

Laryngitis from Reflux: Prevention for the Performing Singer

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Laryngitis in General

Laryngitis is the bane of performers and other professionals who depend on their voice for their art and livelihood. Almost every person has experienced acute laryngitis, usually associated with a viral upper-respiratory infection. Whenever there is inflammation of the vocal fold epithelium, there is an effect on voice quality and strength. Therefore, it is important to understand the factors that can cause laryngitis, especially the preventable causes of laryngitis.

Laryngitis is a generic term for inflammation or irritation of the laryngeal tissues. The inflammation can be caused by any kind of injury, including infection, smoking, contact with caustic or acidic substance, allergic reaction, or direct trauma. Inflammatory response of the tissues includes leakage of fluid from blood vessels with edema or swelling, congregation of white blood cells, which release mediators of inflammation, and engorgement of the blood vessels. Most commonly laryngitis occurs from viral infection of the laryngeal epithelial lining associated with a typical cold. The viral infection is almost always quickly conquered by the body's immune system and lasts at most a few days. This kind of acute laryngitis rarely causes any long-term problem unless the vocal folds are damaged by overuse during the illness. Examination of the larynx will show whether the vocal folds are inflamed and allows some prediction of the degree of risk for damage. Other infections of the larynx are fortunately not common but include infections with bacteria and other organisms. It is extremely rare to have infection as the cause of chronic vocal fold inflammation.

Laryngitis with a Cold

In acute laryngitis from a viral upper-respiratory infection, the swelling usually lasts for a few days at most. The voice becomes hoarse or disappears while the vocal folds are swollen. Inflammation of the larynx is also associated with increased blood flow, enlargement of blood vessels, and fragility of the blood vessel walls. This causes an increased risk of bleeding into the vocal fold. Effortful singing or speaking when the blood vessels are inflamed risks a vocal fold hemorrhage or hemorrhagic polyp. Trying to keep a usable voice quality when the vocal folds are inflamed also requires excessive muscular effort both in respiratory support and in vocal fold closure that can result in faulty technique and traumatic vocal fold injuries. Therefore, it is best to avoid performance while the vocal folds are inflamed.

Steroids

Steroids can be used to decrease some of the effects of inflammation. However, the major risk of using steroids during an episode of laryngitis is that the steroids reduce the vocal fold swelling but do not reduce the proliferation and fragility of blood vessels. Therefore, the risk of significant injury from a vocal fold hemorrhage is increased when taking steroids. Performers who experience vocal fold hemorrhage will be out of work for several months at best, and damage to the voice can be permanent. The risks of using steroids for laryngitis must be carefully weighed.

Irritative Laryngitis

Irritative laryngitis occurs when a noxious substance causes damage to the epithelial lining of the larynx which is mainly a ciliated respiratory (mucus-secreting) membrane. The covering over the vocal folds in

particular is different, a non-keratinizing squamous epithelium without cilia. The structure of the epithelium over the vocal folds is somewhat more resistant to damage than is the respiratory epithelium. However, both types of skin covering of the larynx are susceptible to irritants.

Inhaled substances are probably the most common causes of irritative laryngitis. Most frequently, the irritant is tobacco smoke, but other kinds of inhaled smoke or toxic material can also cause irritation of the laryngeal epithelium. People who work in smoke filled environments can suffer irritation from passively inhaled smoke. However, most toxic materials in the air that we breathe are filtered out by the nose, so that significant irritative laryngitis from inhalation is relatively rare except in smokers and fire victims. Irritative laryngitis from swallowed substances is very rare, even with accidental ingestion of caustic or damaging substances. This is because the swallowing reflex normally protects the larynx very effectively from swallowed material.

Postnasal Drip

In the entire upper-respiratory tract (nose, mouth, throat, trachea and bronchial tubes) and the upper gastrointestinal tract (the esophagus and stomach) the epithelial lining depends on the layer of secreted mucous to protect and keep the lining healthy. In the upper-respiratory tract this epithelium includes cilia, microscopic hairs that beat to keep the layer of secreted mucus moving toward the esophagus.

