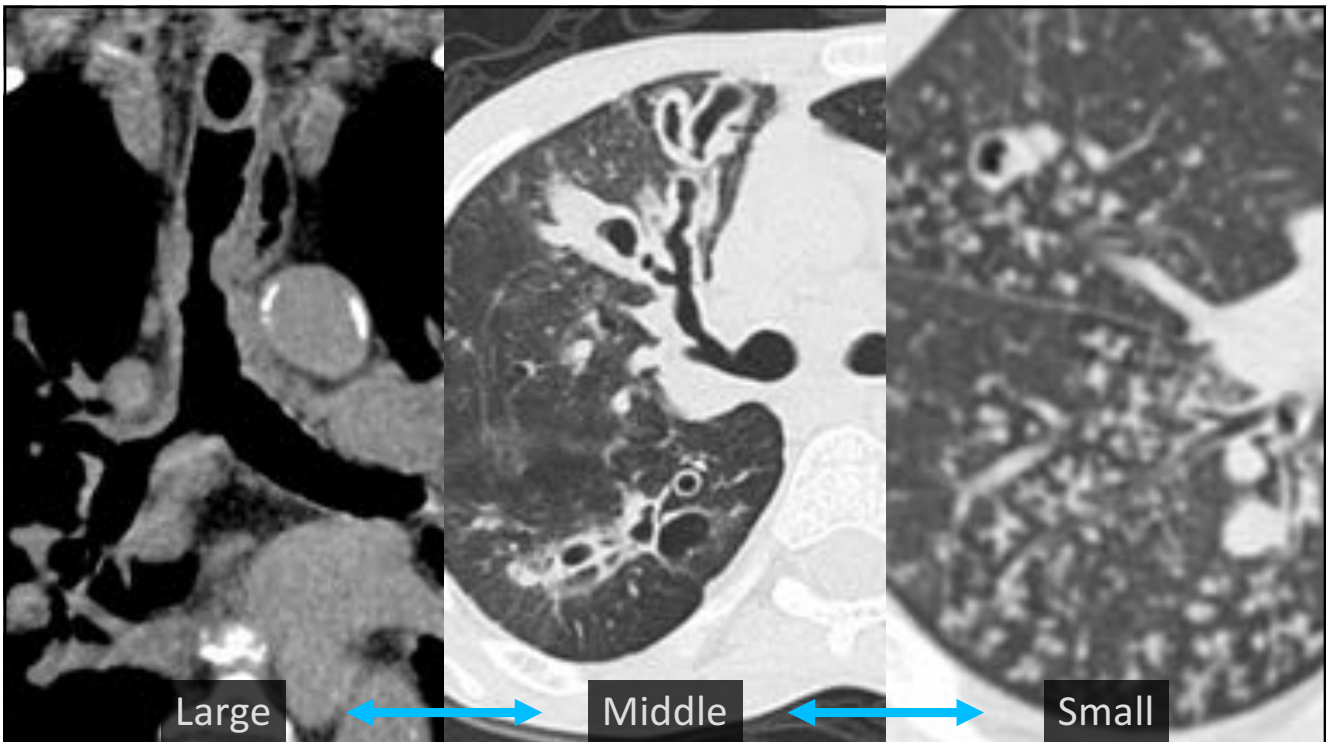


Bronchiectasis: An Imaging Approach



Travis S Henry, MD
Associate Professor of Clinical Radiology
Cardiac and Pulmonary Imaging Section
University of California, San Francisco



Bronchiectasis

- Irreversible dilation of the bronchial tree



¹Seitz AE et al. Trends in bronchiectasis among medicare beneficiaries in the United States, 2000 to 2007. Chest 2012; 142:432-439

²Quint JK et al. Changes in the incidence, prevalence and mortality of bronchiectasis in the UK from 2004 to 2013. Eur Respir J 2016; 47:186-193

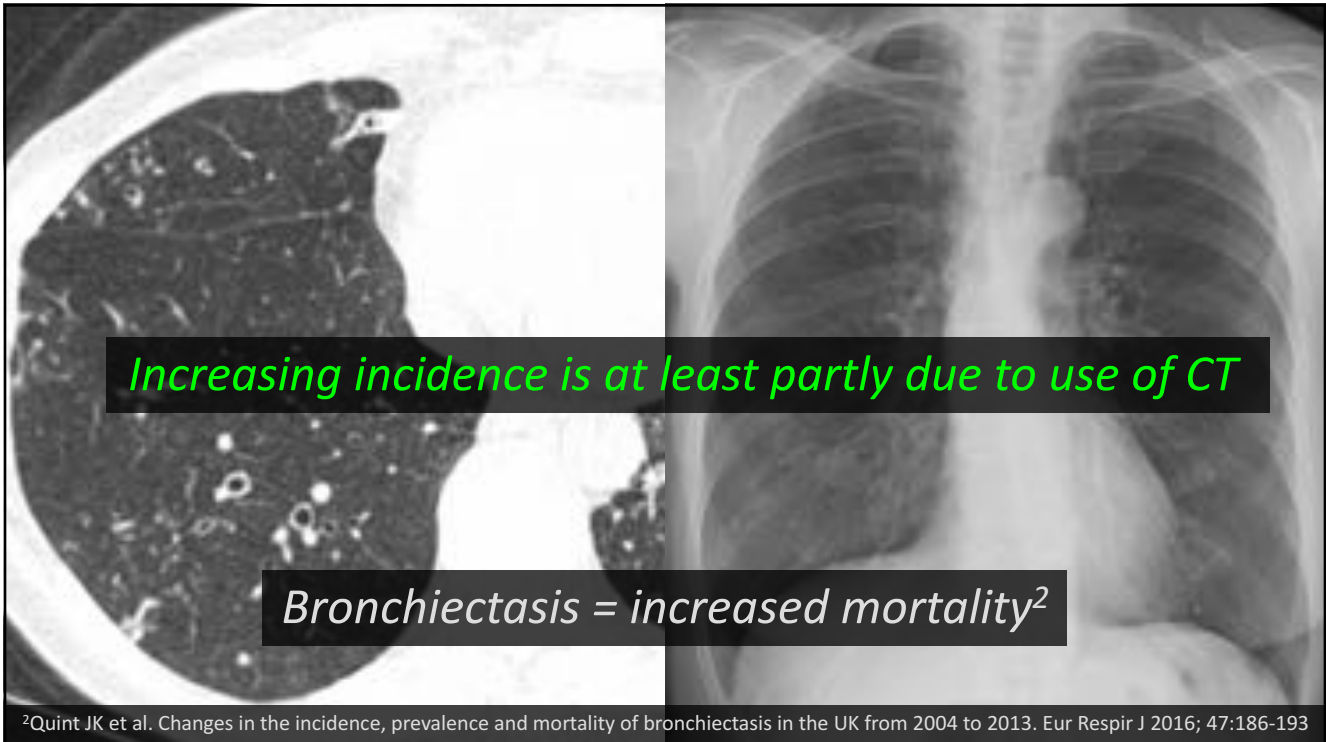
Bronchiectasis

- Irreversible dilation of the bronchial tree
- Increasing incidence:
 - 8.7% increase in Medicare per year 2000-2007¹
 - >60% increased incidence in UK²



¹Seitz AE et al. Trends in bronchiectasis among medicare beneficiaries in the United States, 2000 to 2007. Chest 2012; 142:432-439

²Quint JK et al. Changes in the incidence, prevalence and mortality of bronchiectasis in the UK from 2004 to 2013. Eur Respir J 2016; 47:186-193



Imaging of Bronchiectasis

Imaging Findings:

Radiographic

CT

Imaging-based differential diagnosis

Pitfalls/potential complications

Bronchiectasis – Imaging Findings

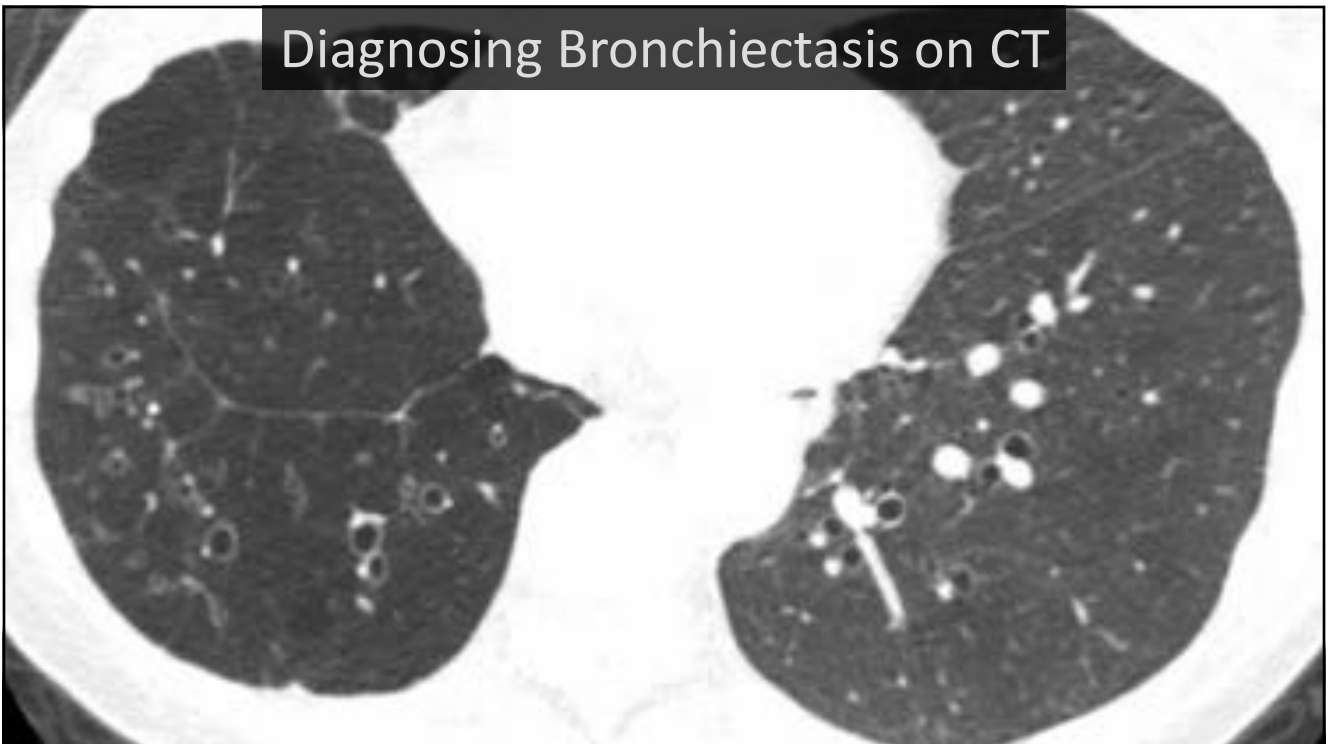
- Radiography:
 - Bronchial wall thickening
 - “Tram-track”
 - “Ring-like” opacities
 - Plugged bronchi

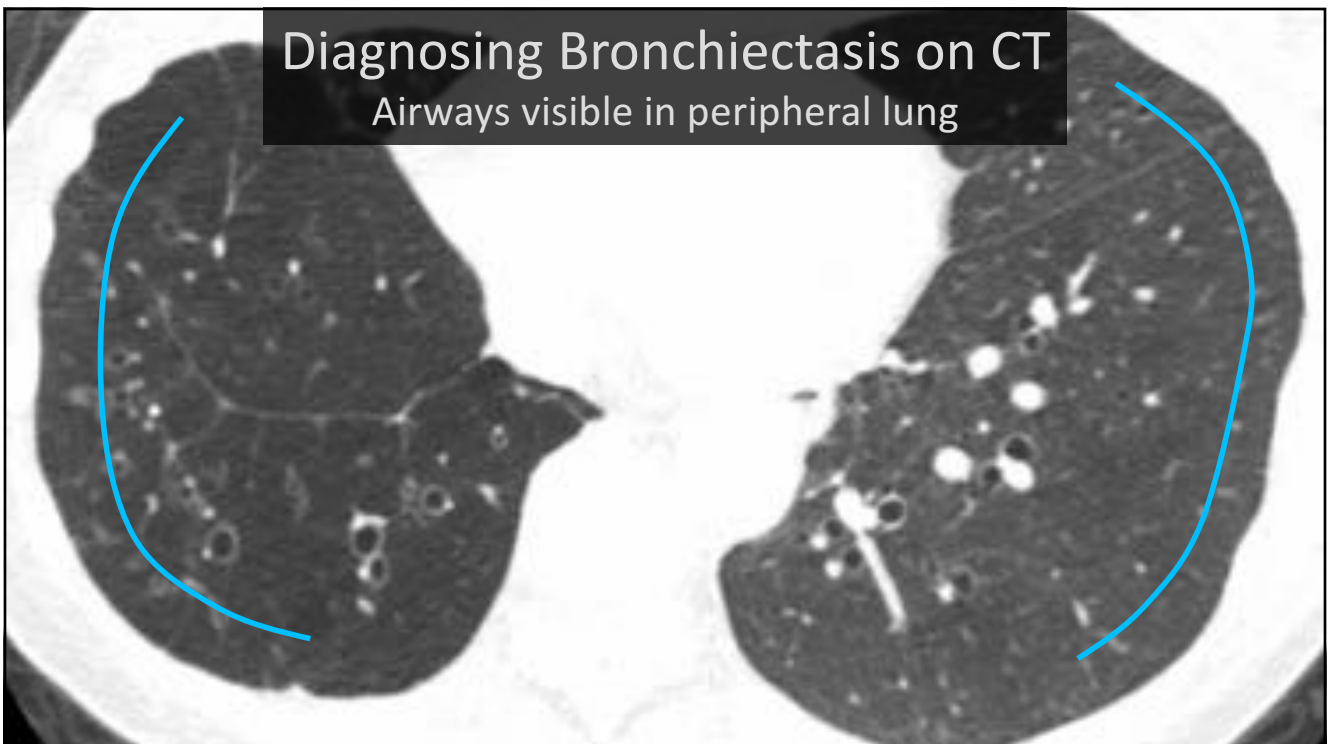
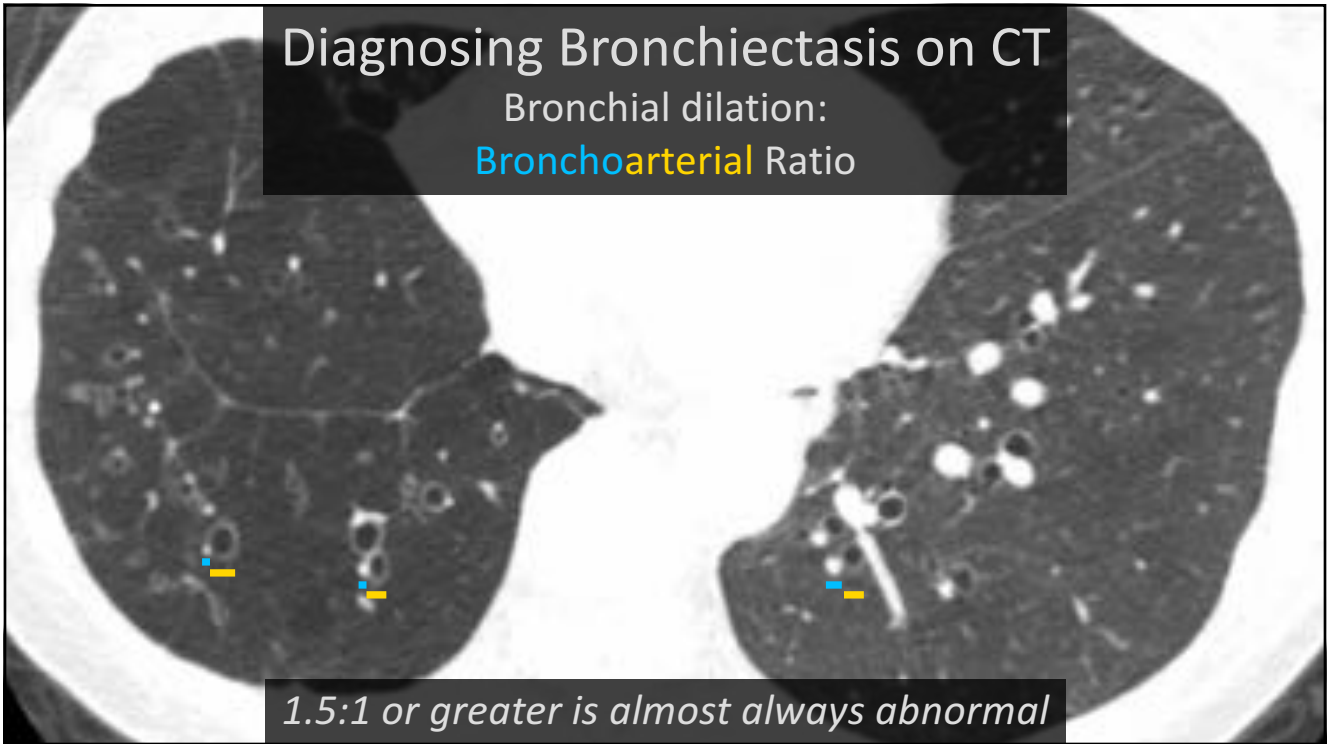


Bronchiectasis – Imaging Findings

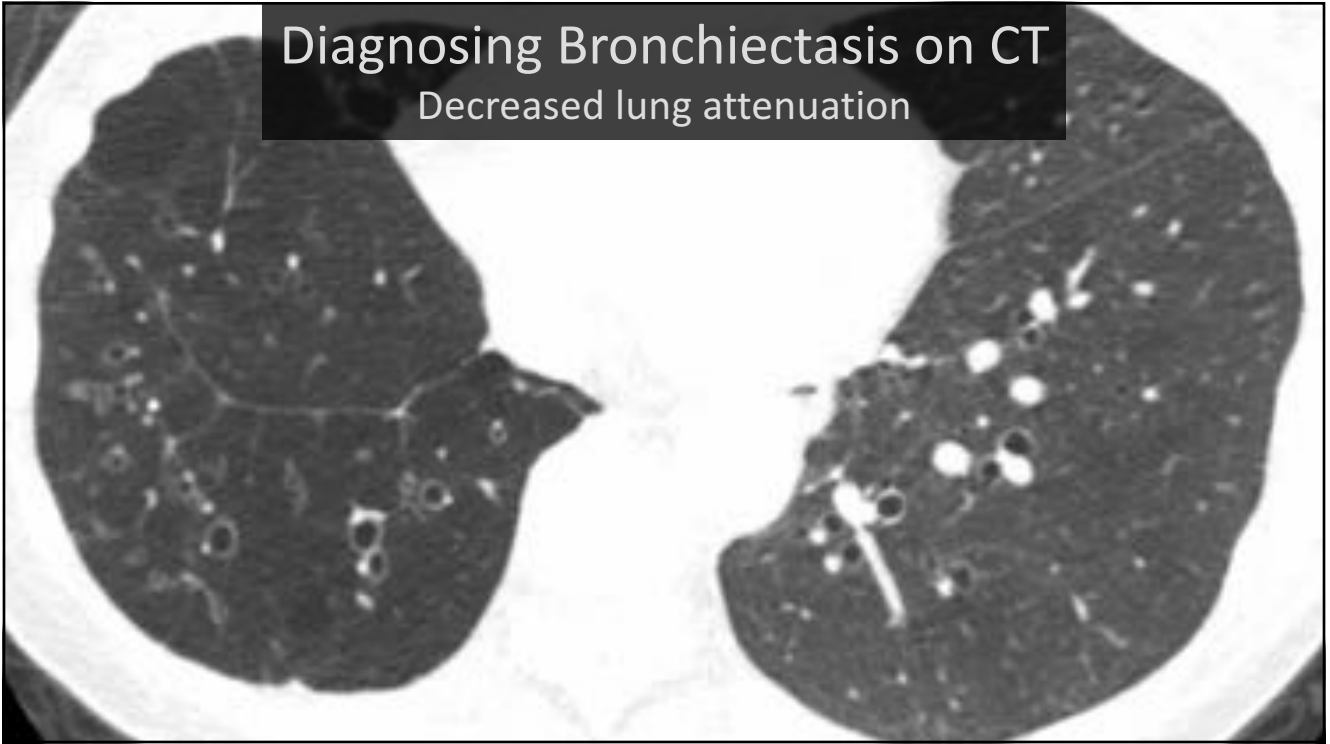
- Radiography:
 - Bronchial wall thickening
 - “Tram-track”
 - “Ring-like” opacities
 - Plugged bronchi
 - Paucity of vessels



