# Laryngotracheal stenosis

## Introduction

- Laryngotracheal stenosis (LTS) is a complex and heterogeneous group of fibroinflammatory conditions of the upper airway. This disease process can be categorized by both location and etiology. Locations are stratified into tracheal, subglottic, laryngeal (commonly posterior glottic stenosis), and supraglottic stenosis. The etiology of LTS can be divided into autoimmune, idiopathic, iatrogenic, and traumatic. Each location tends to clinically behave in somewhat distinct manner and has a defined set of associated etiologies. These associations are shown in the table below.

| Location | Common Etiologies |
|---|---|
| Supraglottic | Autoimmune, Infection, Radiation |
| Glottic | Endotracheal tube duration/size/trauma, Radiation |
| Subglottic | Endotracheal tube duration/size/trauma, Idiopathic |
| Tracheal | Endotracheal tube cuff pressure, Tracheostomy |

*Gelbard A, Francis DO, Sandulache VC, Simmons JC, Donovan DT, Ongkasuwan J. Causes and consequences of adult laryngotracheal stenosis. Laryngoscope. 2015. 125(5):1137-43.*

## Physiology and Function

Laryngotracheal stenosis results from a fibroinflammatory infiltrate within the airway mucosa that leads to dense irregular collagen deposition and progressive contracture of the airway. Etiologies of laryngotracheal stenosis include:

- Autoimmune diseases can affect the larynx such as, granulomatosis with polyangiitis (GPA), lupus, and sarcoidosis.
- Iatrogenic causes include intubation trauma, prolonged intubation, and over-sized endotracheal tube
    - Pressure necrosis results from tissue ischemia as capillary pressure is overcome by rigid components of the endotracheal tube. As the necrotic

area heals it often becomes infected, the mucosa is replaced with dense scar that can often become ossified. This can result in vocal fold immobility as well as direct luminal obstruction from activated fibroblasts.

- Idiopathic stenosis, by nature of the name, does not have a known pathophysiology, but the uniting characteristic of this disease is a very homogeneous demographic of Middle-aged Caucasian women.
- Infection
- Radiation is considered separate from iatrogenic causes

*Gelbard et al. Disease homogeneity and treatment heterogeneity in idiopathic subglottic stenosis. Laryngoscope. 2016. 126(6):1390-6.*
*Rosow DE, Barbarite E. Review of adult laryngotracheal stenosis: pathogenesis, management, and outcomes. Curr Opin Otolaryngol Head Neck Surg. 2016. 24(6):489-493.*

**Method**

LTS is managed by several subspecialties including interventional pulmonology, thoracic surgery, and otolaryngology-head and neck surgery. As a result, there is a wide array of treatment options that are available. Surgical approaches can be primarily divided into endoscopic and open approaches. Open approaches, when appropriate, tend to have much longer surgical intervals and often result in a lifetime cure for idiopathic subglottic stenosis patients; whereas, endoscopic approaches are associated with a more frequent recurrence rate and often require multiple surgeries throughout a lifetime.

- Endoscopic techniques include:
  - serial dilation with a rigid bronchoscope or metal dilators
  - LASER incision with balloon dilation
  - LASER excision without dilation
  - Cryotherapy excision with/without dilation
- Adjuvant medical therapies are often utilized in endoscopic surgery to reduce recurrence rates:
  - Intralesional steroid injection
  - Application of mitomycin C

- Postoperative reflux treatment, inhaled steroids, antibiotics, immune-modulators

- Open surgeries include:
  - Laryngotracheoplasty
  - Tracheal/Cricotracheal resection
  - Cricoid split and rib graft augmentation

Endoscopic surgeries, as a whole, are primarily ablative in approach, while open surgery is augmentative or reconstructive to the entire framework of the upper airway.

*Lewis S, Earley M, Rosenfield R, Silverman J. Systematic review for surgical treatment of adult and adolescent laryngotracheal stenosis. Laryngoscope. 2017. 127(1):191-198.*

*Rosow DE, Barbarite E. Review of adult laryngotracheal stenosis: pathogenesis, management, and outcomes. Curr Opin Otolaryngol Head Neck Surg. 2016. 24(6):489-493.*

*Yamamoto K, Kojima F, Tomiyama K, Nakamura T, Hayashino Y. Meta-analysis of therapeutic procedures for acquired subglottic stenosis in adults. Ann Thorac Surg. 2011. 91:1747-53.*