PHONOSURGERY:
Overview of role of surgery for hoarseness

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University of Nebraska Medical Center
Nebraska Medicine

Disclosures

I have no financial interests

I will briefly mention injectables used off-label, such as Botox (onabotulinum A, *Allergan, Inc.*), Restylane (hyaluronic acid, *Medicis*),

Overview

- Objectives
- Definitions
- Anatomy and Physiology review
- Selected vocal pathology and Surgical Treatment

Objectives

- Define common terms with respect to disordered voice
- Review anatomy of the larynx
- Describe selected pathologic voice conditions and their specific phonosurgical management

What is Phonosurgery

- Surgery that maintains, restores, or enhances the human voice
- May include
  - Vocal cord injections
  - Laser treatment
  - Phonomicrosurgery (removal of lesions off of vocal fold
  - Thyroplasty and other laryngeal framework surgery
  - Laryngeal reinnervation

von Leden H. The history of phonosurgery. In: Ford CN, Bless DM, eds. Phonosurgery: assessment and surgical management of voice disorders. New York: Raven Press, 1991:3-24.

REVIEW OF ANATOMY AND PHYSIOLOGY

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Vocal Anatomy

- Vocal tract
- Laryngeal musculature
- Laryngeal innervation
- Vocal fold microanatomy

Anatomy: Vocal Tract

Resonator

- Oral Cavity
- Pharynx
- Sinonasal Tract

Vibrator

- Larynx

Air Pressure System

- Lungs and surrounding musculature and chest walls

Anatomy:
Laryngeal Musculature

Action of transverse arytenoid muscle
Adduction of vocal ligaments

Action of vocalis and thyroarytenoid muscles
Shortening (relaxation) of vocal ligaments

Action of lateral cricoarytenoid muscles
Adduction of vocal ligaments

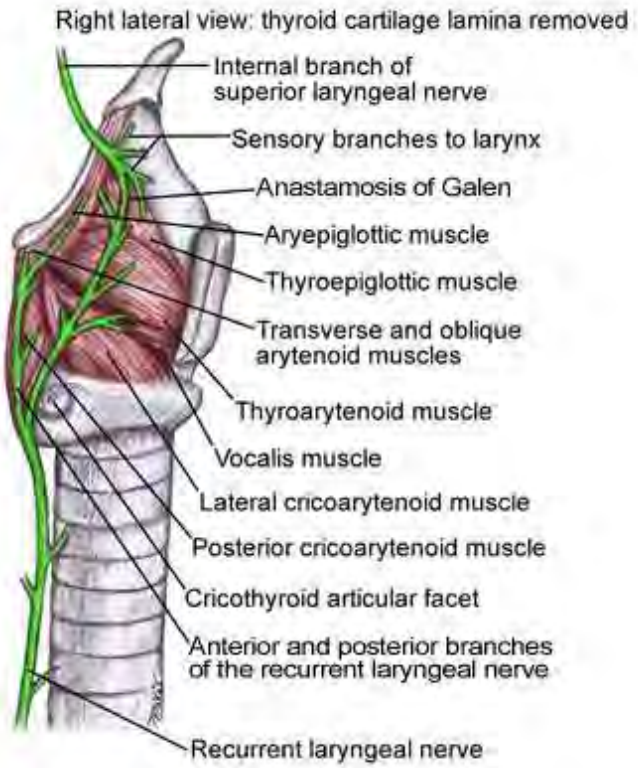
ADduction

Action of posterior cricoarytenoid muscles
Abduction of vocal ligaments

Abduction (1 muscle only!!!)

