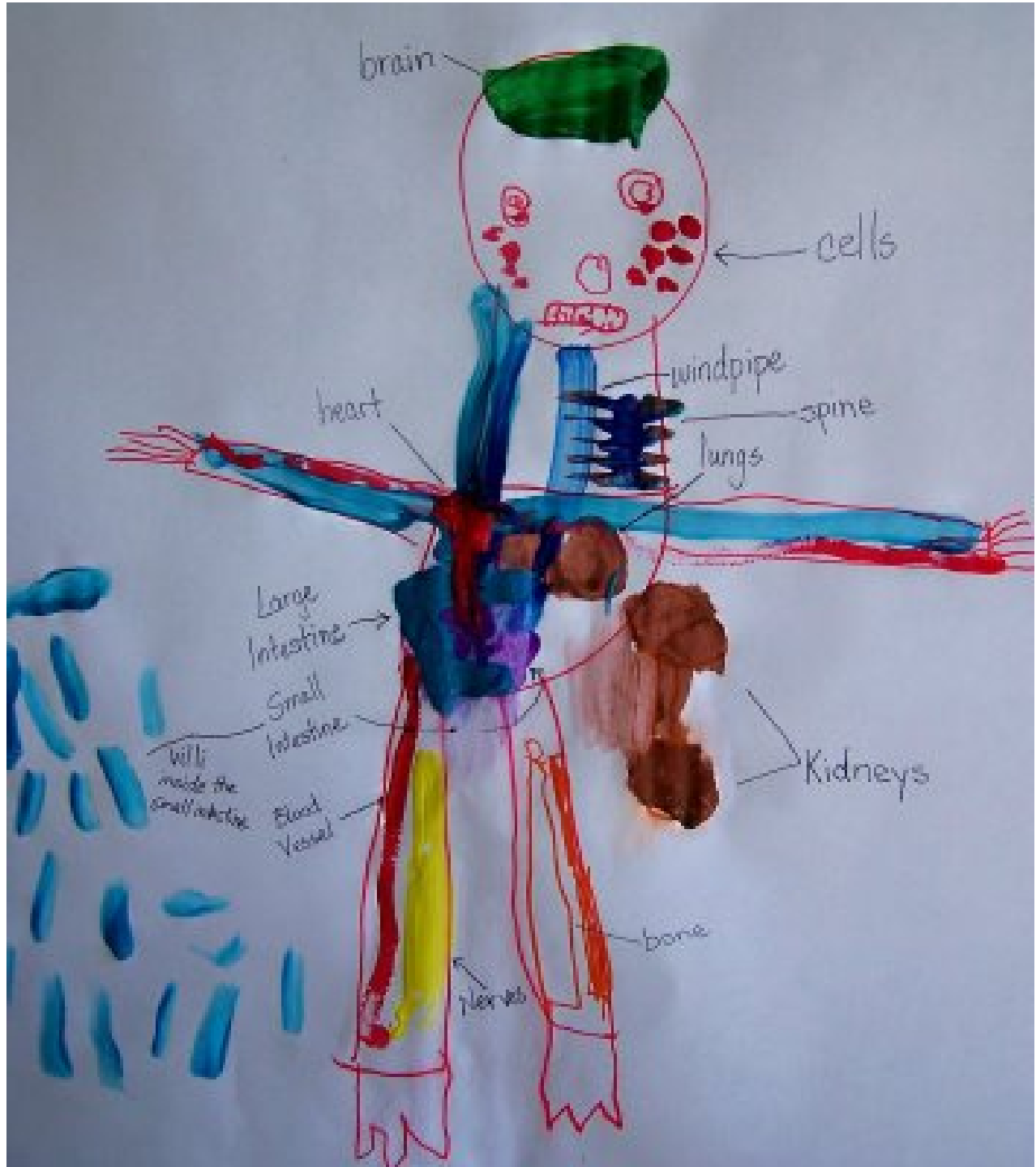
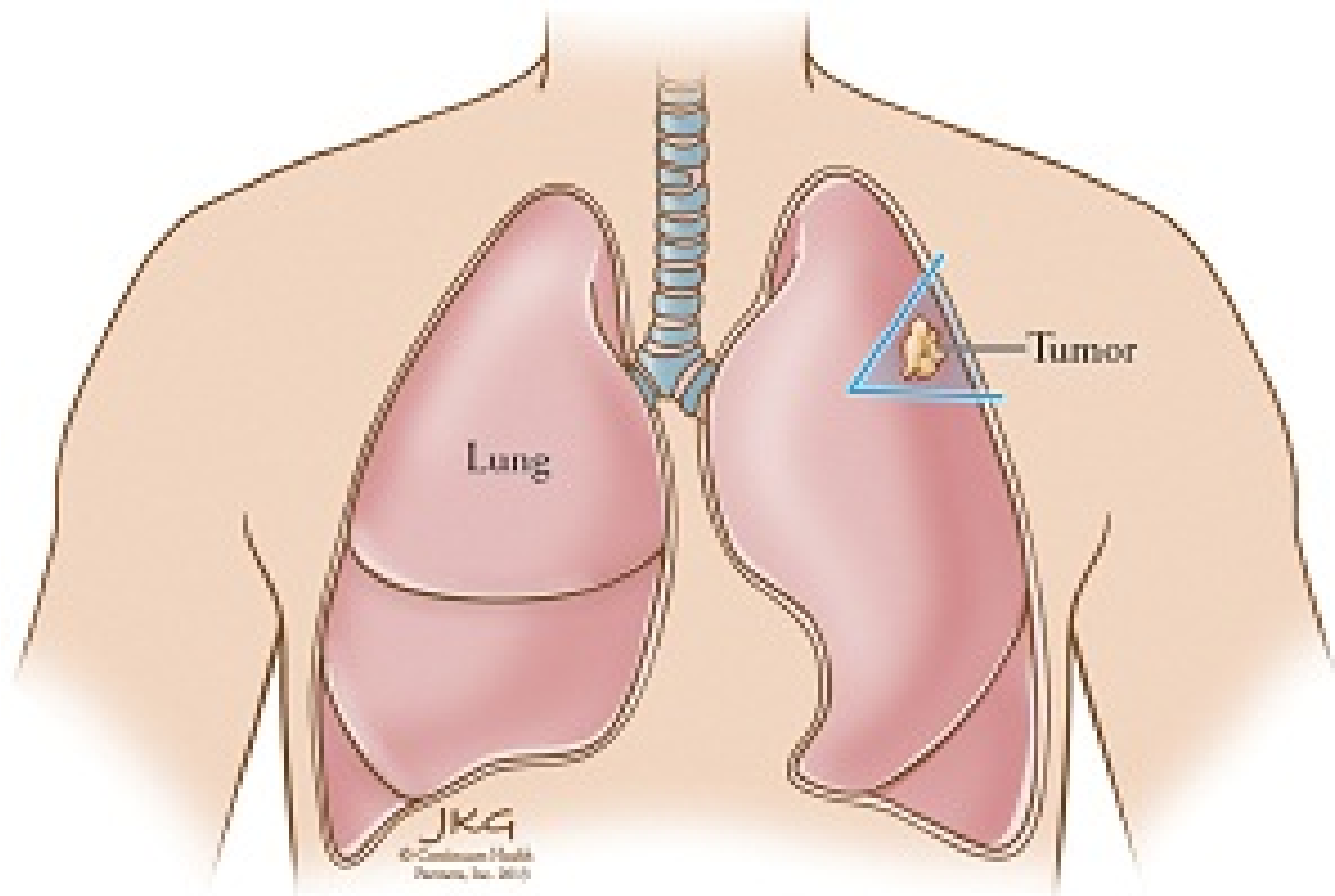


Adam J. Hansen, MD
UHC Thoracic Surgery

Surgical Treatment of Early-Stage Lung Cancer

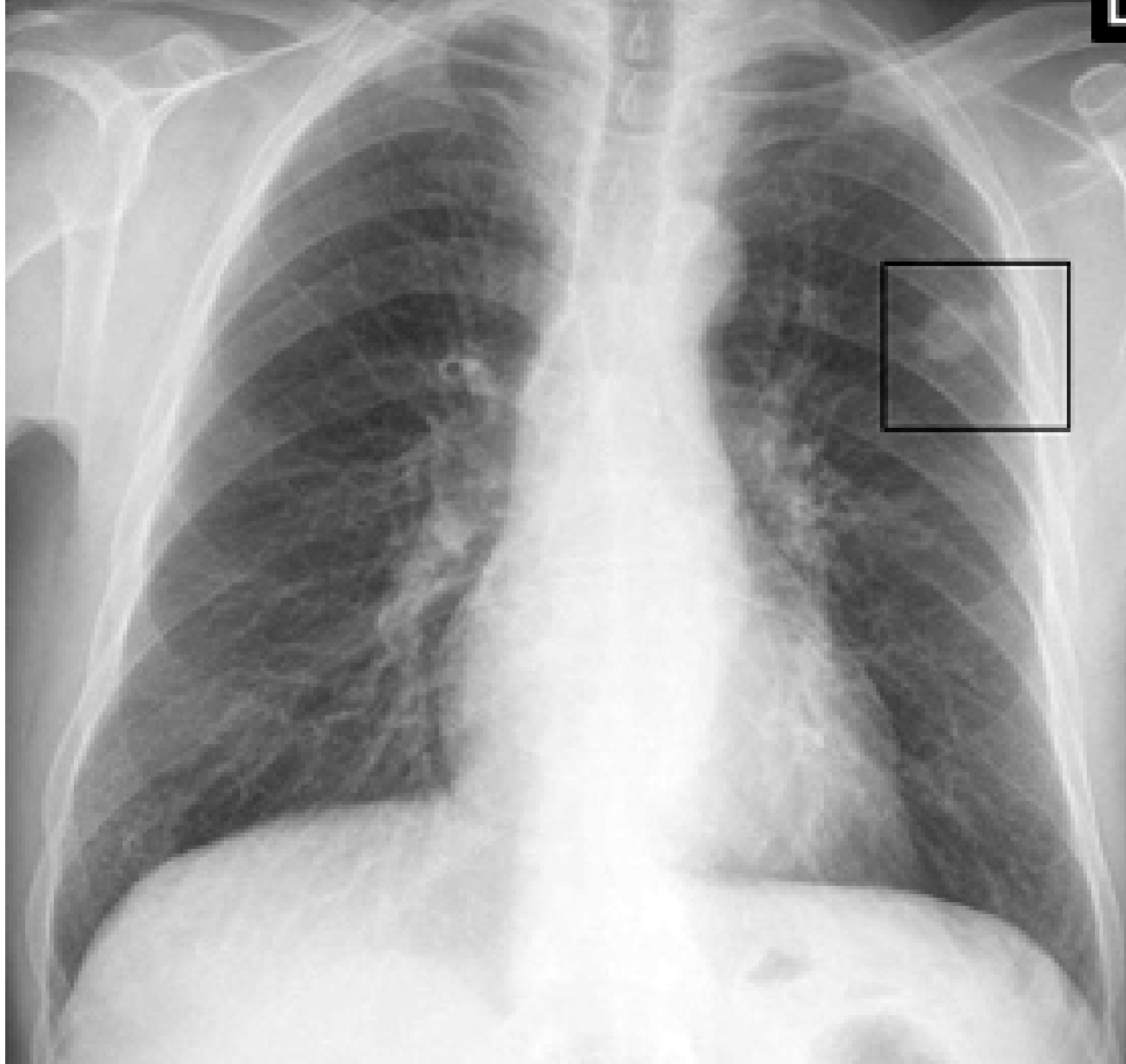
Lung Anatomy 101





Pulmonary Nodules

- Sometimes seen on Chest X-ray (CXR)
- Common incidental findings on computed tomography (CT) chest and abdomen done for other reasons
- Most lung cancers discovered incidentally
- Detection increased with recent coverage by CMS for screening CT chest in smokers

