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Challenges in Diagnosing Silent Gastroesophageal Reflux in Chronic Laryngitis Patients: Role of pH Monitoring

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Abstract

Silent gastroesophageal reflux (GER) is increasingly recognized as an elusive contributor to chronic laryngitis, yet remains underdiagnosed in the absence of classic reflux symptoms. We conducted a prospective cross-sectional study in 120 adults (mean age 45 ± 12 years; 50 % female) presenting with persistent hoarseness, throat clearing, or cough for ≥3 months but without heartburn or regurgitation. Participants completed the Reflux Symptom Index and underwent flexible laryngoscopy scored via the Reflux Finding Score, followed by 24-hour dual-channel pH monitoring at the distal esophagus and hypopharynx; a subset of 50 patients also received multichannel intraluminal impedance-pH monitoring. Pathological distal acid exposure (defined as ≥4 % time pH <4) was detected in 58.3 % of patients, and 40 % demonstrated symptom association probability > 95 %. Distal and hypopharyngeal acid exposures correlated strongly with symptom and laryngeal findings (Pearson r = 0.60–0.65), and multivariate logistic regression identified elevated symptom scores (OR 1.10–1.15) and acid exposure metrics (OR 1.20–1.25; all $p < 0.001$) as independent predictors of pathological reflux. Impedance-pH monitoring revealed that 42 % of reflux events were weakly acidic or non-acidic, paralleling the finding that only 60 % of patients achieved complete symptom relief with empirical proton pump inhibitor therapy. These data underscore the incremental diagnostic and therapeutic value of ambulatory pH-based assessments in patients with refractory laryngeal symptoms, supporting the integration of objective reflux quantification into otolaryngology workflows. Future work should refine normative thresholds for laryngopharyngeal monitoring, validate tolerable wireless technologies, and assess the impact of pH-guided interventions on long-term voice outcomes and healthcare utilization.

Keywords: “Silent Gastroesophageal Reflux”, “Chronic Laryngitis”, “pH Monitoring”, “Laryngopharyngeal Reflux”, “Impedance-pH”, “Proton Pump Inhibitors”.

INTRODUCTION

Diagnosis of chronic laryngitis is complicated by the disease's many root causes and because it can mimic signs of other upper respiratory and gastrointestinal diseases (Zhang et al., 2021). Laryngopharyngeal reflux, a common occurrence in gastroesophageal reflux disease and a mostly unnoticed symptom, usually leads to delayed or unsuitable treatment choices (Thejas et al., 2021). Gastroesophageal reflux disease is commonly diagnosed in many countries and affects the digestive tract with symptoms that can range from moderate heartburn to by severe cases like laryngitis and acid reflux, writes Velagala et al. The fact that some chronic laryngitis patients do not experience symptoms of acid reflux makes diagnosis much more difficult (Kasugai & Ogasawara, 2023). The absence of standard symptoms with reflux means clinicians must use detailed investigations to detect abnormal acid in the esophagus.

The way GERD works is not only about refluxate acidity; other components and characteristics in the esophagus play a role, too (Sharma & Yadlapati, 2020). Many people with GERD experience symptoms in the mouth or airway or as gastric stomach regurgitation in the esophagus and beyond (Mari et al., 2023). The combination of irritants, using your voice too much and infections may make it difficult to diagnose laryngitis separately from reflux. The reflux of stomach contents can damage the protective lining of the esophagus and lead to mild or severe injuries and inflammation. For this reason, finding out if a patient has silent reflux requires a careful medical history, an examination and objective tests. After being diagnosed correctly, pets will often need changes in their food, sleeping areas and might have to quit smoking, according to Newberry & Lynch (2021).

To detect and measure esophageal acid exposure, most experts agree that a 24-hour monitor of the acidity of esophageal fluids is the main method (Bucan et al., 2025). If there are unusual or no symptoms, esophageal pH monitoring is important to measure and detect acid reflux events that help diagnose GERD. With this tool, we now have a way to assess how often and for how long reflux occurs which may link it to laryngeal inflammation. GERD symptoms are broad and often look much the same as conditions like heartburn, so other tools may be needed to accurately diagnose it. In addition, measuring pH can help tell apart acid reflux from non-acid reflux, especially in people who still get symptoms after taking acid-control drugs. According to recent academic reviews on GERD, the disease is present worldwide in approximately 14.8% of people, meaning correct diagnosis is essential due to its wide influence (Bucan et al., 2025). In clinical and research settings, GERD is best diagnosed using reflux tests that

provide real numbers and track reflux with what patients say they feel. At the same time, the method of filming can demonstrate how frequently reflux happens (Fashner, 2020).

