Retinal microvascular changes in people with COPD compared to age-matched smokers without COPD.

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Rationale: COPD is associated with vascular co-morbidities including myocardial infarction, stroke and cerebral white matter lesions. Traditional cardiovascular risk factors do not appear fully to explain these findings, but it remains unclear if there is microvascular damage in COPD, independent of smoking. Microvascular retinopathy is predictive of cardiac events and stroke. Validated imaging software can be used to measure retinal vessel parameters. We hypothesised that standard non-mydratic retinal photography would be feasible in COPD and provide evidence of microvascular damage in COPD vs age-matched smokers without COPD. We also explored associations with demographics and disease severity.

Methods: Volunteers were recruited as part of the Novel Vascular Manifestations of COPD (NOVASC) study. NOVASC was a prospective case control study comparing smokers with and without COPD, matched for age. Exclusion criteria included: hypoxaemia, significant cardiovascular or neurological disease, diabetes and uncontrolled hypertension. Non-mydratic, optic disc-focused retinal photographs were taken by technicians from a medical illustration department. Images were assessed using the Singapore Eye Vessel Analyser (SIVA) software (Figure 1.0).

Results: Retinal images were captured in 51 participants, for whom 5 were of insufficient quality, leaving 24 COPD participants and 22 controls for analysis. COPD participants were of a similar age (65.2 vs. 63.1 years, *p*=0.38), COPD subjects had significantly lower FEV1 (53.4 vs 100.1 % predicted; *p*<0.001) and had smoked more than controls (41.7 vs. 29.6 pack years; *p*=0.04). COPD participants had significantly wider mean arteriolar (155.6 ±15 uM) vs. controls (142.2 ± 12 uM); *p*=0.012 and mean venular diameters (216.8 ±20.7 uM vs. 201.3± 19.1uM): *p*=0.002. Differences in retinal vessel calibre between groups were independent of age, gender, smoking or blood pressure with adjusted odds ratios (OR)= 1.08 (95% CI = 1.02-1.15; *p*=0.007) and OR=1.05 (CI = 1.01-1.10; *p*= 0.013) per uM increase in arteriolar and venular diameter respectively with COPD. There was no significant difference in tortuosity, bifurcation or fractal measures, between the groups.

Conclusion: Routine, non-mydratic retinal photography provides a feasible method of assessing microvascular disease in COPD. There is evidence of significant arteriole and venous dilation in COPD compared to age-matched smokers without COPD, these differences are not fully explained by standard cardiovascular risk factors and do not significantly correlate with demographic or disease severity measures. Retinal photography is a promising, low cost, widely available test that warrants further study as measure of microvascular damage in COPD.

Figure 1.0

