Protecting the Lungs

PGA
New York
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Disclosures:

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58 y.o. Male, Chronic Gallstone Pancreatitis, Open Cholecystectomy

- 100 pack/year smoker
- Dyspnea > 1 block
- WHY dyspneic?
- Rule-out Cardiac etiol: ECG, TTEcho, Myocardial perfusion stress assess
- Rule-in Respiratory etiology
Protecting the Lungs:
From Who/What?

- The Patient him/herself
- The Perioperative Experience (Surgeon)
- The Anesthesiologist
Preoperative Assessment

- History: Cough, Sputum, Exercise Tol. *(Infection)*
- Auscultation *(Bronchospasm)*
- Lab tests: CXR, Spirometry, ABG
Preoperative Assessment

- History: cough, sputum, exercise Tol. (Infection)
- Auscultation (Bronchospasm)
- Lab tests:
  - CXR
  - Spirometry
  - ABG
Spirometry:

- **Forced Expiratory volume (FEV1%)**
  - mild 80=50%
  - mod. 50-35%
  - severe < 35%

- **FEV1/FVC ratio**
  - < 0.7 = obstruction

- **Post-bronchodilator**
  - FEV1% increase
  - >10% = a/w reactivity
Preoperative Assessment

- History: cough, sputum, exercise Tol. (*Infection*)
- Auscultation (*Bronchospasm*)
- Lab tests: CXR, Spirometry, Arterial Blood Gas
Protecting the Lungs: From Who/What?

- The Patient himself/herself
- The Perioperative Experience (Surgeon)
- The Anesthesiologist
Helping Surgical Patients Quit Smoking

Surgical Benefits:
- Decrease ST changes intraop.: 2 days
- Decrease wound complic’s: >4wk.
- Decrease Resp. Complications:
  Cardiac: >8 wk.
  Thoracic: anytime

Abstinence @ 1yr:
- After ACB: 55%
- Angioplasty: 25%
- Angiography: 14%
Preoperative Physiotherapy

- Particularly in patients with excessive secretions
- No proven superior modality
- Proven decrease in pulmonary complications in COPD

Warner DO, Anesthesiology 2000, 92: 1467
Protecting the Lungs:
From Who/What?

- The Patient himself/herself
- The Perioperative Experience (Surgeon) Atelectasis Analgesia
- The Anesthesiologist
Atelectasis

Intra-op.

Recovery Room
Pulmonary Atelectasis
Duggan M, Kavanagh B. Anesthesiology 2005, 102: 838-54
Pulmonary Atelectasis

Duggan M, Kavanagh B. Anesthesiology 2005, 102: 838-54
Atelectasis Causes Lung Injury in Non-Atelectatic Lung Regions


- Rat lung injury model
- Distal airway injury all regions
- Alveolar injury more severe in non-dependent, non-atelectatic regions
Patients:
- n = 209
- PaO2/FiO2 < 300 post-op. in Rec. Room
- FiO2 0.5 by mask or CPAP until PaO2/FiO2 stable > 300 (19-28h)

Results:
- CPAP decreased sepsis (p = .03)
- Decreased pneumonia (p = .02)
- Decreased re-intubation (p < .01)
The Comparative Effects of Analgesia on Pulmonary Outcomes: Meta-Analysis


- **Atelectasis** decreased: Epidural opioid/LA vs. Systemic opioid
- **Pulmonary Infections** decreased Epidural opioid/LA vs. Systemic opioid
- Pain VAS movement (not PFTs) correlate with outcome
Epidural Anaesthesia and Analgesia and Outcome of Major Surgery (MASTER)
n = 888, random., ASA >/=3, Abd./Esoph. Surg.,
225/ 447 Epidural > 72h.

❖ Mortality Epidural vs. IV: ns.
❖ Cardiac/Renal/GI/ Sepsis: ns.
❖ Resp. Fail. Epid. vs. IV: 23% vs. 30% (.02)
❖ Analgesia: Epid. vs. IV @ rest n.s.,
  with cough <.001

Protecting the Lungs: From Who/What?

- The Patient himself/herself
- The Perioperative Experience (Surgeon)
- The Anesthesiologist: Lung Injury
Extravascular Lung Water after Pneumonectomy in Sheep

Principles of Lung-Protective Ventilation:

- Mimic normal spontaneous ventilation
- FiO2 as low as safe
- Tidal volumes 4-6 ml/kg
- Frequent recruitment maneuvers
- Vary position / vary tidal volume
- PEEP to maintain FRC

Low Tidal Vol. + PEEP Prevents Alveolar Coagulation in Patients Without Lung Injury

N=40, Abd. Surg. 5h PPV, VT= 12ml/kg vs. 6 ml/kg +/- 10cmH2O PEEP
Transfusion-Related Acute Lung Injury

Normal Circulating Neutrophil
Normal Neutrophil → Deformed Neutrophil
Pulmonary Capillary
Primed Neutrophil

Human Leukocyte Antigen

Human Neutrophil Antigen

“One Hit”
“One Hit”
Damaged Pulmonary Capillary

ICAM

Cytokine Release

“One Hit”

“Two Hit”
Protecting the Lungs: From Who/What?

- **The Patient:**
  - Smoking Cessation
  - Physiotherapy

- **The Perioperative Experience:**
  - Atelectasis
  - Analgesia

- **Anesthesiologist:**
  - Ventilation
  - TRALI