

COPD

A spectrum of chronic obstructive airway disease encompassing emphysematous changes (airspace destruction & enlargement with closure of small airways – nonreversible obstructive pattern) and chronic bronchitis (mucous hypersecretion).

ANESTHETIC CONSIDERATIONS:

- Airway Hyperreactivity
 - Bronchospasm
- Limited Pulmonary Reserve
 - Hypercarbia, Hypoxia, Atelectasis, Pneumonia
 - Postop pulmonary complications (PPC)
 - Bullae – potential need for OLV
- RV strain
 - Pulm HTN, cor pulmonale (for chronic bronchitis>emphysema)
 - Possible polycythemia
- Drug Therapy
 - Steroids=possible adrenal suppression
 - Sensitive to respiratory depressants
 - Continue B-adrenergic agents
 - Avoid NO for bullae
- Other
 - Smoking cessation
 - Epidural for upper abdominal Surgery
- Increased risk of perioperative pulmonary complications including respiratory failure
 - Postoperative disposition

ANESTHETIC GOALS:

- Preoperative optimization
 - Smoking cessation
 - Bronchodilator therapy, inhaled corticosteroids, systemic steroids
 - Treat URTI
- Intraoperative ventilation strategy
 - Avoid dynamic hyperinflation (slow RR, increased expiratory time)
 - Avoid high PIP/Plateau pressures
 - Prevent bronchospasm – intubate deep, consider intraoperative bronchodilator therapy, avoid unnecessary airway manipulation
- Reduce postoperative pulmonary complications
 - Consider regional or neuraxial technique
 - Adequate analgesia
 - Chest physio and spirometry

HISTORY AND PHYSICAL

- Six things to find out:
 - Meds: Home O2/puffers, steroids
 - Hospital admissions—intubated/ICU/PPV with CPAP/BiPAP ± trach
 - Pulm HTN, loud P2
 - Smoking history (>40 pack years independently increases risk of post-op pulmonary complications)
 - Pulmonary infection—fevers/↑ sputum production/ cough
 - Bullous disease
- Chronic productive cough, progressive exercise limitation
- SOB during daily activities occurs at FEV1 <40%

Gold classification of COPD	
0 at Risk	Normal spirometry Chronic Symptoms (cough, sputum production)
1 Mild COPD	FEV1/FVC<70% FEV1>80%
2 Moderate COPD	FEV1/FVC<70% FEV1 50-80%
3 Severe COPD	FEV1/FVC<70% FEV1 30-50%
4 Very severe COPD	FEV1/FVC<70% FEV1<30% or <50% plus chronic respiratory failure (PaO2<60mmHg, PaCO2>50mmHg)

- Steroid Use
 - May require supplementation if HPA suppression
- Acute exacerbations
 - Acute deterioration due to infection, CHF, increased metabolism
- ICU admissions
- Exercise tolerance
 - Subjective evaluation has proven more accurate than any single laboratory test
- Pink Puffers
 - Thin, no CHF, have emphysema
 - Normal PaCO2, PaO2>60mmHg
- Blue Bloaters
 - Chronic cough and sputum production, 'bronchitis'
 - Frequent pulmonary infections
 - Hypercapnea, Hypoxia

- Reactive erythrocytosis and pulmonary hypertension

TREATMENT

THINGS THAT CHANGE DISEASE PROGRESSION

- Smoking cessation
 - See below
- Oxygen therapy
 - PaO₂<55mmHg, Hct >55%, cor pulmonale
 - Goal PaO₂ 60-80mmHg

THINGS THAT TREAT SYMPTOMS

- Bronchodilators
 - Decrease hyperinflation
 - Very little change to FEV1 and dyspnea
- Steroids
 - Potent anti-inflammatory, don't change disease progression

INVESTIGATIONS

- CBC, Lytes
- PFTs used in diagnosis of COPD
- ABG
- CXR—bullae

CONSULTS

- Possible ICU if severe respiratory disease
- Pulmonology (if not already done)
 - Hypoxemia on room air
 - Bicarb>33mmHg, PCO₂>50mmHg
 - Respiratory failure
 - Severe shortness of breath attributed to respiratory disease
 - Planned pneumonectomy
 - Difficult assessing pulmonary function by clinical signs
 - Determining the response to bronchodilators
 - Suspected pulmonary hypertension

