Laryngectomy Margin Assessment: A Little Help From a Template

Daniel J. Zaccarini, MD, and Lester D.R. Thompson, MD†*

Abstract: Laryngectomy margin assessment is an important part of patient care and can affect outcomes. There is no standard approach to grossing laryngectomy specimens, with variations in the published guidelines. A uniform approach to margin assessment may be helpful to improve patient care and future research. At the very least, sampling of all mucosal margins (arytenoid area, hypopharyngeal, and anterior epiglottis) and tracheal margin should be performed. Sampling of soft tissue margins may be delegated to the pathologist, and contingent on the tumor extent into soft tissue. If a tracheostomy is present, skin and soft tissue margins should be sampled from the stoma. This review provides a template for laryngectomy margin assessment and can be used as a guideline as to which margins should be assessed.

Key Words: laryngectomy template, margin assessment, uniform approach

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INTRODUCTION

Most patients with laryngeal cancer are diagnosed with advanced-stage disease, and survival rates are less than 50%.[1] For patients with pT3 or pT4 tumors or patients with recurrence after radiation/chemotherapy, improved survival can occur after total laryngectomy. Total laryngectomy specimens may be daunting to approach at the grossing bench. Often, they are received fresh during the operation to assess margin status. Communicating the results of frozen section margins between the surgeon and pathologist is exceedingly important. If the reporting of margin status is interpreted incorrectly by the surgeon, it can result in adverse patient outcomes and change in treatment management.[2] Patients with positive margins, perineural/lymphovascular invasion, or positive lymph nodes will have postoperative radiation therapy with or without chemotherapy.[3] Chemotherapy may be added if the patient is deemed high risk, such as if there are positive margins or extranodal extension in a lymph node.[3] In addition, discrepancies in frozen diagnosis and permanent diagnosis can also result in a change in margin status. If a margin is considered positive intraoperatively, the surgeon will typically attempt to take additional tissue to ensure a negative final margin. This underscores the importance of having a more uniform and basic approach to margin assessment so that all necessary margins are sampled, while the appropriate additional marginal tissue is taken from the correct location intraoperatively. This review will try to simplify and standardize the approach to the laryngectomy specimen margin assessment.

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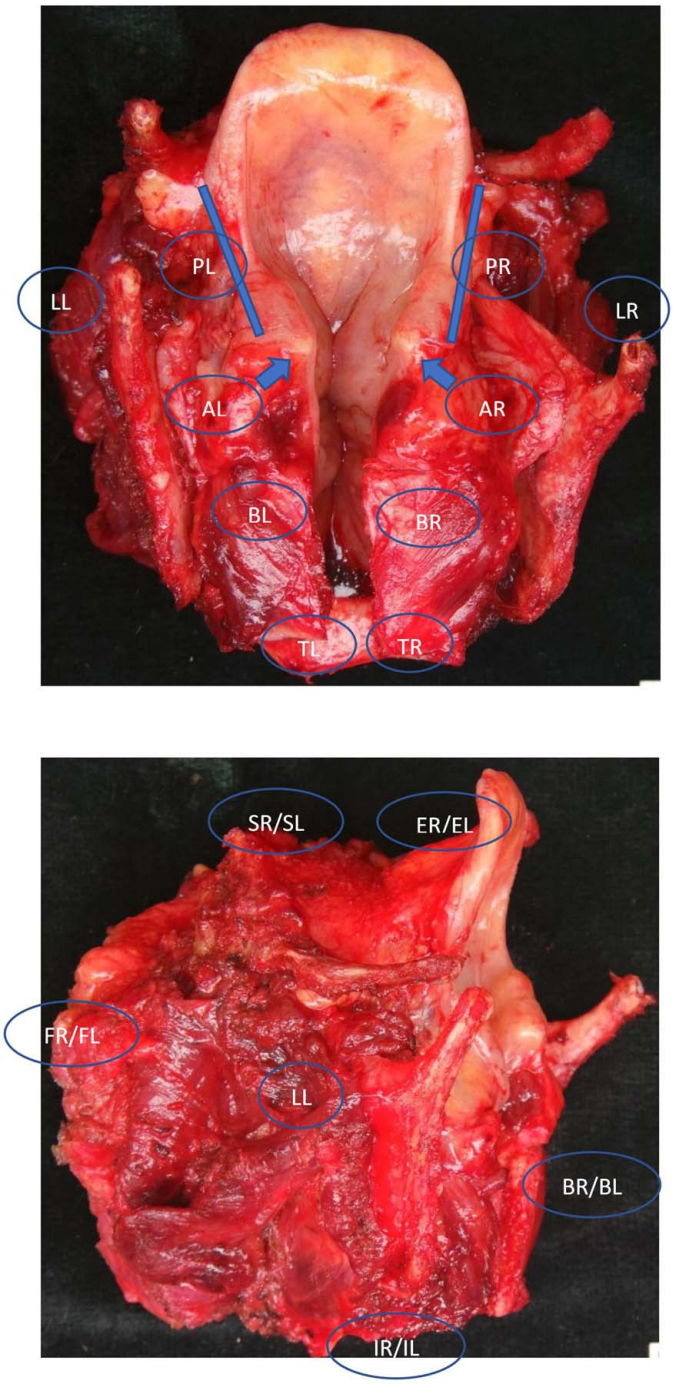
MARGIN ASSESSMENT IN A TOTAL LARYNGECTOMY

