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ASSOCIATION OF GERD WITH VOICE AND IMPORTANCE OF VOICE EVALUATION IN GER DISEASED PATIENTS

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Introduction

Gastroesophageal Reflux Disease (GERD) occurs when stomach acid frequently flows back into the tube connecting your mouth and stomach (oesophagus). This backwash (acid reflux) can irritate the lining of your oesophagus.

Many people experience acid reflux from time to time. GERD is mild acid reflux that occurs at least twice a week, or moderate to severe acid reflux that occurs at least once a week.

Most people can manage the discomfort of GERD with lifestyle changes and over-the-counter medications. But some people with GERD may need stronger medications or surgery to ease symptoms.

GERD and LPR

This condition is one of the extra-digestive manifestations of GERD and occurs when there is retrograde flow of gastric contents (acid, pepsin) or duodenal contents (biliary salts, pancreatic enzymes) into the larynx and the pharynx (Martinucci et al., 2013). LPR is more typical of the "reflux" that may result in a burning sensation in the throat. This also requires a physician to render a medical diagnosis.

LPR symptoms are generally associated with deficits involving the upper esophageal sphincter.

Symptoms of GERD

Common signs and symptoms include –

- A burning sensation in your chest (heartburn), usually after eating, which might be worse at night
- Chest pain
- Difficulty swallowing
- Regurgitation
- Sensation of lump in your throat

Associated problems

- Loss of voice
- Dysphagia
- Barrett's esophagus
- Regurgitation

If one has night acid reflux, one might also experience:

- Chronic cough
- Laryngitis
- New or worsening asthma
- Disrupted sleep patterns

Association of GERD/LPR with voice damage or voice loss

The regurgitation of hydrochloric acid from the stomach, is an internal caustic substance that has been implicated in vocal fold irritation, contact ulcers, and dysphonia as lining of the larynx and upper throat above upper oesophageal sphincter does not have as strong a protective lining as oesophagus. Inquiry into daytime and nocturnal acid reflux is an important component of the voice disorder history in patients with or without observed contact ulcer or contact ulcer granuloma. The regurgitation of hydrochloric acid from the stomach, is an internal caustic substance that has been implicated in vocal fold irritation, contact ulcers, and dysphonia.

Causes of GERD

GERD is a result of the lower oesophageal sphincter (LES) – the muscle at the bottom of the oesophagus not closing properly. When it doesn't close, food, liquids and stomach acid can move back up into the oesophagus. The causes of GERD are uncertain. A hiatal hernia may be a

contributing factor. A hiatal hernia occurs when the stomach bulges up into the chest through the opening in the diaphragm (the muscle wall that separates the chest cavity from the abdomen). The diaphragm normally helps the LES keep stomach contents from going back up into the oesophagus. But the hernia disrupts the normal anatomy of the LES and makes it easier for reflux to occur.

Other factors that may contribute to GERD:

- Alcohol use
- Smoking
- Obesity
- Pregnancy
- Medications
- Fatty foods

If one thinks that any of the medications are causing heartburn, then one should talk to his/her doctor.

Significance and prevalence Of GERD in patients with voice and laryngeal disorders

Acid reflux is a common problem, and is thought to occur in 4-10% of patients presenting to Ear Nose and Throat (ENT) clinics. Laryngopharyngeal reflux (LPR) is an extraoesophageal variant of gastroesophageal reflux disease (GERD) that affects the larynx and pharynx. A recent study of reflux and voice disorders suggests that up to 55% of patients with hoarseness (dysphonia) have laryngopharyngeal reflux (Makhadoom et al, Saudi Med, 2007). Another most recent evidence indicates that LPR represents a complex spectrum of abnormalities and among patients with laryngeal and voice disorders, LPR appears to be associated strongly with, or be a significant etiologic cofactor in, about half of these patients. Many of the current concepts regarding reflux laryngitis and related controversies have been reviewed in the otolaryngologic and gastroenterological literature (Koufman and Wright, 2006; Ormseth and Wong, 1999; Richter and Hicks, 1997). Among patients who present with voice disorders, the estimated prevalence of LPR is much higher. In 1989, Wiener et al. (1989) reported that 78% of 32 patients with voice complaints had LPR documented by pH probe. Koufman et al. (2000) found LPR in 78% of patients with hoarseness, and in roughly 50% of all patients who presented with voice complaints.