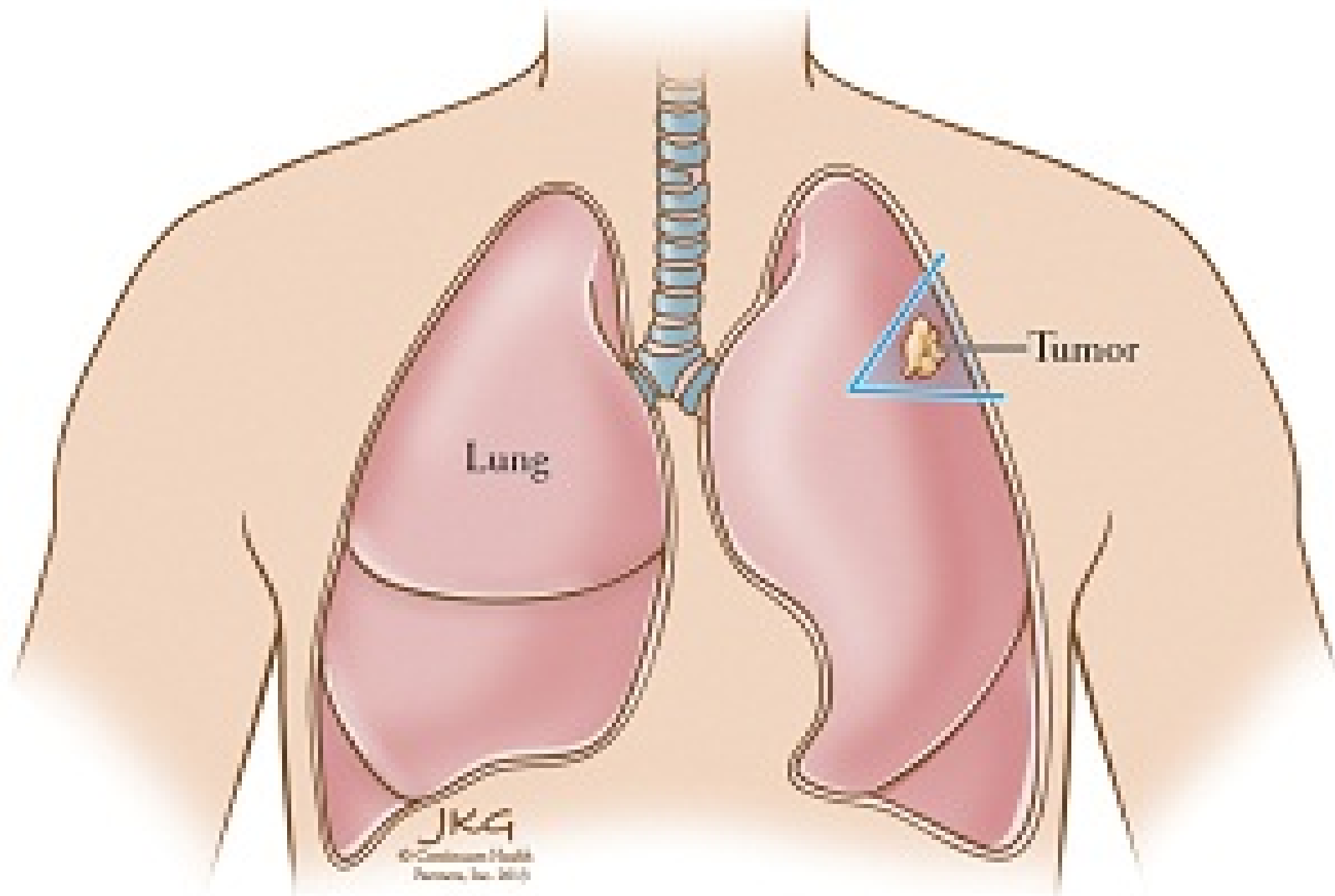




Screening CT Chest for Smokers

- Age 55 – 77 years
- Asymptomatic
- Tobacco smoking history of at least 30 pack-years
- Current smoker or one who has quit smoking within the last 15 years

What do we do with a newly discovered lung nodule/mass?



Two Management Strategies

1. Watchful waiting with serial imaging to detect interval change
 - Fleischner Guidelines used to determine when to continue imaging and when to biopsy
2. Go after the mass
 - Biopsy
 - Surgical resection

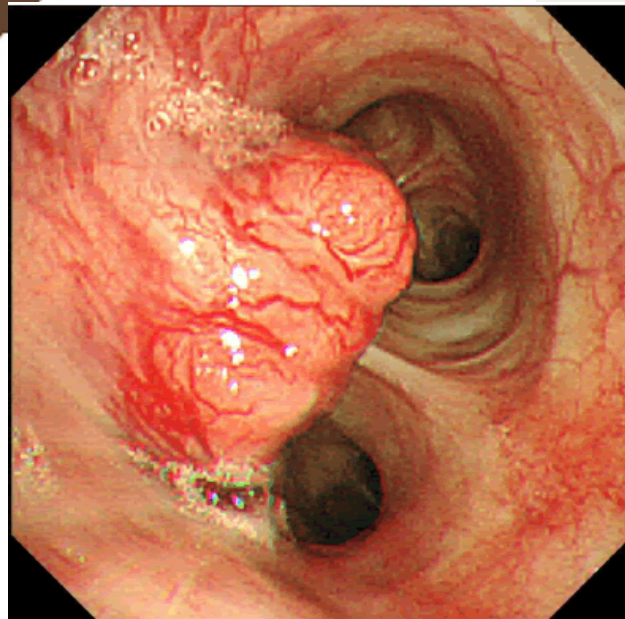
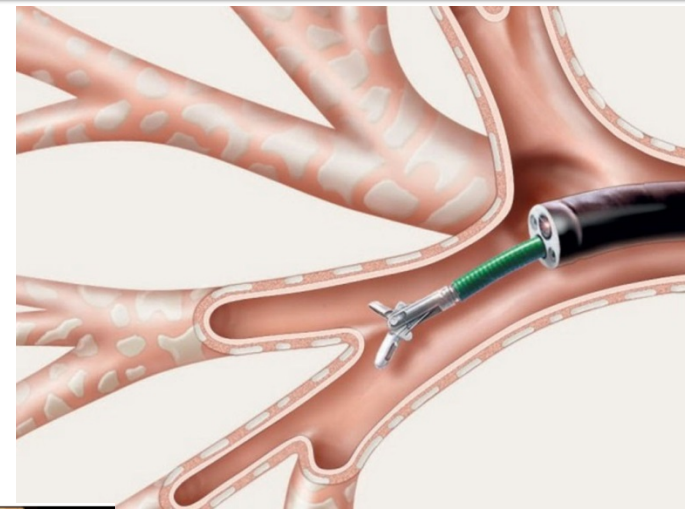
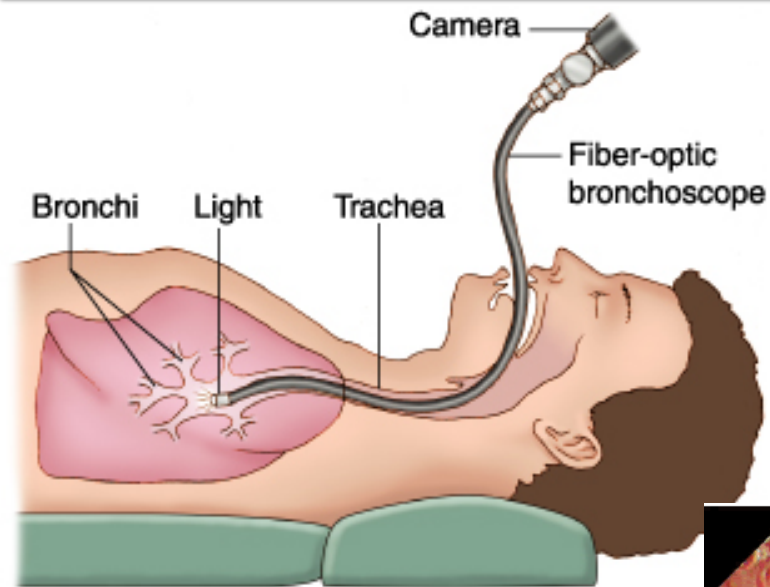
If lung cancer is suspected and we go after the mass

- The patient and doctor will work together through 3 phases of care:
 1. Tissue diagnosis to confirm if cancer, and what type
 2. Cancer staging (I-IV) to determine best treatment options
 3. Treatment
 - Surgery
 - Radiation
 - Chemotherapy
 - Combined therapy