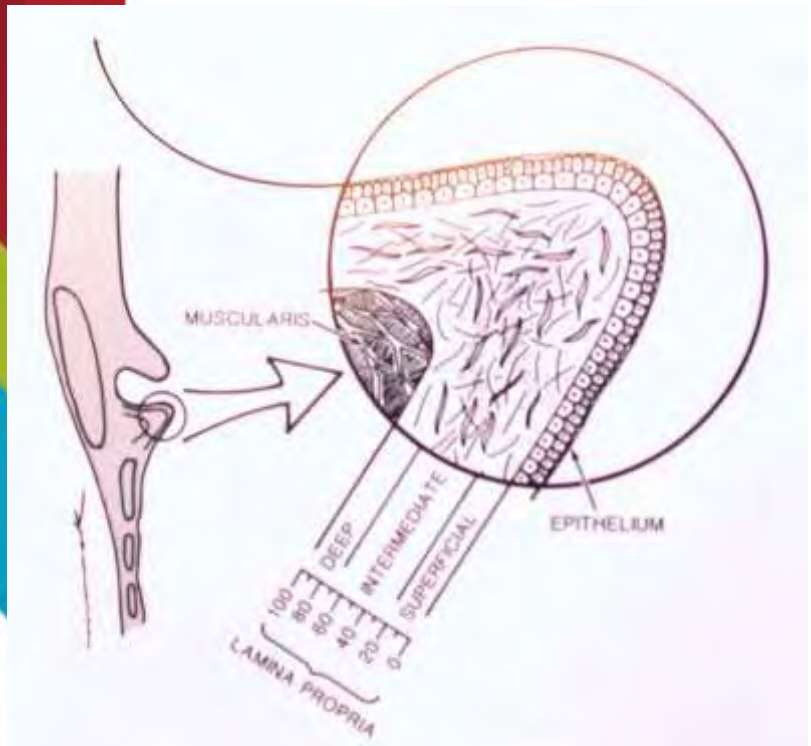
Anatomy: Laryngeal Innervation

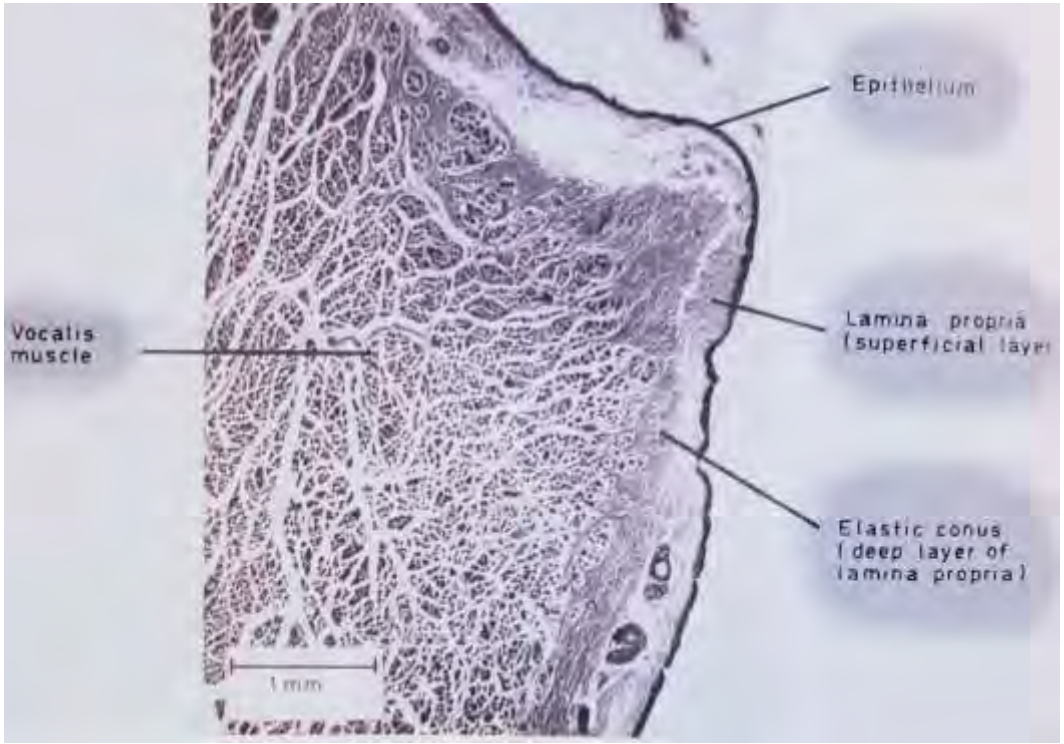
- Superior laryngeal nerve
  - Cricothyroid muscle
- Recurrent laryngeal nerve
  - Glottic intrinsic muscles



http://www.aafp.org/afp/2009/0815/p363.html
http://emedicine.medscape.com/article/1923100-overview

