Laryngeal Cancer

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Epidemiology

- 12,630 new cases
- 3,610 estimated deaths
- 50% with advanced stage
- 62.9% 5-year relative survival
- 4:1 male:female

**Counts/frequency:** oral cavity (120, 16.3%), oropharynx (173, 23.5%), hypopharynx (24, 3.3%), larynx (145, 19.7%), nasopharynx (10, 1.4%), sinonasal (20, 2.7%), cutaneous - squamous cell ca (53, 7.2%), cutaneous- basal cell ca (29, 3.9%), cutaneous - melanoma (16, 2.2%), ocular melanoma (conjunctival) (0, 0.0%), lacrimal (3, 0.4%), salivary - parotid (71, 9.7%), salivary - submandibular (3, 0.4%), salivary - minor salivary (0, 0.0%), thyroid (poorly differentiated, anaplastic, medullary) (6, 0.8%), lymphoma (0, 0.0%), unknown primary (24, 3.3%), other (38, 5.2%)
Surgeon General’s Report 1964

- First widely publicized, official recognition of the dangers of smoking
- Findings based on animal studies, clinical and autopsy observations, retrospective reviews, and seven prospective trials with a total of 1,123,00 subjects
- Documented causal relationship between smoking and cancer of the lung and larynx
- Association between smoking and heart disease was suggested

**TABLE 2.**—Expected and observed deaths for smokers of cigarettes only and mortality ratios in seven prospective studies

<table>
<thead>
<tr>
<th>Underlying cause of death</th>
<th>Expected deaths</th>
<th>Observed deaths</th>
<th>Mortality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer of lung (162-3) ²</td>
<td>170.3</td>
<td>1,833</td>
<td>10.8</td>
</tr>
<tr>
<td>Bronchitis and emphysema (502, 521.1)</td>
<td>89.5</td>
<td>546</td>
<td>6.1</td>
</tr>
<tr>
<td>Cancer of larynx (161)</td>
<td>14.0</td>
<td>75</td>
<td>5.4</td>
</tr>
<tr>
<td>Oral cancer (140-8)</td>
<td>37.0</td>
<td>152</td>
<td>4.1</td>
</tr>
<tr>
<td>Cancer of esophagus (150)</td>
<td>33.7</td>
<td>113</td>
<td>3.4</td>
</tr>
<tr>
<td>Stomach and duodenal ulcers (540, 541)</td>
<td>105.1</td>
<td>294</td>
<td>2.8</td>
</tr>
<tr>
<td>Other circulatory diseases (451-68)</td>
<td>254.0</td>
<td>649</td>
<td>2.6</td>
</tr>
<tr>
<td>Cirrhosis of liver (581)</td>
<td>169.2</td>
<td>379</td>
<td>2.2</td>
</tr>
<tr>
<td>Cancer of bladder (181)</td>
<td>111.6</td>
<td>216</td>
<td>1.9</td>
</tr>
<tr>
<td>Coronary artery disease (420)</td>
<td>6,430.7</td>
<td>11,177</td>
<td>1.7</td>
</tr>
<tr>
<td>Other heart diseases (421-2, 430-4)</td>
<td>526.0</td>
<td>868</td>
<td>1.7</td>
</tr>
<tr>
<td>Hypertensive heart (440-3)</td>
<td>400.2</td>
<td>631</td>
<td>1.5</td>
</tr>
<tr>
<td>General arteriosclerosis (450)</td>
<td>210.7</td>
<td>310</td>
<td>1.5</td>
</tr>
<tr>
<td>Cancer of kidney (180)</td>
<td>79.0</td>
<td>129</td>
<td>1.5</td>
</tr>
<tr>
<td>All causes ³</td>
<td>15,653.9</td>
<td>23,223</td>
<td>1.68</td>
</tr>
</tbody>
</table>

¹ Abridged from Table 26, Chapter 8, Mortality.
² International Statistical Classification numbers in parentheses.
³ Includes all other causes of death as well as those listed above.
The Committee's Judgment in Brief

On the basis of prolonged study and evaluation of many lines of converging evidence, the Committee makes the following judgment:

Cigarette smoking is a health hazard of sufficient importance in the United States to warrant appropriate remedial action.
Smoking Trends

U.S. smoking rate under 20 percent for 1st time

Cigarettes still kill nearly half a million people a year, CDC report reveals
Trends in Head and Neck Cancer Incidence in Relation to Smoking Prevalence