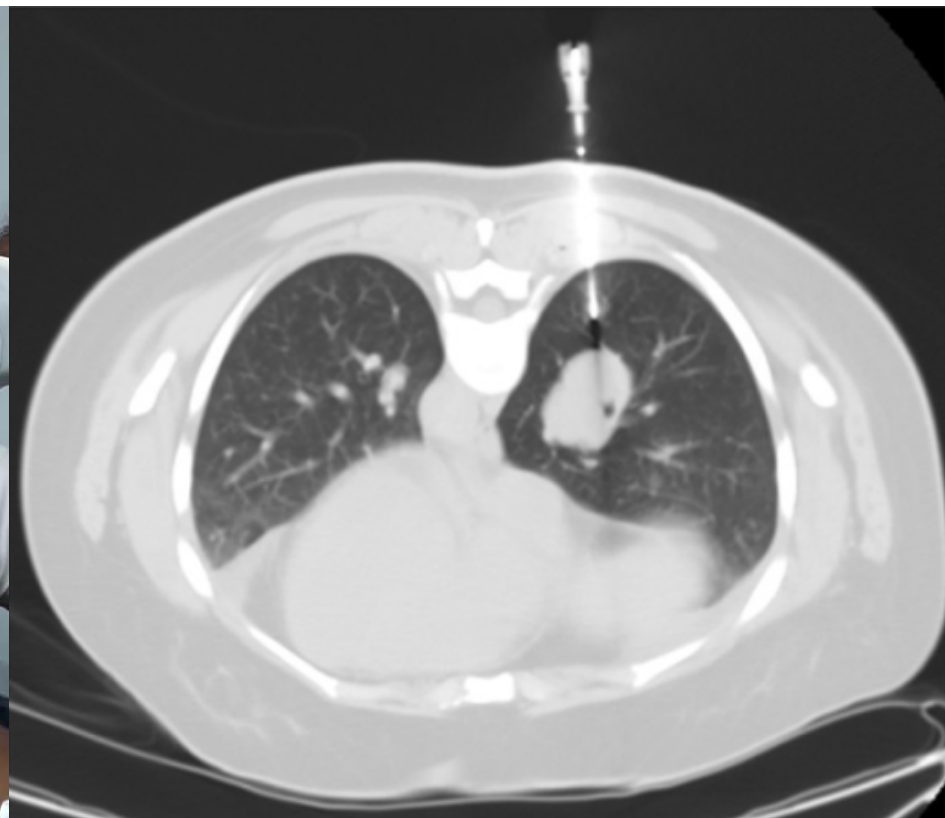
Tissue Diagnosis

1. Minimally invasive diagnostic biopsy
 - Bronchoscopy
 - Trans-thoracic needle aspiration (TTNA)
 - Navigational bronchoscopy
2. Surgical excision for diagnosis and definitive management

Bronchoscopy



CT-guided Biopsy (TTNA)



CT-guided Biopsy (TTNA)

- Sensitivity for malignancy of 90%
- Complicated by pneumothorax in approximately 25% of cases
 - Risk factors include smaller lesion size, deeper location, proximity to fissures and the presence of emphysema
- Rate of hemorrhage substantially higher than for bronchoscopic biopsy

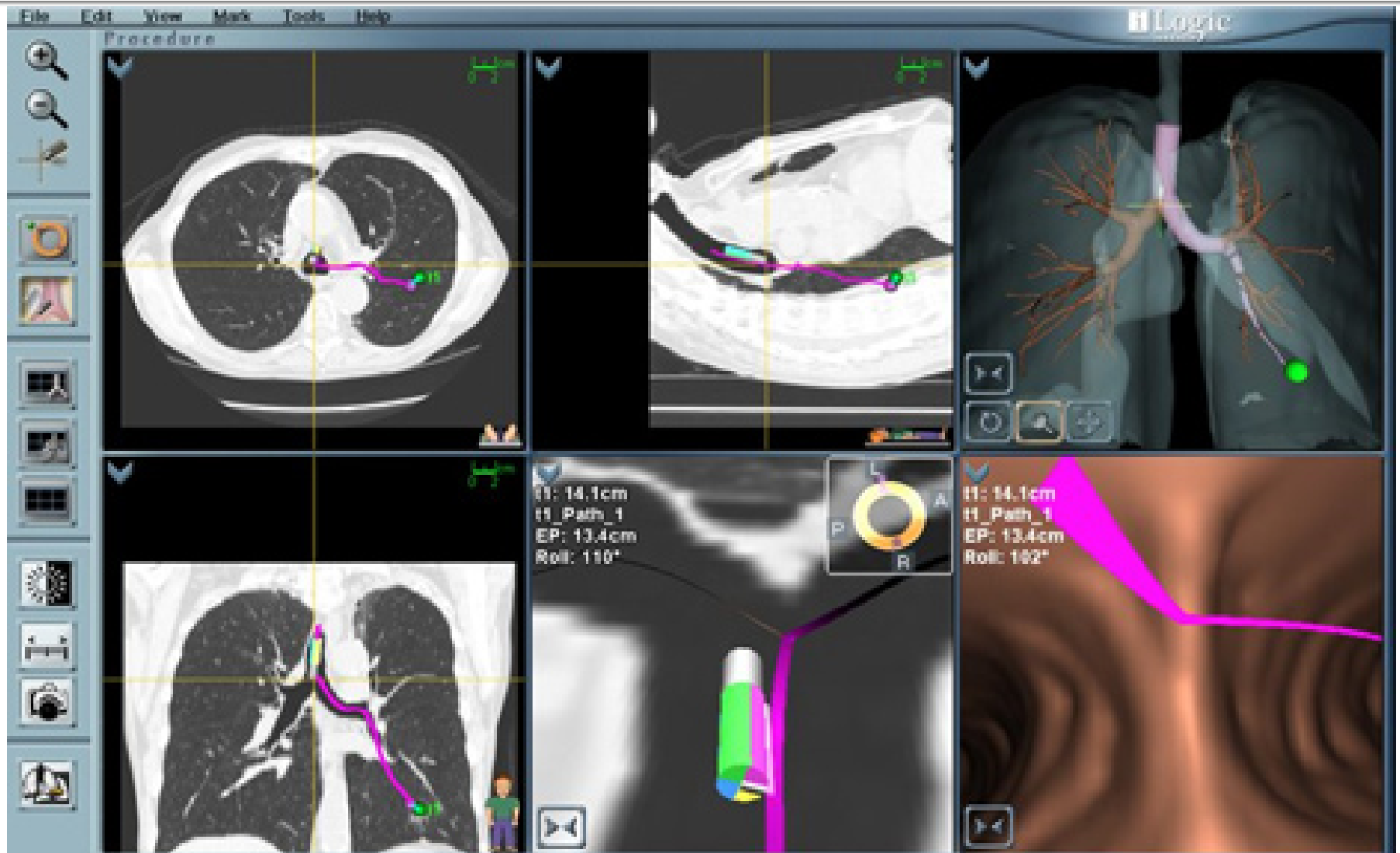
Surgical Biopsy

- Of those that undergo diagnostic surgical excision, almost 20% are benign
- Unnecessarily exposes significant numbers of patients to operative risks
- Surgical resection has significant costs to the health system
- Technically challenging thoracoscopic cases because nodules are small and often can't be seen or felt without placing surgeon's hand on the lung to feel the nodule

Electromagnetic Navigation Bronchoscopy (ENB)

- Provides navigational assistance coupled with steering ability to localize and sample lung masses
- Like a GPS for a bronchoscope

Electromagnetic Navigation Bronchoscopy (ENB)