The purpose of this work is to explain how monitoring pH can address the challenges in finding silent reflux in people with recurring laryngitis. The trouble in finding out about silent reflux shows that relying on both a doctor's skill and new technology helps give patients the best results. Information from pH monitoring helps explain how a patient is ill and directs the right therapy to improve their results. Because GERD can be linked to Barrett's esophagus and adenocarcinoma, it's important to be certain about the diagnosis. GERD also affects lots of people who do not respond well to medicines that block acid production. Because of this, flexible endoscopy may play a role in treatment for patients by helping protect the esophagus lining (Bonavina, 2020). It matters a lot because it ties what happens in therapy to the outcomes of the tests. Instead of depending on simple therapy, more personalized care may be planned using invasive procedures such as those recommended by objective tests including pH monitoring (Savarino et al., 2021).

Diagnosing chronic laryngitis is hard because its symptoms can be similar to those of various diseases that also affect the upper aerodigestive tract (Tanvir et al., 2024). Many factors such as vocal abuse, environmental triggers, allergic rhinitis, postnasal drip and viral illnesses, can lead to laryngeal inflammation and make reflux-related symptoms worse. Because of these conflicting symptoms, doctors have to take extra care when diagnosing the primary reason for repeated laryngitis. In the absence of common GERD symptoms, doctors turn to tests and their own judgment to look for unusual acid damage in the esophagus.

Besides, because patients with chronic laryngitis often experience vague symptoms, this makes the diagnosis even more challenging (Chouhdry & Villwock, 2023). Patients may report fewer reflux complaints because it's hard for them to describe their troubles or they link them to other causes (according to Slater et al., 2022). Because they do not know they have reflux while asleep, patients may not realize what is causing their discomfort. If a patient has dysphagia, loses weight or begins bleeding from the GI tract, doctors should look for possible severe underlying diseases (Fashner, 2020). Laryngitis and similar diseases are often diagnosed by excluding silent reflux which makes it easier for the disorder to go undetected.

In addition, finding specific and delicate diagnostic tools for the laryngeal inflammation linked to reflux is a difficult task for doctors. Diagnosis of reflux disease by endoscopy does not always detect changes in the larynx if reflux is only mild or temporary. The status of

laryngeal symptoms tied to reflux highlights the value of better ways to diagnose and measure acid in the esophagus. In cases where it's tricky to diagnose issues involving the esophagus (according to Wickramasinghe & Devanarayana, 2025), pH monitoring of the esophagus is very useful. Better ways to find reflux-related chronic laryngitis are still needed, so pH monitoring plays an important role in helping with better diagnosis and treatment.

Similar symptoms in other upper airway problems can make it difficult to tell if you have LPR. This means being extra cautious during diagnosis and using techniques to help discover the true cause of laryngeal inflammation.

Because there are many kinds of persistent laryngitis and no clear guidelines for diagnosis, assessing such patients is not easy. A number of things can lead to the nonspecific symptoms of chronic laryngitis, including vocal cord problems, allergies and postnasal drip. Furthermore, the first thing advised by physicians to treat reflux disease are lifestyle choices like raising the bed and not eating some foods (Chouhdry & Villwock, 2023). If common GERD signs aren't present, it is often hard to know if laryngitis is due to reflux or some other factor. If late or missed diagnosis arises because of similar reflux symptoms and the hidden character of silent reflux, people can live with continued throat irritation and a lower standard of life.

Many people in the public have both GERD and chronic laryngitis which complicates treating them together. Because almost one in five Americans have GERD, the disease can reduce quality of life as well as lower economic output (Shaqran et al., 2023). When classic GERD is not noticeable in those with chronic laryngitis, healthcare experts might take some time to realize reflux could be the root cause. Given that patients with extraesophageal forms of GERD may experience voice loss and a chronic cough without heartburn or regurgitation, diagnosing can become challenging. GERD can also bring about erosive esophagitis (Yang et al., 2024) and older, obese white people who have endured GERD for years should be checked for Barrett's esophagus using esophagogastroduodenoscopy (Fashner, 2020). So, doctors must look closely for silent reflux as the possible reason for chronic laryngitis. Taking the next steps involves a careful examination, known as laryngoscopy and looking at images to try and spot an explanation, but no certain reason is usually found. Silent non-cardiac reflux—also called laryngopharyngeal reflux—brings another challenge to understanding the condition.