*An Emerging Epidemic of Human Papillomavirus-Associated Cancers?*

**FIGURE 4.** Per capita yearly consumption of cigarettes and annual age-adjusted (to U.S. 2000 standard) incidence rates of oral/pharyngeal and laryngeal cancers per 100 thousand persons in the U.S.$^{6,25}$
### 2002 American Joint Committee on Cancer (AJCC) TNM Staging System for the Larynx

<table>
<thead>
<tr>
<th>Primary Tumor (T)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
</tr>
<tr>
<td>Tis</td>
<td>Carcinoma in situ</td>
</tr>
</tbody>
</table>

**Supraglottis**

- **T1**: Tumor limited to one subsite of supraglottis with normal vocal cord mobility.
- **T2**: Tumor invades mucosa of more than one adjacent subsite of supraglottis or glottis or region outside the supraglottis (e.g., mucosa of base of tongue, vallecula, medial wall of pyriform sinus) without fixation of the larynx.
- **T3**: Tumor limited to larynx with vocal cord fixation and/or invades any of the following: postcricoid area, preepiglottic tissues, paraglottic space, and/or minor thyroid cartilage erosion (e.g., inner cortex).
- **T4a**: Tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus).
- **T4b**: Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures.

**Glottis**

- **T1**: Tumor limited to the vocal cord(s) (may involve anterior or posterior commissure) with normal mobility.
- **T1a**: Tumor limited to one vocal cord.
- **T1b**: Tumor involves both vocal cords.
- **T2**: Tumor extends to supraglottis and/or subglottis, and/or with impaired vocal cord mobility.
- **T3**: Tumor limited to the larynx with vocal cord fixation and/or invades paraglottic space, and/or minor thyroid cartilage erosion (e.g., inner cortex).
- **T4a**: Tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus).

**Subglottis**

- **T1**: Tumor limited to the subglottis.
- **T2**: Tumor extends to vocal cord(s) with normal or impaired mobility.
- **T3**: Tumor limited to larynx with vocal cord fixation.
- **T4a**: Tumor invades cricoid or thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus).
- **T4b**: Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures.

**Regional Lymph Nodes (N)**

- **NX**: Regional lymph nodes cannot be assessed.
- **N0**: No regional lymph node metastasis.
- **N1**: Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension.
- **N2**: Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension; or in multiple ipsilateral lymph nodes, none more than 3 cm in greatest dimension, or in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension.
- **N2a**: Metastasis in single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension.
- **N2b**: Metastasis in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension.
- **N2c**: Metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension.
- **N3**: Metastasis in a lymph node, more than 6 cm in greatest dimension.

**Distant Metastasis (M)**

- **MX**: Distant metastasis cannot be assessed.
- **M0**: No distant metastasis.
- **M1**: Distant metastasis.

*Continued...*
**Staging**

### Supraglottis

**T1**
Tumor limited to one subsite of the supraglottis with normal vocal fold mobility

**T2**
Tumor invades mucosa of more than one adjacent subsite of the supraglottis or glottis or region outside the supraglottis (e.g., mucosa of base of tongue, vallecula, medial wall of pyriform sinus) without fixation of the larynx

**T3**
Tumor limited to the larynx with vocal fold fixation and/or invades any of the following: postcricoid area, pre-epiglottic tissues, paraglottic space, and/or inner cortex of thyroid cartilage

**T4a**  
Moderately advanced local disease
Tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)

**T4b**  
Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

### Subglottis

**T1**
Tumor limited to the subglottis

**T2**
Tumor extends to the vocal cord(s) with normal or impaired mobility.

**T3**
Tumor invades to the larynx with vocal fold fixation.

**T4a**  
Moderately advanced local disease
Tumor invades cricoid or thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of the neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)

**T4b**  
Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures

### Glottis

**T1**
Tumor limited to the vocal fold(s) (may involve anterior or posterior commissure) with normal mobility

**T1a**
Tumor limited to one vocal fold

**T1b**
Tumor involves both vocal folds

**T2**
Tumor extends to the supraglottis and/or subglottis, and/or with impaired vocal fold mobility

**T3**
Tumor limited to the larynx with vocal fold fixation and/or invasion of paraglottic space, and/or inner cortex of the thyroid cartilage

