Complication of Lung surgery

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Risk Stratifications

Pulmonary risk

- ARISCAT

age, SpO2, incision, emergency, OP time, infection, Hb

- PFT (FEV1, DLCO)

Cardiovascular risk

A-fib, age, structural disease

PTE risk

Caprini score
age, BMI, surgery types, PMHx.

Procedure factors

extent (pneumonectomy > lobectomy > segmentectomy)

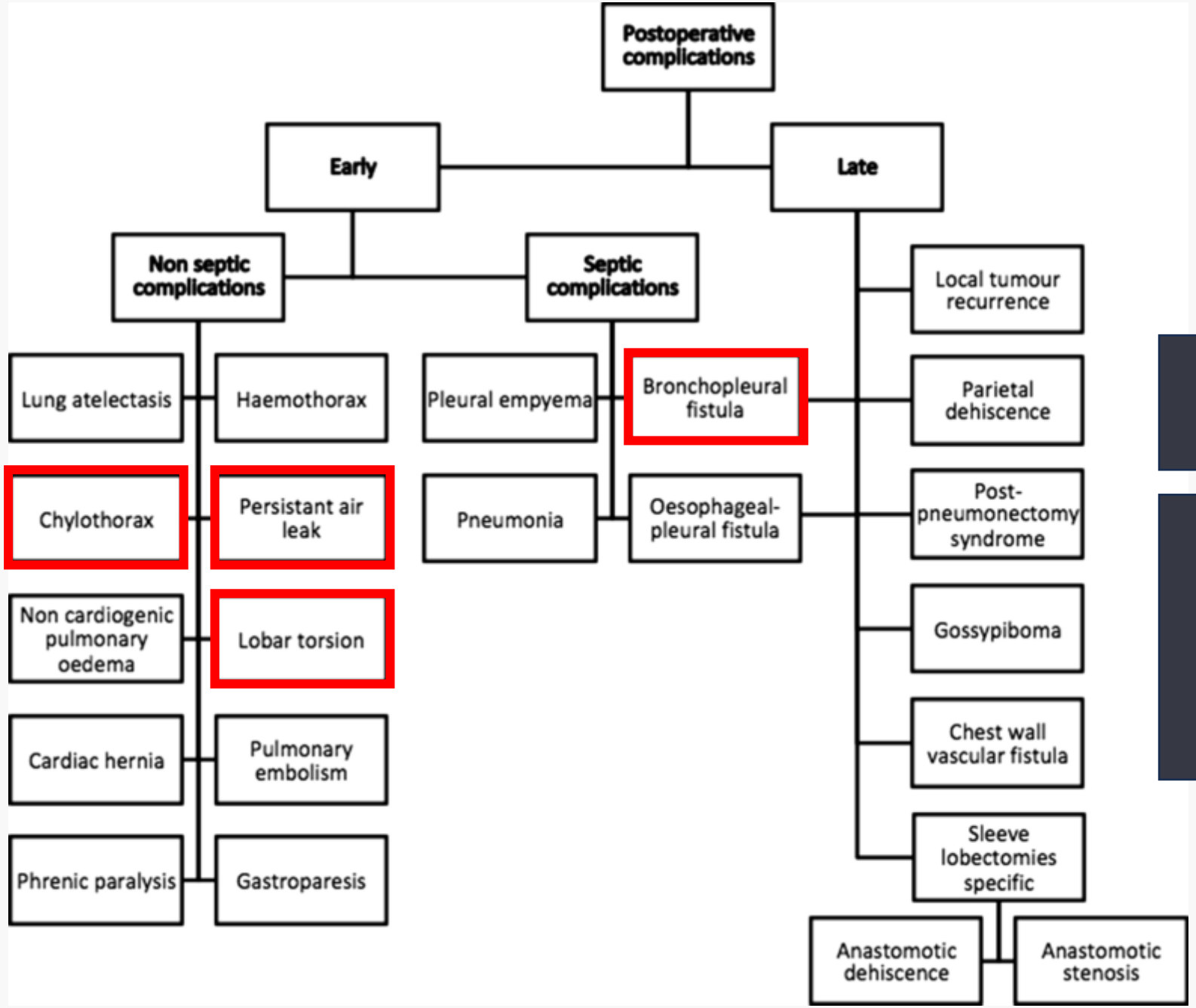
open vs VATS/RATS ; OP time; Blood loss ; complex

