

*Practical Anatomy for  
General Thoracic Surgery:  
The Stuff They Don't Teach  
You in the Picture Books*



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TSDA Boot Camp 9/15/17

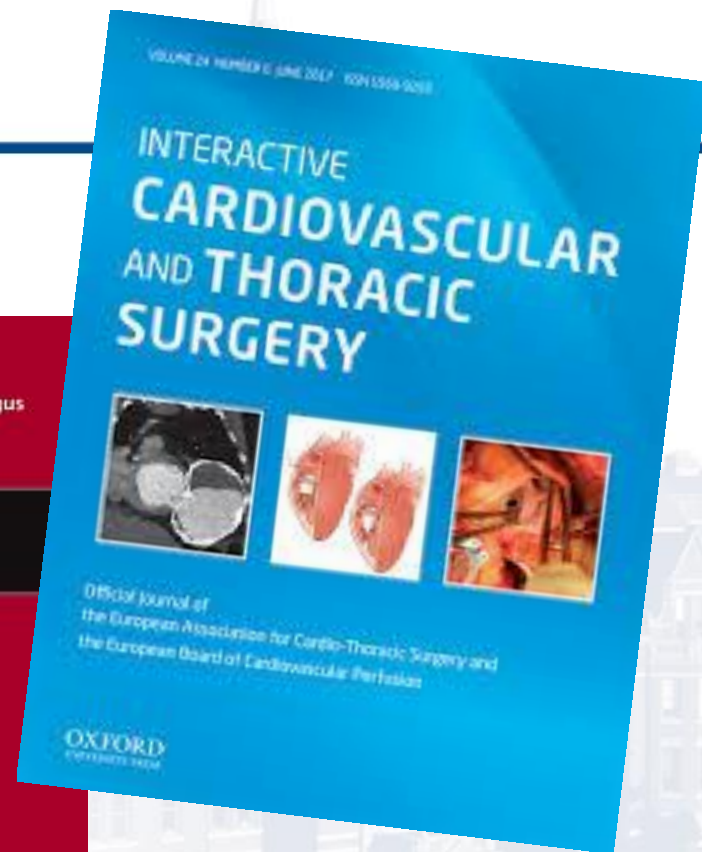
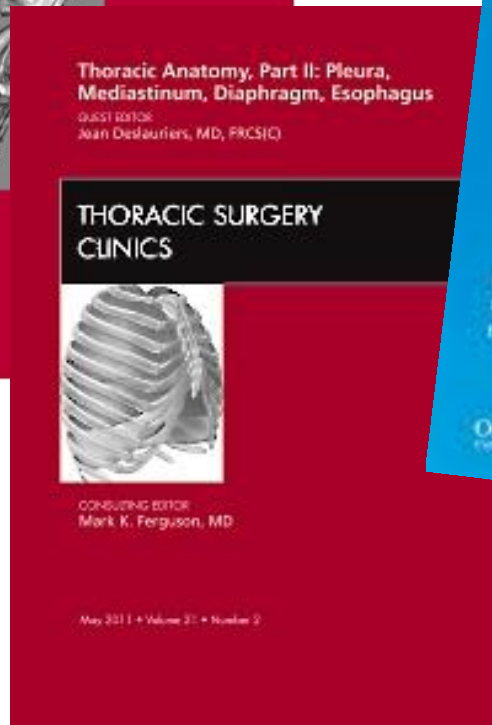
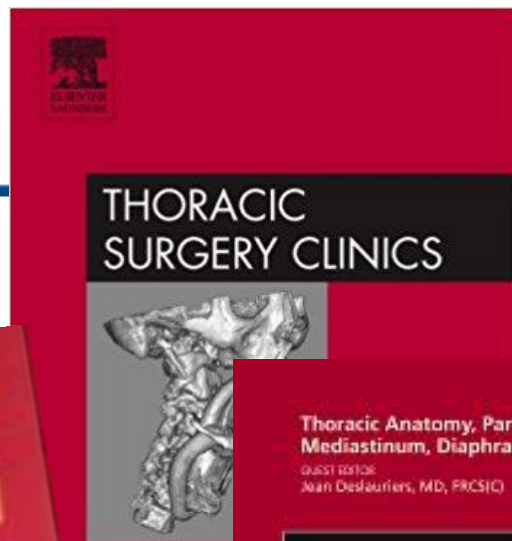
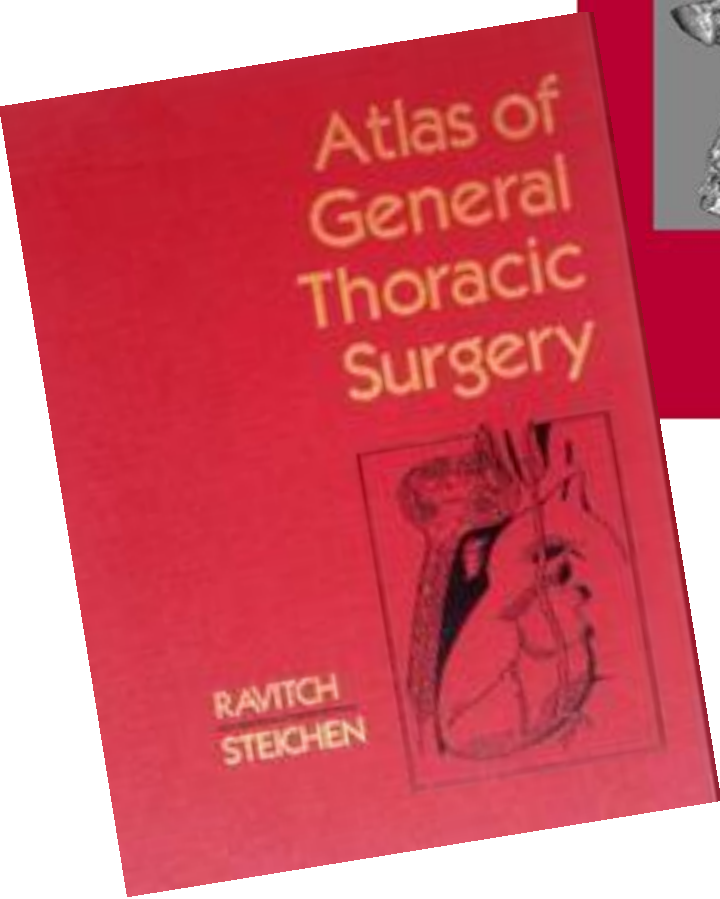


**JOHNS HOPKINS**  
M E D I C I N E

# Disclosures

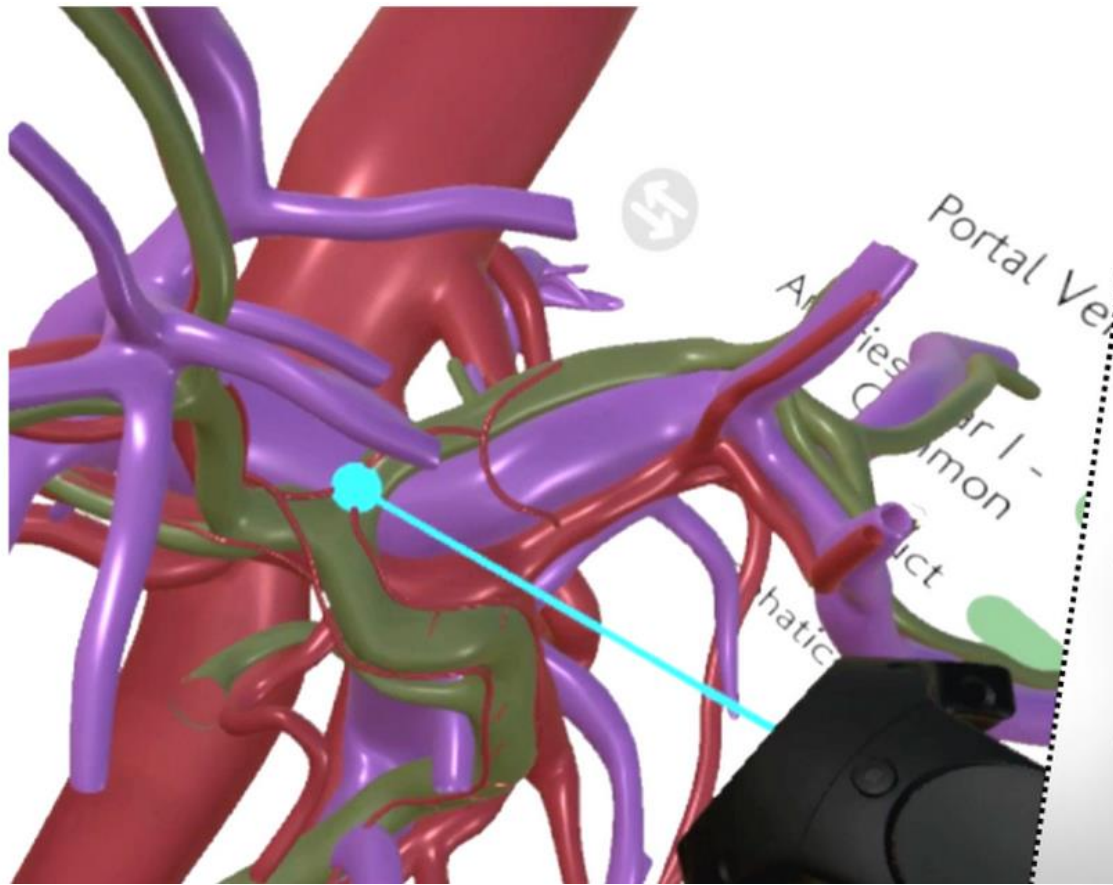
- No financial disclosures
- Modest experience, don't claim to know everything
- Conflict: I'm a Dukie











# Objectives



- Review important anatomic landmarks in general thoracic surgery
- Recognize the common anatomic anomalies encountered during these procedures
- Describe the operative implications of these anomalies



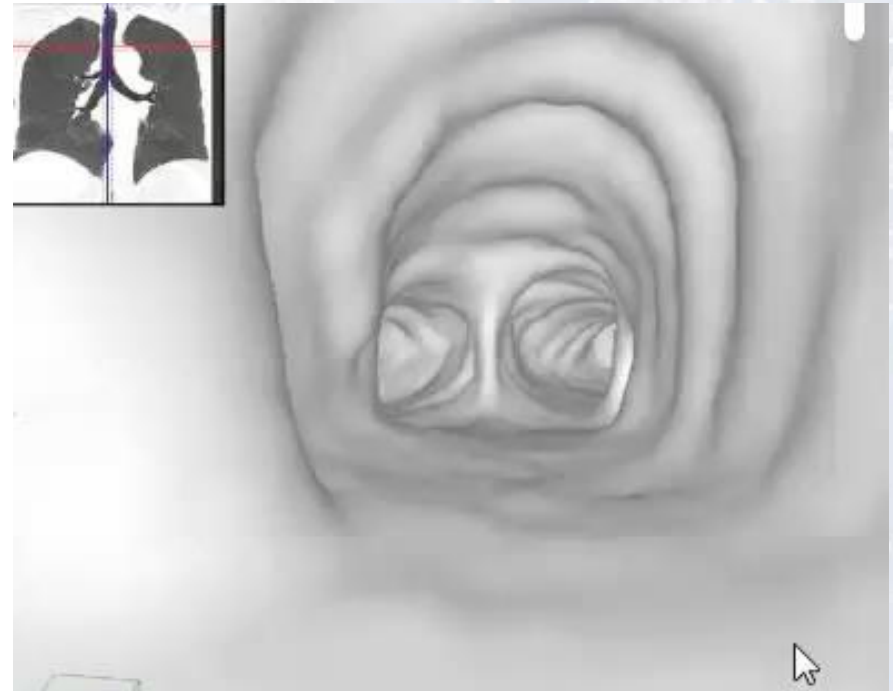
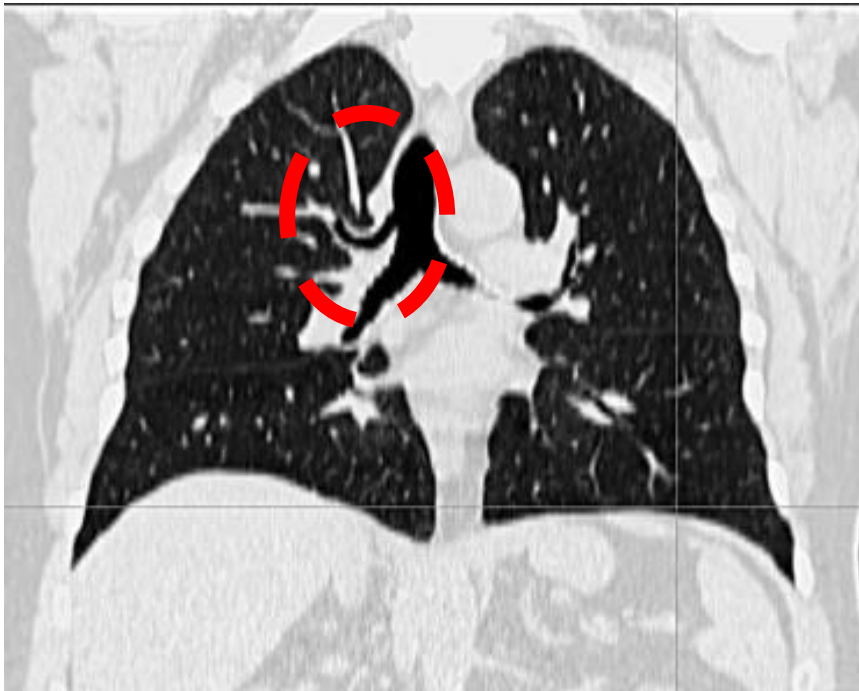
# Bronchoscopy

- Know your scope!