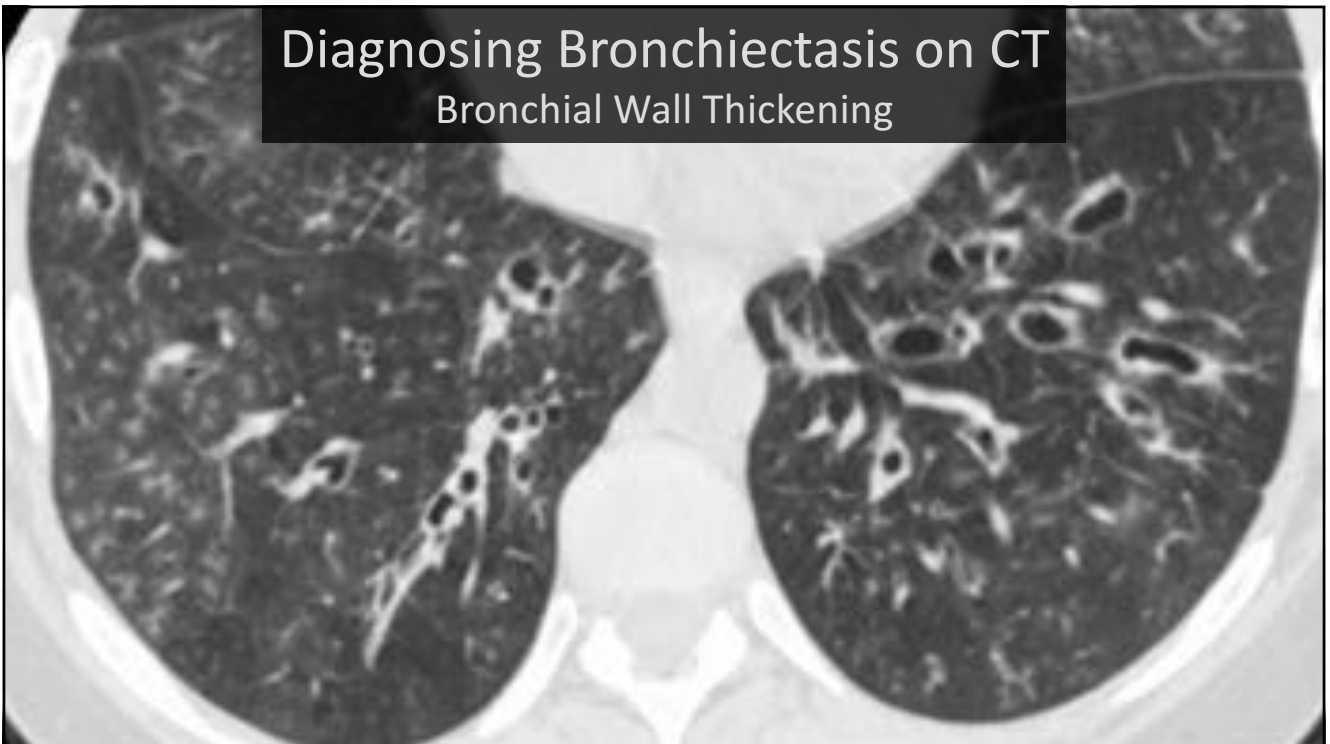


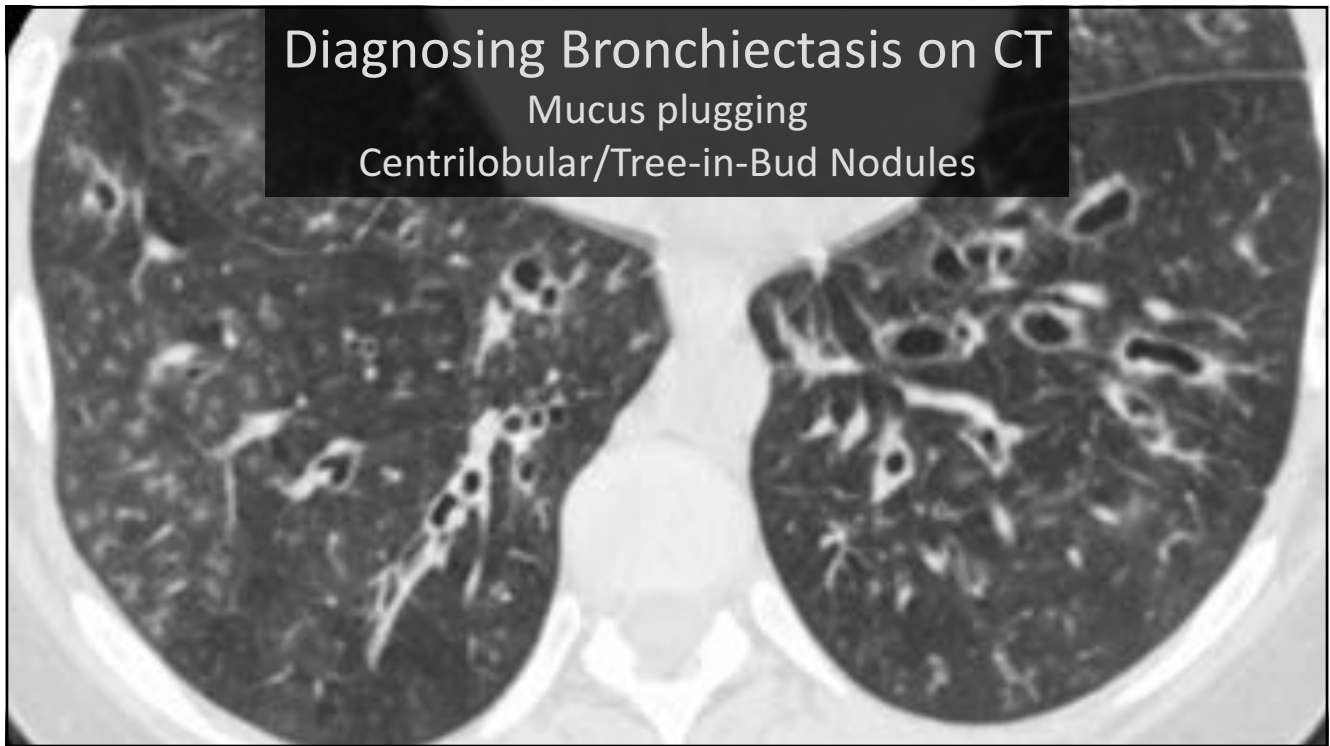


Diagnosing Bronchiectasis on CT
Decreased lung attenuation



Diagnosing Bronchiectasis on CT
Bronchial Wall Thickening



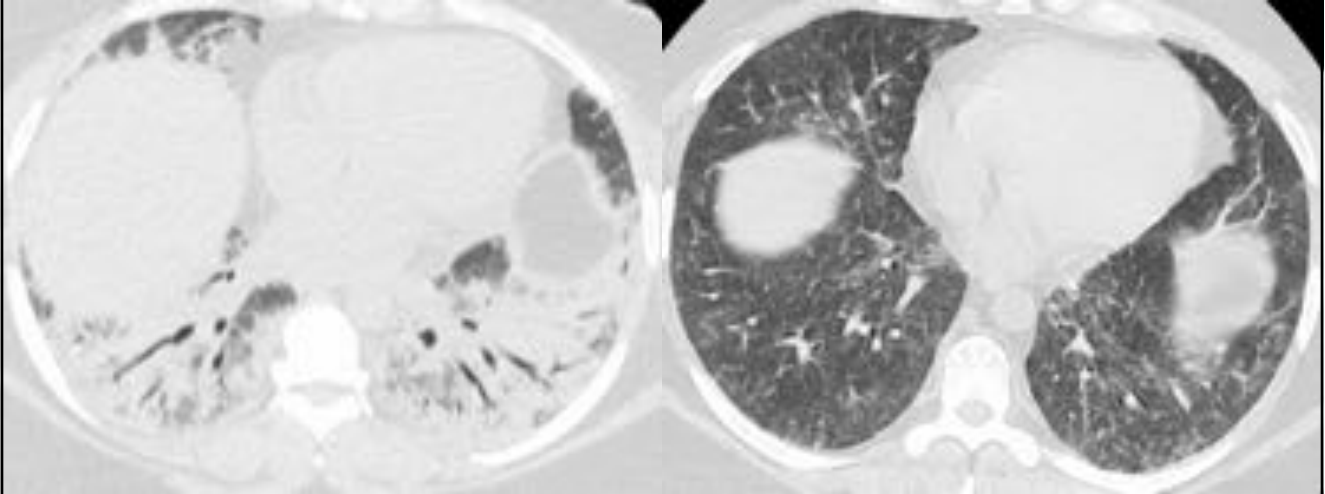


Two Points of Clarification:

Bronchial dilation \neq bronchiectasis

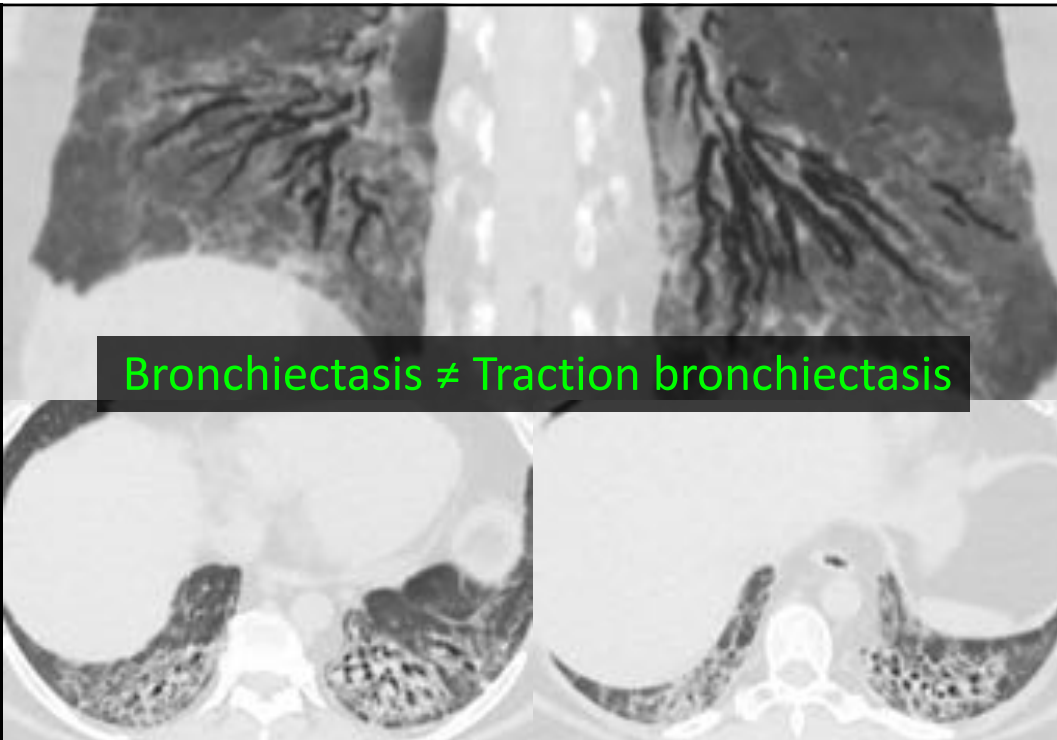
Bronchiectasis \neq Traction bronchiectasis

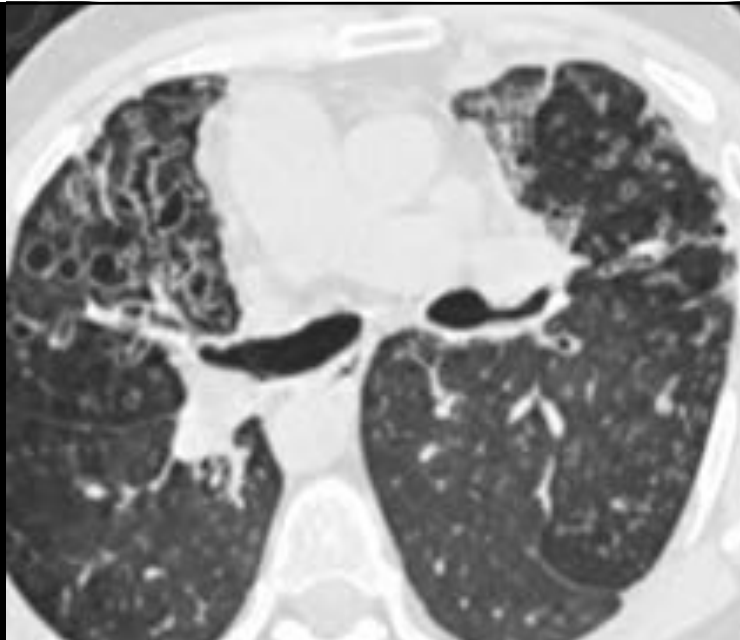
Bronchiectasis is Irreversible



Not bronchiectasis!
(bronchial dilation)

Bronchiectasis ≠ Traction bronchiectasis





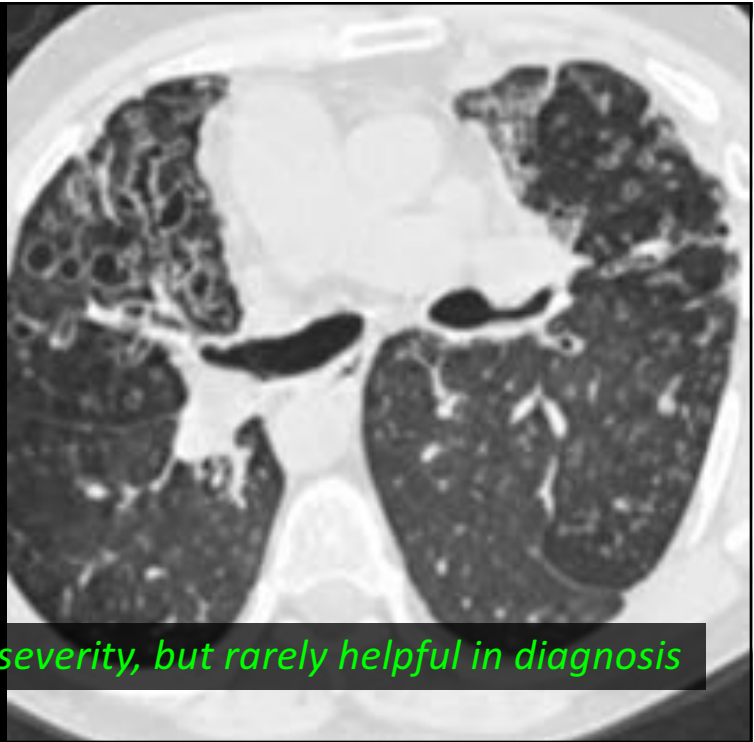
Bronchiectasis - Morphology

What imaging finding is most useful for making a specific diagnosis?

- Morphology of bronchiectasis
- Distribution of abnormalities
- Presence of lymphadenopathy
- Dilated bronchial arteries

Morphology:

- Tubular
- Varicoid
- Cystic



Morphology is indicative of severity, but rarely helpful in diagnosis

Bronchiectasis - Distribution

- Distribution of abnormalities can help narrow differential diagnosis
- Based on CT, confident diagnosis >50% of the time¹
 - HRCT + Clinical Information – Diagnosis >90%²

¹Cartier Y et al. Bronchiectasis: accuracy of high-resolution CT in the differentiation of specific diseases. *AJR Am J Roentgenol* 1999; 173:47-52

²McShane PJ et al. Bronchiectasis in a diverse US population: effects of ethnicity on etiology and sputum culture. *Chest* 2012; 142:159-167

Distribution-based approach

– Upper

- CF (may be diffuse)
- Sarcoid

– Mid/central

- ABPA
- MAC

– Lower

- Chronic infection
- Conditions predisposing to chronic infection



Distribution-based approach

– Upper

- CF (may be diffuse)
- Sarcoid

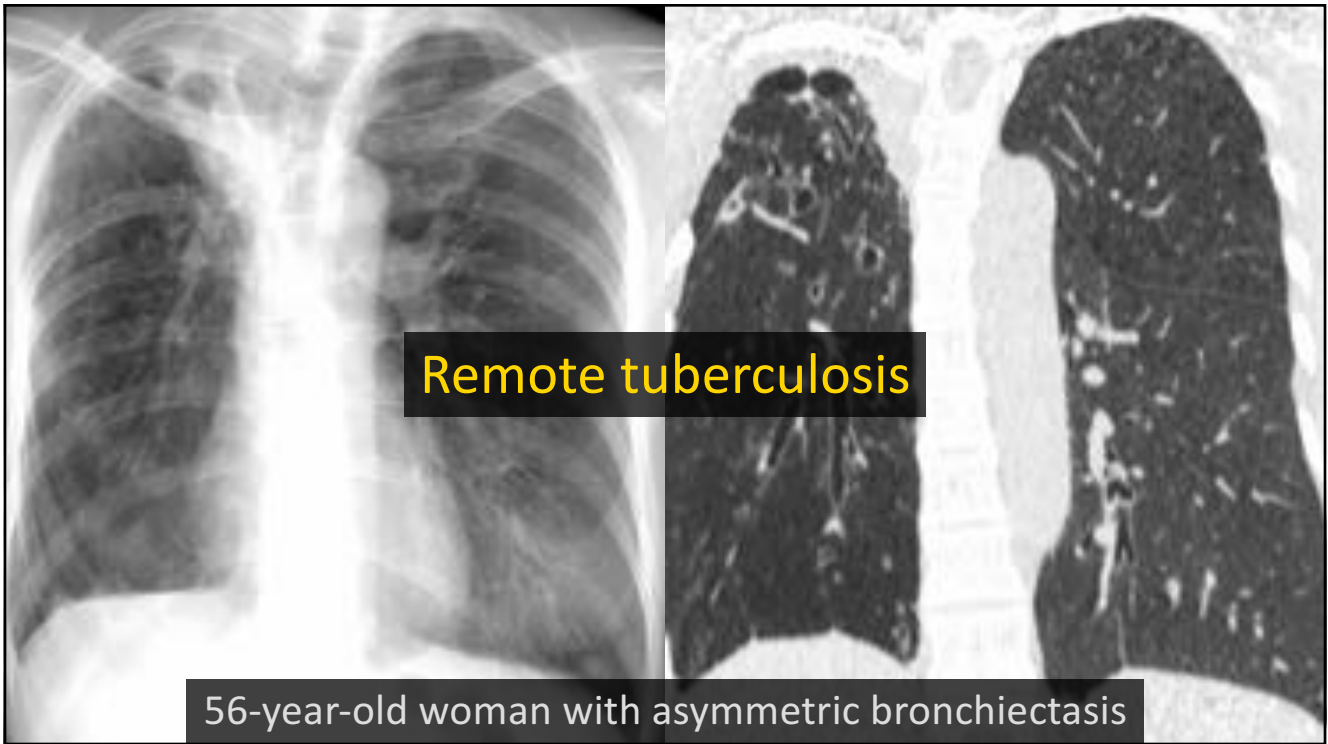
Pneumonia can cause asymmetric bronchiectasis anywhere

