



## Vocal Cord Paralysis

### *What Is Vocal Fold (cord) Paresis And Paralysis?*

Vocal fold (or cord) paresis and paralysis result from abnormal nerve input to the voice box muscles (laryngeal muscles). Paralysis is the total interruption of nerve impulse resulting in no movement of the muscle; Paresis is the partial interruption of nerve impulse resulting in weak or abnormal motion of laryngeal muscle(s).

Vocal fold paresis/paralysis can happen at any age – from birth to advanced age, in males and females alike, from a variety of causes. The effect on patients may vary greatly depending on the patient's use of his or her voice: A mild vocal fold paresis can be the end to a singer's career, but have only a marginal effect on a computer programmer's career.

### *What Nerves Are Involved In Vocal Fold Paresis/Paralysis?*

Vocal fold movements are a result of the coordinated contraction of various muscles. These muscles are controlled by the brain through a specific set of nerves. The nerves that receive these signals are the:

Superior laryngeal nerve (SLN), which carries signals to the cricothyroid muscle, located between the cricoid and thyroid cartilages. Since the cricothyroid muscle adjusts the tension of the vocal fold for high notes during singing, SLN paresis and paralysis result in abnormalities in voice pitch and the inability to sing with smooth change to each higher note. Sometimes, patients with SLN paresis/paralysis may have a normal speaking voice but an abnormal singing voice.

The recurrent laryngeal nerve (RLN) carries signals to different voice box muscles responsible for opening vocal folds (as in breathing, coughing), closing vocal folds for vocal fold vibration during voice use, and closing vocal folds during swallowing. The recurrent laryngeal nerve goes into the chest cavity and curves back into the neck until it reaches the larynx. Because the nerve is relatively long and takes a "detour" to the voice box, it is at greater risk for injury from quite different causes – such as infections and tumors of the brain, neck, chest, or voice box; as well as complications during surgical procedures in the head, neck, or chest regions – that directly injure, stretch, or compress the nerve. Consequently, the recurrent laryngeal nerve is involved in majority of cases of vocal fold paresis or paralysis.

### *What Are The Causes Of Vocal Fold Paralysis/Paresis?*

The cause of vocal fold paralysis or paresis can indicate whether the disorder will resolve over time or whether it is most likely permanent. When a reversible cause is present, surgical treatment will most likely not be recommended given the likelihood of spontaneous resolution of

the paresis or paralysis. Despite advances in diagnostic technology, physicians are unable to detect the cause in about half of all vocal fold paralyses. These cases are referred to as idiopathic (due to unknown origins). In idiopathic cases, paralysis or paresis might be due to a viral infection affecting the voice box nerves (RLN or SLN) or the vagus nerve, but this cannot be proven in most cases. Known reasons for injury can include:

**Inadvertent injury during surgery:** Surgery in the neck (e.g., surgery of thyroid gland, carotid artery) or surgery in the chest (e.g., surgery of the lung, esophagus, heart, or large blood vessels) may inadvertently result in RLN paresis or paralysis. The SLN may also be injured during head and neck surgery.

**Complication from endotracheal intubation:** Injury to the RLN may occur when breathing tubes are used for general anesthesia and/or assisted breathing (artificial ventilation). However, this type of injury is rare, given the large number of operations done under general anesthesia.

**Blunt neck or chest trauma:** Any type of penetrating, hard impact on the neck or chest region may injure the RLN; impact to the neck may injure the SLN.

**Tumors of the skull base, neck, and chest:** Tumors (both cancerous and non-cancerous) can grow around nerves and squeeze them, resulting in varying degrees of paresis or paralysis.

**Viral infections:** Inflammation from viral infections may directly involve and injure the vagus nerve or its nerve branches to the voice box (RLN and SLN). Systemic illnesses affecting nerves in the body may also affect the nerves to the voice box.

### ***What Are The Symptoms Of Vocal Fold Paralysis/Paresis?***

Both paresis and paralysis of voice box muscles result in voice changes and may also result in airway problems and swallowing difficulties.

**Voice changes:** Hoarseness (croaky or rough voice); breathy voice (a lot of air with the voice); effortful phonation (extra effort on speaking); air wasting (excessive air pressure required to produce usual conversational voice); and diplophonia (voice sounds like a “gargle”).

**Airway problems:** Shortness of breath with exertion, noisy breathing (stridor), and ineffective or poor cough.

**Swallowing problems:** Choking or coughing when swallowing food, drink, or even saliva, and food sticking in throat.

### ***How Is Vocal Fold Paralysis/Paresis Diagnosed?***

The otolaryngologist—head and neck surgeon will conduct a general examination and then question you regarding your symptoms and lifestyle (voice use, alcohol/tobacco consumption). The examination of the voice box will be undertaken to determine whether one or both vocal folds (cords) is/are abnormal. Determining whether one or both vocal folds are affected is important in the treatment plan. Other tests may be required:



Laryngeal electromyography (LEMG): LEMG measures electrical currents in the voice box muscles that are the result of nerve inputs. Measuring and looking at the pattern of the electric currents will indicate whether there is recovery or repair of nerve inputs (re-innervation) and the degree of the nerve input problem. The test involves the insertion of small needles that can measure electrical currents in the vocal fold muscles. During LEMG patients perform a number of tasks that would normally elicit characteristic actions in the tested muscles.

Other tests: Because there is a wide list of diseases that may cause a nerve to be injured, further testing is usually necessary (blood tests, x-rays, CT scans, MRI, etc.) to identify the cause(s) of vocal fold paresis/paralysis.

### ***What Is The Treatment For Vocal Fold Paralysis/Paresis?***

The two treatment strategies to improve vocal function are voice therapy, the equivalent of physical therapy for large muscle paresis/paralysis; and phonosurgery, an operation that repositions and/or reshapes the vocal fold(s) to improve voice function. Normally, voice therapy is a first treatment option. After voice therapy, the decision for surgery is dependent on the severity of the symptoms, vocal needs of the patient, position of paralyzed vocal folds, prognosis for recovery, and cause of paresis/paralysis if known.

If you have notice any change in voice quality, immediately contact an otolaryngologist—head and neck surgeon.



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