Dilemmas and Disasters in Pulmonary Surgery

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Bonita Springs

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Dilemma versus Disaster

- Dilemma: When you come to a fork in the road, take it!
  - Quit or persist
  - Stay VATS or open up
  - Resect more, or accept bad margins

Dilemma versus Disaster

- Disaster: you are not calling the shots
- Examples: major bleeding, injury to the airway, cannot ventilate the patient
- The issue in a disaster is not whether to respond, but how and with who's help!

Underlying Causes

- Anatomic variability
- Technical errors
- Hurried or inattentive surgery
- Hubris
- Device malfunction
- Surgical momentum
- Rapture of the deep

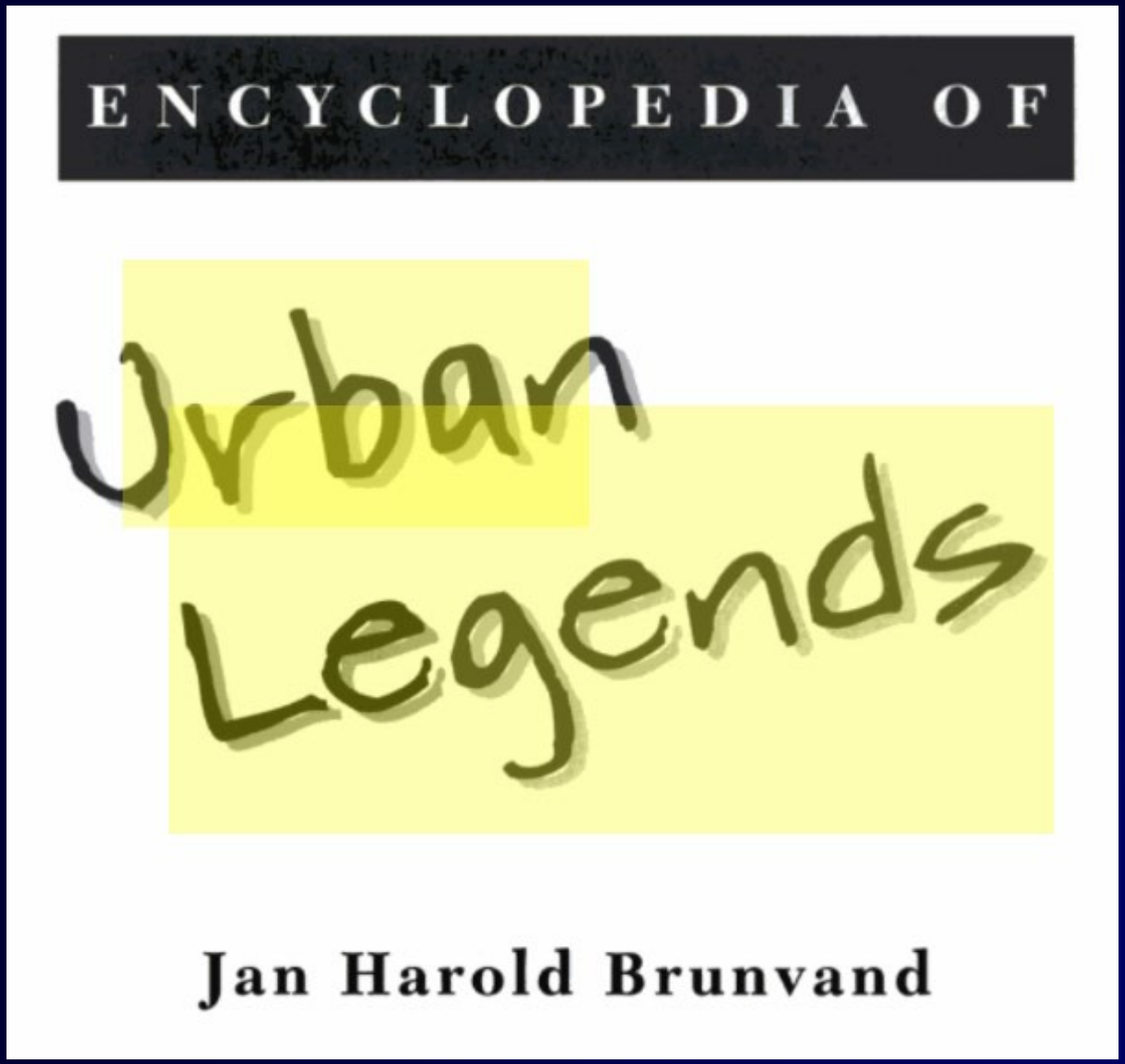
Surgical Momentum

- Also can be viewed as “surgical inertia”
- Inertia is generally described as an object’s resistance to motion, with momentum being the tendency of an object to continue moving
- The surgical analogy describes the difficulty of abandoning the pre-op plan and adapting to unforeseen and unfavorable findings or circumstances

Rapture of the Deep

- “Rapture of the deep”: a reversible alteration in consciousness that occurs while diving at depth. It is caused by the anesthetic effect of certain gases at high pressure. The Greek word (narkōsis), "the act of making numb", is derived from (narkē), "numbness, torpor“. Narcosis produces a state similar to drunkenness, or nitrous oxide inhalation.
- Alternatively: losing sight of the big picture while doing a minimally invasive operation via VATS or RATS. More noticeable when the surgeon has recently read a case series with very low conversion rates.