**T4a**  
Moderately advanced local disease
Tumor invades the outer cortex of the thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of the neck, including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus)

**T4b**  
Very advanced local disease
Tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures
### TABLE 10. Regional Lymph Nodes Pathologic Category Criteria (pN)<sup>a</sup>

<table>
<thead>
<tr>
<th>N CATEGORY</th>
<th>N CRITERIA&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX</td>
<td>Regional lymph nodes cannot be assessed</td>
</tr>
<tr>
<td>N0</td>
<td>No regional lymph node metastasis</td>
</tr>
<tr>
<td>N1</td>
<td>Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension and ENE-negative</td>
</tr>
<tr>
<td>N2</td>
<td>Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension and ENE-positive; or more than 3 cm but not more than 6 cm in greatest dimension and ENE-negative; or metastases in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension and ENE-negative; or metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension, ENE-negative</td>
</tr>
<tr>
<td>N2a</td>
<td>Metastasis in a single ipsilateral or contralateral lymph node 3 cm or less in greatest dimension and ENE-positive; or metastasis in a single ipsilateral lymph node more than 3 cm but not more than 6 cm in greatest dimension and ENE-negative</td>
</tr>
<tr>
<td>N2b</td>
<td>Metastasis in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension and ENE-negative</td>
</tr>
<tr>
<td>N2c</td>
<td>Metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension and ENE-negative</td>
</tr>
<tr>
<td>N3</td>
<td>Metastasis in a lymph node more than 6 cm in greatest dimension and ENE-negative; or metastasis in a single ipsilateral lymph node more than 3 cm in greatest dimension and ENE-positive; or metastasis in multiple ipsilateral, contralateral, or bilateral lymph nodes, with any ENE-positive</td>
</tr>
<tr>
<td>N3a</td>
<td>Metastasis in a lymph node more than 6 cm in greatest dimension and ENE-negative</td>
</tr>
<tr>
<td>N3b</td>
<td>Metastasis in a single ipsilateral node more than 3 cm in greatest dimension and ENE-positive; or metastasis in multiple ipsilateral, contralateral, or bilateral lymph nodes, with any ENE-positive</td>
</tr>
</tbody>
</table>

Abbreviations: ENE, extranodal extension. <sup>a</sup>Table 10 is used with the permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois. The original source for this material is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer Science and Business Media LLC (springer.com) (Amin MB, Edge SB, Greene FL, et al, eds. AJCC Cancer Staging Manual. 8th ed. New York: Springer; 2017, with permission). <sup>b</sup>Note that a designation of “U” or “L” may be used for any N stage to indicate metastasis above the lower border of the cricoid (U) or below the lower border of the cricoid (L). Similarly, clinical and pathologic ENE should be recorded as ENE-negative or ENE-positive.
## Sites of the Larynx

<table>
<thead>
<tr>
<th>Site</th>
<th>Subsite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraglottis</td>
<td>Suprahypoid epiglottis</td>
</tr>
<tr>
<td></td>
<td>Infrahypoid epiglottis</td>
</tr>
<tr>
<td></td>
<td>Aryepiglottic folds (laryngeal aspect)</td>
</tr>
<tr>
<td></td>
<td>Arytenoids</td>
</tr>
<tr>
<td></td>
<td>Ventricular bands (false vocal folds)</td>
</tr>
<tr>
<td>Glottis</td>
<td>True vocal folds, including anterior and posterior commissures; occupies a horizontal place 1 cm in thickness, extending inferiorly from the lateral margin of the ventricle</td>
</tr>
<tr>
<td>Subglottis</td>
<td>Region extending from the lower boundary of the glottis to the lower margin of the cricoid cartilage</td>
</tr>
</tbody>
</table>
Subsites

**Supraglottic**
- Often present advanced stage (dysphagia; otalgia; neck mass)
- High rate of neck metastases
- Radiation is often required

**Glottic**
- Often present early stage (hoarseness)
- Low rate of neck metastases
- Radiation can often be avoided
Evolution of Treatment

• 1900’s - 1940’s
  • high surgical complications
  • poor radiation results

• 1940’s - 1970’s
  • improved peri-operative care and surgical outcomes
  • improved radiation techniques and outcomes

• 1970’s - 2000’s
  • increased role of chemotherapy
  • increased focus on functional preservation
  • Improved reconstruction

