ADVANCES IN TREATMENT OF T1/T2 LARYNX CANCER

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Otolaryngology-Head and Neck Surgery
• I have nothing to disclose
CHANGING TRENDS IN HNSCC
GLOTTIC CANCER STAGING

- **T1a** - Tumor limited to one vocal cord
- **T1b** – Tumor involves both vocal cords
- **T2** - Tumor extends to supraglottis and/or subglottis, and/or reduced mobility
- **T3** - Tumor limited to larynx with vocal cord fixation and/or invasion of the paraglottic space, and/or inner cortex of the thyroid cartilage
- **T4a** – outer cortex or extralaryngeal
- **T4b** - Prevertebral, carotid, mediastinum
NCCN GUIDELINES

- Carcinoma in situ → Endoscopic Resection or Radiation Therapy

- Amenable to Larynx Preserving (Conservation) Surgery (T1, T2) →
  - Radiation Therapy
  - Endoscopic or Open Resection as Indicated
## RADIATION – T1 GLOTTIC TUMORS

<table>
<thead>
<tr>
<th>Author</th>
<th>N</th>
<th>% recurrence</th>
<th>Laryngectomy</th>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradenburg</td>
<td>44</td>
<td>20.5</td>
<td>6</td>
<td>95</td>
</tr>
<tr>
<td>Harwood</td>
<td>571</td>
<td>13.7</td>
<td>72</td>
<td>95</td>
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<tr>
<td>Foote et al</td>
<td>57</td>
<td>5.3</td>
<td>2</td>
<td>100</td>
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<td>Morris</td>
<td>38</td>
<td>26.3</td>
<td>6</td>
<td>97</td>
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<td>Jose et al</td>
<td>81</td>
<td>12.3</td>
<td>9</td>
<td>97</td>
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<tr>
<td>Woodhouse</td>
<td>183</td>
<td>20.2</td>
<td>29</td>
<td>97</td>
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<td>Mittel</td>
<td>147</td>
<td>20.4</td>
<td>23</td>
<td>95</td>
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<tr>
<td>Van Den Bog</td>
<td>138</td>
<td>15.9</td>
<td>19</td>
<td>90</td>
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<td>Minja et al</td>
<td>174</td>
<td>16.1</td>
<td>21</td>
<td>97</td>
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<td>Fletcher</td>
<td>332</td>
<td>11.1</td>
<td>36</td>
<td>98</td>
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<tr>
<td><strong>Total</strong></td>
<td>1867</td>
<td><strong>16.0</strong></td>
<td><strong>248 (13.3%)</strong></td>
<td>95</td>
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# TLM – T1 GLOTTIC CANCER

<table>
<thead>
<tr>
<th>Author</th>
<th>N</th>
<th>% recurrence</th>
<th>Laryngetomy</th>
<th>Survival (%)</th>
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<tbody>
<tr>
<td>Wetmore et al</td>
<td>21</td>
<td>19.0</td>
<td>0</td>
<td>100</td>
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<td>Koufman</td>
<td>23</td>
<td>4.3</td>
<td>0</td>
<td>100</td>
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<td>Blakeslee</td>
<td>35</td>
<td>11.4</td>
<td>2</td>
<td>94.3</td>
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<tr>
<td>Elner</td>
<td>31</td>
<td>19.3</td>
<td>0</td>
<td>100</td>
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<td>Steiner</td>
<td>130</td>
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<td>100</td>
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<td>Myers</td>
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<td>8.7</td>
<td>1</td>
<td>100</td>
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<td>Thomas</td>
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<td>24.1</td>
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<td>Wolfensberger</td>
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<tr>
<td>Bradenburg</td>
<td>30</td>
<td>16.7</td>
<td>1</td>
<td>100</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>386</strong></td>
<td><strong>12.9</strong></td>
<td><strong>12 (3.1%)</strong></td>
<td><strong>100</strong></td>
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</table>
ONCOLOGIC AND VOICE OUTCOMES AFTER TREATMENT OF EARLY GLOTTIC CANCER: TRANSORAL LASER MICROSURGERY VERSUS RADIOTHERAPY