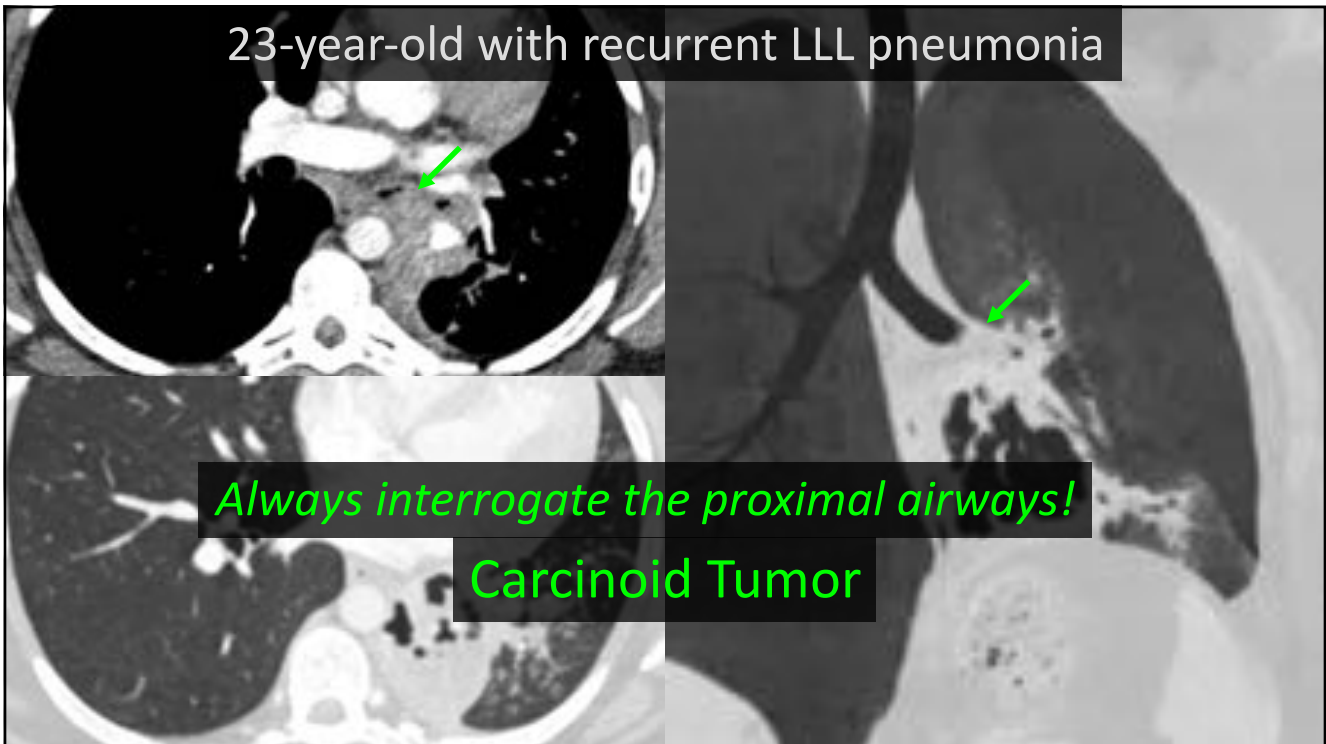
- ABPA
- MAC

– Lower

- Chronic infection
- Conditions predisposing to chronic infection







– Upper

- CF (may be diffuse)
- Sarcoid

– Mid/central

- ABPA
- MAC

– Lower

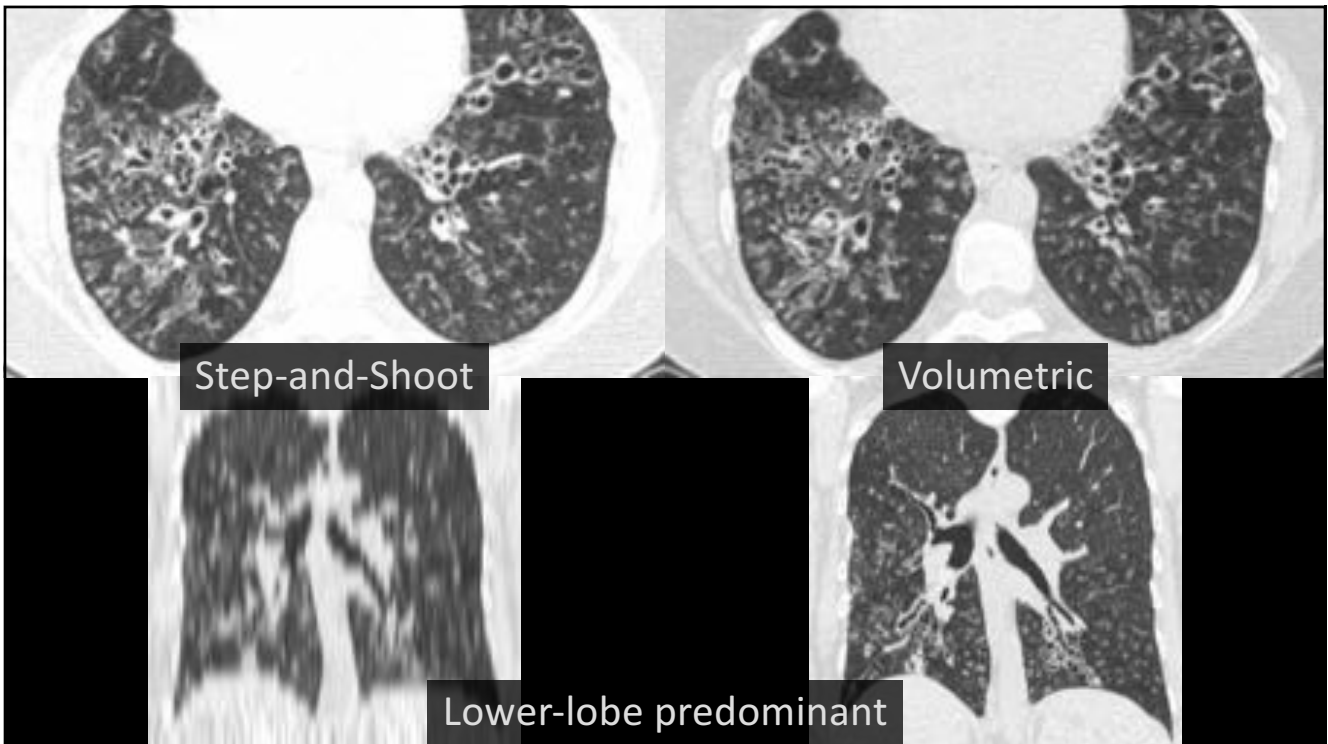
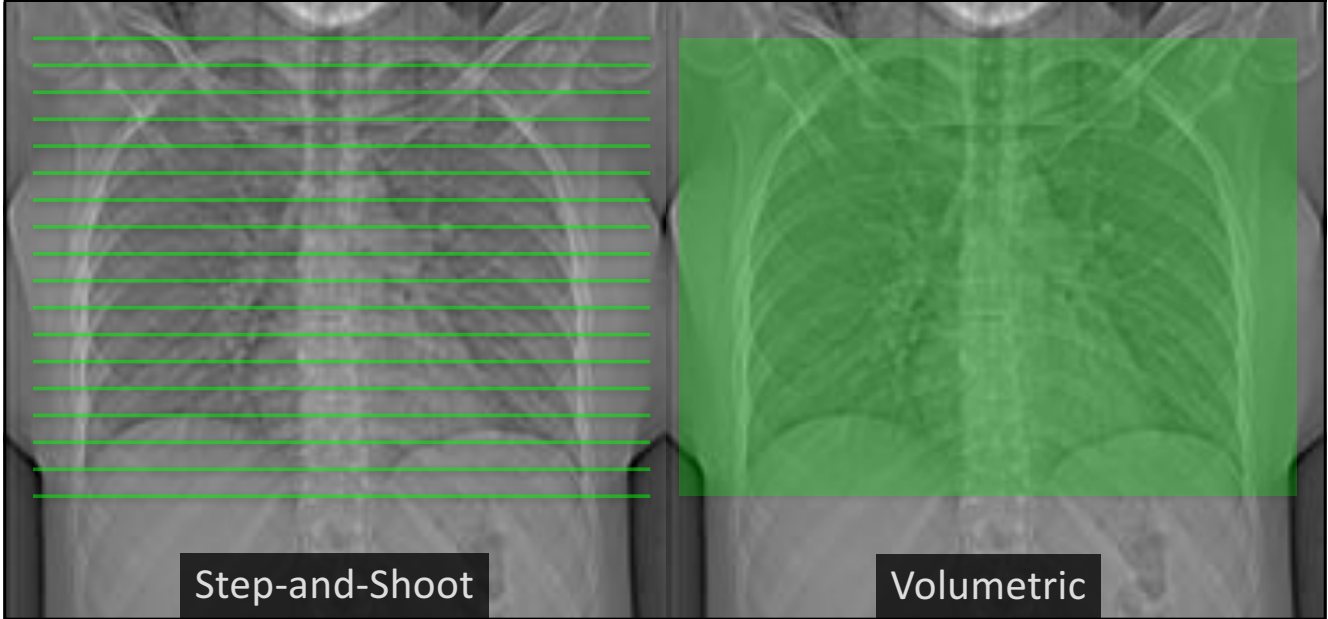
- Chronic infection
- Conditions predisposing to chronic infection