# Bronchoscopy

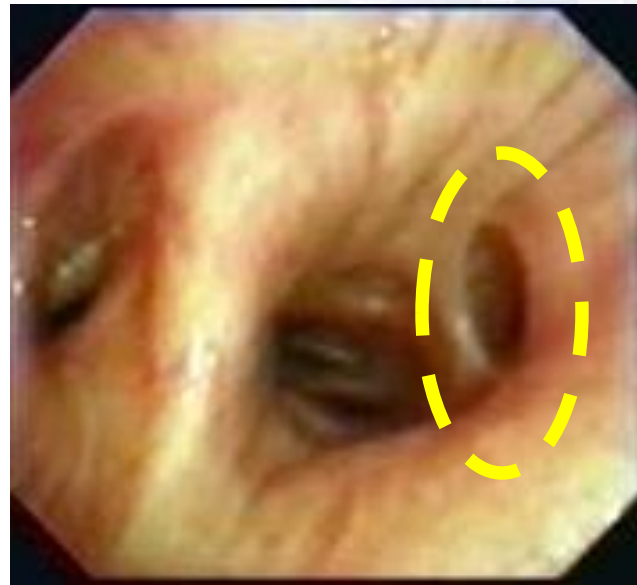
- Know your scope!
- Tracheal RUL bronchus





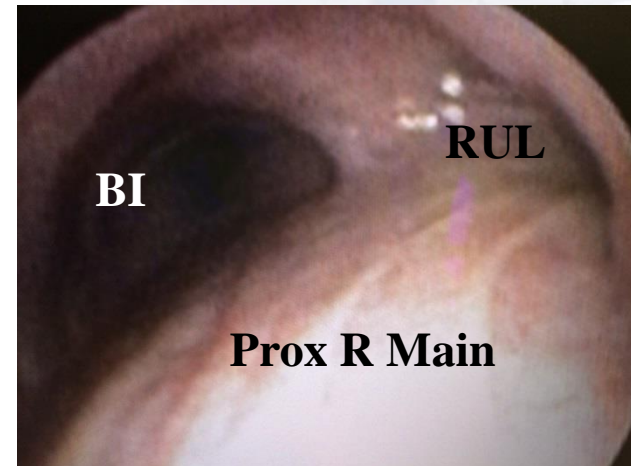
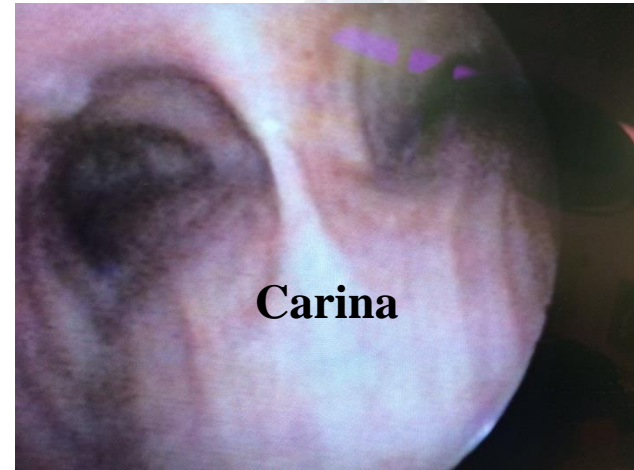
# Bronchoscopy

- Know your scope!
- Tracheal RUL bronchus
- Sup seg take off varies



# Bronchoscopy

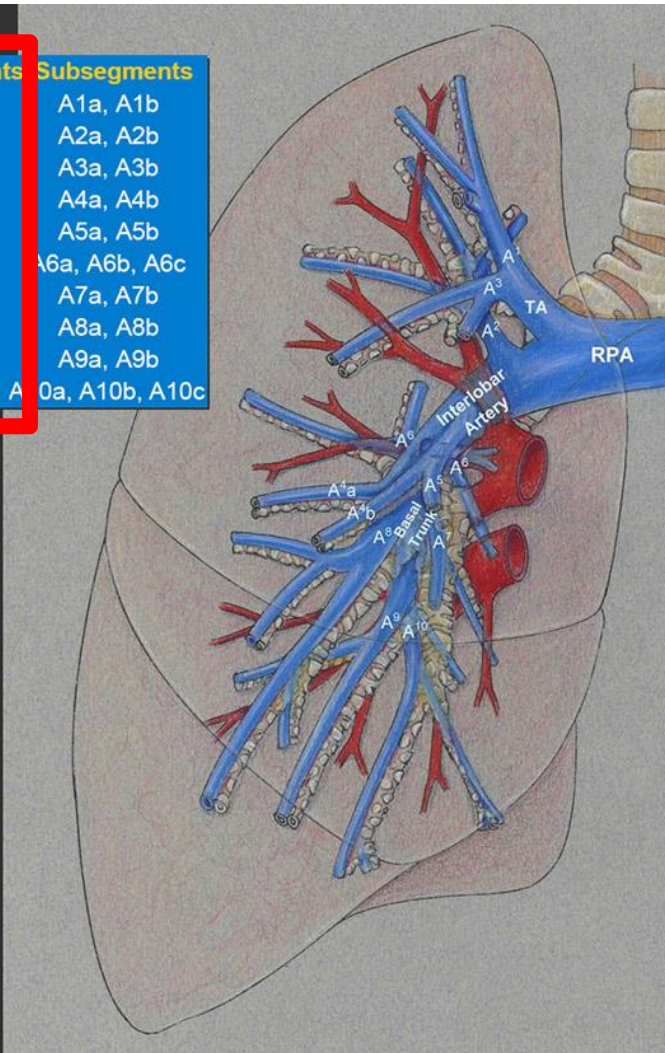
- Know your scope!
- Tracheal RUL bronchus
- Sup seg take off varies
- Troubleshooting malpositioned double lumen tubes



# Bronchoscopy – Segmental Nomenclature (anatomic vs Boyden's)

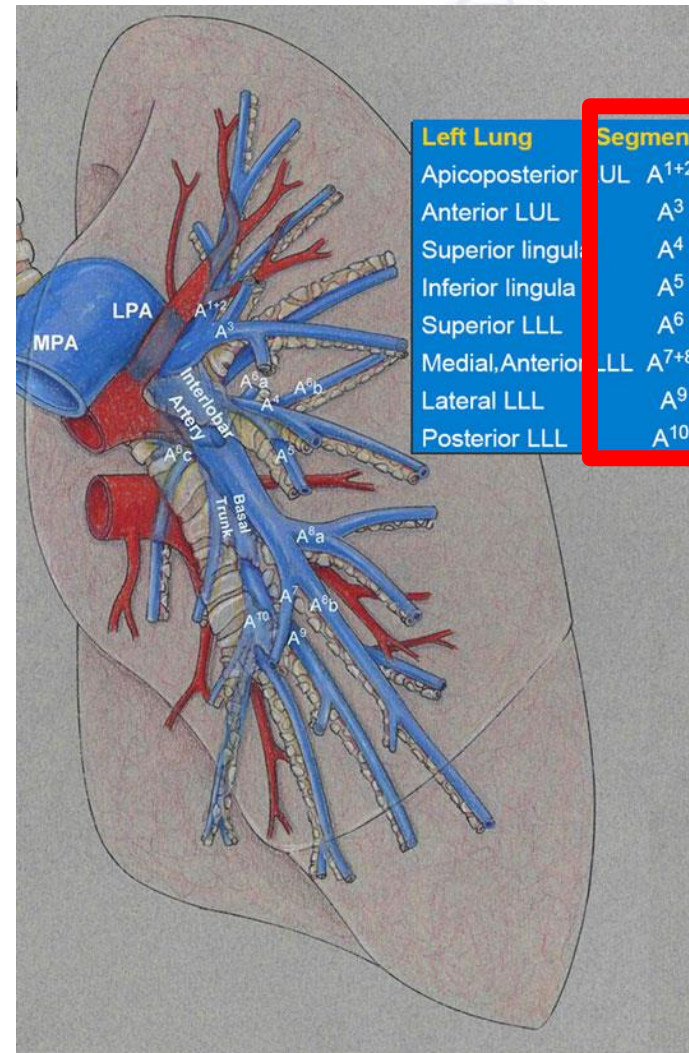
AP view

Right Lung	Segments	Subsegments
Apical RUL	A1	A1a, A1b
Posterior RUL	A2	A2a, A2b
Anterior RUL	A3	A3a, A3b
Lateral RML	A4	A4a, A4b
Medial RML	A5	A5a, A5b
Superior RLL	A6	A6a, A6b, A6c
Medial RLL	A7	A7a, A7b
Anterior RLL	A8	A8a, A8b
Lateral RLL	A9	A9a, A9b
Posterior RLL	A10	A10a, A10b, A10c



