SML for SLPs

16th Voice Conference: Diagnosis and Treatment of Voice and Swallowing Disorders with Laryngeal Imaging Hands-On Instruction

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JOHNS HOPKINS MEDICINE

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Principles

1. Know when to operate
2. Have clearly defined operative goals
   - *Physiology informs technique*
   - Remove disease
   - Preserve vibratory tissue
3. Use the right tools for the job

Pre-operative Decision Making

- *Shared* decision between surgeon, patient
- Patient complaints
- Patient voice needs / obligations
- Exam findings
  - Benign? Malignant?
- Response to non-surgical therapies

Balance Risks and Benefits

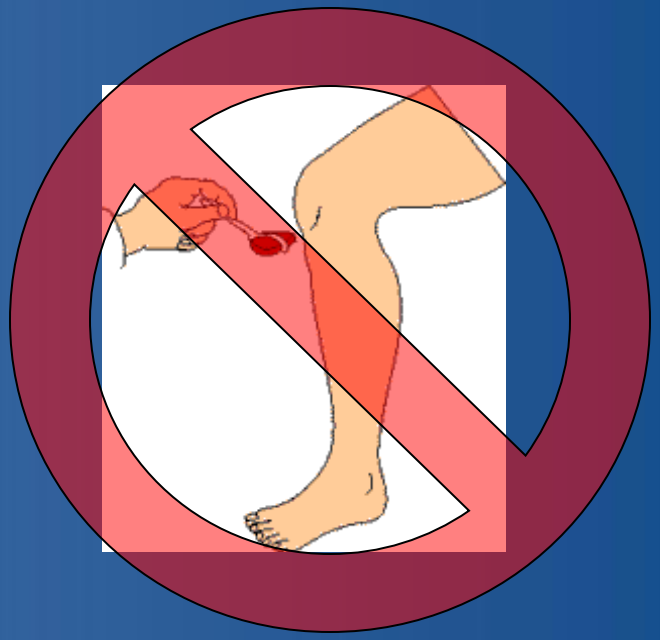
- Risks – dental injury, tongue numbness, dysgeusia, vocal fold scar, vocal deterioration
- Benefits – improve voice, establish diagnosis, treat disease
- Alternatives – medical management, behavioral therapy (SLP), serial observation

Indications for Surgery

- Voice complaints which:
  - Are correlated to the lesion noted on exam
  - Prevent the patient from meeting occupational / social / personal voice needs
  - Persist despite adequate non-surgical therapies as appropriate
- Concern for malignancy or airway compromise

Indications for Surgery

- Just seeing a lesion does *not* mean that it needs to come out (if you have a good exam and know it is benign)



Operative Goals

Physiology informs technique

Anatomy informs physiology

Preserve Vibration

Fo: resonant frequency
K: stiffness
M: mass
L: length
σ: stress
ρ: tissue density
σ_{AM}: active stress
σ_p: passive stress
d_a/d: fraction of muscle vibrating
a_{TA}: activity level in TA muscle

Mass and spring

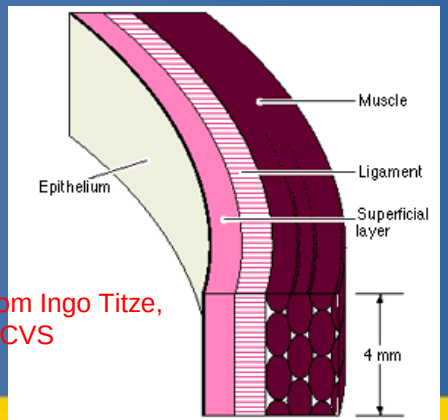
$$F_0 = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

