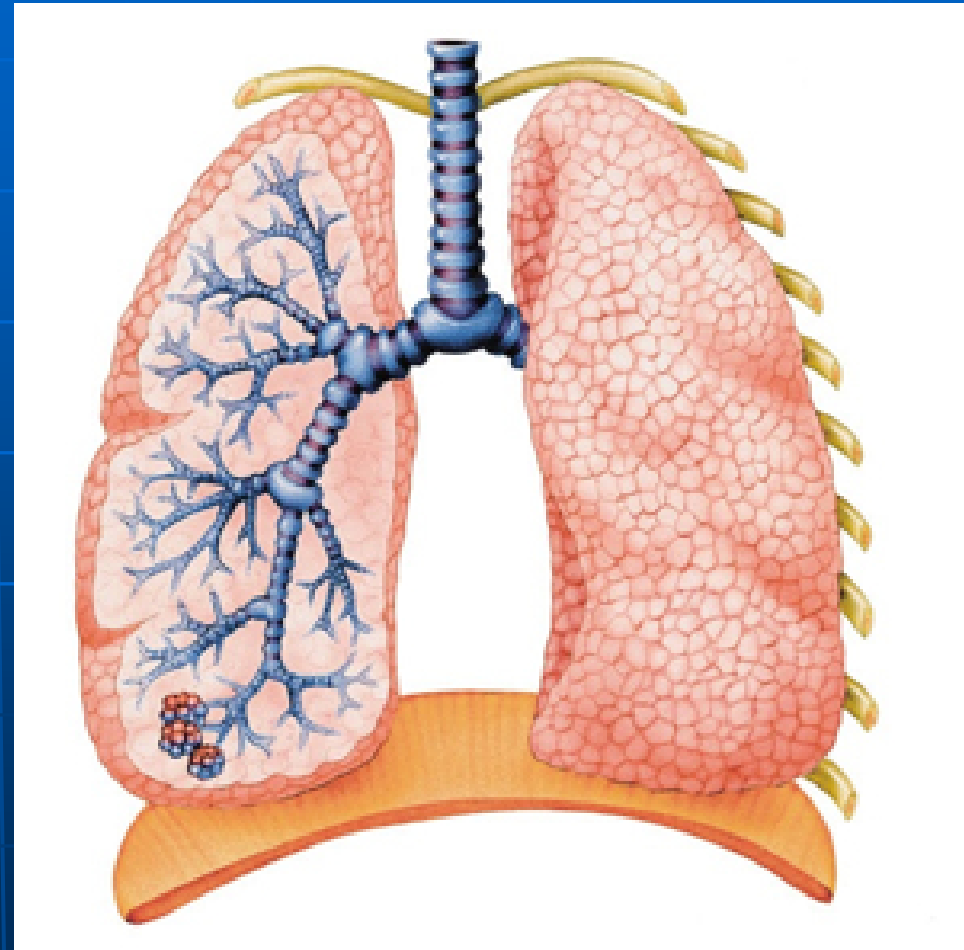# CT imaging in COPDGENE:

Introduction for technologists

What is COPD?

- COPD is a condition characterized by difficulty in emptying the lungs of air during expiration

Components of COPD on CT

- Emphysema
- Airway wall thickening
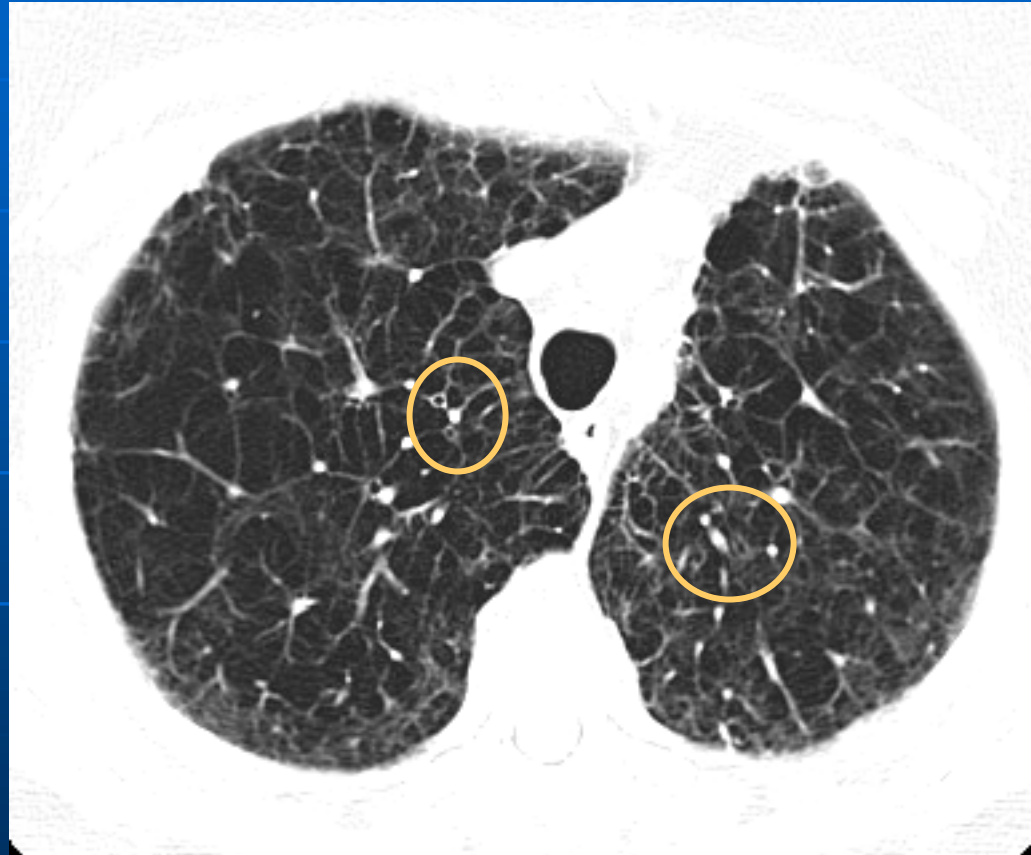- Expiratory air trapping

