

## Quantitative CT Inter-Analyst Agreement in the COPDGene Study

McKenzie A<sup>1</sup>, Al Qaisi M<sup>1</sup>, Williams A<sup>1</sup>, Zach J<sup>1</sup>, Richert D<sup>1</sup>, Wilson C<sup>1</sup>, Stinson D<sup>1</sup>, Lynch DA<sup>1</sup>,  
Tschirren J<sup>2</sup>, Hoffman E<sup>3</sup> and the COPDGene Investigators

<sup>1</sup>National Jewish Health, Denver; <sup>2</sup>VIDA Diagnostics, Inc., Iowa City; <sup>3</sup>University of Iowa, Iowa City  
(National Jewish Health, 1400 Jackson St, Denver, CO 80206, [McKenzieA@NJHealth.org](mailto:McKenzieA@NJHealth.org))

### Introduction

This study evaluated inter-analyst agreement of quantitative computerized tomography (QCT) measures, obtained from the same CT images by two analysts.

### Methods

48 CT scans, 20 from smoking control subjects ( $FEV_1/FVC \geq 70\%$ ) and 28 from COPD subjects ( $FEV_1/FVC < 70\%$ ), were analyzed independently by two trained research analysts using Pulmonary Workstation 2 software from VIDA Diagnostics, Inc. Differences between analysts' measures were normalized using standard deviation and evaluated using Bland-Altman methodology to determine limits of agreement more than two standard deviations from the mean. Linear regression was used to determine  $R^2$  values for each QCT variable.

### Results

Inspiratory and expiratory volume measures between analysts had an average  $R^2$  value of 0.9829, with limits of agreement of  $40.82 \pm 221.47$  ml and  $24.06 \pm 37.51$  ml respectively. Density measures of the lungs and lobes had an average  $R^2$  value of 0.9985. Limits of agreement for % inspiratory lung attenuation  $\leq -950$  HU and % expiratory lung attenuation  $\leq -856$  HU were  $0.01 \pm 0.03\%$  and  $0.08 \pm 0.11\%$  respectively. Only 4.45% of all data evaluated were greater than  $2\sigma$  from the absolute mean difference. Variation in measurements of segmental airway wall thickness, lumen diameter and inner area, was greater, with an average  $R^2$  value of 0.7430. Limits of agreement for airway wall thickness of RB1 and RB10 were  $0.01 \pm 0.06$  mm and  $0.12 \pm 0.24$  mm, respectively. Limits of agreement for airway wall area of RB1 and RB10 were  $0.66 \pm 3.02$  mm<sup>2</sup> and  $2.74 \pm 5.42$  mm<sup>2</sup>, respectively.

### Conclusion

Two individual analysts, trained to the same standards and using the same analysis software, showed a high degree of reproducibility in QCT measures of emphysema and gas trapping, and a lesser degree of reproducibility for airway data.