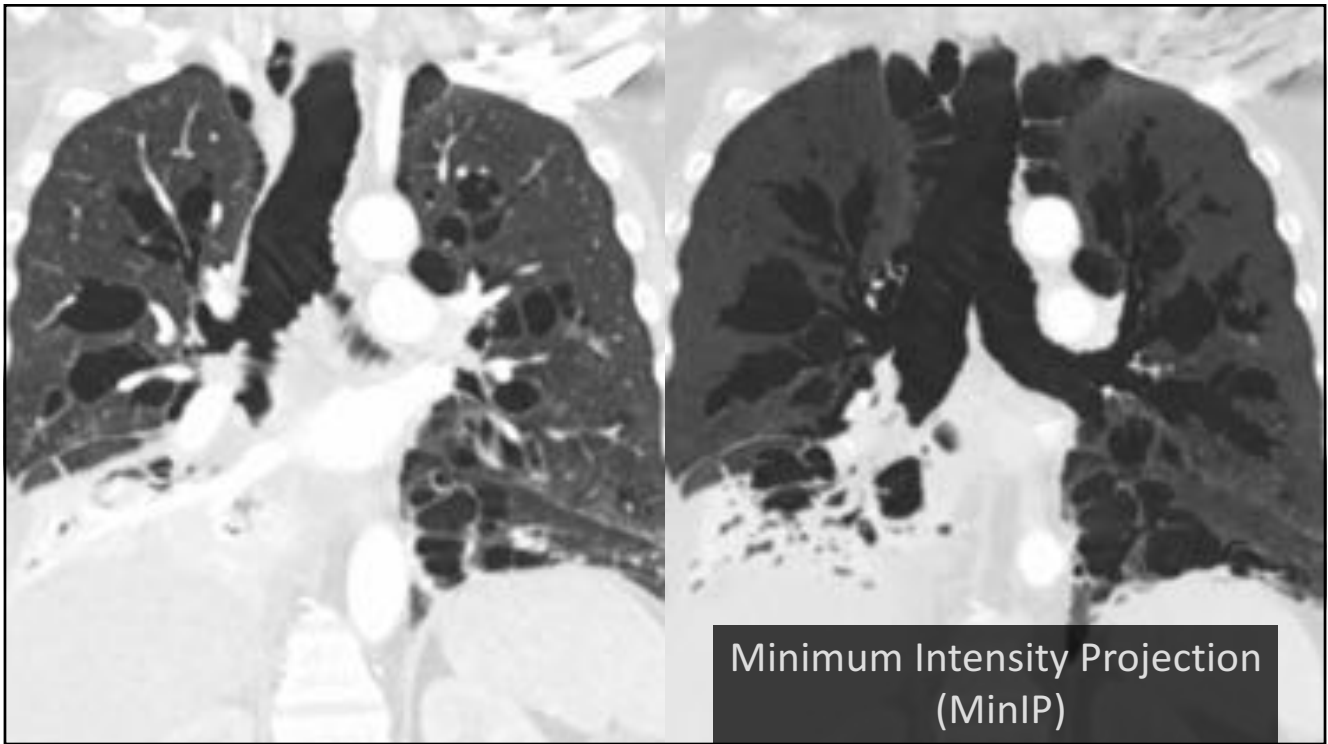
– Asymmetric - Infection



Appropriate CT Technique Will Help With Distribution

CT Technique

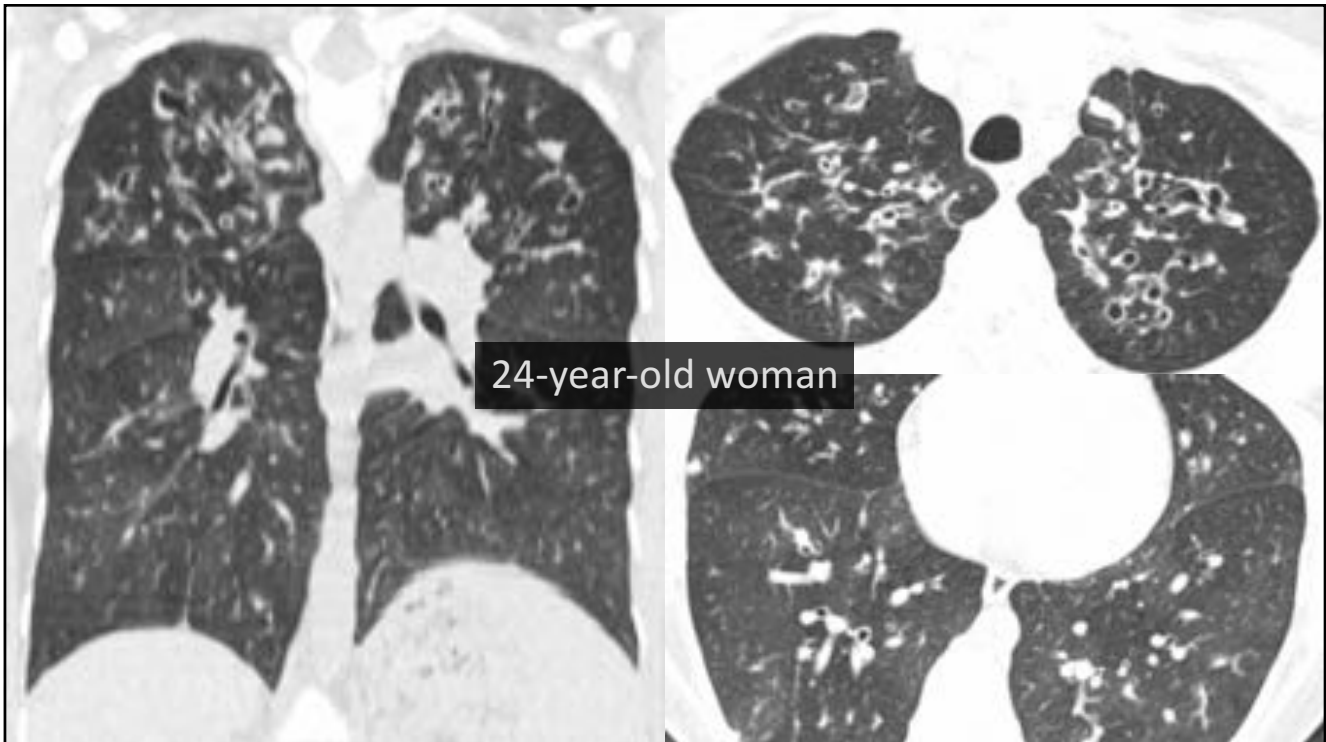




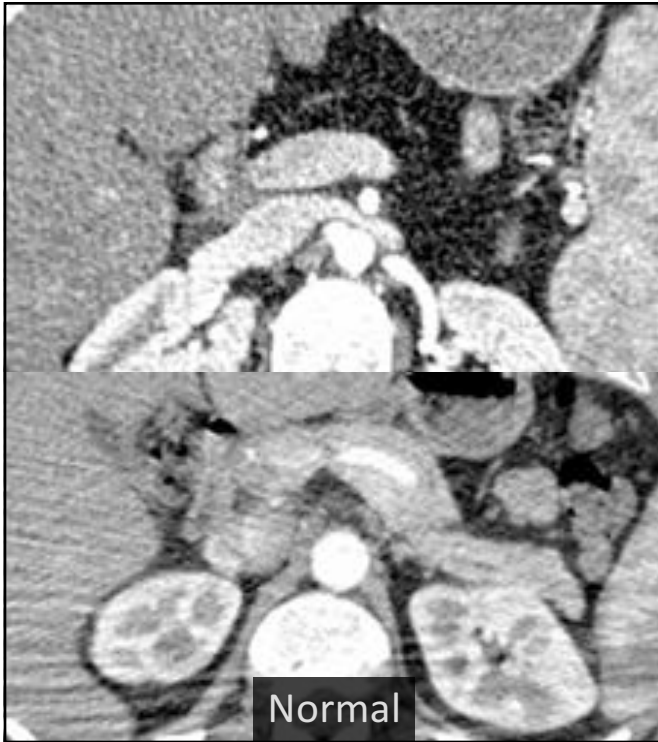
– Upper

- CF (may be diffuse)
- Sarcoid



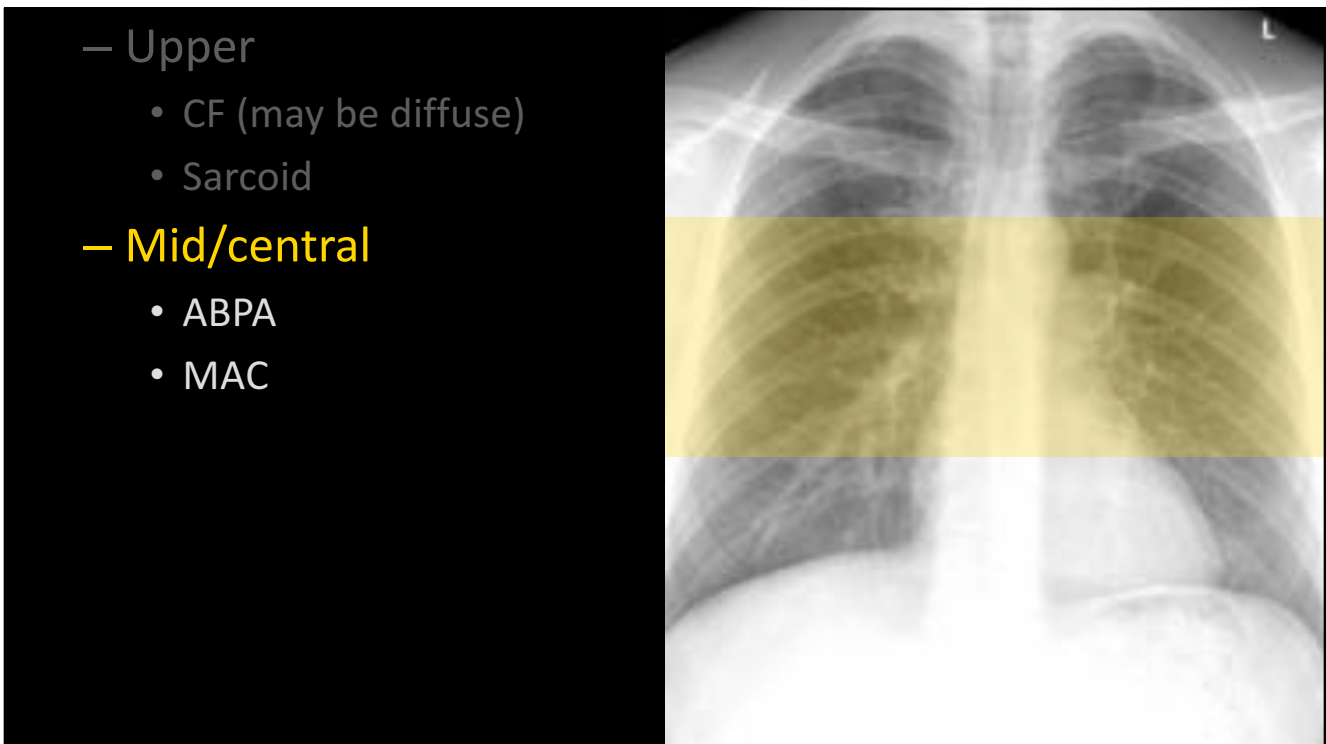
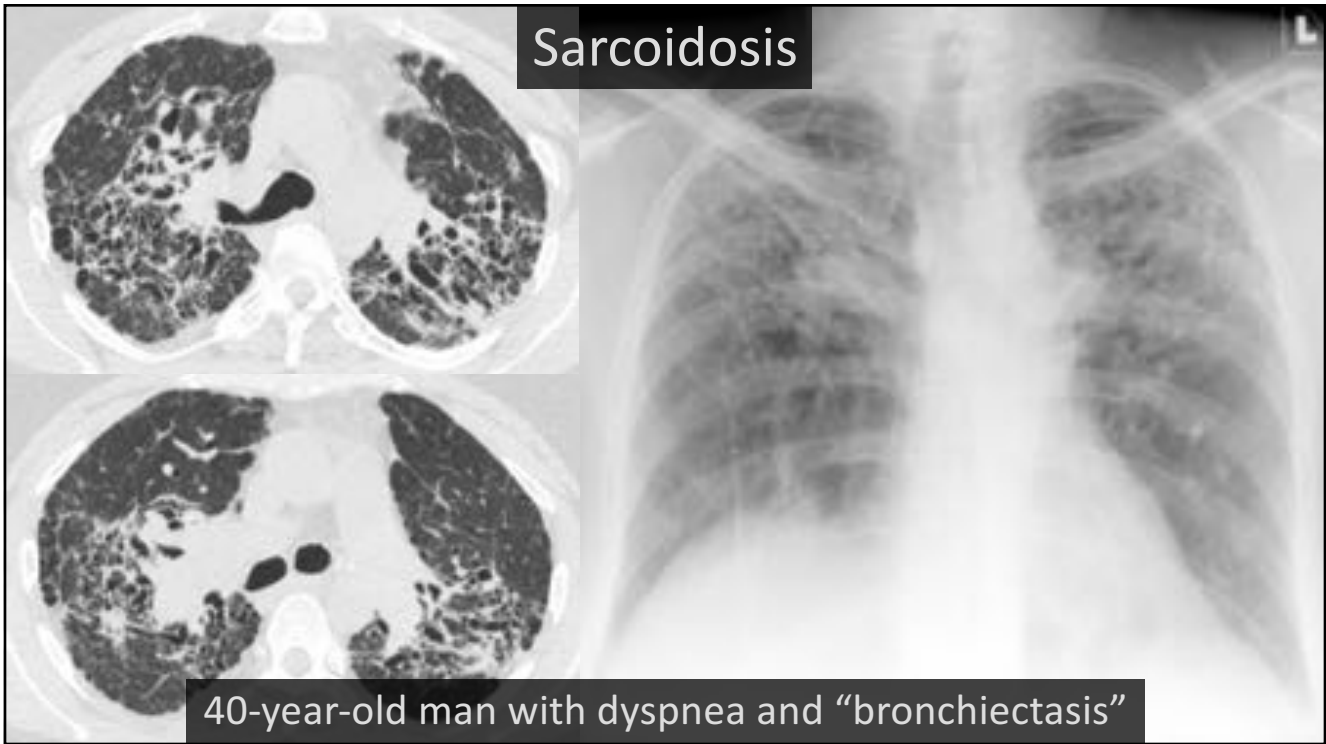


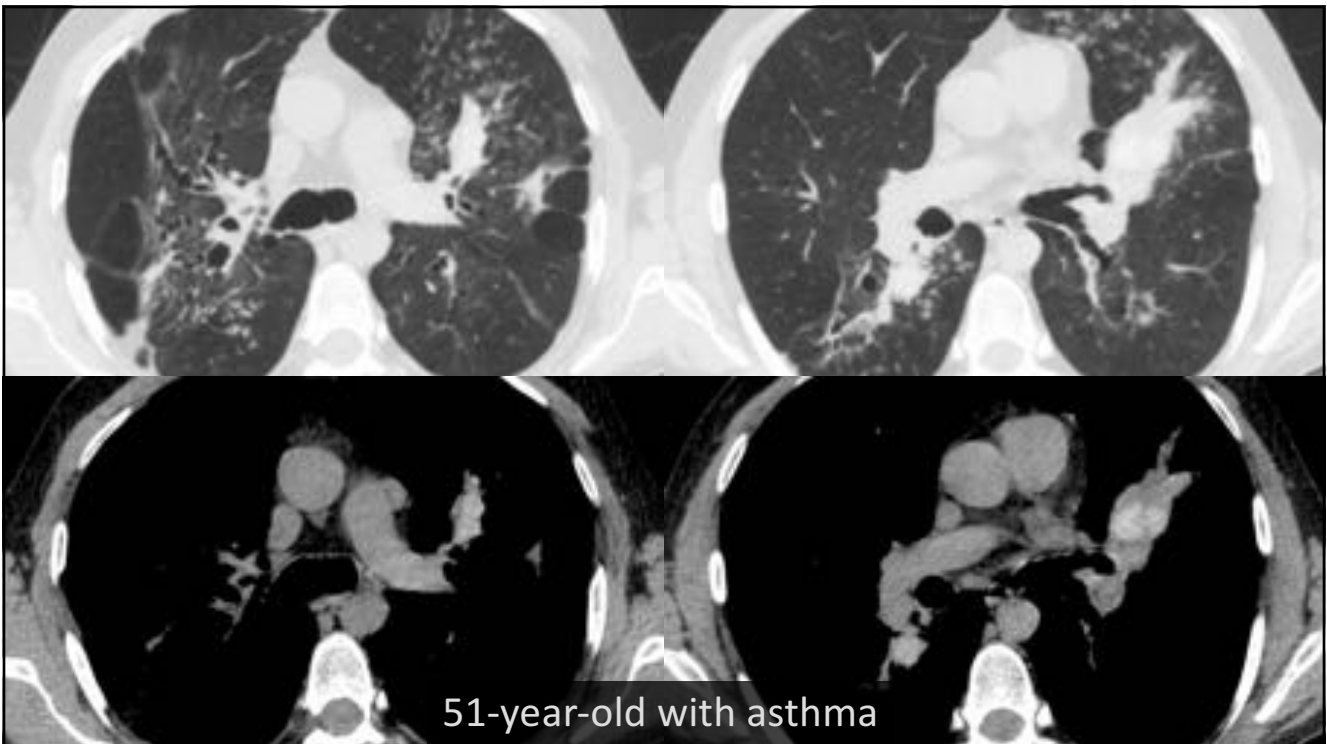
- Cystic Fibrosis
 - Upper lobe predominant or diffuse
 - bronchial wall thickening
 - Nodular opacities → mucoid impaction
 - Mosaic attenuation → air trapping



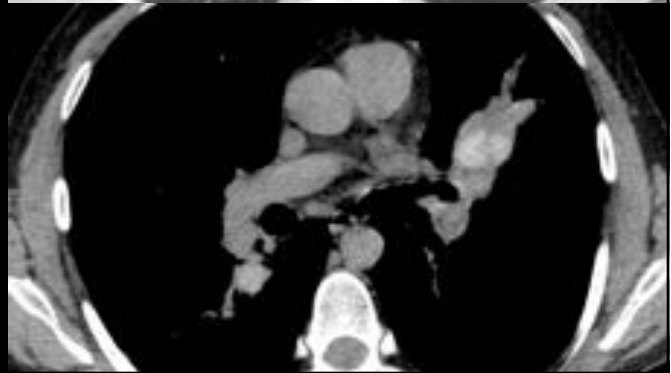
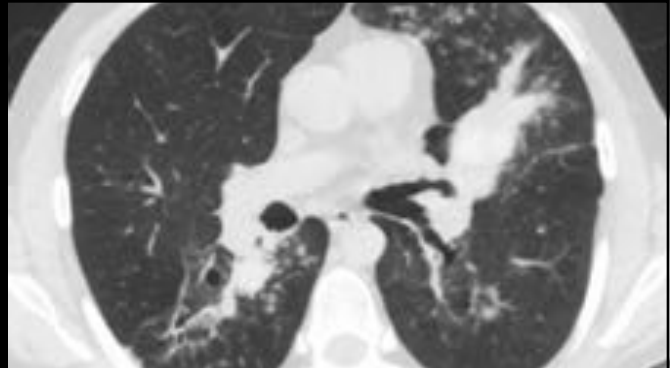
- Cystic Fibrosis
 - Abnormal sweat chloride
 - Lung infection
 - Pancreatic insufficiency







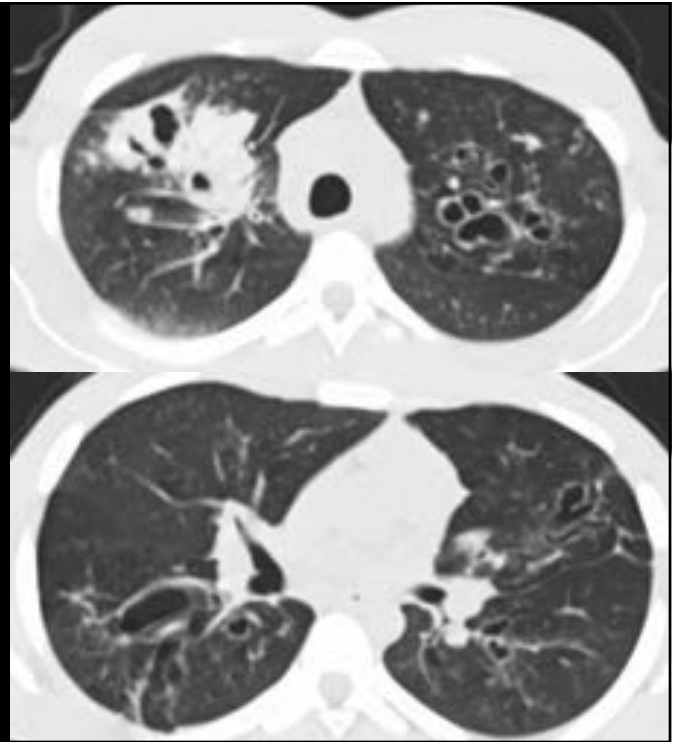
- Allergic Bronchopulmonary Aspergillosis
 - Central bronchiectasis (close to hilum)
 - Mucus impaction
 - HAM (high attenuation mucus)
 - 1/3 of patients → but specific



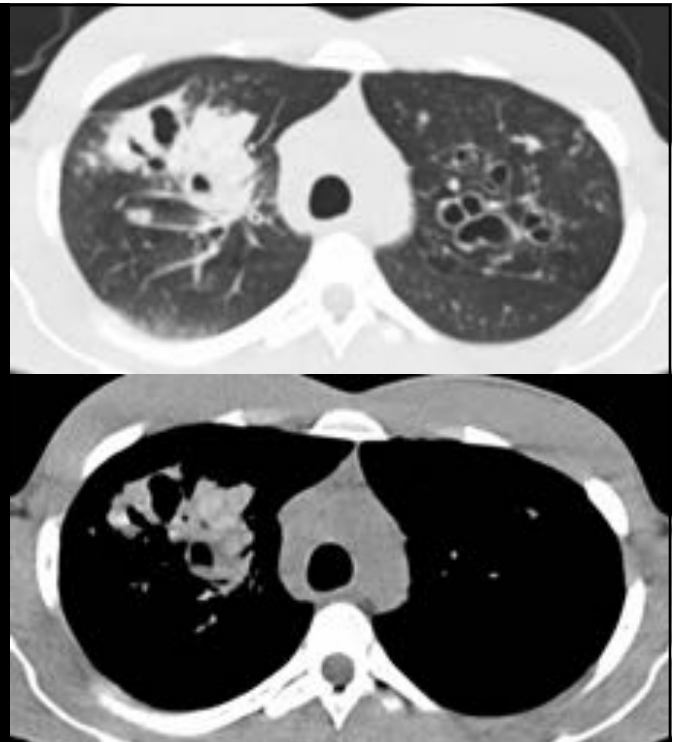
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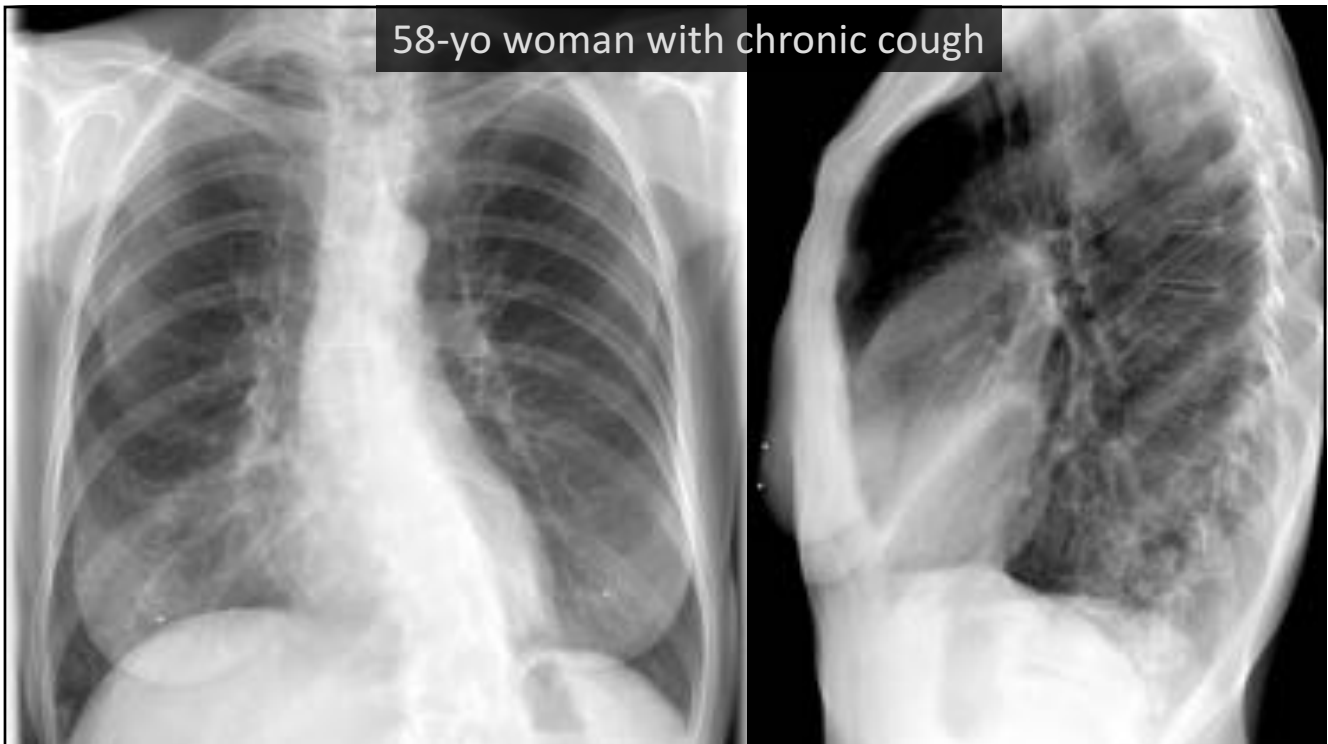
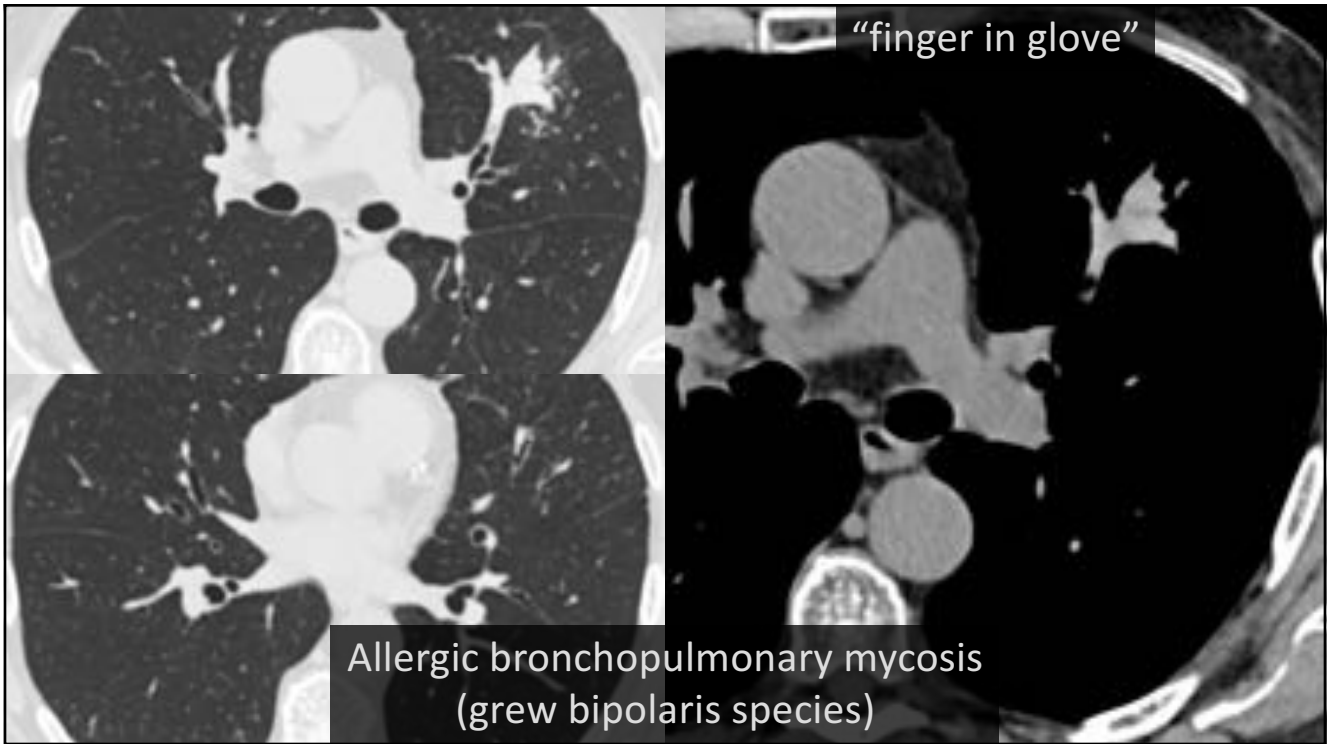


- Allergic Bronchopulmonary Aspergillosis
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 - HAM (high attenuation mucus)
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- Allergic Bronchopulmonary Aspergillosis
 - Central bronchiectasis (close to hilum)
 - Mucus impaction
 - HAM (high attenuation mucus)
 - 1/3 of patients → but specific





58-yo woman with chronic cough



The image shows a frontal chest X-ray of a woman. The lungs appear clear with no obvious infiltrates, masses, or pleural effusions. The heart size is within normal limits, and the diaphragm is well-defined.

