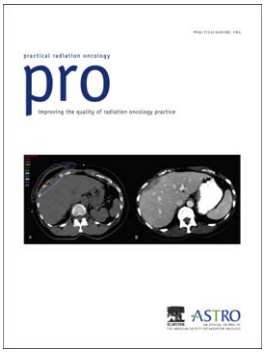

A Radiation Oncologist's Guide to Contouring the Larynx

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A Radiation Oncologist's Guide to Contouring the Larynx

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Conflicts of Interest: None

A Radiation Oncologist's Guide to Contouring the Larynx

Objectives: To present a step-by-step guide for contouring the larynx on axial CT images as would be done for radiation therapy planning.

Materials and Methods: We used the guidelines described in Radiation Therapy and Oncology Group trial 1016 to describe a step-by-step process for contouring the larynx on axial CT images as would be done for radiation therapy planning

Results:

Step one: Identify the most inferior edge of the hyoid bone and begin contouring on the next slice inferiorly.

Step two: The anterior boundary of the larynx contour is the inner surface of the thyroid cartilage.

In the superior portion of the contour, the posterior boundary of the larynx is the lateral surfaces of the ary-epiglottic folds and the posterior surface of the mucosa covering the aretynoids. Do not include the pyriform sinus in the larynx contour.

In the inferior portion of the contour, the posterior boundary of the larynx is the posterior surface of the cricoid cartilage.

Step three: The most inferior extent of the larynx contour is the last image where the cricoid cartilage is seen as a complete ring.

Conclusion: These instructions will help radiation oncologists contour the larynx as is done in national protocols.

Introduction:

The Radiation Therapy Oncology Group (RTOG) head and neck protocol 1016 identifies the larynx as the "triangular prism shaped volume that begins just inferior to the hyoid bone and extends to the cricoid cartilage inferiorly and extends from the anterior commissure to include the arytenoids. It includes the infrahyoid, but not the suprahyoid epiglottis."

The above guidelines leave room for variation of interpretation of larynx contouring. For example, the guidelines do not specify whether to include the thyroid cartilage or not or whether to include the air column within the larynx.

It is not incorrect to see this variability, but certainly these are issues one confronts during contouring. There are likely to be many such variations of contours of the larynx that are reasonable and appropriate The purpose of this paper is to present an interpretation of the guidelines in a step-by-step format that we think will be useful for radiation oncologists and dosimetrists who treat head and neck cancer.

Contouring Guidelines:

See Figure 1 for the associated axial cuts to aid in the understanding of the text.

Step one: Identify the most inferior edge of the hyoid bone and begin contouring on the next slice inferiorly.

Step two: The anterior boundary of the larynx contour is the inner surface of the thyroid cartilage.

In the superior portion of the contour, the posterior boundary of the larynx is the lateral surfaces of the ary-epiglottic folds and the posterior surface of the mucosa covering the aretynoids. Do not include the pyriform sinus in the larynx contour.

In the inferior portion of the contour, the posterior boundary of the larynx is the posterior surface of the cricoid cartilage.

Step three: The most inferior extent of the larynx contour is the last image where the cricoid cartilage is seen as a complete ring.

The cricoid cartilage is seen on many axial cuts. The specific slice to utilize for the inferior border will be the last image where the cricoid cartilage is seen as a complete ring. Again, the contour must include the entire outer edge of the cricoid cartilage. If drawn properly, the larynx will not be contoured on any slices where the esophagus indents into the posterior wall of the airway or where the airway has a convex or membranous appearance.

Conclusion:

These instructions will help radiation oncologists contour the larynx as is done in national protocols.

An issue related to the topic of this paper is the dose constraint to use when the larynx is an avoidance structure. RTOG 1016 [1]guidelines specify mean larynx dose

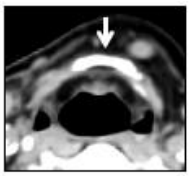
"as low as Possible" with the specific goal of no more than 20 Gy. Recommended dose limits are to reduce the dose as much as possible. Open protocol 0920[2] also recommends keeping the larynx dose as low as possible but the specific number is less than 45 Gy.

References:

1. RTOG 1016 Phase III Trial of Radiotherapy Plus Cetuximab Versus Chemoradiotherapy in HPV-Associated Oropharynx Cancer Version Date: 7/16/2014

2. RTOG 0920 A Phase III Study of Postoperative Radiation Therapy (IMRT) +/- Cetuximab for Locally-Advanced Resected Head and Neck Cancer. Version date 5/18/2015

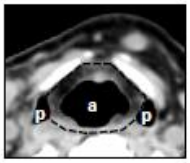
Figure 1: Landmarks for Contouring



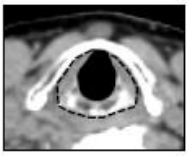
Most inferior edge of hyoid bone (arrow).
Do not contour the larynx at this level

Figure 1
Landmarks for Contouring

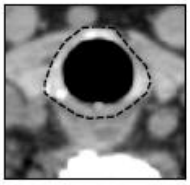
Do not include the pyriform sinuses (p) in the larynx contour. Do include the airway (a) in the larynx contour.



Most Superior Larynx Contour:
On the first image where you do not see the hyoid bone as you go inferiorly.



The boundary of the larynx contour is the inner edge of the thyroid cartilage anteriorly and the posterior edge of the cricoid cartilage posteriorly.



Most Inferior Larynx Contour:
The last image where you see the cricoid cartilage as a complete ring. The larynx contour is the outer surface of the cricoid cartilage

The larynx contour is not present on images where the posterior wall of the airway has a convex or membranous appearance (arrow).