• Kerr et al

• Multicenter restrospective consecutive cohort of stage 1 and stage 2 glottic carcinoma

• Objective: To compare the laryngeal preservation rates and voice outcomes after treatment of early glottic cancer between transoral laser surgery and radiotherapy
ONCOLOGIC AND VOICE OUTCOMES AFTER TREATMENT OF EARLY GLOTTIC CANCER: TRANSORAL LASER MICROSURGERY VERSUS RADIOTHERAPY

- Overall Survival

Figure 1. Overall survival (months) after treatment of early glottis carcinoma with transoral laser microsurgery (solid line) versus radiotherapy (dashed line).
ONCOLOGIC AND VOICE OUTCOMES AFTER TREATMENT OF EARLY GLOTTIC CANCER: TRANSORAL LASER MICROSURGERY VERSUS RADIOTHERAPY

- Laryngeal preservation
  - Stage 1 disease
    - TLM 100%
    - Radiation 92%
  - Stage 2 disease
    - TLM 100%
    - Radiation 88%
ONCOLOGIC AND VOICE OUTCOMES AFTER TREATMENT OF EARLY GLOTTIC CANCER: TRANSORAL LASER MICROSURGERY VERSUS RADIOTHERAPY

• Laryngectomy free survival

• Stage 1 laryngectomy free survival
  – 96% TLM vs 89% RT (p=0.06)

• Stage 1a laryngectomy free survival
  – 97% TLM vs 93% RT (p=0.07)
ONCOLOGIC AND VOICE OUTCOMES AFTER TREATMENT OF EARLY GLOTTIC CANCER: TRANSORAL LASER MICROSURGERY VERSUS RADIOTHERAPY

• VOICE HANDICAP INDEX RESULTS

Figure 4. Voice Handicap Index for all T1 and T2 squamous cell carcinoma of the glottis, transoral laser microsurgery (n = 83) versus radiotherapy (RT) (n = 49). The horizontal line is the median. The box represents 50% of the cohort. Bars represent 100% of the cohort. Dots represent outliers. At 6 months, p = .01; at 12 months, p = .08; at 24 months, p = .04.
PATIENT ASSESSMENT FOR TLM

• Pts should be referred to both Head and Neck Surgeon and Radiation Oncologist

• History and Physical Exam
  – Laryngoscopy
  – Review of Pathology and OR notes
  – CT scan/MRI
  – Staging

• Discussion with patient regarding primary endoscopic resection/radiation

• Tumor Board discussion

• If surgery is desired
  – Informed consent
  – Stroboscopy
  – PPI
  – Day Surgery
History of Transoral Surgery

• TOS first described in 1951

• Practiced selectively at some institutions in 1980s-90s

• TLM developed in 1990s in Germany
LARYNGOSCOPES
STEINER SCOPES
DEDO LARYNGOSCOPE
SUCTION CAUTERY
ENDOSCOPIC PEARLS

• DO NOT HESITATE TO TAKE OFF THE FALSE VOCAL FOLD

• BILATERAL CORD INVOLVEMENT REQUIRES A TUMOR SPLITTING APPROACH AT ANTERIOR COMMISSURE

• ALWAYS START WITH POSTERIOR RESECTION

• MAKE POSTERIOR CUT ALONG LASER TUBE

• LEAVE ANY TUMOR POSTERIOR TO THIS TO THE END OF THE PROCEDURE
ENDOSCOPIC CORDECTOMY. CLASSIFICATION

Fig. 1a, b  Subepithelial corpectomy (type I)

Fig. 2a, b  Sublissental corpectomy (type II)

Fig. 3a, b  Transmuscular corpectomy (type III). In order to ex-

Fig. 4a, b  Total or complete corpectomy (type IV). The ipsilateral
POSTOPERATIVE CARE

• DAY SURGERY VS ADMISSION

• HIGH HUMIDITY O2

• PPI

• ORAL ANTIBIOTICS

• FOLLOWUP
  – 3 WEEKS
  – 3 MONTHS (SURVEILLANCE IMAGING)
Oncological and functional outcome after transoral 532-nm pulsed potassium-titanyl-phosphate laser surgery for T1a glottic carcinoma