When a total laryngectomy specimen is received, the soft tissue and mucosal margins should be inked. While pedantic, standardized color application leads to easier reporting: superior-blue (the sky is up); inferior-green (the grass is down); medial/right-orange; lateral/left-yellow (2 "ll" in lateral and yellow, with "l" in left); anterior-red; and posterior-black. Local modifications suitable to all involved harmonize interpretation and reporting, allowing for easy recognition of margin location. Subsequently, using scissors, the lumen can be opened by cutting posteriorly. Typical mucosal margins include bilateral hypopharyngeal mucosa, arytenoid area (area of posterior cricoid cartilage), and anterior epiglottis (vallecula) (Fig. 1—Template). Specifically, standardization of the margins using a 2-letter combination: the first letter designates the location with the second the laterality (right or left). While initially cumbersome or tedious, with repetitive use and acceptance, this standardized reporting nomenclature could provide an easy shorthand for reporting and discussion.

To appreciate the mucosal margins of the larynx, one must also recognize the boundaries of the hypopharynx. The hyoid bone and superior tip of the epiglottis are the superior boundaries of the hypopharynx and larynx. These regions terminate toward the beginning of the cervical esophagus at the most inferior aspect of the cricoid cartilage. The hypopharynx has 3 subsites, including the postcricoid region/esophagus, posterior hypopharyngeal wall, and pyriform sinuses. The pyriform sinus (Fig. 2) is part of the hypopharynx, not the larynx, and it is essentially a small sac-like area on both sides of the larynx that communicates inferiorly with the opening of the esophagus.[4] The postcricoid region's most superior aspect is the arytenoid cartilage and extends down to the inferior aspect of the cricoid cartilage.[5] The posterior hypopharyngeal wall begins at the superior aspect of the hyoid/floor of vallecula, with its most inferior aspect, the cricoid cartilage, and extends from one pyriform sinus to the other.[6] The aryepiglottic fold is found between the lateral edges of the epiglottis and moves inferiorly toward the arytenoid cartilage.

The inferior tracheal margin and soft tissue margins [including superior (base of tongue), anterolateral, and posterior] should complete the margin assessment. Differentially inking the left and right soft tissue margins is helpful, although guided by medial and lateral designations. Reporting of soft tissue margins may not be applicable unless tumor is seen close to these margins.[7] If the thyroid is present, leave it attached, and ink as described above. Significant portions of esophagus or pharynx can also be



MUCOSAL MARGINS:

AR: Arytenoid area right (at posterior cricoid cartilage)

AL: Arytenoid area left (at posterior cricoid cartilage)

PR: Pyriform sinus/hypopharyngeal/aryepiglottic fold right

PL: Pyriform sinus/hypopharyngeal/aryepiglottic fold left

ER: Epiglottis right (Anterior epiglottis/vallecula)

EL: Epiglottis left (Anterior epiglottis/vallecula)

TR: Trachea right (inferior mucosal margin)

TL: Tracheal left (inferior mucosal margin).

SOFT TISSUE MARGINS:

SR: Soft tissue superior right (base of tongue)

SL: Soft tissue superior right (base of tongue)

IR: Soft tissue inferior right

IL: Soft tissue inferior left

FR: Soft tissue anterior (front) right

FL: Soft tissue anterior (front) left

LR: Soft tissue lateral right

LL: Soft tissue lateral left

BR: Soft tissue posterior (back) right

BL: Soft tissue posterior (back) left

SSR: Stoma skin right (see figure 5)

SSL: Stoma skin left (see figure 5)

FIGURE 1. General template for approaching margin assessment in a laryngectomy specimen.

excised (Figs. 3, 4). The cervical esophagus begins from the cricopharyngeus superiorly and is posterior to the trachea, separated only by connective tissue.[8] Preoperative tracheostomy is an adverse prognostic factor in total laryngectomy when paratracheal margin was reported.[9] If a tracheostomy is present, separately inking the soft tissue/stoma skin margin around it is helpful (Fig. 5). The mucosa on the anterior aspect of the epiglottis extends to the base of the tongue (Fig. 6).

