



## Unilateral Vocal Fold Paralysis

### Introduction

- Unilateral vocal fold paralysis (UVFP) is immobility of one vocal fold due to damage or dysfunction of its principal nerve input. Although the term “vocal fold immobility” is often used interchangeably with “vocal fold paralysis”, the term UVFP specifically refers to loss of function due to neurological derangement and does not include immobility due to mechanical causes such as inflammatory, neoplastic, or traumatic injury to the cricoarytenoid joint.
- Although UVFP is frequently encountered by otolaryngologists, the true incidence of UVFP is not known, due to the lack of recognition of symptoms by both patients and non-otolaryngology clinicians as well as the inability to easily examine the vocal folds without specialty training and equipment.
  - Masroor F *et al.* The incidence and recovery rate of idiopathic vocal fold paralysis: a population-based study. [Eur Arch Otorhinolaryngol](#) 2019 Jan;276(1):153-158. PMID 30443781. Retrospective cohort study of a 3 million patient database in California from 2008 to 2014, which found an average combined incidence of UVFP and paresis of 1.04 per 100,000 per year.

### Pathophysiology

- UVFP results from injury to the efferent motor input to the vocal folds at any point along the neuromuscular pathway from the brainstem to the intrinsic laryngeal muscles. It is distinct from vocal fold fixation or The most common causes of UVFP include:
  - Iatrogenic injury from surgery in the neck or skull base
  - Compression from a non-laryngeal primary malignancy along the course of the vagus or recurrent laryngeal nerve (most commonly a lung neoplasm)
  - Idiopathic (believed to most likely be of viral etiology)
  - Less common causes include identifiable infectious etiologies (i.e. Lyme disease), brainstem injury (i.e. stroke), or systemic neurologic diseases such as multiple sclerosis.
- The reported frequency of various etiologies of vocal fold paralysis varies widely in the literature, and is influenced by factors including practice setting, patient demographics,



referral patterns, volume of at-risk procedures performed at different institutions, and decade of publication.

- Sulica L, Blitzer, A (ed). Vocal Fold Paralysis. Ch 3, p 33-49; Springer 2006. Chapter reviews reported etiologies of UVFP throughout the historical literature.

### **Diagnosis and Assessment**

- A careful medical history should be taken to assess for a possible underlying cause, as well as to determine the degree of functional limitation in voice, swallowing, and laryngeal airway protection.
- The symptoms of UVFP may include dysphonia most commonly characterized by weak, breathy voice; inability to raise vocal volume; weak cough; dyspnea with voice use; or coughing or choking with oral intake (particularly liquids).
- The diagnosis is confirmed by laryngoscopy or videostroboscopy showing immobility of the affected vocal fold. Additional features which should be noted include the resting position of the affected vocal fold, the size of the glottal gap, the degree of atrophy of the affected vocal fold, and the presence of any concurrent lesions that may suggest a non-neurological cause of vocal fold fixation, such as an infiltrative or neoplastic process of the larynx.
- Electromyography may be considered in cases where the status of the nerve is uncertain, or to assist in prognostication for spontaneous vocal fold recovery
- In cases of idiopathic UVFP, a cross-sectional contrast-enhanced imaging study such as CT or MRI encompassing the course of the recurrent laryngeal nerve should be performed to rule out a compressive mass lesion.
- Additional workup for idiopathic UVFP, although often not necessary, may be considered based on the patient's history and the clinician's suspicion. Tests may include brain imaging and serology for infectious etiologies.
  - Misono S, Merati AL. Evidence-based practice: evaluation and management of unilateral vocal fold paralysis. *Otolaryngol Clin North Am* 2012 Oct;45(5):1083-10. PMID 22980687. Good overview of workup of UVFP.
  - Kang BC *et al.* Usefulness of Computed Tomography in the Etiologic Evaluation of Adult Unilateral Vocal Fold Paralysis. *World J Surg* 2013 Jun;37(6):1237-1240. Prospective study of 153 patients with UVFP with unknown etiology who



underwent both contrast-enhanced CT of the neck and chest and CXR to identify a cause for their UVFP. CT yielded an etiology in 24% of patients; the remaining 76% were deemed idiopathic. CXR identified a mass in only 40% of patients who had a positive finding on CT.

