



Video Stroboscopic Features of Laryngopharyngeal Reflux in Patients with and Without Hoarseness of Voice – A Comparative Prospective Study

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Abstract

Background: Reflux of acid in the larynx in patients presents with hoarseness of voice, globus sensation and frequent throat clearing. This has now been a separate clinical entity in present scenario. Use of videostroboscopy helps to detect problem earlier to avoid complications and for betterment of treatment. **Aim:** To evaluate efficacy of videostroboscopy in LPR patients To study the parameters of videostroboscopy for same. **Objectives:** To emphasize on LPR with and without hoarseness patients Compare findings of both. To plan appropriate treatment and sequential follow up using stroboscopy in both groups. **Methods:** This is a prospective comparative study. 157 patients who came to ENT OPD with LPR were taken into study. Patients who comply with inclusion and exclusion criteria included. LPR symptoms assessed using Reflux symptom index (RSI) included in study. RSI > or equal to 13 were taken into study and divided into 2 groups based on with hoarseness and without hoarseness of voice. Stroboscopy done for both groups and its parameters were analysed and compared. **Results:** Videostroboscopic comparison with above mentioned parameters done for both the groups by chi square test. P value statistically not significant on comparing findings in both groups and also findings observed in LPR with hoarseness of voice were present in LPR without hoarseness of voice. **Conclusion:** Videostroboscopy helps in early diagnosis of LPR. It helps in preventing LPR complications in larynx Increases quality of life after treatment by improving phonation. Videostroboscopy serves as better diagnostic and prognostic tool.

Keywords: laryngopharyngeal reflux (LPR), Reflux symptom index score (RSI), Videostroboscopy

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Introduction

Laryngopharyngeal Reflux (LPR) is defined as the backflow of stomach contents into the laryngopharynx described by the American Academy of Otolaryngology Head and Neck Surgery in 2002.^[1] This is relatively a new entity, the interest for which has grown during the past 10-15 years. LPR is the most common condition seen in present day ENT practice.^[2] The true prevalence of LPR is not known due to the lack of agreement as how to diagnose LPR and its different methodologies used by the investigators.^[3] The symptoms of LPR were seen in 49% of the normal community as reported by Connor et al^[4] Heart burn and regurgitation are the most prevalent symptoms of GERD, although they are uncommon in LPR. LPR also differs from conventional gastroesophageal reflux disease (GERD) in many other aspects, including its clinical appearance.^[5]

Lower esophageal sphincter pressure loss causes GERD, but in LPR patients, the lower esophageal sphincter is normal but the upper esophageal sphincter is incompetent.^[1,5] Reflux Symptom Index (RSI) and Reflux Finding Score (RFS), which were first described by Peter C. Belafsky, are used to diagnose LPR.

The development of videostroboscopy made it simple for ENT doctors in a clinical setting to diagnose LPR and carry forward with its therapy. Videostroboscopy is an accurate method for identifying subtle mucosal and functional diseases of the larynx. It is particularly useful for recording oscillatory and mucosal wave features of vocal cord movements and for simulating slow-motion vibration.^[6] LPR prevalence is rising predominantly in our nation, probably as a result of dietary changes, stress, and lifestyle changes.

Inclusion Criteria

Age between 18-65 years

Patients diagnosed to have LPR based on clinical symptoms (using reflux symptom index).

RSI >13 or equal to 13 taken into study.

Exclusion Criteria

Professional voice users

History of Voice abuse

Past laryngopharyngeal injuries

Uncontrolled endocrine

Metabolic problems and biological and/or neurological diseases affecting the larynx, laryngopharynx or oesophagus.

Methods

The study was carried out in the department of otorhinolaryngology in SRM Medical College Hospital and Research Centre, kattankulathur during the period of 2021 to 2022. Patients who comply with the inclusion and exclusion criteria were included in this study. Patients who came with LPR symptoms are assessed using Reflux symptom index (TABLE 1) included in this study. Reflux symptom index (RSI) scores > or equal to 13 taken into study and divided into 2 groups based on with and without hoarseness of voice. All patients included in this study were categorized into 2 groups: 1-LPR with hoarseness of voice (with persistent h/o voice change > 3 weeks), 2-LPR without hoarseness of voice.

Endolaryngeal examination done for all the patients. All patients in both the groups were given treatment as per TABLE 3 and 4. Ethical clearance obtained.