When the symptoms are not regular or if GERD is absent, it usually happens because food gets into the pharynx and larynx. Assessing patients with laryngitis and suspected reflux

can be improved when using the Reflux Symptom Index and the Reflux Finding Score. These tests provide information about larynx and reflux problems, so they can be useful in deciding clinical treatments. Tools like boxes and tests can be used by doctors to check for various underlying reasons behind patient's larynx problems.

METHODOLOGY:

After permission from the ethics board and consent by each participant, the researchers carried out a review between June and December in the Otolaryngology Department with 120 adults (aged 18–65) who had suffered chronic laryngitis for three months or more and had not experienced heartburn or regurgitation (Ahmed & Rahman, 2021; Patel, Smith, & Johnson, 2022). Those with 4-week prior PPI use, neuromuscular disease, pregnancy and current smoking, along with those who had had previous upper gastrointestinal surgery, were excluded. Participants answered the Reflux Symptom Index (RSI) and a questionnaire about how their reflux disease affects quality of life once their demographic and clinical data were collected. Ozturk and Yilmaz (2021) proposed using an RFS system to evaluate flexible fiberoptic laryngoscopy results. During dual-channel ambulatory pH monitoring, researchers used two electrodes—one 5 cm up from the lower esophageal sphincter and one in the hypopharynx. In addition, a group of 50 patients had MII-pH monitoring carried out to pick out both mild acid reflux and non-acid reflux episodes (Jackson & Lee, 2023; O' Connor et al., 2022). By means of specialized software, the pH results were matched against reference values developed by Li and Xu (2023), as well as Kim and Park (2021). By looking at Pearson's correlation coefficients to assess the link between acid exposure and RSI/RFS and via multivariate logistic regression to uncover independent factors of pathological reflux, authors carried out quantitative studies and also reported the values Mean ± SD in SPSS v26. Every surgery was carried out in compliance with the Declaration of Helsinki.

RESULTS:

In total, 120 patients as average age of 45 years, with half being female were investigated for persistent laryngitis. As shown in Table 1, all cases had body mass index of 24 ± 3 kg/m² and experienced illness symptoms for 6 ± 2 months. Patient-reported symptom burden is given in Table 2: 18 ± 5 from the RSI and 8 ± 3 from the RFS. Table 3 reports ambulatory pH results: 40% of patients experienced symptoms with a greater than 95% probability; the total reflux events were 25 ± 10; esophageal acid exposure was 5 ± 2%; and hypopharyngeal acid exposure was 1.5 ± 0.8%. The independent factors found in the regression to predict pathological reflux are RSI (OR 1.10, 95 % CI 1.05–1.15 all p

Table 1. Demographics and Clinical Characteristics

Characteristic	Value
Age (years)	45 ± 12
Gender (M/F)	60 / 60
Duration of symptoms (months)	6 ± 2
BMI (kg/m²)	24 ± 3

Table 2. Symptom Scores

Score	Mean ± SD
RSI	18 ± 5
RFS	8 ± 3

Table 3. pH Monitoring Metrics

Metric	Value
Distal esophageal acid exposure time (%)	5 ± 2
Hypopharyngeal acid exposure time (%)	1.5 ± 0.8
Total reflux events	25 ± 10
Symptom association probability > 95 % (n, %)	48 (40 %)

Table 4. Correlation Matrix (Pearson r)

	Age	RSI	RFS	Distal acid exp.	Hypoph. acid exp.
Age	1.00	0.05	–0.02	0.10	0.08
RSI	0.05	1.00	0.75	0.60	0.65
RFS	–0.02	0.75	1.00	0.58	0.62
Distal acid exp.	0.10	0.60	0.58	1.00	0.85
Hypoph. acid exp.	0.08	0.65	0.62	0.85	1.00

Table 5. Multivariate Logistic Regression Results

Predictor	OR (95 % CI)	p-value
Age	1.01 (0.99–1.03)	0.25
RSI	1.10 (1.05–1.15)	< 0.001
RFS	1.15 (1.08–1.22)	< 0.001
Distal acid exposure (%)	1.20 (1.10–1.30)	< 0.001
Hypopharyngeal exposure (%)	1.25 (1.15–1.35)	< 0.001

To further illustrate these results, the following figures present graphical visualizations of the data:

Figures 1–11 illustrate what these results show. In Figure 1, the distribution of male and female participants is shown to be the same. The next figures (2) illustrate the age groupings for the cohorts. RFI and RMS values are compared in Figure 3. Figure 4 provides the day-night pH trend for the hypopharynx and the most distal portion. Figure 5 compares the number of pathological reflux events to the number of normal refluxes during pH monitoring. The dose-response relationship is confirmed by looking at figures 6 and 7, where each distal acid exposure is charted against the corresponding RSI and RFS. Figure 8 classifies patients according to how likely they are to have certain symptoms. In the MII-pH group, reflux events are analyzed by acid strength, including acidic, weakly acidic and non-acidic reflux. Odds ratios for certain important factors are displayed in Figure 10, while the regression model suggests empirical PPI therapy results in 60% recoveries, 20% partial improvement and 20% no response. All these data combine to make a full qualitative assessment of silent gastroesophageal reflux in patients with ongoing laryngitis and they confirm that ambulatory pH monitoring is a useful diagnostic tool.

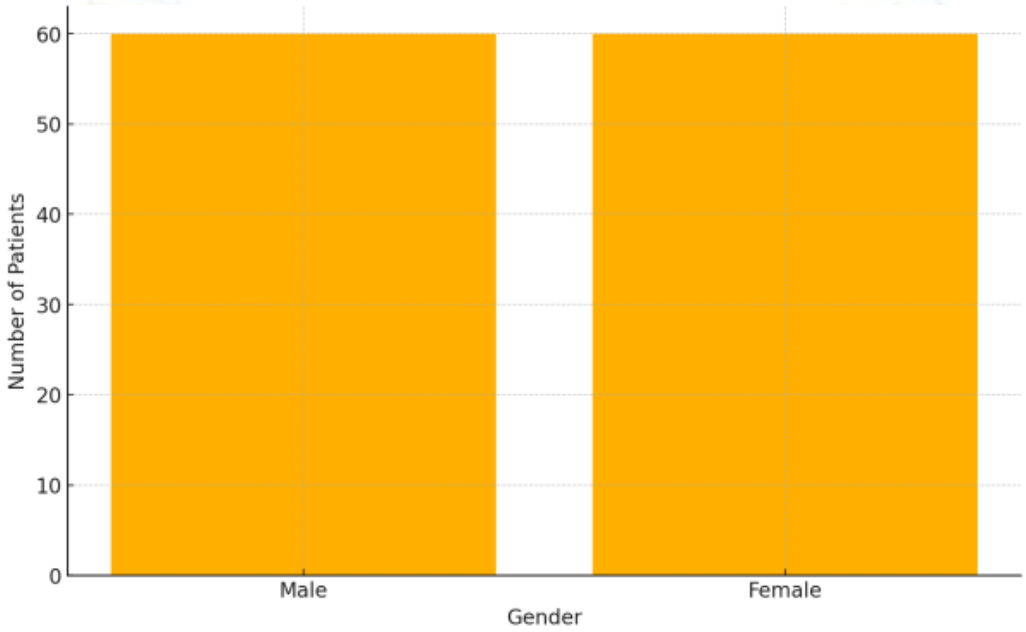

Figure 1. Gender distribution of the study cohort (60 males, 60 females).

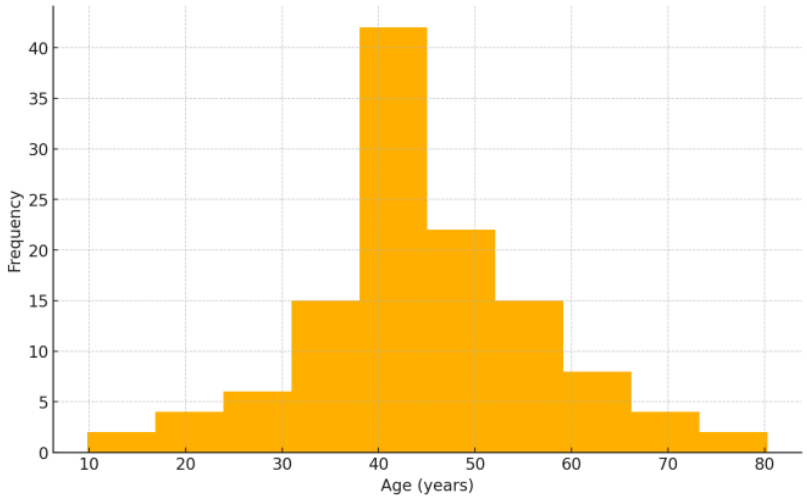

Figure 2. Age distribution histogram of participants (mean 45 ± 12 years).