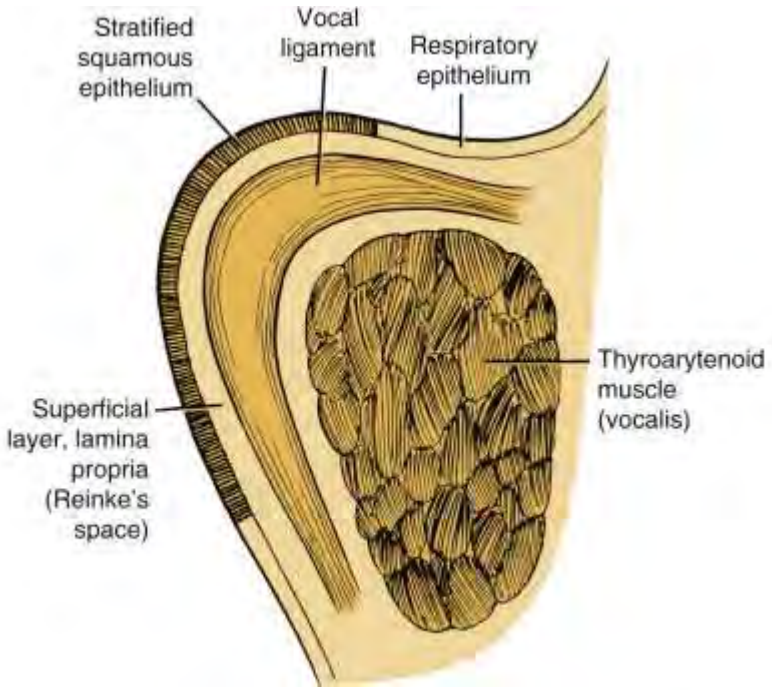
Anatomy:
Vocal Fold Microanatomy





Vocal Fold Microanatomy: Cover and Body Model (Hirano, 1974)

- **Body: Thyroarytenoid muscle**
- **Cover: no muscular tissues superficial to the muscle**
  - Cover vibrates over top of the body
  - **Superficial layer of lamina propria –** gelatinous layer allowing mucosa to oscillate



Stroboscopy of my VFs!

VOCAL PATHOLOGY AND PHONOSURGERY

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Selected Vocal Pathology and Phonosurgery

1. Spasmodic Dysphonia
2. Unilateral Vocal Fold Paralysis
3. Vocal Fold Lesions
    A. Vocal Nodules
    B. Vocal Polyps
    C. Vocal Cysts
4. Recurrent Respiratory Papilloma
5. Vocal Cord Cancer

Vocal Pathology:
1. Spasmodic Dysphonia (SD)

- A focal dystonia of the larynx
- **Task specific**
- Characterized perceptually by **instability**
  - **Strained / strangled** voice
  - Intermittent **voice breaks**
  - **Breathy breaks**

- Voice therapy generally not helpful
- Botox injections standard of care

Blitzer A, Crumley RL, Dailey SH, et al. Recommendations of the Neurolaryngology Study Group on laryngeal electromyography. *Otol—head neck surg. 2009;140(6):782–793.*

SD- Types

ADductor SD
- Most common
- Vocalis m. predominantly
- **Strangled** voice quality

A**B**ductor SD
- Rare
- PCA m.
- **Breathy breaks**

Mixed SD
- Rare
- Presence of both adductor and abductor SD
- Presence of SD and muscle tension dysphonia
- Presence of SD and tremor

Awake vocal cord procedure in clinic

Photos courtesy of Seth Dailey, M.D.

Example of Botox In Office

Vocal Pathology:
2. Unilateral Vocal Fold Paralysis (UVFP)

- Breathy quality
- Decreased loudness
- Sometimes increased pitch
- Sometimes diplophonia
- Low Maximum phonatory time

- Often take multiple breaths just to finish their sentences

Unilateral Vocal Cord Paralysis- Findings on Laryngoscopy

Forward tilted arytenoid

Loss of movement

Loss of muscle tone

Bowing of the vocal fold

Aynehchi BB, McCoul ED, Sundaram K. Systematic review of laryngeal reinnervation techniques. *Otolaryngology--head and neck surgery*. 2010;143(6):749–59.