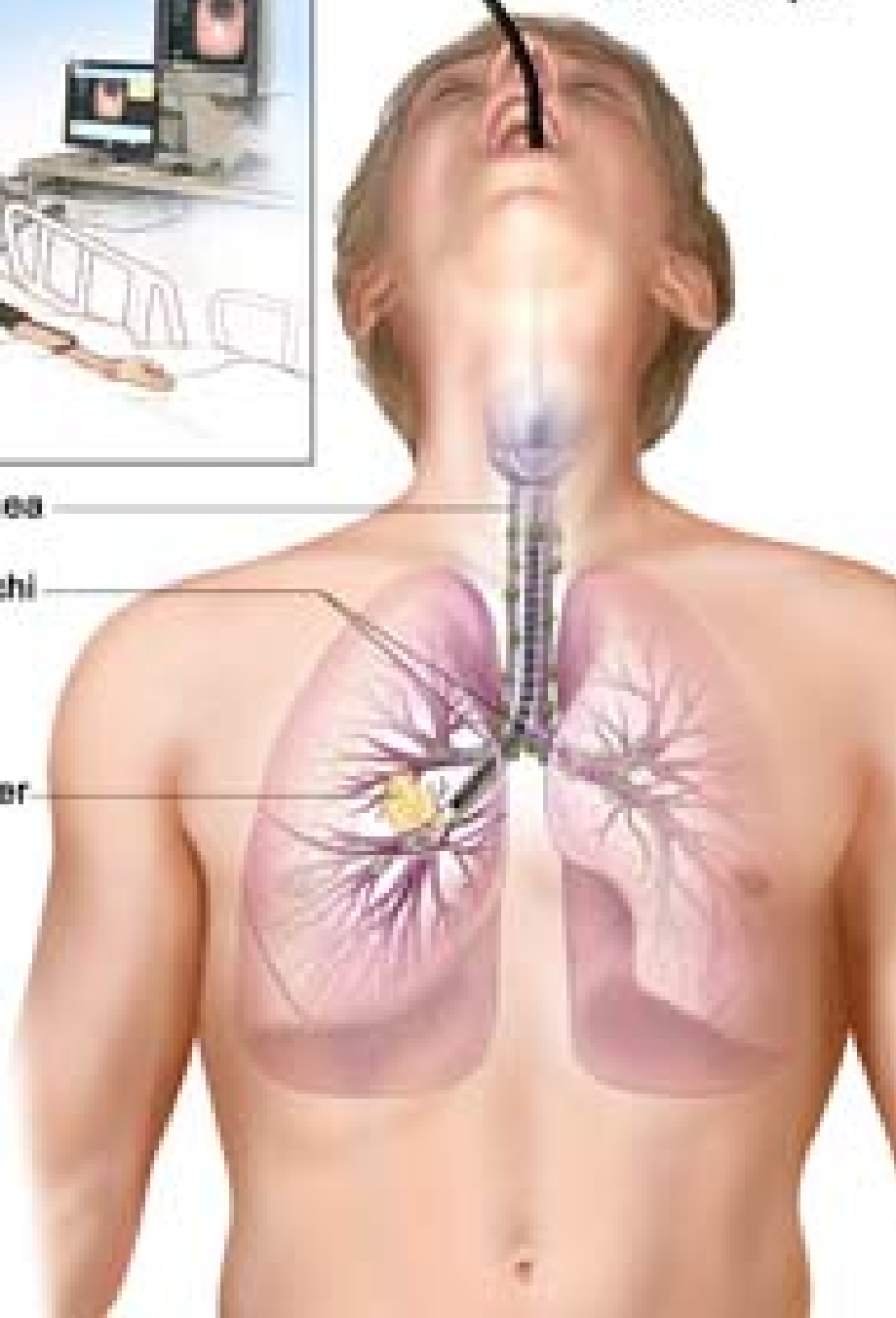


Bronchoscope

Trachea

Bronchi

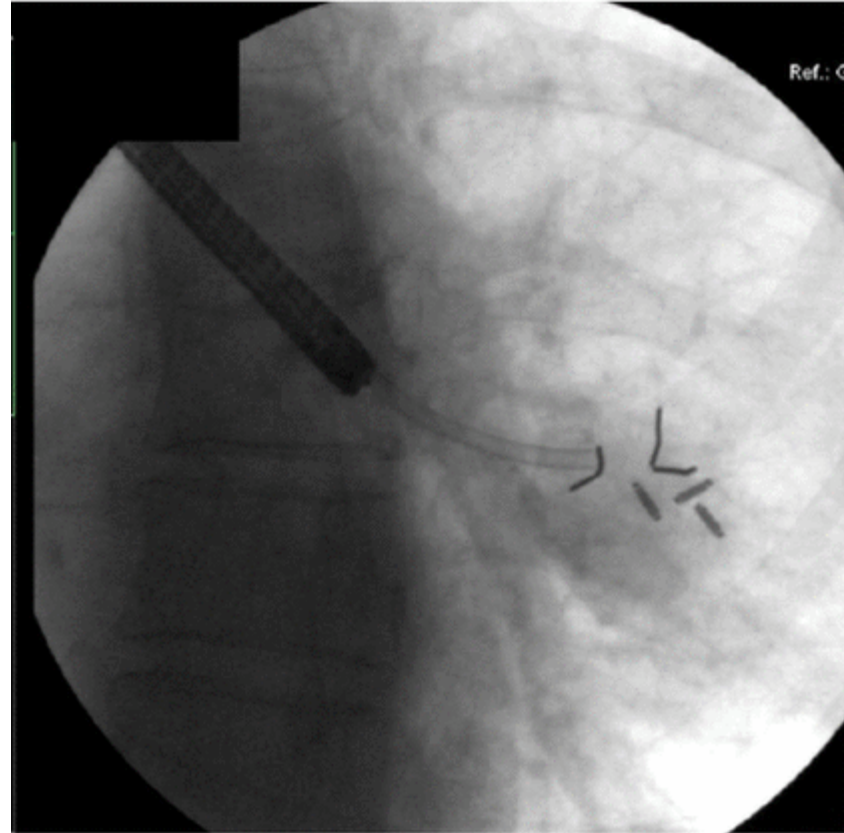
Cancer





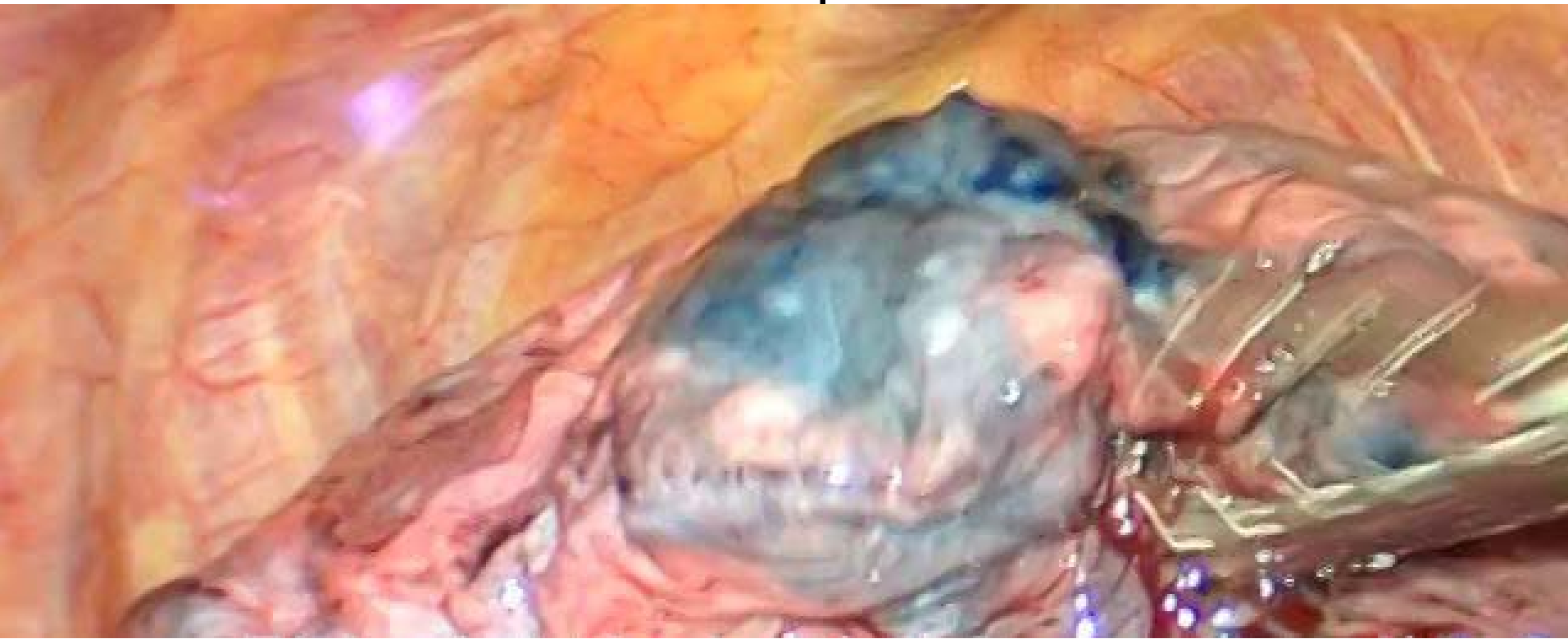
Electromagnetic Navigation Bronchoscopy (ENB)

- Can facilitate placement of metal markers for stereotactic radiotherapy in cases of inoperable lung cancer



Electromagnetic Navigation Bronchoscopy (ENB)

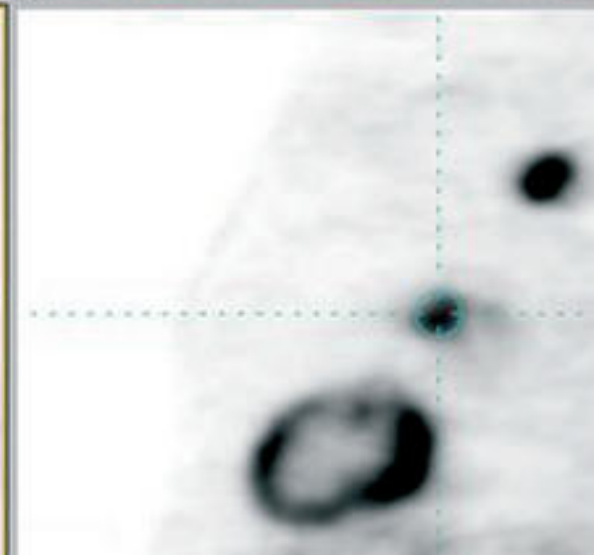
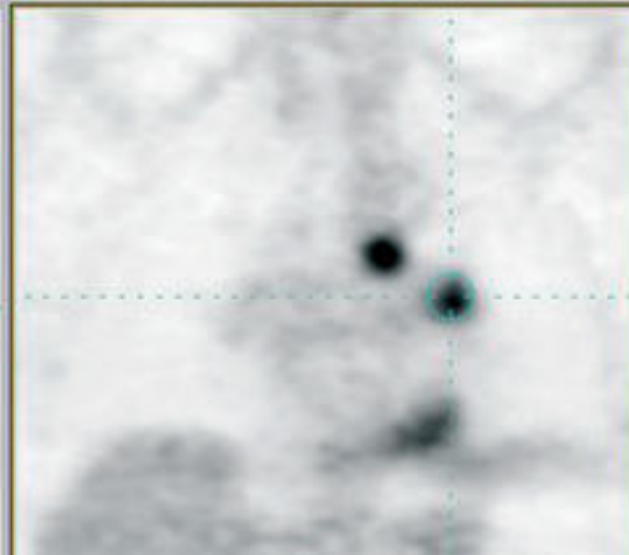
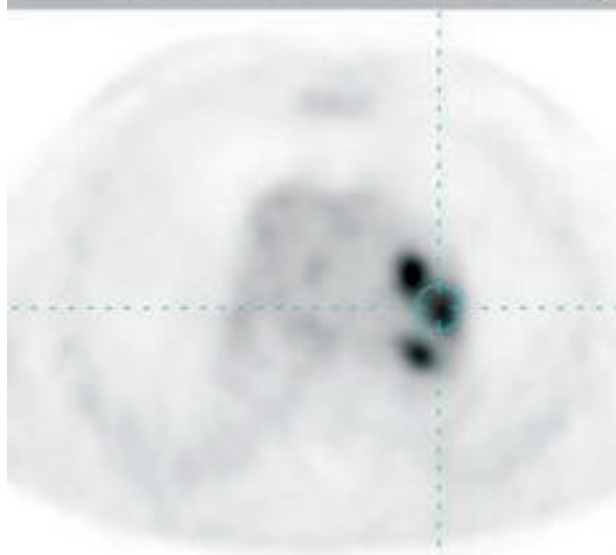
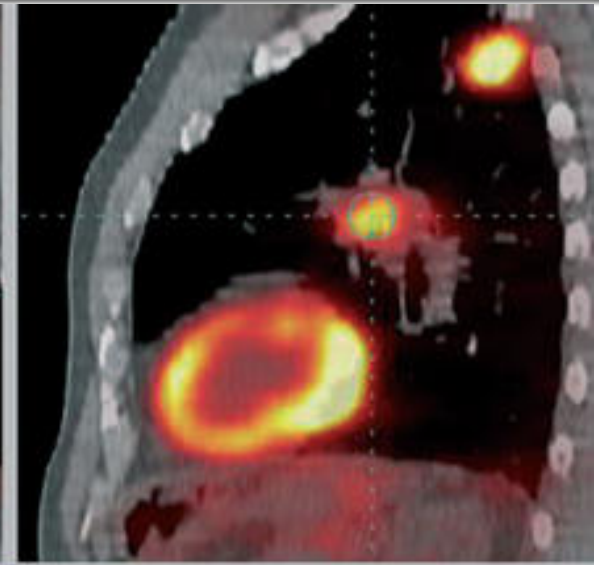
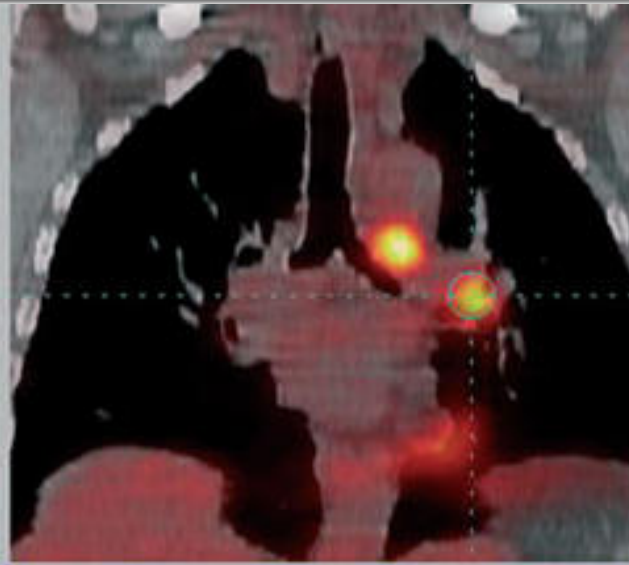
- Can facilitate pleural dye marking for localization of lesions during surgery that would otherwise be impossible to find