Prehabilitations

- Exercise Training
- Nutritional Support
- Psychological Support
- **Smoking Cessation**

  ≥ 4 weeks (ideally ≥ 1-2 months)

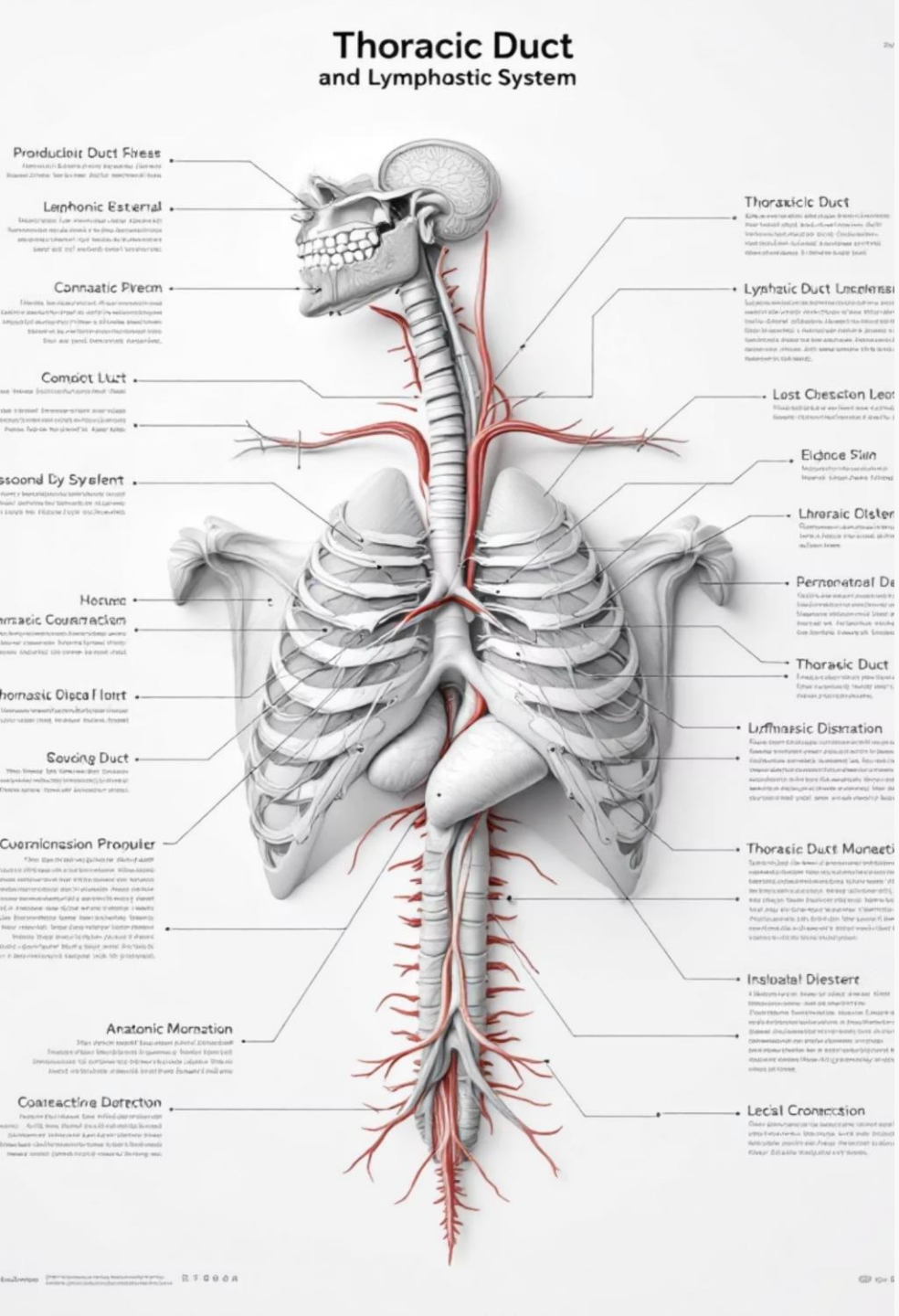
  reduces PPCs and pneumonia



Cardiac complications

AMI

A-fib



1. Chylothorax

- An accumulation of chyle (lymph fluid containing fat) in the pleural cavity
- Caused by an injury to the thoracic duct or its small branches, often during mediastinal lymph node dissection
- A relatively rare complication, occurring in 0.25% to 7% of cases, with higher rates observed after extensive mediastinal lymph node dissection
- Can leas to severe malnutrition, immunosuppression, respiratory distress, and prolonged hospital stays

1. Chylothorax

Pleural Fluid Analysis

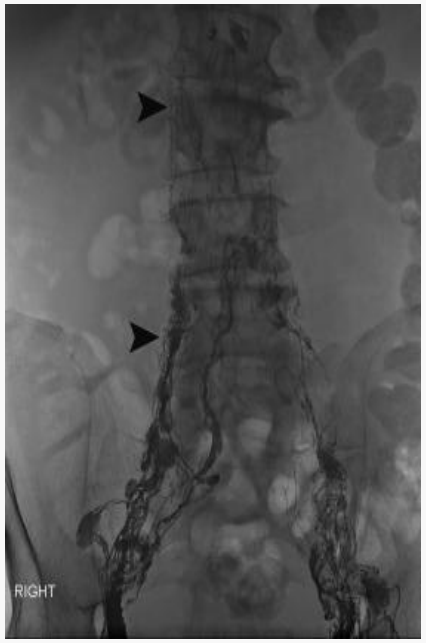
Milky or turbid
Triglyceride level of >110mg/dL
Presence of chylomicrons

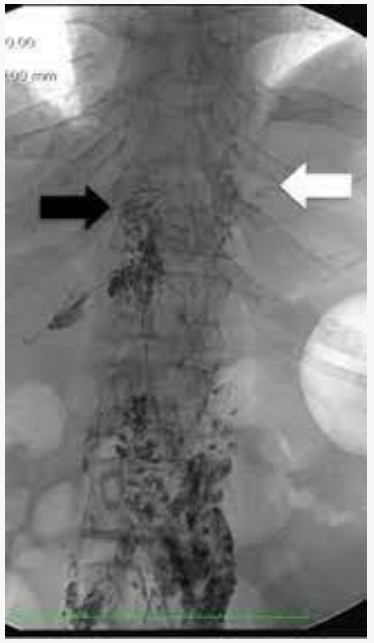
Conservative treatment

- NPO and TPN
- Low-fat diet with MCT
- Octreotide
- (Somatostatin analogue)

Interventional procedures

- Thoracic duct embolization
- Pleurodesis
- Thoracic duct ligation





2. Persistent Air Leak

Prolonged air leak after lung surgery defined

by STS database: postoperative days 5

Incidence: 8~26%

(most common)

delayed length of stay, increase hospital cost, vulnerable to empyema

2. Persistent Air Leak

Risk Factors

- poor pulmonary function
- Chronic use of steroids
- upper lobectomy
- segmentectomy
- presence of a pneumothorax with coinciding an air leak
- the presence of pleural adhesions

Air leak points

- torn or denuded of the visceral pleura
- incomplete fissure division
- staple lines
- the raw surface following segmentectomy
- Non-anatomic resections

2. Persistent Air Leak

Intraoperative prevention

Mobilization of all pleural adhesion

Division of Inferior pulmonary ligament(?)

Apical pleural tenting at upper lobectomy

Transient diaphragmatic paralysis(?)