Well

THINK LIKE A DOCTOR

Think Like a Doctor: A Cough That Won't Quit

BY LISA SAMBER, M.D. | JUNE 6, 2013 | 10:37 AM

The Challenge: Can you figure out what is wrong with a previously healthy 70-year-old woman with a cough that just won't quit?

Every month the *Diagnosis* column of *The New York Times Magazine* asks *Well* readers to take on a difficult case and offer their solutions to a diagnostic riddle. This month's case revolves around a lively, elderly woman — a patient of mine — who suddenly develops a cough that persists and worsens over the course of several months. I'll provide you with the notes, labs and imaging that amassed over the half a year it took to come up with an answer.

The first reader to provide the correct diagnosis gets a signed copy of my book "Every Patient Tells a Story" and the satisfaction of solving a case that had me pulling my hair out for weeks.

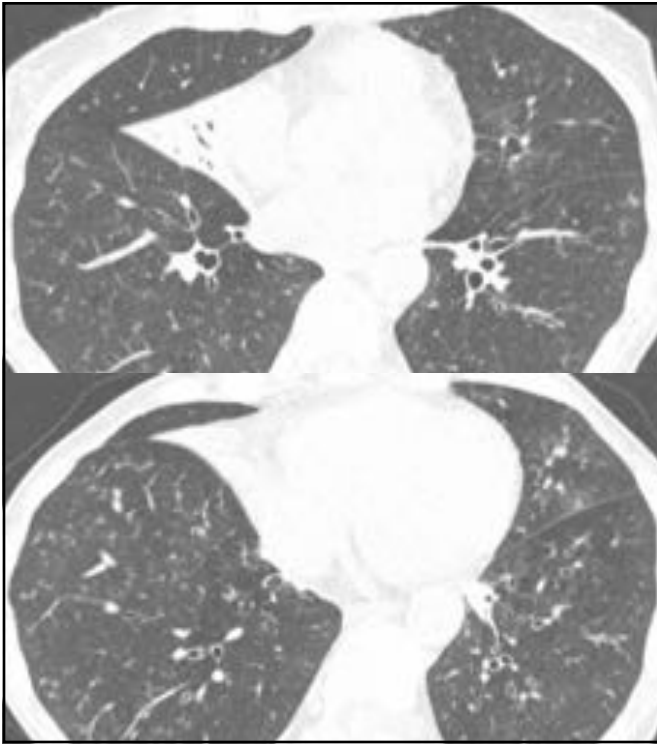
THE PATIENT'S STORY:
"Dr. Sanders, I'm still sick." The slender 70-year-old

<https://well.blogs.nytimes.com/2013/06/06/think-like-a-doctor-a-cough-that-wont-quit/?ref=health>

58-yo woman with chronic cough



The image displays three CT scan slices of the chest. The top-left and bottom-left slices are axial views showing the lungs, heart, and mediastinum. The right lung shows some subtle ground-glass opacities and small nodules. The bottom-right slice is a coronal view showing the lung fields and the central airways, with similar findings of ground-glass opacities and nodules.



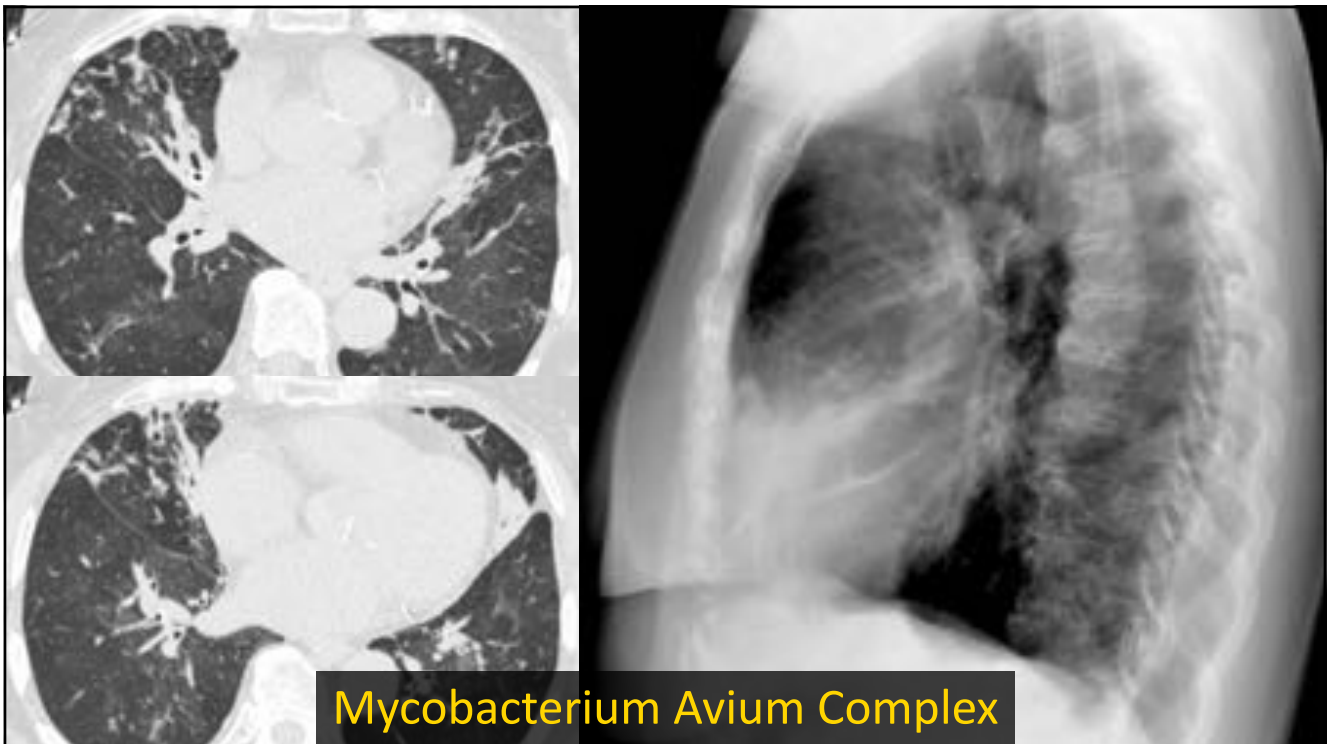
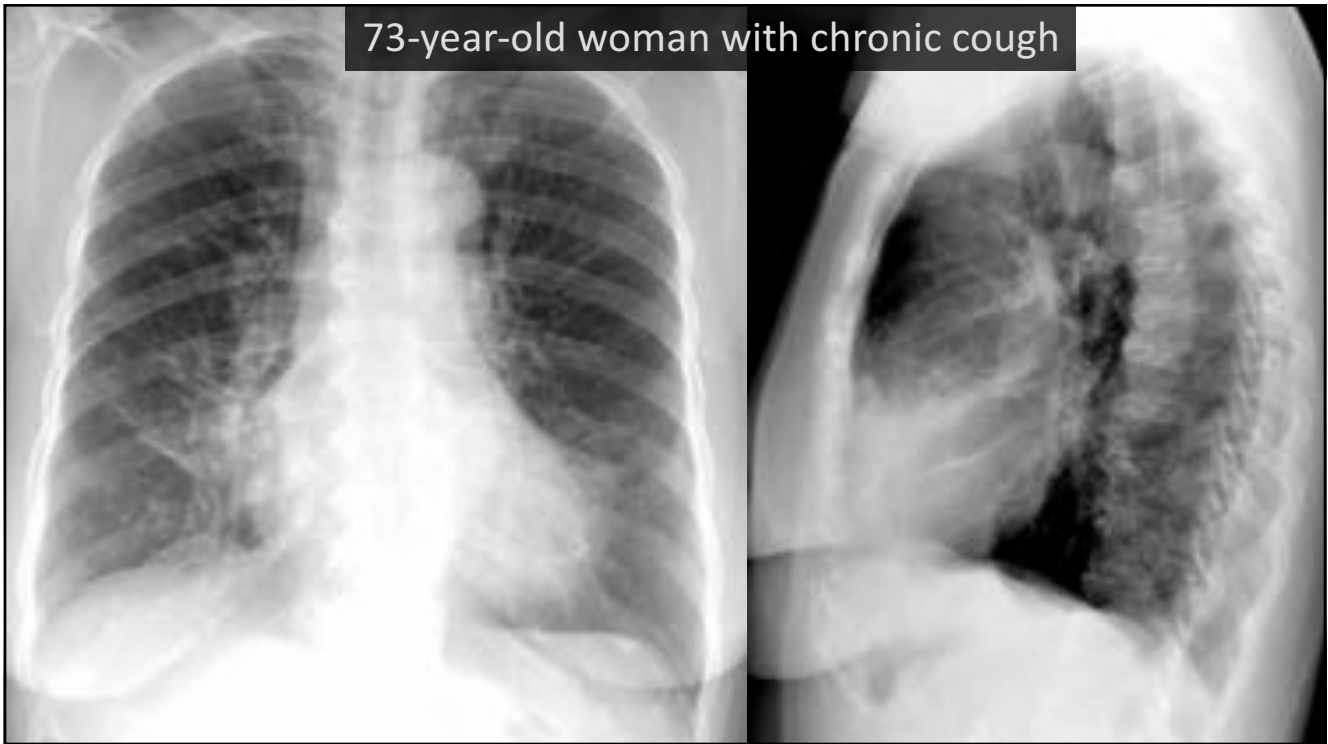
Atypical mycobacterial infection (*M. Avium* Complex)

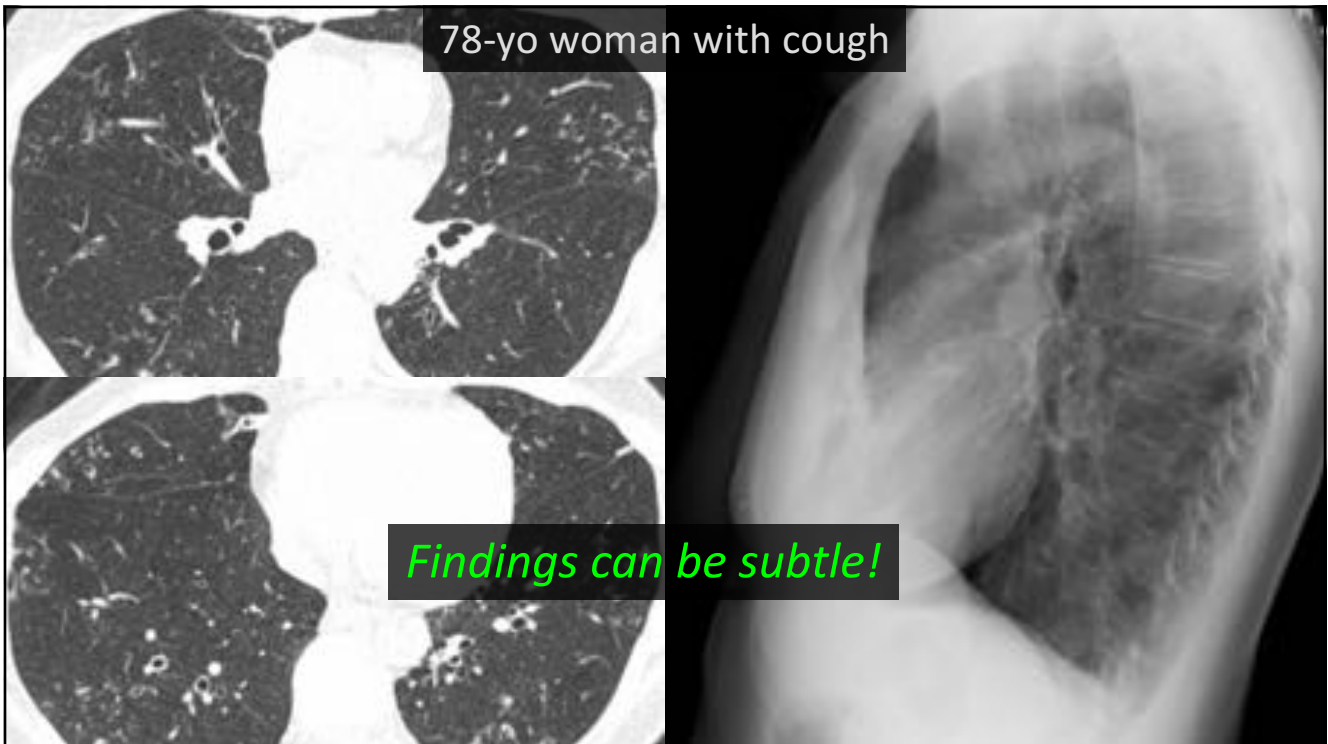
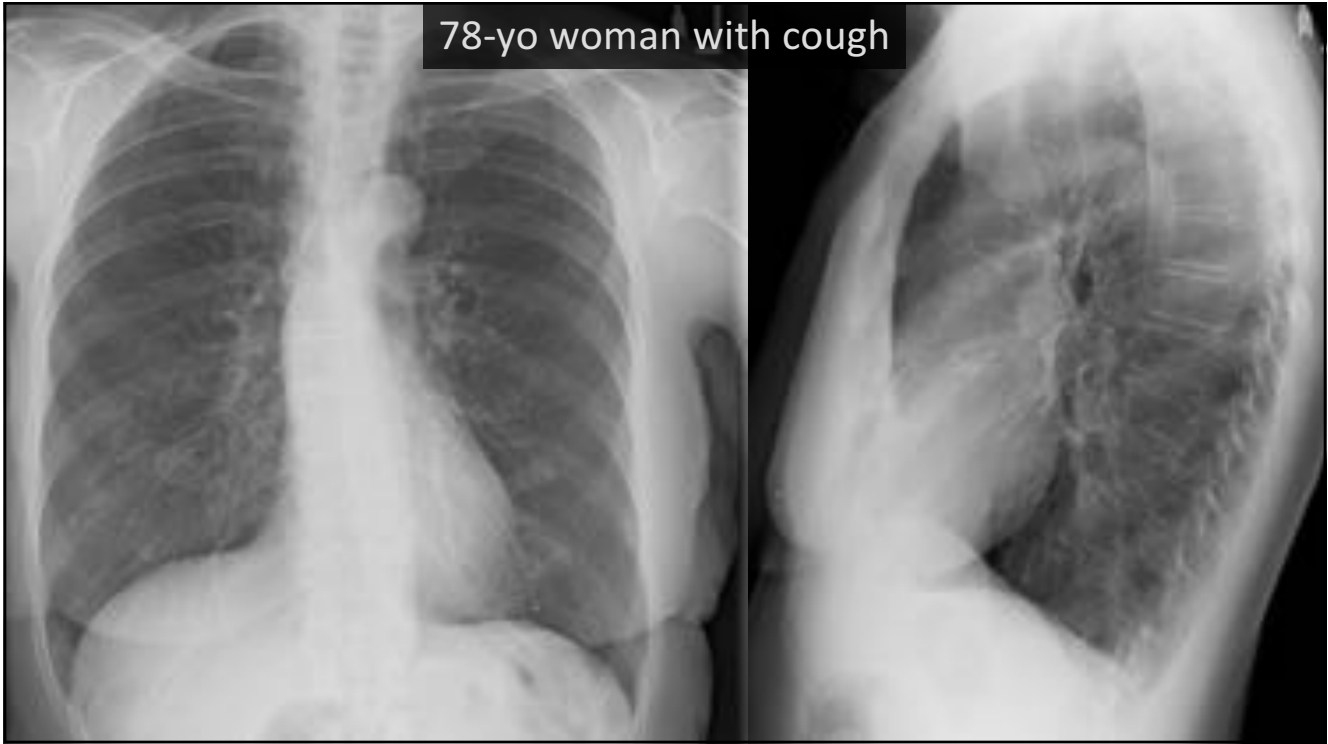
- (non-classic form)
- Middle lobe/lingula
- Bronchiectasis
- Mucus plugging
- Tree-in-bud



Atypical mycobacterial infection (*M. Avium* Complex)

- Phenotype:
 - Thin
 - Older women
 - Scoliosis
 - Pectus excavatum



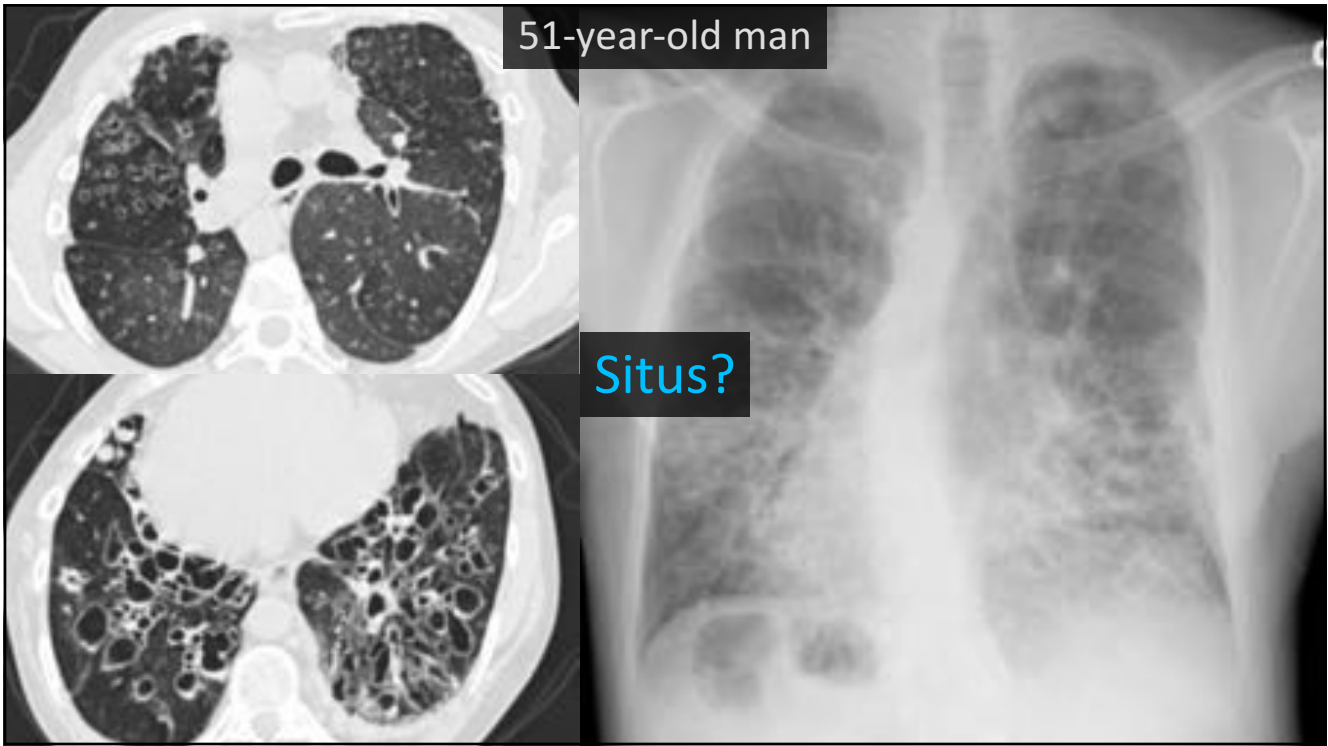


- Upper
 - CF (may be diffuse)
 - Sarcoid
- Mid/central
 - ABPA
 - MAC
- Lower
 - Chronic infection
 - Conditions predisposing to chronic infection