Disasters- Our Shared Culture



The Basics- “Phrenic Prang”

- LUL non-small cell lung cancer- adherent to mediastinal pleura and phrenic. Do you:
  - Peel it off, then check the nerve with nerve stimulator before closing. Plicate diaphragm if not working, or
  - Resect it dramatically, with mediastinal pleura, and plicate the diaphragm for sure

The Case of the Missing Lesion

- Small stage I lesion is the focus of the operation. Possibly GGO, but not required
- Minimally invasive approach
- Lesion not visible and not palpable
- Dilemma- now what?:
  - Open, use palpation or ultrasound to find it
  - Stay VATS and do a lobectomy
  - Stop and do SBRT or observation

Missing Lesion- considerations

- Was there a tissue diagnosis- FNA?
- When was the last CT scan?
- How much excess lung capacity do you have to “spend” on this resection?
- Getting to this point is probably an error in judgement, don’t compound it with another error. (surgical momentum)

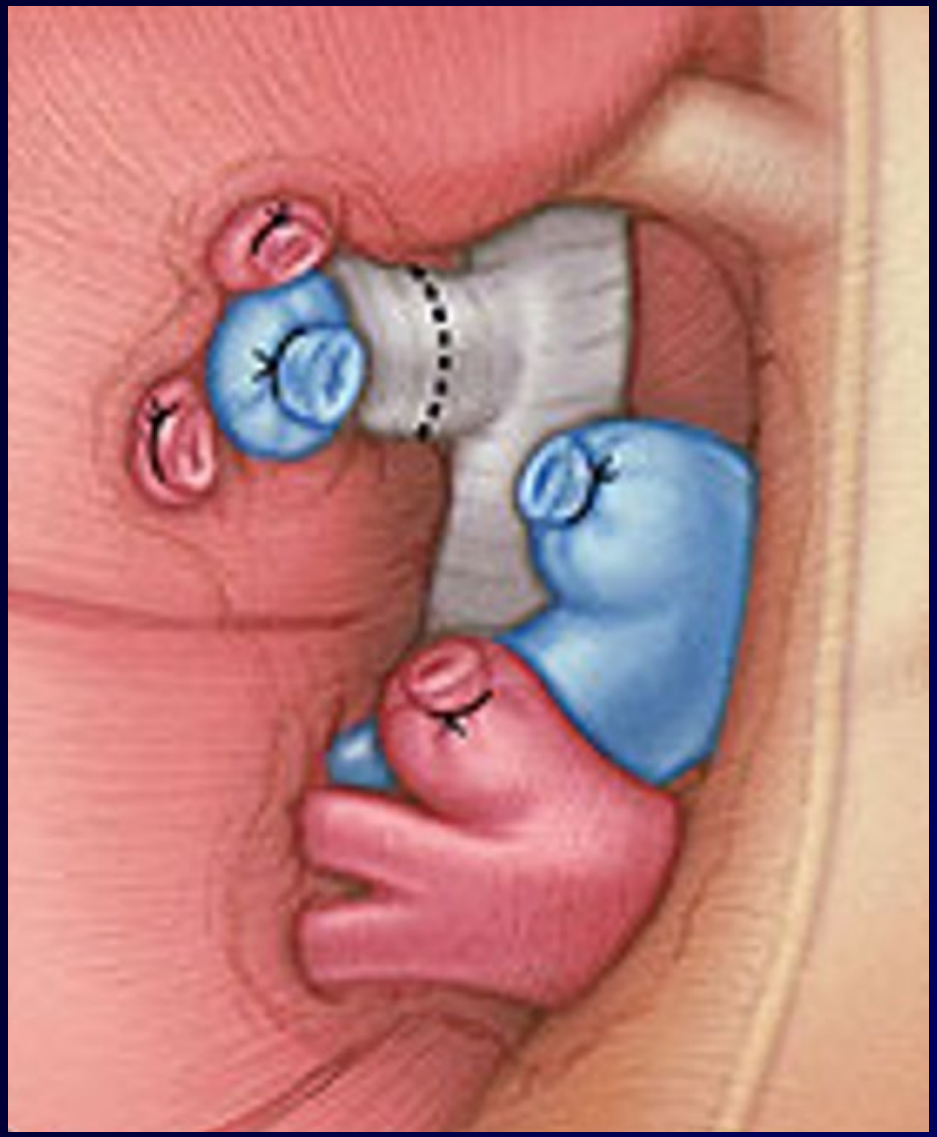
Missing Lesion Consequences

- Conversion to open- usually via a crappy and inelegant incision
- Lobectomy where sublobar resection would have been better
- Increased risk of benign resection
- Special “remorse” points for benign lobectomy or lobectomy with no lesion in the specimen