Fundamental Frequency; Stiffness; Mass

Ideal string

$$F_0 = \frac{1}{2L}\sqrt{\frac{\sigma}{\rho}}$$

Fundamental Frequency; Stress; Tissue Density; Length



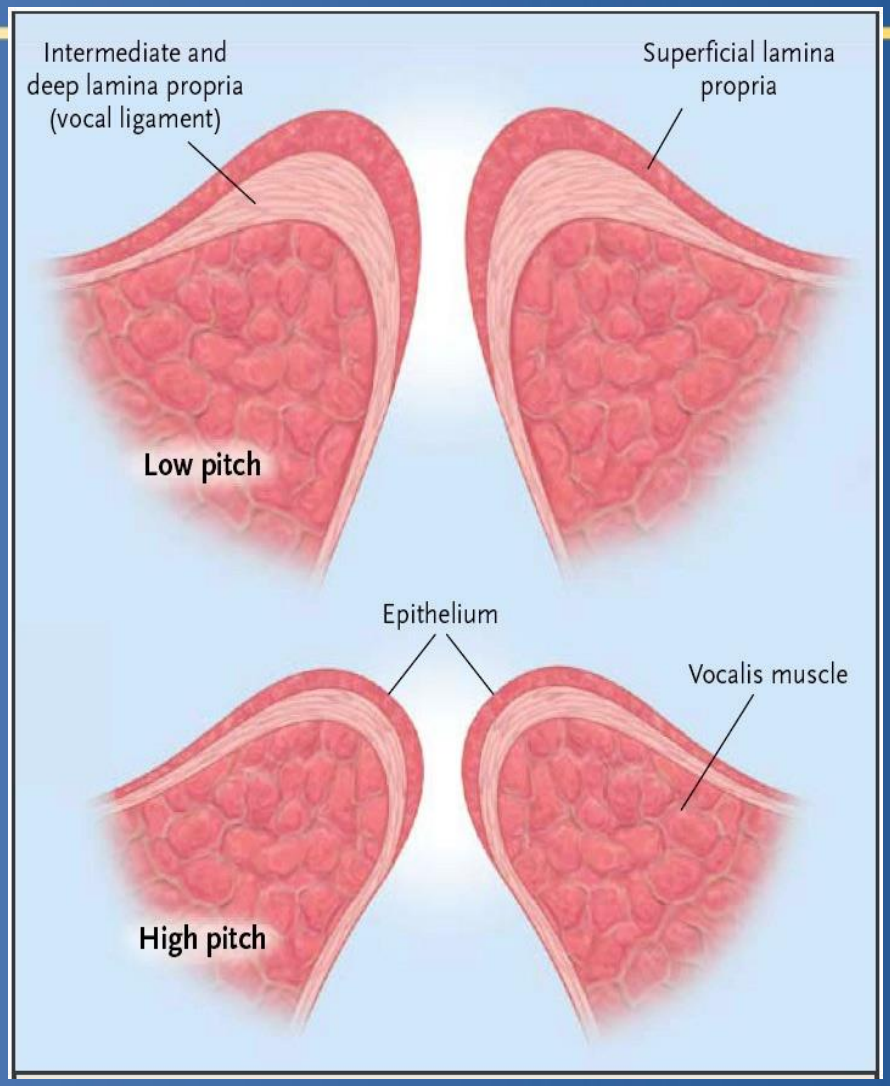
Figures from Ingo Titze, U. Iowa NCVS

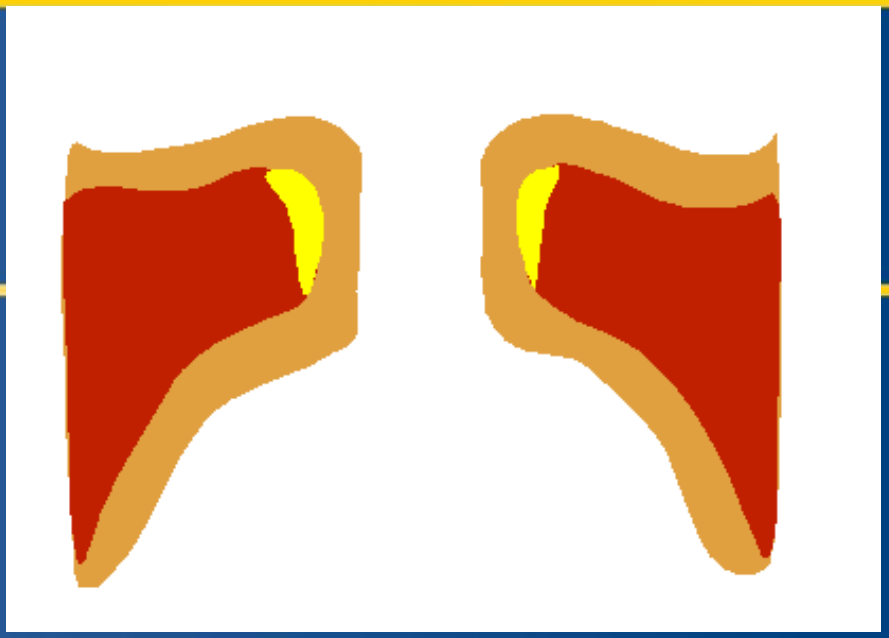
Cover-body model of vocal fold

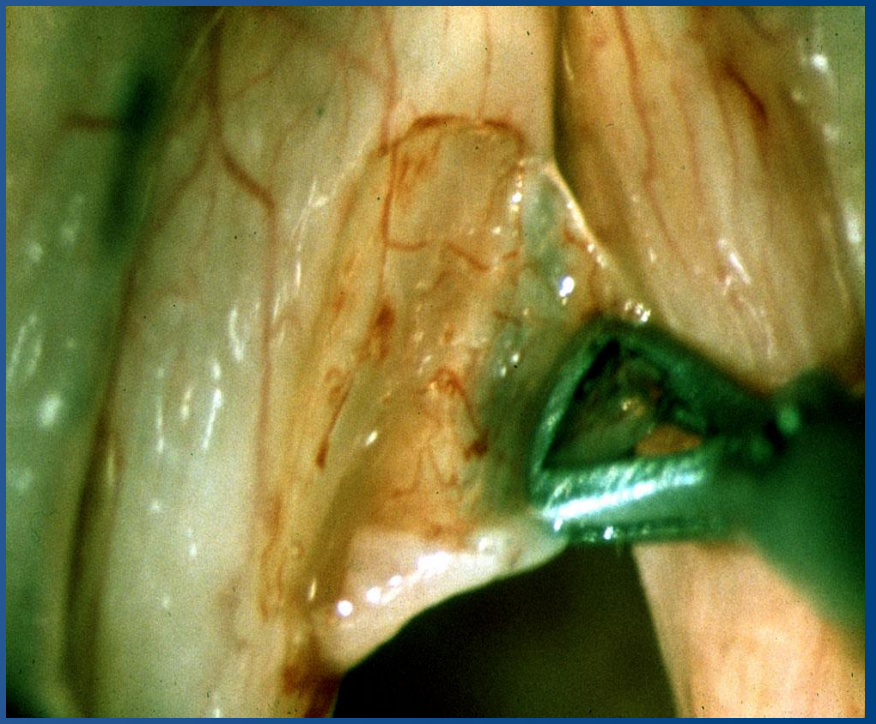
$$F_0 = \frac{1}{2L_m}\sqrt{\frac{\sigma_p}{\rho}\left(1+\frac{d_a}{d}\frac{\sigma_{am}}{\sigma_p}a_{TA}\right)}^{1/2}$$

Maximum active stress; Passive stress; Ratio of depth of TA muscle in vibration to total depth in vibration

