



# Lung Surgery: Post-Operative Complications

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# Lung Surgery: post-operative complications

Nothing to Disclose



# Post-operative complications

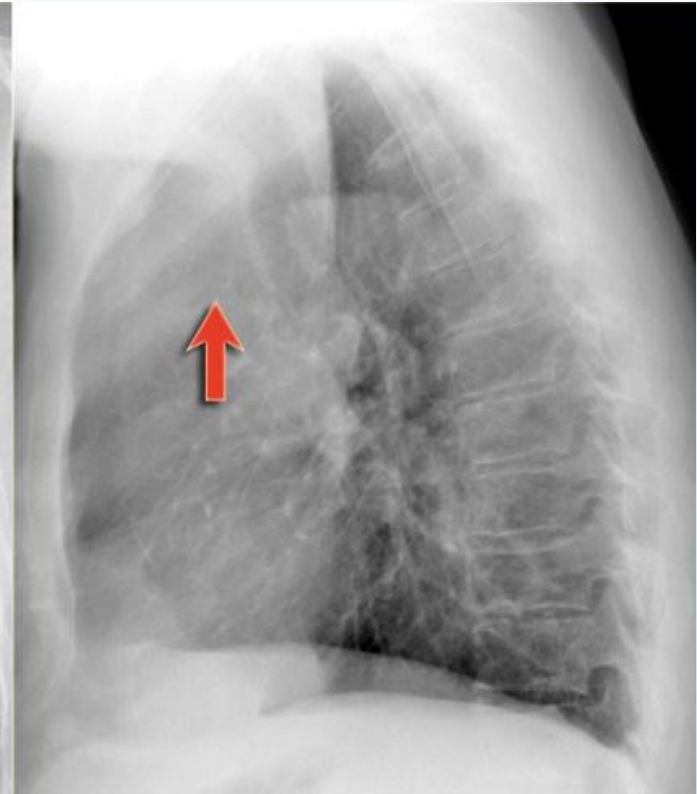
- ▶ Pulmonary complications
- ▶ Prolonged air leak/Subcutaneous emphysema
- ▶ Empyema
- ▶ Atrial arrhythmia
- ▶ DVT/PE



# Postoperative Pulmonary Complications

- ▶ Include atelectasis, mucus plugging, pneumonia, ARDS, respiratory failure and the need for supplemental oxygen at discharge
- ▶ Risk factors include:
  - ▶ Incisional size (VATS versus thoracotomy)
  - ▶ Age of patient
  - ▶  $DL_{CO}\%$  also predicts the likelihood of pulmonary complications after major lung resection, which are associated with increased length of hospital stay and cost.