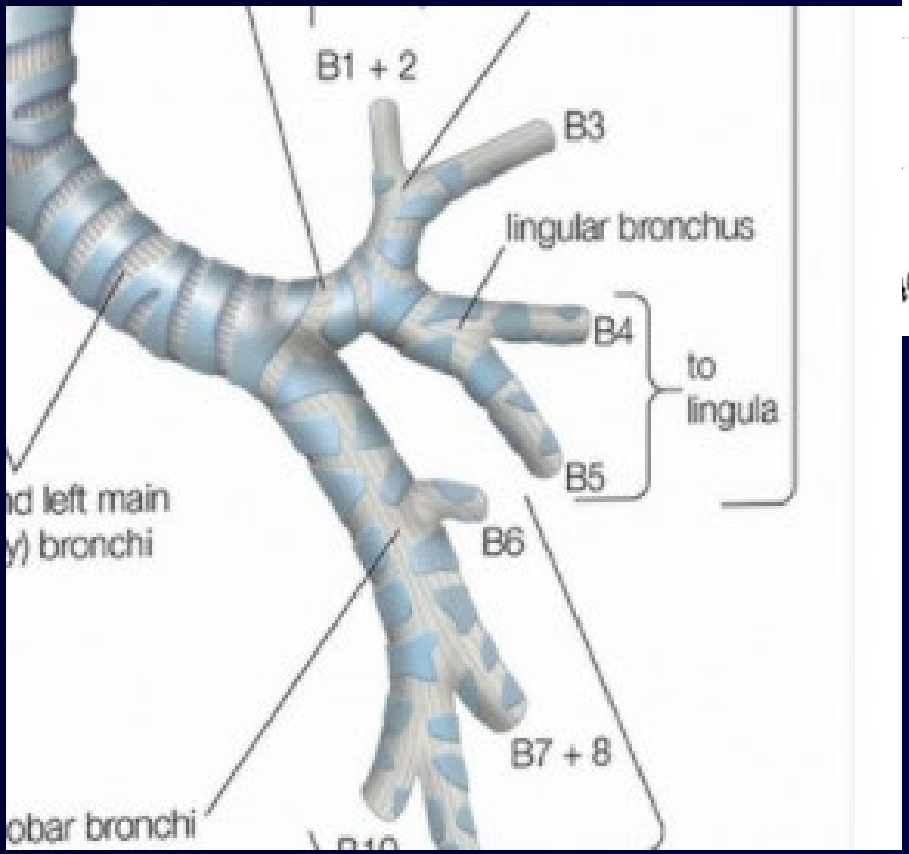
Missing Lesion- prevention/mitigation

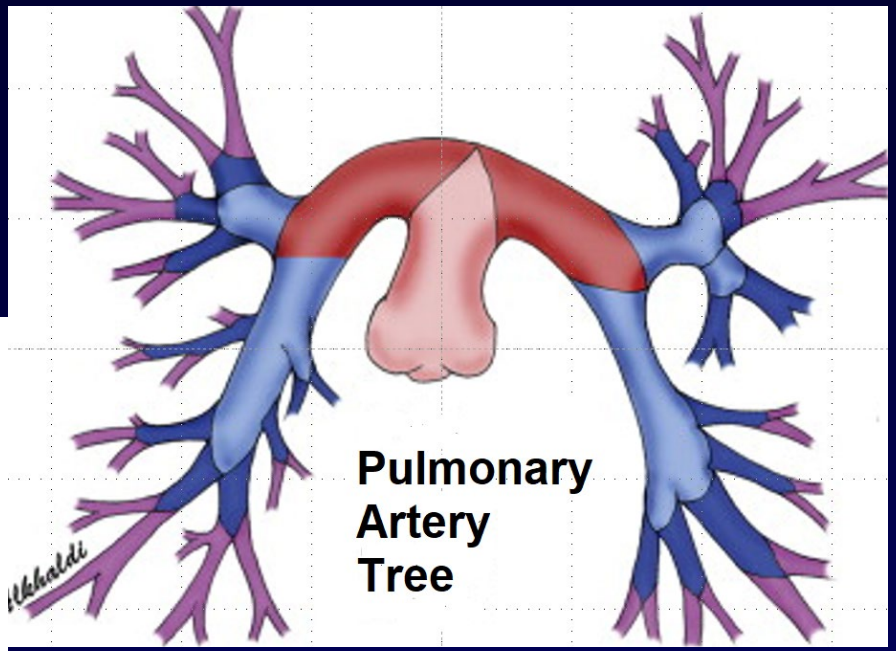
- Make sure there is a recent (< 1 mo) CT
- Consider marking when the lesion is subtle: radiology, Nav bronch options, etc
- Call for help in case you have “blind spot”
- Have the “MIS lobectomy versus open sublobar resection” talk preop
- While you are there, take a bunch of lymph nodes to add value and salvage at least a partial victory.