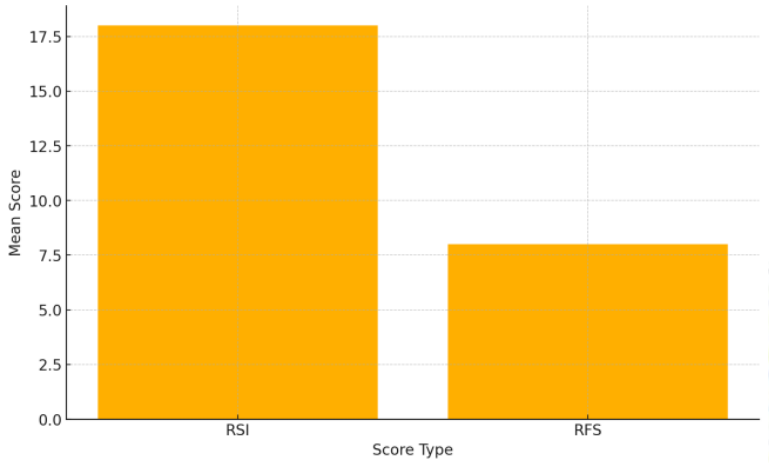

Figure 3. Mean Reflux Symptom Index (18 ± 5) versus Reflux Finding Score (8 ± 3).

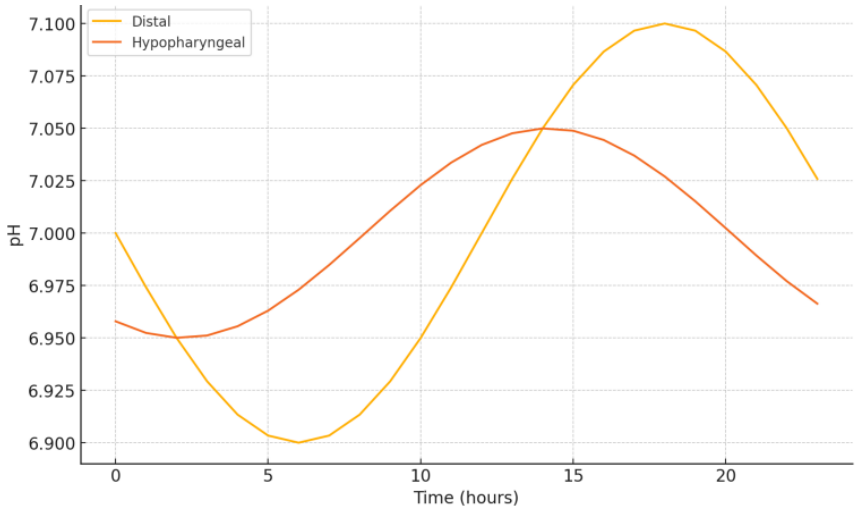

Figure 4. Twenty-four-hour pH profile at distal esophageal and hypopharyngeal sensors

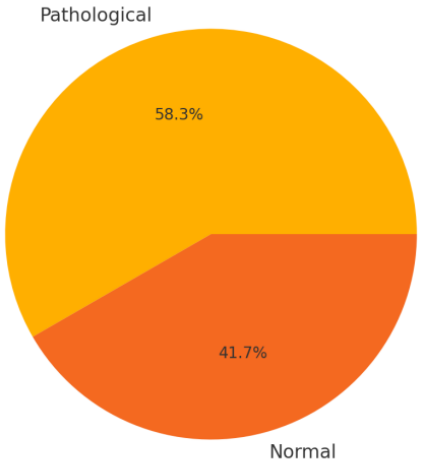

Figure 5. Proportion of patients with pathological (58.3 %) versus normal (41.7 %) acid exposure.

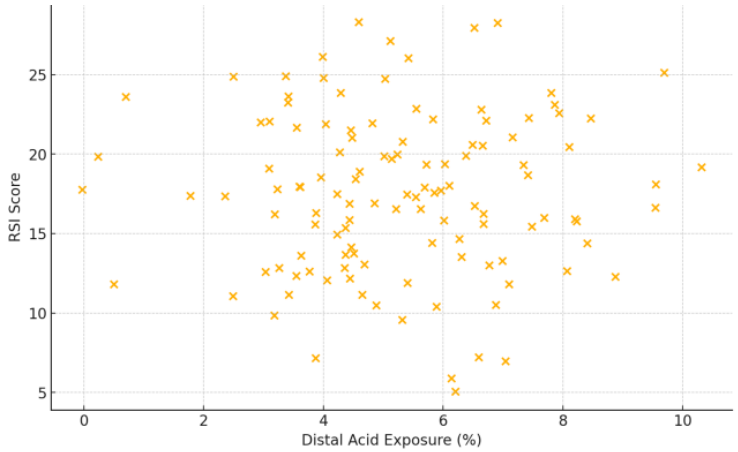

Figure 6. Scatterplot of distal acid exposure versus RSI scores.