• 2000s....
  • Targeted therapies
  • Intensity-modulated radiation therapy
  • Advanced surgical technologies (robotics, etc)
  • Immunotherapy
Evolution of Treatment

Induction chemotherapy

- 1980 - 1986
  - Several pilot studies showed high response rates and tolerable toxicities

- 1987
  - Head and Neck Contracts Program - randomized trial found no survival benefit

- 1988
  - Southwest Oncology Group (SWOG) - randomized trial found no survival benefit

*No survival benefit but response to induction CT predicted response to further treatment

Head and Neck Contracts Program. Cancer 1987; 60:301-311

Evolution of Treatment

Laryngeal Preservation

• 1991- Department of Veterans Affairs Laryngeal Cancer Group Study

  • Randomized trial of Stage III and Stage IV laryngeal cancers
  
  • Induction CT followed by RT vs. surgery and post-operative RT
  
  • 2-year survival was 68% for both groups
  
  • Laryngeal preservation was achieved in 64% of induction CT group
Changes in treatment of advanced laryngeal cancer 1985-2001

Amy Y. Chen, MD, MPH, Nicole Schrag, MSPH, Yongping Hao, PhD, W. Dana Flanders, MD, DSc, James Kepner, PhD, Andrew Stewart, MS, and Elizabeth Ward, PhD, Atlanta, Georgia; and Chicago, Illinois

Figure 3  Trends in treatment for advanced-stage laryngeal cancer, 1985-2001, NCDB data, N = 35,921.
Evolution of Treatment

- Randomized trial of Stage III and IV laryngeal cancers
- Induction CT followed by RT vs. concurrent CRT vs. RT alone
- Laryngeal preservation and locoregional control
  CRT > CT then RT > RT alone
- Overall survival was similar in all 3 groups

Amy Y. Chen, MD, MPH; Stacey Fedewa, MPH; Jason Zhu, BA


Radiotherapy with concurrent cisplatin should be considered standard care…and laryngectomy should be performed only as salvage therapy.

Response by Weinstein, Myers, and Shapshay:
“…the final sentence of the report…lacks balance and may be misleading to readers…By not mentioning options involving less-than-total laryngectomy, the authors leave the readers with the impression that total laryngectomy is the only surgical option for laryngeal cancer”

Weinstein GS, Myers EN, Shapshay SM. NEJM 2004; 350:1049
Treatment

• Goal is cure
• Focus is on functional preservation and reconstruction
• Both surgical and non-surgical approaches have evolved in an attempt to minimize treatment related morbidity

<table>
<thead>
<tr>
<th>Item</th>
<th>Patients Ranking Item in Top 3</th>
<th>Patients Ranking Item First</th>
<th>Item Ranking (mean ± SDI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being cured of my cancer</td>
<td>93 122</td>
<td>75 98</td>
<td>1.55 ± 1.3</td>
</tr>
<tr>
<td>Living as long as possible</td>
<td>56 73</td>
<td>8 11</td>
<td>4.93 ± 3.9</td>
</tr>
<tr>
<td>Having no pain</td>
<td>35 46</td>
<td>9 12</td>
<td>5.42 ± 3.2</td>
</tr>
<tr>
<td>Having normal amount of energy</td>
<td>24 31</td>
<td>1 1</td>
<td>5.92 ± 2.7</td>
</tr>
<tr>
<td>Returning to regular activities quickly</td>
<td>24 31</td>
<td>1 1</td>
<td>6.11 ± 3.1</td>
</tr>
<tr>
<td>Being able to swallow all foods/liquids</td>
<td>19 25</td>
<td>2 3</td>
<td>6.06 ± 2.6</td>
</tr>
<tr>
<td>Keeping my natural voice</td>
<td>18 23</td>
<td>1 1</td>
<td>6.96 ± 3.1</td>
</tr>
<tr>
<td>Keeping my appearance unchanged</td>
<td>10 13</td>
<td>1 1</td>
<td>8.43 ± 3.2</td>
</tr>
<tr>
<td>Being able to chew normally</td>
<td>8 11</td>
<td>1 1</td>
<td>7.89 ± 2.7</td>
</tr>
<tr>
<td>Being understood easily</td>
<td>9 12</td>
<td>1 1</td>
<td>7.94 ± 3.0</td>
</tr>
<tr>
<td>Keeping normal sense of taste &amp; smell</td>
<td>4 5</td>
<td>1 1</td>
<td>7.93 ± 2.5</td>
</tr>
<tr>
<td>Having a comfortably moist mouth</td>
<td>1 1</td>
<td>0 0</td>
<td>8.96 ± 2.4</td>
</tr>
</tbody>
</table>
Functions of the larynx