Swallowing sweeps the mucus layer into the esophagus. Nasal secretions are carried by ciliary sweeping down the pharyngeal wall and are channeled through the pharynx, behind the larynx. It may seem that secretions or drainage from the nose and sinuses could drip into the larynx and cause irritation, but, in fact, the airway protective mechanisms and the anatomy of the airway protects the larynx from being exposed to secretions from the nose and sinuses. Postnasal sensation of dripping secretions occurs when ciliary function is interrupted. These secretions almost never drip into the larynx. The sensation of postnasal drip is, however, commonly experienced with laryngeal inflammation. The cause in this case is not nasal, however, and the secretions involved come from below the larynx.

Although nasal or sinus disease almost never is the direct cause of laryngitis, allergies can cause both nasal symptoms and laryngitis-like symptoms. Recurring voice impairment from allergy is almost always associated with other upper-respiratory tract allergy symptoms and is a problem that will limit the career of a singer.

Chronic and Recurring Laryngitis

A more perplexing problem for professional voice users is laryngitis that is not associated with any signs of infection but which recurs or persists. Laryngitis that lasts weeks or months is termed chronic laryngitis. Chronic laryngitis is rarely caused by infection, but rather by irritants such as tobacco smoke, other inhaled irritants, and gastric reflux. In an otherwise healthy person, laryngitis that recurs or persists over a period of months to years is almost always caused by an irritant. Singers, voice teachers, voice students and other people for whom voice quality is a very important part of their health are becoming increasingly aware of the potential impact of irritative laryngitis on the ability to maintain voice quality and performing schedules. This review summarizes the relatively recent data on irritative laryngitis and its relationship to reflux of gastric contents.

Symptoms of Laryngitis

The symptoms of laryngeal and throat irritation or inflammation are related to the degree and location of tissue damage. The symptoms of chronic irritative laryngitis include change in voice, usually described as hoarseness (which often comes and goes), loss of voice quality with voice use, a feeling of irritation, scratchy feeling, dryness, or soreness (often worst in the morning after awakening). Pain with laryngeal movements such as speaking or swallowing, which may radiate to the ear, is typical of more severe

laryngitis. Difficulty with swallowing and pain with swallowing, chronic cough, laryngeal closure spasms, and exercise-induced upper-airway wheezing are also signs of more advanced inflammation.

The most common symptom of early mild irritative laryngitis is a feeling of postnasal drip with chronic throat clearing and a sensation of secretions in the throat. The secretions that cause the sensation of postnasal drip usually do not come from the nose but are normal mucus from the trachea and bronchial tubes which becomes lodged in the posterior wall of the larynx because normal ciliary clearance function is impaired.

Examination of the larynx with irritative laryngitis shows variable degrees of damage to the laryngeal lining. The earliest sign may be slight redness and evidence of poor clearance of mucous through the posterior larynx and pharynx. In severe chronic laryngitis, there may be ulceration of the lining, granulation tissue from exposure of injured cartilage, and severe scarring with closure of the larynx.

Gastric Reflux and Irritative Laryngitis

For people who do not smoke, the most common cause of chronic or recurring irritative laryngitis is exposure to gastric secretions that have refluxed into the pharynx through the esophagus. The acid exposure that causes most reflux laryngitis occurs during sleep. Whereas it is possible to have reflux into the upper throat during the day, this is unusual and is most often associated with prompt swallow and clearing of the refluxed material from the pharynx. Reflux into the pharynx is more likely to occur during sleep, and the material is then more likely to reach the larynx and less likely to be quickly cleared by swallow.