We used to tie knots



Stapler Woes





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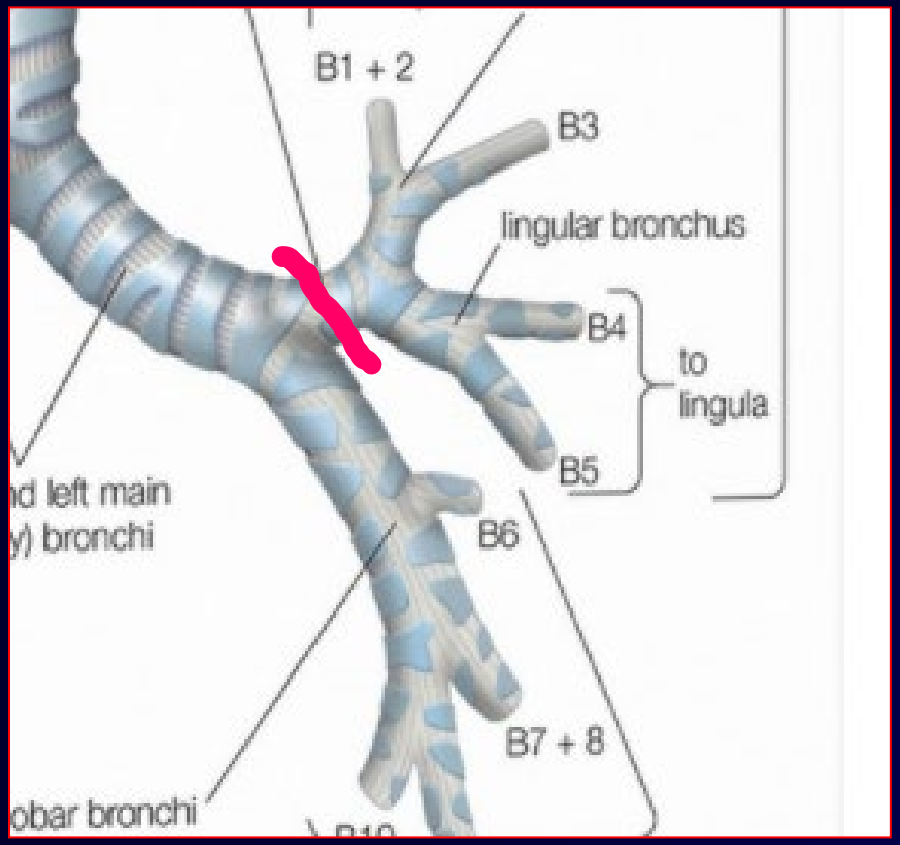
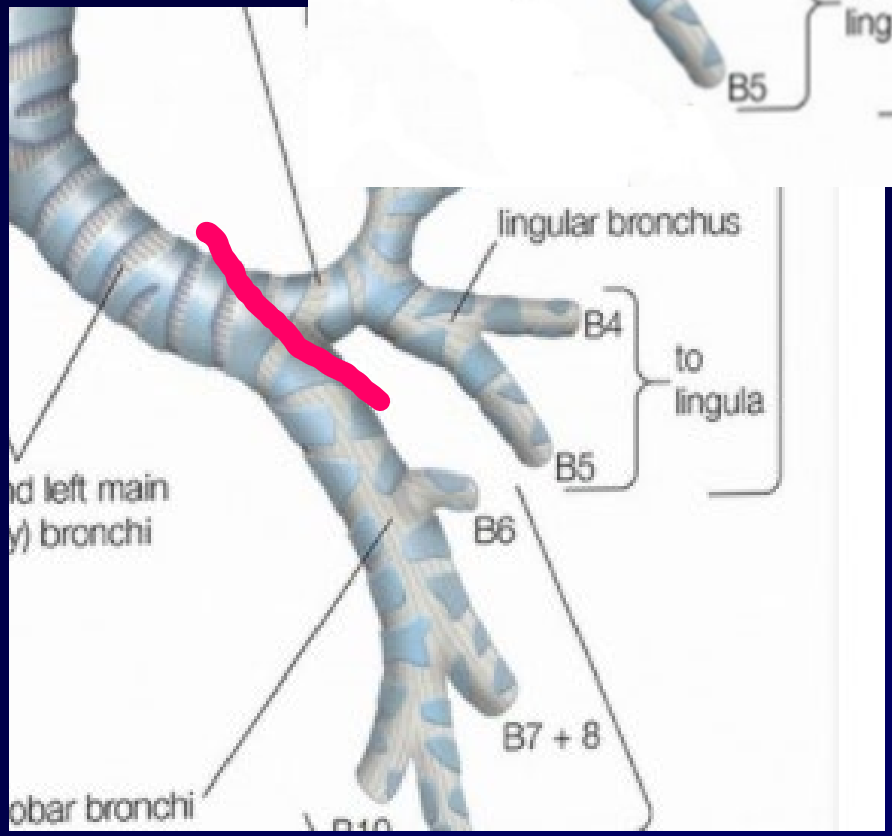