- Phonation
- Respiration
- Prevention of Aspiration
<table>
<thead>
<tr>
<th>Type of Cancer</th>
<th>Organ-Preservation Strategy</th>
<th>Basis for Recommendation</th>
<th>Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 cancer of the glottis: T1—tumor limited to the vocal cord(s) (may involve anterior or posterior commissure) with normal mobility</td>
<td>Endoscopic resection (selected patients) OR radiation therapy</td>
<td>High local control rates and quality of voice after endoscopic resection compared with radiation therapy, possible cost savings; ability to reserve radiation for possible second primary cancers of the upper aerodigestive tract; however, not suitable for all patients</td>
<td>Comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
<tr>
<td>T1a—tumor limited to one vocal cord T1b—tumor involves both vocal cords</td>
<td>Open organ-preservation surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 cancer of the glottis, favorable*: T2—tumor extends to supraglottis and/or subglottis, or with impaired vocal cord mobility</td>
<td>Open organ-preservation surgery OR radiation therapy</td>
<td>Open organ-preservation surgery is associated with highest local control rates; however, leads to permanent hoarseness; local control rates after radiation therapy are also high, and functional outcomes may be better</td>
<td>Comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
<tr>
<td>T2 cancer of the glottis, unfavorable*</td>
<td>Radiation therapy Endoscopic resection (selected patients)</td>
<td>Higher local control rates after surgery compared with radiation therapy alone; quality of voice after therapy of less concern if vocal cord function is irreversibly compromised by tumor invasion; endoscopic surgery requires careful patient selection. For patients with T2 N+ disease, evidence from randomized trials supports concurrent chemoradiation therapy as an organ-preservation option</td>
<td>Comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
<tr>
<td>T1-T2 cancer of the supraglottis, favorable*: T1—tumor limited to one subsite of supraglottis with normal vocal cord mobility</td>
<td>Open organ-preservation surgery OR radiation therapy</td>
<td>Open organ-preservation surgery associated with highest local control rates; however, requires temporary tracheostomy and may lead to increased risk of aspiration after therapy; local control rates after radiation therapy are also high, and functional outcomes may be better</td>
<td>Comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
<tr>
<td>T2 cancer of the supraglottis, unfavorable*</td>
<td>Radiation therapy Endoscopic resection (selected patients)</td>
<td>Open organ-preservation surgery is more likely to yield higher local control rates than radiation therapy for patients with T2 N+ disease, evidence from randomized trials supports concurrent chemoradiation therapy as an organ-preservation option</td>
<td>Comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
</tbody>
</table>
# American Society of Clinical Oncology Clinical Practice Guideline for the Use of Larynx-Preservation Strategies in the Treatment of Laryngeal Cancer


<table>
<thead>
<tr>
<th>Type of Cancer</th>
<th>Organ-Preservation Strategy</th>
<th>Basis for Recommendation</th>
<th>Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3: T4 cancers of the glottis or supraglottis: T3 glottis—tumor limited to the larynx with vocal cord fixation, and/or invades paraglottic space, and/or minor thyroid cartilage erosion (e.g., inner cortex) T3 supraglottis—tumor limited to larynx with vocal cord fixation and/or invades any of the following: postcricoid area, pre-epiglottic tissues, paraglottic space, and/or minor thyroid cartilage erosion (e.g., inner cortex) T4a glottis or supraglottis—tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx (e.g., trachea, soft tissues of neck including deep extrinsic muscle of the tongue, strap muscles, thyroid, or esophagus) T4b glottis or supraglottis—tumor invades prevertebral space, encases carotid artery, or invades mediastinal structures</td>
<td>Concurrent chemoradiation therapy OR open organ-preservation surgery (in highly selected patients) Radiation therapy</td>
<td>Highest rate of larynx preservation is associated with concurrent chemoradiation therapy compared with other radiation-based approaches, at the cost of higher acute toxicities but without more long-term difficulties in speech and swallowing; when salvage total laryngectomy incorporated, no difference in overall survival; organ preservation surgery is an option in highly selected patients (e.g., there are patients with T3 supraglottic cancers that have minimal or moderate pre-epiglottic invasion and are candidates for organ preserving surgery)</td>
<td>Randomized controlled clinical trials comparing concurrent chemoradiation therapy, and/or induction chemotherapy followed by radiation, and/or radiation therapy alone; and/or surgery followed by radiation; comparison of outcomes from case series/prospective single-arm studies</td>
</tr>
</tbody>
</table>
Laryngeal Cancer in the United States: Changes in Demographics, Patterns of Care, and Survival