UVFP Stroboscopy

UVFP
Goals of Surgery

"Close the Gap"

But also achieve SYMMETRY of VF

- Tone
- Bulk
- Contour
- Pliability

UVFP
Surgical Options

- Injection laryngoplasty (aka augmentation)
- Thyroplasty

UVFP
Injection Laryngoplasty

- Temporary solution
- Injectable fillers with different durations of action, routes of administration, safety profile and cost
- **Does NOT fix pharyngeal muscular or sensory dysfunction!**

Example of Injection Laryngoplasty

UVFP
Thyroplasty

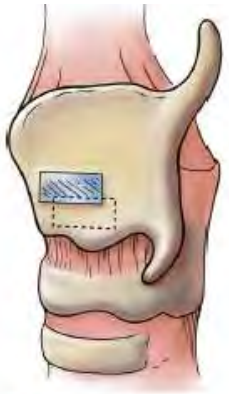


Fig. 37.4 Original window/implant and the outline of the "new" ideal window dimension superimposed

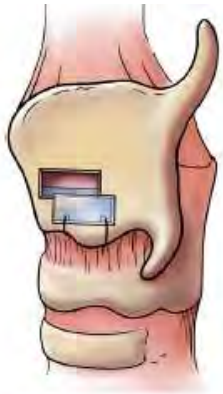


Fig. 37.5 Combined rotation window that is created. Note the secure position of the implant

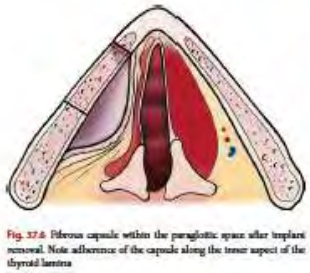


Fig. 37.6 Fibrous capsule within the paraglottic space after implant removal. Note adherence of the capsule along the inner aspect of the thyroid lamina

Fig. 37.7 Sharp incision through the fibrous capsule along the margin of the window

UVFP
Laryngoscopy after Thyroplasty

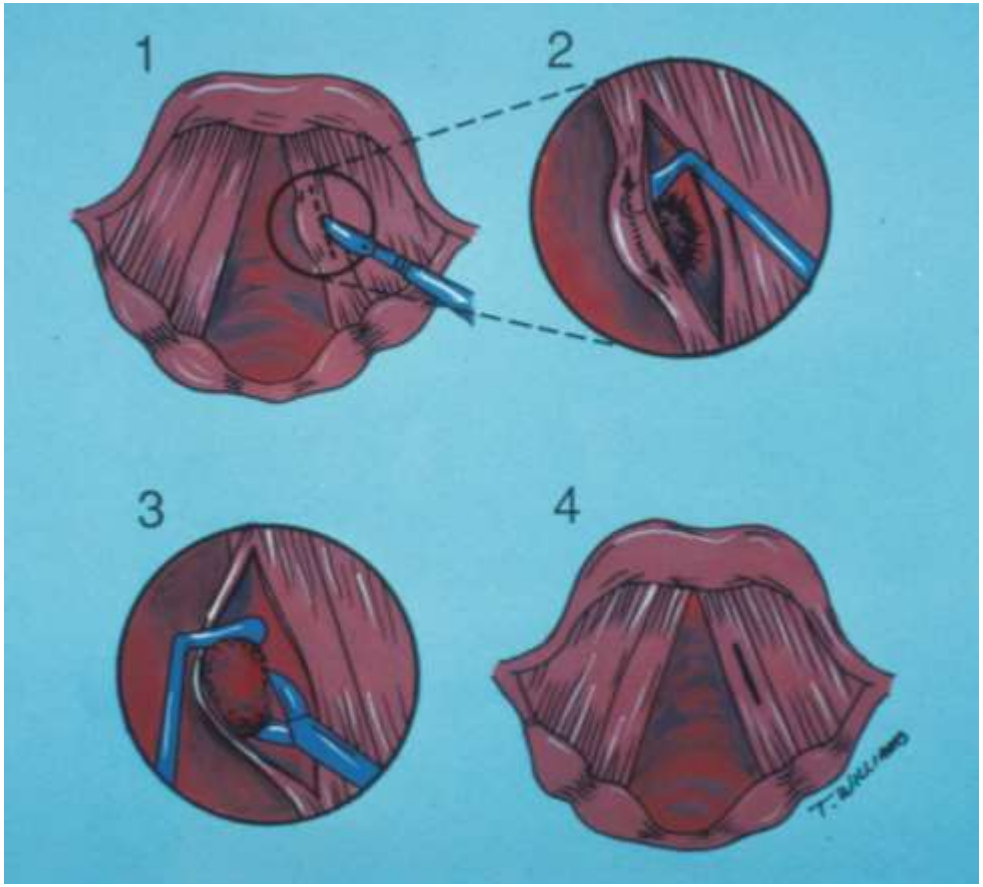
Vocal Pathology:
3. Benign Vocal Fold Lesions

