The association between laryngeal pseudosulcus and laryngopharyngeal reflux

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BACKGROUND: A pattern of edema on the ventral surface of the vocal fold, called pseudosulcus vocalis, was described in 1995. It refers to infraglottic edema extending from the anterior commissure to the posterior larynx. It can be differentiated from sulcus vergeture, which is caused by adhesion of the vocal fold epithelium to the vocal ligament. Although it has been related to laryngopharyngeal reflux (LPR), this has not been thoroughly investigated.

PURPOSE: Our goal was to evaluate the association between pseudosulcus and LPR.

METHODS: Thirty patients with a clinical diagnosis of LPR confirmed by double-probe pH monitoring and 30 controls without LPR were enrolled. The prevalence of pseudosulcus was determined with fiberoptic laryngoscopy.

RESULTS: Seventy percent (21 of 30) of patients with LPR and 30% (9 of 30) of controls had pseudosulcus. Patients with pseudosulcus were 2.3 times more likely to have pH-documented LPR (95% confidence interval 1.3-4.2). The sensitivity and specificity of pseudosulcus in the diagnosis of LPR are 70% and 77%, respectively.

CONCLUSIONS: Pseudosulcus is highly correlated with pH-documented LPR ($P < 0.001$). The presence of pseudosulcus is suggestive of LPR. (Otolaryngol Head Neck Surg 2002;126:649-652.)

Laryngopharyngeal reflux (LPR) is a common ailment that represents a causative or exacerbating factor for many disorders of the upper aerodigestive tract. Despite increasing knowledge of its existence and pathophysiologic mechanisms, the diagnosis of LPR may be illusive. Ambulatory 24-hour double-probe pH monitoring with the proximal probe just above the upper esophageal sphincter is the current “gold standard” for the diagnosis of LPR. This modality is expensive, time consuming, and uncomfortable for some patients. A physical finding predictive of LPR would be clinically beneficial. We have developed an 8-item physical finding score for LPR1,2 (Table 1). It assists the clinician in documenting LPR severity as well as in evaluating treatment efficacy. In our experience, the presence of laryngeal pseudosulcus is one of the most reliable predictors included in the finding score (Fig 1). A recent study by Hickson et al3 reported a positive predictive value of 90% for pseudosulcus in the diagnosis of LPR. Although this investigation did not include a control group, they concluded that pseudosulcus is an accurate predictor of LPR disease. The purpose of this investigation was to evaluate the prevalence, sensitivity, and specificity of pseudosulcus among patients with LPR.

MATERIALS AND METHODS

Thirty consecutive patients with a clinical diagnosis of LPR confirmed by 24-hour dual-pH monitoring were enrolled into the case group. Our technique of pH-metry has been described elsewhere and is not repeated here other than to emphasize that the proximal probe was placed 1 cm above the upper esophageal sphincter under manometric guidance.4 Transnasal fiberoptic laryngoscopy was performed on all subjects to determine the presence of laryngeal pseudosulcus.

Thirty consecutive control patients, matched on race, gender, and age category (within 10 years), without any prior history of gastroesophageal reflux symptoms and no prior history of antireflux medical therapy were enrolled from a normative database of an asymptomatic community cohort.5 All patients in this control cohort underwent transnasal fiberoptic laryngoscopy with documentation of the presence or absence of laryngeal pseudosulcus.

The $\chi^2$ test was used to evaluate the difference in the prevalence of pseudosulcus between groups. The prevalence, sensitivity, and specificity of laryngeal pseudosulcus in the diagnosis of LPR were calculated.
RESULTS

The mean ± SD age of the pH-documented LPR group was 49 ± 14 years. The mean age of the control subjects was 54 ± 13 years. The percentage of women in each group was 73% (22 of 30). Ninety percent (27 of 30) of each group was white.

Seventy percent (21 of 30) of patients with LPR and 30% (9 of 30) of control subjects had evidence of laryngeal pseudosulcus. Patients with pseudosulcus were 2.3 times more likely to have pH-documented LPR (95% confidence interval 1.3-4.2). The sensitivity and specificity of pseudosulcus in the diagnosis of LPR are 70% and 77%, respectively.

DISCUSSION

Knowledge of the symptoms, physical findings, pathophysiologic mechanisms, and treatment of LPR has increased markedly over the past decade. Due to the exacerbating effect that LPR has on many disorders of the upper aerodigestive tract, its treatment in many otolaryngologic patients has become far more important. Treatment is expensive and may be required for 6 months or longer. Therefore, accurate diagnosis of this entity has become increasingly important. Currently, 24-hour ambulatory double-probe pH monitoring with the proximal probe just above the upper esophageal sphincter is considered the “goal standard” for the diagnosis of extraesophageal reflux. However, this test is time consuming, expensive, uncomfortable for some patients, and not readily available to many clinicians. This is particularly true for those practicing outside of the university setting. In addition, a number of otolaryngologists rely on pH laboratories run by gastroenterologists. The vast majority of gastroenterologists use pH probes with fixed interprobe distances that usually place the proximal probe in the esophagus rather than in the hypopharynx. This renders the data from that probe invalid as far as the diagnosis of LPR is concerned.

