Main Article

# A Study of Laryngopharyngeal Reflux Comparing Clinical Features with Endoscopy: Role of pH-Metry

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**ABSTRACT**

***Introduction***

*Laryngopharyngeal reflux (LPR), now a known clinical entity is due to back flow of gastric contents into the upper aero-digestive tract (UADT). LPR is present in up to 50 % of patients with voice disorders.[1]*

***Materials and Methods***

*A total of 50 patients with symptom complex of voice disorders & chronic cough of unexplained origin were investigated at a tertiary care referral hospital with laryngeal endoscopy and 24 hours ambulatory double probe pH-metry to compare the clinical features before and after the treatment.*

***Results***

*A positive clinical endoscopic finding was seen in 74% whereas 80% showed positive acid reflux affecting the pharynx independently and/ or esophagus. Chronic cough of unknown origin (46 %) was the most predominant presenting symptom & posterior laryngeal erythema was the commonest endoscopic finding.*

***Conclusion***

*Chronic cough, persistent throat clearance and change of voice require to be investigated for LPR. Reflux Symptom Index (RSI) & Reflux Finding Score (RFS) are sensitive indices. 24 hour pH monitoring is a sensitive test for detecting LPR and is helpful to assess pre & post therapy outcomes. Positive pH probe studies help select patients who will respond to therapy and this avoids unnecessary treatment in other patients.*

***Keywords***

*Laryngopharyngeal Reflux (LPR); Double Probe pH-metry; Laryngeal Endoscopy*

Laryngopharyngeal reflux (LPR), also known as supra-oesophageal reflux, extra-esophageal pharyngeal reflux disease & atypical reflux laryngitis, is now the most prevalent upper gastrointestinal (GI) & otolaryngological condition in clinical practice. A position statement of the Committee on Speech, Voice and Swallowing Disorders of the American Academy of Otolaryngology-Head and Neck Surgery outlines its symptoms, clinical manifestations, diagnosis & treatment and adopted the name "LPR" in 2002.[2]

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The symptoms of LPR include hoarseness, sore throat, throat irritation, difficult swallowing, chronic cough, globus pharyngeus, throat clearing, choking and difficulty in breathing.[3,4] In patients with gastro esophageal reflux disease (GERD) the main symptom is heart burn. Since the patients with LPR do not have the symptom of heart burn, gastric acidity is not considered either by the patient or their physician as the primary cause of their symptoms. LPR is related to but distinct from GERD.[5, 6, 7]

Gastric reflux occurs in 7% of the population on daily basis and 25% on monthly basis. GERD occurs in supine position & obese patients are at a higher risk of developing

it & have increased severity of symptoms.[8] LPR unlike GERD can also occur in non-obese patients & even in erect position. The reason for low incidence of heart burn in patients with LPR is that the laryngeal epithelium is more sensitive to gastric reflux than distal esophagus & therefore small amounts of reflux are capable of causing damage to the laryngeal mucosa while sparing esophageal mucosa & hence the symptom of heart burn may be absent. Touhil and Kulin have clearly mentioned the role of refluxed acid in the pathogenesis of laryngeal disorders.[9] The esophageal acid clearance mechanism also helps in the defense against the development of reflux esophagitis. Acid clearance normally occurs in two sequential steps. One or two peristaltic movements empty virtually all acid volume from the esophagus, leaving a minimal residual volume that sustains a low pH and then the residual acid is neutralized by swallowed saliva. The bicarbonate present in saliva has the ability to neutralize acid.[10] The symptoms of LPR can also occur via vagally mediated reflexes. However, esophageal dysmotility is an important cofactor in the extra-esophageal manifestations of GERD.[11]

The posterior glottis has the maximum impact of damage due to acid reflux. What leads to the initial inflammatory response is complex to imagine but the presence of pepsin in the reflux leads to worsening of the condition and the causation of symptoms & signs.[12, 13, 14] Another study by Galli et al suggested the role of bile reflux in the symptomatology & causation of LPR.[15]