OPTIMIZATION

- COPD exacerbation: treatment of bronchospasm and eradication of bacterial infection
 - Optimize with steroids, +/- antibiotics
 - Triggers: viral, bacterial infection, CHF, exposure to allergens & irritants, pulmonary embolism (hx influenza/yr and pneumococcal vaccinations/6yr)
 - Antibiotics if 2 of 3: increased purulent secretions, sputum volume, dyspnoea: amoxicillin 500mg PO TIDx5-10d or doxycycline 200 mgx1 then 100mg PO BIDx5-10d; if failure of first-line agent/>4 exacerbations/yr/abx in past 3 mo: levofloxacin 500mg PO QDx5-10d
 - Steroids: prednisone 30-40mg PO QDx10-14 d, methylprednisone 30mg IV
 - Bronchodilators: ipratropium bromide 0.5mg neb QID and short-acting beta-2 agonist: albuterol 2.5-5mg neb QID
- Postoperative Pulmonary Complications
 - Age >60, ASA class >2
 - CHF, COPD, Smoking, Poor Exercise Tolerance
 - Emergency Surgery, Duration of anesthesia >2.5hrs
 - General Anesthesia
 - Abdominal, thoracic, vascular, neuro and H&N surgery
 - Albumin <35g/L
- Risk reduction strategies
 - Smoking cessation
 - 60 Pack year history doubles risk of any pulmonary complication
 - Elimination half-life of Carbon Monoxide is 4-6hrs (negative inotropic effects)
 - Within 12 hours of cessation PaO₂ for 50% sats increases from 22.9 to 26.4mmHg and carboxyhemoglobin decreases from 6.5% to 1%
 - Sympathomimetic effects of nicotine lasts 20-30min
 - Improved ciliary, small airway function, and decreased sputum production require several weeks of smoking cessation
 - Return of normal immune function takes 6 weeks
 - Lung expansion maneuvers
 - Deep breathing exercises, chest physiotherapy, incentive spirometry and CPAP all similar efficacy
 - Twofold reduction in postop pulmonary complications
 - More effective if taught preoperatively

ANESTHETIC OPTIONS

- Regional
 - For operations that don't enter the peritoneum
 - Decreases the incidence of Postop Pulmonary Complications
 - Blocks above T6 may interfere with respiratory function
- GA
 - >2.5hrs increases risk of postop complications
- Local

ANESTHETIC SETUP

- **Drugs**
 - Standard, bronchodilators, steroid supplementation
- **Equipment**
 - Standard CAS monitors
 - Peripheral nerve stimulator (TOF)

MANAGEMENT OF ANESTHESIA

- **Induction**

- Spontaneous ventilation during GA in pts with severe obstructive disease more likely to result in hypercapnia than in patients with normal pulmonary function
- May want to isolate lung for large bullae (have surgeon in room in case of pneumothorax)
- IV administration of opioids and lidocaine prior to airway instrumentation will decrease airway reactivity by deepening anesthesia
- A single dose of corticosteroids may help prevent postoperative increases in airway resistance
- **Maintenance**
 - Avoid drugs associated with histamine release
 - High alveolar concentrations of most inhalational anesthetics will blunt airway reflexes and reflex bronchoconstriction, but require a fairly robust cardiovascular system
 - Avoid N₂O if bullae
 - Humidification of airway gasses
 - Ventilatory strategy:
 - Large tidal volumes and increased inspiratory flow rate, but keep peak airway pressure <40cmH₂O
 - Slow rate (8-10 breaths/min)
 - Increased expiratory time to allow time for exhalation and to avoid air-trapping/auto-PEEP
- **Emergence**
 - Fully awake, good pain control

DISPOSITION & MONITORING

- FEV₁/FVC <50% or PaCO₂>50mmHg preop likely will require postoperative ICU/ventilation
- If you don't have an epidural in place you should lower your ICU admission threshold

COMPLICATIONS

- See Postoperative pulmonary complications above

CONSIDERATIONS IN PREGNANCY

- See Asthma seminar

REFERENCES : coexisting, barash 7th edition