# Atelectasis



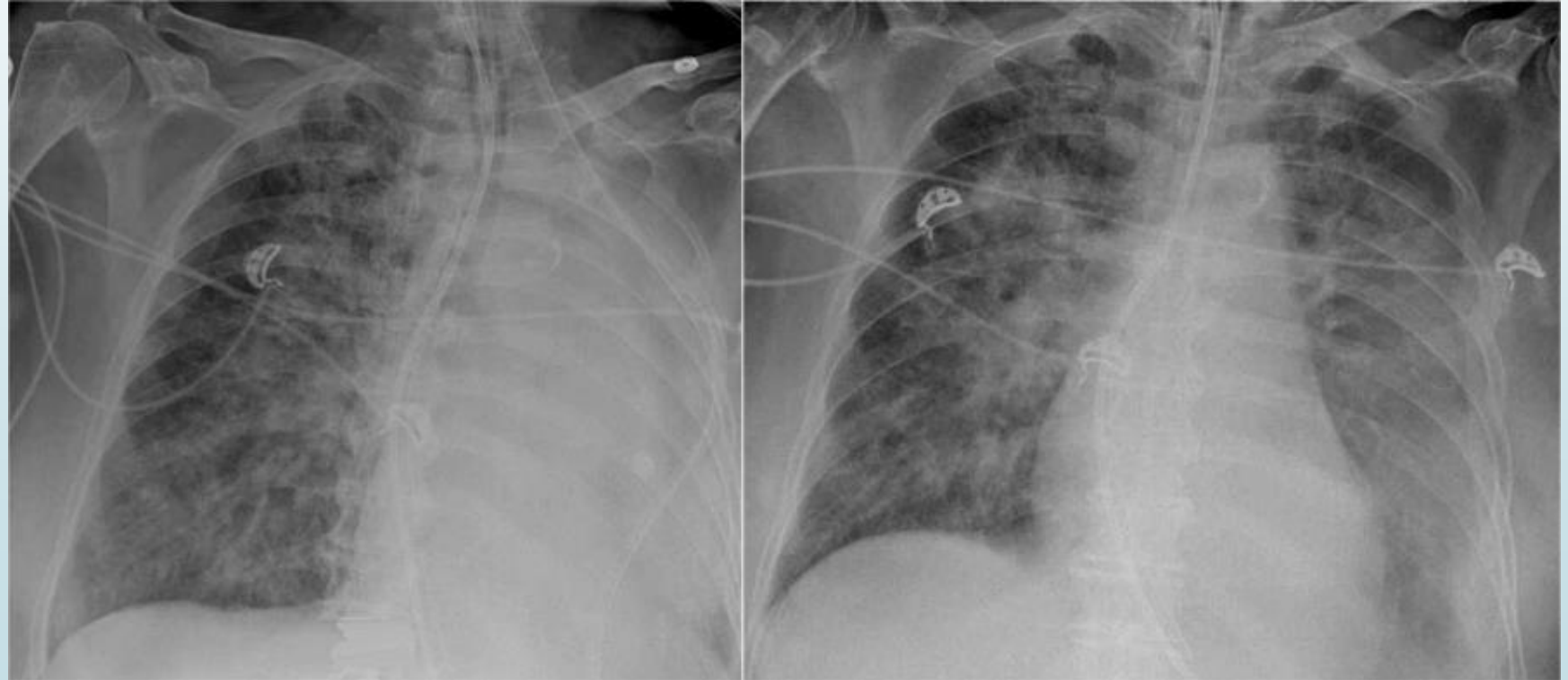


# Atelectasis

- A condition in which one or more areas of the lungs collapse or don't inflate properly.
- Causes: anesthesia, poor cough and shallow breathing (due to surgical pain, narcotic pain medication, ventilator etc...), impaired baseline pulmonary function
  - 1) interferes with gas exchange
  - 2) when persistent can interfere with clearing of mucus/secretions
  - 3) can progress to pneumonia or mucous plugging

# Mucus Plugs

- Accumulation of secretions in the airways that can lead to further obstruction atelectasis and pneumonia.





# Pneumonia

- ▶ It is associated with an increased requirement for noninvasive ventilation or reintubation, ARDS, a higher mortality rate and longer intensive care unit and overall hospital stay.
  - ▶ Pneumonia suspected on the basis of fever, radiographic infiltrate, and either leukocytosis or purulent sputum.
  - ▶ Sputum should be collected before starting broad spectrum antibiotics to direct antibiotic therapy. Bronchoalveolar lavage (BAL) vs. expectorated or induced sputum. Continue aggressive pulmonary toilet. Ventilatory support as necessary.

Prevention is key as mortality from postoperative pneumonia remains significant (about 30-46%).





# Prevention and Treatment

- ▶ Smoking cessation
- ▶ Incentive spirometry (sustained maximal inspiration), deep breathing
- ▶ Directed cough
- ▶ Optimal analgesia
- ▶ Early mobilization
- ▶ Chest physiotherapy
- ▶ Nasotracheal suctioning, inhaled mucolytics, bronchoscopy
- ▶ Antibiotics as indicated

