Transoral laser surgery for early-stage larynx cancer

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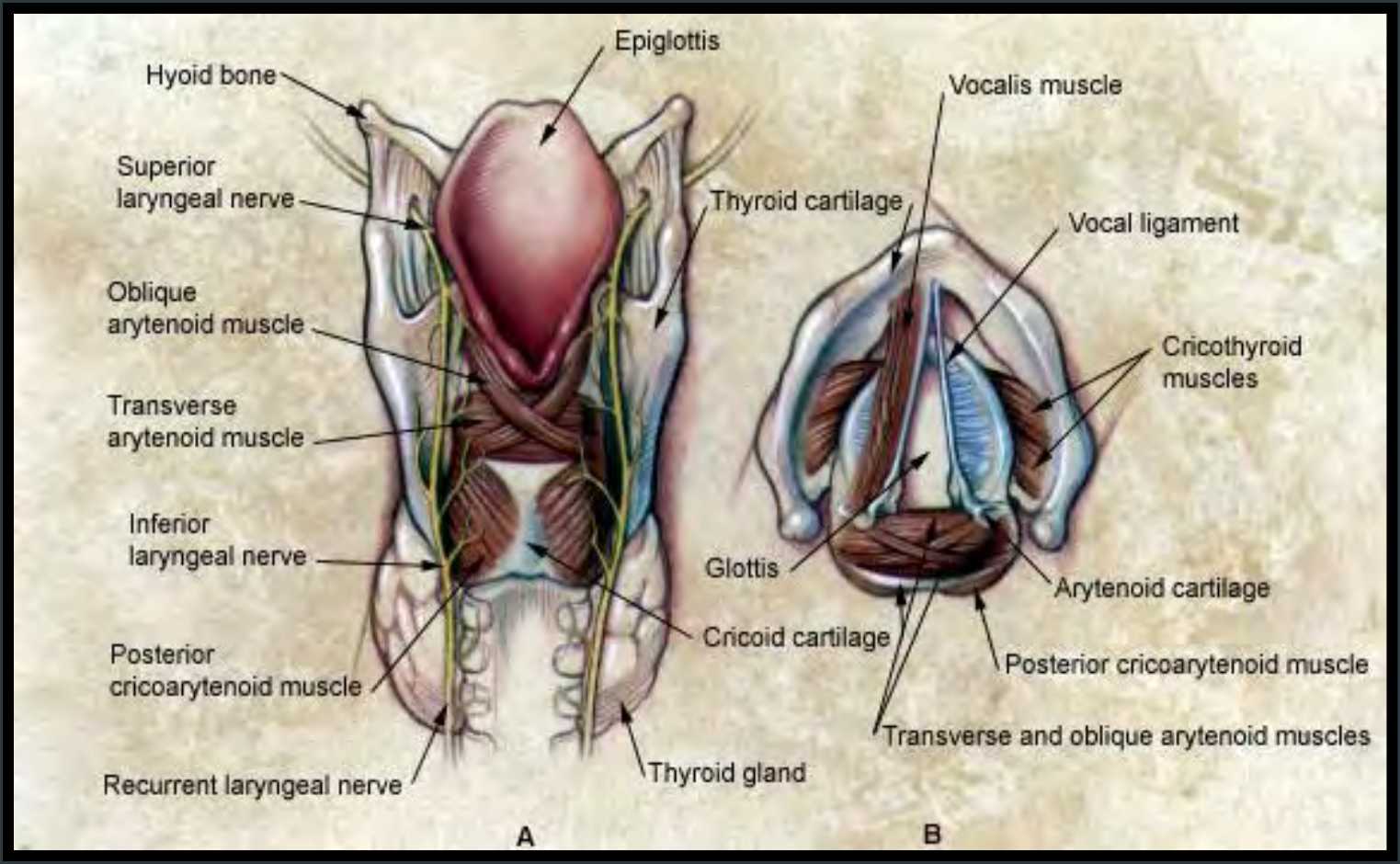
Objectives

1. Discuss role of laser surgery of laryngeal disease
2. Discuss patient selection for laser surgery
3. Discuss the procedure and outcome of laser surgery

Overview

- Anatomy and functions of larynx
- Glottic carcinoma staging
- Principles of laser surgery
- Surgical procedure overview
- Outcomes of laser surgery