Emphysema

- Lung is destroyed and replaced by air
- CT shows black holes of various sizes
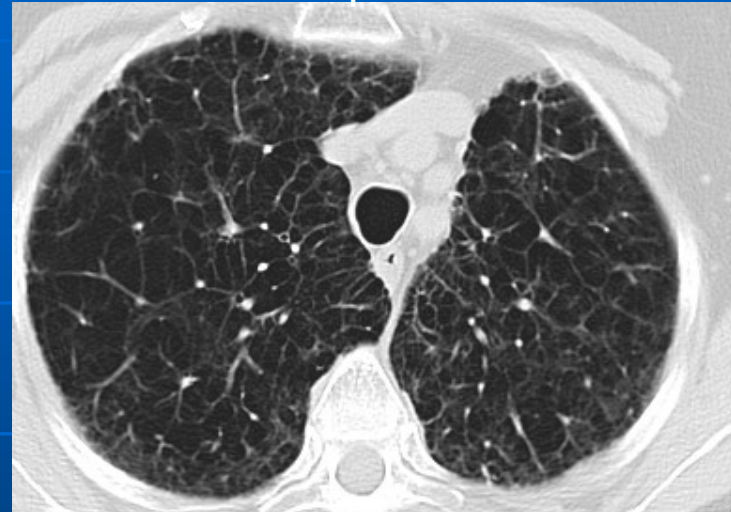
Airways disease

- Airway walls are thickened by inflammation and fibrosis
- CT shows thickening of airway walls
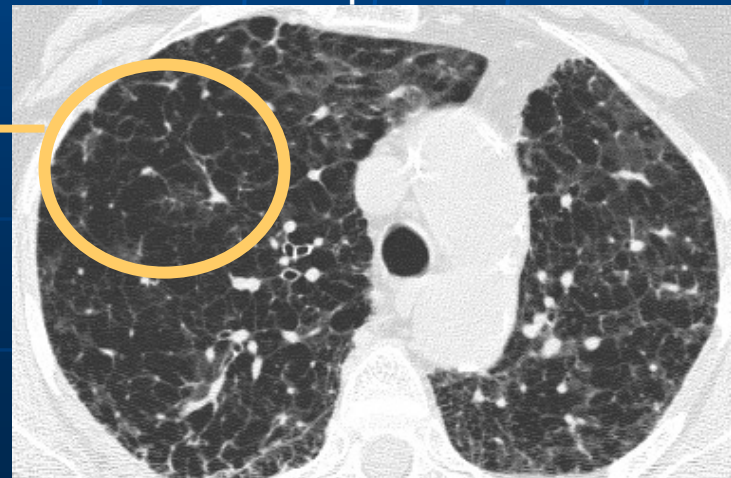
Expiratory air trapping

- On expiration, lung density does not increase as it should

Inspiration

Expiration

Trapping of air in emphysematous lung

Goals of CT imaging

- Identify and quantify emphysema
- Identify and quantify airways abnormality
- Identify and quantify expiratory air trapping

CT protocol

- Helical supine inspiratory and expiratory acquisitions
- 120 kVp
- 200 mAs (inspiratory)
- 50 mAs (expiratory)
- < 1 mm acquisition collimation
- < 1 mm reconstructions
- Specific algorithms/Kernels must be used

Breathing instructions are **critical**

- Coach patient
- Ensure that they will comply with required breathhold

Inspiratory instructions

- For the first part of this scan I am going to ask you to take a deep breath in and hold it
- First, let's practice
  - Take a deep breath in
  - Hold it- do not breathe
  - Breathe and relax
- Take a deep breath in
  - Let it out
- Take a deep breath in
  - Let it out
- Breathe all the way IN..IN..IN
  - Keep holding your breath - DO NOT BREATHE!
  - *At end of scan:* Breathe and relax

Expiratory instructions

- For the second part of this scan I am going to ask you to breathe out and hold it out
- First, let's practice
  - Take a deep breath in
  - Breathe out and hold it- do not breathe
  - Breathe and relax
- Take a deep breath in
  - Let it out
- Take a deep breath in
  - Let it out
- Take another deep breath in
  - Let it out and hold it out
  - ***Signal me when you are ready***
  - Keep holding your breath - DO NOT BREATHE!
  - *At end of scan:* Breathe and relax

Scan quality review

- Is motion artifact present on inspiratory or expiratory scans?
- Are all parts of the lungs included?
- Did the patient take a deep enough breath?

Frequently asked questions

- How can I prevent motion artifact?
- Why is thin slice collimation so important?
- Why do we use mAs of 200?
- Why do we do expiratory scanning?

How can I prevent motion artifact?

- Coach the patient
- Watch while performing practice breathholds
- Remember that patients with COPD take longer to breathe out, so they need more time between breathholds

Why is thin slice collimation so important?

- Slice collimation is important because we are going to do three-dimensional analysis for airways abnormality

- Using thicker slices means that we will be unable to identify and measure the walls of smaller airways

Why do we use mAs of 200?

- We do this in order to reduce image noise. If there is too much image noise, the system will incorrectly identify noise as emphysema

Why do we do expiratory scanning?

- This is because some patients with COPD have near-normal scans at inspiration, but show diffuse trapping of air on expiration

Thank you for participating in this important study