There are various pathology resources discussing recommended laryngectomy margins; however, there is inconsistency in regard to the reporting of soft tissue margins in laryngectomy specimens. There has not been thorough research on the evaluation of soft tissue margins in laryngectomy specimens.[10] In addition, the College of American Pathologists (CAP) cancer template for laryngectomy specimens does not specify which specific margins should be taken.[11] Whether these margins are submitted as shave/en face or radial/perpendicular sections is at the

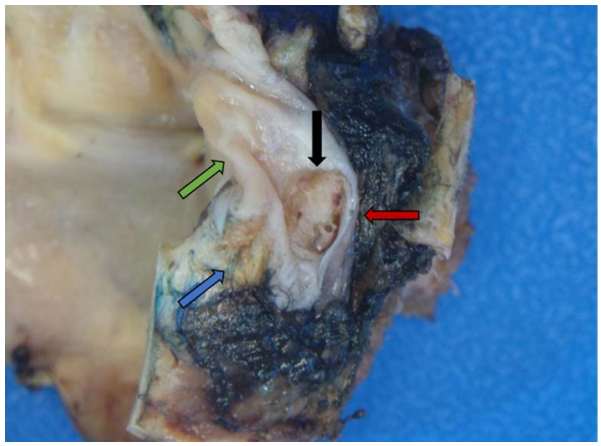


FIGURE 2. Gray-white lesion (black arrow) within the right pyriform sinus that abuts the aryepiglottic fold (green arrow). The pyriform sinus mucosal margin (red arrow) and arytenoid area (blue arrow) have already been sampled. Please see this image in color online.

discretion of the pathologist, influenced by how close the tumor is to these margins. Generally, radial sections are more helpful in determining the distance of the tumor to the closest margin.

MARGIN ASSESSMENT IN A PARTIAL LARYNGECTOMY

Other potential laryngectomy specimens can vary in extent depending on the location of the tumor, and examples include supraglottic laryngectomy, supracricoid laryngectomy, and vertical hemilaryngectomy. Partial vertical laryngectomy (hemilaryngectomy) is taken by cutting midline along the thyroid cartilage and excising the ventricle and vocal cords. Partial horizontal laryngectomy (supraglottic laryngectomy) removes part of the superior half of the larynx (Fig. 7).[12] Direct orientation by the surgeon is important to accurately assess margins in these specimens.

FIGURE 3. Laryngopharyngectomy specimen where a significant amount of pharynx has been resected with the defect noted to extend into the nasopharynx on the right side as per the operative note. The tumor also involved the base of the tongue bilaterally. Differentially designating the hypopharyngeal margins (black arrows) may be helpful to assess margins. Please see this image in color online.

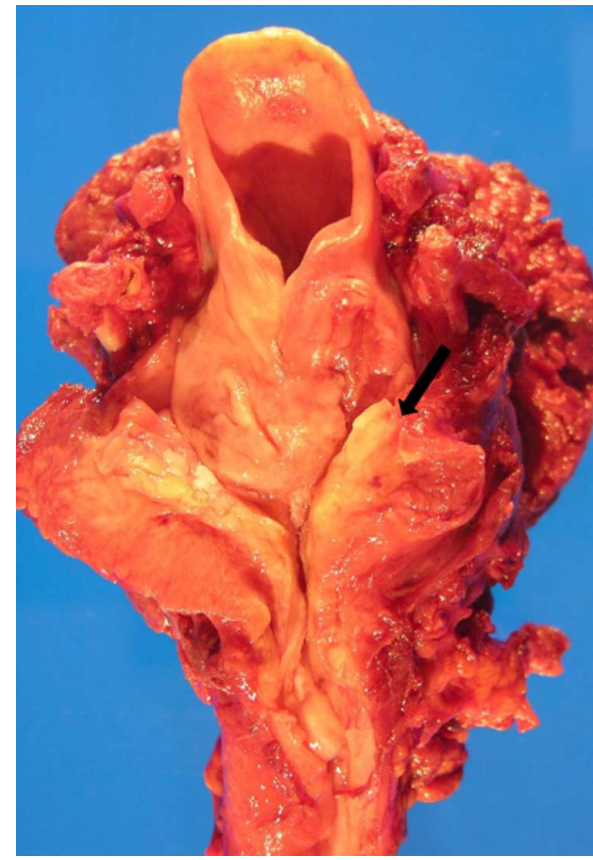


FIGURE 4. An infiltrative squamous cell carcinoma of the esophagus (arrow) is seen posterior to the larynx. Esophageal margins (proximal and distal), hypopharyngeal margins, and soft tissue margins were sampled. Please see this image in color online.

