Bullous Lung Disease

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Clinical Case

- 49 year old man with HTN, SLE, interstitial lung disease, and pulmonary HTN on home O2 presented to ER with 2 days progressive dyspnea

- PMH: followed at KCHC for interstitial lung disease. (FEV1 1.3L, FVC 1.4L, < 1 block exercise tolerance)

- Social: 20 pack-year smoking history

- Medications: include predinsone 80mg daily
Initial Presentation

- T 97  BP 146/101  HR 126  RR 34
- O2 sat undetectable
- Thin appearing, hyper-resonance on chest auscultation bilaterally
- ABG: 7.24/26/62 on 100% Nonrebreather FM
- ER course:
  - Placed on BIPAP (ipap 10/epap 5)
  - Zosyn for presumed PNA
  - CXR, CT chest & CT surgery consultation obtained
  - Admitted to MICU
Hospital Course

- Scheduled for bullectomy to be performed HD #3
- Emergent intubation in early morning on day of surgery for tachypnea (RR 40-50)
- CMV 450/12/5/100%
- Post-intubation: 98.6  149/92  105
- ABG 7.4/41/109/26
- Neither anesthesia or surgical team informed of events
Intraoperative Events

- Hypotension on initiation of anesthesia in OR
- CVC, arterial line, double-lumen ET tube placed
- Right upper lobe blebectomy and decortication via right posteriolar lateral thoracotomy
  - Poor tolerance of single-lung ventilation
  - Endo-GIA 3.5mm stapler with Peri-strips
- Pathology:
  - usual interstitial pneumonitis with subpleural bullae
  - No infection, inflammation, or tumor
Postoperative Course

- Initially improved oxygenation & hemodynamics
- Rapid decompensation 14hrs postop (low BP & UOP) → expired POD 4:
  - Fever 102 F
  - Pulmonary hypertension (PAP 65/40)
  - Echo-confirmed right heart failure (CI 1.5)
  - Liver failure (AST/ALT 1900/1400, bili 16, INR 3.3)
  - Renal failure (BUN/Cr 43/5.3)
Bullous Lung Disease

After a brief discussion of spontaneous pneumothorax...
Questions

- Which of the following is the most common cause of spontaneous pneumothorax?

- Which of the following is an indication for surgical intervention in a patient with spontaneous pneumothorax?

- Which of the following is associated with secondary pneumothorax?
**Pneumothorax**

- Air flow until no pressure difference
- Apex to base pressure gradient
- Lung compliance
- Functional residual capacity
- Ventilation
- Oxygenation
- Slight shunt

**Tension Pneumothorax**

- Continuous air flow (one-way valve)
- Intrapleural pressure
- Mediastinal shift (alteration of lung mechanics)
- Ventilation
- Shunt
- Oxygenation
- Cardiac stroke volume
- Heart rate
Spontaneous Pneumothorax

**Primary**
- 10-30 yrs old
- Thin men with localized apical blebs but otherwise normal lungs
- 7-18/100,000 annually
- Ruptured subpleural bleb

**Secondary**
- 60-65 yrs old
- Structural lung disease
  - COPD, asthma
  - Interstitial lung disease
- HIV/PCP PNA, TB
- Cystic fibrosis, a-1 antitrypsin deficiency
- 6/100,000 annually
- Ruptured bulla (4x increase mortality/PTX)
Spontaneous Pneumothorax

Primary

Tension?

No

PTX < 20% or < 3 cm apex and asymptomatic

Observation and Follow up

No

PTX > 20% or > 3 cm apex or symptomatic

1st episode

Air evacuation

Simple Aspiration

Small bore Chest tube

Persistent air leak

2nd episode

Recurrence prevention

Surgery with bleb resection Pleurodesis

Chest tube with Pleurodesis (If can’t tolerate surgery)

Yes

Secondary

Chest tube Surgery

Needle decompression Chest tube

ALGORITHM 80.4
Negative intra-pleural pressure favors distension of apical alveoli. Rupture → PTX

Alveolar wall destruction by inflammatory cells. Rupture → BULLA
Bleb vs Bulla

BLEB (<2cm)

BULLA TYPE 1

BULLA TYPE 2

BULLA TYPE 3
VATS bullectomy & pleurodesis
Bullectomy (Reduction Pneumoplasty)

- Factors predicting success (based on retrospective data)
  - Bulla size > 1/3 hemithorax = giant bulla
  - Marked compression of adjacent lung tissue demonstrated by CT scan
  - FEV1 < 50% predicted

- NETT (Nat’l emphysema treatment trial) for elective LVRS
  - Operative mortality up to 6%
  - Pulmonary morbidity 30%
  - High risk for death with little functional benefit FEV1<20% predicted → 16% 30-day mortality
Potential LVRS candidate

DLCO ≤ 20% pred or Homogenous emphysema?

Yes

High risk category
No benefit!!

No

FEV1 ≤ 20% pred?

No

Upper lobe predominant emphysema?

Yes

Low Exercise Capacity?
<25 W for women
<40 W for men

Yes

Upper lobe disease
Low Exercise Capacity
Survival Advantage
Improved Exercise capacity

No

Upper lobe disease
High Exercise Capacity

Yes

Non-Upper lobe disease
Low Exercise Capacity
No quantitative improvements
Improved QOL at 24 months

No

Non-Upper lobe disease
High Exercise Capacity
Higher risk of death
No benefit!!
Questions

- Which of the following is the most common cause of spontaneous pneumothorax?
  - A) tuberculosis
  - B) rupture of small blebs
  - C) emphysema and chronic bronchitis
  - D) endometriosis
Questions

Which of the following is an indication for surgical intervention in a patient with spontaneous pneumothorax?

- A) recurrent spontaneous pneumothorax
- B) persistent air leak at the end of a 3-day trial of closed drainage of a spontaneous pneumothorax
- C) complete collapse of the lung in a patient with an initial spontaneous pneumothorax
- D) pregnancy
Questions

- Which of the following is associated with secondary pneumothorax?
  - A) usually occurs in young women
  - B) observation if small and asymptomatic
  - C) video-assisted repair usually effective
  - D) rarely associated with underlying lung disease
References


- Reyes, KG and Mason DP. “Spontaneous Pneumothorax” in Sabiston & Spencer’s Surgery of the Chest, 8th ed. 2009.

