Inducible Laryngeal Obstruction: Excessive Dynamic Airway Collapse vs. Inducible Laryngeal Obstruction

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Upper Airway Wheezing: Inducible Laryngeal Obstruction vs. Excessive Dynamic Airway Collapse

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Introduction

Inducible dynamic airway collapse (EDAC) describes focalized collapse of the trachea or main bronchi.
- Commonly the posterior trachea invaginates while the cartilaginous tracheal ring structure is maintained.
- Combination of posterior membrane laxity, airway and pleural pressures.
- Typically observed in COPD, bronchiectasis and asthma.
- Inducible laryngeal obstruction (ILO), previously called ‘vocal cord dysfunction,’ describes vocal cord closure with inspiratory wheezing.
- Can be exercise induced and believed to occur in up to 10% of incorrectly diagnosed cases of asthma.

Case

Past Medical History
- 31 year old male with past medical history significant for GERD
- Dyspnea upon exertion developed after a nine month deployment to Iraq

History of Present Illness
- Non-reactive methacholine challenge with 9% reduced FEVI
- Exercise laryngoscopy found ILO/VCD by ENT
- Vocal cord relaxation training with speech pathology yielded symptomatic improvement.
- Continued to be intermittently dyspneic upon exertion with hoarseness over the next two years.
- Developed dyspnea at rest with symptomatic response to bronchodilators and non-invasive positive pressure ventilation (NIPPV).
- Pulmonary function testing unremarkable (Table 1)
- Repeat exercise laryngoscopy found laryngeal edema and m ILO
- Noted to have expiratory wheezing best heard over upper airway
- Exercise bronchoscopy found EDAC of the distal trachea with 50% collapse continuous into left and right mainstem bronchi and 90% collapse of right superior bronchus (Figures 1 & 2)
- All foci of collapse resolved with return of minute ventilation
- Subglottic protrusion upon forceful exhalation of unknown etiology overlying tracheal ring in region of upper airway wheezing

Discussion

Excessive Dynamic Airway Collapse
- EDAC is a weakening and narrowing of the posterior trachea associated with obstructive lung diseases and found in 6% of COPD patients
- Believed to be caused by chronic inflammatory destruction of elastic fibers of the posterior tracheal membrane
- Hyperbolic invagination of the posterior trachea occurs during exercise or forceful exhalation
- Diagnosed based on clinical symptoms, auscultatory findings, CT imaging and foci of collapse localized by bronchoscopy
- Treatments include bronchodilators, NIPPV, tracheostomy, airway splitting, tracheal resection

Inducible Laryngeal Obstruction
- ILO is an inspiratory closure of the vocal cords associated with noisy breathing, often confused with asthma
- May be caused by anxiety irritants or exercise
- Diagnosed with exercise laryngoscopy
- Speech-language therapy is cornerstone of treatment along with GERD management

Conclusion
- EDAC is a rare cause of dyspnea without underlying pulmonary disease
- Defined by a >50% collapse of the airway lumen due to laxity of the posterior membrane with maintained tracheal cartilage integrity
- ILO is associated with inspiratory wheezing and is inspiratory closure of the vocal cords, often during exertion.
- Inspiratory wheezing suggests EDAC; inspiratory wheezing suggests ILO
- This case highlights one of the few presentations of EDAC in a young, otherwise healthy patient and is amongst first with reported concurrent tracheal ring of unknown etiology

Table 1: Pulmonary function testing

<table>
<thead>
<tr>
<th>Pulmonary function testing</th>
<th>L/I (90%)</th>
<th>LIR (98%)</th>
<th>FEV1/FVC (%)</th>
<th>RV (predicted%)</th>
<th>DL (predicted%)</th>
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<tr>
<td>Hyperbolic</td>
<td>71%</td>
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Table 2: Causes of Upper Airway Wheezing

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<thead>
<tr>
<th>Causes of Upper Airway Wheezing</th>
<th>Vocal cord edema or paralysis</th>
<th>Paradoxical vocal cord motion</th>
<th>Laryngeal stenosis</th>
<th>Laryngocoele</th>
<th>Tonsillar hypertrophy</th>
<th>Past nasal drip syndrome</th>
<th>Anaphylaxis</th>
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References