Synthetic/fibrin sealant

Staple line buttressing

Non-surgical management

Watchful waiting: a few weeks

Chemical pleurodesis

Surgical management

Unidirectional endobronchial valve

Decortication

Parietal pleurectomy

Mechanical pleurodesis

Muscle or omental transposition

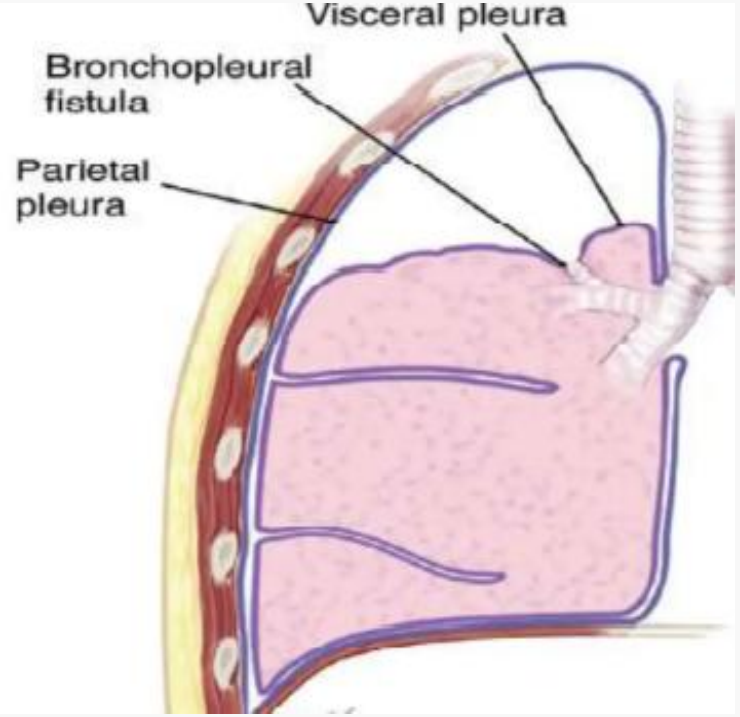
Completion lobectomy

Thoracoplasty/Open thoracotomy window

3. Bronchopleural Fistula

Definition

A BPF is communication between the pleural space and the bronchial tree



Alveolopleural fistula (APF)

Distal to segmental bronchus and pleural space

Common after lung resection except pneumonectomy

Bronchopleural fistula (BPF)

Mainstem, lobar or segmental bronchus or the pleural lined cavity

3. Bronchopleural Fistula

- Incidence

  pneumonectomy : 2 ~ 11%

  lobectomy : 0.5%

- Mortality

  5 ~ 70%

★ ***Risk factors – PSTER***

Poor nutrition

Septic condition associated underlying infection

Tb, Aspergillosis

Excessive long stump

Irradiated stump or disease stump

- **Rt. Pneumonectomy > Lt. Pneumonectomy**
- **Insufficient bronchial stump coverage**
- **Poor vascularity**