In study of Makhadoom et al, it was found to be of 30 patients with change of voice, the sense of hyperactivity was present in 19(63.33%) and not present in 11(36.67%).

Both the above studies concluded that gastroesophageal reflux (GER) can cause serious voice problems and laryngopharyngeal disorders influencing the patient's quality of life and approximately laryngopharyngeal reflux (LPR) is present in up to 50% of patients with voice disorders.

Relationship between GERD and voice disorder

Patients presenting with voice complaints are often unaware that reflux could underlie their symptoms especially those that never experienced heartburn or regurgitation.

Here investigation of relation is based on Bradford-Hill Criteria given below in table.1

Table 1 Bradford-Hill Criteria
Biological Plausibility It is easier to accept an association as causal when there is a rational and theoretical basis for such a conclusion.
Experimental Findings Related research that is based on experiments will make a causal inference more plausible
Dose Response Relationship There should be a direct relationship between the risk factor (i.e., exposure) and the people's status on the disease variable (i.e. outcome).
Temporality It is logically necessary for a cause to precede an effect in time.
Strength of Association The stronger the relationship between the independent variable and the dependent variable, the less likely it is that the relationship is due to an extraneous variable.
Consistency Multiple, observations of an association, with different people under different circumstances and will different measurement instruments increase the credibility of a finding.
Specificity In the ideal situation, the effect only has one cause. There is added credibility to a causal claim when an outcome is best predicted by one primary factor.
Coherence A cause-and-effect interpretation for an association is clearest when it does not conflict with what is known about the variables under study and when there are no plausible competing theories or rival hypotheses. The association must me coherent with other knowledge**.**
Analogy Sometimes a commonly accepted phenomenon is one area can be applied to another area.

Assessment of voice

Screening

Screening may be conducted if a voice disorder is suspected. It may be triggered by concerns from individuals, parents, teachers, or health care providers. When deviations from normal voice are detected during screening, further evaluation is warranted.

Screening includes evaluation of vocal characteristics related to respiration, phonation, and resonance, as well as vocal range and flexibility (e.g., pitch, loudness, pitch range, and endurance). Clinicians may use a formal screening tool (Lee et al., 2004) or obtain data using informal tasks. Standardized self-report questionnaires can be included for a more thorough screening (e.g., Deary, Wilson, Carding, & MacKenzie, 2003; Hogikyan & Sethuraman, 1999; Jacobson et al., 1997).

Comprehensive Assessment

All patients/clients with voice disorders are examined by a physician, preferably in a discipline appropriate to the presenting complaint. The physician's examination may occur before or after the voice evaluation by the speech-language pathologist.

A comprehensive assessment is conducted for individuals suspected of having a voice disorder, using both standardized and nonstandardized measures (see ASHA resource on assessment tools, techniques, and data sources). Norms are based on age, gender, type of instrumentation used, cultural background, and dialect. For a review of clinical voice assessments, see Roy et al. (2013). Diagnostic therapy may be performed as part of the comprehensive assessment to help in making a diagnosis and to determine if the individual is stimulable to voice therapy efforts.

Consistent with the World Health Organization's (WHO*) International Classification of Functioning, Disability and Health* (ICF) framework (ASHA, 2016b; WHO, 2001), comprehensive assessment is conducted to identify and describe

- **impairments in body structure and function**, including underlying strengths and weaknesses in speech sound production and verbal/nonverbal communication;
- **co-morbid deficits** such as other health conditions and medications that can affect voice;
- the individual's **limitations in activity and participation**, including functional status in communication and interpersonal interactions;

- **contextual (environmental and personal) factors** that serve as barriers to, or facilitators of, successful communication and life participation; and
- the impact of communication impairments on **quality of life** and functional limitations relative to premorbid social roles and abilities for the individual and the impact on his or her community.

Comprehensive Assessment for Voice Disorders: Typical Components	
Case History	• Individual's description of voice problem, including onset and variability of symptoms • Medical status and history, including surgeries, chronic disorders, and medications • Previous voice treatment • Daily habits related to vocal hygiene

Self-Assessment	• Individual's assessment of how voice problem affects
	  ○ emotions and self-image; and
	  ○ ability to communicate effectively in everyday activities and in social and work settings (e.g., Hogikyan & Sethuraman, 1999; Jacobson et al., 1997; Ma & Yiu, 2001).