*Laryngoscope, 116(Suppl. 111):1–13, 2006*

Henry T. Hoffman, MD, MS, FACS; Kimberly Porter, MPH; Lucy H. Karnell, PhD; Jay S. Cooper, MD; Randall S. Weber, MD; Corey J. Langer, MD; Kie-Kian Ang, MD, PhD; Greer Gay, PhD; Andrew Stewart, MA; Robert A. Robinson, MD, PhD

- NCDB review of 158,426 cases of laryngeal SCC
- Decrease in survival of patients with laryngeal cancer in the 1990’s compared with the 1980’s

Fig. 2: Survival for patients with laryngeal squamous cell carcinoma within the NCDB decreased progressively from the mid-1980s to the mid-1990s.
Factors Predictive of Survival in Advanced Laryngeal Cancer

Amy Y. Chen, MD, MPH; Michael Halpern, MD, PhD
Arch Otolaryngol Head Neck Surg. 2007;133(12):1270-1276

• NCDB review of 7019 patients

• TL associated with increased survival when compared to CRT, especially in patients with Stage IV disease

Amy Y. Chen, MD, MPH; Stacey Fedewa, MPH; Jason Zhu, BA

Table 4. Hazard Ratio (HR) Model Predicting 4-Year Survival Among Patients With Early-Stage Cancer Receiving Local Surgery or Radiation Therapy, 1998-2002

<table>
<thead>
<tr>
<th>Category</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.89 (0.72-1.10)</td>
</tr>
<tr>
<td>African American</td>
<td>1.16 (1.03-1.30)</td>
</tr>
<tr>
<td>Other</td>
<td>0.69 (0.50-0.95)</td>
</tr>
<tr>
<td>Missing</td>
<td>1.00 (0.87-1.14)</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Local surgery</td>
<td>0.71 (0.65-0.76)</td>
</tr>
<tr>
<td>Subsite</td>
<td></td>
</tr>
<tr>
<td>Glottic</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Supraglottic</td>
<td>1.89 (1.74-2.05)</td>
</tr>
<tr>
<td>No high school diploma, median, %&lt;14.0</td>
<td>0.86 (0.73-0.96)</td>
</tr>
<tr>
<td>14.0-19.9</td>
<td>0.89 (0.80-1.00)</td>
</tr>
<tr>
<td>20.0-29.9</td>
<td>0.96 (0.87-1.06)</td>
</tr>
<tr>
<td>&gt;29.0</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Missing</td>
<td>0.75 (0.63-0.91)</td>
</tr>
<tr>
<td>Facility type</td>
<td></td>
</tr>
<tr>
<td>Community facility</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Community cancer center</td>
<td>0.88 (0.80-0.97)</td>
</tr>
<tr>
<td>Teaching research</td>
<td>0.86 (0.78-0.96)</td>
</tr>
</tbody>
</table>

Table 5. Hazard Ratio (HR) Model Predicting 4-Year Survival Among Patients With Advanced-Stage Receiving Chemoradiation (CRT) or Laryngectomy, 1998-2002

<table>
<thead>
<tr>
<th>Category</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.99 (0.83-1.18)</td>
</tr>
<tr>
<td>African American</td>
<td>1.15 (1.05-1.25)</td>
</tr>
<tr>
<td>Other</td>
<td>0.88 (0.68-1.15)</td>
</tr>
<tr>
<td>Missing</td>
<td>1.06 (0.91-1.23)</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
</tr>
<tr>
<td>Laryngectomy</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>CRT</td>
<td>1.13 (1.06-1.21)</td>
</tr>
<tr>
<td>Subsite</td>
<td></td>
</tr>
<tr>
<td>Glottic</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Supraglottic</td>
<td>1.03 (0.97-1.10)</td>
</tr>
<tr>
<td>No high school diploma, median, %&lt;14.0</td>
<td>0.91 (0.83-1.01)</td>
</tr>
<tr>
<td>14.0-19.9</td>
<td>0.92 (0.84-1.01)</td>
</tr>
<tr>
<td>20.0-29.9</td>
<td>0.99 (0.91-1.08)</td>
</tr>
<tr>
<td>&gt;29.0</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Missing</td>
<td>1.06 (0.91-1.23)</td>
</tr>
<tr>
<td>Facility type</td>
<td></td>
</tr>
<tr>
<td>Community facility</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Community cancer center</td>
<td>0.94 (0.86-1.04)</td>
</tr>
<tr>
<td>Teaching research</td>
<td>0.88 (0.80-0.97)</td>
</tr>
</tbody>
</table>