Almost always traumatic, irritative, or overuse/abuse

- Vocal nodules
- Polyps
- Cysts

Surgery usually performed with microsurgical technique

Microlaryngeal Surgery



- Operating room with microscope under general anesthesia
- Goals to minimize mucosal trauma / prevent scarring
- RESPECT SLP!

Vocal Nodules- Symptoms and Endoscopic Findings

Hoarseness, rough with vocal fatigue

Vocal abuse

Singers

- Inability to sing high notes
- Talking voice may NOT be affected

Midpoint of membranous segment

Often symmetric and <u>bilateral</u>

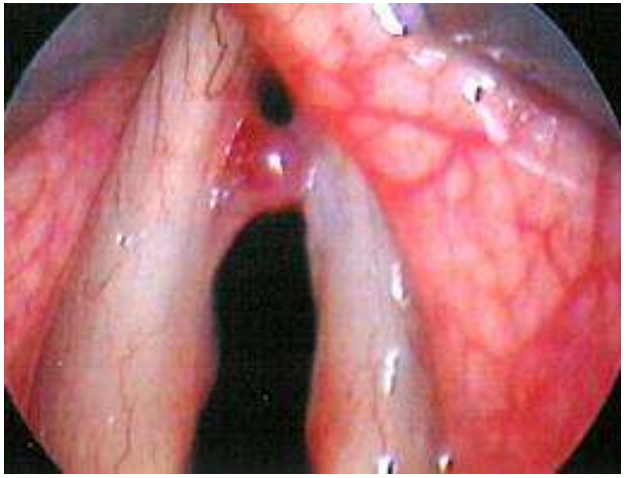
Vocal Nodules- Treatment

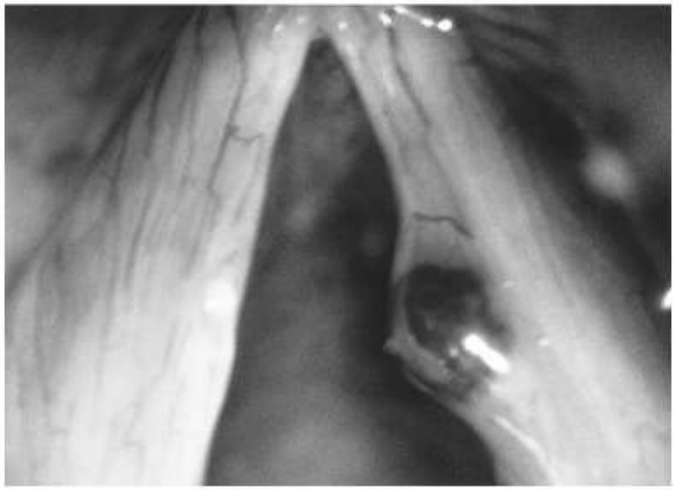
- Hydration
- Management of allergies, and GERD/LPR
- **Voice therapy gold standard**
- Surgery seldom needed

Polyp

History

- Severe, intermittent voice use
- History of antiplatelet or anticoagulant meds
- Men > women (unless h/o capillary ectasia)

