



## Case Report

# Endotracheal brachytherapy alone: An effective palliative treatment for tracheal tumors

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**ABSTRACT**

**BACKGROUND:** Tracheal tumors are rare. They are usually unresectable and treated primarily with external beam radiation. The use of palliative endotracheal brachytherapy (ETBT) alone in treating patients with tracheal tumors has not been reported.

**METHODS:** Using a prospective database, demographic, treatment, and outcome data of patients with tracheal tumors treated palliatively with ETBT from 2006 to 2014 were analyzed. Tumor and symptom responses were evaluated based on response evaluation criteria in solid tumors criteria. Survival, in-field disease control, symptom response, and duration of symptom responses were evaluated using descriptive analyses.

**RESULTS:** Sixteen ETBT (median, 2) treatments were delivered to 8 patients. Median age was 63.4 years old. Common symptoms were hemoptysis, cough, and dyspnea. Tracheal lengths of 3.5–11 cm were treated with 5–7 Gy/fraction, using 1–3 fractions. The mean overall survival was 5 months and symptom-free survival was 6.8 months, respectively. After ETBT, 88% of patients experienced symptomatic improvement (hemoptysis [ $n = 3/3$ ], cough [ $n = 6/7$ ], and dyspnea [ $n = 4/4$ ]). One patient developed Grade 1 stenosis that did not require intervention.

**CONCLUSIONS:** This is among the largest series of tracheal tumors treated palliatively with ETBT alone. ETBT provided effective palliation with symptom improvement and minimal toxicity. © 2015 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

**Keywords:**

Endotracheal brachytherapy; Tracheal tumors; Palliation; High-dose rate

**Introduction**

Primary tracheal malignancies account for <1% of malignancies and are associated with a poor prognosis (1). Metastases into the trachea have also been reported from other cancers, such as laryngeal, thyroid, lung, and esophageal cancers. Curative treatment consists of resection; however, most patients are inoperable or present with unresectable cancer (2). As these tumors are located in a critical

location, they are often associated with distressing symptoms, such as hemoptysis, dyspnea, or cough.

Palliation is given to restore airway patency and improve patient's symptoms. Treatment options include external beam radiotherapy (EBRT), laser, cryosurgery, stents, and endotracheal brachytherapy (ETBT) (1). As these tumors are rare, studies describing the effectiveness of various palliative modalities are few and often limited to case reports.

At our institution, patients with thoracic malignancies are often treated with high-dose-rate intraluminal brachytherapy with a radical or palliative intent. In this prospective case series, we present outcomes of patients with tracheal tumors treated with palliative ETBT alone. To our knowledge, this is the largest series describing the use of ETBT alone in tracheal tumors.

**Methods and materials**

Our local Hamilton Integrated Research Ethics Board committee reviewed and approved this prospective case series.

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Submission: This material has never been published and is not under evaluation in other peer-reviewed publications.

Conflict of interest/financial disclosure: None to report.

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We identified from our prospective database 8 consecutive patients treated with ETBT between 2006 and March 2014.

Patients were included if they had bronchoscopically documented endotracheal tumor, biopsy-proven malignancy, and if they were deemed unsuitable for radical treatments (nonoperable, had unresectable tumor, or had prior radical radiation at the same site).

Patients were excluded if they did not have followup, they underwent chemotherapy or EBRT during ETBT, or they received ETBT perioperatively.

Patients' demographic data, performance status, symptoms, tumor data (histology and stage), treatment description, and outcomes were recorded. The age-adjusted Charlson Comorbidity Index (3) was calculated using comorbidities retrieved as part of the chart review.

### Endpoints evaluation

Primary endpoints were symptom and tumor responses within the irradiated fields. Tumor responses were assessed bronchoscopically and/or radiologically with a CT scan and stratified into complete response, partial response, stable disease, and progression of disease (PD) based on the response evaluation criteria in solid tumors 1.0 guidelines (4). From a symptomatic perspective, complete response was defined as complete resolution of symptoms, partial response as some symptomatic improvement, stable disease as no symptomatic improvement, and PD as worsening of symptoms.