Good staple line

Bad staple line



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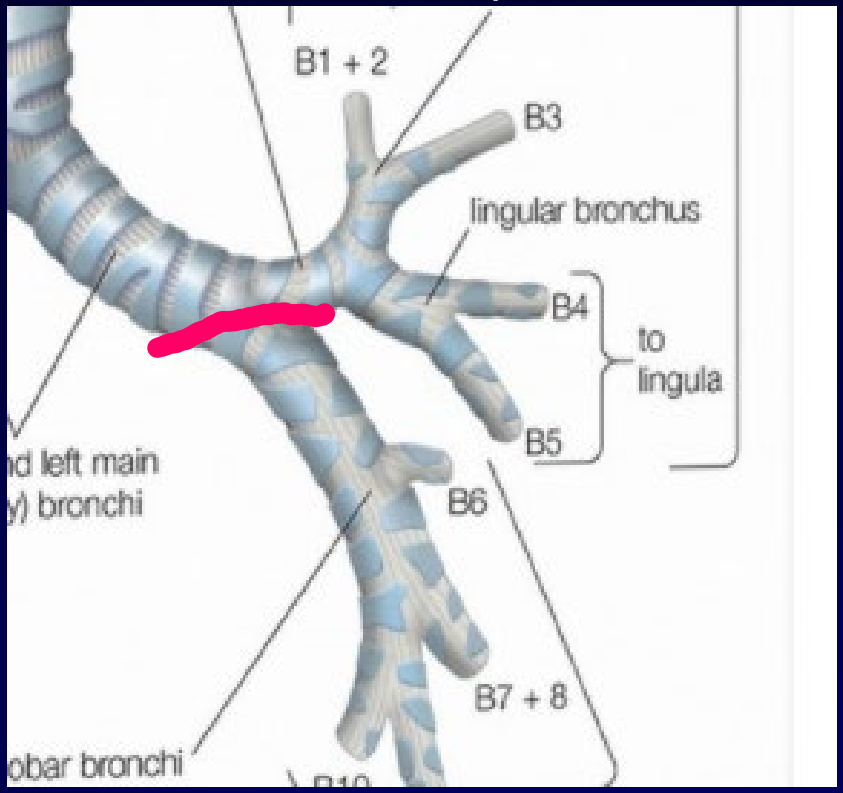

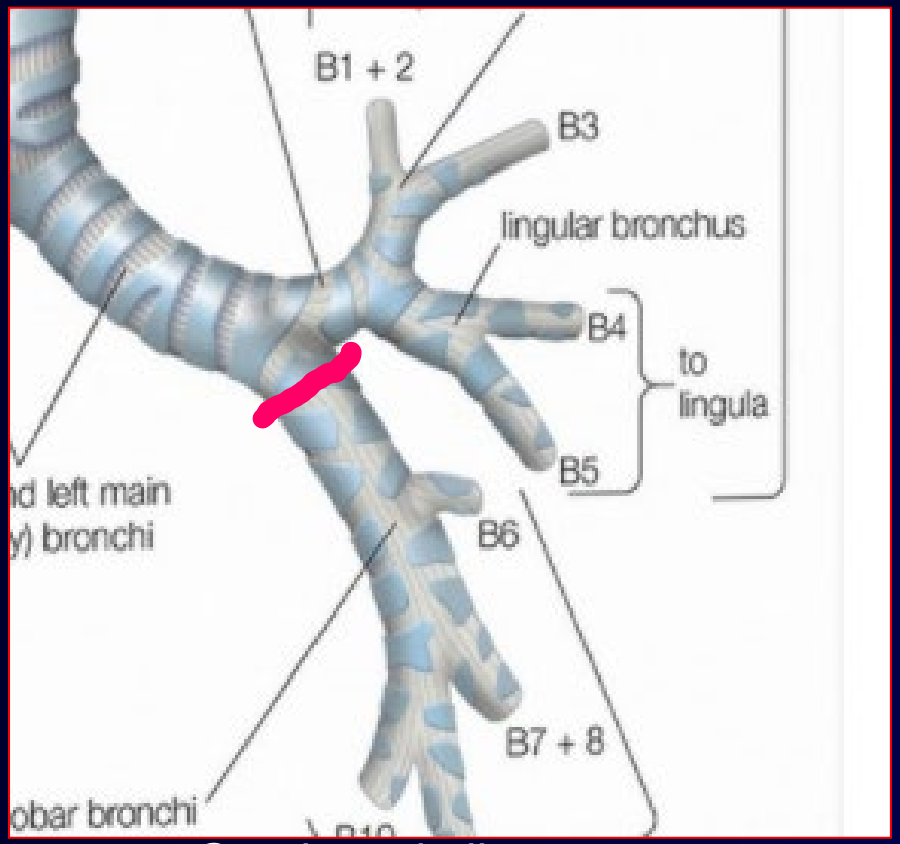

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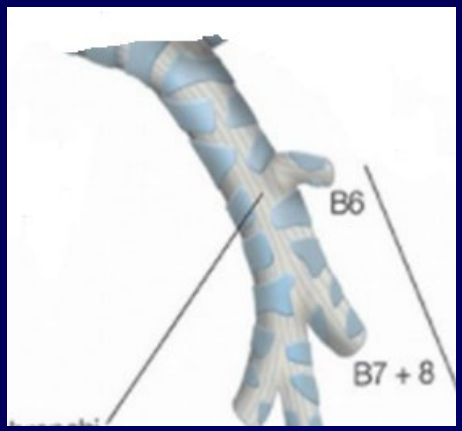

