THORACIC SURGERY DIRECTORS ASSOCIATION
BOOT CAMP
SEPTEMBER 17-20, 2015

SECTION: LUNG

Thoracic Faculty

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Location

William and Ida Friday Center for Continuing Education
University of North Carolina, Chapel Hill
Thoracic Surgery Directors Association
Boot Camp

General Thoracic Surgery
Syllabus

OPEN LOBECTOMY

Overview

The TSDA Boot Camp will be an introduction course of technical skills needed in cardiothoracic surgery. This program is designed for first year cardiothoracic surgical residents who are currently enrolled in ACGME approved programs in the United States. The Boot Camp will allow the resident to practice techniques and learn sequence of events needed to complete basic general thoracic procedures in the operating room.

To succeed in general thoracic surgery it is necessary to combine detailed anatomical knowledge with precise technical skills. In this section, Open Lobectomy, we will focus on the techniques of hilar dissection and lobectomy using a perfused porcine left lung placed in a thoracotomy model. The resident will first perform a wedge resection, then lobectomy followed by bronchial reconstruction. The didactic session will review the normal anatomy of the porcine lung with regards to the pulmonary artery and veins and bronchus and discussion of sequences of events needed to perform anatomical resections.

This course will also allow the faculty and resident to identify and correct areas of weakness in technique. Our goal is to provide the resident with an understanding of the technical aspects of an anatomical lung resection, with direct supervision and practice, and ongoing formative feedback.

Course Schedule

Introduction

Wet Lab (Left Lung)
  Wedge excision tumor
  Left upper lobectomy
  Sleeve resection
**Goals**

To learn the sequence of events to perform an anatomical and non-anatomical resection of the lung and bronchus

To learn and practice proper operative technique through a thoracotomy incision, as both surgeon and first assistant

To identify and correct areas of weakness in technique and judgment

**Skills**

To establish competency in open lung resections in the wet lab

**Program**

**Formative Assessment**
Assessment of resident’s progress with formative feedback
Evaluate surgical skills using the wet-lab
Ongoing review of surgical skills

**Structures Sessions**
Four hour session dedicated to lung resection
Open approach
Instrument use and selection
Anatomy recognition and knowledge
Hilar dissection and isolation of pulmonary vessels
Bronchial dissection and stapling
Fissural dissection and stapling
Stapler use and selection

**Procedures**
Wedge excision
Segmentectomy
Lobectomy
Mediastinal and hilar lymph node dissection

**Feedback**
The resident will receive guidance and formative feedback from the faculty during the dry and wet lab experience. Also, the resident will be able to provide feedback regarding the perceived relevance of the assignments and the validity of the tasks.
Normal Human Lung Anatomy

Right Hemithorax
FIG. 4.103. Anterior view of the bilateral hilar structures without the aorta or vena cava. Note the length and origin of the right main pulmonary artery.

FIG. 4.104. Posterior view of the right lung. The right main stem bronchus and inferior pulmonary vein are the most posterior of the central hilar structures.
RIGHT LUNG, ANTERIOR OBLIQUE VIEW

We can see the bronchus to the right upper lobe with its trifurcation and its arterial blood supply. The posterior arterial branch to the posterior segment of the right upper lobe can be seen as it comes from the pulmonary artery caudad to the right upper lobe takeoff, rather near the longitudinal fissure. It moves posteriorly and cephalad to supply the posterior segment. This artery branch has to be looked for. It is sometimes hard to dissect and can be a source of trouble to the surgeon. The superior pulmonary vein is well seen anteriorly. The spatial configuration of the bronchi and arteries are shown, whereas the inferior pulmonary vein is seen as a main channel only.
FIG. 4.8. The hilar structures are shown from the surgeon's view.
**FIG. 4.11.** The various right upper lobe pulmonary arterial arrangements and their frequency are depicted. (Modified from Milloy, Wragg, and Anson. The pulmonary arterial supply to the upper lobe of the right lung. *Surg Gynecol Obstet* 1963;116:34-41, with permission.)
FIG. 4.2. Close-up view of the highlighted anatomy to the RUL.
FIG. 4.4. Close-up view of the highlighted anatomy to the right upper lobe.
RIGHT LUNG, POSTERIOR VIEW