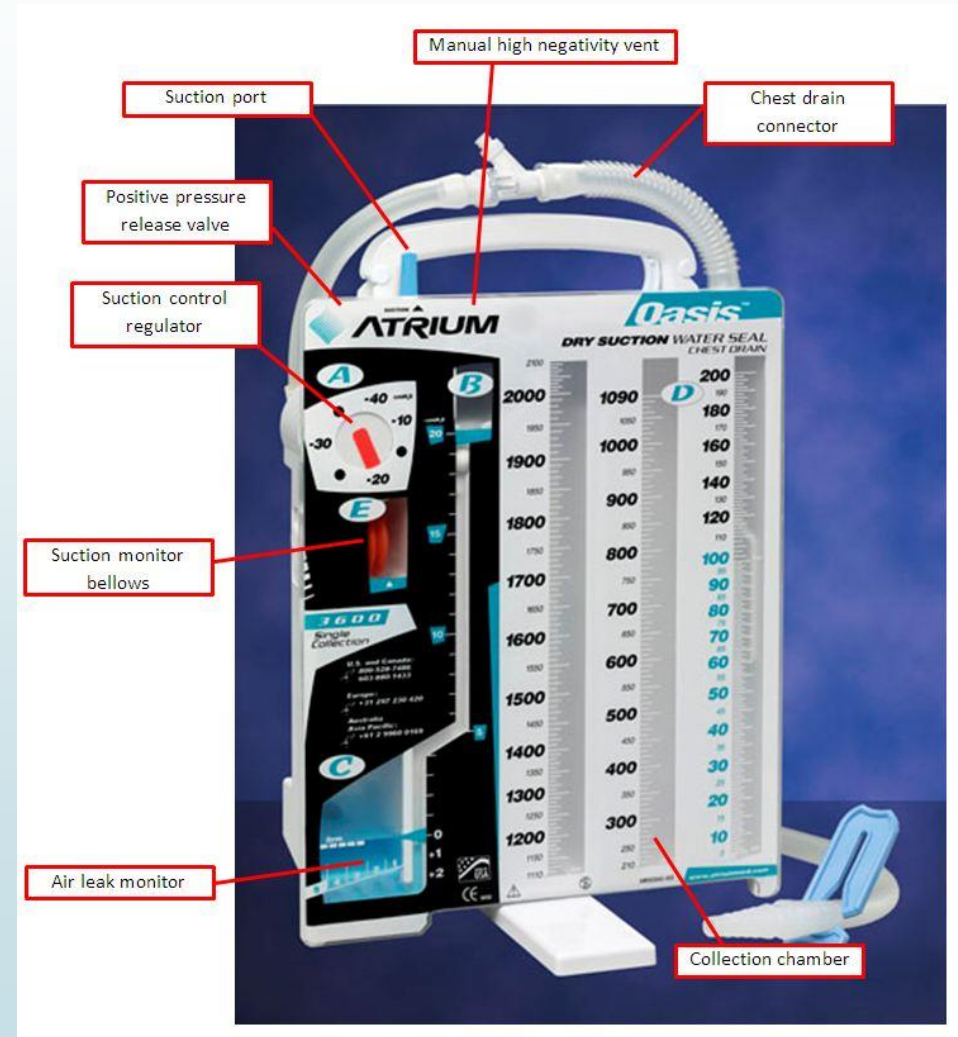


# Persistent Air Leak

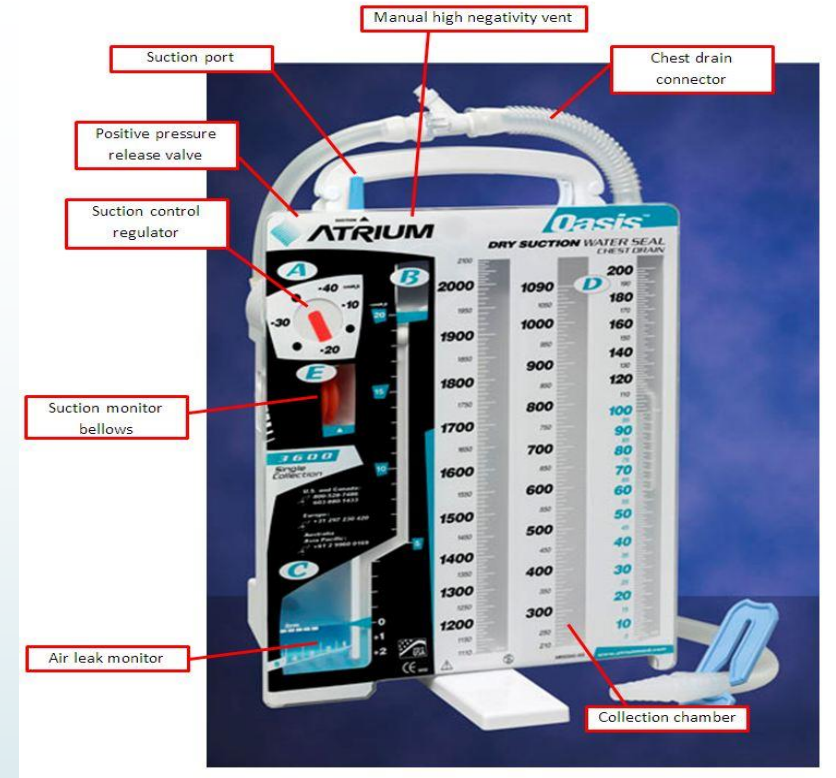
- ▶ A postoperative air leak is defined by air escaping the lung parenchyma into the pleural space after any kind of surgery in the chest.
- ▶ A persistent air leak is defined as lasting beyond postoperative day 5 (consistent with the STS database) \*5 days is the average LOS for a lobectomy
- ▶ It occurs in approximately 8% to 15% of all lung resections (4)
- ▶ It is a major driver in length of stay after pulmonary resection. It is also associated with increased patient discomfort, increased length of hospital stay and costs, and increased risk of developing empyema and other cardiopulmonary complications

# Evaluating for Air Leak

- Evaluating for an air leak
  - Check the system
  - Ensure suction is removed
  - Check for tidaling
  - Have the patient cough to evacuate any space created by the lung resection.