Table 1: RSI Scores







Hoarseness or problem with your voice	0-5
Clearing your throat	0-5
Excess throat mucous or postnasal drip	0-5

Difficulty swallowing food, liquids or pills	0-5
Coughing after you have eaten or after lying down	0-5
Breathing difficulties or choking episodes	0-5
Troublesome or annoying cough	0-5
Sensations of something sticking in your throat	0-5
Heartburn, chestpain, indigestion or stomach acid coming up	0-5

Videostroboscopy done for both groups and results calculated (table 2)

Table 2: Stroboscopy Research Instrument

Stroboscopy Research Instrument

Symmetry Symmetry of mucosal displacement	Symmetry	Normal	Mild	Moderate	Severe
Amplitude Horizontal excursion away from mid-line	Amplitude	Normal	Mild	Moderate	Severe
	Patient's Right				
	Patient's Left				
Periodicity Temporal regularity of vibratory cycles	Periodicity	Normal	Mild	Moderate	Severe
	Patient's Right				
	Patient's Left				
Non-Vibratory segments Mucosal segments that do not participate in vibratory activity	Non-Vibratory Segments <i>Check all that apply</i>	None	Anterior 1/3	Middle 1/3	Posterior 1/3
	Patient's Right				
	Patient's Left				
Duration of Closure Duration of mucosal contact during vocal fold vibration	Duration of Closure	Predominately Closed	1/3 Closed, 2/3 Open	Predominately Open	Always Open
Closure Predominant mucosal closure pattern	Closure <i>Choose one closure</i>	Present	<i>If present, please choose:</i>		
	Hourglass 		Mild	Moderate	Severe
	Spindle 				
	Posterior Glottic Chink 				
	Anterior Glottic Chink 				
	Complete Closure 				
	Complete Nonclosure 				

_____ Check if you viewed this case in slow-motion.

Table 3: Grading of LPR

Grade	RSI
Grade 1 (Mild)	<15
Grade 2 (Moderate)	15-29
Grade 3 (Severe)	30-45

Table 4. Proposed Treatment Regimen for LPR

Grade	Proposed Treatment
Grade 1 (Mild)	Only diet and lifestyle changes (Appendix IX)
Grade 2 (Moderate)	Diet and Lifestyle changes + Proton Pump Inhibitors Esomeprazole 20mg twice daily
Grade 3 (Severe)	Diet and Lifestyle changes + Proton Pump Inhibitors. Esomeprazole 40mg twice daily + Prokinetics Domperidone 30mg once daily

Assessment: Patients followed up at 1st and 3rd month with sequential videostroboscopic assessment were documented and analysed.

Statistical Analysis: To compare the data, chi-square test used. A value of $p < 0.005$ considered to be statistically significant. Statistics done using SPSS software.

Results

157 patients taken into study, patients in the age group of 16-65 years, Group 1- 84 patients and Group 2- 73 patients. Demographic characteristics and age distribution calculated in both groups. Videostroboscopy parameters – symmetry, amplitude, periodicity, non-vibratory segments, duration of closure and closure pattern were assessed in both groups during baseline, 1st month and 3rd month follow up.

Demographic Characteristics

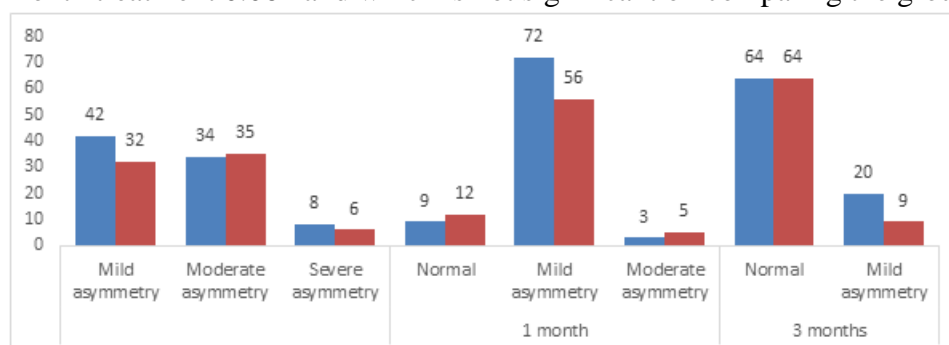
Among the 157 patients included in this study, female patients made up to 45.9% (72) and male patients made up to 54.1% (85).