Preserve Vibration







Use the right tool for the job

For me, that means:

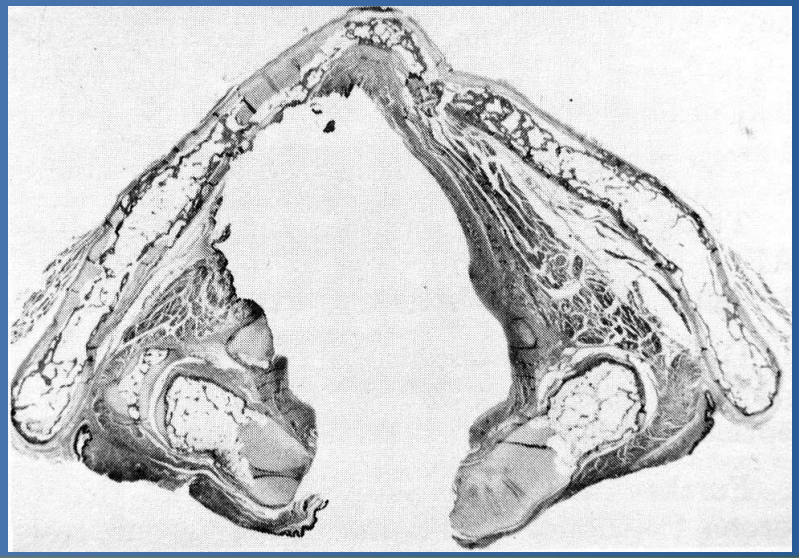
- Universal modular glottiscope
- Gallows suspension arm
- Infusion needle
- Phonosurgery set
- KTP laser

Goal: Preserve vibratory tissue

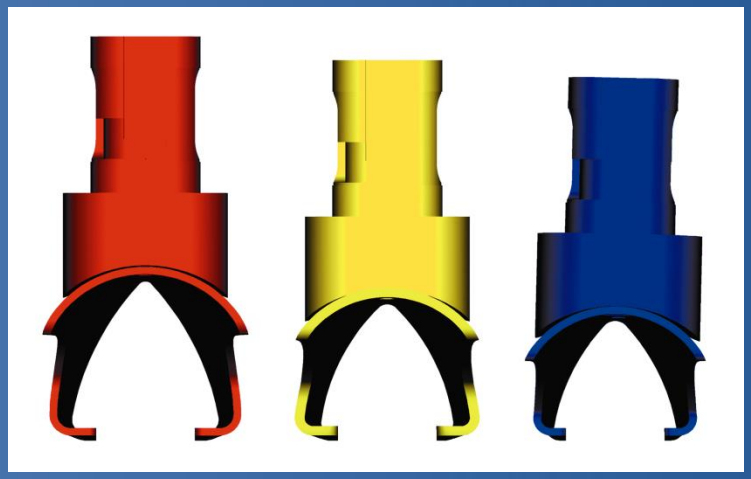
- There's more than *ONE* right way
- Any choice is fine:
  - Cold instrument
  - KTP laser
  - CO2 laser

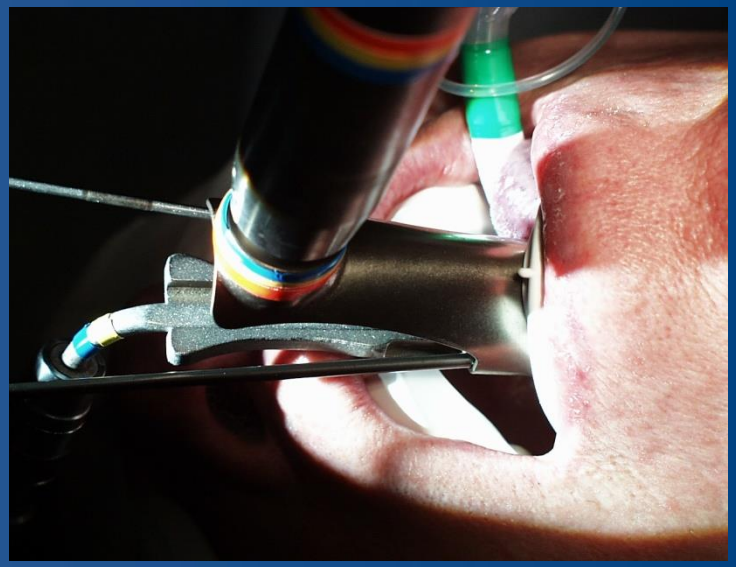
- *So long as you consider anatomy and preserve function*

