

### **Expiratory central airway collapse**

Exaggerated luminal narrowing during expiration due to:

- Excessive dynamic airway collapse of the posterior membrane (EDAC)
- Pathological collapse of the cartilaginous rings
  - Tracheomalacia (TM): limited to the trachea
  - Tracheobronchomalacia (TBM): collapse extends into one or both mainstem bronchus
- Combined TM or TBM and EDAC

### **Etiology**

- Congenital
  - Polychondritis
  - Mounier-Kuhn syndrome “idiopathic giant trachea”
- Acquired
  - Chronic inflammatory lung diseases
    - COPD/asthma, ILD, bronchiectasis/chronic bronchitis, recurrent aspiration/GERD, relapsing polychondritis, AAV
  - Posttraumatic
    - Intubation, tracheostomy, chest trauma
  - Chronic external compression
  - Obesity makes the expiratory airways alterations more prominent

### **Classification based on tracheal narrowing**

- Mild: 70 to 80%
- Moderate: 81 to 90%
- Severe: >90%

### **Clinical presentation**

TM-TBM and EDAC have similar clinical presentation, diagnostic evaluation, and share some therapeutic measures.

Mild to moderate are usually asymptomatic and moderate to severe are commonly associated with:

- Dyspnea
- Cough, frequently barking quality
- Inability to clear airway secretions
  - Wheezing
  - Recurrent bronchitis/pneumonia

### **Diagnosis**

- Direct visualization by bronchoscopy
- Dynamic airway CT scan can be used to measure the airway collapsibility index (ACI)
  - Area at the end of inspiration (AEI) minus dynamic area at the end of expiration (DEA) divided by the AEI x100 (AEI-DEA/AEI x100)

### **Treatment:**

- Asymptomatic
  - Management of underlying conditions and observation

- Because it is usually progressive, it is recommended for patient >60 years frequent assessment:
  - PFTs with flow-volume loop yearly
  - Dynamic airway CT chest every two years
- Symptomatic
  - Management of underlying conditions
  - Pursed lip breathing
  - Promote airway clearance
    - Oscillating positive expiratory pressure (OPEP) q12h (breath through nose and a hold for 2 sec and repeat for up to 10 min)
    - Albuterol followed by saline 3% or 7% or NAC 10 or 20% by nebulization q12h or daily
  - Pulmonary rehabilitation
  - Baseline assessment with reassessment in 4 to 8 weeks:
    - Clinical parameters (mMRC dyspnea score, cough, and ability to clear secretions)
    - Spirometry with flow-volume loop
    - 6 MWT
  - Consider beneficial response if both:
    - Improvement in two out of three of the clinical parameters
    - Improvement in spirometry and or 6MWT
  - If beneficial response continue with medical therapy
  - If no beneficial response assess suitability for stent trial for 1-2 weeks if:
    - TBM is severe and central (limited to trachea, main bronchus and bronchus intermedius)
    - Persistent or worsening dyspnea
      - Stents can improve dyspnea but usually no other symptoms
    - No large tracheomegaly
  - If dyspnea does not improve, TBM is unlikely to be the cause
  - If improvement and patient can tolerate surgery, refer for central airway stabilization surgery
    - Tracheobronchoplasty, open or robotic
    - Less frequently short-segment tracheal resection if suitable
  - If patient is not a surgical candidate
    - NIV (CPAP or BiPAP). Can maintain an open airway and facilitate secretion drainage
      - Bronchoscopy with a PAP facial mask in place
        - PAP pressures are increased until airway collapse is <70% or a pressure of 16 cm H<sub>2</sub>O is reached
      - If bronchoscopic titration is not feasible, start PAP at 8 cm H<sub>2</sub>O and titrate up according to symptoms
      - For patients with hypercapnic respiratory failure use BiPAP

- Initially PAP 24 hours per day with gradual transition to intermittent PAP as tolerated (usually while sleeping and daytime as needed along with pursed lip breathing)
- Long-term stenting only if NIV fails
- Tracheostomy as a last resort for patients with respiratory failure requiring NIV