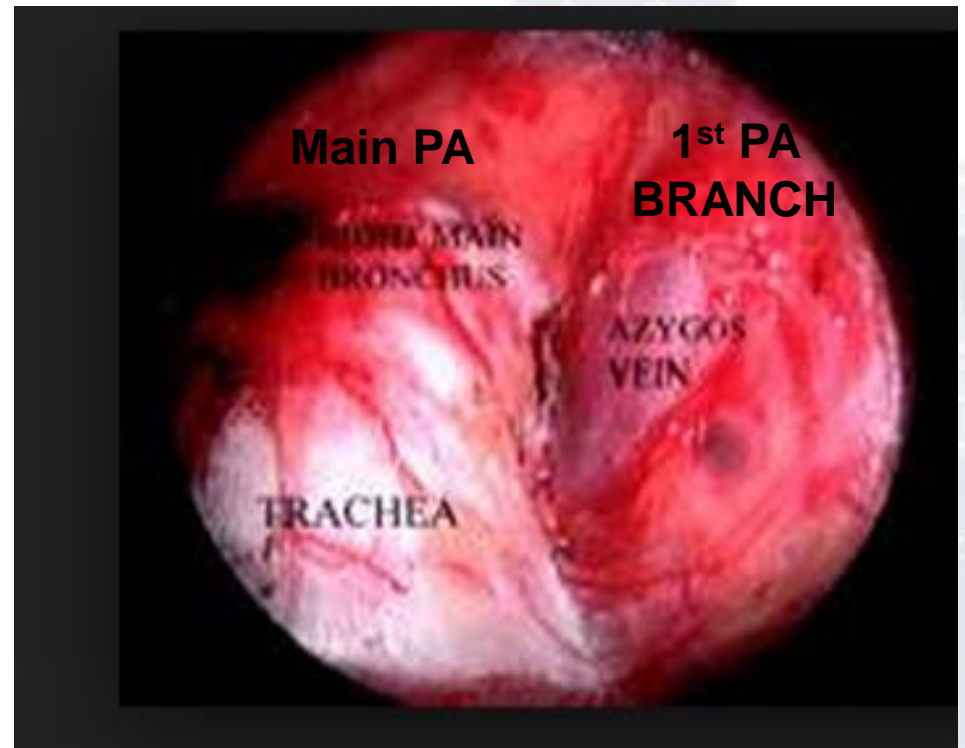
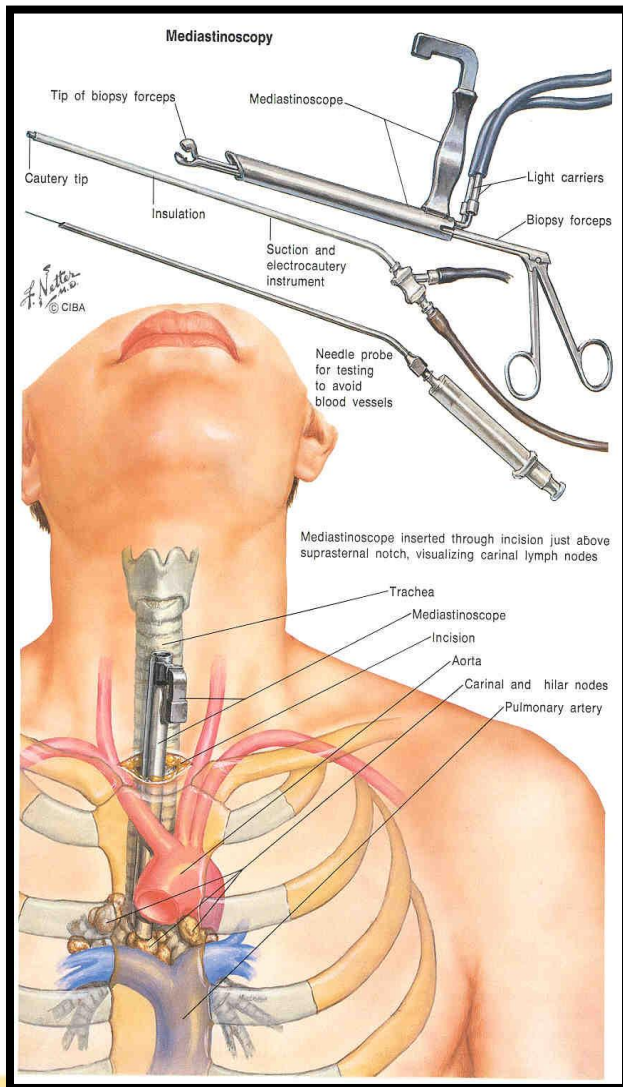
AP view

Left Lung	Segments	Subsegments
Apicoposterior LUL	A <sup>1+2</sup>	A <sup>1+2</sup> a, A <sup>1+2</sup> b, A <sup>1+2</sup> c
Anterior LUL	A <sup>3</sup>	A <sup>3</sup> a, A <sup>3</sup> b, A <sup>3</sup> c
Superior lingula	A <sup>4</sup>	A <sup>4</sup> a, A <sup>4</sup> b
Inferior lingula	A <sup>5</sup>	A <sup>5</sup> a, A <sup>5</sup> b
Superior LLL	A <sup>6</sup>	A <sup>6</sup> a, A <sup>6</sup> b, A <sup>6</sup> c
Medial, Anterior LLL	A <sup>7+8</sup>	A <sup>7</sup> a, A <sup>7</sup> b, A <sup>8</sup> a, A <sup>8</sup> b
Lateral LLL	A <sup>9</sup>	A <sup>9</sup> a, A <sup>9</sup> b
Posterior LLL	A <sup>10</sup>	A <sup>10</sup> a, A <sup>10</sup> b, A <sup>10</sup> c



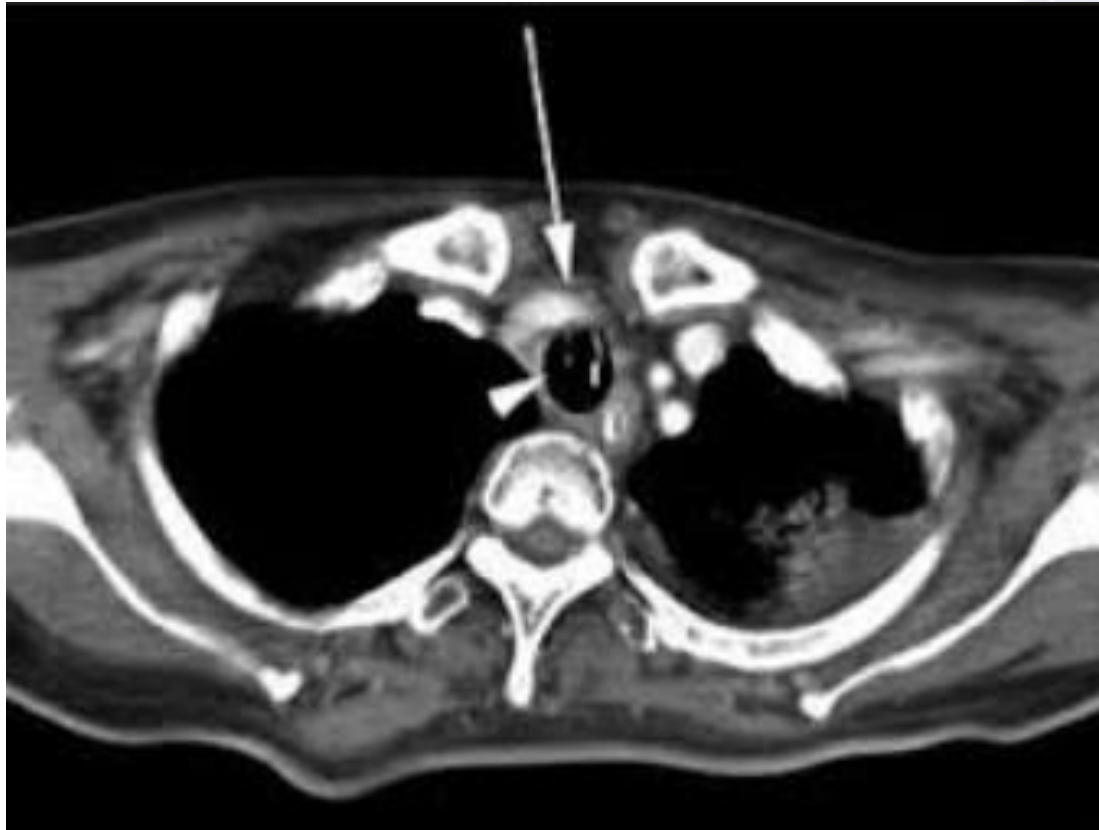


# Mediastinoscopy

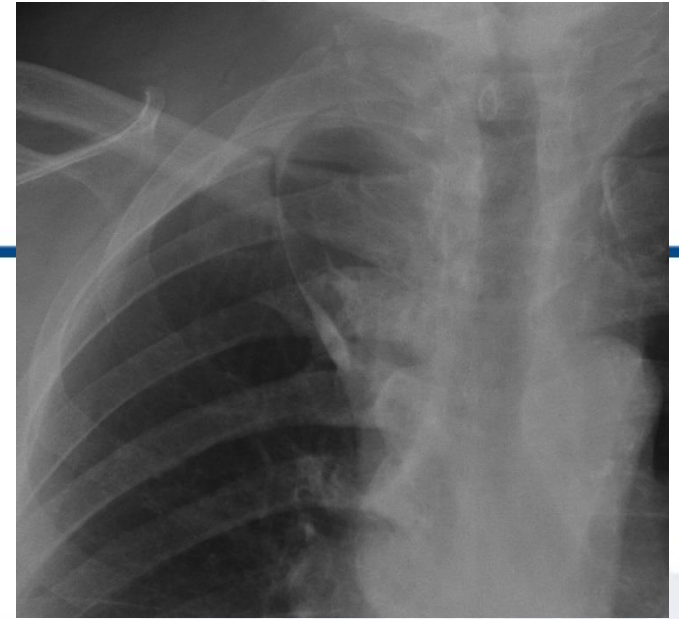
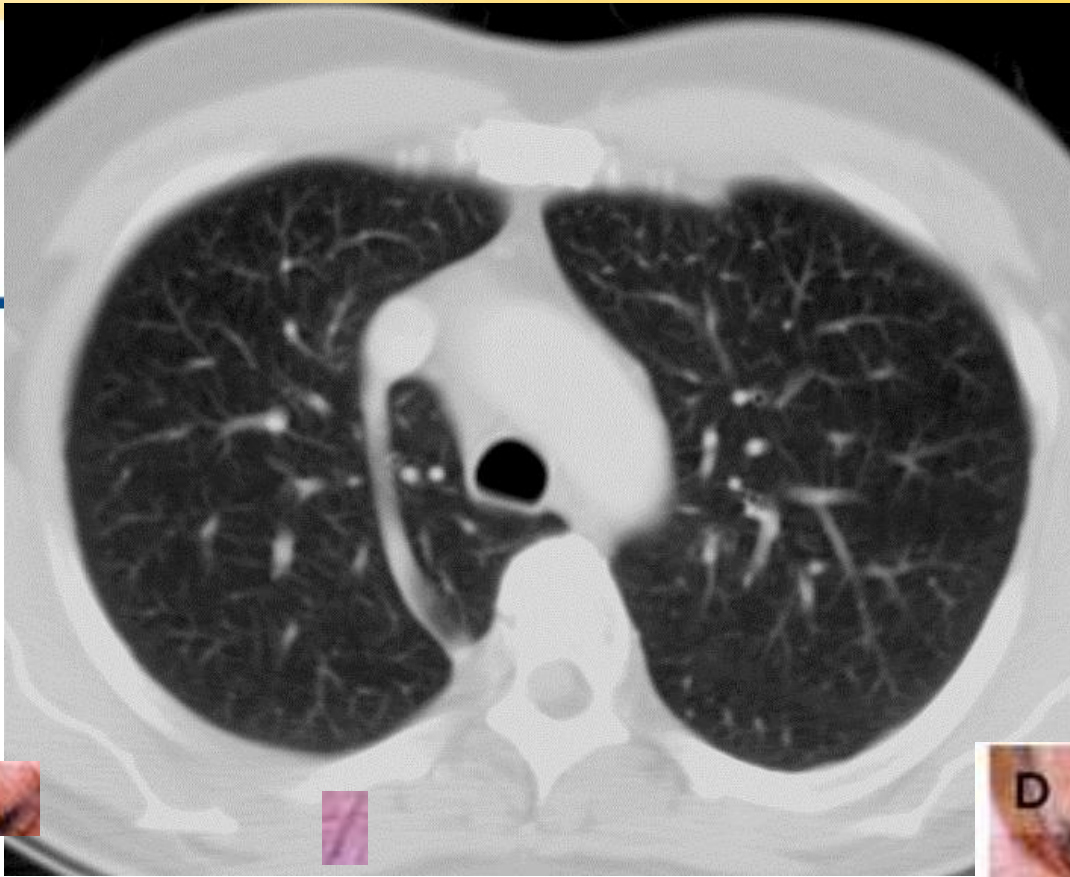