Secondary endpoints included progression-free survival within the irradiated field, defined as survival without PD within the radiation field, symptom-free survival (SFS), overall survival (OS), and toxicities according to the Common Terminology Criteria for Adverse Events, version 4.0 (5). The dates and causes of death were retrieved from the charts and correlated with the Cancer Care Ontario database. Patients were evaluated at every followup appointment.

### Followup

At followup, history, physical, and bronchoscopic examinations were performed, when indicated. Patients were seen during the course of ETBT to assess for toxicities and manage symptoms. Patients had a followup at 4–6 weeks after ETBT and were followed thereafter every 3 months and/or discharged from the clinic when too unwell to continue followup. Patients with PD were treated with further treatments or best supportive care, depending on the patients.

### ETBT procedure

Patients' oral cavity and oropharynx were sprayed with lidocaine 1%; conscious sedation was achieved using fentanyl and midazolam. A radiation oncologist and

respirologist undertook the procedure under direct bronchoscopic visualization using a Pentax Ultraslim Video Bronchoscope (PENTAX Canada, Inc., Ontario, Canada). After visualizing the tumor, the bronchoscope was advanced to its proximal extent; its position was recorded using X-ray images. The bronchoscope was thereafter advanced across the tumor to its distal extent; its position was similarly recorded. The bronchoscope was finally advanced into the tracheobronchial tree. A single radiopaque 2 mm intrabronchial catheter (Varian Medical Systems, Inc., Palo Alto, CA) was guided through the bronchoscope either into the right or into the left lower lobe bronchus, depending on the tumor location on the tracheal wall, to centralize the catheter within the trachea. A radiographic marker wire with a centimeter scale was inserted into the catheter; X-ray images were obtained (Fig. 1).

ETBT planning was performed in real time. The gross tumor volume, which visualized tumor on bronchoscopy, was expanded by 1 cm margin at each extremity in its craniocaudal axis to make the planning target volume. If the tumor was large, polypoidal, or confined to one bronchial wall, two catheters were placed on either side of the tumor to improve optimization. An ETBT plan was generated using BrachyVision Treatment Planning Program (Varian Medical Systems, Inc., Palo Alto, CA). Dose was prescribed at 1 cm radial to the center of the source axis. An example of an ETBT plan is illustrated in Fig. 2. Doses were delivered using VariSource Afterloader HDR-<sup>192</sup>Ir

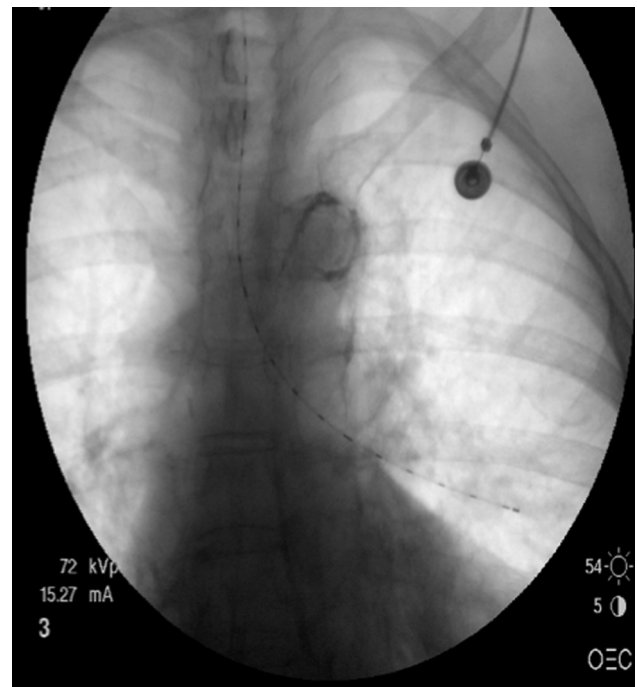


Fig. 1. Marker wire with a centimeter scale inserted into the endotracheal catheter to aid in the marking of the position of the tumor and length of the endotracheal brachytherapy radiation field.

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