the reflux, with or without proton pump inhibitor therapy. Thus, they suggest lifestyle modification for 2 months, a reasonable alternative to medical therapy for chronic laryngopharyngitis secondary to acid reflux.<sup>9</sup> Empirical trials with proton pump inhibitors have revealed 8 weeks as the optimal duration for treatment in patients with otolaryngological symptoms, such as posterior laryngitis.<sup>8</sup>

Politzer hypothesized that ETD was an important factor in the pathogenesis of middle ear disease in the 1860s. Much research has been conducted to better understand the role of ETD in otitis media with effusion.

Eustachian tube obstruction can result in altered middle ear function. The obstruction can be mechanical, functional or both. Acute salpingitis is the first stage in development of acute suppurative otitis media. At times, the respiratory epithelium lining of the tube may become congested with inflammatory swelling or produce an excessive secretion, resulting in blockage of the tube and some deafness.

There is increasing evidence that GERD causes laryngeal signs and symptoms. This is often referred to as reflux laryngitis or LPR. In fact, it is estimated that 4 to 10% of patients presenting to the ENT. Nose and throat physician do so because of symptoms that are, in part, related to GERD.<sup>10</sup>

White et al<sup>11</sup> have done a study to explore the possible relationship between gastroesophageal reflux and ETD in an animal model. They concluded that nasopharyngeal exposure to stimulate gastric juice causes ETD in rats; specifically, middle ear pressure regulation and mucociliary clearance of middle ear contents were



disabled.<sup>11</sup> This supports the linking of nasopharyngeal reflux to ETD and secondary development of otitis media. Sudhoff et al<sup>12</sup> have done a study to trace gastric reflux and to examine whether it reaches middle ear in a Mongolian gerbil model. They concluded that in animals with traceable laryngeal reflux the ink (they had injected Chinese ink into the stomach to trace the path of a potential gastroesophageal reflux) advanced through Eustachian tube and reached the middle ear. They also found that when reflux reaches middle ear on one side it also reaches the contralateral middle ear in most cases. Heavner et al<sup>13</sup> have done a study to delineate the relationship between gastroesophageal reflux and Eustachian tube function. This study was done on rats and it suggested that middle ear exposure to pepsin/hydrochloric acid (HCl) leads to ETD in rats.<sup>13</sup>

In our study of 50 adult patients with Eustachian tube catarrh, itching in the ears was the commonest symptom (84%). Other symptoms were otalgia (76%), popping sensation on swallowing (74%), hearing loss (66%), tinnitus (56%) and giddiness (56%). The symptoms of ETD are fullness, pain in the ears, hearing loss, ringing in the ears and dizziness. Itching was not reported as a symptom of Eustachian tube catarrh in other studies.<sup>14</sup> The possible cause of itching is the mild stretching and retraction of the tympanic membrane due to negative pressure in the middle ear following prolonged Eustachian tube block.

The group consisted of 15 (30%) men and 35 (70%) women with a mean age group of 36.98 + 11.67 (mean + standard deviation). The majority of the patients were of 45 years and above. Gastroesophageal reflux is more common in an older age group. It has been documented that there is an increased incidence in reflux and esophageal contact time in adults older than 50 years. This is likely due to combination of increased incidence of hiatus hernia, diminished peristaltic amplitudes and reduced salivary response to esophageal acid contact.<sup>15</sup>

The most common presenting symptoms of GERD are heartburn and regurgitation. This pattern is often referred as typical GERD. Patients with extraesophageal manifestations often do not complain of the classical symptoms.<sup>16</sup>

In our study of patients with Eustachian tube catarrh (without local cause, e.g. upper respiratory tract infection, allergy), 78% had to or more typical symptoms of GERD. The remaining (22%) did not have any of the typical symptoms.

Hoarseness is caused by GERD in 10% of cases. Chronic laryngitis and persistent cough are associated with reflux in 60% of patients. Gastroesophageal reflux disease is the third leading cause of chronic cough in 20% of the cases. Globus sensation is caused by GERD in 25 to 50% of the cases.<sup>17</sup>

In our study, 32% of patients had two or more symptoms of laryngitis. On indirect laryngoscopy examination, they also had congestion of the arytenoids.

A negative middle ear pressure less than (-100) curve was found in 8% of studied cases. Type C curve was found in 8% > of the cases and tympanic membrane retraction on otoscopic examination more than grade II was found in 10% of the cases. A normal tympanic membrane was seen in 6%, grade I retraction in 57% and grade II retraction in 27% cases. Our study showed that all patients with symptoms of Eustachian tube catarrh had a negative Eustachian tube function test (Williams' test). Major changes in the pressure of the middle ear need not appear in Eustachian tube catarrh; they may be time dependent.

In our study, all the patients of Eustachian tube catarrh with and without symptoms of gastroesophageal reflux were treated with proton pump inhibitors. Patients were followed up at an interval of 4 weeks to a maximum of 3 months. Our study shows that at the end of 4 weeks 52% of the patients had improvement, 20% had no improvement and 28% did not return for follow-up. Response of treatment to proton pump inhibitors was significant ( $Z = 3.53$ ,  $p < 0.05$ ) at the end of 4 weeks.

All patients who did not respond to treatment at the end of 4 weeks were continued on the same treatment for another 4 weeks at the end of which 60% responded, 40% did not respond to the treatment. This group of four patients who did not respond to treatment was again given treatment for another 4 weeks, at the end of which they were all asymptomatic.

At the end of 8 weeks, 64% patients had responded, 8% were symptomatic and 28% had not returned for follow-up.

Bilgen et al<sup>18</sup> studied 36 patients with symptoms suggestive of LPR. In these patients, they compared proton pump inhibitor therapy as a method of diagnosis of LPR with 24 hours double probe pH monitoring.

They concluded that empirical trial of proton pump inhibitors provides reliable information about the relationship between the pharyngeal reflux and the laryngopharyngeal symptoms. The improvement in symptoms in 2 months confirms the presence of this relationship.

In our study also, response to treatment to proton pump inhibitors was highly significant ( $Z = 7.14$ ,  $p < 0.001$ ) at the end of 8 weeks. This supports the hypothesis that Eustachian tube catarrh could be due to LPR. It also suggests that proton pump inhibitors are effective in the treatment of Eustachian tube catarrh (without features of local disease) in higher doses and with regular follow-up.

Further studies on larger population will be required to establish a comparative effect of different proton pump inhibitors on Eustachian tube catarrh.

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