

Pulmonary Aspiration

Entry of foreign material into the lungs.

ANESTHETIC CONSIDERATIONS:

- Identify those at risk
 - 1/8600 GAs (Miller)
 - Risk Factors:
 - emergency surgery
 - pregnancy
 - full stomach – not fasted, bowel obstruction, intraperitoneal pathology
 - geriatrics
 - obesity
 - altered GI motility - autonomic dysfunction, scleroderma
 - altered LOC
 - neuromuscular disease and bulbar dysfunction
- Reduce the risk
 - Follow ASA taskforce guidelines for fasting
 - Aspiration prophylaxis:
 - Motility agent (metoclopramide 10mg IV/po)
 - Non particulate antacid (Na Citrate)
 - H2 blocker (reduce the acidity of gastric contents)
 - No prophylaxis is recommended for routine cases
 - Cricoid pressure is non-evidence based, but culturally accepted
- Treatment
 - Supportive; head down, suction, intubate
 - Ventilate FiO2 1.0 and PEEP >5cmH2O
 - Tx bronchospasm with ventolin not volatiles
 - **CXR and bronchoscopy** (bronch with particulate matter)
 - No role for Antibiotics and Steroids as initial therapy
- Sequelae
 - Cancel and elective case, minimize length of ER cases
 - Asymptomatic=observe in PARR for 2 hrs then can D/C
 - Stable x 2 hrs (95% FiO2 0.5, HR<100/min, RR<20/min) can D/C to ward

PATHOPHYSIOLOGY

- 3 types of injury included in Pulmonary Aspiration
 - Acid Associated aspiration pneumonitis
 - 'Mendelson syndrome' 1946
 - pH <2.5, >0.4cc/kg or 25cc total
 - 2 phases
 - 1)Direct physiochemical injury
 - type I pneumocytes, basement membrane destruction and leak
 - infiltration/edema=VQ mismatch and decreased compliance
 - 2)Inflammatory cascade
 - 2-3hrs post injury
 - second wave of membrane injury
 - Bacterial Infection
 - Aspiration of colonized/infected fluids
 - Secondary infection from transudation during phase 2 of aspiration pneumonitis
 - Particulate associated Aspiration
 - Usually particles in gastric contents
 - Blocks small to medium caliber airways causing atelectasis and shunt exacerbating hypoxemia

HISTORY AND PHYSICAL

- Aspiration is most likely to occur on induction and at emergence from anesthesia.
- Risk factors have been identified
 - Delayed gastric emptying
 - Trauma, opioids, sedatives
 - Gastric hypersecretion
 - Pain, stress
 - Increased Regurgitation
 - GERD, Geriatrics (9fold increase), Obesity, Diabetes, Hiatus hernia
 - Neurologic disorders
 - Head injury, Neuromuscular disease, MS, Parkinsons, GBS, DMD, cp
 - Airway management
 - Prehospital intubation, Emergency surgery, light anesthesia
- Signs can range from filling of the oral cavity with gastric contents, to unexplained hypoxemia/decreased compliance after intubation. Bronchospasm is a frequent sign but not a requirement of the diagnosis

TREATMENT

- Wherever possible ASA taskforce fasting guidelines should be observed
 - Clear liquids 2hrs
 - Breast milk 4hrs
 - Formula 6hrs
 - Non human milk 6hrs
 - Light meal 6hrs

- Fried or fatty meal 8hrs
- High risk patients can be given prophylactic treatment
- Sodium Citrate non particulate antacid to neutralize gastric contents
- Ranitidine is the most effective agent at reducing residual gastric volume and increasing pH
- Cricoid pressure (Sellick's Maneuver 1961)
 - Conflicting evidence
 - Most care providers perform it improperly
 - Midline position on cricoid cartilage 20N of force (1kg=9.81N)
 - High pressure can result in esophageal rupture if active vomiting
 - Application decreases LES pressure
 - Application can interfere with laryngoscopy and BMV
 - Aspiration does occur during application of cricoid pressure
- Treatment of aspiration is supportive
 - Prevent lung damage
 - Suction airway, head down, intubate
 - Ventilate
 - FiO₂ 1.0, PEEP >5cm H₂O
 - Treat bronchospasm
 - Ventolin is treatment of choice
 - Worse outcomes attributed to using volatiles as bronchodilators
 - Reinforcement of inflammatory cascade
 - Investigations
 - Bronchoscopy if particulate matter is suspected
 - CXR in all patients
 - No acute role for steroids or antibiotics

MANAGEMENT OF ANESTHESIA

- Elective cases: should be cancelled
- Emergency cases: should limit duration wherever possible, discuss with surgeon

DISPOSITION & MONITORING

- Asymptomatic individuals should be observed in PARR x 2 hrs
- Stable individuals should be observed in PARR x 2hrs then sent to the ward
 - SpO₂>95% on FiO₂<0.5, HR<100/min, RR<20/min
 - No fever or wheeze, normal CXR
- Persistently hypoxemic individuals should be consulted to the ICU

REFERENCES

- Miller
- Faust 3rd ed
- Janda et al. 2006. Management of pulmonary aspiration. Best Practice & Research Clinical Anaesthesiology 20(3)409-27
- ASA Taskforce on Preoperative Fasting 1999