Perioperative Implications for Surgical Correction

Preoperative Preparation
- Thorough history to evaluate for associated syndrome or craniofacial abnormality.
- Type and crossmatch for PRBCs.
- Prepare parents for long surgery, postop swelling of face, potential for continuing intubation postop, and need for blood transfusion.

Monitoring
- Standard monitors
- Arterial line
- UO

Airway
- Potentially difficult if there are additional craniofacial abnormalities or severe torticollis is present

Preinduction/Induction
- Premedication with oral or intranasal anxiolytic as needed
- Standard inhalational induction

Maintenance
- Standard inhalational agents.
- Monitor Hgb/Hct.
- Consider use of antifibrinolytic agent and cell saver.

Extubation
- Long duration of procedure and large volume fluid and blood administration can lead to postop airway edema, low threshold for remaining intubated.

Postoperative Period
- Pediatric ICU
- Potential for continued blood loss, coagulopathy
- Risk of cerebral edema
- Adequate pain management
- Potential for difficult reintubation due to facial and airway edema

Anticipated Problems/Concerns
- Risk of venous air embolism during skull removal

Pneumocystis jirovecii Pneumonia

Neal H. Cohen

Risk
- PJP is a respiratory infection seen in immunocompromised pts, usually associated with a CD4 cell count <500/μL.
- Can affect pts with both acquired and congenital immunodeficiency syndromes.
- Seen in both males and females and all age groups.
- Often associated with chronic HIV infection, particularly if not treated with HAART.

Perioperative Risks
- Respiratory failure often necessitating mechanical ventilatory support with high airway pressures even when ventilating with low tidal volumes; often accompanied by severe dyspnea independent of gas exchange.
- Hemodynamic instability associated with induction of anesthesia, initiation of positive pressure ventilation.
- Pneumothoraces.
- Persistent expiratory airflow reduction after resolution of acute infection.
- Bronchiectasis, lung cysts.
- Often associated with other comorbidities related to immune deficiency.

Worry About
- Progressive respiratory failure with diffuse bilateral interstitial infiltrates.
- Pneumothoraces, either spontaneous or associated with positive-pressure ventilation.
- Persistent pulm dysfunction.
- Common cause of nonproductive cough, dyspnea, fevers in immunosuppressed pt
- Associated with other opportunistic infections, particularly CMV and *Candida albicans* esophagitis.
- Toxicity from therapy with sulfa antimicrobials, including methemoglobinemia, anemia, leukopenia, and severe skin rashes.
- High incidence of drug resistance.

Overview
- Indolent disease; can progress to severe respiratory failure.
- May be cause for nonproductive cough in high-risk pt.
- High incidence of spontaneous pneumothoraces.
- Extrapulmonary sites of *Pneumocystis* infection are rare.
- May be associated with other infections (tuberculosis, bacterial, viral, fungal) and malignancies (Kaposi sarcoma, lymphoma) in immunosuppressed pts.

Etiology
- *P. jiroveci* (previously *carinii*), originally characterized as a parasite, is now classified as a fungus.
- Organisms reside in the lungs, usually as latent infection; activated in an immunosuppressed host.
- High prevalence of antibodies to *P. jirovecii* in nonimmunosuppressed humans, suggesting that most individuals are "colonized" early in life.
- Human-to-human transmission has not been documented.

Usual Treatment
- Chemoprophylaxis for PJP: TMP/SMX.
  - Second-line agents: Dapsone; pentamidine, systemic and aerosolized; atovaquone.
- Treatment for PJP:
  - TMP-SMX is the mainstay.
  - Corticosteroids (strongly recommended but conflicting data on value of steroids, particularly for non-HIV pts).
  - Alternative antimicrobial therapy: Pentamidine, clindamycin plus primaquine, dapsone plus trimethoprim, atovaquone.
  - Supportive respiratory care including positive-pressure ventilation.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Oropharyngeal lesions	Fever, chills, sweats	Circumoral, acral, and mucous membrane lesions	
CV	Intravascular volume deficits Cardiomyopathy	Fluid intake, syncope, respiratory rate	Hemodynamic lability Distended neck veins Abnormal heart sounds	Orthostatic BP changes
RESP		Cough, usually nonproductive Progressive dyspnea Hemoptysis	Tachypnea Breath sounds, prolonged expiratory phase Exam often normal though coarse breath sounds common	ABG PFTs Transbronchial biopsy Gallium scan of lung LDH
GI	Hepatopathy Bowel lesions	Often associated with wt loss, other infections causing diarrhea, GI symptoms	Hepatosplenomegaly	LFTs
HEME	Anemia, leukopenia Coagulopathy			CBC Clotting studies
RENAL	Nephropathy, oliguria	Oliguria		BUN, Cr
CNS	Encephalitis, meningitis	CNS changes	Abnormal mental status	

Key References: Travis TJ, Hart E, Helm J, et al.: Retrospective review of *Pneumocystis jirovecii* pneumonia over two decades, *Int J STD AIDS* 20(3):200–201, 2009; *Centers for Disease Control and Prevention*: Pneumocystis pneumonia. <http://www.cdc.gov/fungal/diseases/pneumocystis-pneumonia/>, (Accessed 01.06.16.)

Perioperative Implications

Preoperative Preparation

- Ensure adequacy of oxygenation, ventilation, acid-base balance.
- Assess pulmonary function, particularly expiratory phase of respiration.
- Evaluate for evidence of other opportunistic infections.
- Review CXR for evidence of infiltrates, abscesses, cystic lesions or cavitations, bullae, pneumothorax, effusions.

Monitoring

- If treated with sulfa drugs, confirm presence or absence of metHb.
- Interpret SpO_2 with caution if metHb present; measure SaO_2 by cooximeter.