Age Distribution

In this study, the minimum age of the patient is 18 and maximum age is 60. LPR WITH HOARSENESS AND WITHOUT HOARSENESS were up to 7.1% and 9.6% below 20 years, 23.8% and 15.1% between the ages 21-30 years, 19% and 19.2% between the ages 31-40 years, 25% and 31.5% between the ages 41-50 years, 23.8% and 23.3% between the ages 51-60 years and 1.2% and 1.4% were above 60 years. Mean age at presentation in LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS is 40.15 and 40.66, which is same in both groups. On comparing both the groups, P value is 0.792 which is not significant.

Comparison of Symmetry

In this study, LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS during the first visit, mild asymmetry was 50% and 43.8% moderate asymmetry was 40.5% and 47.9% and severe asymmetry was 9.5% and 8.2%. After treatment, 1st month follow up in group 1 and group 2 was normal in 10.7% and 16.4%, mild asymmetry present in 85.7% and 76.7%, moderate asymmetry present in 3.6% and 6.8% and there was no severe asymmetry found. In the 3rd month follow up in group 1 and group 2, normal symmetry present in 76.2% and 87.7% asymmetry, which showed significant improvement in the treatment in both groups, mild asymmetry in 23.8% and 12.3% and there were no moderate and severe asymmetry. P value was 0.642 in the baseline (during 1st visit), after 1 month treatment 0.338 and after 3rd month treatment 0.064 and which is not significant on comparing the groups (FIGURE 1)



- LPR Without Hoarseness
- LPR With Hoarseness

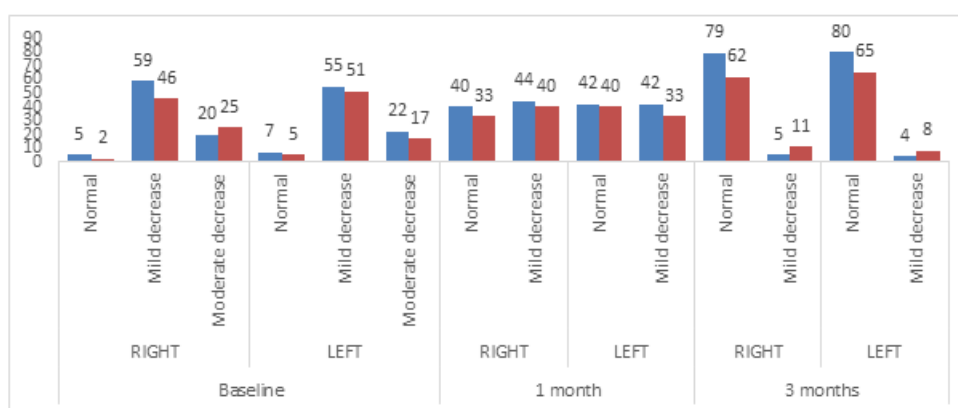
Figure 1

Comparison Of Amplitude

In this study, LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS, it was normal amplitude in 6% and 2.7%, mild decrease in amplitude in 70% and 63%, moderate

decrease in amplitude in 23.8% and 34.2% in right side, left side it was 8.3% and 6.8% normal, mild decrease in amplitude in 65.5% and 69.9%, moderate decrease in amplitude in 26.2% and

23.3% in both the groups during 1st visit. After a month treatment follow up, amplitude normal in 47.6% and 45.2%, mild decrease in amplitude 52.4% and 54.8% in right side, in the left side, it was normal in 50% and 54.8%, mild decrease in amplitude in 50% and 45.2%. In the 3rd month follow up right side it was normal in 94% and 84.9%, mild decrease in amplitude in 6% and 15.1% and in the left side it was normal in 95.2% and 89%, mild decrease in amplitude in 4.8% and 11% in both groups. On comparing the groups, p value is 0.260 in right side and 0.837 in left side during 1st visit, 1 month follow up p value is right-0.762 and left-0.549 and 3rd month follow up right-0.060 and left-0.145. There was a significant improvement in the treatment on both groups. On comparing the groups, it is not statistically significant. Baseline, 1st month and 3rd month follow up comparison within the groups not found to be significant. (FIGURE 2)