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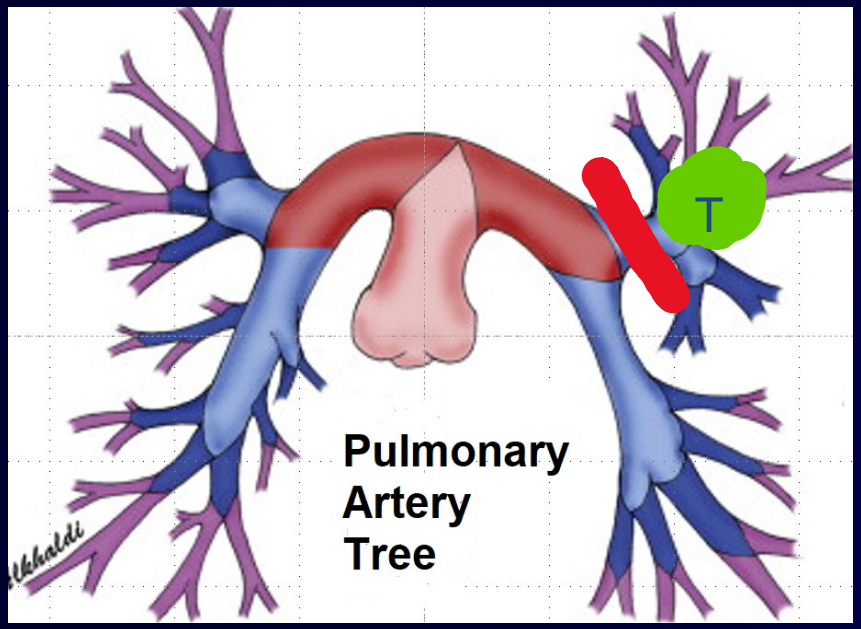
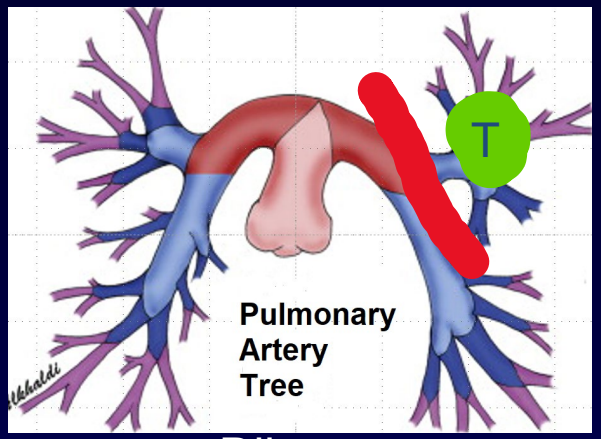
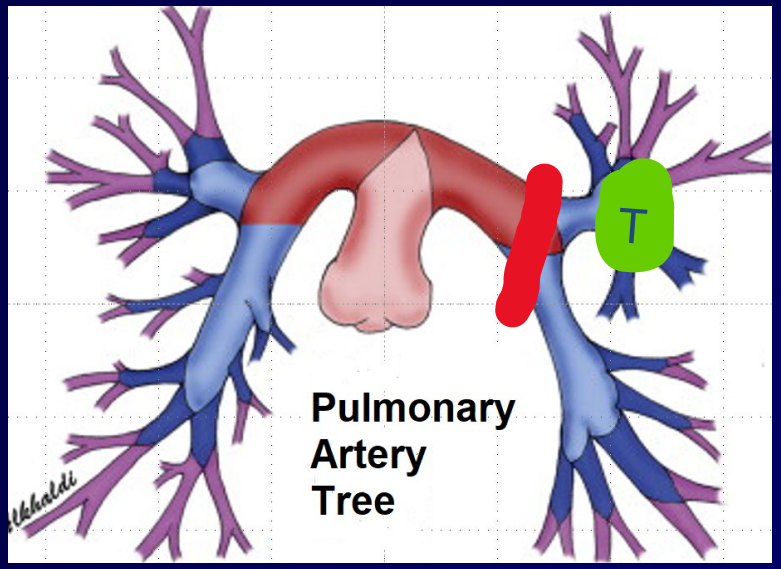


The desired outcome: staple line is tangent to the arc of the originating vessel and takes the tributary flush



Dilemma

Disaster



Stapler Woes- Innocent Bystander, Friendly Fire

- Staple vessel loop into an artery stump
- Staple an unbilical tape into artery stump
- Staple surgical glove…
- Staple a PA line into a main PA stump

