



**OVERVIEW OF DIAGNOSIS,  
TREATMENT AND PREVENTION**

# **PHONOMICROSURGERY**

# Phonomicrosurgery: Highlights

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## In Brief

Phonomicrosurgery is a specialized form of phonosurgery. In phonomicrosurgery, surgeon-voice specialists use microsurgical techniques and instruments to treat abnormalities on the vibratory edge of the vocal fold, thus helping a patient regain or improve voice function.

- **Phonosurgery:** Surgery to improve voice
- **Microsurgery:** Surgery performed with microscopic detail; the location of the procedure is viewed through an operating microscope and the procedure is performed using microsurgical instruments

## Recent Advances

Increased understanding of voice function and new instrumentation have allowed phonomicrosurgery to become an effective treatment option for patients with certain voice disorders that are due to vocal fold abnormalities and that have not responded to medical or voice therapy.

## Need for Voice Therapy

Most patients who require phonomicrosurgery will also require postsurgical voice therapy.

## Working Philosophy

To improve voice function in patients with voice disorders, the surgeon must remove the abnormal tissue while preserving the normal surrounding tissues. The use of magnification and fine microsurgical instruments makes this possible.

# Understanding Phonomicrosurgery

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## What is phonomicrosurgery?

Phonomicrosurgery is a key surgical treatment for certain voice disorders.

### Working Definition

Phonomicrosurgery	Microsurgery	Phonomicrosurgery
<i>voice improvement</i> Surgery to improve or restore voice	<i>microscopic scale</i> Surgical procedures performed through an operating microscope using specialized microsurgical instruments	<i>phonosurgery + microsurgery</i> <ul style="list-style-type: none"><li>• Microsurgical techniques applied to phonosurgery</li><li>• Use of an operative microscope allows highly magnified views of the fine layers of the vocal folds</li><li>• Microsurgical instruments allow surgical manipulation of delicate structures of the vocal folds while minimizing damage to surrounding normal tissue</li></ul>

## Access to the Voice Box Through a Laryngoscope

Phonomicrosurgery is usually performed through a rigid tube called a laryngoscope that is inserted through the mouth. This tube provides an avenue for the microscope viewing field, as well as the passageway for the surgical instruments.

## General Anesthesia

Phonomicrosurgery is performed with the patient "completely asleep" under **general anesthesia**.

## Working Philosophy

To obtain the best results, the surgeon must remove the diseased tissue or lesions while preserving the normal functional vocal fold tissues. The use of magnification and delicate instruments makes this possible.

# How Phonomicrosurgery Is Done

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## How is phonomicrosurgery performed?

Phonomicrosurgery is an extremely complex and precise technique that involves several elements.

### **Element 1: Voice Box Viewed and Reached Through a Laryngoscope**

The phonosurgeon visualizes the larynx (voice box) through a laryngoscope that is gently inserted into the mouth and advanced down the throat to expose the larynx. In addition, surgical instruments reach the vocal folds through this tube.

### **Element 2: Magnified View of the Vocal Folds Through a Microscope**

The vocal folds are viewed through an operating microscope, which provides a clear, magnified image. The magnified image is often displayed on a monitor for unrestricted viewing.

### **Element 3: Re-Examination of Vocal Folds**

Before proceeding, the surgeon re-examines the vocal folds with greater magnification. Careful inspection of the tissues with particular instruments allows a re-assessment of the abnormality of the vocal folds to:

- Reconfirm the diagnosis
- Examine the extent of the abnormality
- Find other abnormalities that may have not been identified

### **Element 4: Microsurgery: Long Instruments Passed Through Laryngoscope**

Specialized instruments are then used to perform surgery on the vocal folds under magnified views through a microscope. Precise surgical manipulations remove the abnormalities while preserving normal tissue, which is key to successful treatment of a voice disorder and improvement or preservation of voice function.

### **Element 5: "Cold Steel" Instruments and Lasers**

Phonomicrosurgery can be performed with metallic instruments (so called "cold steel") and/or various lasers (laser beams) that can be adjusted and aimed to cut or vaporize tissue.

# Phonomicrosurgery: Indications

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## When is phonomicrosurgery recommended as treatment for voice disorders?

### General Indications

The phonosurgeon, often working in concert with a speech pathologist and/or voice care team (see *Voice Care Team*), will recommend phonomicrosurgery to patients with voice disorders caused by:

- Vocal fold abnormality that is unlikely to respond to voice therapy or medical management
- Vocal fold abnormality that has not responded to a trial of voice therapy and/or medical therapy
- Vocal fold abnormality that is "suspicious" for cancer (atypia, early cancer) (*For more information, see Laryngeal Atypia and Early Cancer.*)

### Specific Indications

In combination with medical and voice therapies when necessary, as well as lifestyle changes when applicable, phonomicrosurgery can be effective in treating and improving the voice function of patients with the following voice disorders:

- Vocal fold nodules
- Vocal fold polyps
- Vocal fold cysts
- Vocal fold pseudocysts
- Vocal fold granulomas
- Vocal fold vascular lesions
- Vocal fold papillomatosis
- Vocal fold atypia or leukoplakia
- Laryngeal early cancers
- Vocal fold scarring (to some extent)

## What are key factors in successful phonomicrosurgery?

### Correct Diagnosis Is Key

As with any treatment strategy, the most important factor in achieving the best surgical result is in making the proper diagnosis. In some cases, the diagnosis needs to be made by microlaryngoscopy (while viewing the vocal folds with an operating microscope).