Technique – Laryngoscopes



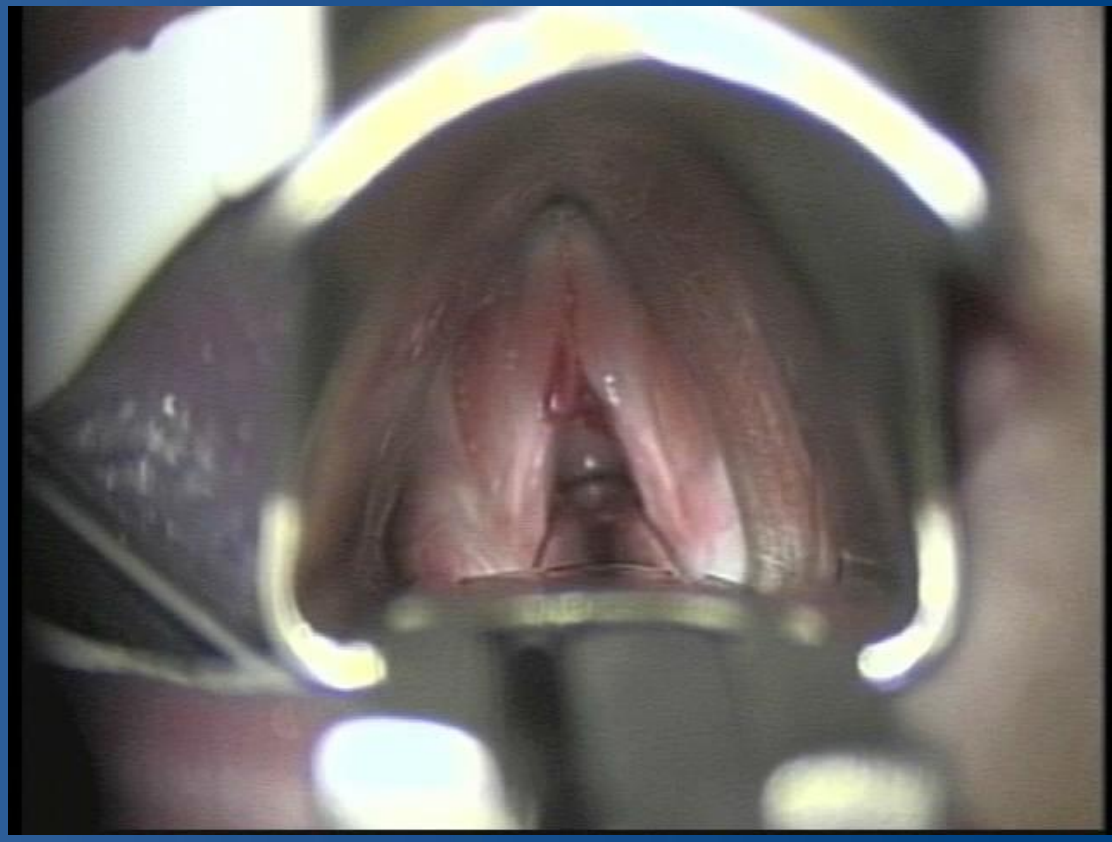
Universal Modular Glottiscope





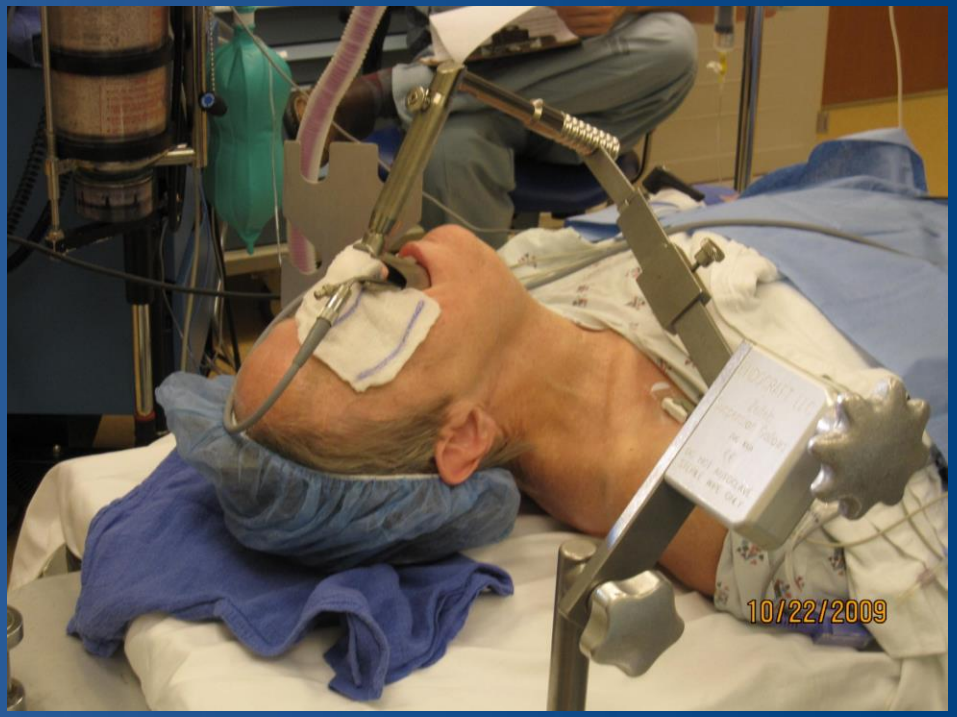
Technique – Laryngoscopes

vs.



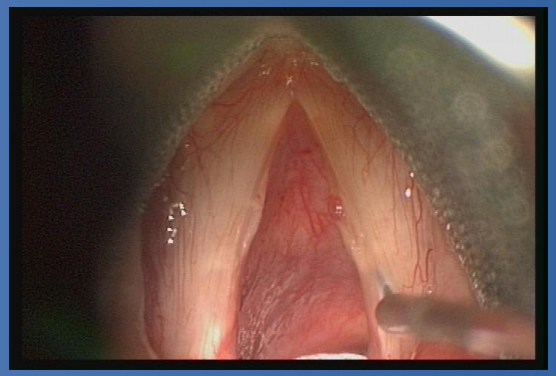
Suspension Arm

- True elevated vector suspension
- Improves anterior exposure
- Force on mandible, not maxilla



Zeitels SM, Burns JA, Dailey SH. Suspension laryngoscopy revisited. Ann Otol Rhinol Laryngol. 2004 Jan;113(1):16-22.