The shortcomings of pH testing have led many clinicians to seek alternative methods of diagnosing LPR. This clinical diagnosis usually relies on any combination of symptoms and physical findings. However, even among experienced practitioners, there remains disagreement as to which symptoms are associated with LPR. Historically, the most frequently reported finding was erythema of the posterior larynx or hypertrophic interarytenoid mucosa (posterior laryngitis). However, others have noted that laryngopharyngeal edema is a much more common finding. This controversy has led to the development of a Reflux Finding Score (RFS) (Table 1) based on physical findings.

<table>
<thead>
<tr>
<th>Finding scoring points</th>
<th>Subglottic edema</th>
<th>Ventricular obliteration</th>
<th>Erythema/ hyperemia</th>
<th>Vocal cord edema</th>
<th>Diffuse laryngeal edema</th>
<th>Posterior commissure hypertrophy</th>
<th>Granuloma/ granulation</th>
<th>Thick endolaryngeal mucus/ other</th>
<th>Total Score</th>
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<tbody>
<tr>
<td>Subglottic edema</td>
<td>2 = Present</td>
<td>0 = Absent</td>
<td>2 = Partial</td>
<td>2 = Moderate</td>
<td>2 = Polypoid</td>
<td>1 = Mild</td>
<td>2 = Moderate</td>
<td>2 = Present</td>
<td>0 = Absent</td>
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<tr>
<td>Erythema/ hyperemia</td>
<td>2 = Arytenoids only</td>
<td>4 = Complete</td>
<td>2 = Diffuse</td>
<td>3 = Severe</td>
<td>3 = Obstructing</td>
<td>3 = Moderate</td>
<td>4 = Obstructing</td>
<td>3 = Severe</td>
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<tr>
<td>Vocal cord edema</td>
<td>1 = Mild</td>
<td>2 = Moderate</td>
<td>3 = Moderate</td>
<td>4 = Polypoid</td>
<td>4 = Obstructing</td>
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<tr>
<td>Diffuse laryngeal edema</td>
<td>1 = Mild</td>
<td>2 = Moderate</td>
<td>3 = Severe</td>
<td>4 = Obstructing</td>
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<tr>
<td>Posterior commissure hypertrophy</td>
<td>1 = Mild</td>
<td>2 = Moderate</td>
<td>3 = Severe</td>
<td>4 = Obstructing</td>
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<tr>
<td>Granuloma/ granulation</td>
<td>2 = Present</td>
<td>0 = Absent</td>
<td>2 = Absent</td>
<td>0 = Absent</td>
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<td>Total Score</td>
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**Table 1. Reflux Finding Score (RFS)**

![Fig 1. Bilateral laryngeal pseudosulcus (arrowheads), showing the subglottic edema extending from the anterior commissure past the vocal process to the posterior larynx.](image)
and a Reflux Symptom Index (RSI) (Table 2). The RSI is a 9-item, self-administered reflux questionnaire. This instrument accurately documents symptomatic improvement among patients with LPR. Normative data suggest that an RSI of >10 is associated with a high likelihood of pH-documented LPR. The RFS is an 8-item, weighted instrument in which the examiner rates physical findings in various areas of the larynx. Normative data suggest that an RFS of >7 is associated with a high likelihood of pH-documented LPR. This instrument has displayed excellent criterion-based validity and interobserver and intraobserver reproducibility.

This work has encouraged us to evaluate individual physical findings that could be pathognomonic for the presence of LPR. It has been suggested by Koufman, as well as other laryngologists, that subglottic edema (pseudosulcus) may represent such a finding. The present study suggests that pseudosulcus is more prevalent in individuals with pH-probe documented LPR. The calculated sensitivity and specificity of 70% and 77%, respectively, however, suggest that the presence of pseudosulcus is not pathognomonic for LPR. This is in slight disagreement with Hickson et al., who reported a prevalence and positive predictive value of 90%. However, they used a smaller sample size and failed to include a control group. Patients with LPR may, for example, have other findings, such as posterior commissure hypertrophy, ventricular obliteration, and glottic hyperemia with a normal-appearing infraglottis. Alternatively, an individual with presbylaryngis and no reflux may appear to have edema of the ventral surface of the vocal fold when in reality atrophy of the true vocal fold gives the appearance of a pseudosulcus.

There are several limitations of this study. The study patients with pH-documented LPR represent a somewhat biased sample in regard to gender (73% female), race (predominately white), and age (mean 49 years). Perhaps there are gender-, race-, or age-related (presbylaryngis) differences that affect the development or diagnosis of LPR. Thus, these findings should not be generalized to the population at large without further investigation. In addition, our control group, although virtually asymptomatic, did not undergo pH monitoring. It is possible that some of these individuals may have had evidence of LPR on pH monitoring. Despite these acknowledged shortcomings, the present study supports the notion that the presence of laryngeal pseudosulcus is suggestive of a diagnosis of LPR.

CONCLUSIONS

Laryngeal pseudosulcus refers to edema of the ventral surface of the true vocal fold that extends from the anterior commissure to the posterior larynx. Patients with pseudosulcus are nearly 2.5 times more likely to have pH-documented LPR (P < 0.001). Although the sensitivity and specificity of pseudosulcus in the diagnosis of LPR are only 70% and 77%, respectively, the presence of laryngeal pseudosulcus is suggestive of a diagnosis of LPR.

REFERENCES