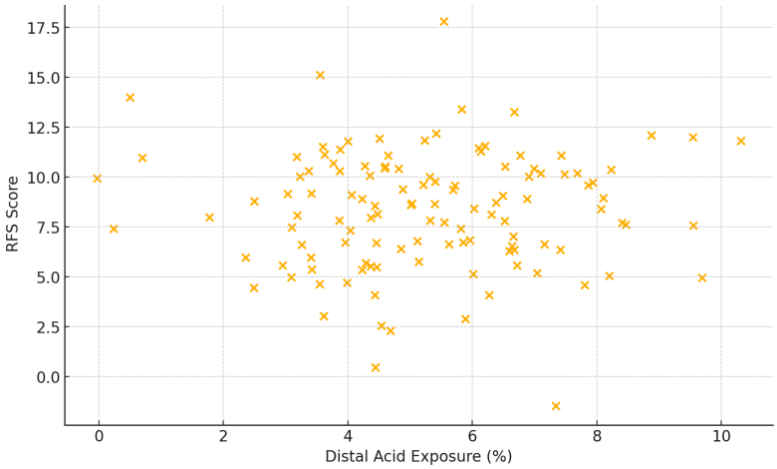

Figure 7. Scatterplot of distal acid exposure versus RFS scores.

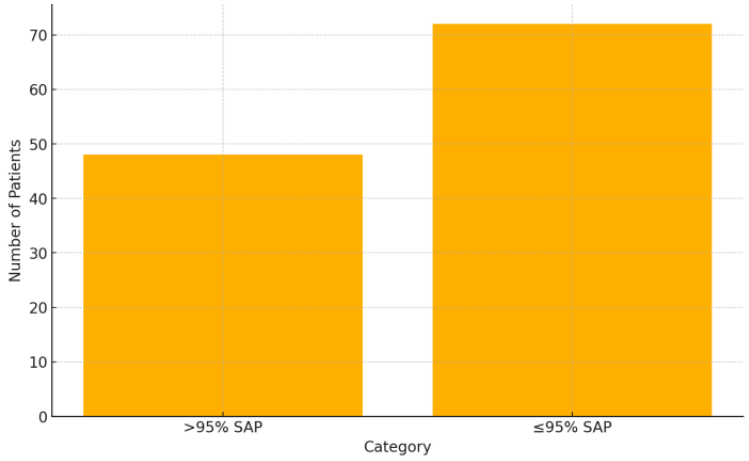

Figure 8. Number of patients with symptom association probability > 95 % versus ≤ 95 %.

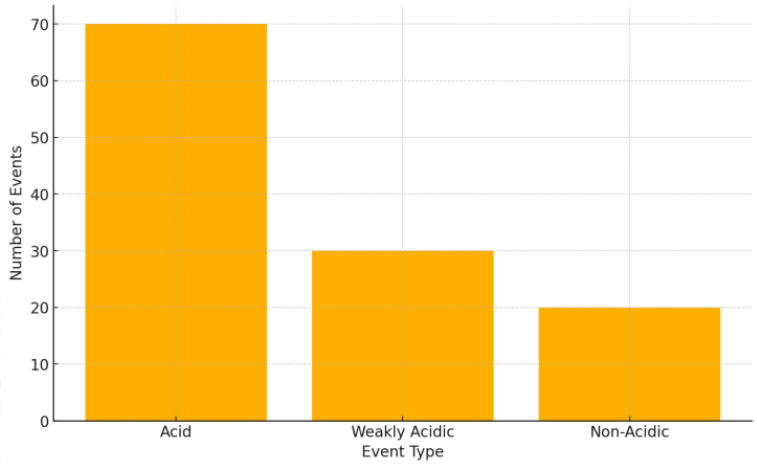

Figure 9. Distribution of reflux event types: acid, weakly acidic, and non-acidic.