Infusion Needle



Infusion Needle

- Diagnostic
  - Degree of expansion helps predict depth of lesion / density of intra-SLP scarring

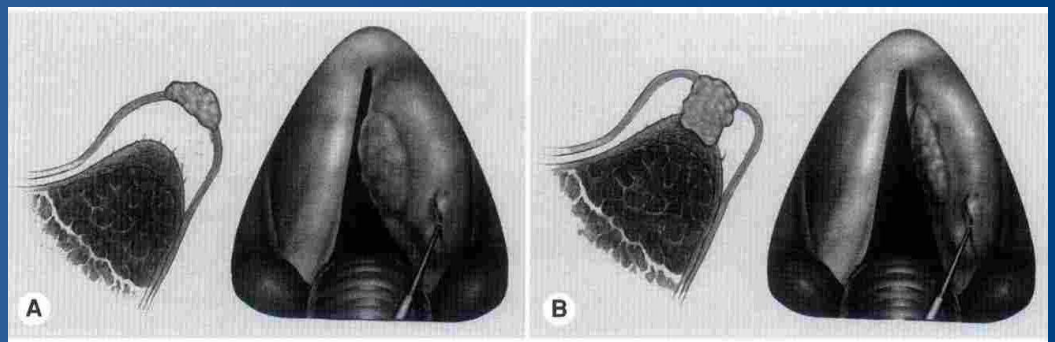


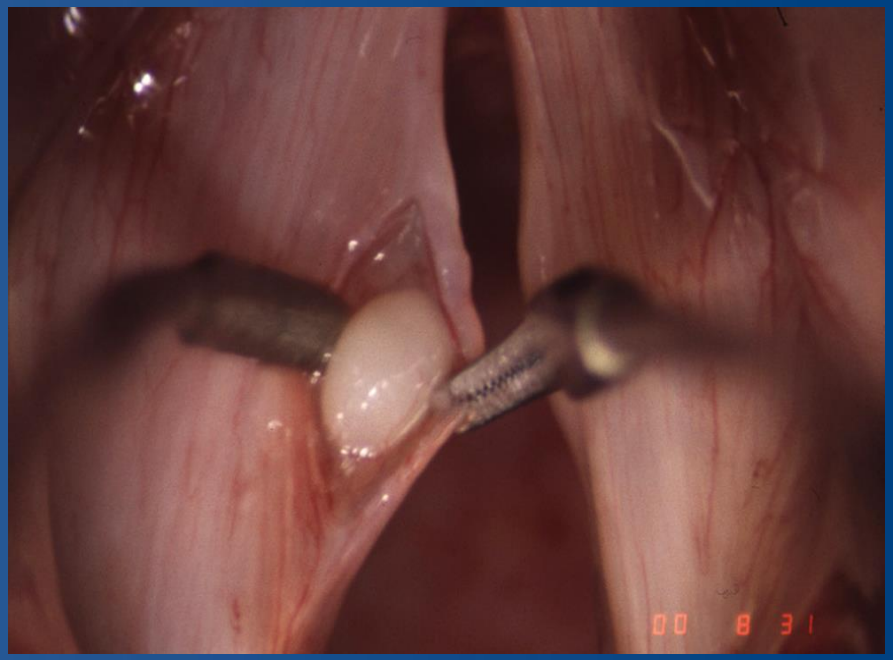
Fig 1. Diagrammatic representations of subepithelial infusion in which there is **A)** no invasion and **B)** invasion of epithelial lesion into vocal ligament. (Reprinted with permission.[35])

- Therapeutic
  - Tense the cord for cordotomy
  - Expand SLP to limit scarring
    - SLP twice as thick → scar proportionally half as much
  - Add epinephrine for hemostasis
  - Add “heat sink” for laser use

Principles of Phonosurgery

- Exposure, exposure, exposure
- *Save superficial lamina propria*
- Save epithelium
- “Aim small, miss small”