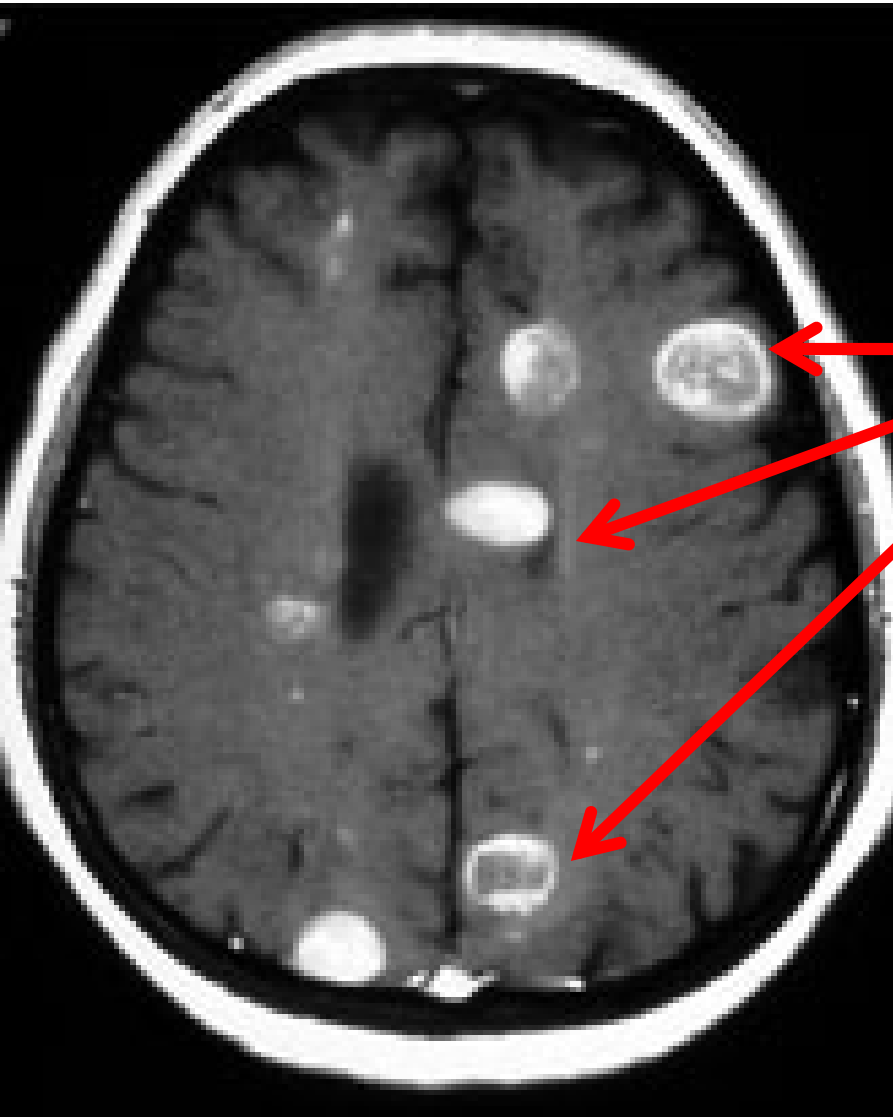
Metastatic Workup

- Done after cancer diagnosis made by biopsy
- Includes imaging
 - Positron Emission Tomography (PET scan)
 - Brain MRI (because PET doesn't see the brain very well)
- Usually includes sampling of lymph nodes in the common sites of cancer spread
 - Mediastinoscopy
 - Endobronchial Ultrasound (EBUS)

PET Scan

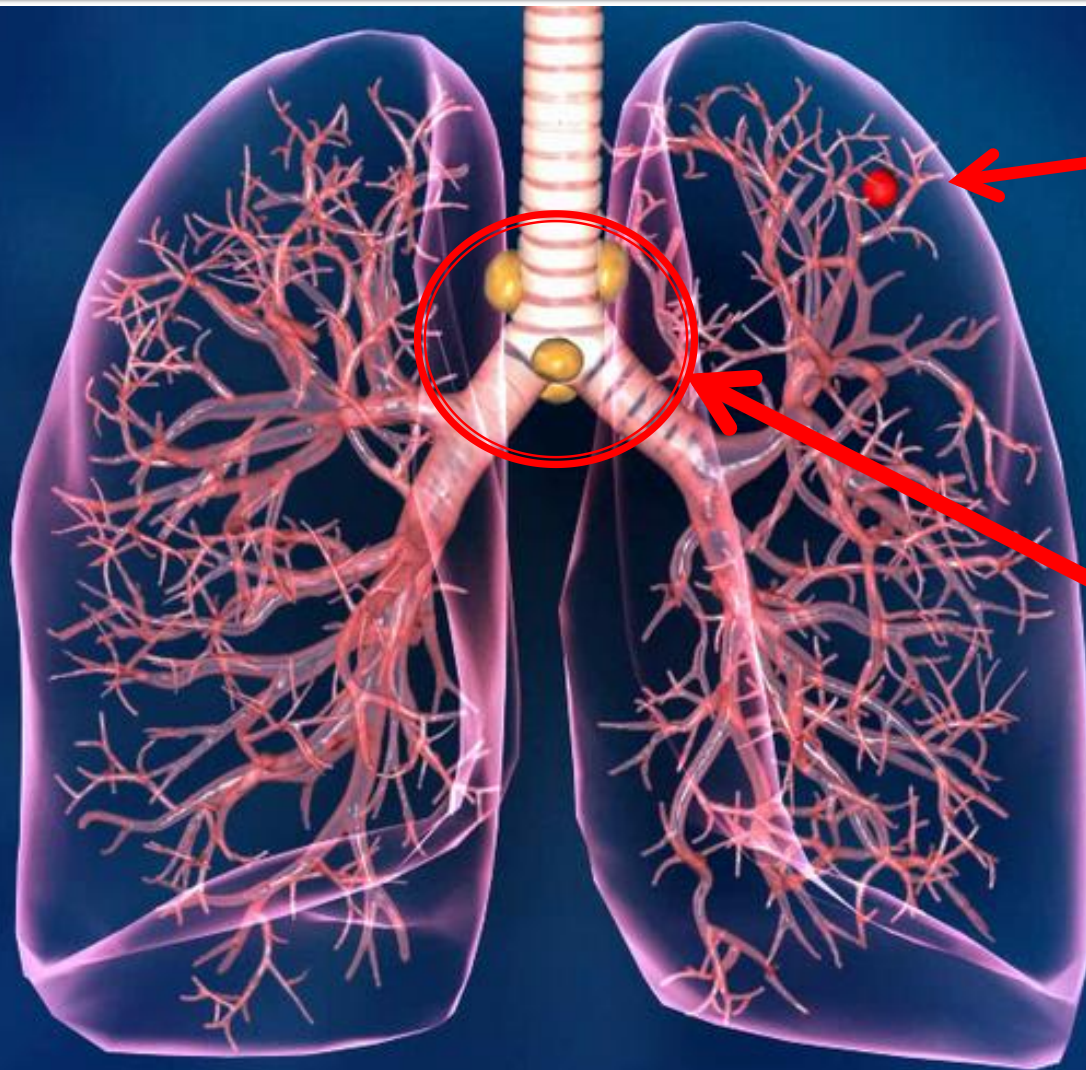


Brain Magnetic Resonance Imaging (MRI)