- MURONO ET AL
  - KTP LASER
    - 532-NM PULSED POTASSIUM-TITANYL-PHOSPHATE LASER
    - Selectivity for hemoglobin leading to ablation of aberrant neovascularity

- 24 patients with T1a glottic SCCA

- Evaluated
  - Voice quality
    - Voice related Quality of Life questionnaire (V-QROL)
    - Voice Handicap Index-10
Oncological and functional outcome after transoral 532-nm pulsed potassium-titanyl-phosphate laser surgery for T1a glottic carcinoma

• Results
  – 24 patients
    • Local control in 22 patients → 91.7%
    • Remaining 2 rescued by a second TLS-KTP

• Mean V-RQOL score → 81.0
  – Mean social-emotional domain → 84.4
  – Physical functioning 78.8
• Mean VHI-10 scores was 6.2
• **SEER database**
  – Study included patients with early stage T1N0, T2N0 SGC
  – Single modality therapy
    • Organ preservation surgery (with or without Neck dissection)
    • Radiation therapy

– 2631 T1/T2 N0 SGC patients identified
  • 167 (6%) treated with OPS+ND
  • 186 (7%) treated with OPS only
  • 2278 pts (87%) treated with definitive RT only

• OPS surgery consisted of local tumor excision, partial/hemilaryngectomy, and supraglottic laryngectomy
Survival Differences between Organ Preservation Surgery and Definitive Radiotherapy in Early Supraglottic Squamous Cell Carcinoma

A

T1N0 cancers only

- Surgery with ND
- Radiation only
- Surgery without ND

Overall Survival (Months)

B

T2N0 cancers only

- Surgery with ND
- Radiation only
- Surgery without ND

Overall Survival (Months)
Survival Differences between Organ Preservation Surgery and Definitive Radiotherapy in Early Supraglottic Squamous Cell Carcinoma
RECURRENCE AFTER IRRADIATION

• Recurrence rates after irradiation
  – 5-13% for T1
  – 25-30% for T2

• 1/3 of these recurrences remain localized

• Treatment
  – Total laryngectomy
  – Conservations surgery
    • Vertical partial laryngectomy
    • Horizontal supraglottic laryngectomy
    • Supracricoid partial laryngectomy
    • Endolaryngeal laser surgery
CONSERVATION LARYNGEAL SURGERY VERSUS TOTAL LARYNGECTOMY FOR RADIATION FAILURE IN LARYNGEAL CANCER

F. Christopher Holsinger, MD, Etai Funk, MD, Dianna B. Roberts, PhD, Eduardo M. Diaz, Jr., MD

<table>
<thead>
<tr>
<th>Type of Laryngectomy</th>
<th>No.</th>
<th>%</th>
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<tbody>
<tr>
<td>Transoral laser microsurgery</td>
<td>6/105</td>
<td>5.7</td>
</tr>
<tr>
<td>Vertical partial laryngectomy</td>
<td>19/105</td>
<td>18.1</td>
</tr>
<tr>
<td>Frontolateral laryngectomy</td>
<td>2/105</td>
<td>1.9</td>
</tr>
<tr>
<td>Extended frontolateral laryngectomy</td>
<td>1/105</td>
<td>1.0</td>
</tr>
<tr>
<td>Supraglottic laryngectomy</td>
<td>3/105</td>
<td>2.9</td>
</tr>
<tr>
<td>Subtotal laryngectomy</td>
<td>1/105</td>
<td>1.0</td>
</tr>
<tr>
<td>Total laryngectomy</td>
<td>71/105</td>
<td>67.6</td>
</tr>
<tr>
<td>Total laryngectomy with partial pharyngectomy</td>
<td>2/105</td>
<td>1.9</td>
</tr>
</tbody>
</table>
CONSERVATION LARYNGEAL SURGERY VERSUS TOTAL LARYNGECTOMY FOR RADIATION FAILURE IN LARYNGEAL CANCER