### Accurate Delineation of Abnormality and Surrounding Normal Areas

It is equally important to assess the extent of involvement of surrounding tissue, since preserving normal tissue is critical to adequate healing and the restoration or improvement of voice function.

### Surgical Competence and Skills

The experience and skills of the operating surgeon are central to the success of phonomicrosurgery.

## Is phonomicrosurgery similar to other types of surgery?

In many ways, the principles of phonomicrosurgery are the same as the basic principles of surgery, but with a higher expectation of precision.

- **Adequate exposure:** It is important to have adequate exposure (open surgical area) so the tissues can be easily visualized and manipulated.
- **Preserve normal tissue:** Tissues must be handled gently to minimize damage to normal structures, which should be carefully preserved when removing the abnormal tissue.
- **Control of bleeding:** Bleeding should be prevented or controlled so the microscopic structures are easily visualized, facilitating dissection.
- **Minimize postsurgical scarring:** Postsurgical healing should be facilitated to minimize scarring that might be detrimental to voice function.

# Phonemicsurgery: Strategies

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## Equipment Plays Key Role

Successful phonemicsurgery is based on the use of equipment that gives the best unobstructed magnified view of the vocal folds and the use of the most delicate instruments for handling the tissue.

## Preservation of Superficial Lamina Propria

Most benign or non-cancerous vocal fold lesions are within the upper sublayers of the vocal fold (epithelia, basement membrane, and superficial lamina propria – the vocal fold mucosa). These upper layers are fairly elastic and vibrate most during voice production. Benign vocal fold lesions seldom extend deeper than the superficial lamina propria, so removal of lesions need not damage deeper structures of the vocal folds. *(For more information, see Anatomy & Physiology of Voice Production.)*

### Key Information

Removal or destruction of superficial lamina propria causes the epithelium to adhere to the deeper vocal fold structures, restricting vocal fold vibration and making the voice harsh and breathy. *(For more information, see Anatomy & Physiology of Voice Production.)*

## Preservation of Vocal Ligament

The **vocal ligament** is composed of the intermediate and deep laminae propria, which contain collagen fibers that are stronger and more rigid than the superficial lamina propria contained in the mucosa. The vocal ligament is thought to be responsible for transmitting the action of the vocal fold muscles up to the mucosa, thus allowing vibratory function to occur. Cutting into the vocal ligament can result in a proliferation of cells that produce scar tissue. Scar tissue decreases vocal fold vibration – without proper vocal fold vibration, the voice can be breathy, harsh, or hoarse, which can then result in voice fatigue, voice strain, etc. *(For more information, see Anatomy & Physiology of Voice Production.)*

## Staying in the Proper Surgical Plane

During phonemicsurgery, it is critical to identify the vocal fold layers, preserve the superficial lamina propria – a layer that is central to vocal fold vibration, and stay in the proper dissection plane. Surgeons often inject saline or other solutions in the plane of the superficial lamina propria to delineate it for optimal preservation.

## Minimally Invasive Surgery Principles

As voice research has revealed the importance of the cellular and non-cellular protein substances in the vocal fold, voice surgeons have used smaller and smaller incisions to afford optimal tissue preservation.

## Avoiding "Secondary Intention Healing"

It is important to preserve as much of the normal tissue as possible and to cover any exposed deeper layers with epithelium (the lining cover) in order to avoid "secondary intention healing." Secondary intention healing is healing by a process of granulation and scarring, both of which impede or destroy vocal fold vibration.

# The Patient's Role In Phonomicrosurgery

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## Key Role of Patient in Recovery of Voice Function

The results of phonomicrosurgery can be either improved or impaired by the patient. Examples are presented below.

- If a patient has backflow of stomach fluids to the voice box (**laryngopharyngeal reflux**), the patient should carefully follow physician recommendations for the aggressive treatment of the reflux, especially during the perioperative period. (*For more information, see Reflux Laryngitis.*)
- If the voice disorder results from voice abuse or excessive voice use, the patient must correct these voice behaviors to avoid delayed healing or relapse of the voice disorder.
- The patient must also address other aggravating factors, such as allergies, smoking, and other environmental factors, in order to ensure the best outcome.

## Elimination of Bad Vocal Habits

Patients should design a plan for postoperative voice care with their surgeon and/or speech pathologist before the surgery. In some instances, patients may be instructed to perform certain exercises that will help eliminate bad voice habits after the surgery, thus promoting proper healing.

## Voice Rest

Voice rest is often prescribed for a certain period of time following phonomicrosurgery. It is always wise to limit voice use after surgery on the vocal folds. Talking, straining, and coughing can cause trauma to the vocal folds and delay healing. Although strict/complete voice rest is often only necessary for a short time after surgery, it is advisable to limit voice use for an additional week or more.

### Key Information

- Patients are often tempted to try out their voice soon after surgery – but this is a bad idea since it might delay healing or cause damage to the healing tissues.
- Patients should not expect immediate results from many types of phonosurgical procedures because it may take some time for swelling to subside and healing to occur.
- Patients must follow the voice care team's specific recommendations for voice rest, vocal hygiene, and postoperative vocal tasks to optimize the outcome of surgery. (*For more information, see Prevention.*)

# Phon microsurgery: Vocabulary

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## **Phon microsurgery**

Highly specialized surgery to improve voice (phonosurgery) using microsurgical techniques and highly magnified views (microsurgery) in order to provide microscopic detail

## **Superficial Lamina Propria (Reinke's space)**

Top layer of the laminae propria that plays a key role in vocal fold vibration; loosely structured; located just underneath the cell lining (epithelium) covering the vocal fold

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