Done to rule out brain metastases of lung cancer, like these

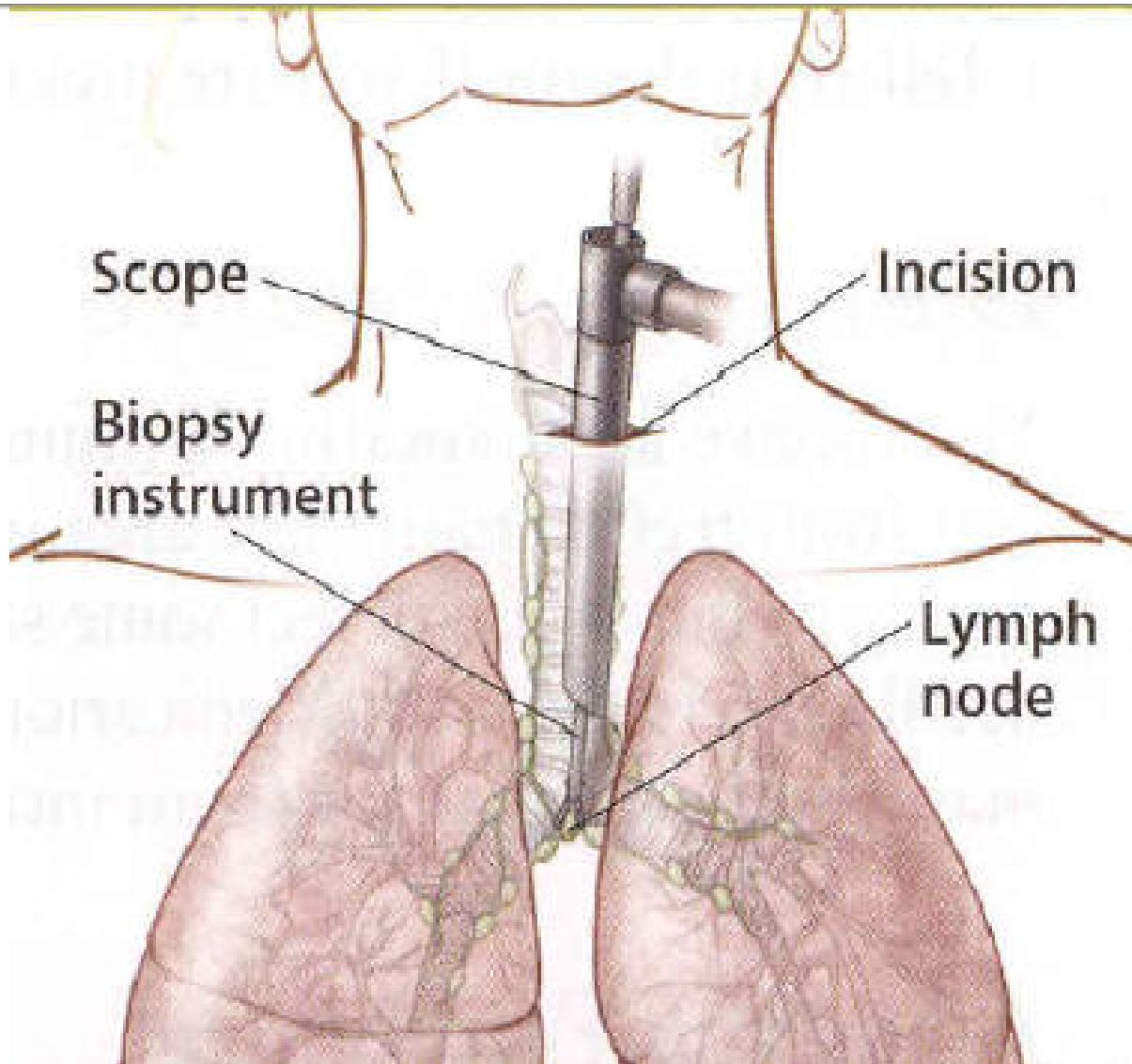
Nodal Sampling



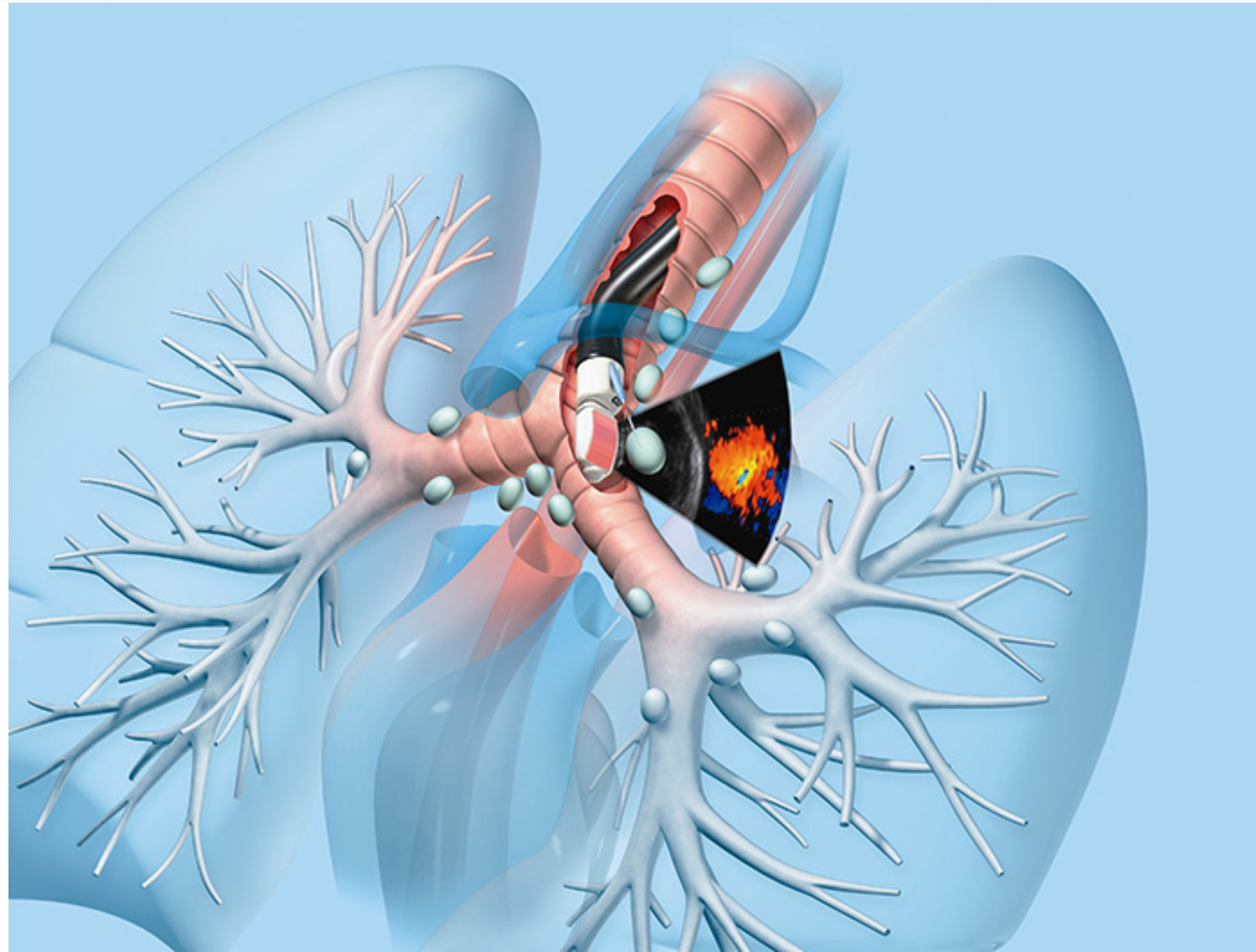
Tumor

Mediastinal lymph nodes are the most common site of metastasis (spread of cancer)

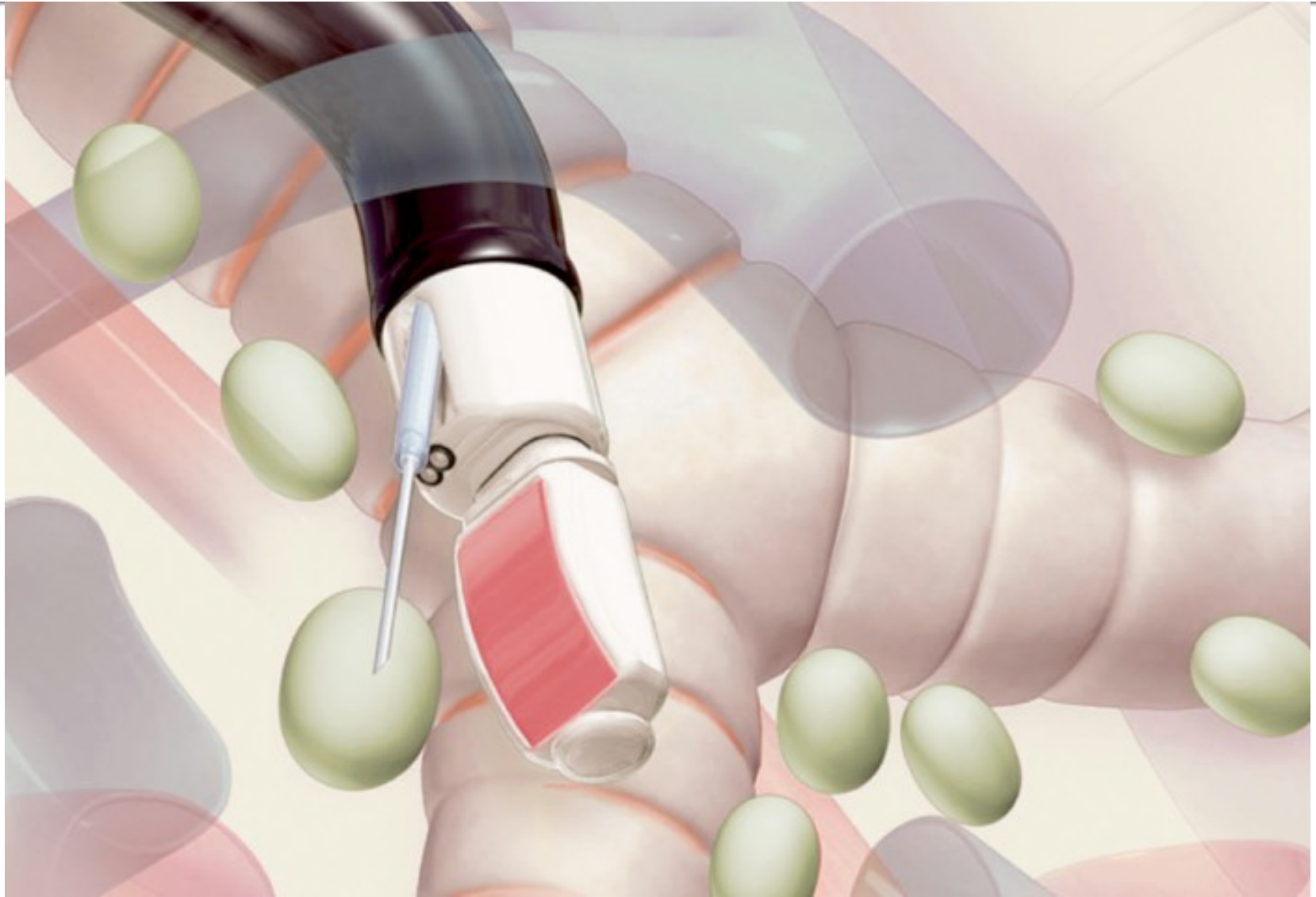
Mediastinoscopy



Endobronchial Ultrasound (EBUS)



Endobronchial Ultrasound (EBUS)



Other Preoperative Considerations

- Pulmonary Function Testing (PFTs)
 - Important in determining pulmonary reserve (i.e. how much lung can be sacrificed to remove cancer)
- Cardiopulmonary fitness for surgery
 - Cardiopulmonary Exercise Testing (CPET) can be used in questionable cases.
- Smoking status
 - I require smoking cessation for 30 days prior to resection.

How Much Lung to Remove?



