VATS Lobectomy
Prevention & Management of Intra-op Challenges

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Disclosure

• Boston Scientific Advisory Board
• Patent for Esophageal Anastomotic Stent Device
• Funded clinical trials for ablation (Medtronic), cryotherapy (TruFreeze), and stapling (Dextera) technology
• Ethicon Touch System Project Member
Objectives:

• Review potentially dangerous situations and how to manage them

• Review several sample cases of VATS lobectomy challenges

The best way to avoid an unexpected event in surgery is to prevent it…
Basics

• Take your time
• The learning curve is real
• Conversion is not failure
• Always remember the importance of the team - if they are weak, you are weak
• Only 1 learner in the room at a time
• Be mindful about how you bring in new technology…
• Practice as a group and plan for events…
There are Different Intraoperative Events

- Lung deflation
- Cannot locate lesion
- Cannot see target
- Bleeding from PA
- Bleeding from PV
- Bleeding from lung parenchyma
- Airway separation
- Airway stenosis
- Space
- Leak
- Other

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While collapsing the lung…

• Exposure is key in VATS surgery
• Lung must be out of your way
• Be sure ETT in correct position, cuff adequately inflated and diaphragm is paralyzed
• CO2 insufflation will bring the lung down faster
• Change/add port placement
• Use table position & gravity to hold lung away
Technical Considerations

• Camera
  • See the vessel at all times
  • 30° camera is key
  • Back up the camera when there is bleeding to gain perspective
  • Must positively identify structures prior to dissection and division
  • Keep camera oriented as if open view
  • Experienced camera driver helps

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Technical Considerations

• Be aware of aberrant pulmonary anatomy
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R Posterior Ascending Pulmonary Artery off RLL Superior Segment PA
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Things to watch for:

- Common pulmonary vein
- RML vein
- Small RUL PA PA
- Additional L posterior LUL PA branches
- Passing behind the bronchus for LUL
- Adherent LN
- Tension on the lung during stapling
Emergency Drill

• Make sure your team knows where the emergency oxygen shut-off valve is

• ALWAYS have a tonsil sponge on a ring clamp on the back table and test your team regularly - make it a habit

• IMMEDIATELY stop distraction; call everyone’s attention; announce what you think is the emergency

• Source control

• Catch-up; wait for blood to be in the room; stop the problem; gather hemostatic tools; clean the camera

• Work on repair only when patient has stabilized
General Principles

• Develop a language that allows rapid communication, especially in an emergency

• Identify other surrounding structures to be sure they will be uninjured (i.e. upper vein when dividing lower vein) (i.e. middle vein when dividing upper vein)

• Pull the camera back to prevent soiling the screen
General Principles

• Never force an instrument or stapler
  • Unlike open surgery; where with a hand present a little bit of twisting is helpful
  • Resistance means important tissue in the way

• Visual cues substitute for tactile cues
  • Look for stretch of vascular structures
  • Direction of travel of vessels is informative
General Principles

• Use a leader (red rubber catheter works) if the angle is not perfect or if you think the stapler may not pass
  • Beware of silk suture cutting through the PA-tension can cause this to happen
**General Principles**

- Use a leader (red rubber catheter works) if the angle is not perfect or if you think the stapler may not pass.
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Event #0 VATS LUL

- 52 y.o. woman smoker with 4cm LUL nodule
- Asymptomatic
- Negative EBUS
VATS LUL
VATS LUL L Superior PV Division
Pearls

• When a stapler misfires, may place another below that area to seal the hole

• Most bleeding resolves with pressure, patience, and sometimes procoagulant
Event #1
AS VATS RLL
VATS R side
VATS RLL
VATS RLL
VATS RLL alternative approach

Pulmonary artery to right lower lobe dissected

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VATS RLL alternative approach
Event #1
Pearls

- Do not place clips in the hilum
- Do not staple over clipped areas
- Release tension and collapse the vessel when bleeding is identified
- Leave the stapler in place to hold pressure
Event #2
BRM VATS RUL
VATS RUL

- Posterior ascending artery
- Superior segmental artery
- RUL
- Upper lobe bronchus
- Right bronchus
- RML
- RLL
- PV
- PA
- TA
- Heart
- Pulmonary vein dissection
- Phrenic nerve
- Caudal
- Cranial
- Medial

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Technical Considerations

• Endoscopic Stapling
  • Prevent complications by releasing tension on the vessel when stapling
  • Encircle the main PA whenever you are concerned about an arterial dissection
  • Beware of LN erosion into vessels
  • Do not continue to dissect when there is bleeding and you cannot see- apply coagulant or pressure and go somewhere else
VATS RUL

RML

RUL

RLL

PV

PA

TA

Heart

Caudal

Cranial

Medial

Upper lobe bronchus dissected

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Event #2

RM VATS RUL
Pearls

- Do not tug on small vessels
- Most bleeding resolves with pressure, patience, and sometimes procoagulant
- Go to another area and work while waiting for the bleeding to stop if manageable
PA bleeding

- Biggest fear in VATS surgery
- Generally not a problem- most stop with pressure
- Stay calm
- Train team to release retraction immediately
- Reaction to the injury can cause more of a problem than injury itself
- Compress the area with a sponge, pledget or kitner
- Put Arrista, surgical cellulose, or procoagulant between injury and compression

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How to avoid PA bleeding from the start…

- Check pre-op for pulmonary HTN
- Enlarged PA’s
- R heart cath if not sure
- Echo if not sure
RUL Bleeding Tips

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Event #3
CTR VATS LLL
VATS LLL
VATS LLL
Leader LLL Bronchus: Key = hug the bronchus to stay away from the artery...
VATS LLL
Event #3
What are your options at this point?

- Wait and see if the bleeding stops
- Consider VATS Repair:
  - Knot pusher
  - Needle driver
  - Avoid clamping the vessel
- Conversion to open
  - Extend utility incision
  - Traditional postero-lateral approach

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If VATS Repair is not possible, Conversion Options:

- Postero-lateral Thoracotomy
- Anterior Thoracotomy

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How to control the hilum for VATS conversion...

L hand through the extended incision

Camera port
Pearls

• When potential bleeding is identified, call for blood into the room, anesthesia, and all necessary help, sometimes even enlarge the utility incision such that a hand can reach into the chest prior to checking for that bleeding…
Event #4
JK VATS LUL w patent mammary
VATS LUL

- Anterior axillary line
- Utility port (4cm)
- Camera port (1cm)
- Optional port (1cm)

- Posterior axillary line
- Upper lobe bronchus
- Aorta
- Superior pulmonary vein dissected
- Inferior pulmonary vein
- Phrenic nerve

- Cranial
- Postero-lateral
- Antero-medial

Heart

LUL

LLL

PA
VATS LUL
VATS LUL

Upper lobe bronchus dissection

Cranial

Posterior lateral

Caudal

Anteromedial

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Event #4JK VATS LUL w patent mammary
Pearls

• It is okay to staple and leave lung against a patent mammary

• If tumor is near, have CPB and cardiac surgery on back-up
Summary

• Make sure you understand anatomy
• Learn to feel normal and abnormal passage of an instrument
• Clear entry point and exit points by removing LN
• Most errors can be repaired - in this case the bronchus was closed with interrupted 4-0 vicryl suture and the patient had an uneventful recovery
Questions & Discussion

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