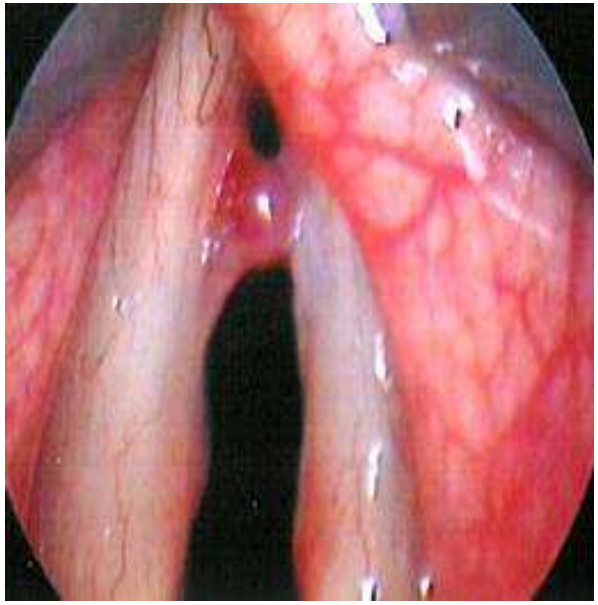




Vocal Polyp
Symptoms and Endoscopy

Sudden onset of hoarseness after extreme voice use, with persistent rough, raspy quality

Unilateral polyp, dark and filled with blood



Vocal Polyp Treatment

- Stop any anticoagulant/antiplatelet meds
- Voice therapy often successful for small polyps
- Surgery is usually needed
  - Can be cut or laser applied

Vocal Fold Cysts

Cysts may rupture and progress to sulcus

History

- Mucus retention cyst: Often no voice abuse/risk factors
- Epidermoid inclusion cyst: Similar risk factors to vocal fold nodules (voice overuse, etc)

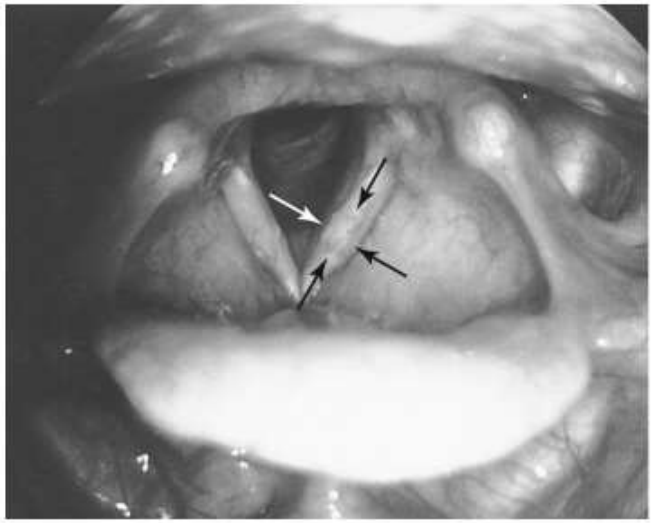
Symptoms

- Epidermoid cysts cause greater hoarseness than what would be expected, mucus retention cysts cause less

Vocal Fold Cysts

Treatment

- Generally require surgery
- Voice therapy sometimes helpful if vocal abuse, and may be enough to help