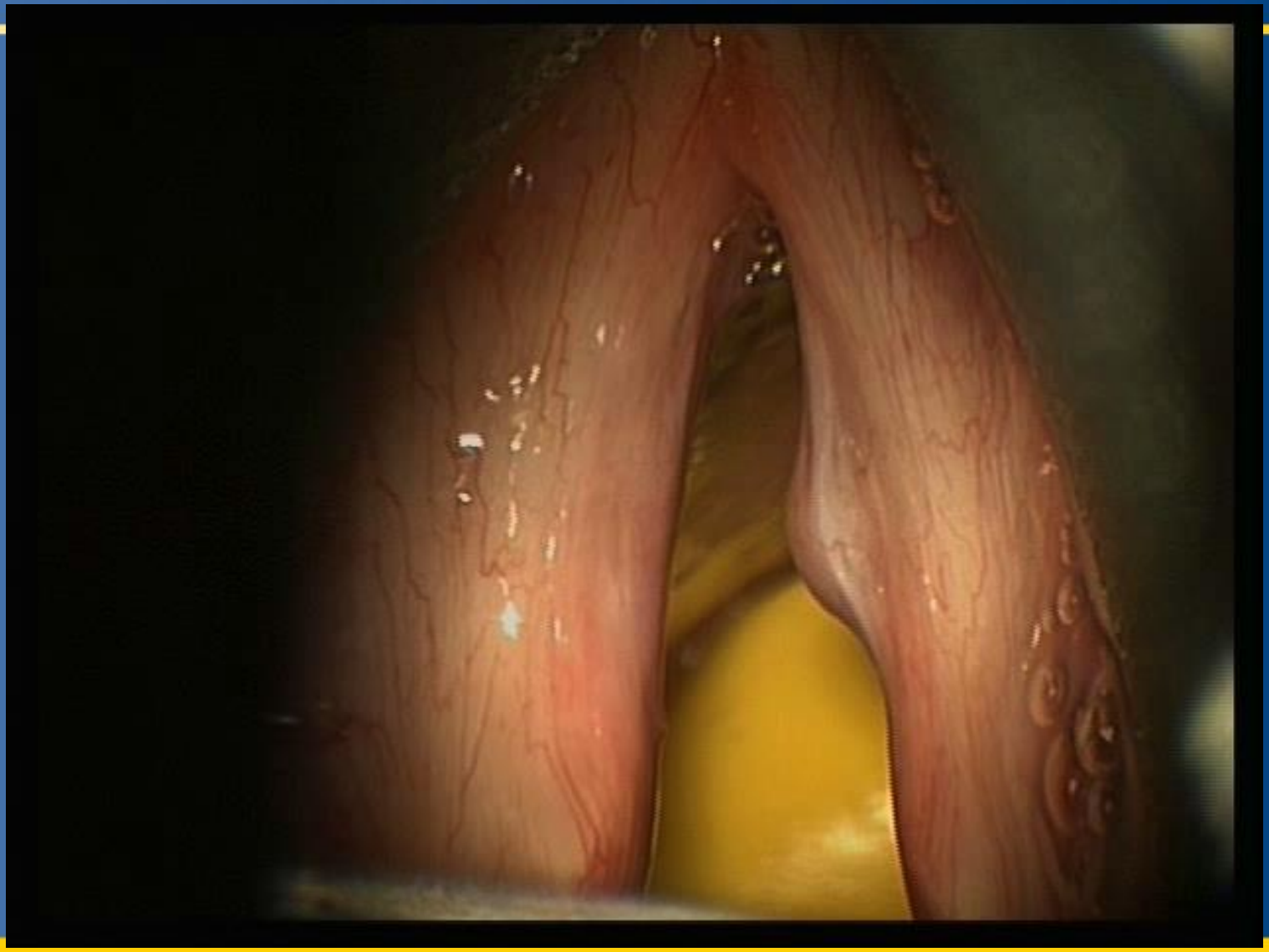
  → magnification



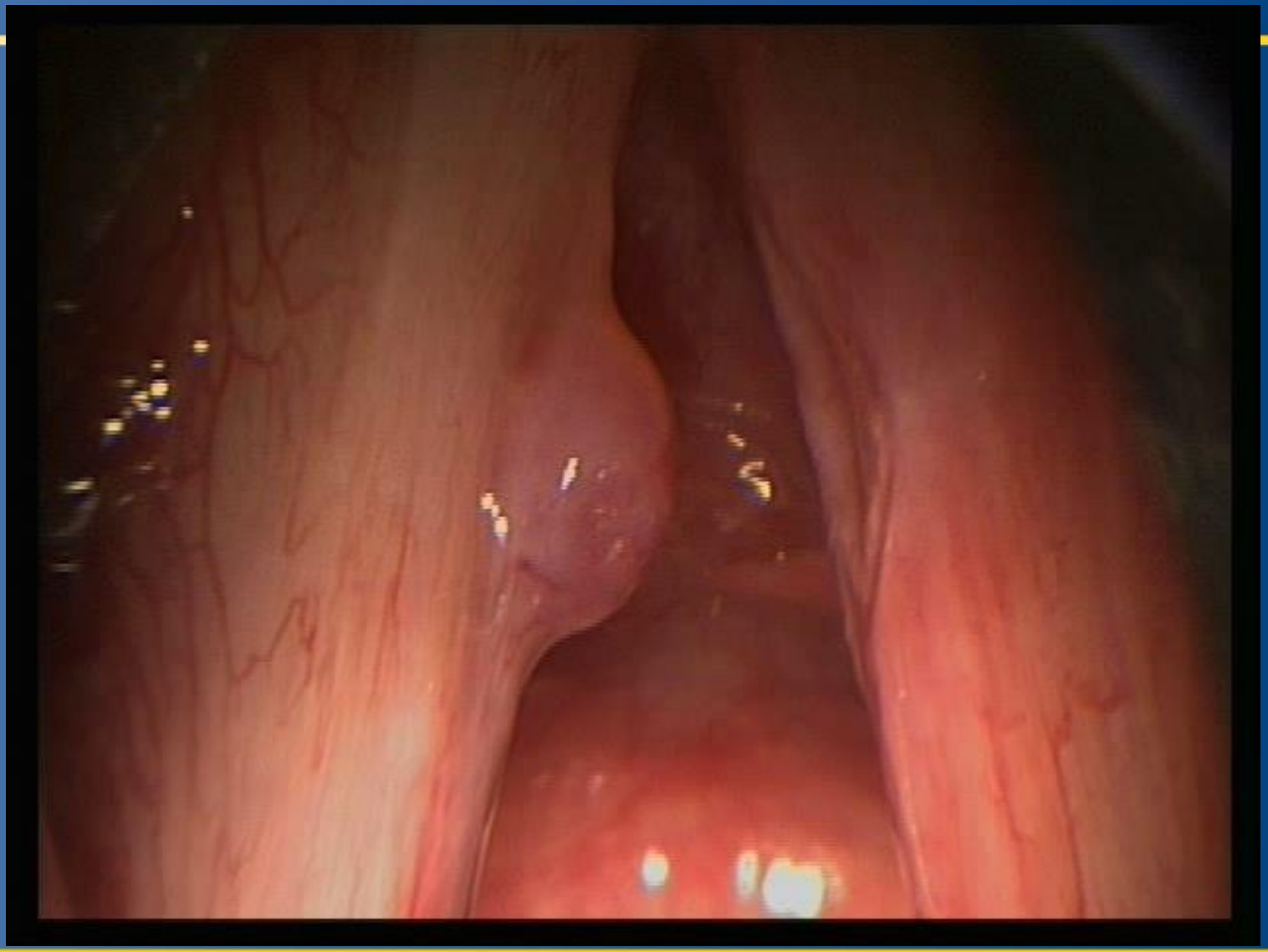
Benign Lesions – Phonomicrosurgical Resection