# Chest tube drainage devices



# Subcutaneous Emphysema



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# Subcutaneous Emphysema

- ▶ Management:
  - ▶ Functional chest tube
  - ▶ Suction
  - ▶ subcutaneous incisions, needles or drains
  - ▶ Time
  - ▶ Reassurance!!



# Empyema

- ▶ A condition in which pus gathers in the area between the lungs and the inner surface of the chest wall. By definition empyema implies that the pleural space is infected, usually by bacteria and/or fungi.
- ▶ **Three phases**
  - ▶ Phase 1- acute exudative
  - ▶ Phase 2- subacute, fibrinopurulent
  - ▶ Phase 3- chronic organizing phase
- ▶ **Following lobectomy, segmentectomy or wedge resection**
  - ▶ Incidence is less than 3%
  - ▶ More commonly associated with a persistent airleak
- ▶ **Following pneumonectomy**
  - ▶ Incidence is about 2%-16%
  - ▶ More commonly associated with the presence of a bronchopleural fistula (75%-80% of cases)
- ▶ **Risk factors:** include older age, cardiopulmonary impairment, malnutrition, induction therapy (especially chemoXRT, diabetes, steroids, right pneumonectomy, complex procedures as extended resections, postoperative pneumonia and barotrauma caused by mechanical ventilation,



# Treatment of Empyema

## ► Medication

- Antibiotics (Broad spectrum, narrow with culture data). Consider ID consult.

## ► Interventions

- Drainage (Chest tube placement versus pigtail placement) in phase I
- chest tube drainage with fibrinolytic agents (phase II) Video-assisted thoracic surgery (VATS) versus open drainage with decortication (phases II and III)
- Open pleural window (particularly with bronchial stump insufficiency) versus empyema tube for non-surgical candidates





# Postoperative Atrial Fibrillation (POAF)

- ▶ Atrial fibrillation (A-fib) is consistently second only to duration of air leak as the major driver of length of stay after pulmonary resection. (3 days longer than the normal length of stay)
- ▶ It occurs in 10% to 20% of major non-cardiac thoracic operations.
- ▶ Patient's with atrial fibrillation had worse outcomes than patient who did not. Higher rates of pulmonary, infectious and cardiovascular complications and 30 day mortality were significantly higher.



# Atrial Fibrillation

- Risk factors: Increasing age, increasing extent of operation, preoperative increased resting heart rate, history of congestive heart failure, history of peripheral vascular disease, male sex, and intraoperative transfusions.
- Potentially reversible causes:
  - Uncontrolled pain
  - Electrolytes imbalance (hypokalemia, hypomagnesaemia)
  - Missed medications (beta blockers, calcium channel blockers)
  - Hypoxia (pulmonary embolism; obstructive sleep apnea, atelectasis)
  - Hypotension
  - Infection (sepsis, pneumonia)
  - Severe anemia
  - Hypovolemia, dehydration
  - Worsening heart failure/cardiac ischemia
  - Withdrawal (alcohol, benzodiazepines, cocaine)
  - Hypothermia
  - Thyroid disease (hyperthyroidism)



# Management of post-op Atrial Fibrillation

- ▶ Hemodynamically unstable patients are defined by the presence of any of the following: hypotension, altered mental status, acute heart failure, or ongoing angina.
  - ▶ immediate synchronized direct current cardioversion (DCCV) is indicated and patients need to be transferred to a critical care unit. If there is a delay in organizing the electrical cardio-version, intravenous amiodarone can be considered for both rate and rhythm control.
- ▶ Hemodynamically stable patients are defined as patients with stable blood pressure and with minimal or moderate symptoms
  - ▶ Beta-blockers
  - ▶ Calcium channel blockers
  - ▶ Amiodarone
  - ▶ Digoxin
- ▶ Prophylaxis
- ▶ Anticoagulation

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# DVT/PE

- ▶ DVT/PE occurrence after lung resection
- ▶ Imaging Studies: U/S, CTA, V/Q scan
- ▶ Treatment with anticoagulation
- ▶ Prevention?

# QUESTIONS??

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