Performers may be particularly at risk for irritative laryngitis from reflux because of lifestyle factors that contribute to nocturnal reflux. Performers often work in the evening and wait to have dinner after their performances. Retiring while there is food or liquid in the stomach, and while the digestive process is active, predisposes to reflux during sleep. Performers are often under significant stress, which can also contribute to increased gastric acid secretion during the sleeping hours. Because irritative laryngitis is a significant problem for performers and because this cause of laryngitis is largely preventable, it is useful for singers and other voice professionals to understand the problem of reflux and laryngitis.

Gastroesophageal reflux occurs when the contents of the stomach escape the sphincter closure at the top of the stomach and regurgitate into the esophagus. The burning discomfort that may be associated with gastroesophageal reflux has been termed "heartburn." In fact, severe pain from reflux induced esophagitis or muscle spasm can be mistaken for pain of cardiac origin. Reflux into the esophagus is particularly likely when there is herniation of the stomach through the diaphragm, a condition termed hiatal hernia. The herniation is associated with loss of the normal lower esophageal sphincter and allows gastric acid secreted in the stomach to extend freely into the esophagus upon contraction of the stomach. Hiatal hernia is present in approximately 20 percent of individuals. Reflux of gastric contents into the esophagus, however, commonly occurs without hiatal hernia; therefore, reflux is not an unusual event. In most instances of reflux, the gastric juices just go into the esophagus and do not get above the upper esophageal sphincter.

The stomach normally secretes hydrochloric acid to digest food. Important digestive enzymes, such as pepsin, are also activated by the acidity of the hydrochloric acid. The stomach and also the lining of the esophagus are fairly well protected by a thick lining of mucus from damage by hydrochloric acid, and in the esophagus by the neutralizing effect of bicarbonate in swallowed saliva. However, if there is repeated or prolonged exposure of the esophageal lining to gastric acid, the gastric acid breaks through the protective mucus coating of the esophagus and causes injury to the epithelial layer that lines the esophagus.

Gastroesophageal reflux disease does not cause laryngitis unless the refluxed material is forced above the upper esophageal sphincter and into the pharynx. This rarely happens when we are awake, except in

patients with a prominent tendency to reflux, or with vomiting. However, if there is reflux to the level of the pharynx, it is much more likely to cause damage to the lining of the larynx and pharynx than to the esophagus. The ciliated respiratory epithelium that lines the larynx does not protect from acid exposure as well as does the esophageal lining. Therefore, the laryngeal and pharyngeal tissues are susceptible to injury from acid exposure that is not sufficient to cause any esophageal damage. Research studies have shown that brief application of small amounts of gastric acid to laryngeal epithelium once a day can cause chemical burn, ulceration, and scarring. Most patients with irritative laryngitis do not have symptoms of gastroesophageal reflux disease, including heartburn, and do not have any disease of the esophagus. This is because the damage to their larynx occurs from exposure to amounts of acid that are not sufficient to injure the esophagus.

One of our clinical research studies examined the hypothesis that it was hydrochloric acid that caused damage to the larynx in patients with chronic laryngitis symptoms. The study was reported in the American Journal of Medicine in 1994. Patients with symptoms and signs of chronic irritative laryngitis were put on a medication, omeprazole (a proton pump inhibitor sold under the brand name Prilosec), which, in most people, effectively blocks the secretion of acid in the stomach. Patients were followed at regular intervals, and a record was kept of their throat and voice symptoms and the appearance of their larynx and vocal folds, and recordings of their voices were made.

That study clearly showed that symptoms of laryngitis resolved, the appearance of the larynx improved, (particularly the visible redness of inflammation), and voice quality improved when patients with chronic irritative laryngitis were treated with omeprazole. Objective measurement of the degree of erythema showed that this sign of inflammation was clearly reduced with omeprazole treatment. Symptoms recurred when the subjects stopped taking the acid-blocking omeprazole. The outcome of the study supported the hypothesis that chronic irritative laryngitis was due to reflux of gastric acid into the pharynx even though patients were not aware of reflux symptoms during daytime.