### Treatment

- The goals of treatment of unilateral vocal fold paralysis are two-fold: 1) address the underlying cause, and 2) improve or eliminate functional deficits in voice, swallowing, and the airway protective reflexes. Accordingly, determination of the appropriate intervention is based on both the underlying cause as well as the degree of functional deficit experienced by the patient.
- At present there is no rigorously studied intervention that has been shown to improve the rate of recovery in idiopathic vocal fold paralysis. However, animal studies as well as studies of nerve injury in other anatomic locations have suggested that calcium channel blockers such as nimodipine may increase both the speed and likelihood of recovery in incomplete nerve injuries. Early observational studies of nimodipine in humans also suggest an increased rate of spontaneous recovery, but additional research is needed.
- Since no currently available treatment can restore meaningful vocal fold motion, surgical intervention is aimed at restoration of glottal competence by medialization of the paralyzed vocal fold. This can be accomplished by temporary means, in the way of injection laryngoplasty, or in permanent fashion, by way of medialization laryngoplasty or arytenoid adduction.
- Behavioral voice therapy has been shown to be effective in rehabilitation of the weak, breathy voice quality seen in UVFP both as a stand-alone intervention as well as in conjunction with surgical treatments.
- Laryngeal reinnervation, most commonly in the form of an ansa cervicalis to recurrent laryngeal nerve anastomosis, is gaining increased attention in treatment of unilateral vocal fold paralysis. Although this technique does not restore vocal fold motion due to the lack of topographical organization of the adductor and abductor fibers of the RLN, it can restore vocal fold muscle tone and bulk. For this reason, it is often performed in combination with a medialization procedure to optimize the resting position of the vocal fold for full glottal closure during phonation and deglutition.



- Rosen CA *et al.* Prospective investigation of nimodipine for acute vocal fold paralysis. [Muscle Nerve](#) 2014 Jul;50(1):114-8. PMID 24639294. Open-label, prospective non-randomized study of 28 patients with VFP of less than 4 months duration who received nimodipine 30mg tid for 2-3 months. A recovery of purposeful motion was seen in 60% of patients, which was significantly higher than historical comparisons using similar selection criteria.
- Sulica L, Blitzer, A (ed). Vocal Fold Paralysis. Ch 7, p 87-96; Springer 2006. Chapter reviews voice therapy for UVFP including timing and types of interventions, assessment of counterproductive compensations, and results of therapy.
- Siu J *et al.* A comparison of outcomes in interventions for unilateral vocal fold paralysis: A systematic review. [Laryngoscope](#) 2016 Jul;126(7):1616-24. PMID 26485674. Broad literature review of the four main surgical interventions for UVFP.

### Prognosis

- The prognosis of UVFP depends on numerous factors including the cause and severity of the injury, the location of the injury, and patient-specific factors such as age and baseline functional status. A small percentage of patients are largely asymptomatic without intervention, whereas most experience significant limitations in voice and swallowing, and some may suffer life-threatening consequences due to uncontrolled aspiration.
- Laryngeal electromyography may assist in prognostication of likelihood of recovery in UVFP, but its use is not standardized.
- UVFP that is due to nerve transection is not expected to recover. However, UVFP that is not due to nerve transection may spontaneously recover. The rate of recovery is most influenced by the severity of the injury: simple neurapraxic injuries almost always recover within days to weeks, whereas higher grade nerve injuries may take weeks to months and may have some residual weakness. The majority of recoverable vocal fold function occurs within the first 6 months after nerve injury. Although the classic teaching was to wait one year prior to consideration of permanent medialization procedure, a recent study has suggested that most patients who have recovery of motion do so in the



first 6 months, and that patients who have persistent UVFP past the 6 month time point may be considered for a permanent medialization procedure.

- Smith LJ *et al.* Vocal fold motion outcome based on excellent prognosis with laryngeal electromyography. [Laryngoscope](#) 2016 Oct;126(10):2310-4. PMID 27242070. Found an 80% rate of spontaneous recovery in patients with LEMG findings associated with excellent prognosis (good to normal motor recruitment, no signs of denervation, and no signs of synkinetic activity); supporting the use of LEMG in prognostication of recovery.
- Mau T *et al.* The natural history of recoverable vocal fold paralysis: Implications for kinetics of reinnervation. [Laryngoscope](#) 2017 Nov;127(11):2585-2590. PMID 28608475. Describes a hybrid distribution of time to recovery of UVFP, and suggests that most cases of UVFP will recover within 6 months after nerve injury, and that a 6 month time frame is reasonable before deciding on a permanent medialization procedure.