The pathophysiology of GERD & LPR differs. The food from the oesophagus mixes with the acidic gastric juice in the stomach. Due to the relaxation of lower oesophageal sphincter (LES), some of this, gets intermittently leaked into the lower oesophagus. This episode termed as gastro esophageal reflux occasionally becomes pathological and constitutes GERD. The transient relaxation of LES up to 10-15 times a day for few seconds is normal, which increases the pH of lower oesophagus for short times and is physiological. However, whenever this gastric content crosses the Upper Esophageal Sphincter (UES) on to the unprotected laryngeal mucosa it causes damage & even a single episode of pH fall in the pharyngeal area is considered diagnostic of LPR. The detailed pathophysiology of LPR has been well described by Datta K et al.[16] Continuous pH monitoring studies are felt to be gold standards for study of LPR using probes that sense pH changes placed at different locations in the oesophagus & pharynx.[17] The general practitioners treat these patients empirically and symptomatically with antibiotics and supportive treatment for sore throat, allergic pharyngitis & pain throat, which may actually aggravate the condition due to use of antibiotics which cause gastritis. In these patients the only manifestations of reflux are upon the larynx. In GERD only LES is faulty while in LPR, UES is also malfunctioning.

Zerbib & Stoll have outlined diagnosis and treatment of LPR.[18] The diagnostic workup includes careful history, meticulous physical examination, nasopharyngo-laryngoscopy, upper GI endoscopy, radionucleide scanning and pH monitoring tests. Dual probes are used, with one probe 2.5 cm below the upper oesophageal sphincter & one 2.5 cm above the upper oesophageal sphincter to detect reflux in laryngopharynx. Awareness & importance of LPR can be gauged by the suggestion that up to 50% of all patients suffering from hoarseness and voice disorders may have significant LPR. The stress and strain of life, dietary irregularities and life styles may have made individuals more prone to this relatively new disorder and hence it was felt that a clinical study comparing clinical features with endoscopic studies & the role of ph metry before & after treatment would be noteworthy.

## Materials and Methods

The study was carried out in a tertiary care referral hospital ENT centre for two years wherein a total of fifty patients with preset inclusion criteria were included in the study.

**A. Inclusion criteria:**

The patients with following symptoms of unknown cause i.e. persistent hoarseness of voice, chronic cough without URI or allergy, use of anti-hypertensives, feeling of obstruction in throat, laryngospasm /choking, chronic throat clearing,

difficulty in swallowing, post nasal drip without any nasal pathology/allergy, halitosis & frequent sore throat were included.

The Belafasky Reflux Symptom Index (RSI) (Table I)[19] based on a questionnaire listing various symptoms ranked from 0 (no problem) to 5 (severe problem) in the past month affecting the patient was considered to label the clinical scoring. **An index score of more than 10 was considered positive for LPRD**.

**Table I: The Reflux Symptom Index (RSI)**

| FINDING | | | | | | |
|---|---|---|---|---|---|---|
| **Within the last Month, how did the following problems affect you?** | **0 = no problem 5 = severe problem** | | | | | |
| **1. Hoarseness or a problem with your voice** | **0** | **1** | **2** | **3** | **4** | **5** |
| **2. Clearing your throat** | **0** | **1** | **2** | **3** | **4** | **5** |
| **3. Excess throat mucus or post nasal drip** | **0** | **1** | **2** | **3** | **4** | **5** |
| **4. Difficulty swallowing food, liquid, or pills** | **0** | **1** | **2** | **3** | **4** | **5** |
| **5. Coughing after you ate or lying down** | **0** | **1** | **2** | **3** | **4** | **5** |
| **6. Breathing difficulties or choking episodes** | **0** | **1** | **2** | **3** | **4** | **5** |
| **7. Troublesome or annoying cough** | **0** | **1** | **2** | **3** | **4** | **5** |
| **8. Sensation of something sticking in your throat or a lump in your throat** | **0** | **1** | **2** | **3** | **4** | **5** |
| **9. Heartburn, chest pain, indigestion, or stomach acid coming up** | **0** | **1** | **2** | **3** | **4** | **5** |
| **Total** | | | | | | |