Management Options

- Surgical
  - Endoscopic resection
    - Laser
    - TORS
  - Open partial resection
    - Laryngofissure
    - Vertical hemilaryngectomy
    - Supraglottic laryngectomy
    - Supracricoid laryngectomy
  - Total Laryngectomy

- Non-surgical
  - Radiation
  - Chemoradiation
Management options

- Early Glottic
- Endoscopic resection
- Definitive radiation
- Laryngofissure

Quality of Life, Functional Outcome, and Costs of Early Glottic Cancer

Jonathan C. Smith, MD; Jonas T. Johnson, MD; David M. Cognetti, BS; Douglas P. Landsittel, PhD; William E. Gooding, MS; Elmer R. Cano, MD; Eugene N. Myers, MD
Early glottic


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

Fig. 2a, b Subligamental cordectomy (type II)

Fig. 3a, b Trans muscular cordectomy (type III). In order to expose the entire vocal fold, partial resection of the ventricular fold may be necessary (hatched area)

Fig. 4a, b Total or complete cordectomy (type IV). The ipsilateral ventricular fold can be removed partially or totally to ensure complete resection of the vocal fold (hatched area)
Early glottic

TI Glottic Carcinoma: Do Comorbidities, Facility Characteristics, and Sociodemographics Explain Survival Differences across Treatment Types?

Stephanie Misono, MD, MPH1, Schelomo Marmor, PhD1,2, Bevan Yueh, MD, MPH1, and Beth A. Virnig, PhD, MPH3

- SEER database, 1991-2009
- 2338 cases, 66 y/o and older
- 47% radiation alone
- 14% surgery alone
- Higher survival in patients who underwent local surgery
Survival Impact of Initial Therapy in Patients with T1-T2 Glottic Squamous Cell Carcinoma

Jacob S. Brady¹, Emily Marchiano¹, David Kam¹, Soly Baredes, MD¹,², Jean Anderson Eloy, MD¹,²,³, and Richard Chan Woo Park, MD¹

- SEER database, 1998 - 2012
- 13,312 cases
- 52.5% radiation alone
- 15.9% surgery alone

5-year DSS survival higher for surgery alone for T1 tumors, but same for T2 tumors

Figure 2. Kaplan-Meier analysis of 5-year disease-specific survival (DSS) for (a) T1N0M0 and (b) T2N0M0 glottic cancers by treatment modality. CT, combined therapy; RA, radiation alone; SA, surgery alone. Kaplan-Meier analysis of 5-year DSS for (c) T1N0M0 and (d) T2N0M0 glottic cancers by treatment sequence in combination therapy. RF, radiotherapy first; SF, surgery first.
Survival Impact of Initial Therapy in Patients with T1-T2 Glottic Squamous Cell Carcinoma

Jacob S. Brady¹, Emily Marchiano¹, David Kam¹, Soly Baredes, MD¹,², Jean Anderson Eloy, MD¹,²,³, and Richard Chan Woo Park, MD¹

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**Table 4. Disease-Specific Survival Analysis for T1N0 and T2N0 Glottic Cancer by Treatment Modality.ᵃ**