The omeprazole study led to an outcome study of more than 150 patients with chronic irritative laryngitis, in which the patients were treated with precautions against reflux that occurs during sleep. The treatment was a progressively intense regimen that included avoiding ingestion of food or liquid for two hours before bedtime and elevation of the head and neck during sleep. About 50 percent of patients had resolution of their symptoms with these precautions. For patients who did not respond promptly to nocturnal anti-reflux precautions, we added a common over-the-counter acid blocker, famotidine (sold as Pepcid). Treatment progressed to increasingly higher doses of omeprazole for the subjects who continued to have laryngitis in spite of anti-reflux precautions and famotidine. That study showed that 94 percent of nonsmokers with chronic laryngitis symptoms eventually responded to treatment aimed at preventing reflux of gastric acid at night. The small number of patients who did not respond to usual doses of omeprazole did find relief with high doses of omeprazole or with surgical repair of hiatal hernia. This study strongly suggested that irritative laryngitis could be treated successfully by precautions against reflux of acid containing gastric secretions during sleep. The study also showed that patients with chronic laryngitis that clears up with anti-reflux treatment do not necessarily have hiatal hernias, usually do not have any esophageal disease, and usually do not have reflux that is apparent on a barium swallow esophageal study.

While the upper and lower esophageal sphincters provide protection against reflux while we are awake, they relax during deep sleep. When we are lying prone during sleep, the pharynx may well be located downhill from acid-secreting parts of the stomach. Furthermore, studies have shown that patients who have chronic laryngitis may be more likely to have acidification of the upper esophagus and pharynx during sleep. Signs of inflammation in chronic laryngitis are most common in the posterior larynx, just in front of the opening to the esophagus. However, in more severe reflux disease, inflammation is also seen all the way up into the upper pharynx and nose. There is considerable variation in the degree of injury, from mild symptoms that will respond to anti-reflux treatment, even though there is little evidence of laryngeal injury, to severe upper-respiratory tract changes. Our outcomes study showed that the degree of injury seen was predictive of what therapy would be needed. Patients with mild evidence of irritation in the posterior larynx were likely to respond to simple precautions against nocturnal reflux. On the other hand, patients with ulcerations and granulation tissue and severe inflammation of the entire pharynx were

likely to require high doses of proton pump-inhibiting acid blockers in order to heal. The inflammation has often been present for a long time when patients first come for treatment, and it usually takes months for symptoms to resolve after treatment is started. The chemical burn injury heals with time, if further burns are prevented. Therefore, the treatment is aimed at prevention of further injury. Relapse is common.

The effect on the voice depends on the amount of injury to the vocal folds. With mild posterior laryngitis, there may be no voice complaints. Many patients notice that the voice gives out with use and changes in quality during the day. Singers notice that their voice quality deteriorates the longer they sing. We used a computer analysis of voice characteristics to study the effect of treatment on the voices of patients with chronic irritative laryngitis. We were able to detect changes over time that we could not hear and, in some cases, that the patients did not notice. With treatment of irritative laryngitis, the voice analysis showed that the tone became more pure, with less noise, and variation in the periodicity of the vocal output was reduced. There was a statistically significant change in the voices with treatment, even when we could not hear the change from one appointment to the next.

Chronic Irritative Laryngitis is Common

Sore, irritated, or dry throats that persist for weeks are usually related to reflux. Cough that persists long after a cold is often related to reflux. Chronic cough in the absence of any detectable pulmonary disease is often related to reflux. Laryngospasms in which the vocal folds go into spasm for several seconds are usually related to reflux. Patients with reflux may awake from sound sleep with coughing and laryngospasm if the refluxed material enters the trachea. The sensation of a lump in the throat is sometimes related to reflux.