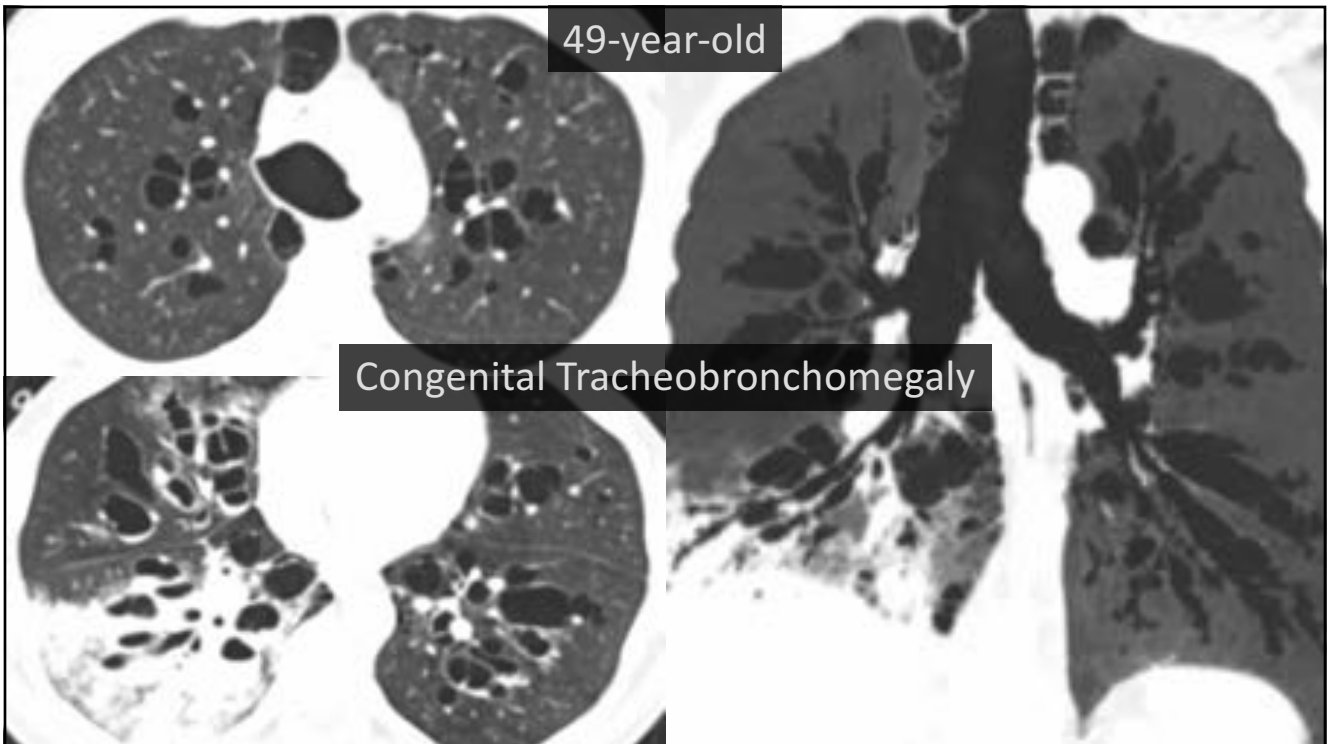
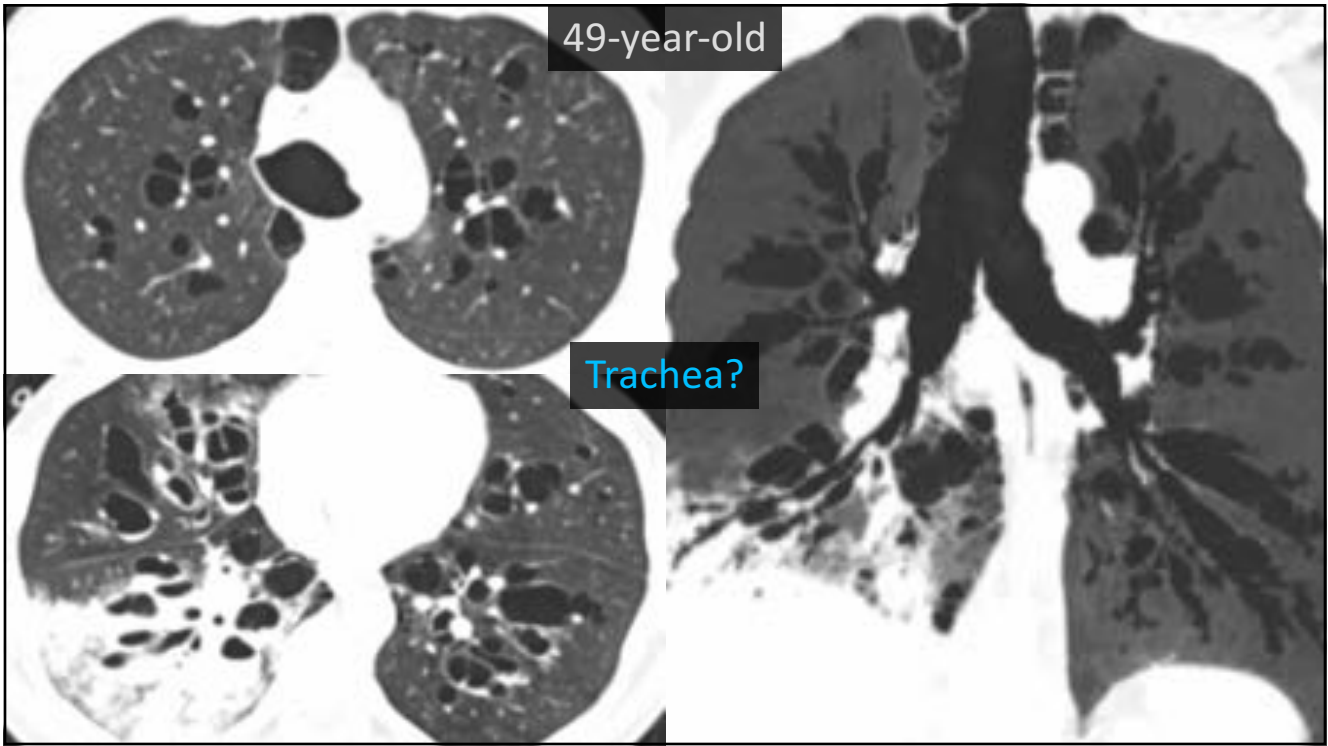


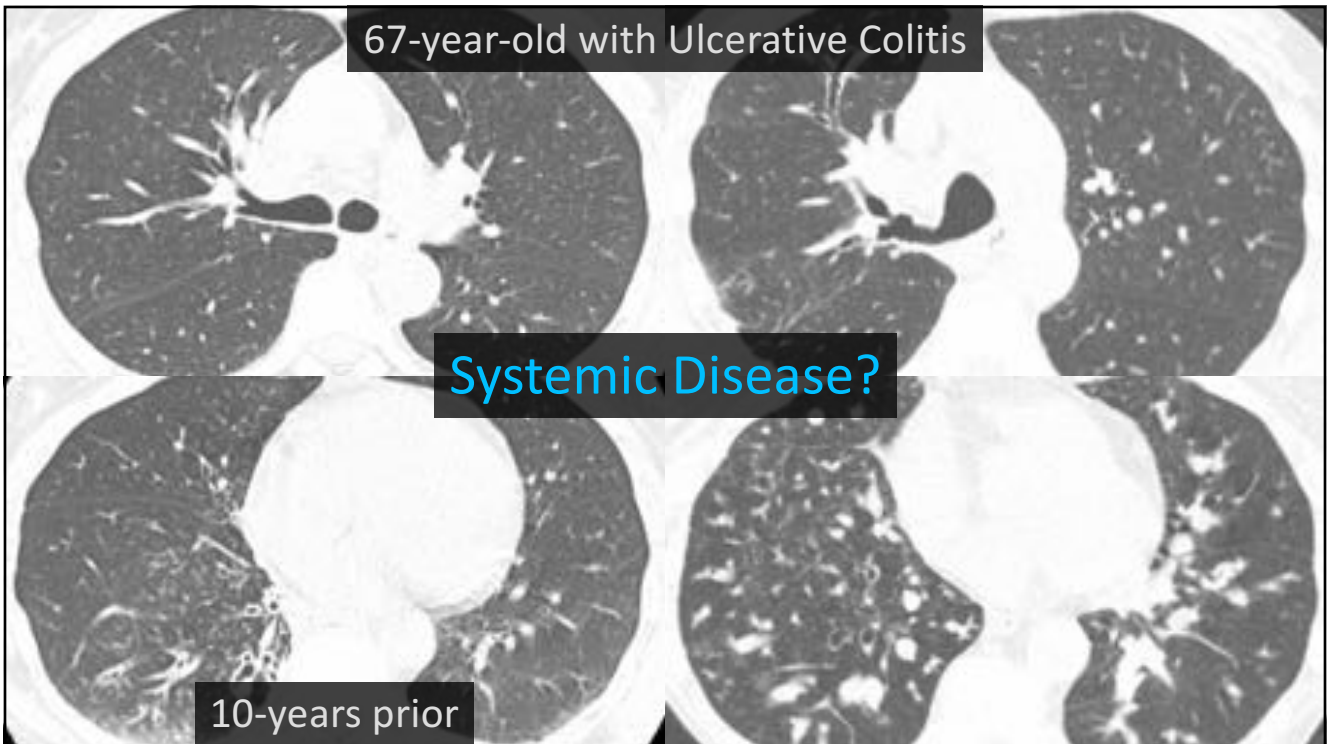
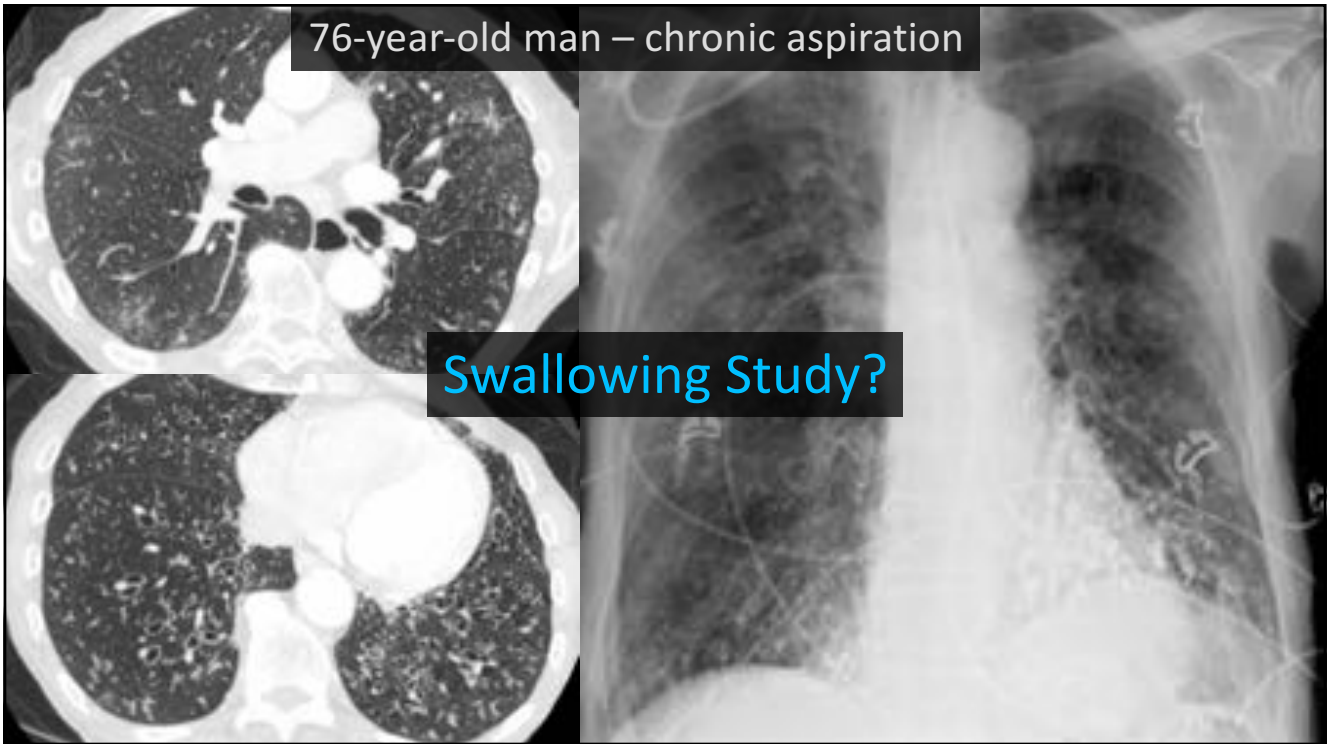
Lower-Lobe Predominant Bronchiectasis

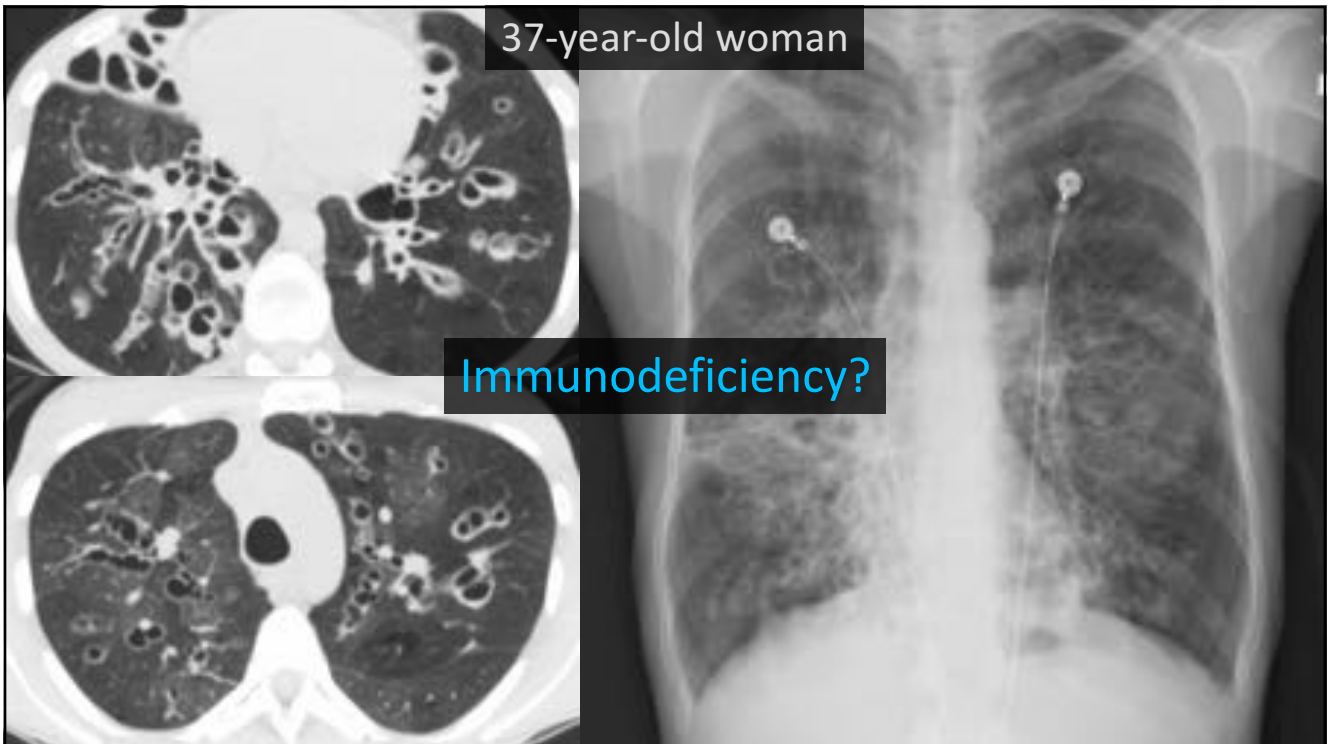
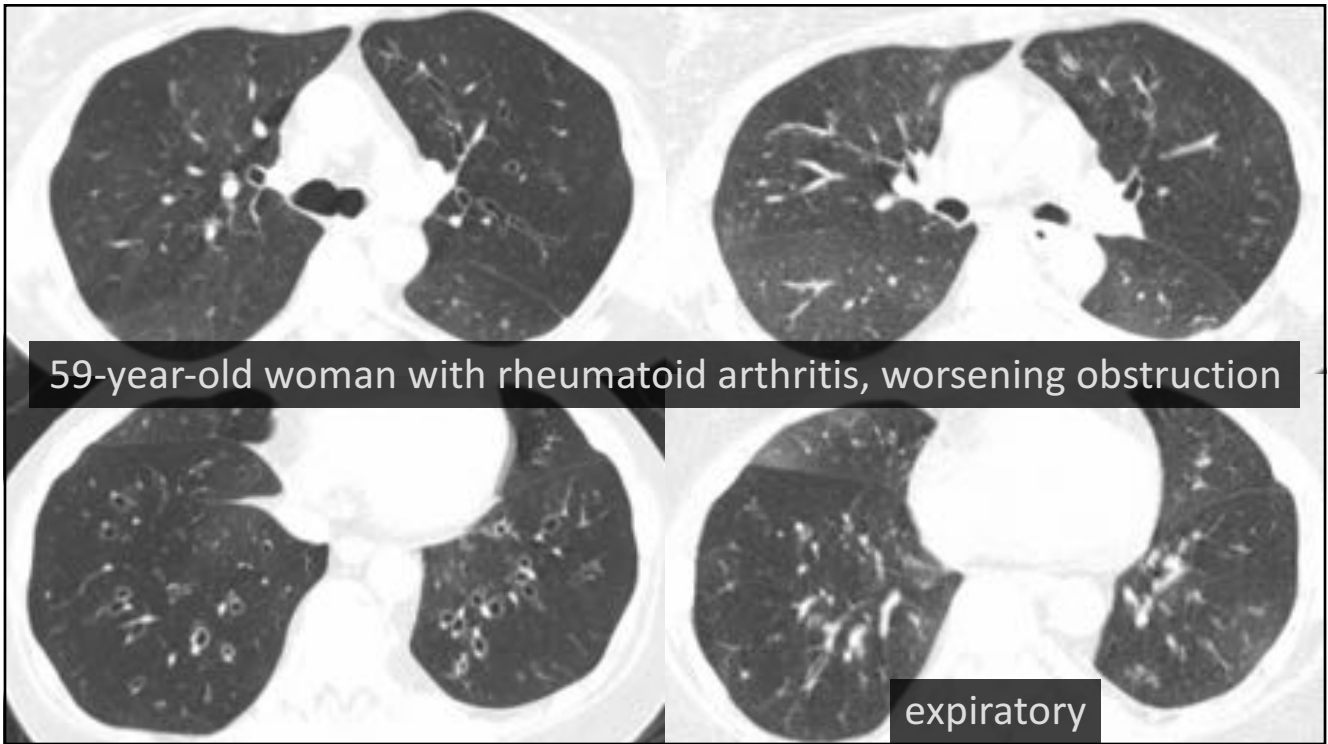
- Immotile cilia
- Congenital tracheobronchomegaly
- Williams-Campbell Syndrome
- Immunodeficiency
 - CVID
 - Hypogammaglobulinemia
 - IgA deficiency
 - HIV
- Recurrent Aspiration
- Alpha-1 Antitrypsin
- Inflammatory bowel disease
- Constrictive bronchiolitis
- Idiopathic bronchiectasis

