Chronic Obstructive Pulmonary Diseases:
Journal of the COPD Foundation

Online Supplementary Material

Physiologic and Quantitative Computed Tomography Differences Between Centrilobular and Panlobular Emphysema in COPD

Nicola Sverzellati, MD, PhD,[1] David A. Lynch, MB [2] Massimo Pistolesi, MD,[3] Hans-Ulrich Kauczor, MD,[4] Phillippe A. Grenier, MD,[5] Carla Wilson, [6] James D, Crapo, MD [7]; on behalf of the COPDGene ®CT workshop group.

1 Department of Surgery, Section of Diagnostic Imaging, University of Parma, Parma, Italy
2 Division of Radiology, National Jewish Health, Denver, CO
3 Section of Respiratory Medicine, Department of Internal Medicine, University of Florence, Italy
4 Diagnostic and Interventional Radiology, University Clinic Heidelberg, Germany
5 Service de Radiologie Polyvalente, Diagnostique and Interventionelle, Hospital Pitie-Salpetriere, Paris, France
6 Division of Biostatistics and Bioinformatics, National Jewish Health, Denver, CO
7 Division of Pulmonary, Critical Care and Sleep Medicine, National Jewish Health, Denver, CO

CT Technique and Visual Score

Computed tomography (CT) scans were acquired using multi-detector CT scanners (at least 16 detector channels).

Volumetric CT acquisitions were obtained both on full inspiration (200mAs), and at the end of normal expiration (50 mAs). Image reconstruction utilized sub-millimeter slice thickness, with high-spatial, smooth and edge-enhancing algorithms. Details on CT techniques are found elsewhere.[1]

Standard definitions for several COPD-related abnormalities were provided from the Fleischner Society Glossary of terms for thoracic imaging.[2] During a training session, illustrations of all findings on the standardized score sheet were presented in the form of a slide presentation, standard images for scoring each parameter, including CLE and PLE, were provided to each participant for reference during the scoring of cases. Reviewers were divided into 5 groups, and each group read 59-60 scans. Thus, each scan was scored by 9-11 observers.

The readers were blinded to the clinical category of the study subject.

Quantitative CT Analysis

$RVC_{-856\ to\ -950}$ is calculated using the formula: expiratory relative lung volume $_{-856\ to\ -950\ HU}$ – inspiratory relative lung volume $_{-856\ to\ -950\ HU}$. To calculate $\%RVC_{-856\ to\ -950}$, the relative lung volume -856 HU to -950 HU is defined as the volume of voxels with attenuation values between -856 to -950 HU divided by the volume of voxels with the attenuation values above -950 HU.[3] Since the percentage of pixels at the attenuation value between -856 and -950 HU on expiratory CT is lower than that on inspiratory CT, $\%RVC_{-856\ to\ -950}$ is usually negative. However, as gas trapping increases, the relative volume of limited lung with attenuation values between –856 and –950 HU increases more on expiration, resulting in less negative values for this parameter.

References:

1. Regan EA, Hokanson JE, Murphy JR, et al.Genetic epidemiology of COPD (COPDGene®) study design. *COPD*. 2010;7(1):32-43. doi: http://dx.doi.org/10.3109/15412550903499522.

2. Hansell DM, Bankier AA, MacMahon H, McLoud TC, Muller NL, Remy J. Fleischner Society: glossary of terms for thoracic imaging. *Radiology*. 2008;246 (3):697-722. doi: http://dx.doi.org/10.1148/radiol.2462070712.

3. Mets OM, Murphy K, Zanen P, et al. The relationship between lung function impairment and quantitative computed tomography in chronic obstructive pulmonary disease. *Eur Radiol*. 2012;22(1):120-8. doi:http://dx.doi.org/10.1007/s00330-011-2237-9.