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

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TSDA Boot Camp 9/14/19
Disclosures

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

HIS SHOE BROKE.

WOW, IT IS SO REFRESHING TO SEE A PRESIDENT WHO CAN ACTUALLY SEE A PROBLEM AND IDENTIFY IT.
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

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- 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)

Right Lung
- Apical RUL: A1
- Posterior RML: A2
- Anterior RUL: A3
- Lateral RML: A4
- Medial RML: A5
- Superior RUL: A6
- Medial RLL: A7
- Anterior RLL: A8
- Lateral RLL: A9
- Posterior RLL: A10

Subsegments:
- A1: A1a, A1b
- A2: A2a, A2b
- A3: A3a, A3b
- A4: A4a, A4b
- A5: A5a, A5b
- A6: A6a, A6b, A6c
- A7: A7a, A7b
- A8: A8a, A8b
- A9: A9a, A9b
- A10: A10a, A10b, A10c

Left Lung
- Apicoposterior UL: A1+2
- Anterior LUL: A3
- Superior lingula: A4
- Inferior lingula: A5
- Superior LLL: A6
- Medial, Anterior LLL: A7+8
- Lateral LLL: A9
- Posterior LLL: A10

Subsegments:
- A1+2: A1+2a, A1+2b, A1+2c
- A3: A3a, A3b, A3c
- A4: A4a, A4b
- A5: A5a, A5b
- A6: A6a, A6b, A6c
- A7: A7a, A7b A7a, A7b A7a, A7b A7a, A7b A7a, A7b A7a, A7b A7a, A7b A7a, A7b
- A8: A8a, A8b
- A9: A9a, A8b
- A10: A10a, A10b, A10c
Mediastinoscopy

Main PA

1st PA BRANCH

Tip of biopsy forceps

Mediastinoscope

Cautery tip

Insulation

Suction and electrocautery instrument

Biopsy forceps

Needle probe for incision to avoid blood vessels

Mediastinoscope inserted through incision just above suprasternal notch, visualizing central lymph nodes

Trachea

Mediastinoscope

Incision

Aorta

Cervical and hilar nodes

Pulmonary artery

TRACHEA

AZYGOS VEIN
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 with CT screening
- Use 3-D recon
- Landmarks:
  - Xiphoid
  - Table position
  - Sup seg tip
  - IPV
  - Nipples
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

<table>
<thead>
<tr>
<th>Lobe</th>
<th>Common</th>
<th>Variant</th>
</tr>
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<tbody>
<tr>
<td>RUL</td>
<td>Truncus anterior</td>
<td>Post asc branch</td>
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</tbody>
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- **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 - Right

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Common PA Variants - *Left*

- **Left Upper Lobe (LUL):** Random order of segments 2-8 may arise. 10% lingular branches may arise proximally.
- **Left Lower Lobe (LLL):** 70% sup-segmental branches off before lingula. 60% single common basilar trunk. 30% <2 branches to sup-segment.

**Common PA Variants:**
- Left Upper Lobe (LUL) PA
- Descendent PA
- Anomalous Lingular PA bronchus
- Sup Seg PA
- SpV PA
## Common PA Variants - *Left*

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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)
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\textsuperscript{st} after opening ICS

Do not wrap circumferentially!
Lymph Node Dissection/Sampling
Injuries: nodal dissection, esophageal mobilization

- 20% with anomalous anatomy
- Some advocate ligation during thoracic portion
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

- Esophagus
- R Mainstem
Esophageal Dissection

- Esophagus
- Subcarinal LN packet
- R Mainstem
- Divided Azygous
- Trachea
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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