Wedge Resection



Segmentectomy



Lobectomy



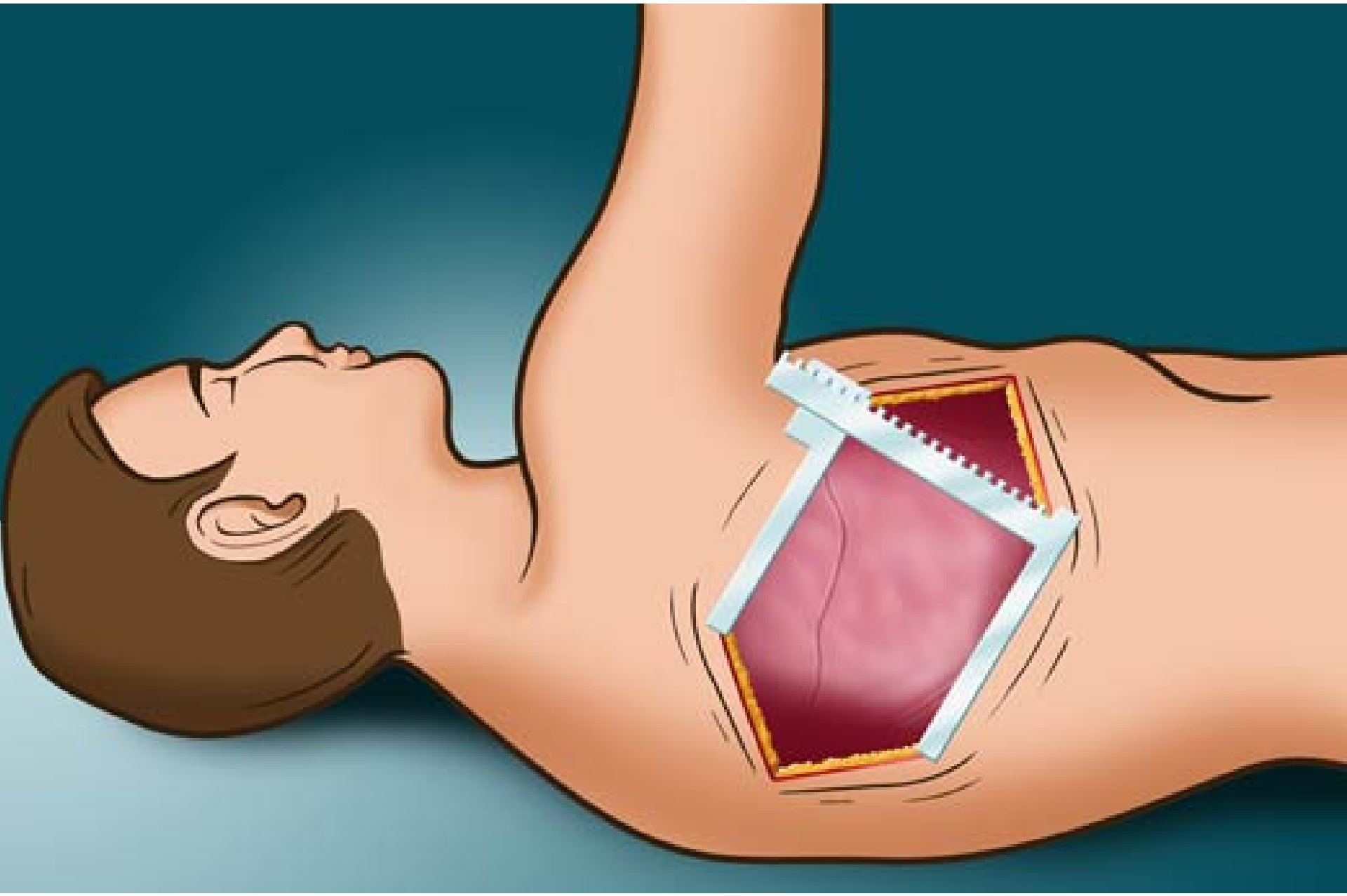
Pneumonectomy

Non-Small Cell Lung Cancer (NSCLC)

- Resection is preferred treatment over ablative radiotherapy
 - Lower recurrence rate
- Anatomic pulmonary resection is preferred for most patients with NSCLC
- Segmentectomy or wedge resection appropriate when
 - Poor pulmonary reserve
 - Peripheral nodule <2cm with ground-glass CT appearance or radiologic long doubling time (>400 days)

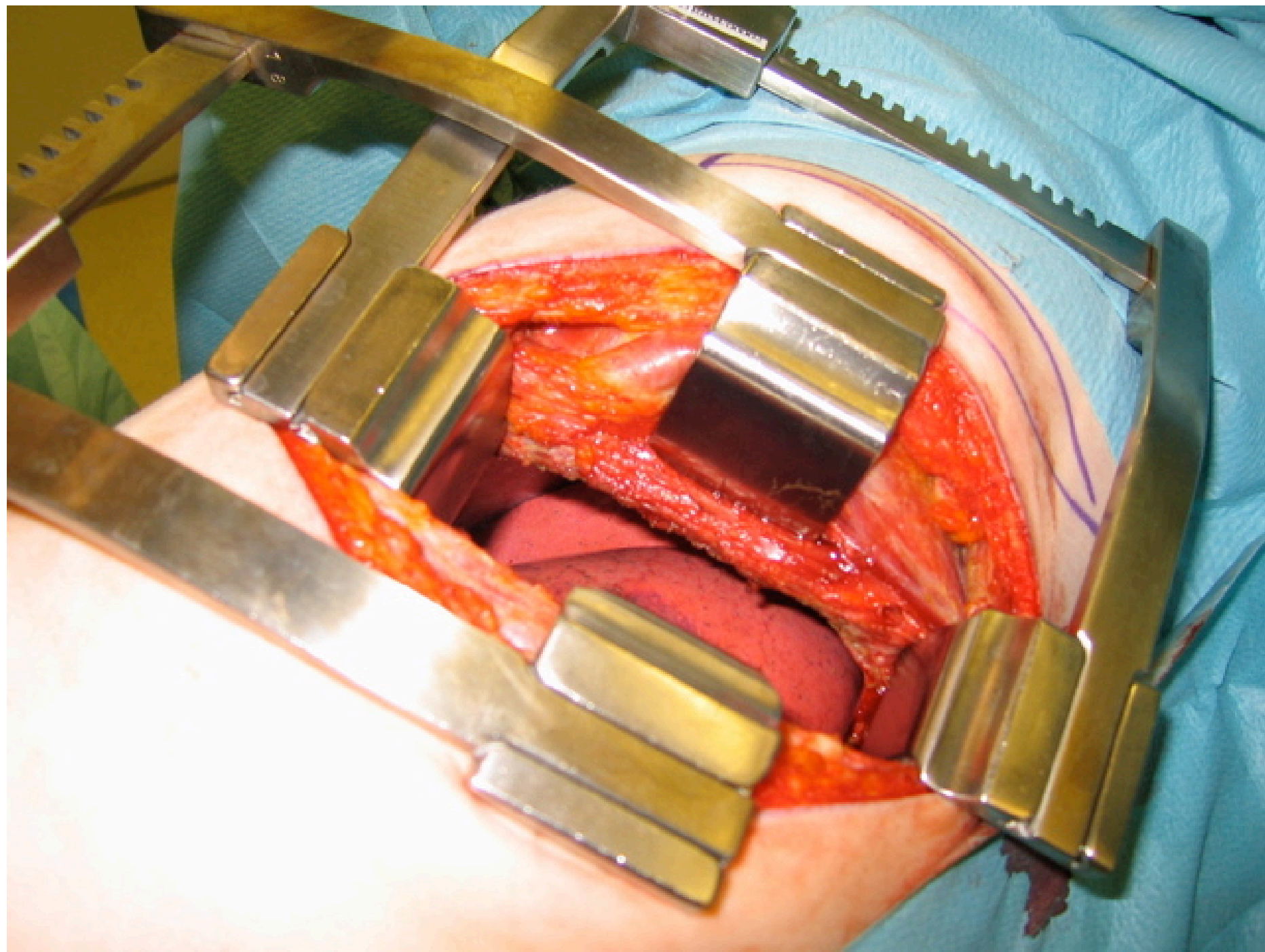
Results of Resection of NSCLC

	Wedge resection	Segmentectomy	Lobectomy
Local recurrence	16-31%	2.2-23%	1.3-11.5%
5-yr survival	26-69%	43-93%	67-90%



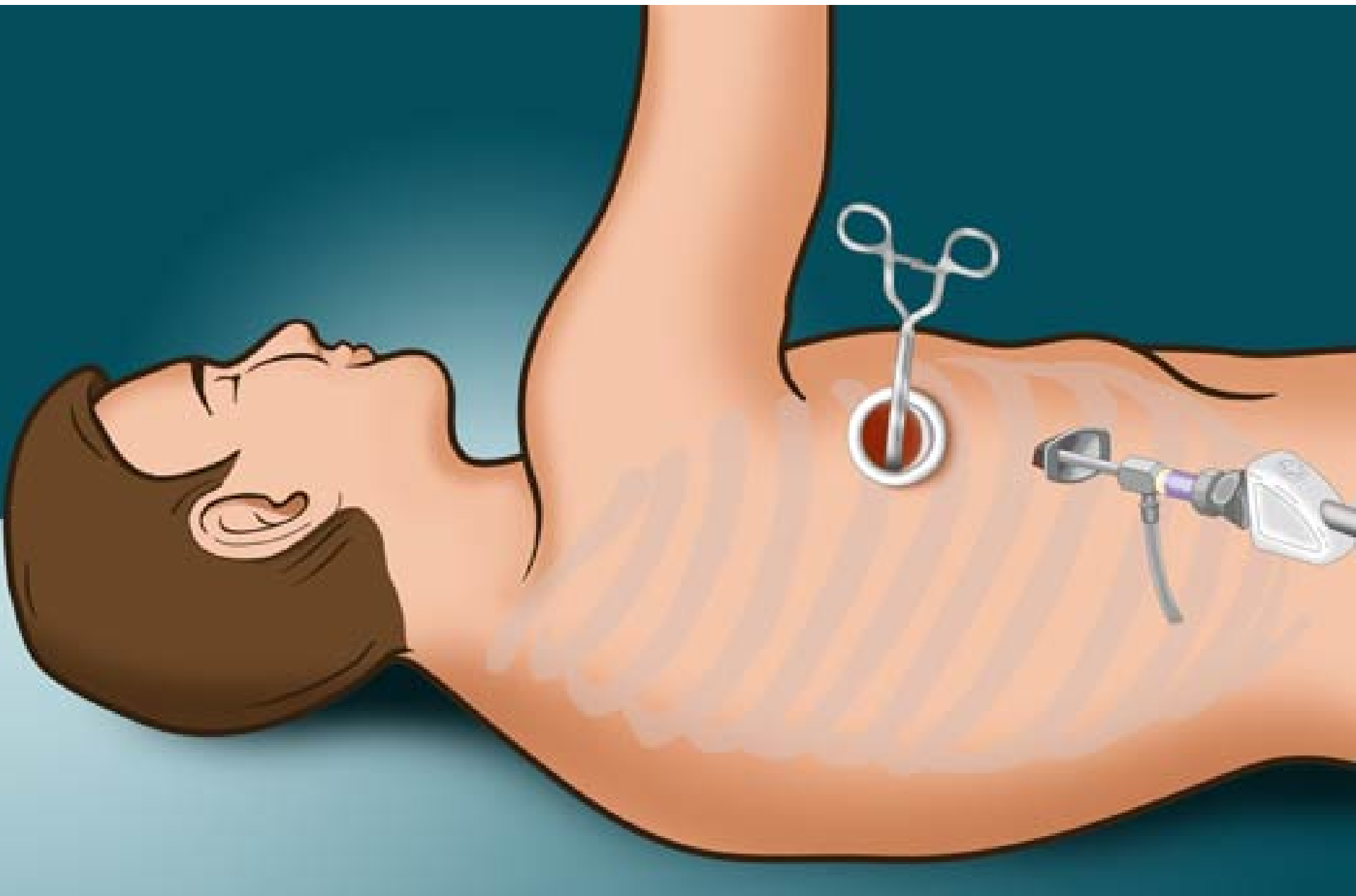
Thoracotomy

- Requires division of one or more major muscles of the chest wall including the latissimus and serratus
- Ribs spread with a spreader
- Difficult surgical incision to deal with post-operatively
 - Painful
 - Pain can hinder effective breathing, leading to atelectasis or pneumonia