- Subepithelial lesion → subepithelial dissection
  - Cordotomy approach
  - Work on deep side of lesion first
    - More important plane is deep, to save SLP
  - Dissect epithelial attachments next
    - Minimize cordotomy defect, save epithelium to minimize scarring

What it looks like: Cyst



Polyp



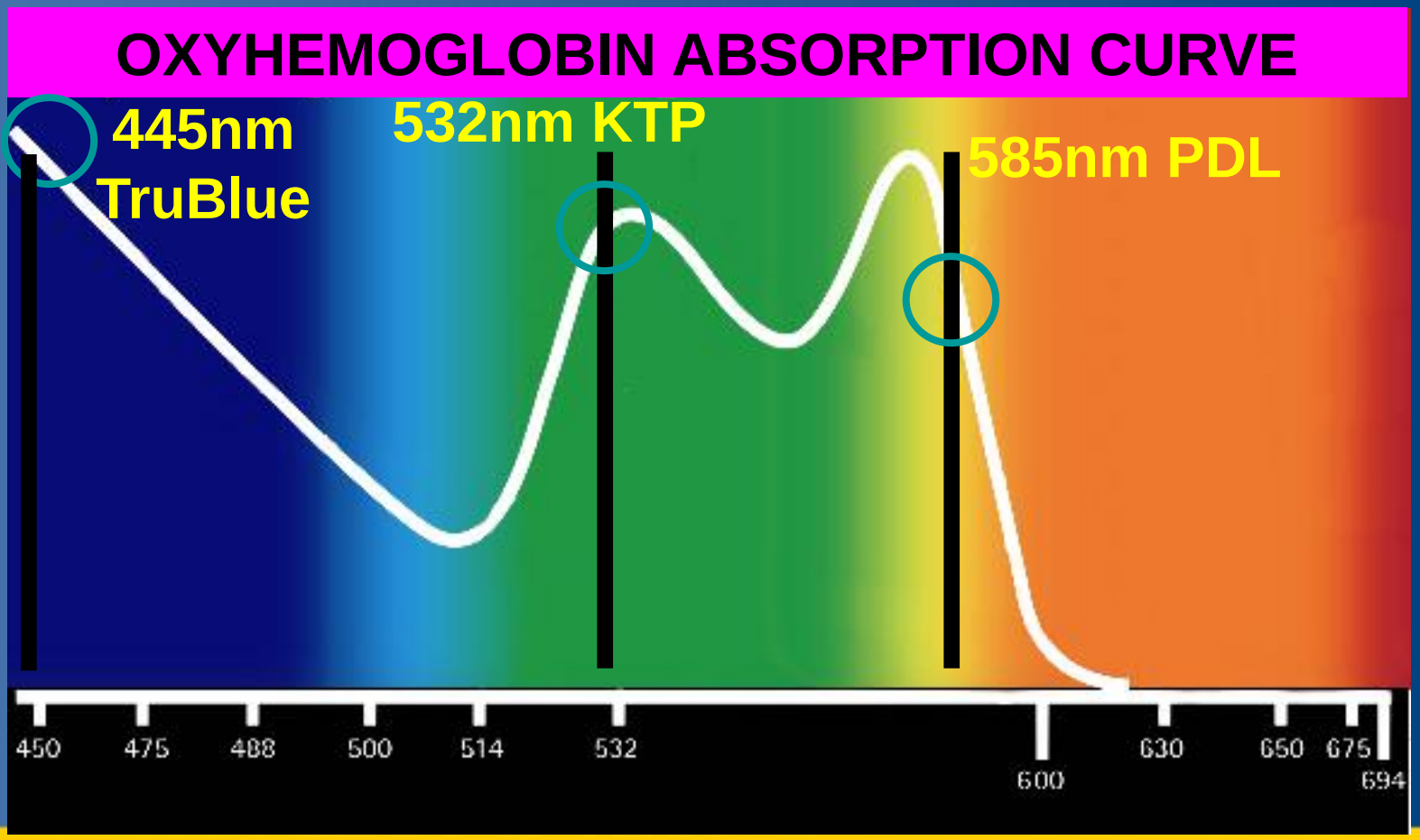
Pulsed Angiolysis

- Pulsed KTP Laser
- Pulsed Dye Laser

- Target oxyhemoglobin
- Pulsed energy (0.45-15 ms)
- Coagulate vessel selectively
- No thermal damage to surrounding tissue
- Anderson RR, et al. *Science* 1983