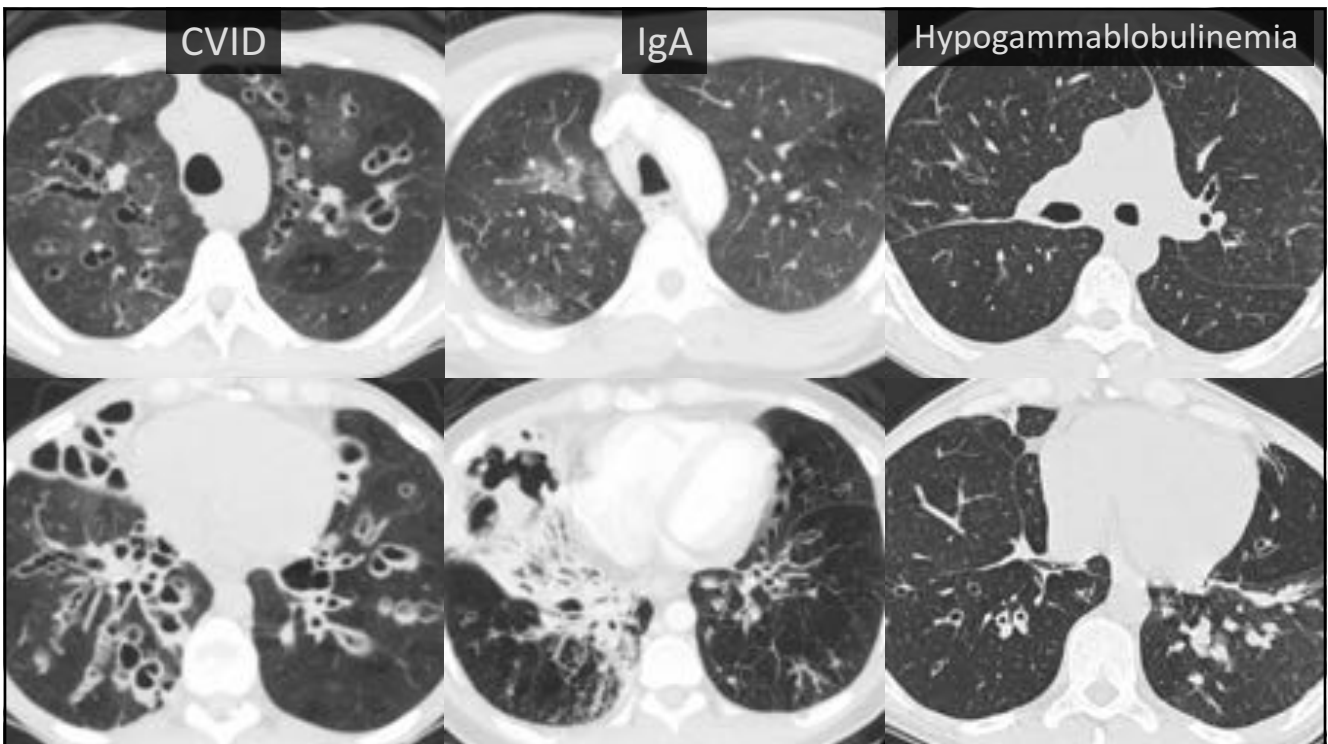
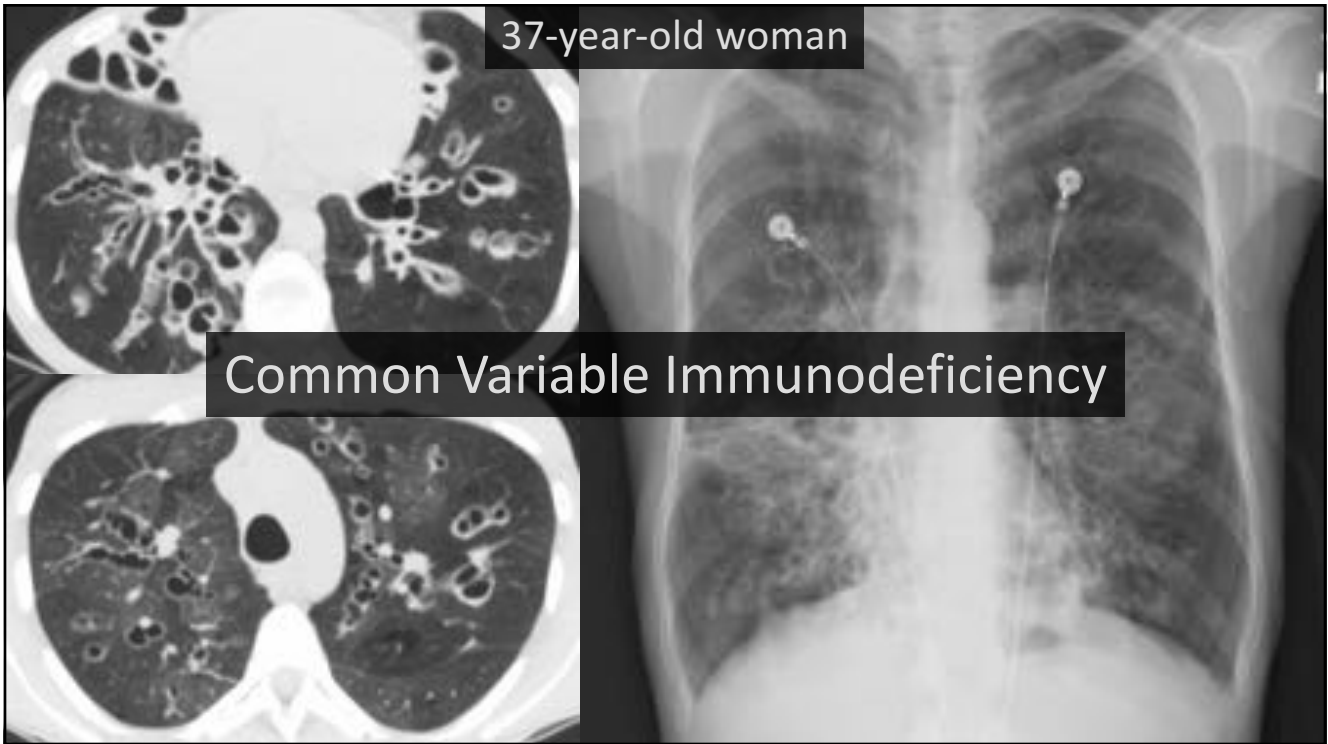














– Upper

- CF (may be diffuse)
- Sarcoid

– Mid/central

- ABPA
- MAC

– Lower

- Chronic infection
- Conditions predisposing to chronic infection

– Asymmetric - Infection



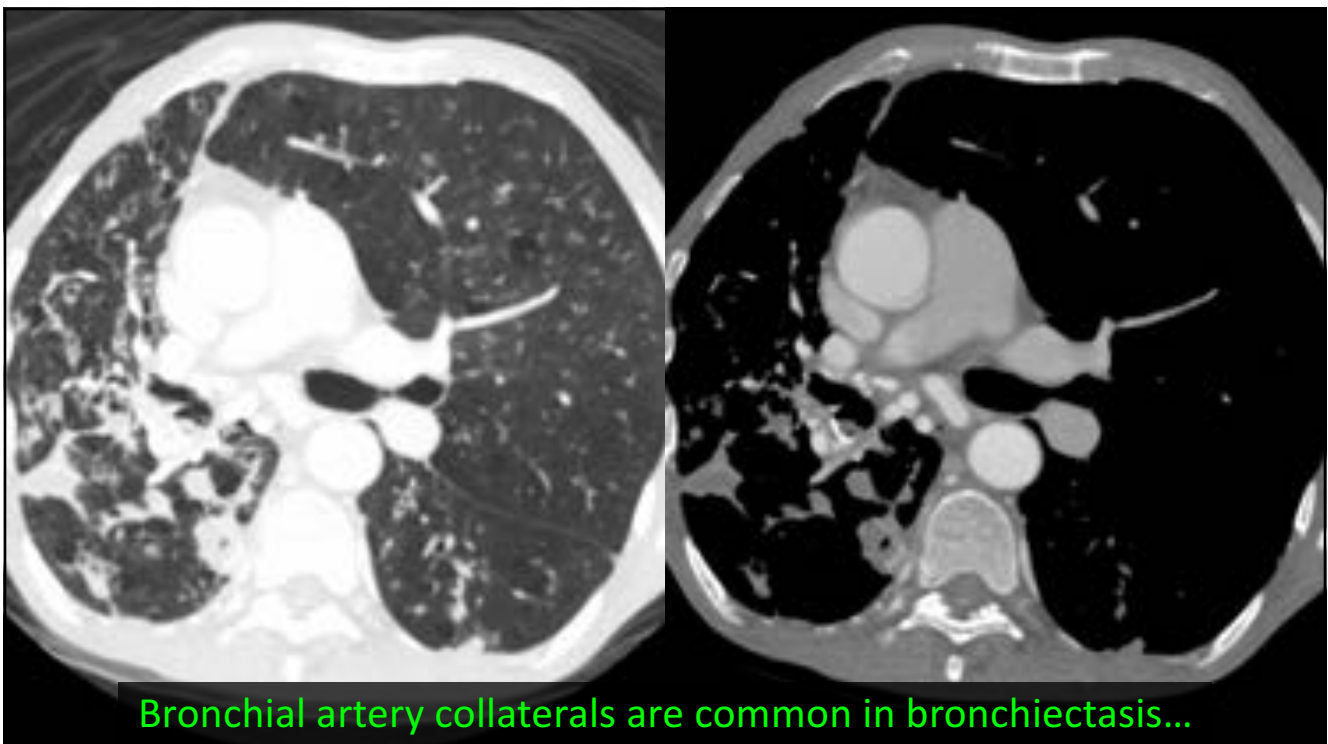
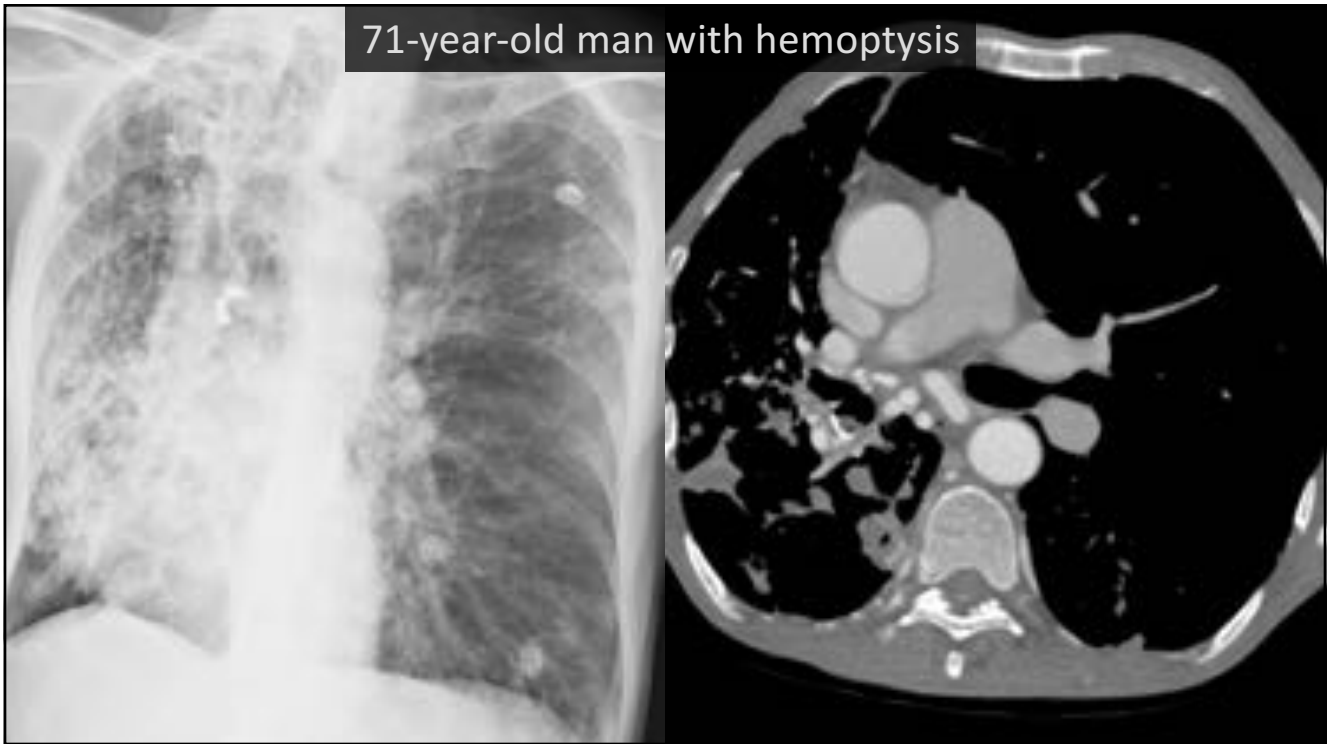
Lower-Lobe Predominant Bronchiectasis

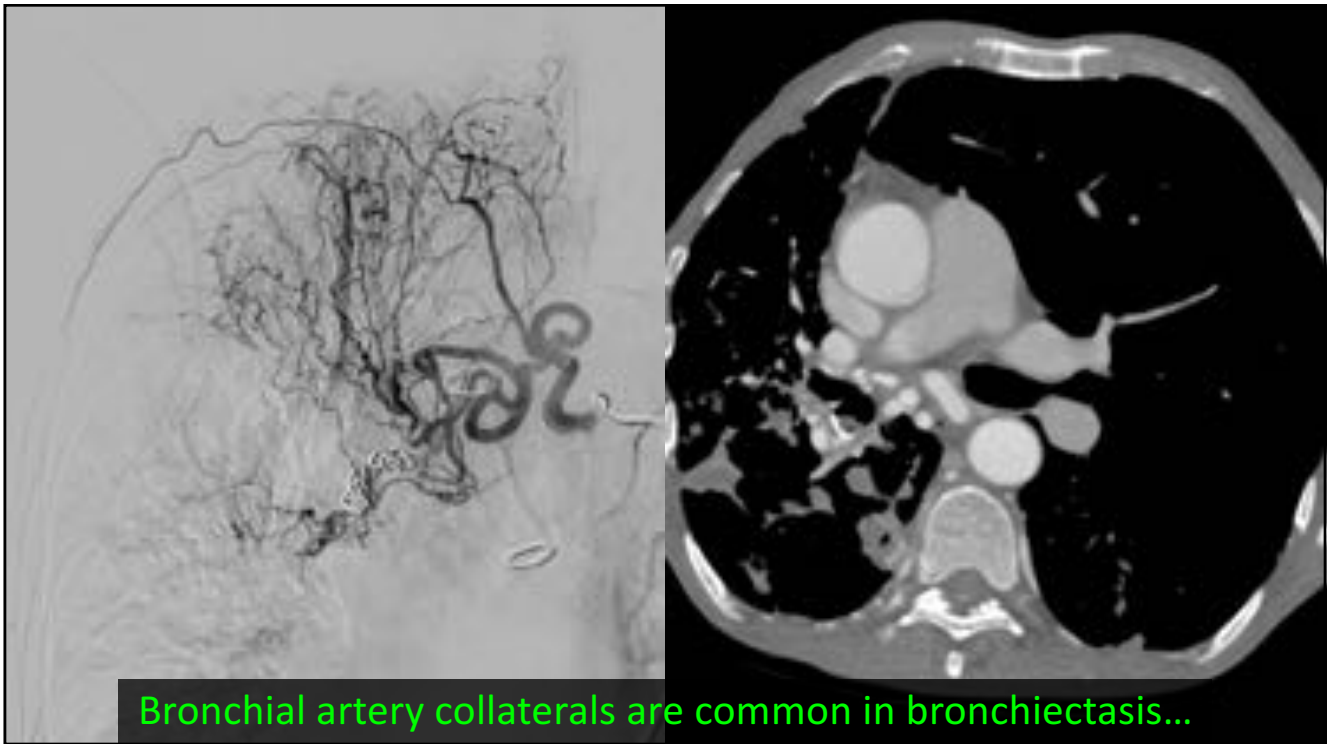
- Immotile cilia
- Congenital tracheobronchomegaly
- Williams-Campbell Syndrome
- Immunodeficiency
 - CVID
 - Hypogammaglobulinemia
 - IgA deficiency
 - HIV
- Recurrent Aspiration
- Alpha-1 Antitrypsin
- Inflammatory bowel disease
- Constrictive bronchiolitis
- Idiopathic bronchiectasis
- Situs?
- Trachea?
- Immune status?
- Alpha-1 antitrypsin?
- Aspiration?
- Inflammatory bowel disease?
- Connective tissue disease?

