

SEEING CHRONIC OBSTRUCTIVE PULMONARY DISEASE BEFORE IT BREATHES

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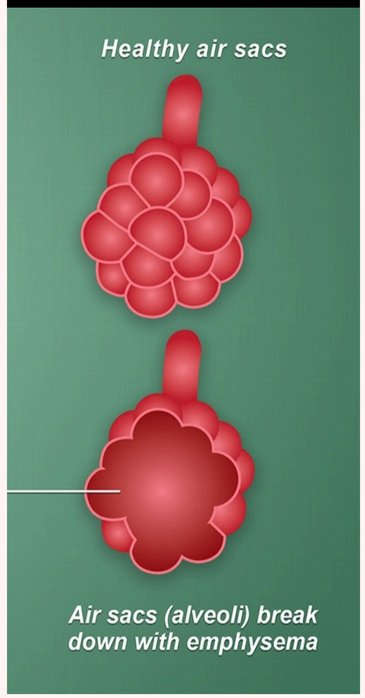
WHAT IS COPD?

Chronic obstructive pulmonary disease (COPD) refers to a lung disease that is characterized by obstruction of air flow that interferes with a person's ability to breathe. COPD is a leading cause of morbidity and mortality and has affected approximately 11.1 million adults in the United States. the disease is characterized by a group of symptoms such as breathing problems, wheezing, excess mucus, shortness of breath and tightening of the chest.

EMPHYSEMA

Emphysema occurs when there is damage to the air sacs in the lungs. Figure 1. demonstrates what healthy air sacs look like. In a healthy set of lungs, the sacs are elastic and allow for normal oxygen exchange and carbon dioxide removal. A person diagnosed with COPD has difficulty breathing as their air sacs are no longer elastic. They cannot fully exhale and the airways collapse and essentially air is trapped.

FIGURE 1



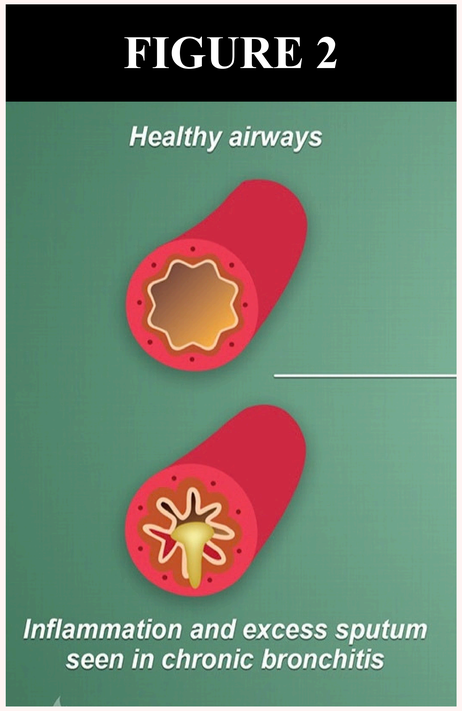
IMAGING WITH CT SCANS

A chest CT is used to measure the estimation of difference between expiration and inspiration. The expiratory to inspiratory relative volume change of voxels with attenuation is a quantitative CT metric used to assess the air trapping. A voxel is used to represent density of lung tissue and air. It represents the difference between the normal volumes of these voxels on expiration and inspiration. Airway wall thickness is a measure used on an inspiratory lung screening CT. By using thin-section CT, small pits can be detected along the inner surfaces of the large bronchi. CT software measures this by calculating the wall area percent (WA%) to determine how much the airways have thickened or narrowed. An increase in wall area percent correlates with low lung function.

BRONCHITIS

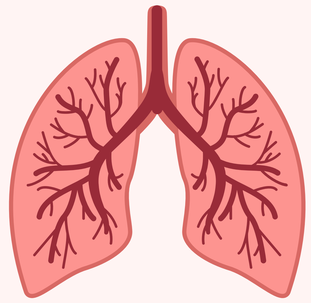
Bronchitis is caused by inflammation of the airway lining which leads to the airway becoming inflamed and irritated over time. The inflammation causes excess mucus production in the airway which then narrows the airway making it difficult for patients with COPD to breathe. Figure 2 shows the difference between healthy airways compared to someone with excess mucus production. The mucus production also increases the thickness of the airway walls which leads to limited airflow.

FIGURE 2



CHRONIC BRONCHITIS VS. EMPHYSEMA

While COPD is a progressive respiratory disorder, the disease is characterized by two main conditions: chronic bronchitis and emphysema. Chronic bronchitis refers to the airway inflammation while emphysema is the destruction of the actual lungs.



REFERENCES

- https://www.lung.org/media/press-releases/world-copd-day-louisiana-2025
- https://pmc.ncbi.nlm.nih.gov/articles/PMC4067738/
- https://www.nhlbi.nih.gov/health/copd
- https://www.svhlunghealth.com.au/conditions/copd-chronic-obstructive-pulmonary-disease