

# Distal Tracheal Resection and Reconstruction

## State of the Art and Lessons Learned



Douglas Mathisen, MD

### KEYWORDS

- Tracheal stenosis • Stridor • Tracheal resection • Suprahyoid laryngeal release
- Idiopathic subglottic stenosis

### KEY POINTS

- Bronchoscopic assessment of condition of airway; that is, the extent of lesion and the amount of normal airway, is essential. Careful radiologic assessment is complementary and equally important.
- Careful collaboration with the anesthesiologist is essential to manage critical airways. Safe induction and emergence from anesthesia is essential to a good outcome. Patients should be managed to allow extubation at the conclusion of the procedure.
- Careful, precise technique is essential to good outcomes. Judgment is required to understand extent of resection. It is important to understand the principles to reducing anastomotic tension.
- Careful postoperative care is essential to good outcomes. Patients must be kept in mild flexion for 7 days. Flexible bronchoscopy is advisable at 7 days to examine for satisfactory healing.

*It is indeed an honor and privilege to contribute to a volume on airway surgery dedicated to Griff Pearson. He was a true giant in this area contributing many creative solutions to difficult airway problems. He will be long remembered as a great friend and invaluable colleague!*

—Doug Mathisen, July 2017.

### INTRODUCTION

Tracheal resection is a relatively uncommon operation. The most common indication for distal surgical resection is tracheal stenosis resulting as a complication of prolonged intubation or as a consequence of tracheostomy. The injury from intubation results from an overinflated endotracheal cuff causing excessive pressure on the trachea and reducing blood supply. The resulting ischemic injury can be mucosal or the full-

thickness of the airway, depending on the severity. Tracheostomy stomal injuries occur as a result of excessive damage of the trachea from technique, excessive traction on the tracheostomy tube, or infection. The pathophysiologies of these injuries are described in greater detail elsewhere. Tracheal tumors are uncommon. They can roughly be divided into 3 categories: squamous cell carcinomas, adenoid cystic tumors, and a group of benign or low-grade tumors. Whenever feasible, tracheal resection is the preferred treatment.

### Symptoms

Patients with tracheal stenosis present with symptoms of shortness of breath of varying degrees. The degree of shortness of breath depends on the diameter of the stenosis. Slow growing tumors may have an insidious onset with shortness of breath only noticed with extremes of exertion. Over time, the stenosis progresses to symptoms

Disclosure: The author has nothing to disclose.

General Thoracic Surgery, Massachusetts General Hospital, Harvard Medical School, 55 Fruit Street, Founders 710, Boston, MA 02114, USA

E-mail address: [dmathisen@partners.org](mailto:dmathisen@partners.org)

Thorac Surg Clin 28 (2018) 199–210

<https://doi.org/10.1016/j.thorsurg.2018.01.010>

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at rest and frank stridor. Postintubation injuries usually present within days to weeks after extubation or decannulation. Recently extubated or decannulated patients who present with shortness of breath should raise suspicion of tracheal stenosis.

### **Initial Evaluation and Treatment**

Surgeons initially treating patients with tracheal stenosis are responsible for diagnosis, initial management, and stabilizing the airway. In the non-emergent airway, computerized axial, sagittal, and coronal views of the trachea should establish the diagnosis in most patients. Initial management should include humidified oxygen and elevation of the head of the bed. Heliox and steroid administration can be effective in some patients who remain symptomatic. When a more urgent situation exists, it is best to secure the airway in the operating room. Control of the airway can be achieved by balloon dilation of strictures or dilation with bougies and rigid bronchoscopes. If a tumor exists, debridement may be required to establish a safe airway. Tracheostomy is a last resort. Care must be taken to place the tracheostomy in the proper position. Ideally, the tracheostomy should be placed through the damaged stenotic segment after dilation has been successfully achieved. This is to preserve maximum viable trachea for subsequent reconstruction. Ideally, a thoracic surgeon is best suited to control the airway with a combination of anesthesiologists, pulmonologists, and general surgeons. Once stabilized, the patient should have a thorough

evaluation. There is never a need for emergency tracheal resection. Patients who have been misdiagnosed with asthma and treated with high-dose steroids should be weaned and prepared for surgery after a sufficient period of time. After steroids are weaned, a wait of 3 to 4 weeks is preferable.

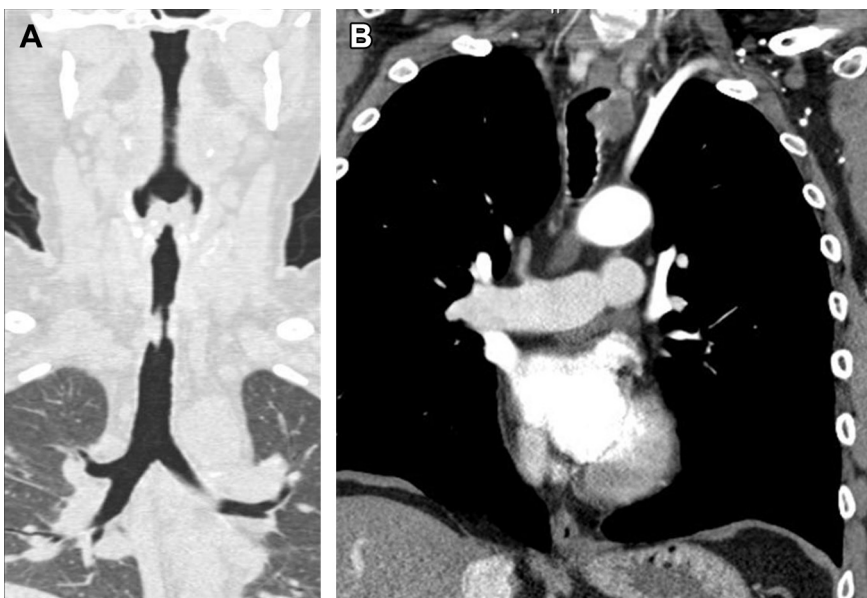
### **INDICATIONS**

The indications for tracheal reconstructive operations are (1) primary tumors, principally adenoid cystic and squamous cell carcinoma, and a wide variety of malignant, low-grade malignant, and benign tumors; and (2) secondary tumors, primarily thyroid carcinoma, bronchogenic carcinoma, and, rarely, esophageal carcinoma. Benign conditions include (3) postintubation lesions, including cuff and stomal stenosis, tracheomalacia, tracheoesophageal fistula, and brachiocephalic arterial fistula. Other conditions include trauma, prior surgery, tuberculosis, amyloidosis, relapsing polychondritis, congenital malformation, mediastinal fibrosis, idiopathic stenosis, and Wegener granulomatosis.

### **PREOPERATIVE PLANNING**

#### **Radiology**

The entire airway can be imaged with computed tomography (CT) and 3-dimensional reconstruction (**Fig. 1A**). Sagittal, coronal, and axial images are quite helpful in assessing the airway and are becoming standard. CT adds data about potential



**Fig. 1.** (A) Tight midtracheal postintubation stenosis. (B) CT image with lateral tumor of proximal trachea.

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