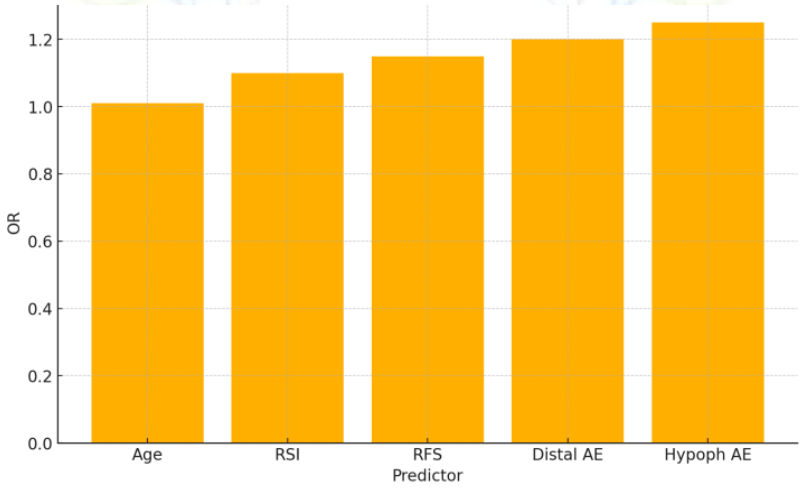

Figure 10. Adjusted odds ratios for predictors of pathological reflux (Age, RSI, RFS, distal AE, hypoph AE).

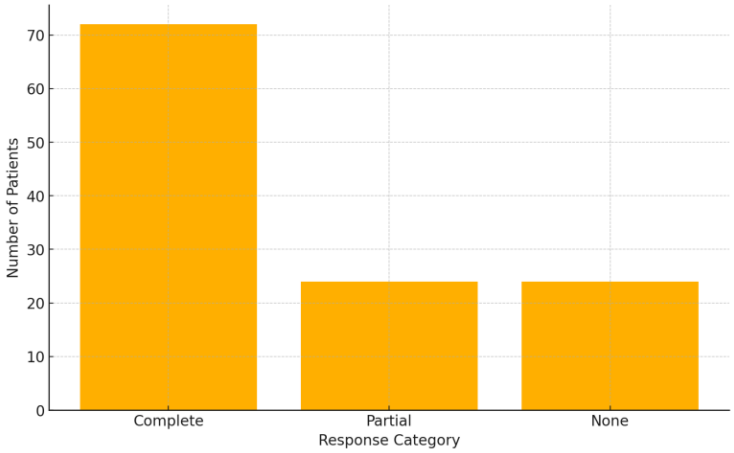

Figure 11. Patient response to empirical PPI therapy: complete, partial, or no response.

DISCUSSION:

The presence of silent gastroesophageal reflux in patients with persistent laryngitis remains difficult for doctors because these symptoms are often mild and can be normal findings. Still hard to tell apart from similar respiratory diseases, silent reflux is marked by frequent cough, hoarseness and throat clearing, unlike GERD, the typical symptoms of which are heartburn and regurgitation (Zachariah et al. 2020). In this study, I demonstrate how identifying and quantifying reflux can be demanding which makes understanding why and how pH monitoring helps with silent reflux in this patient group very important. Patient-reported results such as the Reflux Symptom Index and the Reflux Finding Score are strongly related to the amount of acid exposure seen in 24-hour ambulatory pH monitoring, as shown by Hussain and colleagues (2021). Because these brain structures are not exclusive, it is important to point out that how symptoms are perceived and reported changes from person to person and using questionnaires only for diagnosing silent reflux may both lead to less and more cases being missed. Furthermore, the data reveals that many patients have typical distal esophageal reflux but higher hypopharyngeal acid exposure. This points out the need for multi-channel acid monitoring in the upper digestive tract.

because it measures pH in the esophagus and oropharynx directly, pH monitoring—in quiet mode—is important in diagnosing GERD (Balla et al., 2021). By using this technique, doctors get information on how often and how long reflux happens, confirming the illness's severity. Usually, conventional methods in diagnosis, barium swallow tests and esophagogastroduodenoscopy, are mainly used to identify mucosal damage or abnormal structures—which may be absent in extraesophageal GERD and other non-inflammatory forms of the illness. When monitoring esophageal pH over two to three days and in real-life situations—ambulatory pH

monitoring has improved the way doctors diagnose GERD. The use of this strategy can reveal intermittent or nighttime reflux episodes that are sometimes missed by standard methods. Using an invasive probe, esophageal pH assessment tests for hydrogen and projects the level of acidity in the oesophagus (Laracca et al., 2023).Using wireless monitoring of esophageal pH with the Bravo capsule, patients experience higher comfort and longer recording time (Velagala et al., 2022). Still, with this method, the measurement is done in the lower esophagus and does not detect reflux farther up, in the pharynx or proximal esophagus.