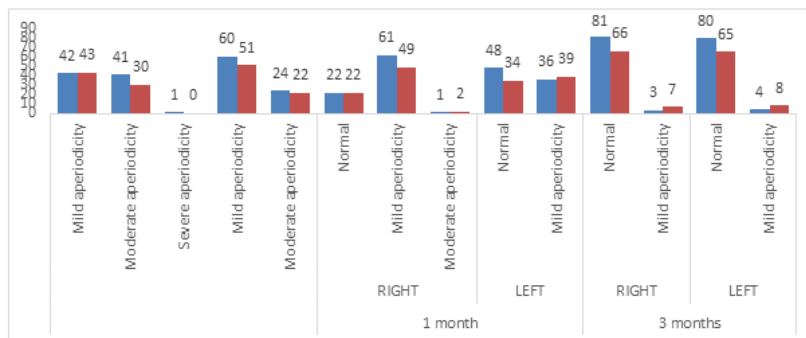


- LPR Without Hoarseness
- LPR With Hoarseness

Figure 2

Comparison Of Periodicity

In this study, in LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS, mild aperiodicity present in 58.9% and 50%, moderate aperiodicity in 41.1% and 48.8%, severe aperiodicity in 0 and 1.2% in the right side. In the left side, mild aperiodicity in 69.9% and 71.4%, moderate aperiodicity in 30.1% and 28.6%. After 1st month follow up, normal periodicity seen in 30.1% and 26.2%, mild aperiodicity in 67.1% and 72.6%, moderate aperiodicity in 2.7% and 1.2% in the right side. In the left side, normal periodicity seen in 46.6% and 57.1%, mild aperiodicity in 53.4% and 42.9%. After 3rd month follow up, right side normal periodicity seen in 90.4% and 96.4% and mild aperiodicity in 9.6% and 3.6%. in the left side, normal periodicity present in 89% and 95.2%, mild aperiodicity in 11% and 4.8%. P value on comparing the groups, during 1st visit right-0.376 left-0.830, 1st month follow up right-0.645 left-0.186 and 3rd month follow up right-0.123 and left-0.144 which did not show significant results. (FIGURE 3)

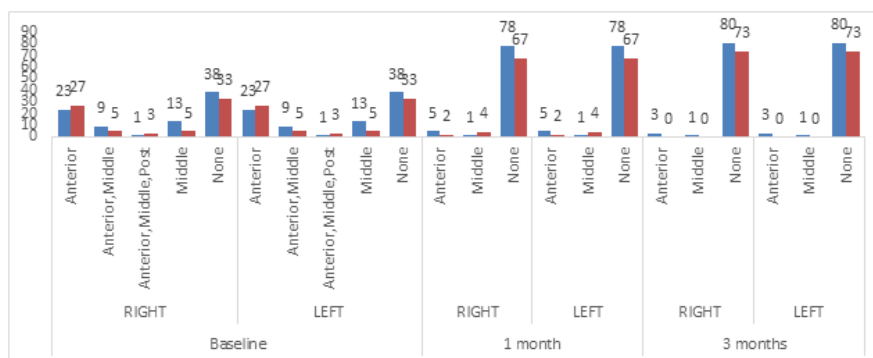


- LPR Without Hoarseness
- LPR With Hoarseness

Figure 3

Comparison Of Non-Vibratory Segment

In this study, LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS, during 1st visit non vibrating segment of vocal cord, anterior was 27.4% and 37%, anterior and middle was 10.7% and 6.8%, anterior, middle and posterior was 1.2% and 4.1%, middle in 15.5% and 6.8% and normal in 45.2% on both groups in the right side. In the left side, non-vibrating segment of vocal cord, anterior 27.4% and 37%, anterior and middle in 10.7% and 6.8%, anterior, middle and posterior in 1.2% and 4.1% and normal in 45.2% in both the groups. After 1st month follow up, non-vibrating segment of vocal cord in anterior was 6% and 2.7%, middle was 1.2% and 5.5% and normal in 92.9% and 91.8% in the right side. In the left side, non-vibrating segment of vocal cord, anterior was 6% and 2.7%, middle was 1.2% and 5.5%, normal in 92.9% and 91.8%. after 3rd month follow up, non-vibrating segment of vocal cord in the right side, anterior was 3.6% and 0, middle was 1.2% and 0 and normal in 95.2% and 100%. In the left side, anterior 3.6% and 0, middle was 1.2% and 0 and normal in 95.2% and 100%. On comparing groups, p value in 0.229 on both sides in the 1st visit, 0.205 on both sides in the 1st month follow up and 0.168 on both sides in the 3rd month follow up which did not show significant value but showed improvement in the treatment in both groups.(FIGURE 4)



