

DLCO Influences Morbidity Beyond Spirometry and CT Evidence of Emphysema in COPD Gene

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MEDICINE



INTRODUCTION

- Spirometry is the cornerstone of COPD diagnosis and recent initiatives incorporate symptoms and radiographic features to classify and manage the disease.
- DLCO, a major component of pulmonary function testing, is inconsistently utilized as a tool in COPD assessment.
- The COPD Gene study provides an opportunity to determine the independent relationship between DLCO and key COPD outcomes.

OBJECTIVE

- To explore whether lower DLCO is associated with greater COPD morbidity, independent of FEV₁ and emphysema, and whether the combination of a severe reduction in DLCO and FEV₁ is associated with worse outcomes than either condition in isolation.

METHODS

- 5-year visit was analyzed in 1892 COPD Gene participants GOLD Stages 1-4
- DLCO % predicted was calculated using Miller non-smoking reference equations, adjusting for hemoglobin and altitude. FEV₁ % predicted was calculated using NHANES reference equations
- A categorical variable was created to represent four possibilities: 1) FEV₁ and DLCO both > 50% predicted, 2) FEV₁ ≤ 50% and DLCO > 50%, 3) DLCO ≤ 50% and FEV₁ > 50% and 4) both ≤ 50%
- Outcomes included CAT, SGRQ, SF-36, 6 minute walk distance, resting oxygen saturation, COPD hospitalization rate
- Multivariable models were created adjusting for age, sex, obesity, race, education, pack-years of smoking, smoking status, diabetes, FEV₁ and emphysema