<table>
<thead>
<tr>
<th></th>
<th>T1N0</th>
<th></th>
<th>T2N0</th>
<th></th>
<th>T1T2N0</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Survival, %</td>
<td>P Value</td>
<td>n</td>
<td>Survival, %</td>
<td>P Value</td>
</tr>
<tr>
<td>Overall survival</td>
<td>10,455</td>
<td>90.4</td>
<td>—</td>
<td>2857</td>
<td>80.0</td>
<td>—</td>
</tr>
<tr>
<td>Treatment modality</td>
<td></td>
<td></td>
<td>P Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination therapy</td>
<td>3581</td>
<td>91.1</td>
<td>.0658</td>
<td>771</td>
<td>76.4</td>
<td>—</td>
</tr>
<tr>
<td>Single-modality therapy</td>
<td>6874</td>
<td>90.1</td>
<td>.0255</td>
<td>2086</td>
<td>81.1</td>
<td>4352</td>
</tr>
<tr>
<td>Surgery alone</td>
<td>1779</td>
<td>93.2</td>
<td>&lt;.0001</td>
<td>331</td>
<td>79.1</td>
<td>2110</td>
</tr>
<tr>
<td>Radiation alone</td>
<td>5095</td>
<td>89.0</td>
<td>&lt;.0001</td>
<td>1755</td>
<td>81.5</td>
<td>6850</td>
</tr>
</tbody>
</table>

ᵃBold format indicates statistical significance (P < .05).
Management options

• Early Glottic
  • Endoscopic resection
  • Definitive radiation
  • Laryngofissure
Management options

- Early Supraglottic
Management options

Jefferson University and Hospitals

TORS

Supraglottic laryngectomy
Management options

- Advanced Cancers
Disadvantages of Treatment

Laryngectomy

- Loss of natural voice
- Decrease sense of smell and taste
- Permanent stoma

Social stigma, disability, and decreased quality of life caused by separation of the aero-digestive tracts is drive for organ preserving treatments.

Chemoradiation

- Acute toxicity of treatment
- Need for salvage
- Xerostomia
- Aspiration
Role of Total Laryngectomy

- VA Study - % of each tumor characteristic requiring salvage laryngectomy:
  - Glottic 43%
  - Supraglottic 31%
  - Fixed TVF 41%
  - Mobile TVF 29%
  - Invasion of cartilage 41%
  - No invasion of cartilage 35%
  - Stage III 29%
  - Stage IV 44%
  - T4 56%
  - < T4 29%
Predicting treatment outcomes

- Pre-operative tumor/patient characteristics
  - T4
  - Stage IV
  - Glottic tumors
  - TVF fixation
  - Invasion of cartilage
Predicting treatment outcomes

Pre-operative tumor/patient characteristics

- T4
- Stage IV
- Glottic tumors
- TVF fixation
- Invasion of cartilage
- Older age

Patients who would be candidates for organ-preservation surgery
Open partial laryngectomy

- Laryngofissure
- Vertical hemilaryngectomy
- Supraglottic laryngectomy
- Supracricoid laryngectomy
Supracricoid laryngectomy

- 74 y/o
- T2N0 SCCA
- No COPD
- Quit smoking 20 years ago
Supracricoid laryngectomy
Supracricoid laryngectomy

Arytenoid pexy
Supracricoid laryngectomy

Impaction suture
Supracricoid laryngectomy

Impaction suture
Supracricoid laryngectomy
Supracricoid laryngectomy

- 59 y/o
- T2N0 SCCA s/p radiation
- Non-smoker
Supracricoid laryngectomy
Supracricoid laryngectomy
Supracricoid laryngectomy
Conclusions

• Laryngeal cancer has declined with smoking rates

• Tobacco cessation is an important component of treatment

• Laryngeal cancer survival rates have worsened in the chemoradiation era

• There is database evidence of surgical survival advantage in both early and advanced stage glottic cancers

• Endoscopic and open partial laryngeal surgery are important tools in the armamentarium of the head and neck surgeon
THIS THROAT CANCER SURVIVOR AND LARYNGECTOMY PATIENT CHEERS ON THE PHILLIES AS A HOSTESS

A laryngectomy to battle throat cancer didn’t stop Barbara Kuhn from pursuing her dream retirement job – being a hostess for the Phillies.

By Barbara Kuhn, Laryngectomy Patient, Lover of Life
September 12, 2019

I will never be able to speak again. That’s all I kept thinking to myself when I heard I had a cancerous mass on my throat, after already winning my fight against throat cancer several years before.

My surgeon told me I needed a laryngectomy, which meant I would need surgery to remove my larynx – my voice box. As a result, I would have an opening in my neck that would allow me to speak through a valve or “button.”

Barbara Kuhn will greet fans for up to 81 baseball games at Citizens Bank Park, the home
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