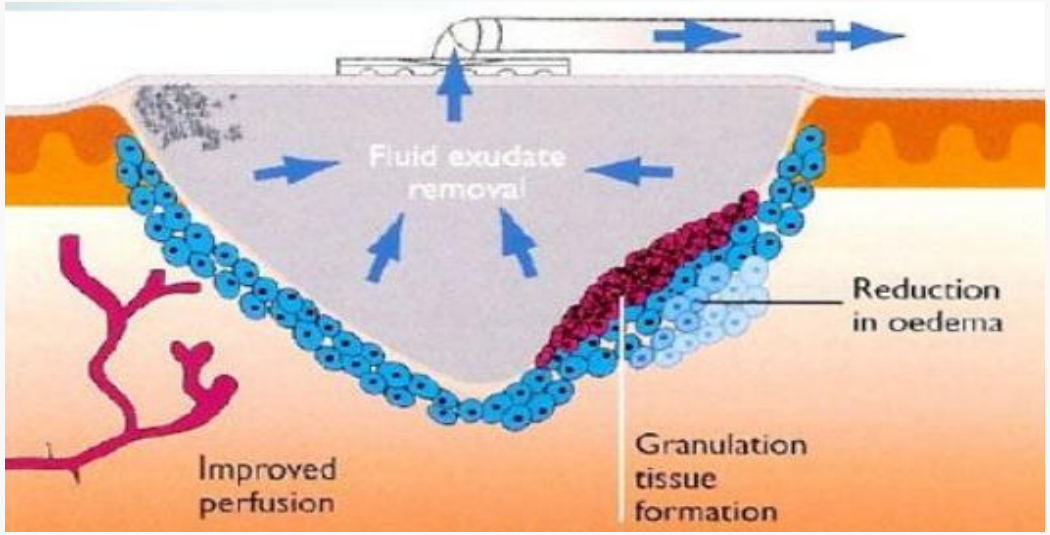
3. Bronchopleural Fistula_management

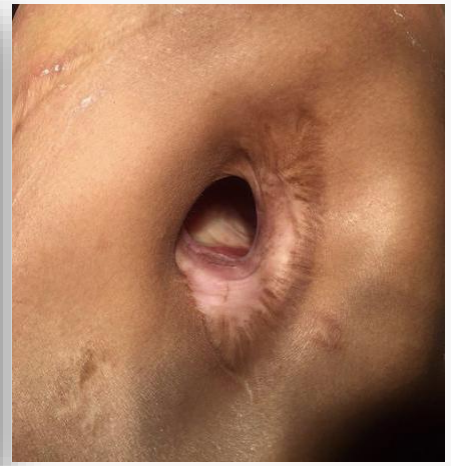
Acute post pneumonectomy BPF

- Debridement of bronchial stump
- Interrupted suture
- Stump coverage

Omentum, pedicled intercostal muscle

or mediastinal fat





Chronic pneumonectomy fistula

- Open window thoracostomy or Eloesser flap
- Intrathoracic muscle transposition
  - Thoracoplasty
  - Vacuum Assisted Closure Device
  - Long bronchial stump

    Transsternal approach for re-amputation

4. Lobar torsion

- Lobar torsion is the rotation of a lung lobe around its bronchovascular pedicle, resulting in airway obstruction, vascular compromise, and potential infarction.
- A rare but potentially fatal complication, reported in 0.09~0.4% of pulmonary resections
- The mortality rate can be as high as 8.3%
- Torsion of the middle lobe following a right upper lobectomy is the most frequent occurrence.

4. Lobar torsion

Diagnosis

- CXR
- CT
- Bronchoscopy

Gold standard imaging modality

Distorted or twisted course of the involved bronchus and vessels

Lobar consolidation with signs of edema

Abrupt cutoff of the contrast-filled pulmonary vessels

Early recognition is key to a favorable outcome

Once suspected, urgent operation~!!!