LIMITATIONS OF MARGIN ASSESSMENT

It has been shown that patients with squamous cell carcinoma who have positive initial margins during laryngectomy are at increased risk for recurrence, even with negative final margins.[13] In this study, margins were usually taken from the total laryngectomy specimen and typically included bilateral superior and inferior pharynx, bilateral tongue bases, postcricoid mucosa, and trachea.[13] If the tumor was growing deep into the soft tissue, additional deep margins were taken.[13] Despite having additional margins taken for overall negative margin status, these patients had an increased risk of recurrence.[13] The reasons for this increased risk of recurrence are unclear but could represent widespread disease. However, this study makes us consider that more uniform margin assessment in laryngectomy specimens may help provide less variability in future studies. Fresh laryngectomy specimens oriented by the surgeon with margins sampled directly from the specimen provide the best information.

FIGURE 5. Anterior view of laryngectomy showing tracheostomy (black arrow). Separately inking the stoma skin and soft tissue margin is useful. Please see this image in color online.

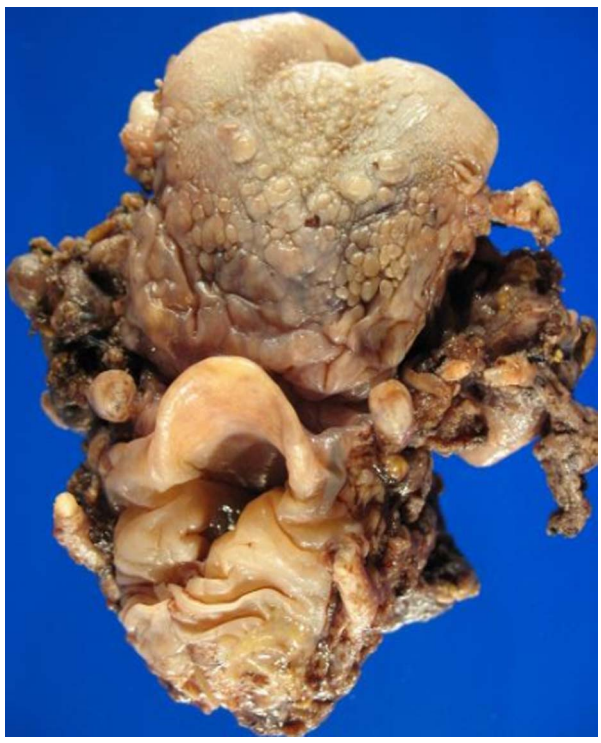


FIGURE 6. Total glossectomy and total laryngectomy specimen with tongue sitting anterior and superior to the epiglottis. Please see this image in color online.

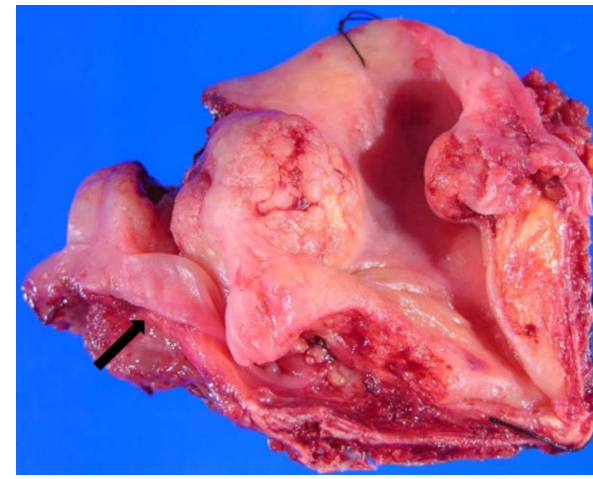


FIGURE 7. Supraglottic laryngectomy specimen with a red tan, ulcerated, fungating mass present on the left side of the epiglottis (black stitch), extending lateral to the pharyngeal wall and anterior to the base of the tongue. Left hypopharyngeal margins (black arrow), base of the tongue, and soft tissue margins would be important to assess in this specimen. Please see this image in color online.

CONCLUSIONS

Laryngectomy specimens can vary in appearance depending on the extent of the tumor. There is no standardized approach to which margins, if any, are taken intraoperatively for frozen sections. However, using a template may help adhere to more consistent margin assessment. At minimum, sampling of all mucosal margins (arytenoid area, hypopharyngeal, and anterior epiglottis) and tracheal margins should be performed. Soft tissue margins may be left up to the discretion of the pathologist, and depends on the tumor extent into soft tissue. If a tracheostomy is present, skin and soft tissue margins should be taken from the stoma. Furthermore, good communication with the surgeon to discuss margins of concern is salient.

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