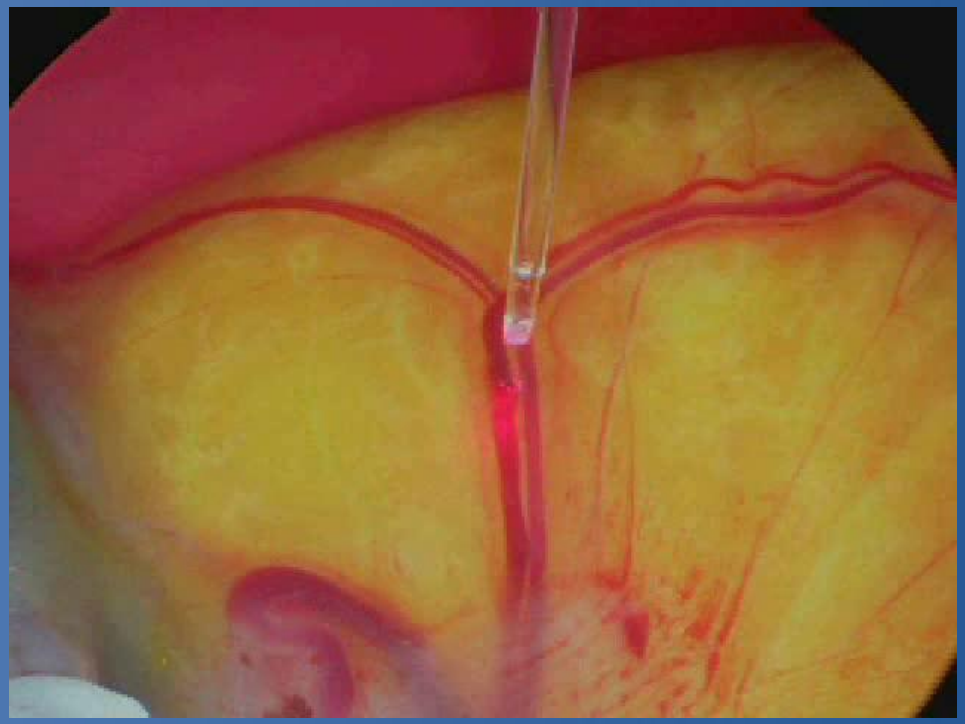
Pulsed Angiolysis

- Cutaneous lesions → Vocal Folds



Pulsed KTP Laser

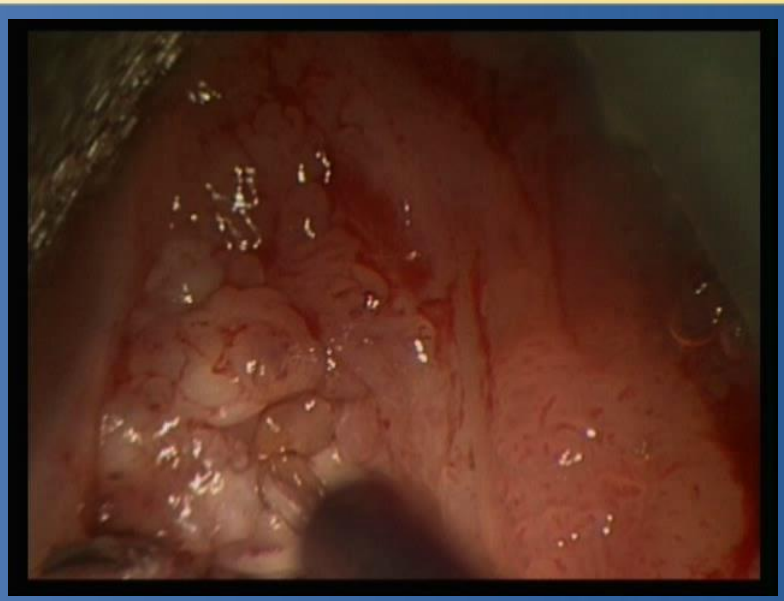
- Papilloma, Dysplasia, Early Cancer
- Vascular Malformations



Chorioallantoic Membrane

Vascular Malformation

Recurrent Respiratory Papilloma

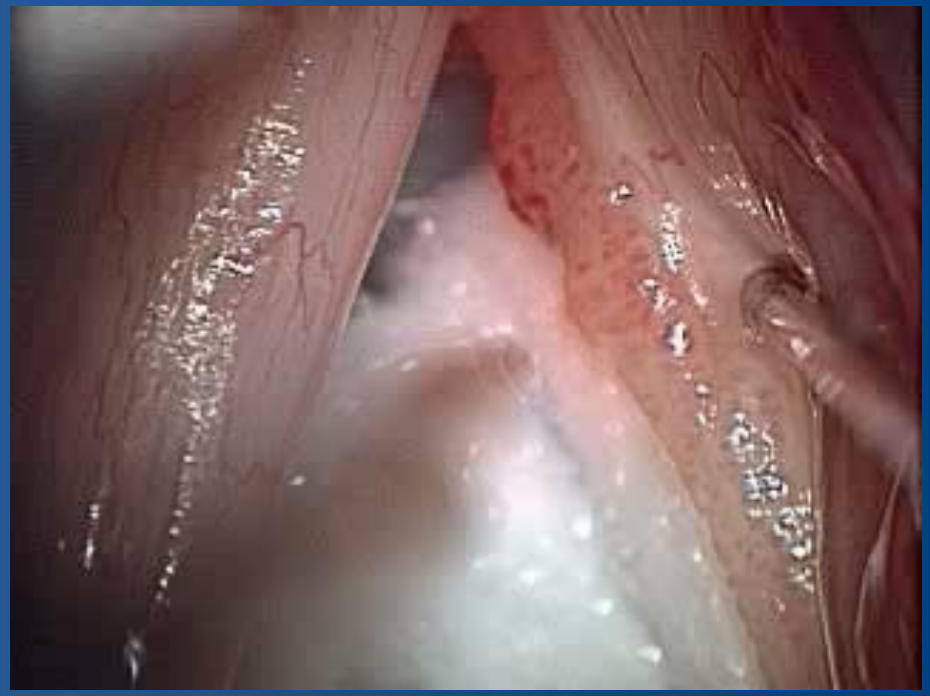


532 nm Pulsed Potassium-Titanyl-Phosphate Laser Treatment of Laryngeal Papillomatosis under General Anesthesia

James A. Burns, MD, FACS; Steven M. Zeitels, MD, FACS; Lee M. Akst, MD; Matthew S. Broadhurst, MD, FRACS; Robert E. Hillman, PhD; Rox Anderson, MD

Laryngoscope 117:1500-4, 2007

- Infusion (based on location)
- Pulsed KTP
- Stepwise debridement with suction
- Identify, protect normal



Leukoplakia

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Questions?