**Table-II : Belafasky Reflux Finding Score (RFS)**

| | | | |
|---|---|---|---|
| **A** | **Erythema** | **Arytenoids only - 2** | **Diffuse - 4** |
| **B** | **Ventricular edema** | **Partial - 2** | **Complete - 4** |
| **C** | **Subglottic edema** | **Absent - 0** | **Present - 2** |
| **D** | **Vocal fold edema** | **Mild - 1**<br>**Moderate - 2** | **Severe - 3**<br>**Polypoidal - 4** |
| **E** | **Diffuse laryngeal edema** | **Mild - 1**<br>**Moderate - 2** | **Severe - 3**<br>**Obstructing - 4** |
| **F** | **Posterior commissure hypertrophy** | **Mild - 1**<br>**Moderate - 2** | **Severe - 3**<br>**Obstructing - 4** |
| **G** | **Granuloma** | **Absent - 0** | **Present - 2** |
| **H** | **Thick endolaryngeal mucous** | **Absent - 0** | **Present - 2** |

B. **Exclusion Criteria**

Children below 14 years, high risk cardiac patients, patient on medication known to alter esophageal motor function or gastric acid secretion, definite upper airway pathology, operated cases of duodenal, gastric & peptic ulcer and their perforations and GERD patients already on anti-reflux therapy & systemic diseases like hypothyroidism were excluded.

C. All patients were subjected to complete ENT exam including 90 degree rigid telescope examination / fiber-optic laryngoscopy & findings were recorded on proforma. Laryngeal findings were documented using Belfaskys Reflux Finding Score (RFS)[20] details as mentioned in Table - II.

D. All patients underwent dual channel ambulatory 24 hours continuous pH monitoring using Gastrograph Mk IV for pH-metry.

E. Patients were administered antireflux treatment for 16-24 weeks. Proton pump inhibitor (PPI) has been the main stay of treatment,[21, 22, 23] different studies using different PPIs. In our study, capsule Omeprazole 20 milligrams was given twice daily one hour before meals, supplemented with proper advice on dietary regulation including avoidance of excessive coffee & aerated drinks and other life style modifications i.e. time of meals, sleep timings and body weight reduction wherever required.[24] Some authors have used liquid alginate suspension in the treatment of LPR.[25, 26] However in our studies; we have not used liquid alginate suspension. Patients were evaluated at 2 weeks, 8 weeks, 16 weeks and 24 weeks intervals when clinical symptoms and signs were again documented. pH-metry was repeated at 24 weeks again.

## Results

The followings observations have been made:-

1. **Age and Sex Distribution**: The ages of fifty patients was ranged from 14 yrs to 72 yrs. 56% were females (n=28) and 44% were males (n=22). Table III.
2. **Symptomatology & Diagnosis** is shown in Table-IV in order of occurrence.
3. **Laryngoscopic findings**: RFS was recorded in all patients, pretreatment and 24 weeks after treatment. The laryngoscopy findings are mentioned in Table V. The average RFS in patients with confirmed LPRD is shown in Table VI. A normal larynx & larynx with features of LPR are depicted in photographs for .The RFS reduced to <7 in 38 patients & 7-10 in 12 cases as compared to to RFS prior to treatment.
4. **Ambulatory 24 Hr pH metry:** Dual probe 24 hr pH monitoring was done in all the patients, some as inpatient & some as outpatient. Even one episode of pH value of less than 4 in proximal pharyngeal probe or pharyngeal and esophageal probes has been considered positive. The observed abnormal reflux in the various LPR diagnostic categories is shown in Table VII.
5. **Number of Reflux Episodes**: The number of reflux episodes of pH less than 4 in 24 hours period in positive cases of abnormal reflux of LPR is depicted as shown in Table VIII. The table IX shows the number of reflex episodes of less than 4 after 24 weeks of treatment.
6. Ten patients though clinically diagnosed, failed to elicit either of the two investigative positivity (endoscopic or pH metry) & were subjected to minimum of 2 weeks of anti reflux treatment. Three patients improved & were continued on treatment. Seven patients were advised to stop treatment and were dropped out of the study. Three patients (6%) who did not show any clinical findings endoscopically showed positive reflux by pH metry and improved symptomatically on anti reflux therapy. These were the patients who had 1- 3 episodes of reflux. This suggests that symptomatology has relationship with number of reflux episodes and appears much before endoscopic manifestations and those symptoms disappear much before endoscopic findings come back to normal as seen by Belafasky et al.[27]

Table III : Age and Sex Distribution

| AGE IN YEARS | NUMBER OF FEMALES | NUMBER OF MALES | TOTAL |
|---|---|---|---|
| 14-20 | 1 | 4 | 5 (10%) |
| 21-30 | 5 | 4 | 9 (18%) |
| 31-40 | 13 | 4 | 17 (34%) |
| 41-50 | 6 | 4 | 10 (20% |
| 51 and above | 4 | 5 | 9 (18%) |
| Total | 29 (58%) | 21 (42%) | 50 |