4. Lobar torsion treatment

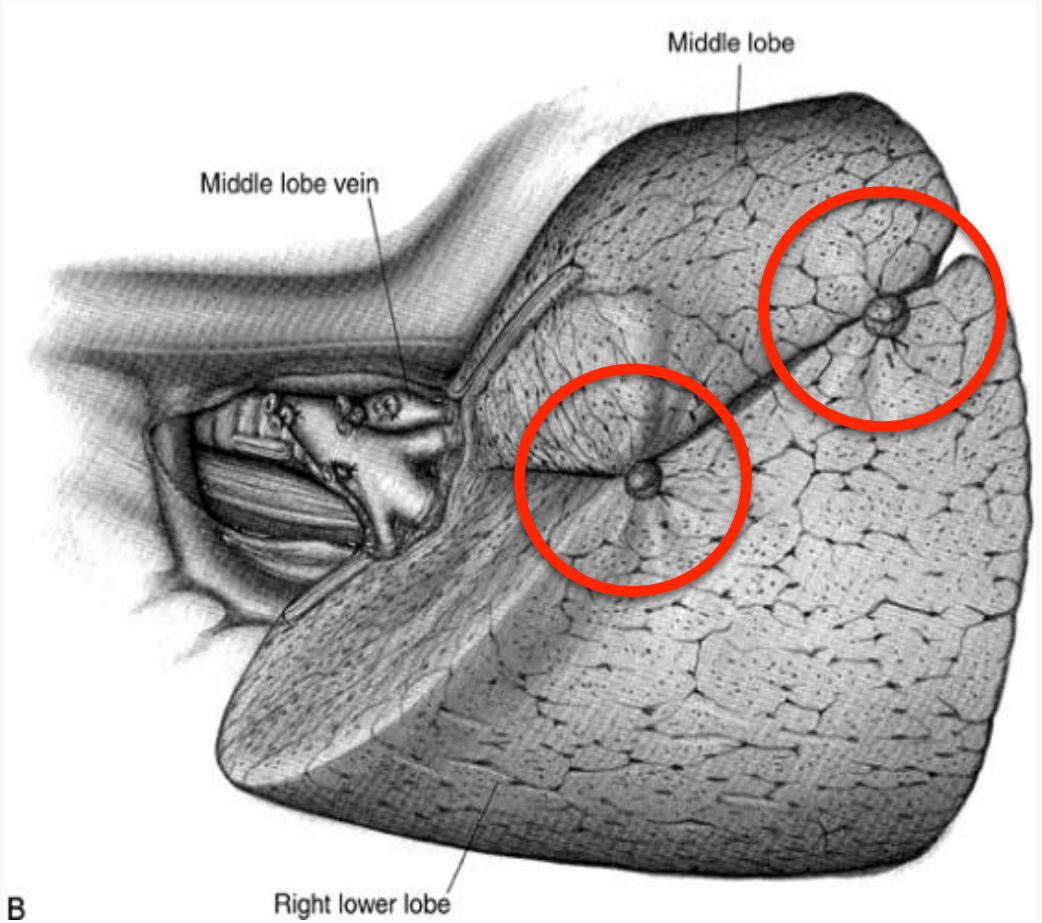
Torsion

Reposition and fixation

(Interlobar and mediastinal anchoring)

Gangrene

Lobectomy (or Segmentectomy)



5. Postoperative A-fib

- **Incidence**

  Lobectomy : 10 ~ 20% of cases

  Pneumonectomy : higher incidence, up to 20 ~ 40%

- Inflammation / autonomic changes / atrial stretch / hypoxemia
- **Pneumonectomy** is a greater risk than lobectomy
- **Older patients** have a higher risk
- Rate control / Rhythm control / Anticoagulation

Prophylaxis – beta blockers / **amiodarone**

Table 3A. Surgical and Respiratory Complications During Hospital Stay

	Low Risk (<10%)	Medium Risk (10%-20%)	High Risk (>20%)
Surgical complications*	Wedge resection	Segmentectomy	Lobectomy
		Mediastinal tumor	Bilobectomy
		Chest wall resection	Pneumectomy
		Rib resection	Decortication
		Diaphragm surgery	
Respiratory complications†	Wedge resection	Lobectomy	Bilobectomy
	Chest wall resection	Segmentectomy	Pneumectomy
		Mediastinal tumor	Decortication
		Rib resection	
		Diaphragm surgery	

* Air leak >7 days, new chest drain, bronchial insufficiency, chylothorax, rebleeding, revision surgery, wound infection, recurrent nerve paralysis, lung infarction, or other surgical complication.

† Respiratory failure, pneumonia, ARDS, NIV, reintubation, invasive ventilation >48 hours, or initiation of ECMO therapy.

Table 3B. Cardiac Complications During Hospital Stay

	Low Risk (<1%)	Medium Risk (1%-5%)	High Risk (>5%)
Cardiac complications*	Wedge resection	Segmentectomy	Lobectomy
	Rib resection	Mediastinal tumor	Bilobectomy
		Chest wall resection	Pneumectomy
		Decortication	Diaphragm surgery

* New-onset atrial fibrillation, myocardial infarction, pulmonary embolism or cardiac arrest.

Less resection, fewer complications

M. Schieren et al. Journal of Cardiothoracic and Vascular Anesthesia 39 (2025)