Usually irritative laryngitis starts after there has been some kind of injury to the lining of the larynx. It is likely that reflux into the pharynx of a small amount of gastric acid does not cause problems for many people when the laryngeal covering is intact and healthy. However, after acute laryngitis from a cold or influenza with damage from coughing, the larynx becomes vulnerable to injury from reflux. When there is reflux of acid on an epithelium damaged from acute laryngitis and coughing, the material is much more likely to cause a burn, and, once the epithelium is injured, it suffers greater damage with each episode of new irritation.

Prevention

Irritative laryngitis is best prevented by practicing healthy eating habits. The stomach responds to ingestion of food or liquids by turning on the digestive cycle, with secretion of hydrochloric acid and digestive enzymes. Normally, when the stomach empties, the secretory cycle slows and the stomach quiets down. In conditions of stress and with some medications, such as steroids, the stomach may secrete gastric acid even when it is not stimulated by food ingestion. Large meals with high fat content will delay gastric emptying. Therefore, to avoid having active acid secretion during sleep, one should avoid food or liquids for two to three hours before retiring. Drinking fluids during the night increases the risk of reflux, because they stimulate new acid secretion and the fluids can easily come back up during sleep. Reflux into the esophagus during sleep is less likely to affect the larynx if the position during sleep favors protection of the larynx. Elevation of shoulders and neck during sleep will prevent or significantly decrease reflux in many individuals. This is most effectively done by raising the head of the bed several inches or, alternatively, adding a foam rubber wedge-shaped mattress supplement that extends from the waist to the top of the bed. If precautions against reflux at night are being followed and throat irritation symptoms persist, medication to suppress gastric acid secretion may be necessary. The trauma of throat clearing increases likelihood of persistent laryngeal injury. Therefore, it is important to avoid throat clearing and to substitute swallowing to clear the bothersome throat secretions.

Just as it is common that chronic laryngitis develops after illness that includes coughing or vomiting, the larynx is also vulnerable to acid reflux damage after endotracheal intubation for general anesthesia. We recommend that patients who have recovered from irritative laryngitis take particular precautions against

reflux and go back on acid-suppressing medication when they have a cold or if they are at some other risk for injury to the lining of the larynx. For patients who require long-term suppression of gastric acid secretion and for patients who have esophageal symptoms, we like to prescribe treatment and follow symptoms in conjunction with a gastroenterologist.

It is important for performers to understand that not all physicians are experienced in diagnosing and treating chronic irritative laryngitis. Examination with a magnifying 90- or 70-degree telescope with a good fiberoptic light source is important for recognition of the color changes that are characteristic of laryngitis from acid irritation, but many physicians are not experienced with telescopic laryngoscopy. However, because prevention is the key treatment in irritative laryngitis and because life style changes are often the most important factors in prevention, the most important factor in treatment of chronic irritative laryngitis is patient education that results in a clear understanding of the disorder. We hope that this review is helpful to performers and to the physicians who care for them.

References

Delahunty JE, Cherry J: [Experimentally produced vocal cord granulomas](#). Laryngoscope 1968 Nov;78(11):1941-1947.

Little FB, Koufman JA, Kohut RI, Marshall RB: [Effects of gastric acid on the pathogenesis of subglottic stenosis](#). Ann Otol Rhinol Laryngol 1985 Sep;94(5 Pt 1):516-519.

Kamel PL, Hanson D, Kahrilas PJ: [Omeprazole for the treatment of posterior laryngitis](#). Am J Med 1994 Apr;96(4):321-326.

Hanson DG, Jiang J, Chi W: [Quantitative color analysis of laryngeal erythema in chronic posterior laryngitis](#). J Voice 1998 Mar;12(1):78-83.

Hanson DG, Kamel PL, Kahrilas PJ: [Outcomes of antireflux therapy for the treatment of chronic laryngitis](#). Ann Otol Rhinol Laryngol 1995 Jul;104(7):550-555.

Hanson DG, Jiang JJ, Chen J, Pauloski BR: [Acoustic measurement of change in voice quality with treatment for chronic posterior laryngitis](#). Ann Otol Rhinol Laryngol 1997 Apr;106(4):279-285.

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