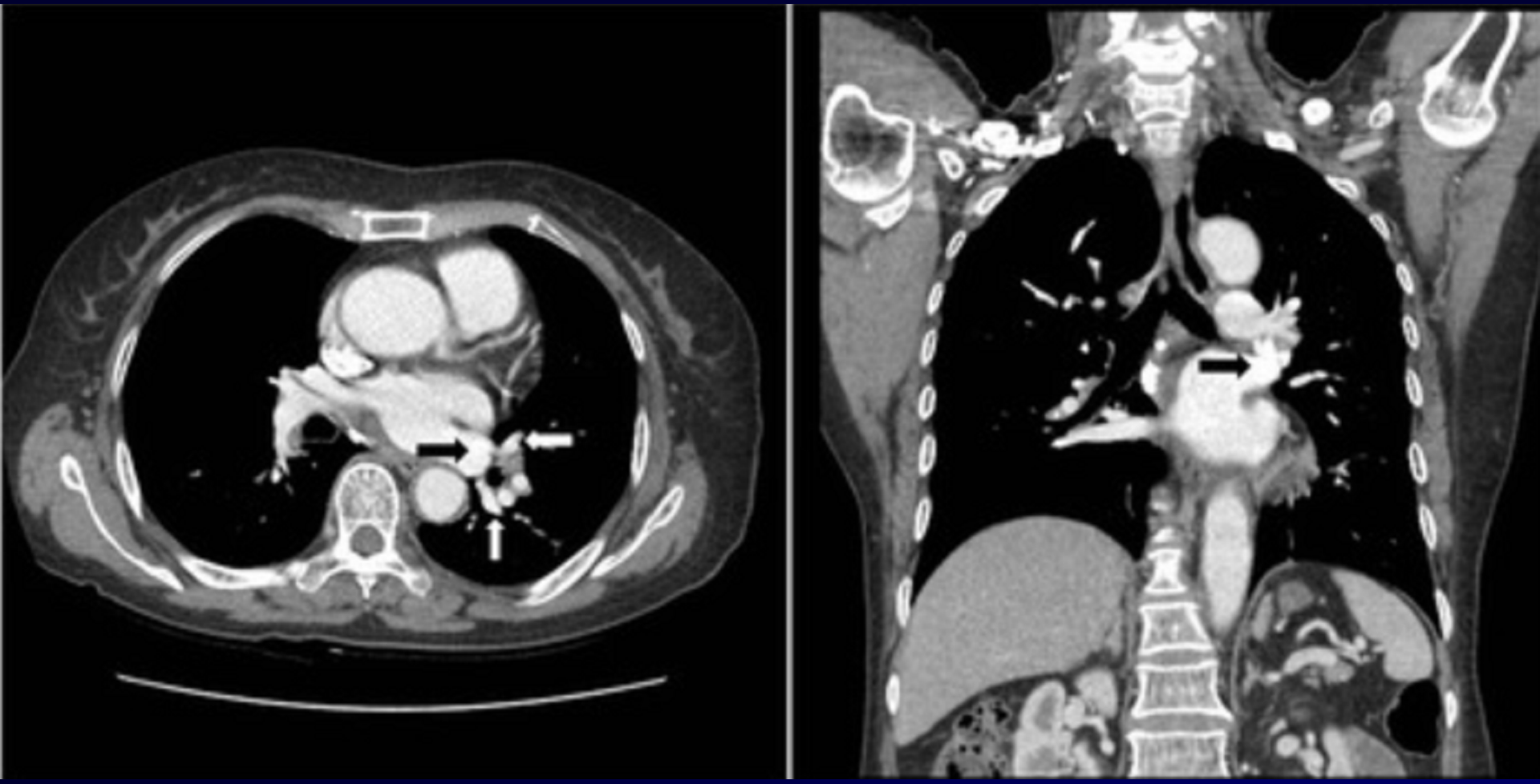
The transected Uni-vein

- Common, severe and preventable
- Typical scenario- left lower lobe resection for early stage lung cancer.
  - vein divided
  - artery divided
  - bronchus divided.
- Realization that there is no additional upper lobe vein!

The Uni-vein

- Preferred approach- personal choice
- Call for 2nd attending help
- Full thoracotomy- don't make a bad situation worse by a lousy exposure
- Intrapericardial mobilization of vein stumps
- Heparin, Central control on PA
- Remove staple lines and re-anastomose the upper lobe vein
- Lymph node dissection!

The Uni-vein



Review Article on Robotic Surgery

Catastrophes and complicated intraoperative events during robotic lung resection

Brian E. Louie

In one VATS series the middle lobe vein was most commonly the structure transected for no apparent reason other than failure of recognition; however, when an upper or lower vein was transected the common finding was either a centrally placed tumor and/or the use of induction chemoradiotherapy (3). Most authors noted the importance of clearly identifying and delineating the lower lobe vein as a separate entity from the upper vein as one method for avoiding an erroneous transection. Once the injury occurred, a thoracotomy was performed and the lower or upper veins were reimplanted if appropriate. If the middle lobe vein was transected, conversion was not performed but bilobectomy was completed

https://www.asvide.com/articles/1449

doi: 10.21037/jovs.2017.02.05
Louie BE. Catastrophes and complicated intraoperative events during robotic lung resection. J Vis Surg 2017;3:52.

Mission Creep

- Physiological fragile patient who is suitable for right lower lobectomy, but barely. Big tumor, adjacent N1 disease. Plan is surgery and adjuvant chemo.
- Intra-operatively: surprise stuck node at the sump. No “shelling it out”, it is plastered to RUL and RBI.
- RLL vein divided, now what?