Oral-Peripheral Examination	• Assessment of structural or motor-based deficits that may affect communication and voice, including strength, speed, and range of motion of oral musculature • Assessment of symmetry and movement of structures of the face, oral cavity, head, neck, and respiratory system during rest and purposeful speech tasks • Testing of mechano-sensation of face and oral cavity • Testing of chemo-sensation (i.e., taste and smell) • Assessment of laryngeal sensations (dryness, tickling, burning, pain, etc.) and palpation of extrinsic laryngeal musculature, as indicated
Assessment of Respiration	• Respiratory pattern (abdominal, thoracic, clavicular) • Coordination of respiration with phonation (breath-holding patterns, habitual use of residual air, length of breath groups) • Maximum phonation time (MPT; Dejonckere, 2010; Speyer et al., 2010) • s/z ratio to assess for glottal insufficiency, which may be indicative of laryngeal pathology (Eckel & Boone, 1981; Stemple et al., 2010)
	Voice Quality

Auditory-Perceptual Assessment
Subjective Assessment Based on Clinical Impressions of the SLP
	• **Consensus features** assessed during production of sustained vowels, sentences, and running speech
	  ○ **Roughness**—perceived irregularity in voicing source
	  ○ **Breathiness**—audible air escape in voice
	  ○ **Strain**—perception of excessive vocal effort
	  ○ **Pitch (perceptual correlate of fundamental frequency)**—deviations from normal relative to age, gender, and referent culture
	  ○ **Loudness (perceptual correlate of sound intensity)**—deviations from normal relative to age, gender, and referent culture
	  ○ **Overall severity**—global, integrated impression of voice deviance
	• **Additional perceptual features**
	  ○ Diplophonia, aphonia, pitch instability, tremor, vocal fry, falsetto, wet/gurgly
	(Kemper, Gerratt, Abbott, Barkmeier-Kraemer, & Hillman, 2009; ASHA, 2002; ASHA , n.d.)

	Resonance* • Assess resonance quality (normal, hyponasal, hypernasal, cul-de-sac). • If abnormal, assess stimulability for normal resonance. • If normal, evaluate the focus of resonance (oral, pharyngeal/laryngeal, nasal). See ASHA's Practice Portal page on Resonance Disorders.
	Phonation • Voice onset/offset (e.g., delayed voice onset; quality of voice at onset) • Ability to sustain the voice to achieve appropriate phrasing during speaking • Ability to demonstrate strong and consistent rate of vocal fold valving during diadochokinesis
	Rate Deviations from normal relative to age, gender, and referent culture

Instrumental Assessment Adapted from *Recommended Protocols for Instrumental Assessment of Voice* (ASHA, 2015)	**Laryngeal Imaging**
	• Measures of structure and gross function (using videoendoscopy) and measures of vocal fold vibration during phonation (using videostroboscopy)
	  ○ **Videolaryngoendoscopy**
	  ▪ Vocal fold edges—appearance of superior vocal fold edges during abduction

	▪ Vocal fold mobility—movement of vocal folds toward and away from midline at level of cricoarytenoid joint during laryngeal diadochokinetic task ▪ Supraglottic activity—degree of compression of supraglottic structures during sustained phonation ○ **Videolaryngostroboscopy** ▪ Regularity—consistency of successive glottic cycles ▪ Amplitude—lateral movement of the vocal fold medial plane ▪ Mucosal wave—independent lateral movement of mucosa over vocal fold ▪ Left/right phase symmetry—symmetry of vocal folds (opening, closing, maximum lateral–medial excursion) during glottic cycle ▪ Vertical level—level difference in vertical plane between vocal folds during maximum closed phase of glottic cycle ▪ Glottal closure pattern—glottal configuration during maximum closure ▪ Glottal closure duration—relative proportion of glottal cycle in which glottis is closed
	Acoustic Assessment • Objective measures of vocal function related to vocal loudness, pitch, and quality ○ **Vocal amplitude** ▪ Habitual sound pressure level (SPL) in decibels (dB)—typical sound level of voice during connected speech (standard reading passage) ▪ Minimum and maximum vocal SPL (dB)—softest and loudest sustainable phonation ○ **Vocal frequency** ▪ Mean vocal f_0 (Hz)—average of the estimates of the f_0 for acoustic signal recorded during connected speech (standard reading passage) ▪ Vocal f_0 standard deviation (SD; Hz)—SD of the estimates of the f_0 for acoustic signal recorded during connected speech