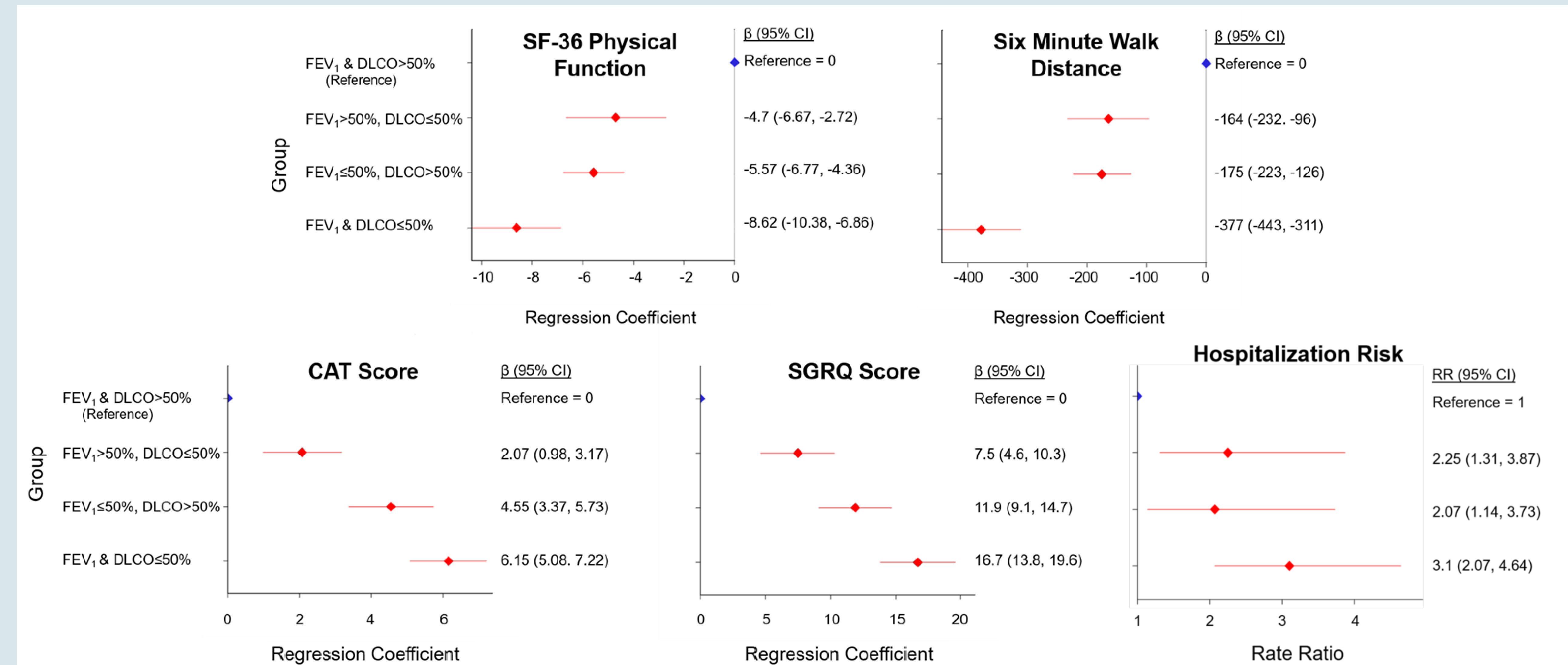
RESULTS

Participant Characteristics (N=1325)	
Characteristic	(N=1325)
Age	68 (63, 75)
Male, N (%)	719 (54%)
Black, N (%)	226 (17%)
BMI kg/m ²	28 (24, 31)
Obese (BMI≥30), N (%)	434 (33%)
ATS pack years	45 (34, 63)
Smoking Status, N (%)	
Former smoker	788 (59%)
Current to former smoker	156 (12%)
Current smoker	381 (29%)
FEV ₁ percent predicted	62 (45, 78)
DLCO percent predicted	63 (48, 80)
CAT	13 (7, 20)
SGRQ, Median	28 (13, 45)
SF-36 Physical	42 (33, 50)
SF-36 Mental	55 (47, 60)
6MWD (meters)	1279 (1000, 1502)
% Emphysema	4 (1,15)
Emphysema >5%, N (%)	644 (49%)
Resting oxygen saturation %	96 (94, 97)

*Data are displayed as median (IQR) unless otherwise indicated

The Association between DLCO and FEV ₁ and COPD Morbidity				
Outcomes	DLCO % predicted		FEV ₁ % predicted	
	Regression Coefficient (95% CI)	p-value	Regression Coefficient (95% CI)	p-value
CAT score	-0.70 (-0.89, -0.52)	<0.001	-1.23 (-1.46, -1.01)	<0.001
SGRQ score	-1.92 (-2.44, -1.4)	<0.001	-3.21 (-3.61, -2.8)	<0.001
Activity	-2.78 (-3.68, -1.88)	<0.001	-4.48 (-5.02, -3.94)	<0.001
Impact	-1.49 (-2.03, -0.95)	<0.001	-2.41 (-2.88, -1.94)	<0.001
Symptom	-1.77 (-2.33, -1.22)	<0.001	-3.51 (-3.87, -3.15)	<0.001
SF-36 Physical Function	1.05 (0.73, 1.38)	<0.001	1.47 (1.12, 1.81)	<0.001
SF-36 Mental	-0.01 (-0.41, 0.4)	0.974	0.06 (-0.31, 0.43)	0.764
6MWD (meters)	48.35 (36.79, 59.9)	<0.001	51.54 (44.21, 58.87)	<0.001
Resting oxygen saturation %	0.25 (0.06, 0.44)	0.010	0.21 (0.16, 0.27)	<0.001
Hospitalization Rate (Risk Ratio)	0.80 (0.71, 0.90)	<0.001	0.77 (0.73, 0.82)	<0.001

*Models are per 10% change in DLCO or FEV₁, and are adjusted for age, race, smoking history, pack years, diabetes, obesity, percent emphysema



CONCLUSIONS

- Impairment in gas transfer, represented by a reduction in DLCO, was associated with increased COPD morbidity across domains of symptoms, quality of life, functional status, and risk of hospitalization, even after accounting for spirometry and CT evidence of emphysema.
- Severe impairment in both FEV₁ and DLCO was associated with worse symptoms, quality of life, and functional exercise capacity compared to severe impairment in either alone.
- We speculate that the association between DLCO and COPD morbidity, independent of spirometry and CT emphysema, may reflect the presence of subclinical pulmonary vascular injury and its impact on clinical outcomes, an area that is underappreciated in the assessment of patients with COPD.
- DLCO is a widely available, inexpensive, minimal risk test that may be an underutilized tool in COPD assessment and future studies investigating the integration of DLCO into multi-dimensional assessment approaches are warranted.