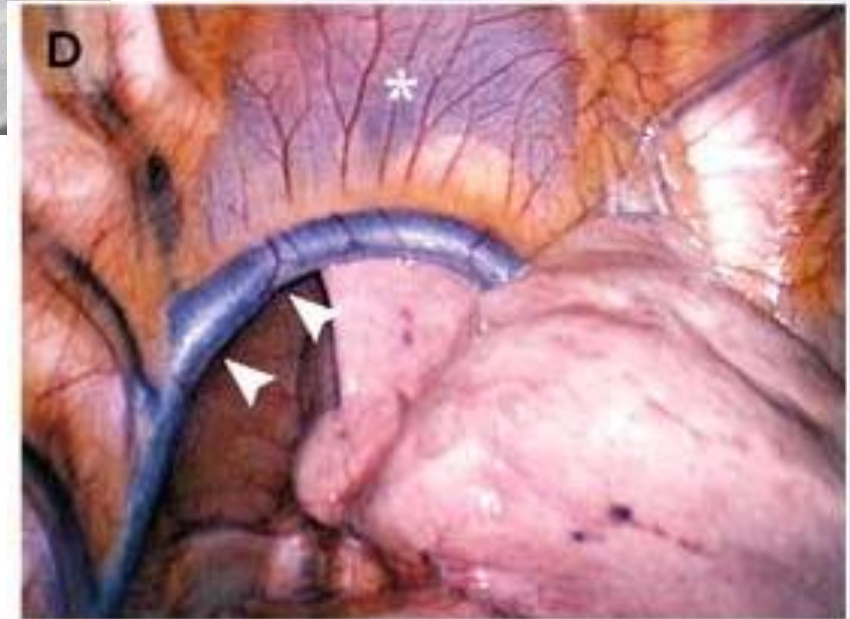
# *Sternotomy, tracheostomy*

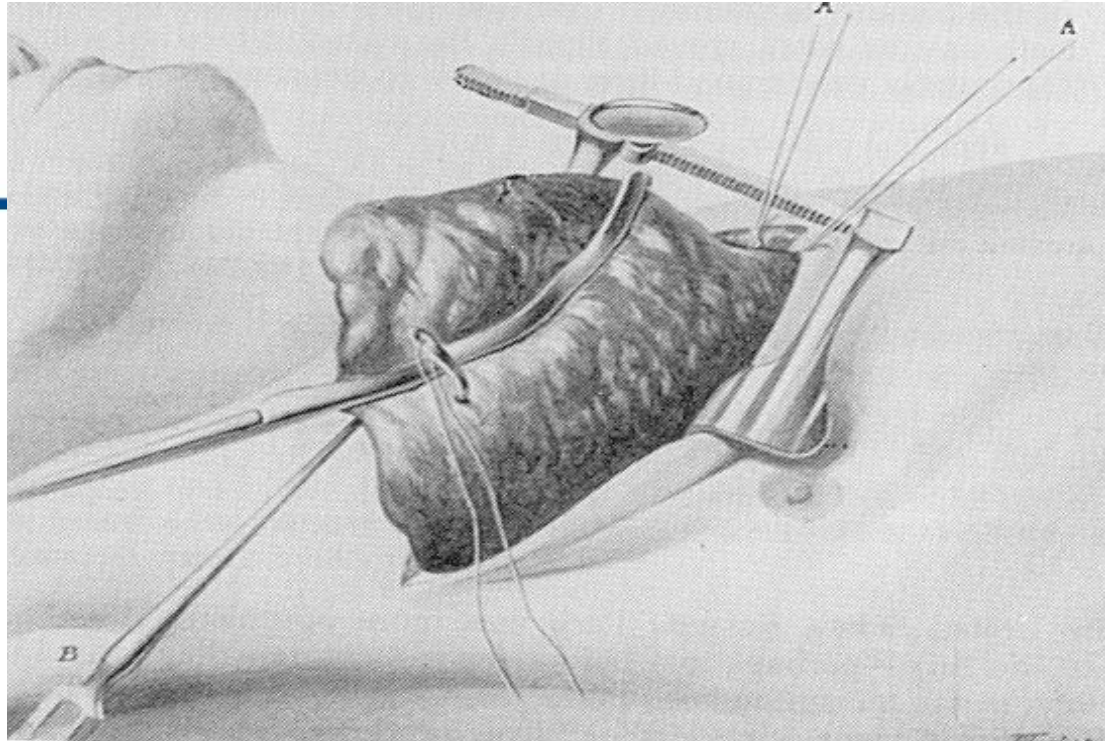


*High riding innominate artery*



*Azygous lobe*





- 1891 – Tuffier, first successful lung resection for TB**
- 1908: Babcock, RLL lobectomy**
- 1931: Churchill, dissection lobectomy**
- 1933: Graham, left pneumonectomy for lung cancer**

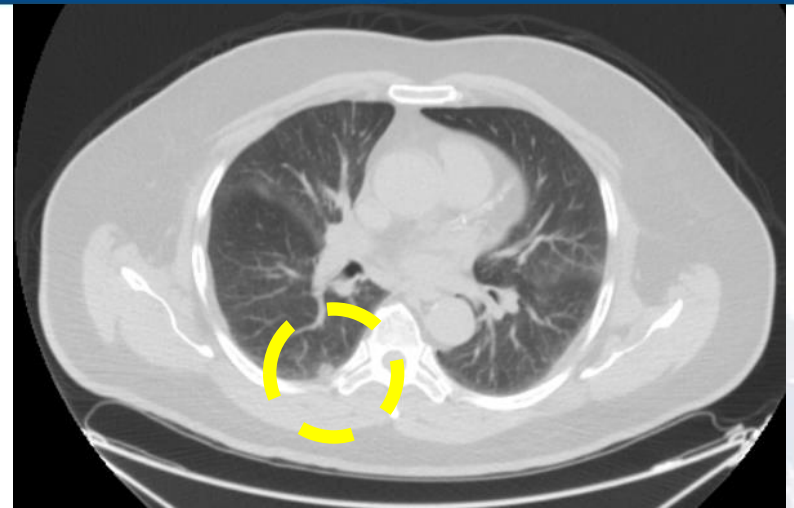
# Lung Resections

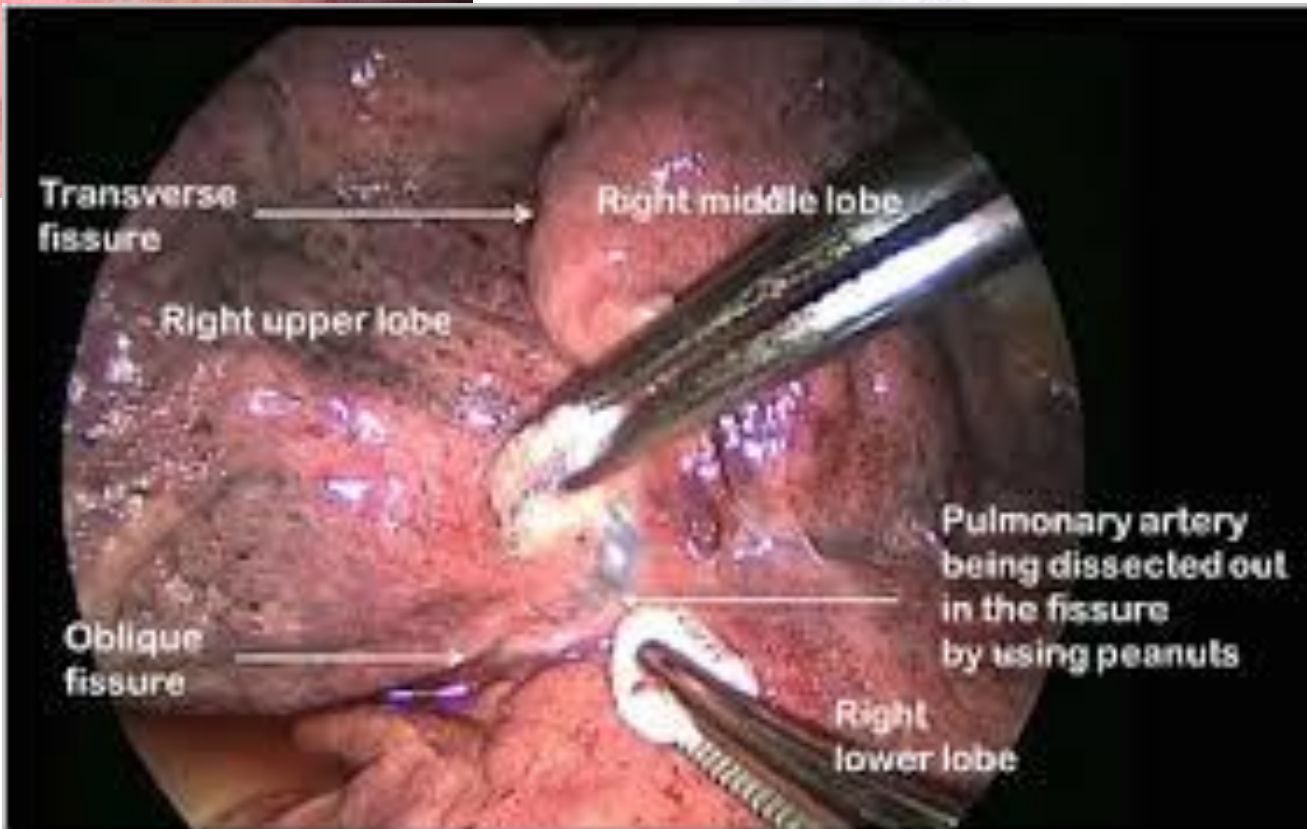
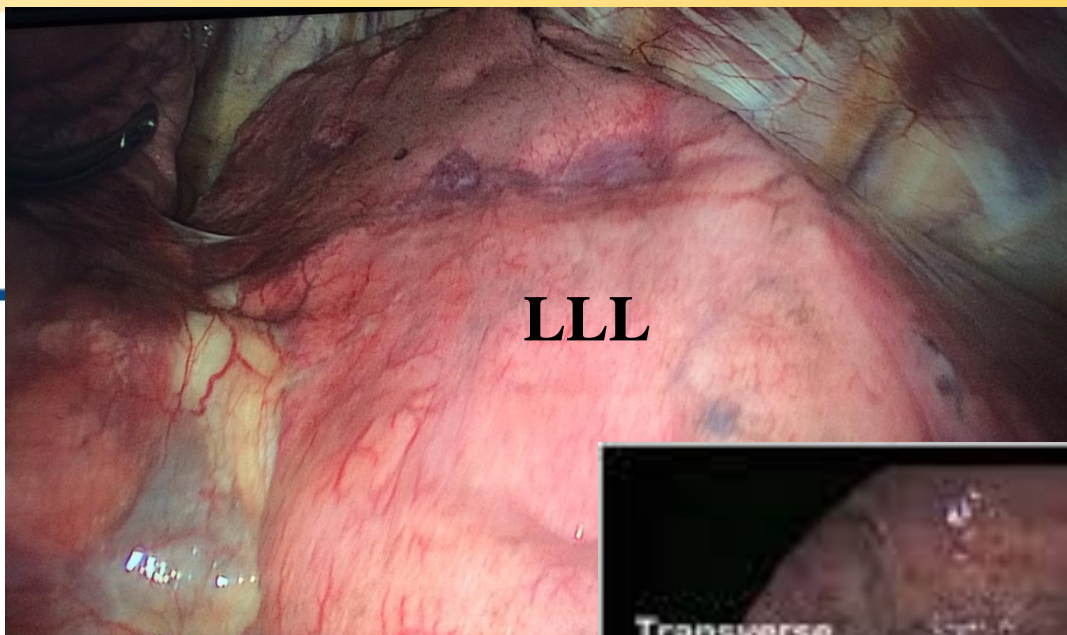
- **3D vascular anatomy difficult via VATS (thus appreciate open experience)**
- **Anatomic anomalies are frequent**
- **Increasing number of (VATS) segmentectomies given screening programs picking up small lesions**



# Nodule Localization

- Increased incidence w CT screening
- Use 3-D recon
- Landmarks:
  - Xiphoid
  - Table position
  - Sup seg tip
  - IPV
  - Nipples