F. Christopher Holsinger, MD, Etai Funk, MD, Dianna B. Roberts, PhD, Eduardo M. Diaz, Jr., MD

- OSS

- DSS

**FIGURE 1.** Overall survival after salvage laryngectomy. Open circles, died; +, censored.

**FIGURE 2.** Disease-specific survival after salvage laryngectomy. Open circles, died; +, censored.
SALVAGE CONSERVATION SURGERY AFTER IRRADIATION FAILURE FOR EARLY LARYNGEAL SURGERY

- Motamed et al, Laryngoscope 2006
  - Compared endolaryngeal laser surgery vs. conservation laryngeal surgery using the external approach

  - External Partial laryngeal surgery (407 cases)
    - Local control: 77%
    - Overall control rate: 90%

  - Endolaryngeal laser surgery (145 cases)
    - Local control rate: 65%
    - Overall control rates: 83%
SALVAGE CONSERVATION SURGERY AFTER IRRADIATION FAILURE FOR EARLY LARYNGEAL SURGERY

• Functional Outcomes
  – Partial conservation laryngeal surgery
    • Postoperative tracheostomy: 8-28 days
    • Return of swallowing: 9-55 days
    • Average hospitalization: <32 days
    • Common complications: fistula formation, aspiration pneumonia occurring in 25% of cases
  – Endolaryngeal surgery
    • Tracheostomy and NGT not routinely required
    • Hospitalization <9 days
    • Complications in less than 5% of cases
      – Granuloma formation, laryngeal edema
CO2-LASER TREATMENT OF RECURRENT GLOTTIC CARCINOMA

• De Gier et al
  – 40 pts treated for recurrent glottic carcinoma after radiation therapy with CO2 laser
    • Primary tumor was Tis in 4 pts, T1a in 26 pts, T1b in 7 pts, and T2 in 3 pts
  • Table 2. Criteria for CO2 laser treatment of recurrent glottic carcinoma.
    • No large tumor bulk
    • Limitation of the tumor to the glottis with at most limited supraglottic extension
    • No subglottic extension
    • Complete endoscopic visualization of the tumor possible
    • No impairment of mobility of vocal cords
    • No extension into the anterior commissure
# CO2 LASER FOR RECURRENT GLOTTIC CARCINOMA AFTER RADIATION THERAPY

## Table 1. Results of CO₂ laser treatment for recurrent carcinoma after radiotherapy.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Successful laser treatment(s) (%)</th>
<th>Successful TLE after laser (%)</th>
<th>Failure of TLE after laser (%)</th>
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<tbody>
<tr>
<td>No involvement of anterior commissure</td>
<td>23</td>
<td>13 (57)</td>
<td>9 (39)*</td>
<td>1 (4)†</td>
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<tr>
<td>Involvement of anterior commissure</td>
<td>17</td>
<td>7 (41)</td>
<td>8 (47)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>20 (50)</td>
<td>17 (43)</td>
<td>3 (8)</td>
</tr>
</tbody>
</table>

*One patient had a total laryngectomy because of a second primary tumor; therefore, the laser procedure is considered successful regarding the glottic primary tumor.

†The patient did not have involvement of the anterior commissure. He had an undifferentiated carcinoma and died of disease.
• Zeitel et al - Retrospective review
  – 20 pts with recurrence after treatment with radiation
    • 4 – T1aN0M0
    • 1 – T1bN0M0
    • 1 – T2aN0M0
    • 14 – T2bN0M0
  
  • 16 pts free of disease at least 2 yrs after follow up (median 39 months)
  • 4 pts (20%) developed recurrence, 3 of these subsequently died from disease
KTP LASER TREATMENT OF RECURRENT GLOTTIC CARCINOMA

- Zeitels et al
CONCLUSIONS

• Radiation therapy and TLM are both effective for treatment of Early Glottic cancer

• Laryngectomy rates of 10-15% across all early stages for pts treated with radiation

• Voice outcomes are slightly better for radiation therapy in comparison to TLM

• Laser surgery is an option for appropriate patients with recurrence after radiation

• KTP laser may prove to be an excellent option for treatment of primary and recurrent early glottic cancer