Anatomy- Larynx



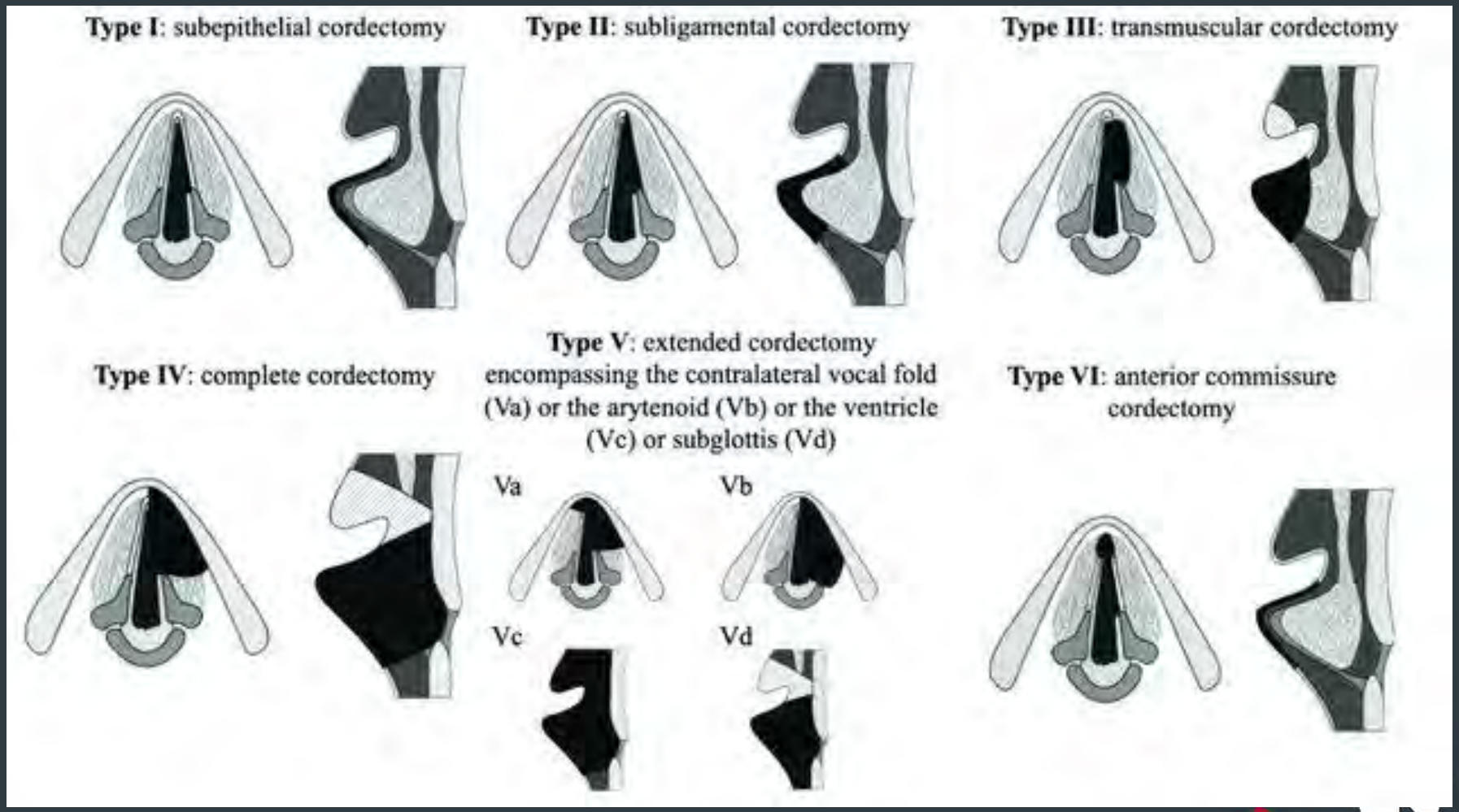
Functions of the Larynx

Phonation
Deglutition
Respiration
Valsalva
Cough

Glottic Carcinoma AJCC 8th edition

- **pTX:** Primary tumor cannot be assessed
- **pTis:** Carcinoma in situ
- **pT1:** Tumor limited to the vocal cord(s) (may involve anterior or posterior commissure) with normal mobility
  - **pT1a:** Limited to 1 vocal cord
  - **pT1b:** Involves both vocal cords
- **pT2:** Tumor extends to supraglottis or subglottis or with impaired vocal cord mobility
- **pT3:** Tumor limited to the larynx with vocal cord fixation or invasion of paraglottic space or inner cortex of the thyroid cartilage
- **pT4a:** Moderately advanced local disease: invades through the outer cortex of the thyroid cartilage or invades tissues beyond the larynx (e.g. trachea, cricoid cartilage, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid or esophagus)
- **pT4b:** Very advanced local disease: invades prevertebral space, encases carotid artery or invades mediastinal structures

ELS classification of endoscopic excision (European Laryngological Society)



Principles of Transoral Laser Microsurgery (TLM)

Treatments for Early Glottic Carcinoma

- Open transcervical surgery
- Endoscopic transoral surgery using cold steel instrumentation (transoral laryngeal microsurgery- TLM)
- **External beam radiation therapy**
- **Endoscopic transoral surgery with lasers (TLM with laser)**