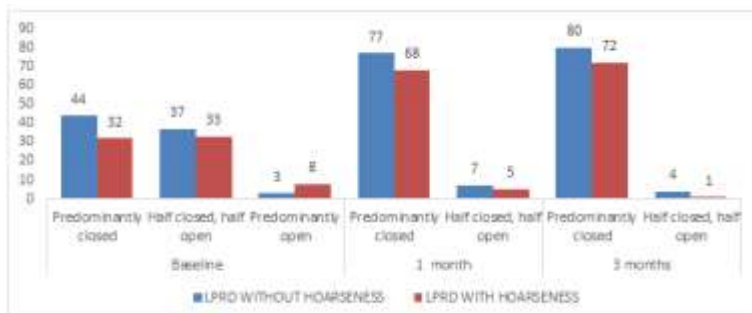
- LPR Without Hoarseness
- LPR With Hoarseness

Figure 4

Comparison of Duration of Closure

In this study, LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS, during 1st visit, vocal cord was predominantly closed in 52.4% and 43.8%, half closed and half open in 44% and 45.2%, predominantly open in 3.6% and 11%. after 1st month follow up,

predominantly closed in 91.7% and 93.2%, half closed and half open in 8.3% and 0%. After 3rd month follow up, predominantly closed in 95.2% and 98.6%, half closed and half open in 4.8% and 1%. P value in 1st visit on comparing the groups is 0.162, 1st month follow up is 0.727 and 3rd month follow up is 0.376 which did not signify on comparing but showed improvement in the treatment on both groups.(FIGURE 5)

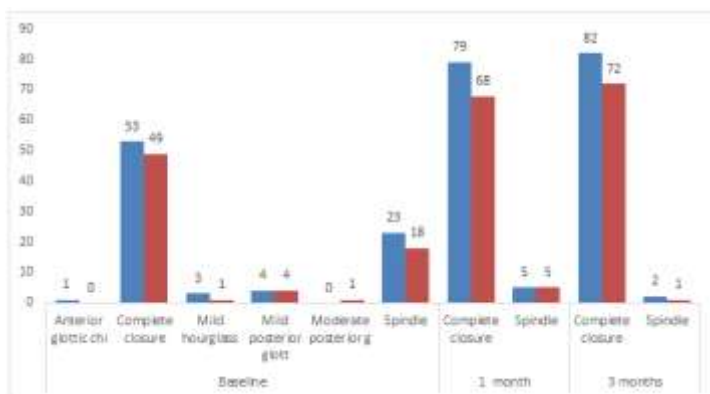


- LPR Without Hoarseness
- LPR With Hoarseness

Figure 5

Comparison of Closure Pattern

In this study, LPR WITH HOARSENESS AND LPR WITHOUT HOARSENESS, closure pattern observed was anterior glottic chink was 1.2% and 0, complete closure in 63.1% and 67.1%, mild hourglass in 3.6% and 1% and moderate posterior glottic chink in 0 and 1.4% and spindle shaped in 27.4% and 24.7% during the 1st visit. After 1st month follow up, complete closure seen in 94% and 93.2% and spindle shaped in 2.4% and 1.4%. after 3rd month follow up complete closure seen in 97.6% and 98.6% and spindle shaped in 2.4% and 1.4%. (FIGURE 6)



- Lpr Without Hoarseness
- Lpr With Hoarseness

Figure 6

Discussion

Backflow of gastric contents into laryngopharynx, where they come into contact with tissues of upper aerodigestive tract, is known as laryngopharyngeal reflux (LPR) [1]. Number of studies cited in the literature claim that hoarseness, frequent throat cleaning, and a feeling of a foreign body are the most typical LPR symptoms [7,8,9]. The most prevalent LPR symptoms, according to a global survey of American Bronchoesophagological Association members, were hoarseness (95%), globus pharyngeus (95%), persistent cough (97%), and throat

clearing (98%)^[10]. Posterior supraglottic edema, posterior supraglottis erythema and vocal cord edema are three most common findings on initial stroboscopic examination. Raghunandhan et al in their study also reported same common findings in their stroboscopic examination^[11]. Findings such as erythema of vocal folds, polyp, nodule, leukoplakia and granuloma were also observed to a lesser extent. According to studies by Ulualp et al., severe cases of chronic acid reflux include granulation tissue formation, increased interarytenoid or posterior glottic inflammation and erythema, and hypertrophy of the posterior commissure (cobblestoning/interarytenoid banding) and Videostroboscopy serves as the best method for diagnosing these symptoms^[7].

The clinician receives objective data through the use of videostroboscopy to assess vocal fold diseases, which can then be further investigated to plan further care. In videostroboscopy amplitude, symmetry, periodicity, non-vibratory segments, closure pattern and duration of closure were used and compared within the groups. In this study, there were no statistical differences in symmetry, amplitude, periodicity, non-vibratory segments, closure pattern and duration of closure between 2 groups of patients.

