

Headmirror's ENT in a Nutshell
Laryngotracheal Stenosis
Expert: Alexander Gelbard, MD



Laryngotracheal Stenosis (LTS): general term for multiple disease processes with common physiologic end-point that result in ventilator restriction from luminal narrowing of the larynx, subglottis, or trachea causing a fixed extra-thoracic restriction of pulmonary ventilation

Presentation (2:46)

- LTS: Many causes, all anatomic/clinical exam similar. Etiology important as it often predicts outcome.
 1. Iatrogenic (70%) – intubation, tracheostomy
 2. Autoimmune (15%) – collagen vascular disease GPA/Wegner's, relapsing polychondritis
 3. Idiopathic (15%)
 4. Other (rare) - trauma, radiation, infection
- Symptoms
 - o Dyspnea
 - o Cough
 - o Dysphonia
 - o Trouble swallowing
- Differential diagnosis (4:38)
 - o Benign tumor: epithelial tumor (papilloma/cyst), non-epithelial tumor (schwannoma, neurofibroma, etc.)
 - o Malignancy: squamous cell carcinoma, chondrosarcoma, adenoid cystic carcinoma
 - o Intrinsic pulmonary disease: asthma, ILD, IPF, infection

Pathophysiology (17:25)

- Mucosal fibrosis: sustained inflammatory cell activation/infiltration, accumulation of fibrous connective tissue of extracellular matrix
- Mucosal involvement and cartilaginous involvement. Latter can decrease structural integrity.
- Histopathology (does not differentiate sub-type, help understand active inflammation): sub-epithelial inflammation with lymphocytic infiltrate, fibrosis of lamina propria with excess collagen. Granulation tissue with neovascularization
 - o Iatrogenic: Inflammation cascade from known cause (i.e. intubation). Often, exposed cartilage, chondritis, structural loss
 - o Autoimmune: GPA. Of patients with GPA, 10-20% develop airway stenosis. Control of systemic disease improves stenosis and better outcomes from treatment
 - o Idiopathic: Adult, Caucasian, female primarily. Subglottis. Estrogen? Genetics?

Workup (5:42)

Triage: determine who has severe ventilator impairment

Define etiology, type of obstruction (cartilaginous/mucosa), site (trachea/subglottis/etc)

- Physical Exam

- Respiratory sounds: identify site and severity of obstruction
 - Stridor, stertor, wheezing
 - Inspiratory vs expiratory
- Nasal inspiration forces maximal ABduction of larynx
- Signs of significant stenosis:
 - Nasal flaring, supraclavicular retractions, intercostal/subcostal retractions
- Oral cavity exam:
 - Mouth opening for laryngoscopy
 - Phenotype of OSA may contribute
- Nasal exam:
 - Mucosal disease: septal perforation or crusting increases suspicion for GPA
 - General obstruction may worsen symptoms
- Flexible Laryngoscopy
 - glottis movement, subglottis (infraglottic)
- Microdirect laryngoscopy/bronchoscopy under anesthesia
 - Determine extent and anatomical involvement
 - See treatment below
- Pulmonary function testing
 - LTS: *Fixed extra-thoracic obstruction*. Flow volume diminished in inspiratory & expiratory phase of disease
 - Objective indices:
 - Expiratory disproportion index:
 - (FEV1/peak exp flow rate) >50, fixed extra-thoracic
 - Sens 96%, spec. 94%
 - Maximum voluntary ventilation: # of breaths taken in a prescribed period of time
 - Pulmonary DLCO: if DLCO is low, strong pulmonary component and dyspnea may not be improved with removal of stenosis
- Imaging
 - Thin cut, non-contrast CT to localize and define extent
 - Variable obstruction: insp/exp phase images
- Laboratory Evaluation
 - C-ANCA to rule out GPA. Antibodies against proteinase 3, myeloperoxidase
- Diagnosis
 - Adult LTS: staging/grading allows for direct comparison of outcomes
 - Anatomic:
 - Cotton-Myer (extent of luminal stenosis)
 - McCaffry (degree of glottic involvement)
 - Physiologic
 - Swallowing, breathing, phonation
 - Lung function, voice (dynamic voice range profile), swallow exam
 - RDW increased, >12.5 worse outcome. Marker of inflammation
 - pH impedance, understand roll of reflux in patient's disease

Treatment (22:20)

Goal: breathing, swallowing, phonation

- Initial Medical Management
 - Control GERD
 - Post: CO2 laser: Inhaled steroid, PPI, Bactrim

- Surgical Management
 - Airway prosthesis: Tracheostomy, T-tube, stomal stent
 - Disease limited to mucosa: endoscopic
 - Dilation: balloon, rigid bougie
 - Endoscopic resection: CO2 laser used to remove section of stenosis. NOT circumferential
 - Adjuvant: Intra-lesional steroids, Mitomycin C injection
 - Complication: tongue paresthesia from DL, dental/mucosal injury, perforation of trachea

 - Disease involving tracheal framework: open reconstruction
 - Expand the airway: LTR, anterior/posterior grafting
 - Resect the airway: remove stenosis, tracheal resection, cricotracheal resection
 - Slide: divide deficient region and overlay and widen
 - Anastomotic complications: granulation tissue, re-stenosis, dehiscence, fistulas
 - Non- anastomotic complications

- Follow up
 - Remote monitoring
 - Peak exp flow rate: measures highest flow during expiration and disease progression in sub-glottis.