The fissure outlining the superior segment of the right lower lobe comes up quite high since this is a rather voluminous segment. The anatomy of the bronchus is seen. The cartilaginous horseshoe all face forward with their open hoops posteriorly connected by the membranous portion. This means that one has always to exercise more care in dissecting the thin posterior membranous portion of the tracheobronchial tree than the tougher anterior-cartilagenous portion of the tracheobronchial tree. It is relatively clearly shown how one can approach from posteriorly the right upper lobe bronchus since the arterial and venous supplies to the right upper lobe are primarily anterior to this lobe. It can also be seen that the main pulmonary artery runs lateral and anterior to the bronchus down the lung. The inferior pulmonary vein is primarily caudal to the bronchus intermedius. As already mentioned, these veins drain from the intersegmental planes and tend to be caudal to the bronchi in this location.
Left Hemithorax

- Phrenic n.
- Innominate v.
- Subclavian a.
- Ascending aorta
- Hemiazygous system
**FIG. 4.130.** An anterior view of the proximal bronchial and pulmonary vascular structures is shown. The left main pulmonary artery is 2 to 3 cm shorter than the right main pulmonary artery while the left main bronchus is 3 to 4 cm longer than the right main bronchus.

**FIG. 4.131.** A posterior perspective of the left lung is shown. Note the relationships between the structures as depicted in the previous illustrations.
Left Lung – Anterior View

- Left mainstem bronchus
- Left pulmonary a.
- Superior pulmonary v.
- Inferior pulmonary v.
- Apical posterior segment, left upper lobe
- Anterior segment, left upper lobe
- Lingula
- Left lower lobe bronchus
FIG. 4.151. The variations of LUL segmental pulmonary arterial anatomy are illustrated. The most common arrangement (c) provides three segmental branches: apical and anterior (depicted as a common apico-anterior trunk), posterior and lingular.
FIG. 4.179. An oblique view of the lung is depicted, the surgeon's perspective.
LEFT LUNG, LATERAL VIEW

This is the lateral view of the left lung. The artist has drawn in the standard anatomy which the surgeon should be familiar with and look for. As one opens the longitudinal fissure, the structure seen first is the main pulmonary artery. Here one can see the lingular artery branch, which runs anteriorly in the lowest portion of the left upper lobe. There is a more proximal arterial branch going up to the anterior segment and a branch to the posterior segment. As mentioned already, these branches are variable. The superior segmental branch can be seen running to the superior segment of the left lower lobe. The bronchus is very hard to expose in this area until the necessary branches of the pulmonary artery are divided so that the bronchus can be uncovered. The left upper lobe bronchus with its inferior division lingula and superior division containing the rest of the upper lobe segments is clearly seen. The superior segmental bronchus and then the continuation into the left lower lobe basal segmental bronchus are also seen. The inferior pulmonary vein is hidden and is not readily visible in this approach, although one can see some of it slightly anterior and caudal to the bronchus.
LEFT LUNG, POSTEROLATERAL VIEW

In this view we see the hilar anatomy from the rear. Here the pulmonary artery is seen to be the highest portion of the hilum. Caudal to that in roughly the same plane is the left mainstem bronchus. The tracheal carina is rather high near the aortic arch in this approach. The inferior pulmonary vein can be well seen here since it is in the same plane as the bronchus and caudal to it. The various branches of the upper lobe and lower lobe bronchi are well depicted. The surgeon should be very familiar with the standard anatomy in any approach to the lung but should be alert for anatomic variations, which are all too common.
SESSIONS

Total of 4 – Four hours each

4 stations (tables)

8 residents in each session (2 per table)

4 instructors in each session (1 per table)

Wet Lab Procedure (Left Lung)

Thoracotomy

Lung palpation (nodule location)
Wedge excision
Segmentectomy
Lobectomy
Hilar and mediastinal lymph node dissection
References