Video-assisted Thoracoscopic Surgery (VATS)

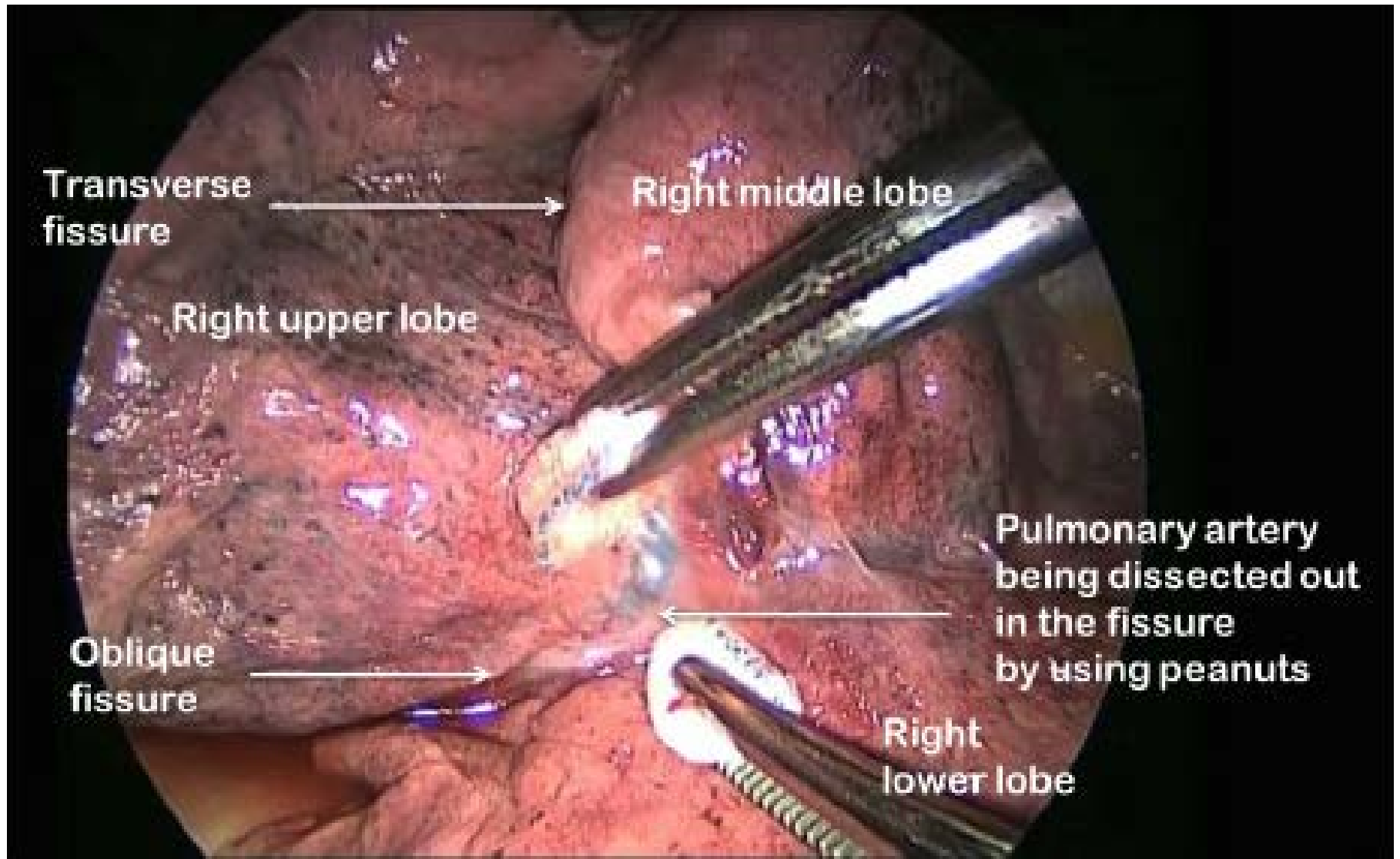
- Thoracic surgery performed using minimally invasive techniques
- Camera and instruments inserted through ports in the chest wall



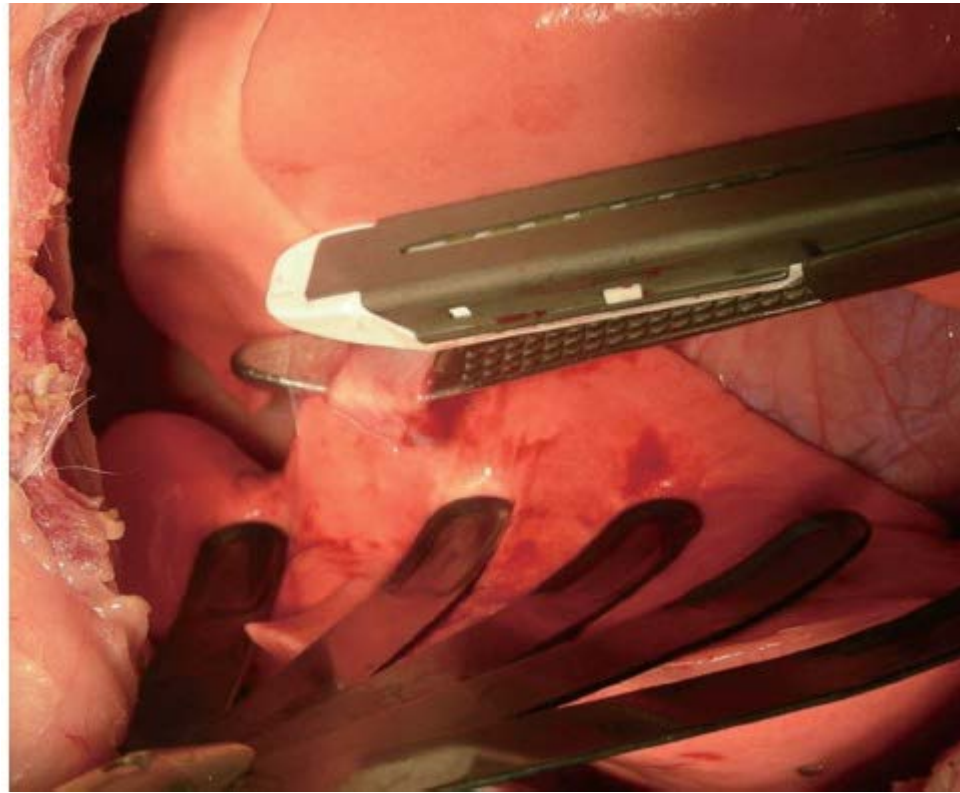
Video-assisted Thoracoscopic Surgery (VATS)

- Advantages of VATS over sternotomy or thoracotomy
 - Avoidance of muscle division and bone fractures
 - Diminished duration and intensity of pain
 - Shorter time to return to full activity
- VATS came into widespread use beginning in the early 1990s

VATS Lobectomy



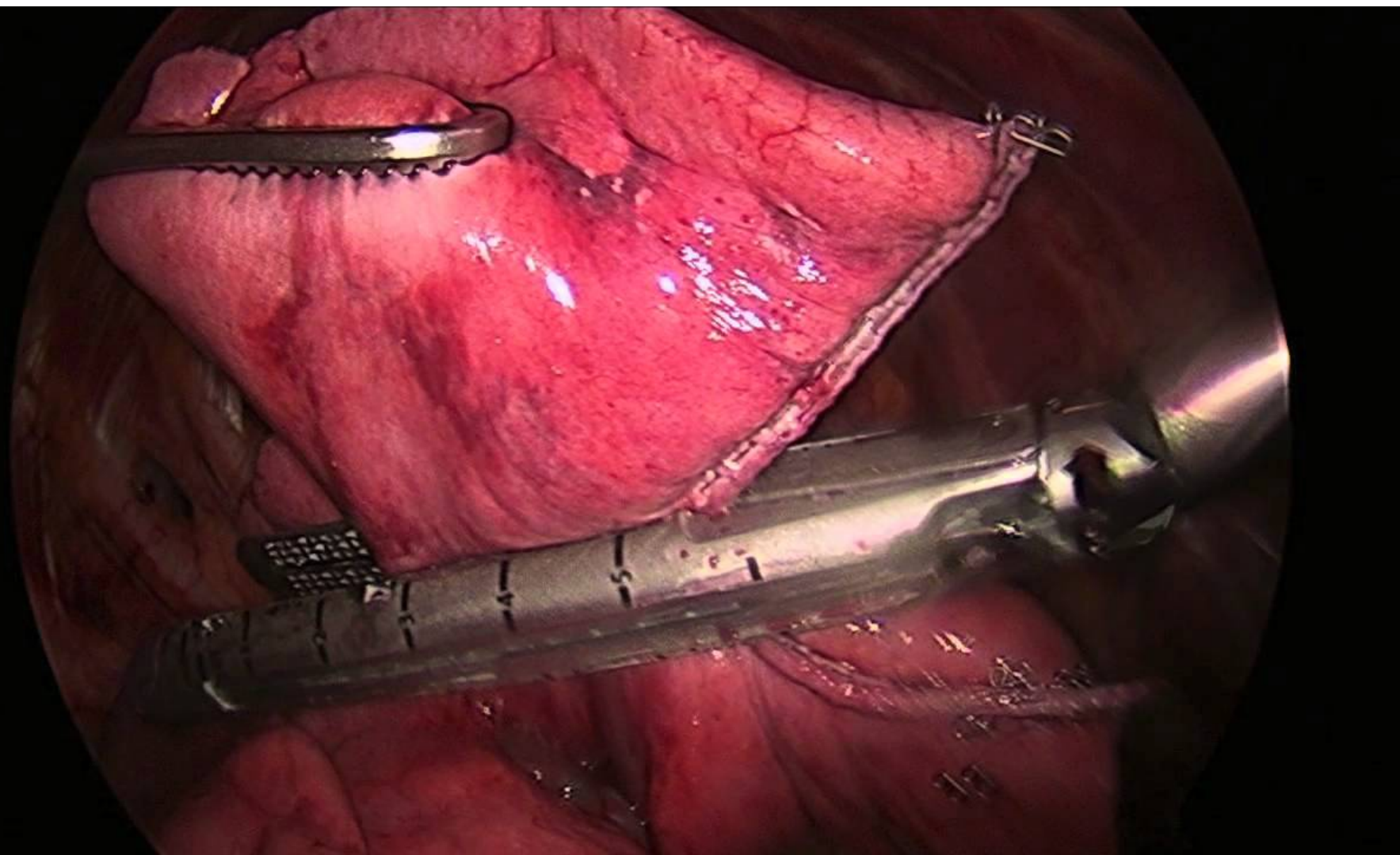
Surgical Staplers are Key





Right upper lobe

Stapler across right
lower lobe bronchus



Questions?