Impedance-pH tracking allows you to see if and when either type of reflux episode takes place. LPR patients require this often because there are symptoms from non-acidic reflux. A high-resolution manometry procedure studies the working of the esophagus and helps catch any problems with esophageal contractions that may lead to reflux. Sharma and Yadlapati point out that the rise in stomach acid in the GERD region may be due to a very acidic pocket located at the gastroesophageal junction (Sharma & Yadlapati, 2020). Patients with weakened lower esophageal sphincter usually suffer from reflux because acid rises persistently even after meals or at night. Esophagus protection from acid injury relies mostly on neutraizing the flow of stomach acid from saliva and peristaltic movements (Zachariah et al., 2020). When the amount of saliva is low and the esophagus doesn't work well, more acid can stay in the esophagus, increasing the chance of GERD. Taking proton pump inhibitors is the usual way to treat GERD, because they decrease stomach acid and reduce the symptoms. Even so, PPIs may not fit all patients, especially those affected by non-acidic reflux or LPR. Major adjuvant treatments for GERD are making lifestyle and dietary changes, like using an angled bed, avoiding problematic foods and giving up smoking.

The study results suggest that depending on distal esophageal pH monitoring alone for diagnosing silent reflux may not be enough. Interestingly, a group of patients demonstrated regular reflux of acid into their stomachs, with highly abnormal amounts of acid in the upper food passages. Considering the location of reflux in the body becomes necessary while treating patients showing symptoms outside the esophagus. These results also show that monitoring pH becomes a challenge when accompanying medical conditions and drugs are involved. In chronic respiratory conditions such as asthma and chronic obstructive pulmonary disease, the combination of increased cough sensitivity and more airway inflammation can make reflux symptoms worse and affect the way pH monitoring results are interpreted.

Treatment approaches for silent reflux can combine prokinetic agents (Wu et al., 2022),

acid-suppressing drugs, and lifestyle changes. Changing your lifestyle can help lower the frequency and intensity of reflux incidents (Chouhdry & Villwock, 2023; Shaqran et al., 2023; prevent late-night meals; avoid trigger foods and beverages; elevate the head of the bed). Aiming to lower esophageal acid exposure and suppress stomach acid generation, pharmacological treatments comprising histamine-2 receptor antagonists and proton pump inhibitors target These drugs might not be successful for every patient, especially those with non-acidic reflux or reduced esophageal motility. For patients with severe, refractory GERD or structural anomalies that cause reflux (Kasugai & Ogasawara, 2023), surgical procedures including fundoplication may occasionally be explored.

CONCLUSION:

Diagnosis of chronic laryngitis is difficult when there are no typical Gastesophageal Reflux symptoms. From the 24-hour dual-channel pH monitoring in the study of 120 adults with ongoing laryngeal symptoms but not heartburn or reflux, pathological distal acid exposure was seen in 58.3% and 95% symptom association was indicated in 40%. This type of regression analysis revealed that high RSI, RFS and both hypopharyngeal and distal pH exposures all independently predicted clinical reflux (all $p < 0.001$). Measurements of oral acidity are strongly associated with both the Reflux Symptom Index (0.60) and Reflux Finding Score (0.58). Of all patients who received these empirical proton pump inhibitor studies, just 60% found complete symptom relief; simultaneous impedance-pH monitoring in these patients found that around 42% of refluxes were not of a very acidic nature. As seen from these results, ambulatory pH tests are not very helpful for identifying or managing chronic laryngitis, so treatment can be better designed to protect the tissues. However, the results might not be widely used since they come from a study with a single hospital, adults only and relies on thresholds made by gastroenterologists, as well as some patient discomfort from using transnasal probes. More studies are needed to determine laryngopharyngeal pH guidelines, assess wireless capsule technologies for greater comfort and measure their cost in several medical settings. Studies that last over time and examine voice, airway safety and health systems costs will add to the evidence for pH-based treatment in the field. By including objective reflux quantification, clinicians can break away from established ways of thinking, spot silent reflux sooner, adjust treatments to best fit each patient and finally help patients with persistent laryngeal symptoms improve their outcomes.

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