Table IV : Symptomatology & Diagnosis

| S NO | DIAGNOSIS | | NO OF CASES (%) N = 50 |
|---|---|---|---|
| 1. | Chronic Cough | CC | 14 (28) |
| 2. | Chronic throat clearing | CTC | 12 (24) |
| 3. | Hoarseness/change of voice | CV | 9 (18) |
| 4. | Globus Pharyngeus | GP | 7 (14) |
| 5. | Halitosis | H | 4 (8) |
| 6. | Frequent sore throat | FST | 2 (4) |
| 7. | Laryngospasm/choking | L | 1 (2) |
| 8. | Post Nasal drip | PND | 1 (2) |

Table V : Laryngoscpic Findings

| FINDINGS | | NUMBER OF PATIENTS (%) PRE TREATMENT N = 50 | 24 WEEKS |
|---|---|---|---|
| Erythema of Posterior Larynx | EPL | 22(44%) | 8/22 (36%) |
| Diffuse Laryngeal edema | DLE | 3 (6%) | 1/3 (33%) |
| Posterior Commissure Hypertrophy | PCH | 5 (10%) | 2/5 (40%) |
| Vocal fold edema | VFE | 3 (6%) | 0 |
| Granulations | GR | 3 (6%) | 1/3 (33%) |
| Pseudo sulcus Vocalis | PSV | 1 (2%) | 0 |
| | | 37 (74 %) | 12/33 (36%) |

After treatment the erythema of posterior larynx was the main feature on endoscopy.

**Table VI : Average Reflux Findings score in confirmed LPR**

| TIME | SCORE | | | |
|---|---|---|---|---|
| | < 7 | 7-10 | 11-14 | > 15 |
| Pre-treatment | 13 | 24 | 11 | 02 |
| Post treatment (24 weeks ) | 38 | 12 | - | - |

**Table VII : Diagnostic Categories by abnormal Reflux (Number of patients) abnormal Reflux**

| DIAGNOSIS | NORMAL | ESOPHAGEAL ONLY | PHARYNGEAL & OESOPHAGEAL | PHARYNGEAL ONLY | TOTAL |
|---|---|---|---|---|---|
| Hoarseness of voice | 2 | 1 | 5 | 1 | 9 |
| Chronic cough | 2 | 0 | 9 | 3 | 14 |
| Globus Pharyngeus | 0 | 0 | 3 | 4 | 7 |
| Chronic throat clearing | 2 | 1 | 7 | 2 | 12 |
| Post Nasal drip | 0 | 0 | 1 | 0 | 1 |
| Frequent sore throat | 1 | 0 | 0 | 1 | 2 |
| Halitosis | 1 | 0 | 2 | 1 | 4 |
| Laryngospasm | 0 | 0 | 0 | 1 | 1 |
| Total | 8 | 2 | 27 | 13 | 50 |

**Table VIII : No of Reflux episodes in LPR Episodes in LPR confirmed cases on PH Metry before treatment**

| NO OF EPISODES | NO OF PATIENTS |
|---|---|
| 1 Episode | 9 |
| 1-3 Episodes | 11 |
| 3-5 Episodes | 12 |
| 5 or more Episodes | 8 |

**Table IX : No of Reflux episodes in LPR confirmed cases on PH Metry after 24 weeks of treatment**

| NO OF EPISODES | NO OF PATIENTS |
|---|---|
| 0 Episode | 16 |
| 1 Episode | 18 |
| 1-3 Episodes | 4 |
| 3-5 Episodes | 2 |
| 5 or more Episodes | 0 |

## Discussion

Gastro esophageal reflux into the laryngopharynx contributes significantly to a variety of upper respiratory problems. A good history and laryngeal endoscopy is critical to label the diagnosis of LPR & treat patients

The commonest symptom associated with LPR in our study was chronic cough of unexplained cause (28%). In a retrospective review of 216 patients who had positive probe studies, Fraser and Morton[28] found cough and hoarseness as the most common symptoms. Rival[29] and colleagues found that most frequent complaint was cervical dysphagia (35%) followed by globus (19%) and sore throat (17%).