Transverse  
fissure

Right middle lobe

Right upper lobe

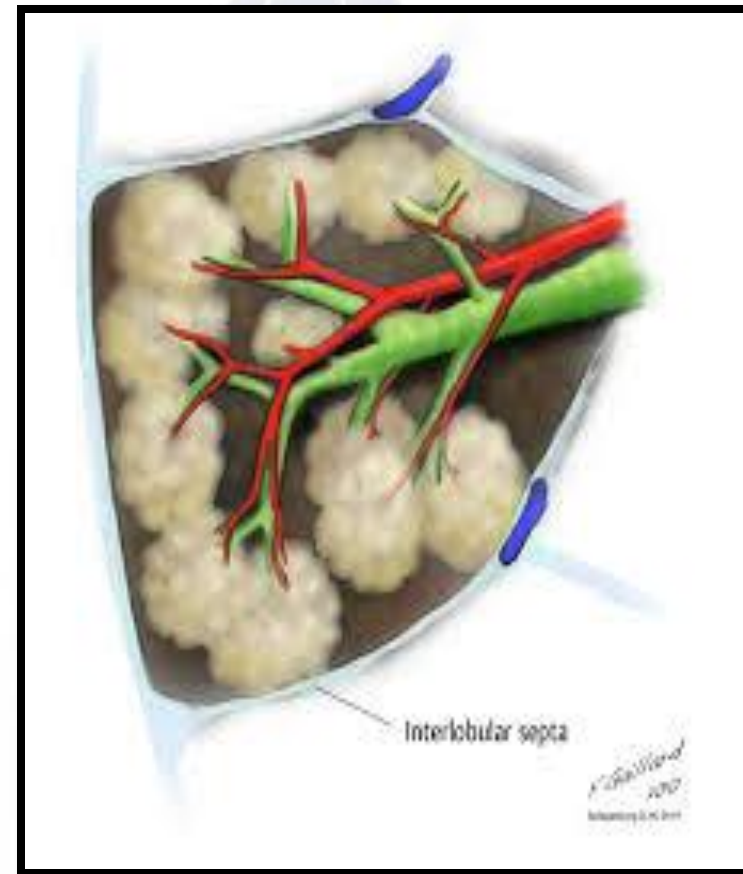
Oblique  
fissure

Pulmonary artery  
being dissected out  
in the fissure  
by using peanuts

Right  
lower lobe

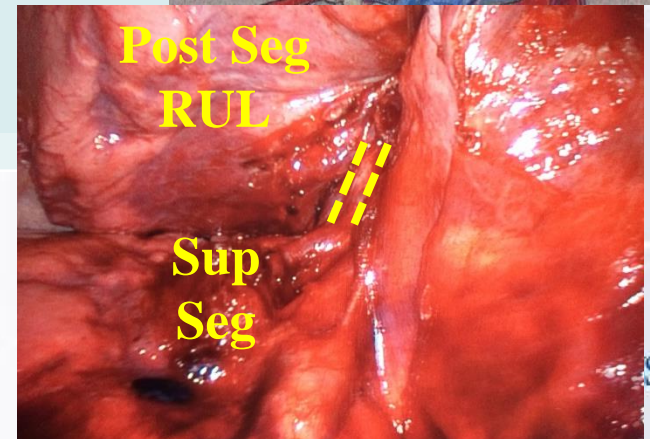
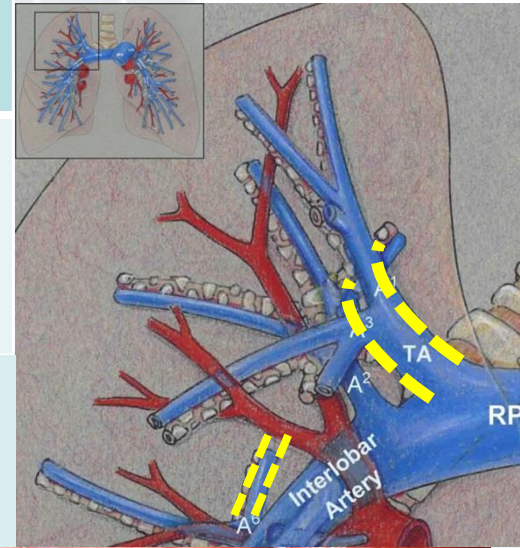
# Pulmonary Collaterals: *Pores of Kohn*

- Interalveolar connections,  
Canals of Lambert
- Account for:
  - ◆ Ventilation across  
segments and fissures
  - ◆ Failure of endobronchial  
valves
  - ◆ Local recurrence after  
wedge resection



# Common PA Variants - *Right*

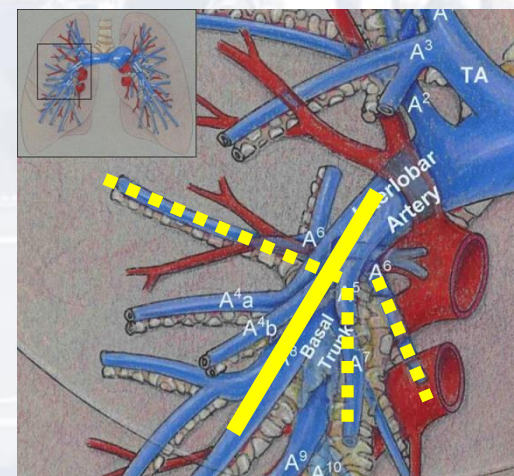
Lobe	Common	Variant
RUL	Truncus anterior Post asc branch	15% no post asc 5% post asc from sup seg





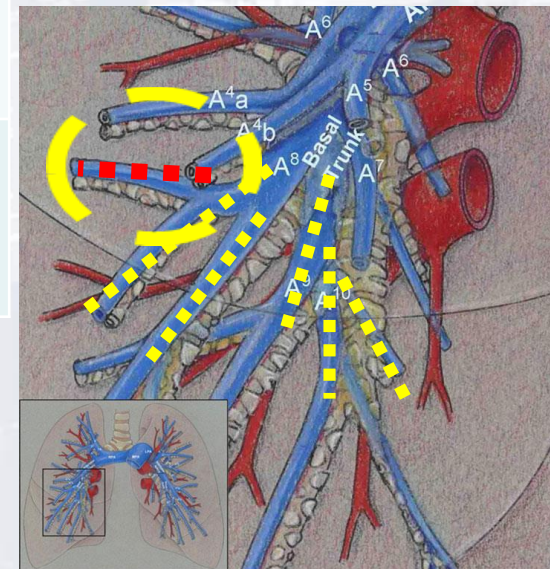
# Common PA Variants - *Right*

Lobe	Common	Variant
RUL	Truncus anterior Post asc branch	15% no post asc 5% post asc from sup seg
RML	55% one common trunk 45% two branches	5% > 2 branches



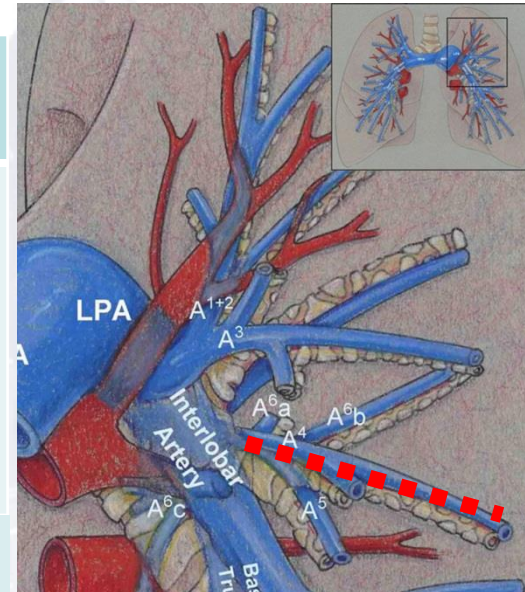
# Common PA Variants - *Right*

Lobe	Common	Variant
RUL	Truncus anterior Post asc branch	15% no post asc 5% post asc from sup seg
RML	55% one common trunk 45% two branches	5% > 2 branches
RLL	5 distinct branches or common trunk to basilar	20% have multiple sup seg



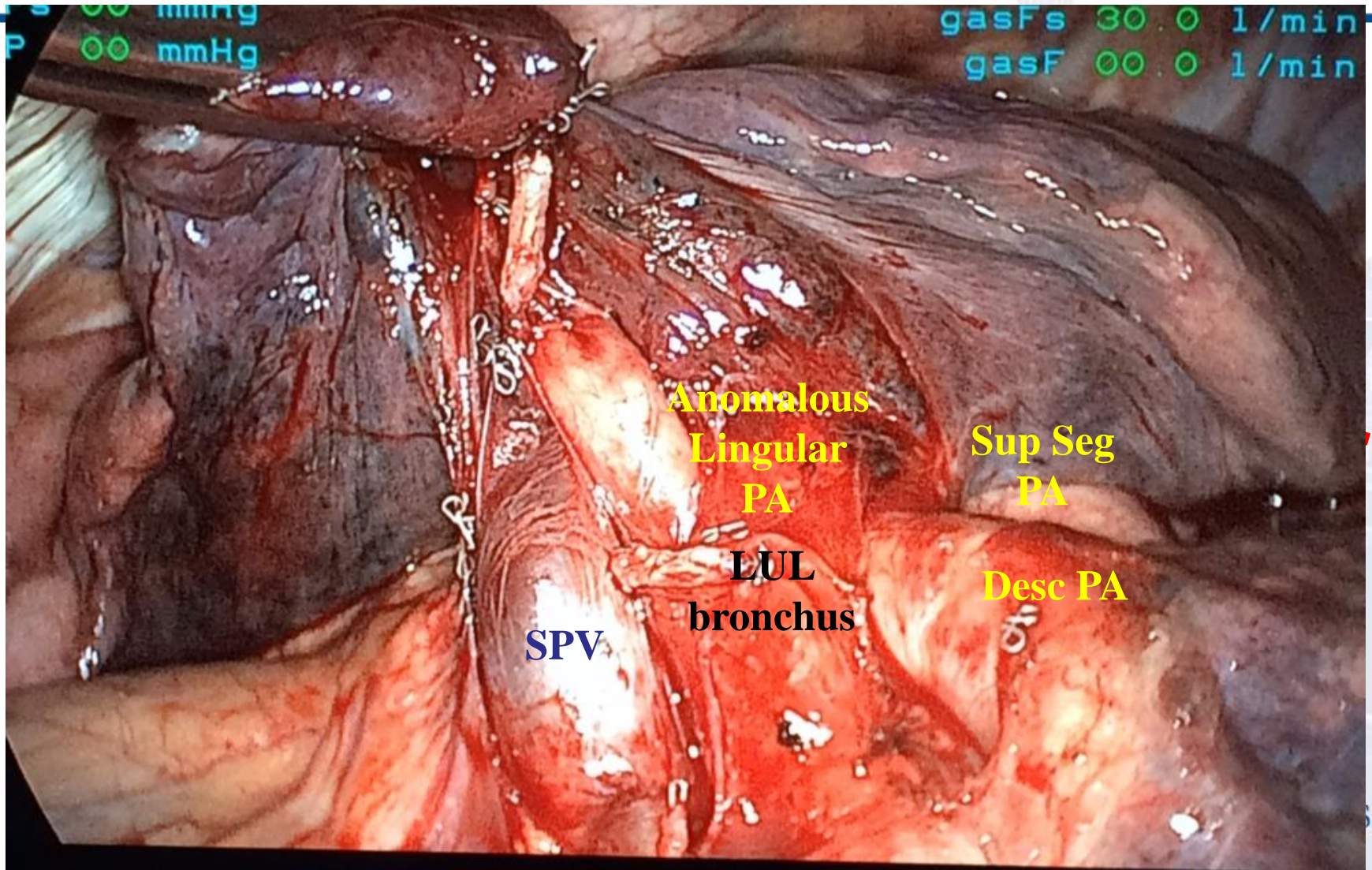
# Common PA Variants - *Left*

Lobe	Common	Variant
LUL	Random order of seg branches 2-8 may arise	10% lingular branches: none or arise proximally