	▪ Minimum and maximum vocal f_0 (Hz)—f_0 values for the lowest and highest pitched sustainable phonations ○ **Vocal signal quality** ▪ Vocal cepstral peak prominence (CPP; dB)—relative amplitude of the peak in the cepstrum that represents the dominant harmonica of the vocal acoustic signal (sustained vowels and connected speech samples)
	Aerodynamic Assessment • Measures (using non-invasive procedures) of glottal aerodynamic parameters required for phonation ○ **Glottal airflow** ▪ Average glottal airflow rate (L/sec or mL/sec)—estimated from oral airflow rate during vowel production ○ **Subglottal air pressure** ▪ Average subglottal air pressure (cm of water [cmH_2O] or kilopascals [kPa])—estimated for intraoral air pressure produced during repetition of stop consonants in syllable strings ○ **Mean vocal SPL and f_0**—extracted from simultaneously recorded acoustic signal; facilitates interpretation of airflow and air pressure measurements

Assessment may result in

- diagnosis of a voice disorder;
- clinical description of the characteristics and severity of the disorder;
- statement of prognosis and recommendations for intervention;
- identification of appropriate treatment or management options; and
- referral to other professionals, as needed.

Through endoscopy clinician can diagnose various direct-indirect causes of voice disorder such as:

- ulcers
- cancers
- inflammation or swelling
- blockages
- polyps and other growths

Diagnosis of GERD

Diagnose of GERD is based on a physical examination and history of your signs and symptoms.

1. **Upper endoscopy-** A thin, flexible tube equipped with a light and camera (endoscope) inserted down your throat, to examine the inside of your esophagus and stomach. Test results can often be normal when reflux is present, but an endoscopy may detect inflammation of the esophagus (esophagitis) or other complications. An endoscopy can also be used to collect a sample of tissue (biopsy) to be tested for complications such as Barrett's esophagus
2. **Ambulatory acid (pH) probe test-** A monitor is placed in your esophagus to identify when, and for how long, stomach acid regurgitates there. The monitor connects to a small computer that you wear around your waist or with a strap over your shoulder. The monitor might be a thin, flexible tube (catheter) that's threaded through your nose into your esophagus, or a clip that's placed in your esophagus during an endoscopy and that gets passed into your stool after about two days.
3. **Esophageal manometry.** This test measures the rhythmic muscle contractions in your esophagus when you swallow. Esophageal manometry also measures the coordination and force exerted by the muscles of your esophagus.
4. **X-ray of your upper digestive system.** X-rays are taken after you drink a chalky liquid that coats and fills the inside lining of your digestive tract. The coating allows your doctor to see a silhouette of your esophagus, stomach and upper intestine. You may also be asked to swallow a barium pill that can help diagnose a narrowing of the esophagus that may interfere with swallowing.

CONCLUSION

GERD is the condition in which stomach acid flows back into the oesophagus. LPR is more typical of the reflux in which gastric contents (acid, pepsin) or duodenal contents (biliary salts, pancreatic enzymes) into the larynx and pharynx.

The lining of larynx and upper throat above the upper oesophageal sphincter does not have as strong a protective lining as the oesophagus. As a result, when acidic stomach contents are refluxed, they cause the larynx (voice box) which is responsible for voice production to become irritated and inflamed which ultimately results in voice damage.

Therefore, it is important to diagnose for GERD as early as possible through various methods have been discussed and if GERD is present then it is important for individuals with GERD to be checked for LPR and voice assessment to avoid any potential throat or voice damage. Symptoms of LPR may include: hoarseness, chronic throat clearing, feeling of a lump in throat, chronic cough, choking episodes, rawness in throat, voice problems. We can assess voice problems through various methods which have been discussed earlier.

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