



# ARCEPOCIII

Annual Review of Congresses EN EPOC

Descubriendo lo nuevo en EPOC presentado en ATS, ERS y SEPAR

## ATS - Computed Tomography (ct) Measure Of Lung At-Risk And Lung Function Decline In Chronic Obstructive Pulmonary Disease

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## Introduction

- Regions of the lung adjacent to emphysematous areas are subject to abnormal stretch during respiration, and this biomechanical stress likely influences emphysema initiation and progression. We hypothesized that quantifying this penumbra of lung at risk would predict forced expiratory volumen in one second (FEV<sub>1</sub>) decline.

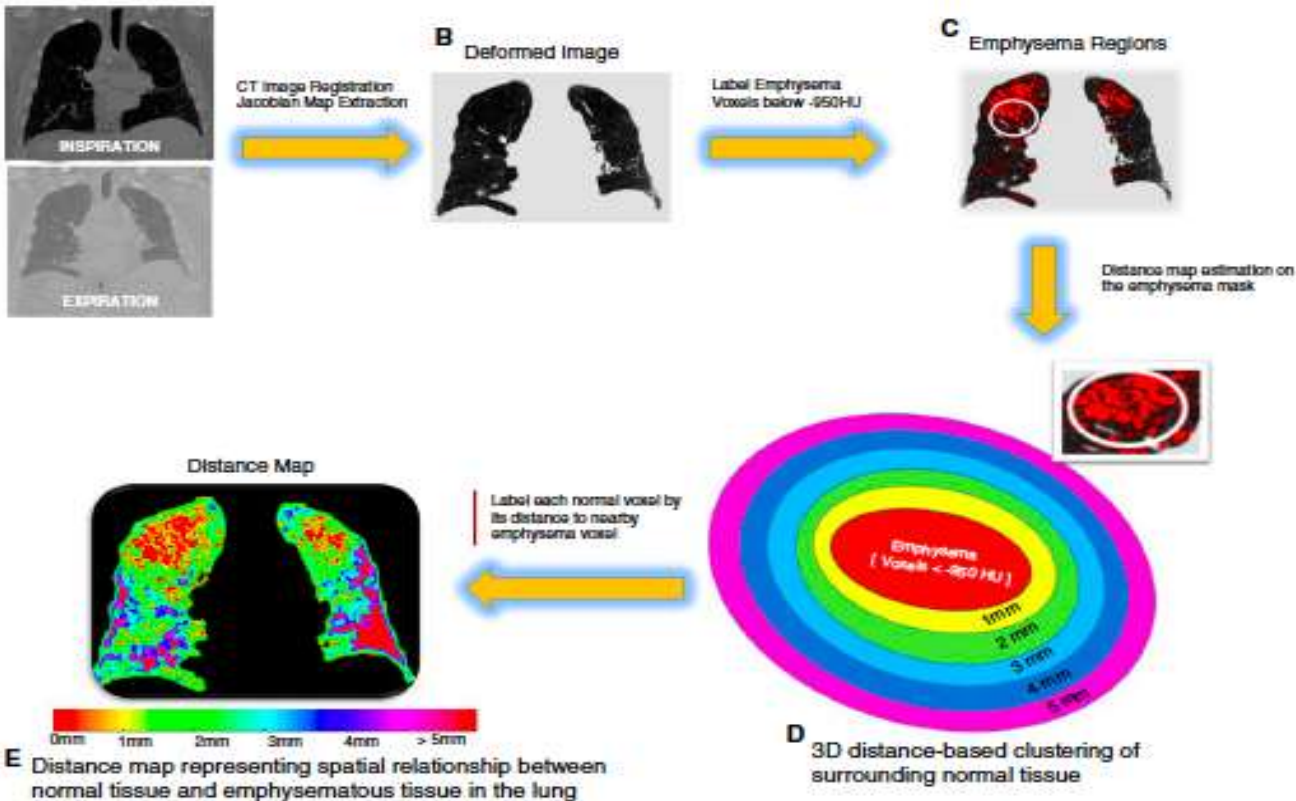
## Methods (I):

- Analyzed paired inspiratory expiratory computerized tomography (CT) images at baseline of 680 subjects with Global Initiative for Chronic Obstructive Lung Disease (GOLD) stages 1-4 participating in a large multicenter study (COPDGene) over approximately 5 years.
- By matching inspiratory and expiratory images voxel by voxel using image registration, we derived the Jacobian determinant, a measure of local lung expansion and contraction with respiration.

## Methods (II):

- We calculated the Euclidean distance between each normal voxel to the nearest emphysematous voxel, and quantified the percentage of normal voxels within each mm distance from emphysematous voxels a **mechanically affected lung (MAL)**..
- Multivariable regression analyses were performed to assess the relationship between the Jacobian determinant, MAL and FEV<sub>1</sub> decline.

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## Results (I):

- The mean (standard deviation, SD) rate of decline in FEV1 was 39.0 ml/year.
- **There was a progressive decrease in the mean Jacobian determinant of both emphysematous and normal voxels with increasing disease stage ( $p < 0.001$ ).**

## Results (II):

- On multivariable analyses, the mean Jacobian determinant of normal voxels within 2 mm of emphysematous voxels ( $MAL_2$ ) was significantly associated with FEV1 decline.
- In mild-moderate disease, for participants at or above the median  $MAL_2$  (threshold 36.9%), the mean decline in FEV1 was 56.4 (68.0) ml/year vs. 43.2 (59.9) ml/year for those below the median (p 0.044).

## Conclusions:

- Areas of normal appearing lung are mechanically influenced by emphysematous areas and this lung at-risk can be quantified to predict lung function decline.







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