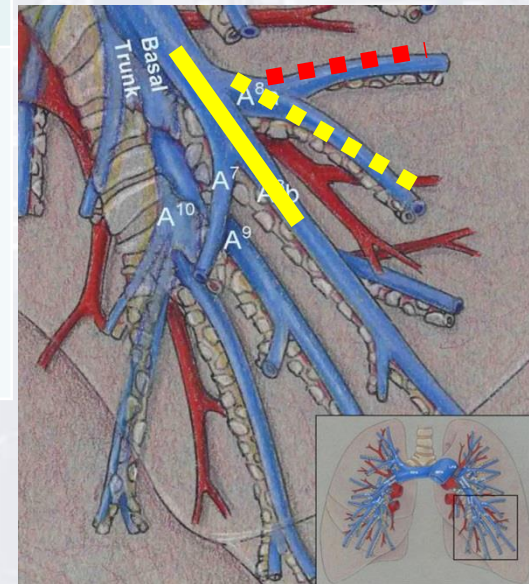


# Common PA Variants - *Left*



# Common PA Variants - *Left*

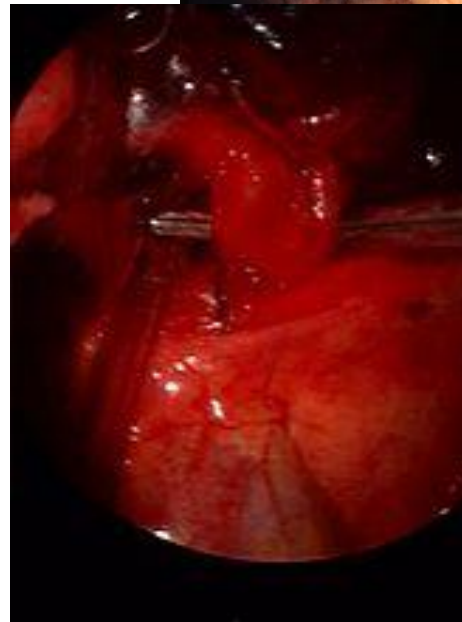
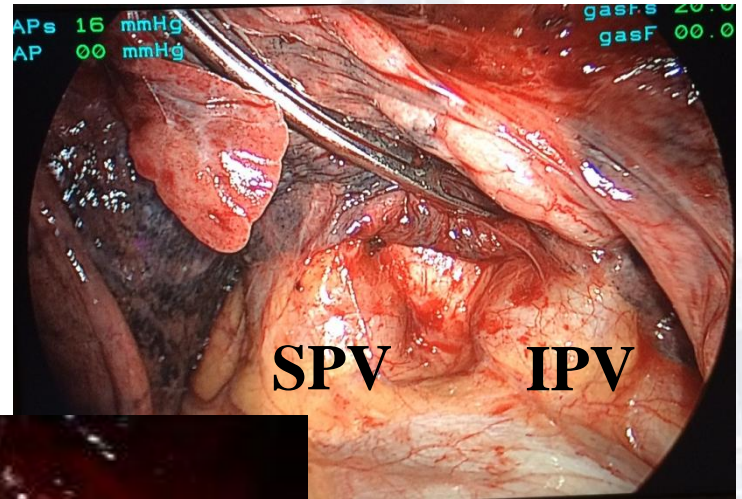
Lobe	Common	Variant
LUL	Random order of seg branches 2-7 may arise	10% lingular branches: none or arise proximally
LLL	70% sup seg branches off before lingula 60% single common basilar trunk	30% $\leq 2$ branches to sup seg





# Common PV Trunk

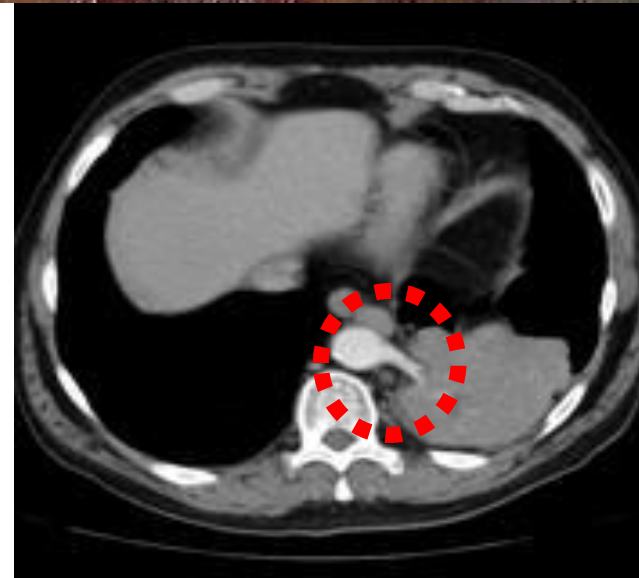
- L>R
- Reported 14% cases
- Identify both SPV and IPV
- If accidentally divided, convert to open, reanastomose to LA (not completion pneumonectomy)





# Inferior Pulmonary Ligament

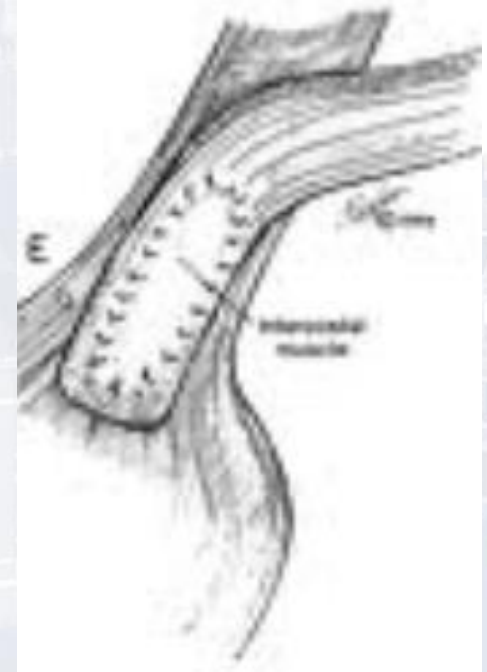
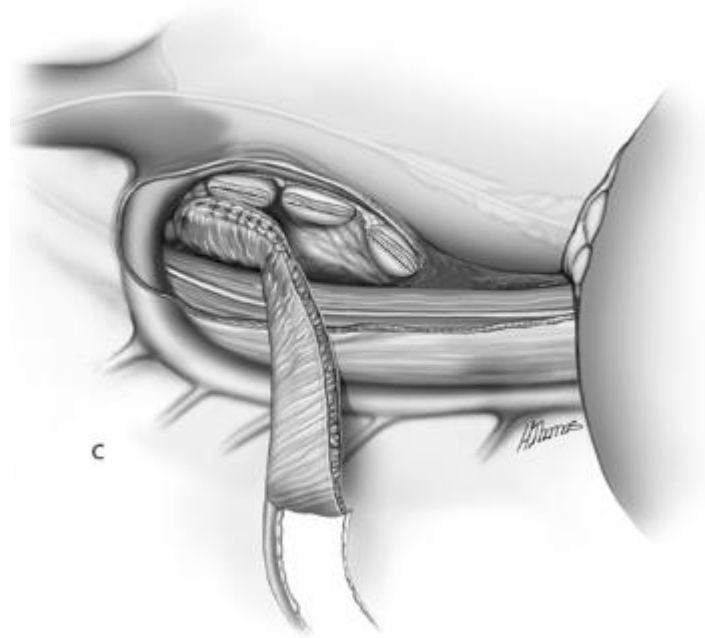
- Station 9 LN
- Vascularity increases with inflammation (esp cystic fibrosis)
- Pulmonary sequestration systemic arterial supply
- Chyle leak



# Operative Pitfalls During VATS Lung Resections

- **RUL:** ligate RML PV, injury to PA during dissection behind RUL PV, azygous v. injury, dividing R mainstem bronchus
- **RML:** avulsion med seg branch
- **RLL:** dividing RML bronchus when completing lower oblique fissure, damage phrenic nerve
- **LUL/LLL:** multiple PA branches, dividing L mainstem bronchus, single PV

# Intercostal Muscle Flap

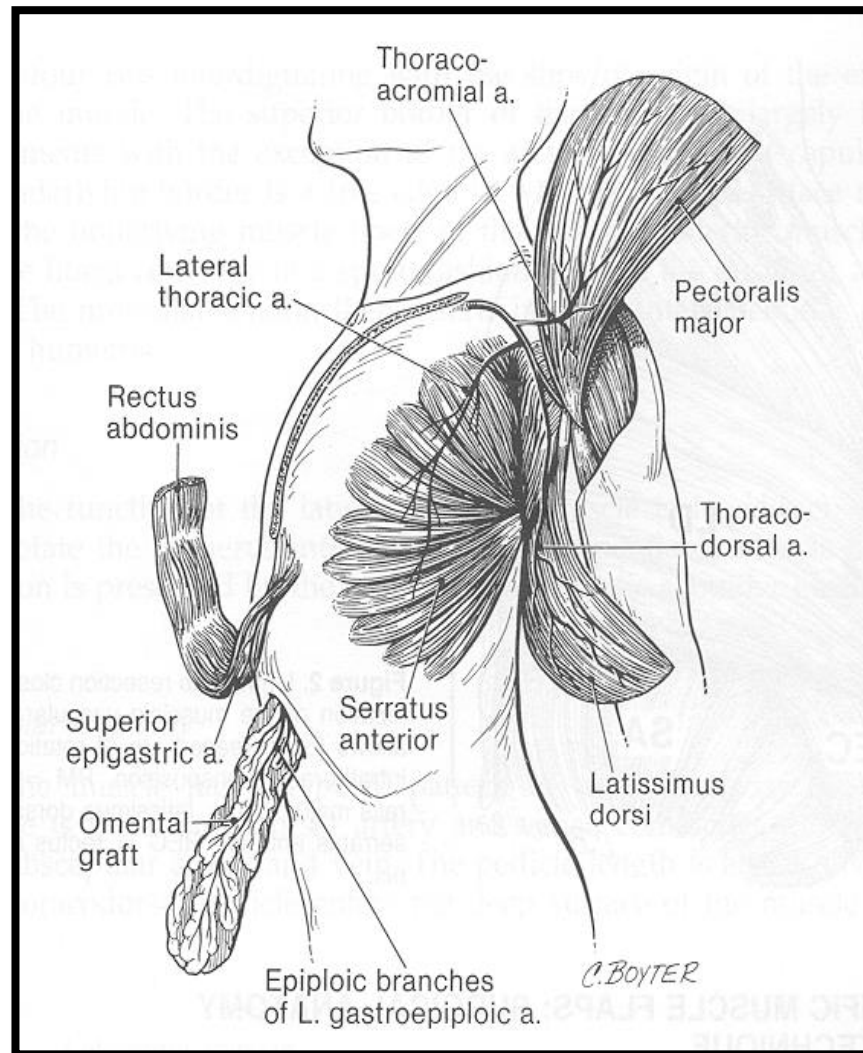


**Take down 1<sup>st</sup> after  
opening ICS**

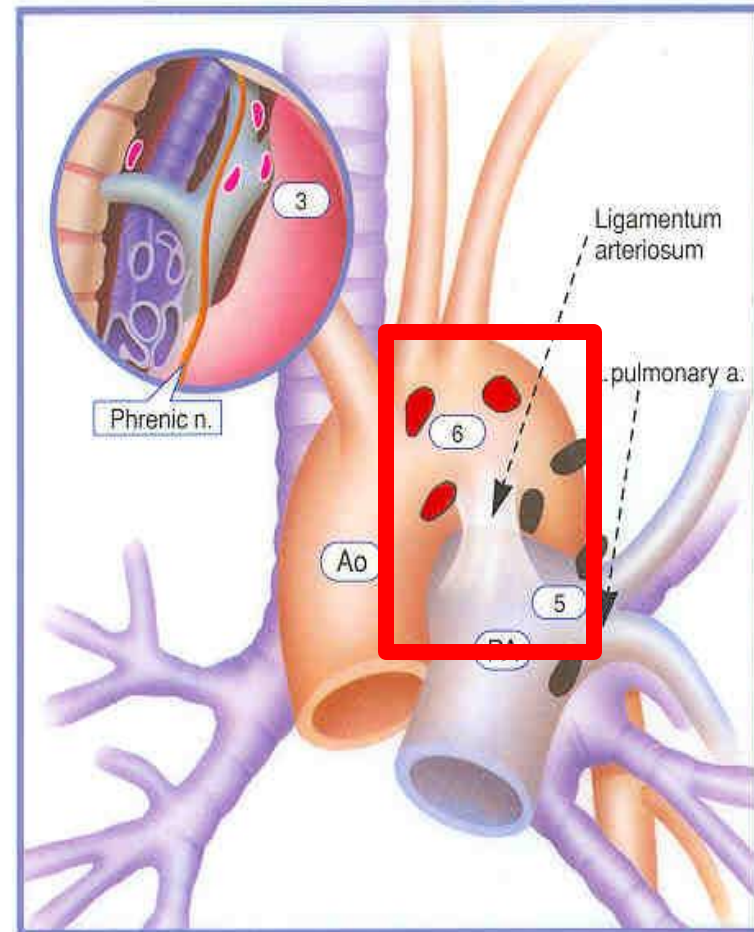
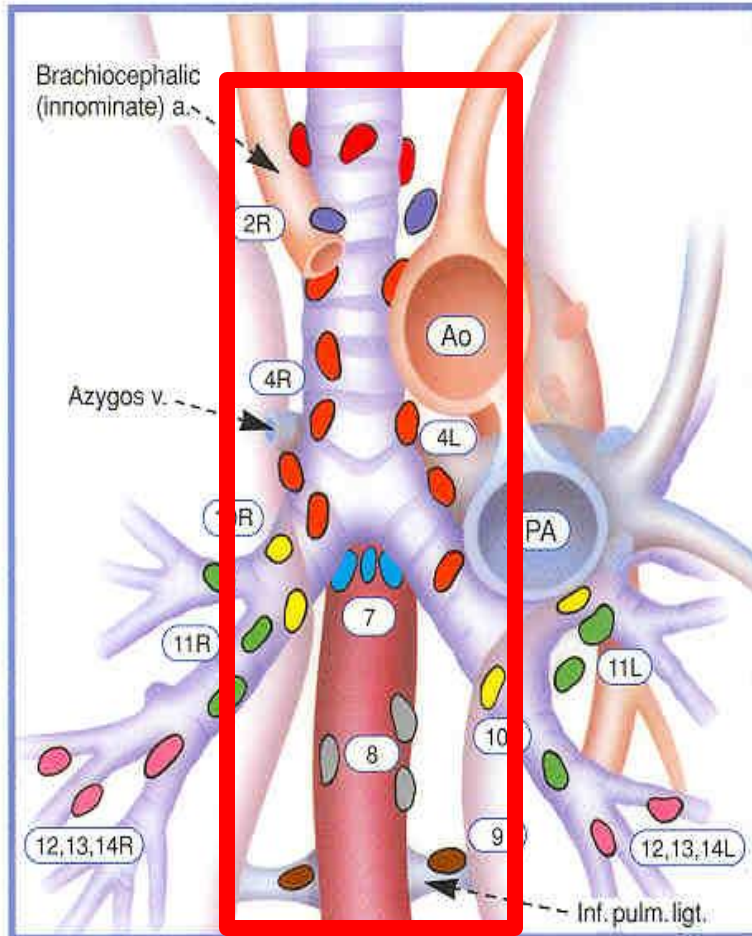
**Do not wrap  
circumferentially!**