Bronchial Artery Hypertrophy

Hemoptysis

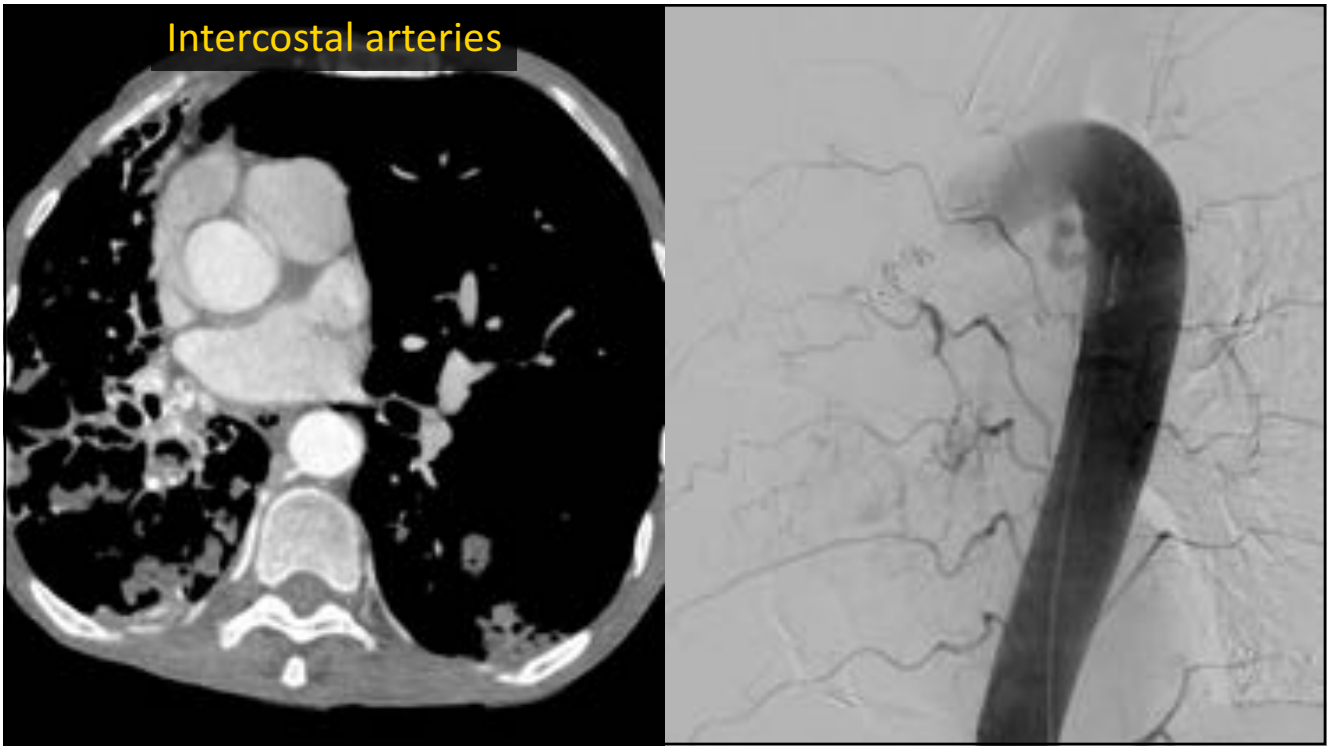
False-positive Pulmonary Embolism CT



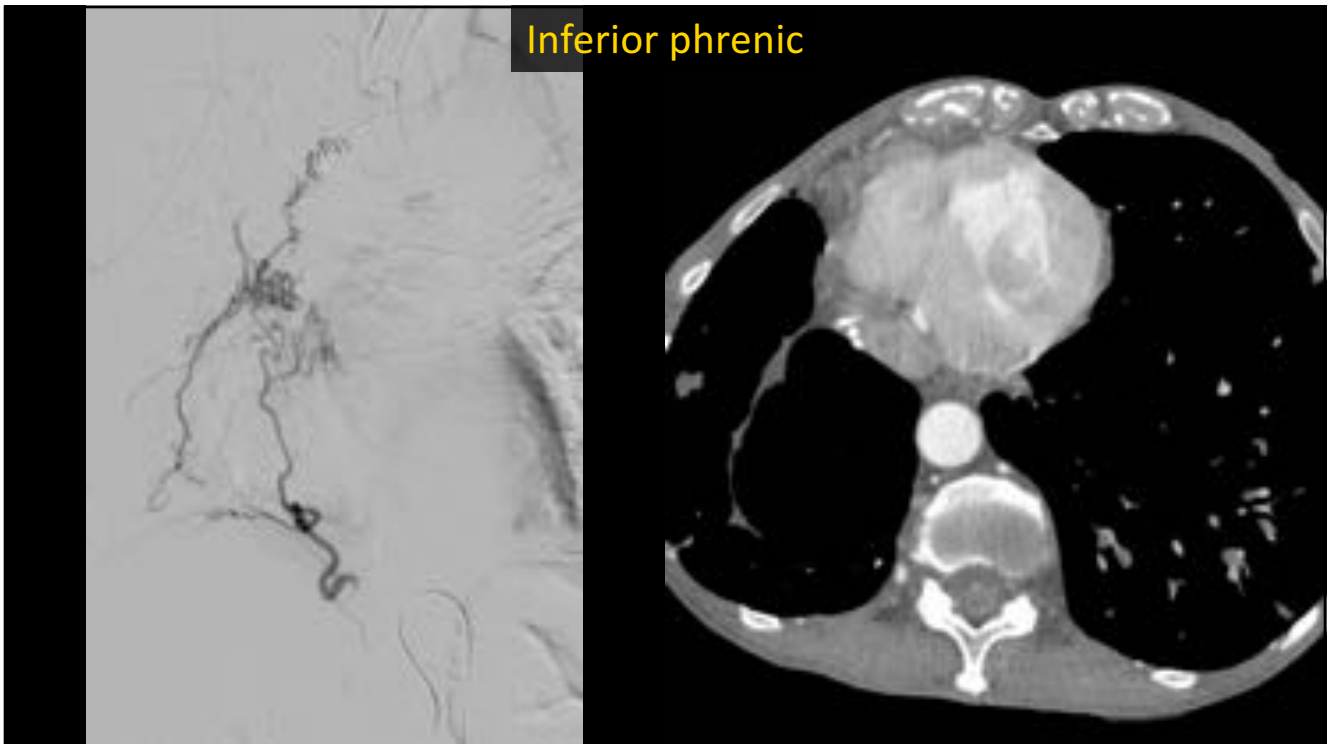


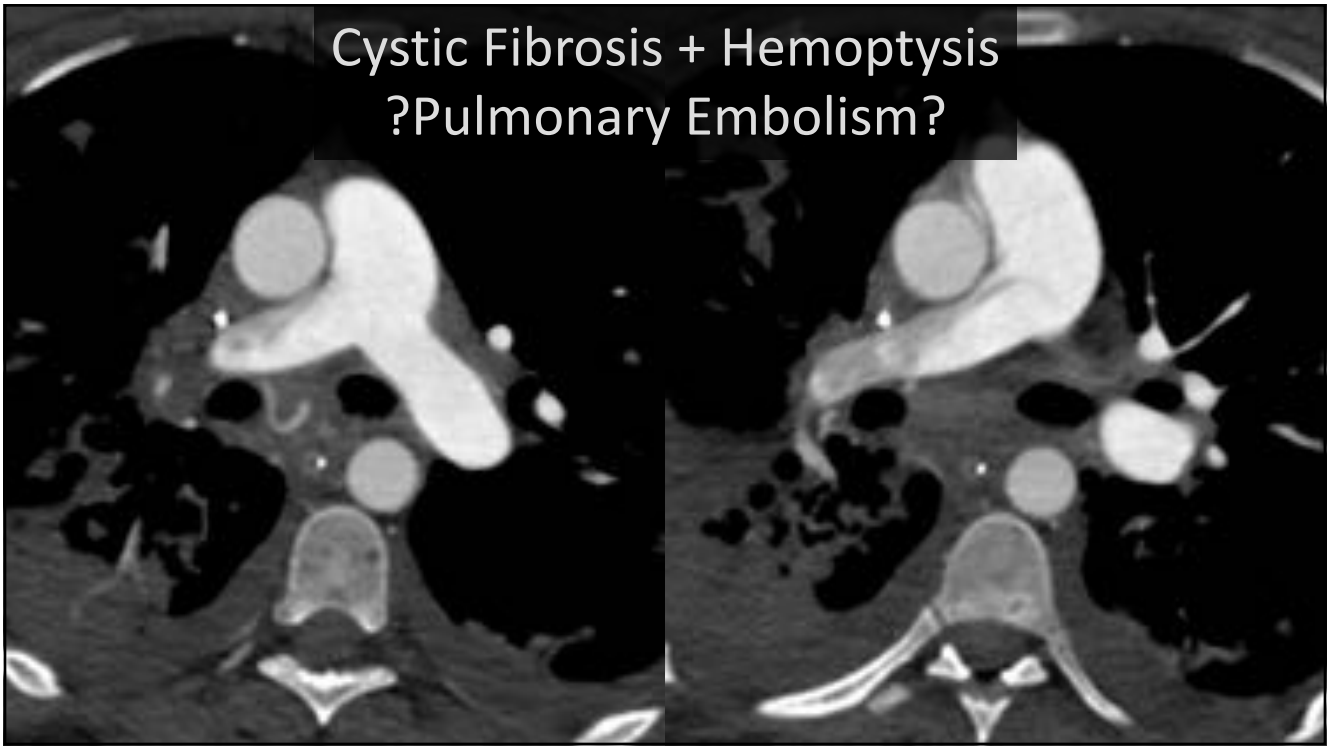
...but other systemic collaterals can also form!

Intercostal arteries

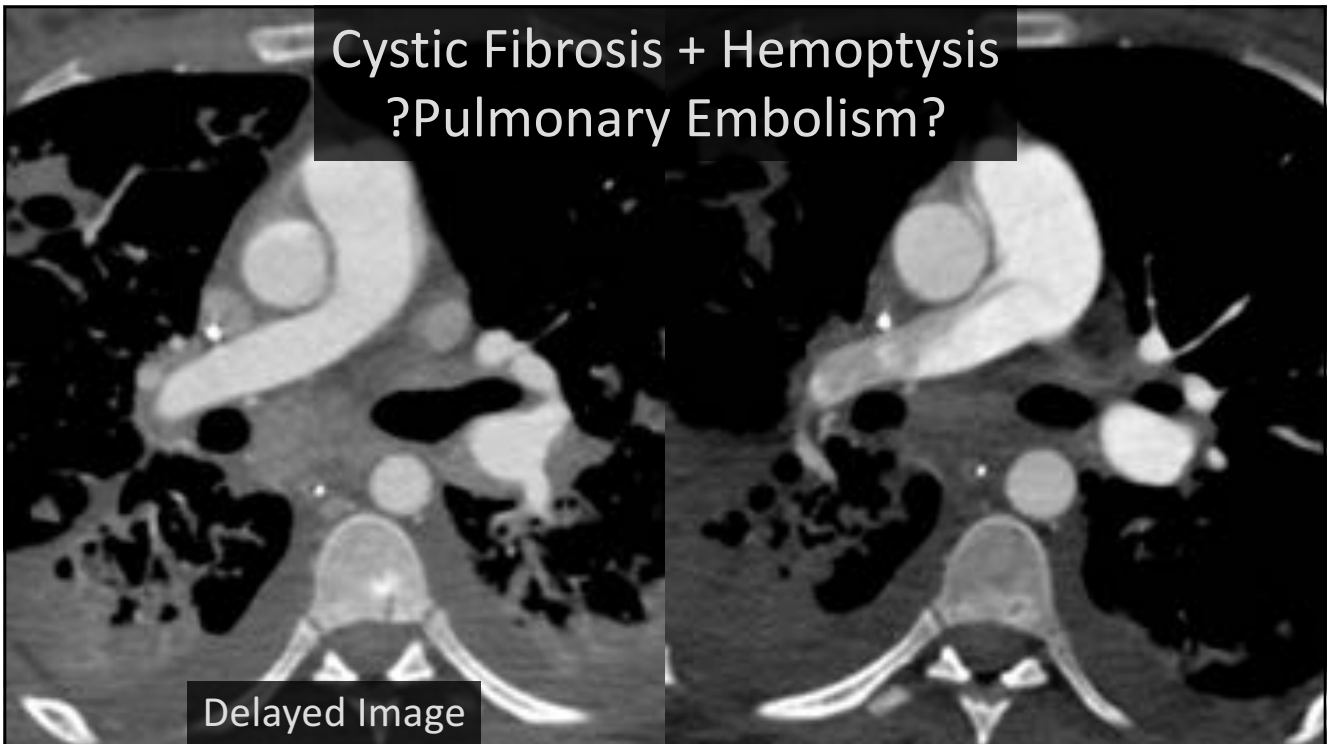
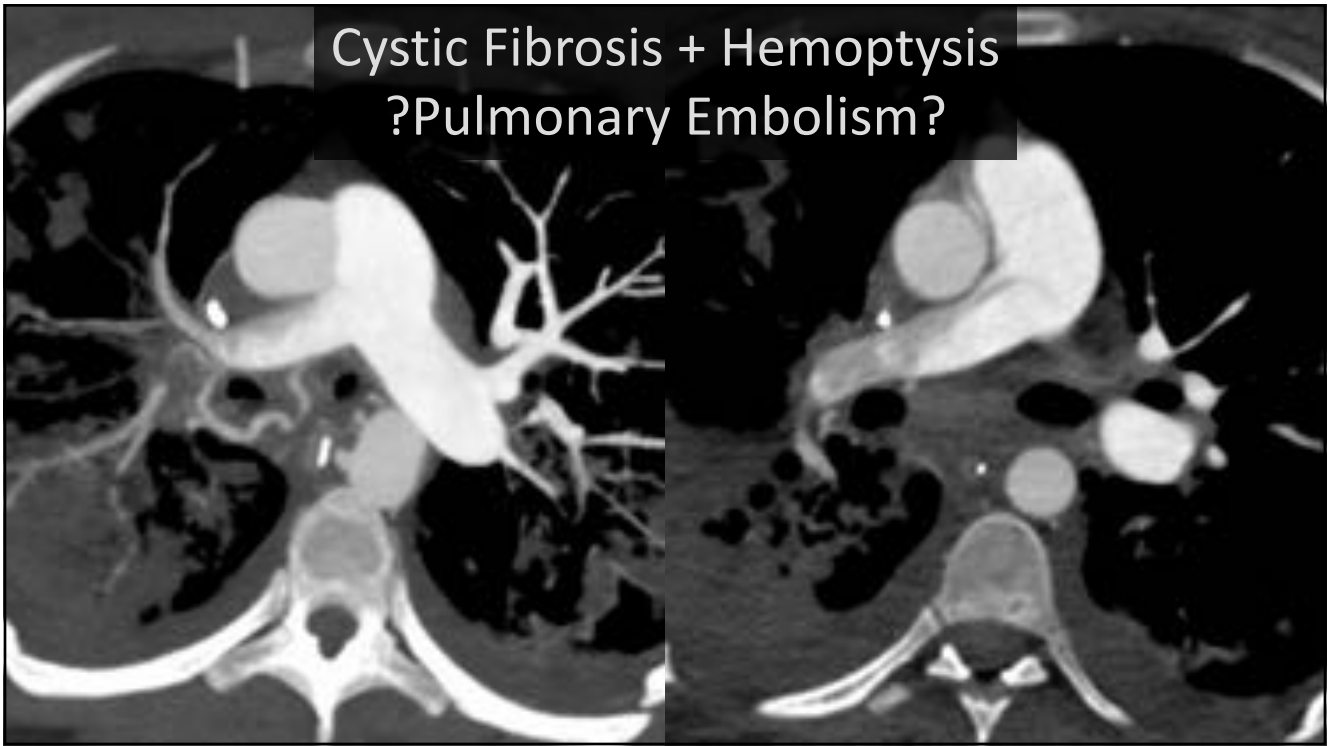


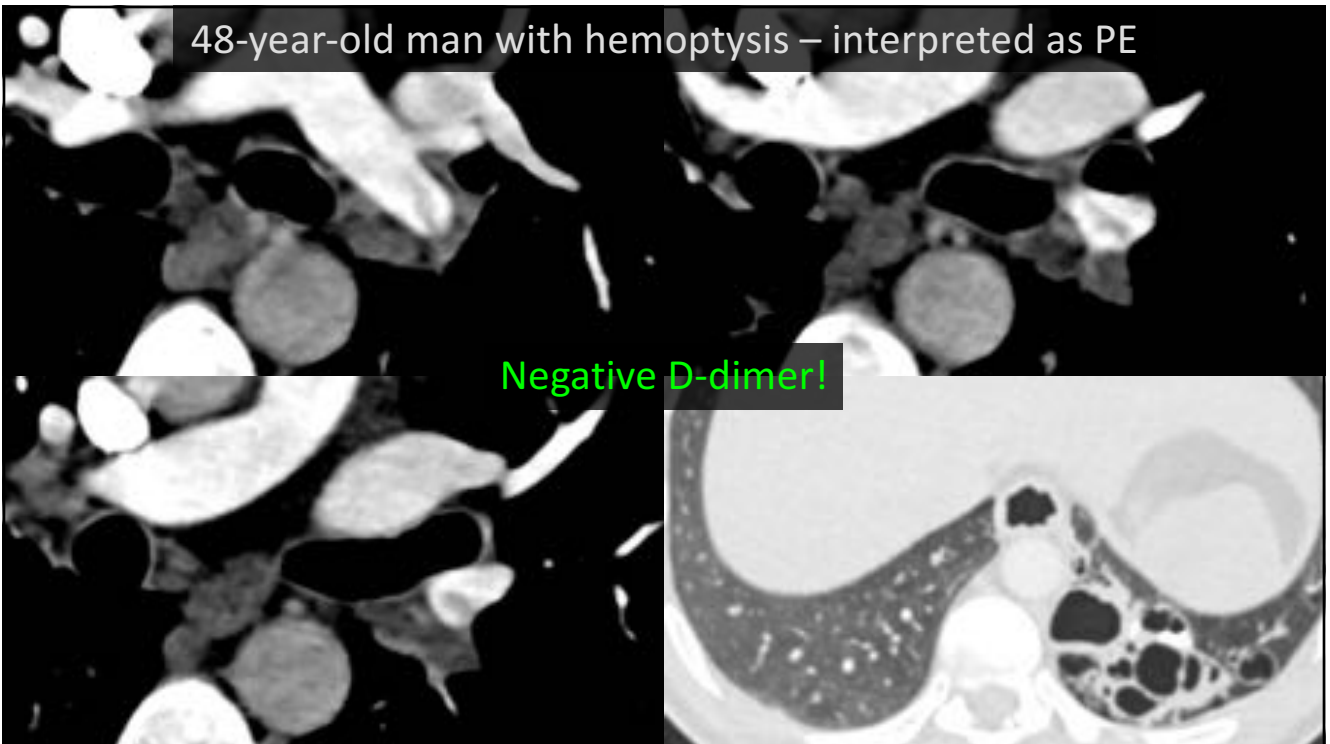
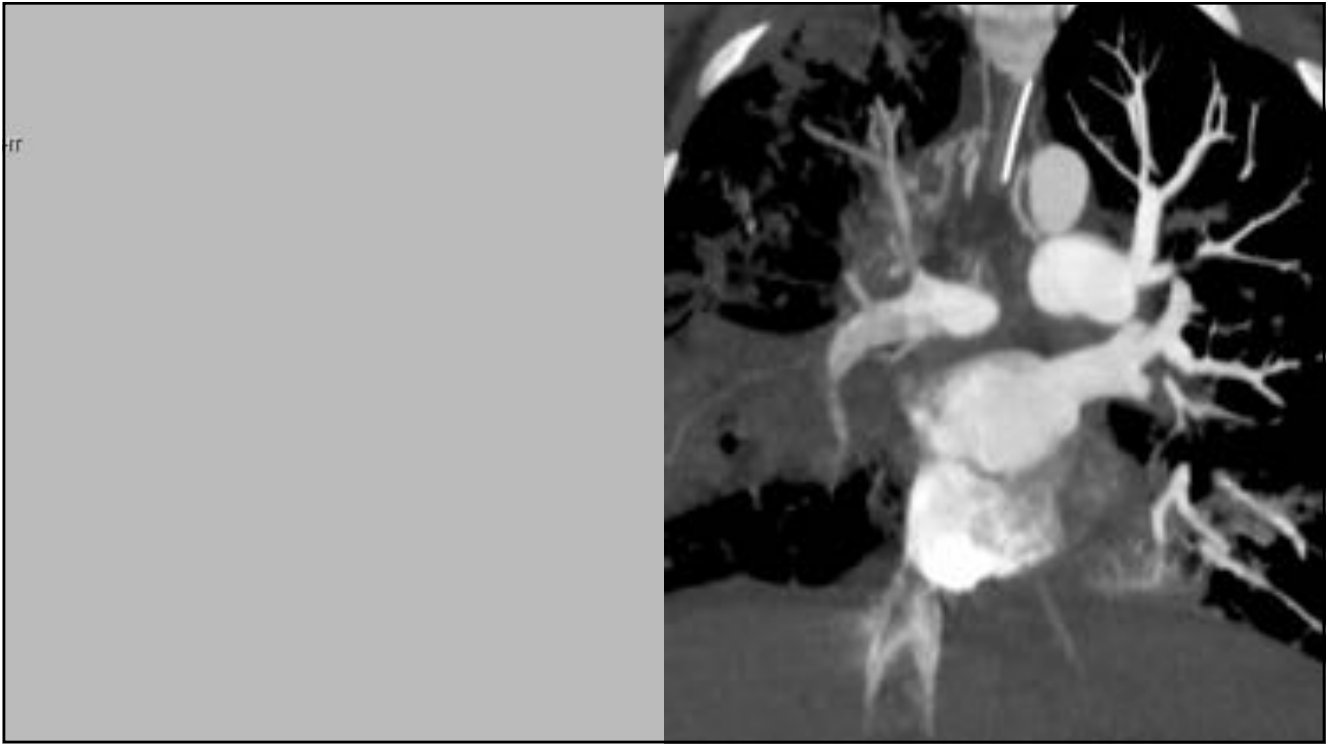
Inferior phrenic





Bronchial Artery Inflow Can Cause Mixing Artifact





Conclusion

- CT is more sensitive than radiograph for detection of bronchiectasis
- Distribution of abnormalities is key to differential diagnosis (volumetric CT is a must)
- Beware of bronchial arteries
 - Hemoptysis
 - PE fakeout

Thank You!

For references and more information please see my website (below)

travis.henry@ucsf.edu

THrads.com