Two commonly used lasers

Carbon Dioxide (CO_2)
Potassium Titanyl Phosphate (KTP)

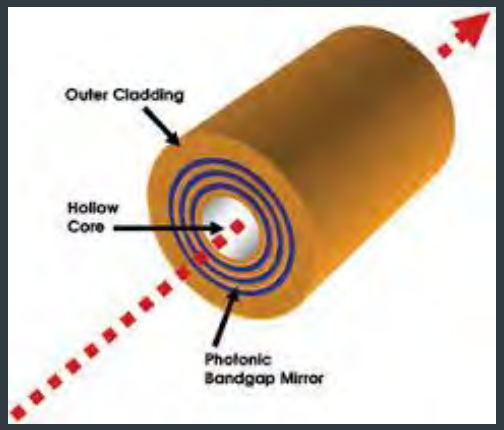
CO2 laser

Delivery

- Line of site or
- Fiber-based

10,600 nm wavelength

Chromophore- water



KTP

Delivery- glass fiber
532 nm wavelength
Chromophore- oxyhemoglobin

TLM with laser Methods for treatment

- Partial Cordectomy- En Bloc Resection
  - Described by Strong, Eckel and Thumfart and Ossoff et al.
  - Poorer voice outcomes compared to radiation
- Partial Cordectomy-Piecemeal Resection
  - Described by Steiner
  - Established the ability to achieve good oncologic results
- Photoangiolytic ablation with KTP laser
  - Described by Zeitels, et al. 2008
  - Layer-by-layer ablation through the tumor

TLM with KTP Photoablation- surgical procedure (Zeitels)

- Suspension laryngoscopy
- Binocular microscope
- False vocal cord resection
- Laser-assisted photoablation of the tumor
  - Layer by layer ablation
  - Interface of abnormal and normal tissue

Intraoperative Frozen Sections

- Samples at margin taken with microcup forceps versus microexcised margins
- Very small samples
- Thermal effect of the laser on reliability of frozen section.
- Remacle et al.
  - Retrospective on CO2 cordectomies for T1 to T3 glottic cancers
  - n=97
  - Routine path confirmed 94.8% of the intraop frozen
  - Conclusion- Intraop frozen reliable with an experienced surgical path team

Outcomes of TLM

Oncologic Results

- Lucioni and colleagues- overall survival was 90%, disease–free survival was 98.8%. [42]
- Remmelts et al.- 5-year laryngeal preservation for T1 glottic cancers- 93%
- Krengli et al.- local control over 60 mo- 95.6%
- Meta-analysis by Higgins et al-
  - Local control and laryngectomy-free survival in 7600 patients with T1 or T2 glottic cancer and found that there was no difference between endoscopic laser surgery and radiation therapy

- Murono et al.-
  - TLM with KTP laser surgery for T1a glottic carcinoma
  - N= 24
  - Tumor was excised with KTP laser, followed by circumferential ablation surrounding the surgical margin
    - local control in 22 of the 24 patients (91.7%).
    - voice results were found to be excellent

Voice Outcomes

- Early studies voice quality was significantly worse for surgical resection
  - Higgins et al. of 7600 patients with early glottic cancer showed a trend for better voice quality with radiation over endoscopic laser surgery.
- recent studies suggest that voice outcomes after endoscopic laser surgery for glottic carcinoma are no worse than radiation therapy
  - depth of invasion and deeper resection worsens voice quality.
  - significant worsening when the anterior commissure was involved

Costs of TLM

- Goor et al.
  - N= 89 patients
  - T1a glottic carcinoma over two years.
  - 35 were treated with 6000 cGy
  - 54 were treated with endoscopic laser resection.
  - Radiotherapy cost 8322 euros per case versus 4434 euros per case for surgery.
  - disease control and voice quality was not found to be different.
- Higgins meta-analysis
  - comparing radiotherapy versus endoscopic laser resection for T1 glottic cancers.
  - Average costs of radiotherapy were found to be $4829 whereas endoscopic laser resection cost $2407

Complications of TLM

- Healy et al.
  - 9 complications in 4416 CO2 laser cases of the aerodigestive tract for a rate of 0.2%.[30]
    - 6 fires
    - bleeding from bronchial tumors.
    - one facial burn from an overheated rigid bronchoscope
  - Other complications
    - Granuloma from exposed cartilage or char left after the operation.
    - Chondritis
    - Hemorrhage

Challenges to TLM with laser

Location of tumor
Experience of surgical pathology
Local regional referral patterns
Difficult to teach method

SUMMARY

- Early glottic carcinomas treated with TLM can achieve good oncologic results
- Voice quality can be maintained with TLM
- Costs can be decreased with TLM
- Careful selection of candidates is required

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QUESTIONS?
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THANKS FOR YOUR ATTENTION
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