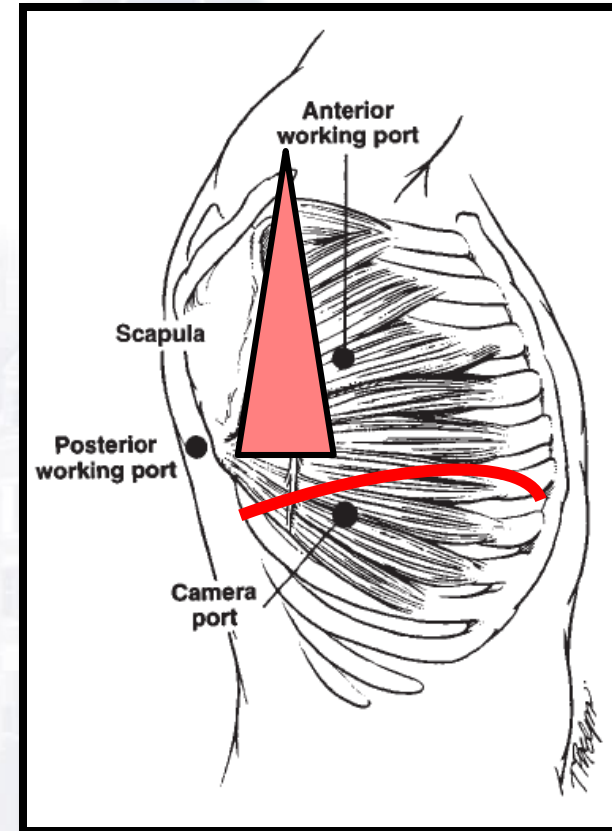
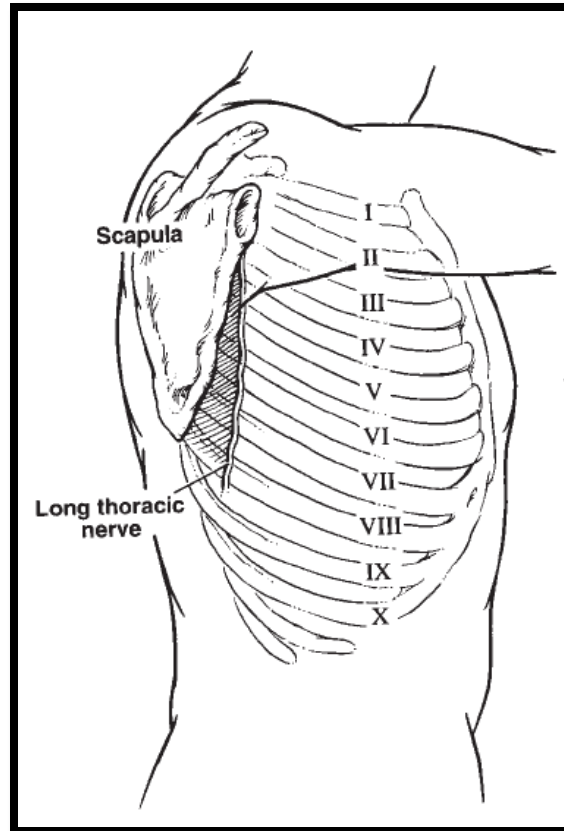
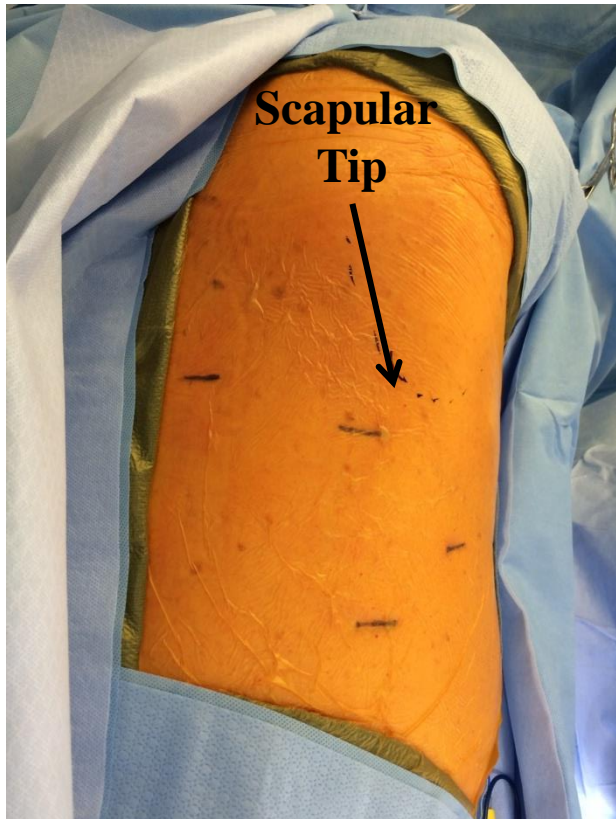
# Tissue Flaps of the Chest



# Lymph Node Dissection/Sampling



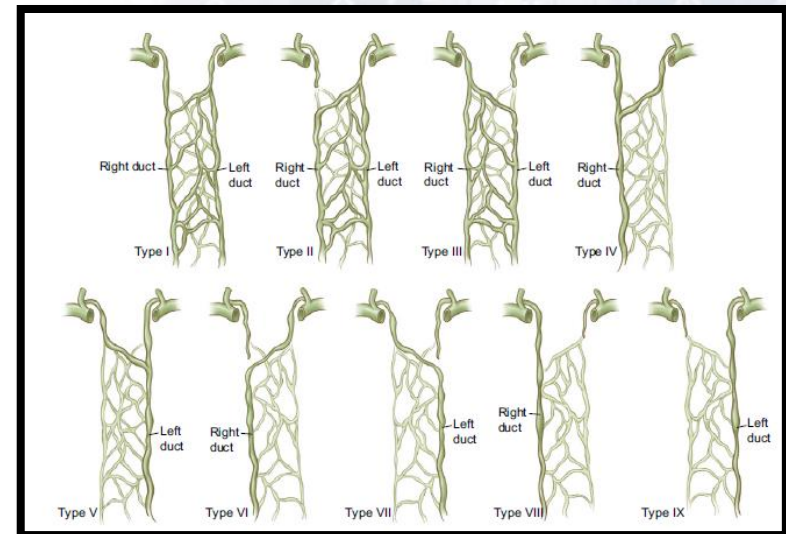
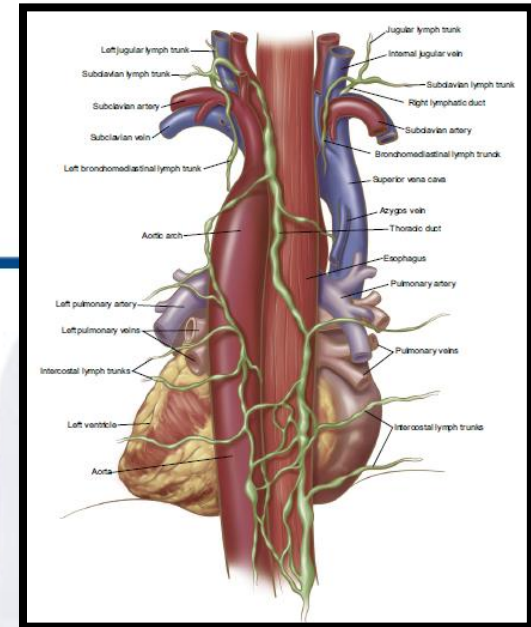
# VATS Ports





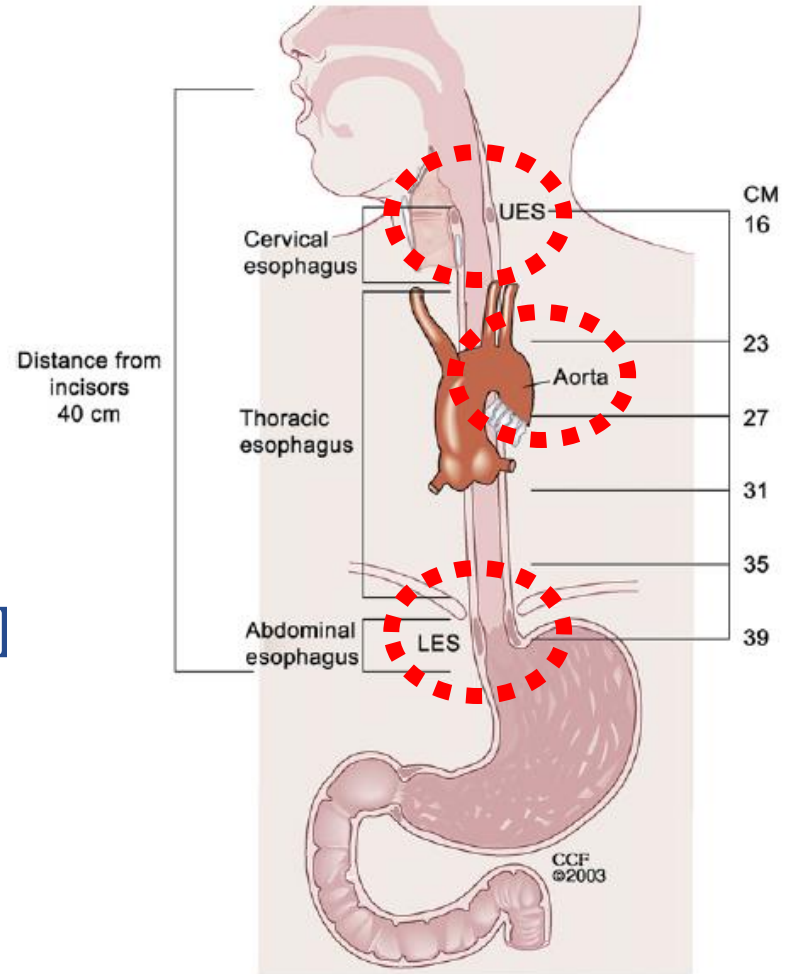
# Thoracic Duct

- Injuries: nodal dissection, esophageal mobilization
- 20% with anomalous anatomy
- Some advocate ligation during thoracic portion