Our study also correlates with the above study in both groups. Rizka Fathoni Perdana et al compared the LPR in the occupational group with the highest number of patients is unemployed and it was dominated by the female patients^[12]. In a trial patients with LPR had the mean age of 49 years, and 53% (31 of 58) were women showing no risk difference according to gender^[14]. Gender distribution in our study is male predominance ratio of 54.1% (85) while female is 45.9% (72). Few other studies have found LPR prevalence to be higher in female.^[15] The variations may be the result of various investigators using various diagnostic tools and methodologies. These differences in incidence and prevalence may be due to lifestyle changes in patients.

Perdana et al reported that the age range 30-59 had a percentage of up to 67%, indicating that middle age dominated LPR and this age range is one that is productive and also Stress is thought to play a part in the high number^[12]. Kamani T in their study showed the age distribution to LPR incidence was calculated in a English population in UK and which found to be higher in certain age groups and their test was significant at the 4th and 5th decades when compared with 2nd, 3rd and 6th decades^[13]. But our study has higher LPR incidence in 2nd, 3rd, 4th and 5th decade of life which may be related to lifestyle changes.

On comparing amplitude, symmetry, periodicity, non-vibrating segment, closure pattern and duration of closure during 1st visit, 1 month and 3rd month follow up P value does not seem to be significant statistically in our study, which is seem to same in both the groups in the treatment progress also. In this study, both the groups in the first visit, mild asymmetry was 50% and 43.8% moderate asymmetry was 40.5% and 47.9% and severe asymmetry was 9.5% and 8.2%. After treatment, 1st month follow up in group 1 and group 2 was normal in 10.7% and 16.4%, mild asymmetry present in 85.7% and 76.7%, moderate asymmetry present in 3.6% and 6.8% and there was no severe asymmetry found. In the 3rd month follow up in group 1 and group 2, normal symmetrical pattern present in 76.2% and 87.7%, which showed significant improvement in the treatment in both groups, mild asymmetry seen in 23.8% and 12.3%. Upadhyay et al in their study observed that there was still asymmetry presence in 8% of patients after treatment^[7]. Asymmetry may be due to vocal cord thickening and edema. But majority of the patients improved after the treatment.

Closure pattern includes hourglass, spindle, posterior glottic chink, anterior glottic chink, complete closure and complete non closure. Upadhyay et al in their study observed, that there was still a incomplete closure pattern in 12% patients. 88% patients showed complete closure after treatment which was also statistically significant in their study^[7]. In our study, complete closure seen in 97.6%(82) and 98.6%(72) and spindle shaped in 2.4%(2) and 1.4%(1).

Khurshid H et al reported a 4 weeks trial of proton-pump inhibitors can be easily used to confirm the clinical suspicion of LPR, however, a follow up period of up to 3 months is often required, as a significant proportion of LPR patients achieve complete symptom control after the initial 4 weeks trial period^[16]. In our study also, we prescribed PPI based on the treatment algorithm and most of our patients responded to treatment in both groups. This study also signifies, we were able to see the findings of LPR with hoarseness in LPR without hoarseness. Our patients received the treatment according to the algorithm discussed above (TABLE 3 and 4). Patients with LPR respond better to proton pump inhibitors (PPI) in healing rate. H2-blockers are frequently useful in treating GERD patients for turning the acid down but this is insufficient for many individuals with LPR. Since the larynx is significantly more vulnerable to damage from acid reflux than the oesophagus is, the acid needs to be essentially “turned off”. The protective mechanism and barrier that the esophageal mucosa must stop damage from exposure to acid and pepsin are absent from the laryngeal mucosa. This includes the inability to buffer acid, the absence of normal peristalsis to clear the refluxate, and the existence of a thinner, more vulnerable, more sensitive mucosal lining in the larynx^[17]. Hence videostroboscopy allows for a more thorough evaluation of vocal fold function and a more precise diagnosis and also in treatment progression in our study.

Conclusion

In this current study, vivid pictures of videostroboscopic changes could be identified. Using the device, early lesion could be picked up and intervened. Based on which, sequential follow up and treatment can be given in early stages. Hence videostroboscopy serves as a sensitive predictor and a good prognostic tool.

Authors have no conflicts of interest.

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ABBREVIATIONS

LPR – LARYNGOPHARYNGEAL REFLUX

RSI – REFLUX SYMPTOM INDEX

GERD – GASTROESOPHAGEAL REFLUX DISEASE

PPI – PROTON PUMP INHIBITORS