Mission Creep options

- Pneumonectomy despite ppo FEV1 and ppoDLCO less than 35% predicted.
- RLL resection and node dissection, refer for adjuvant therapy- chemo + radiation
- Sleeve resection (vascular sleeve) with hopes of preserving RUL and achieving an R-0 resection

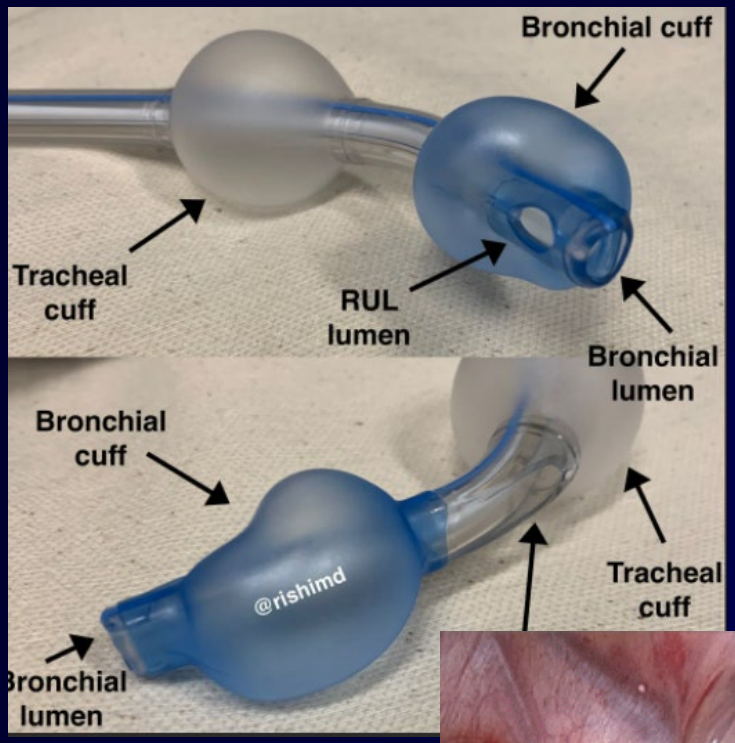
Mission Creep #2 Example

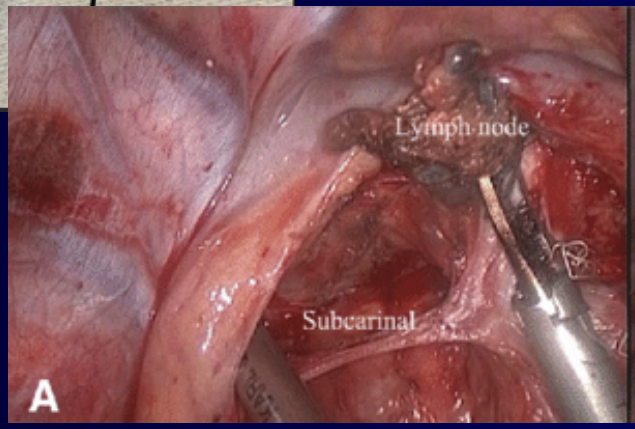
- 1.5 cm peripheral LUL adeno with biopsy proof and negative PET scan.
- At the onset of VATS/RATS case- node dissection. Firm and abnormal level 5 node. Frozen positive for NSCLC.
- Dilemma:
  - Do a lobectomy and complete the LND and then offer adjuvant chemo. (lobe in N2 IIIa)
  - Stop, give chemo, re-evaluation
  - Wedge the peripheral tumor and stop

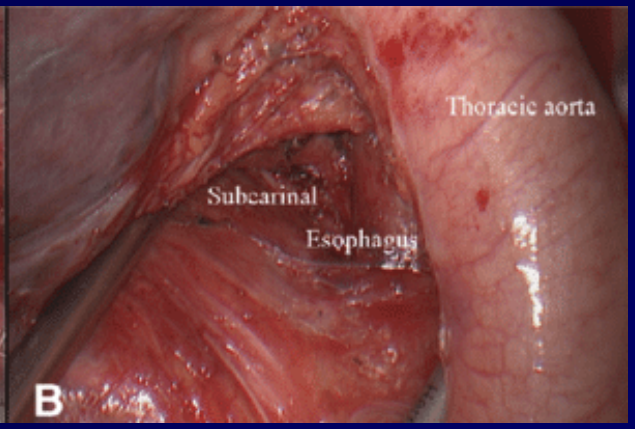
Mission Creep #2 Example

- Up front lobectomy is not usually the chosen therapy for stage IIIa N2 lung cancer
- The fact that the level 5 node was positive and the PET was not- undermines the value of PET in this patient. Could be more nodal disease…
- High risk for other nodal disease and thus high risk for non-therapeutic intervention

Lymph node versus balloon?







Face Saving Moves

- “I am going to run to the bathroom (*and hurl*) while we set up for a conversion to the thoracotomy”
- “I am going to talk to the family (and my senior partner/mentor/ally) while we set up blood and get blood units to the room”.
- Both of these get you out of the room and give a chance to think/talk/strategize

Why phone a friend?

- You are stressing out and feeling mix of anger, regret, guilt, self-pity and fear.
- Your partner feels none of those things and might be a more “rational actor”.
- Your partner might have better skills and judgement than you or the person helping you now.
- Everyone will hear about this dilemma or disaster eventually, you might as well give them a first hand look

Wrap-up and Conclusions

- This is part of our heritage, and your worst mistakes are part of your legacy and your value as a teacher
- Ask for help and advice in the moment
- Share your struggle later by adding a new “cautionary tale” to your repertoire
- Leave two knots on the end that stays in