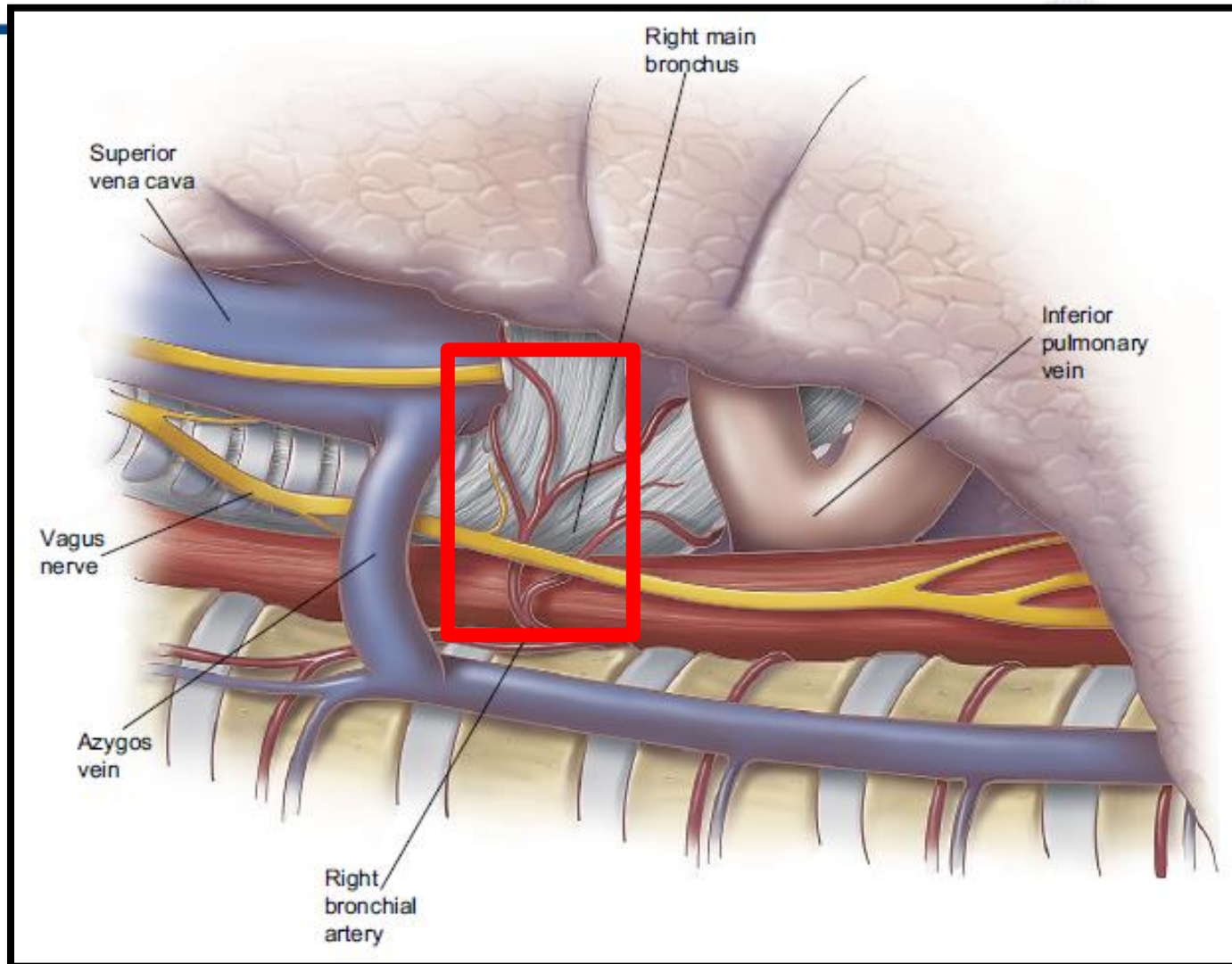


# Esophagus

- 4 points of narrowing
- Watch for aberrant or replaced L hepatic a. (25%)
- Upper path: R chest
- Lower path: L chest
- Replaced subclavian – special approaches

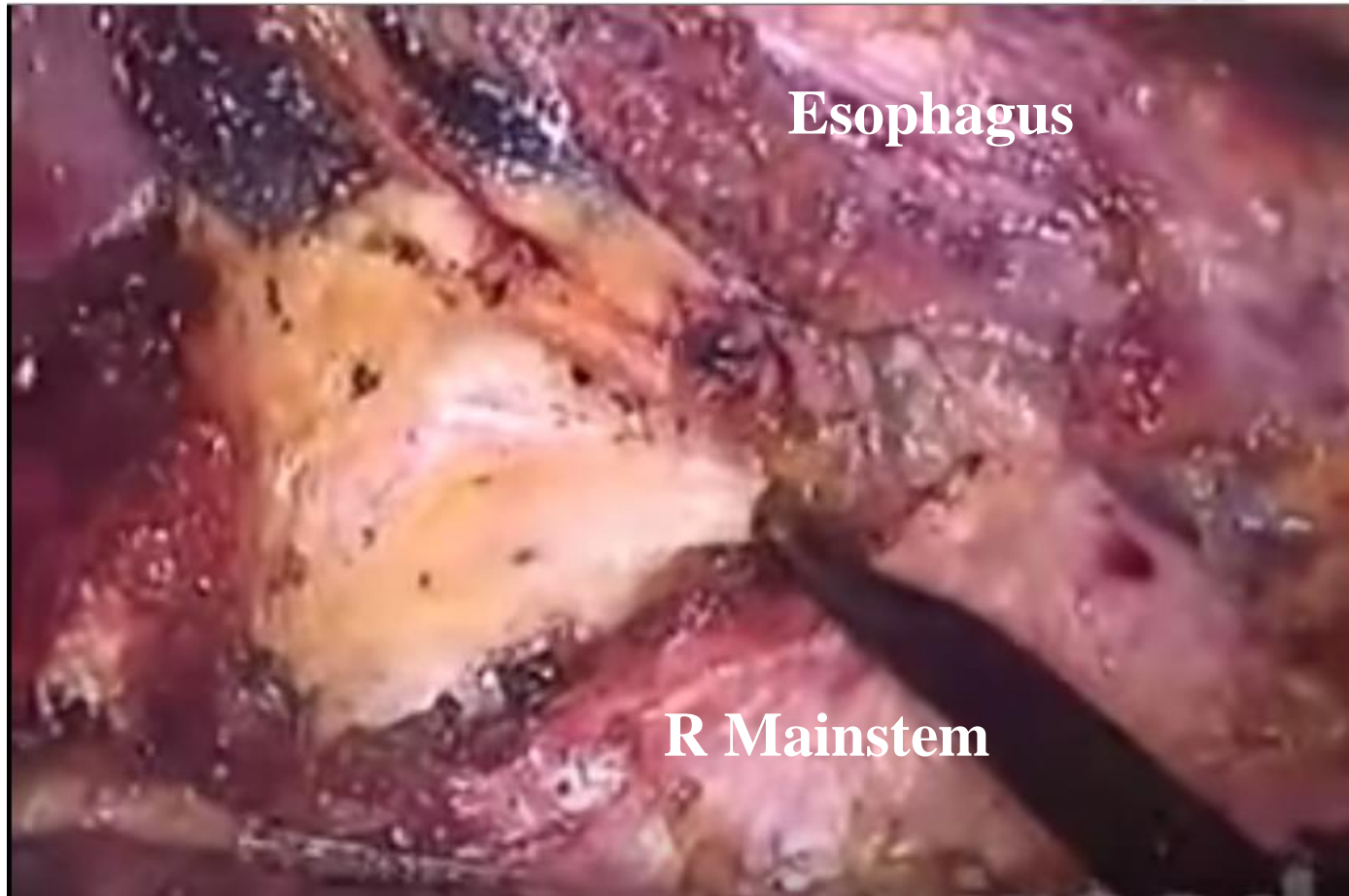


# Esophageal Dissection

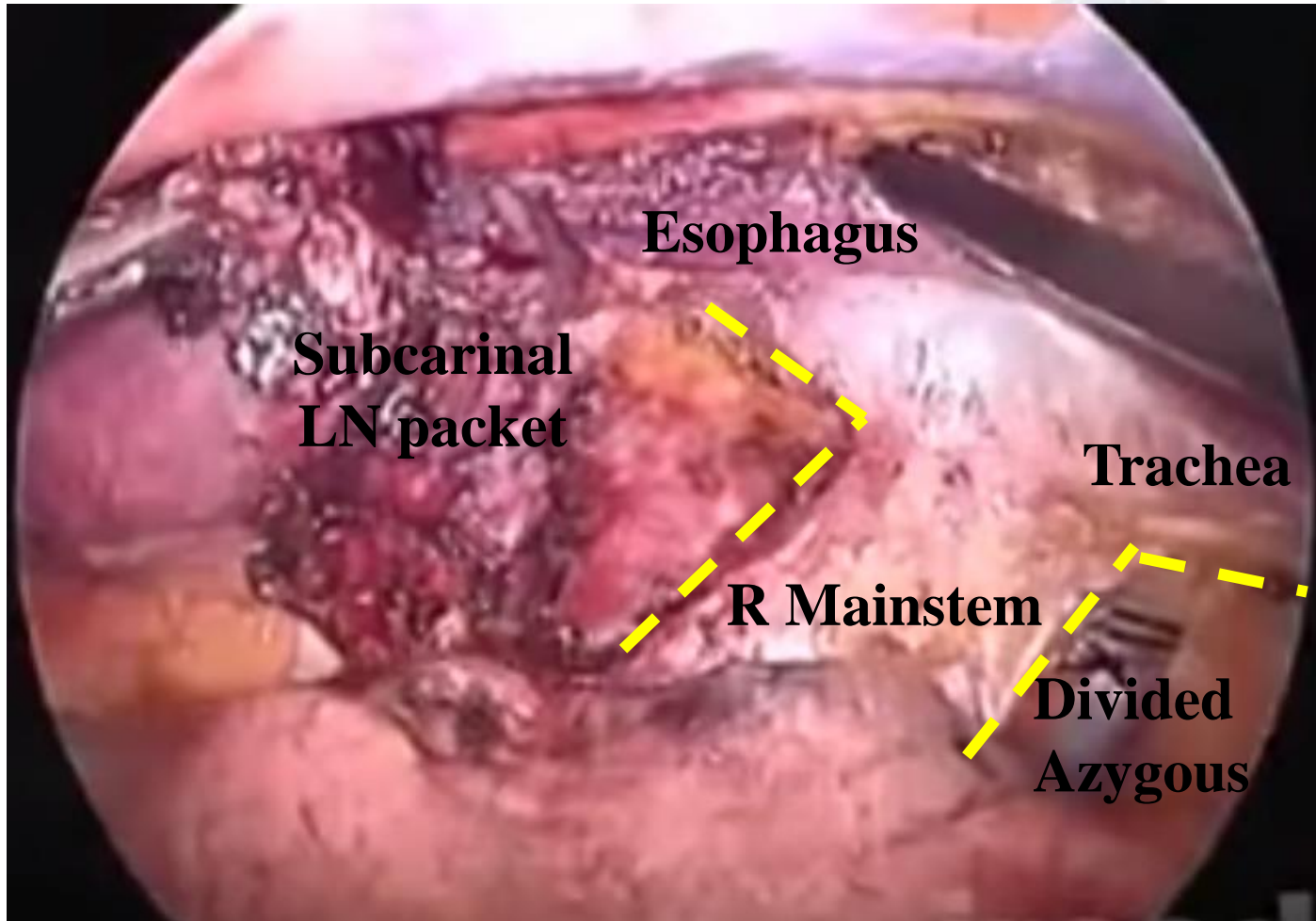




# Esophageal Dissection



# Esophageal Dissection



# Conclusion

I might have forgotten all my Gross Anatomy but I'm still a boss in the OR....



someecards  
user card

- **A number of common anomalies exist particularly for pulmonary resections**
- **Value open operations to aid in VATS/robotics approach**
- **Vary operative procedure to gain confidence in anatomy**
- **Study CT 3D reconstructions carefully**





*Thank you*  
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