Airway

- Minimize airway pressures, tidal volume.
- Consider local anesthesia to upper airway to manage increased airway reactivity.

Induction

- Maintain adequate PaO_2.
- Minimize airway pressures; risk of pneumothorax.
- Ensure adequate intravascular volume.
- Monitor for hypotension associated with positive-pressure ventilation, myocardial depressants.

Maintenance

- Ensure adequate oxygenation, ventilation.
- Minimize airway pressures.
- Administer bronchodilators.

Extubation

- May be delayed.
- Prolonged ventilatory support often required.

Postoperative Period

- Ensure adequate oxygenation, ventilation.
- If mechanically ventilated, minimize airway pressures using low-tidal-volume ventilation.
- Maintain intravascular volume; optimize myocardial function.
- Continue anti-*Pneumocystis* therapy; consider other antiviral agents.

Anticipated Problems/Concerns

- Deterioration of respiratory status; prolonged respiratory failure.
- Pneumothorax; may require surgical repair if tube thoracotomy unsuccessful.
- Nosocomial infections and associated viral infections.
- Monitoring oxygenation with pulse oximeter may be inaccurate if pt treated with dapsone or primaquine.
- Drug resistance.

Pneumonia, Community-Acquired

Emily J. MacKay

Risk

- Incidence of CAP requiring hospitalization is 24.8:10,000 individuals.
- Incidence is 9 times higher among those 65 y of age or older (compared with age group 18–49).
- Incidence is 25 times higher among those 80 y of age or older (compared with age group 18–49).

Perioperative Risks

- Intraop decrease in FRC could worsen the severity of hypoxemia.
- Prolonged mechanical ventilation.

Worry About

- Irritable airway at increased risk for laryngospasm
- Hypoxemia

Overview

- CAP is defined as involving no history of hospitalization within 90 d of onset of symptoms.
- The responsible pathogen is identified in approximately 40% of cases.

Etiology

- Viruses (23%):
  - Human rhinovirus most common (9%)
  - Influenza (6%)
  - HMPV, RSV, and parainfluenza viruses; coronaviruses and adenovirus
- Bacteria (11%):
  - *S. pneumoniae* most common (5%)
  - *M. pneumoniae*, *L. pneumophila*, and *C. pneumoniae* second most common (4%)
  - *Staphylococcus aureus* (1%)
  - Enterobacteriaceae (1%)
- Bacteria plus virus (2%)
- Fungus or mycobacteria (1%)

Viral pathogens:

- Human rhinovirus
- Influenza (A or B)
- HMPV
- RSV
- Parainfluenza virus

Bacterial pathogens:

- *Streptococcus pneumoniae* (gram-positive cocci in chains)
- *Mycoplasma pneumoniae* (small bacterium, Mollicutes, no peptidoglycan cell wall [no stain])
- *Legionella pneumophila* (gram-negative, aerobic, non-spore-forming)
- *Chlamydia pneumonia* (gram-negative, small)
- *Staphylococcus aureus* (gram-positive cocci in clusters)
- Enterobacteriaceae (gram-negative, enteric)

Usual Treatment (Empiric)

- Combination therapy: Beta-lactam (third-generation cephalosporin) plus macrolide. For example (70-kg pt):
  - Ceftriaxone (third-generation): 1.5 g q8h plus azithromycin 500 mg q24h
  - Cefotaxime (third-generation): 2 g q8h plus azithromycin: 500 mg q24h
- Monotherapy: Fluoroquinolone
  - Levofloxacin: 750 mg daily
  - Moxifloxacin: 400 mg daily

Assessment Points

System	Effect	Assessment by Hx	PE	Test
RESP	Upper respiratory infection Tracheobronchitis Pneumonia	Sore throat, rhinorrhea, headache, myalgias Cough: Nonproductive Cough: Productive, shortness of breath, fever	Inflammation of nasal turbinates Erythematous soft palate Inspiratory wheeze Focal or nonfocal crackles on lung auscultation	Nasopharyngeal swab Rapid strep test CXR, sputum sample CXR, sputum sample

Key References: Jain S, Self WH, Wunderink RG, et al.: Community-acquired pneumonia requiring hospitalization among US adults, *N Engl J Med* 373(5):415–427, 2015; Futier E, Constantin JM, Paugam-Burtz C: A trial of intraoperative low-tidal-volume ventilation in abdominal surgery, *N Engl J Med* 369(5):428–437, 2013.

Perioperative Implications

Preoperative Preparation

- Elective procedure: Delay surgery for at least 6 wk.
- Urgent or emergent procedure: Proceed with caution.
- If sputum purulent, send for sputum culture.
- Ensure that appropriate antibiotic therapy is initiated.
- Bronchodilator must be available in the OR.

Monitoring

- Routine.
- Consider arterial line for serial blood gas analysis.

Airway

- At risk for rapid desaturation secondary to shunt
- At risk for laryngospasm and bronchospasm secondary to inflammation

Induction

- Ensure adequate depth of anesthesia prior to airway instrumentation (increased risk of bronchospasm).
- Use neuromuscular blockade (increased risk of laryngospasm).

Maintenance

- Inhalational anesthesia has benefit of bronchodilation.
- Consider avoiding desflurane (increased risk of airway reactivity).
- Consider protective lung ventilation strategy intraop (i.e., tidal volume of 6–8 mL/kg ideal body weight, PEEP ≥5 cm H_2O, maintain plateau pressure <30 cm H_2O).

Extubation

- Awake and following commands
- Vital capacity >15 mL/kg ideal body weight
- Adequate analgesia to accommodate aggressive pulmonary toilet