The symptoms of 225 patients with GERD related conditions, hoarseness was found as 71%, chronic cough 51 %, globus pharyngeus 47 %, chronic throat clearance 42% and difficulty in swallowing 35% as seen by Koufman [30]. They demonstrated that Belafasky RSI score is reliable and valid. A RSI of 10 or more is associated with high likelihood of positive dual channel probe study. In our study only those patients, who on initial interrogation were found to have more than 10 score on RSI were included. Belafasky[20] in another study has proved that the RFS accurately documents treatment efficacy in patients with LPR. It demonstrates excellent inter and intra observer reproducibility. In their study, the RFS at entry was 11.5 (± 5.2 SD). This score improved to 9.3 (± 4.7 SD) at 2 months, 7.3 (± 5.5 SD) at 4 months, and 6.1 (± 5.2 SD) at 6 months of treatment. The mean RFS in our study group was 11.5 at entry which dropped to 6.1 after 06 months of treatment. This confirms with results of other authors like Beaver & Karow.[17]

In our study, 37 patients (74%) showed positive endoscopic findings of which erythema of the posterior larynx was the commonest occurring in 44% patients.

Postma[31] describes a review of patients with extra esophageal reflux (EER) who underwent dual probe pH testing, wherein 59% patients would have been inappropriately assumed to have a negative pH if their diagnosis was based solely on esophageal probe. In a similar study, Koufman[32] showed 11% patients had positive upper probe with normal esophageal pH probe findings. Little et al [33] showed importance of proximal probe in children and noted that 46% of subjects demonstrated positive EER by proximal probe in face of negative lower esophageal probe studies.

In our study, patients with RSI of more than 10 score, 40 (80%) patients had positive pH metry result; 13 patients (32.5%) had positive findings only in proximal probes with normal oesophageal probe and 27(67.5%) had both esophageal and pharyngeal positive result. In our series, 37 patients (74%) with RSI of more than 10 who were evaluated by pH monitoring were found to have LPR findings suggestive on endoscopy as well. In 30 patients the number of reflux episodes reduced following 24 weeks of treatment indicating a good response. Hanson et al[34] state a false negative rate of up to 50% because of small variation in probe placement. Other studies have documented that small percentage of normal subjects have proximal pH probes drops below 4. Contensin et al[35] have stated that pH drops below 4 may be too stringent in children. They have shown that pH drops of 6 are also significant in children. This is because pepsin which is critical in pathogenesis of tissue damage is active at pH levels up to 5.

Three patients who did not show any clinical findings endoscopically, showed positive reflux acidity by pH metry and improved symptomatically on anti reflux therapy. These were the patients who had 1- 3 episodes of reflux. One patient aged 14 presented with complaints of globus pharyngeus and frequent sore throat & this patient was confirmed to have LPR on pH monitoring. The patient was put on proton pump inhibitors and there was significant relief of symptoms.

Gastro esophageal reflux contributes to a variety of upper respiratory problems in children.[36] It has been suggested that GERD plays a major role in development of subglottic stenosis in paediatric age group, recurrent croup, apnoea, chronic cough, voice changes and hoarseness and probably sudden infant death syndrome. It is an important cofactor in laryngomalacia.

## Conclusion

Chronic cough, persistent throat clearance and change of voice should be investigated for LPR to institute proper treatment. Reflux Symptom Index (RSI) & Reflux Finding Score (RFS) are reliable sensitive indices in our study. 24 Hour pH monitoring is a sensitive test in detecting LPR and is helpful to assess pre & post therapy response. Positive pH probe studies help select patients who will respond to therapy and avoid unnecessary treatment in other patients. A clinical protocol needs to be formulated and meticulously followed similarly in ENT centers for valuable record.[37] Symptomatology has relationship with number of reflux episodes. More the number of episodes of low pH, more severe are the symptoms. Symptoms of LPR may appear before endoscopic manifestations and get relieved much before endoscopic findings have disappeared after treatment. A stress on dietary regulations, reduction of body weight, regular exercise & avoidance of aerated drinks & coffee has helped the patients to avoid recurrence of symptoms. Twelve weeks of anti-reflux treatment is sufficient to improve the symptoms. However 24 weeks of treatment is required for symptoms to disappear completely. Occasionally patients with recurrence of symptoms require further medication.

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