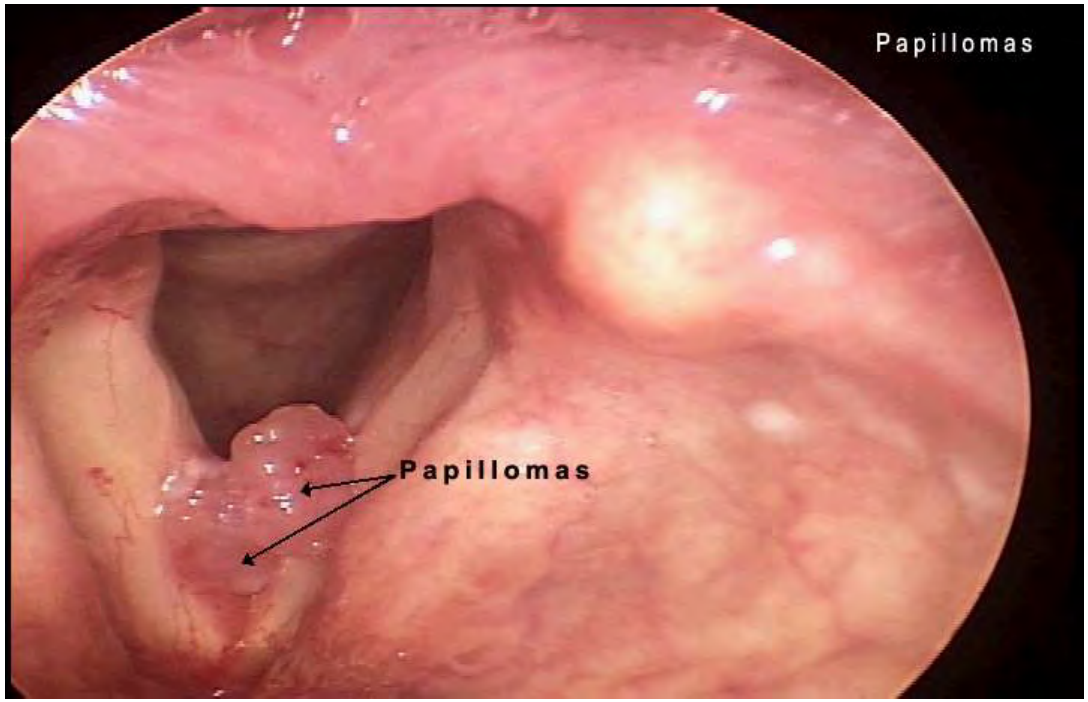
Microlaryngeal surgery of Cyst

Vocal Pathology
4. Laryngeal Papillomas

Caused by HPV

Can transform to cancer

Grape-like cluster appearance



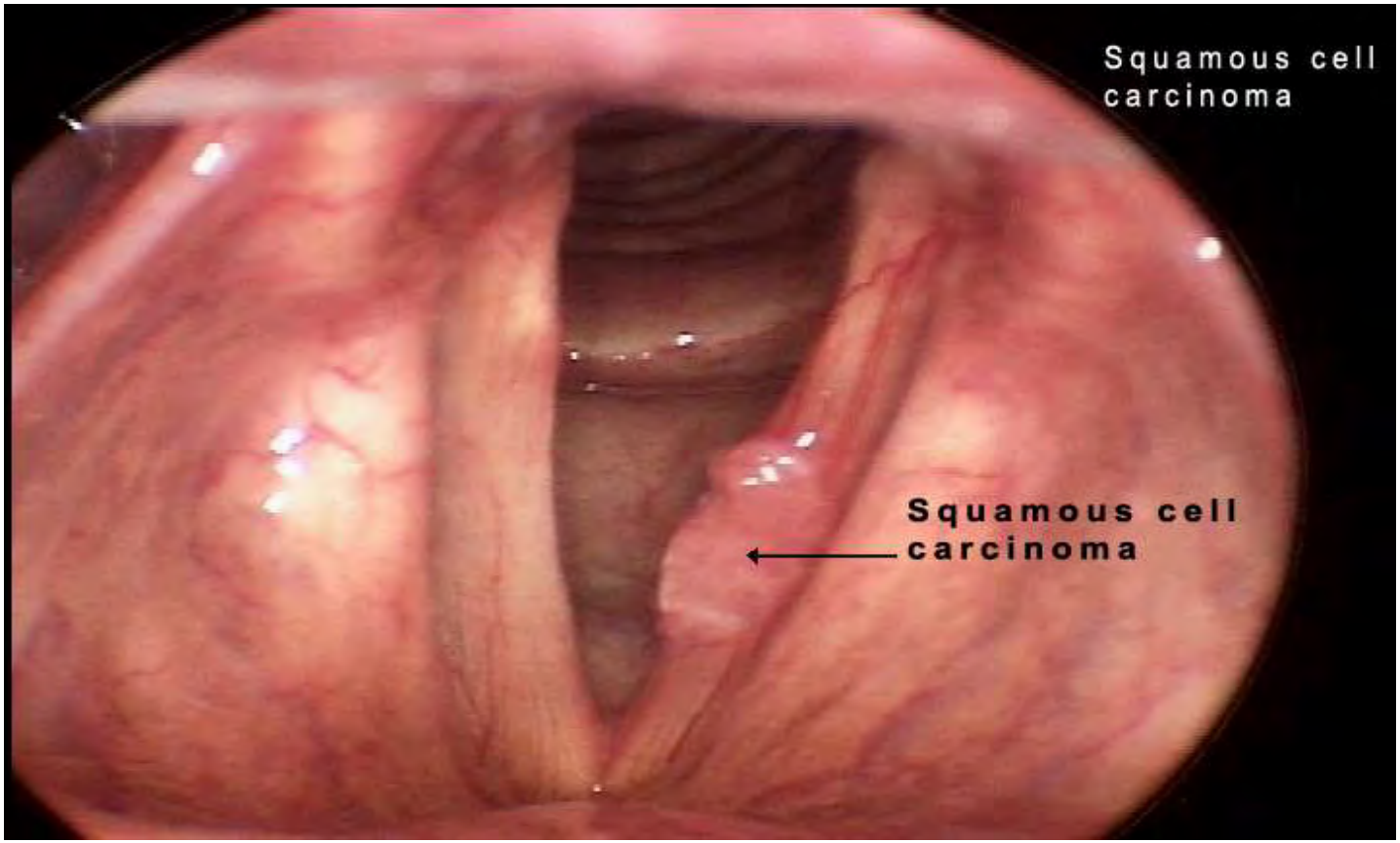
Laryngeal Papilloma Treatments

- Cold instrument excision
  - Microscissors and microforceps
  - Microdebrider
- Laser ablation

Laryngoscopy with Laser Treatment

- KTP or TruBlue
- Best absorbed by blood vessels
- Superficial thermal damage to avoid scarring
- Indications
  - Papilloma, leukoplakia, polyps, ectasia/varices, polypoid corditis, vocal fold granuloma, vocal fold scar

Vocal Pathology:
5. Laryngeal Cancer



Laryngeal Cancer

- Risk Factors- Tobacco, EtOH
- MANDATORY laryngeal examination if hoarseness > 3 weeks
- Can be treated with surgical excision or radiation

Voice Rest???

The Laryngoscope
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Current Practices for Voice Rest Recommendations After Phonomicrosurgery

Ashwini Joshi, PhD, CCC-SLP; Michael M. Johns III, MD

Objectives/Hypothesis: The aim of this study was to understand current protocols for voice rest implemented by laryngologists immediately after phonomicrosurgery for benign vocal fold lesions.

Study Design: Cross-sectional survey.

Methods: A 24-item survey was sent via electronic mail to laryngologists across the country to gather data on their recommendations of type and dosage of voice rest, factors involved in this decision, and recommendations for other behavioral modifications.

Results: A majority of the laryngologists implement 7 days of complete voice rest for nodules, cysts, polyps, and Reinke's edema, 1 to 4 days for leukoplakia and papilloma, and over 8 days of relative voice rest for most lesions. A majority of the laryngologists also employ a combination of complete and relative voice rest.

Conclusions: The more common recommendation for complete voice rest is 7 days for nodules, cysts, polyps, and Reinke's edema, and 1 to 4 days for leukoplakia and papilloma. Relative voice rest when recommended is typically recommended for over 8 days. Voice rest recommendations were not affected by surgery type alone, but were determined by either lesion type alone or lesion type combined with surgery type.

Key Words: Voice rest, voice conservation, phonomicrosurgery, postoperative voice rest.

Level of Evidence: 4.

***Laryngoscope*, 128:1170–1175, 2018**

Summary

- Voice therapy is the gold standard for most vocal disorders
- Laryngoscopy is mandatory for chronic hoarseness before beginning voice therapy
- Most voice disorders that require surgical treatment should have peri-surgical voice therapy
- Total strict voice rest is seldom used by laryngologists except in the case of post-phonosurgical care

QUESTIONS?

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