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Pulmonary vascular density: comparison of findings on computed tomography imaging with histology

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Vascular density on CT imaging correlates with vascular density in histology in smokers. Imaging-based quantification of pulmonary vasculature provides a noninvasive method to study the multiscale effects of smoking on the pulmonary circulation. <http://bit.ly/2WprQe8>

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ABSTRACT

Background: Exposure to cigarette smoke has been shown to lead to vascular remodelling. Computed tomography (CT) imaging measures of vascular pruning have been associated with pulmonary vascular disease, an important morbidity associated with smoking. In this study we compare CT-based measures of distal vessel loss to histological vascular and parenchymal changes.

Methods: A retrospective review of 80 patients who had undergone lung resection identified patients with imaging appropriate for three-dimensional (3D) vascular reconstruction (n=18) and a second group for two-dimensional (2D) analysis (n=19). Measurements of the volume of the small vessels (3D) and the cross-sectional area of the small vessels (<5 mm² cross-section) were computed. Histological measures of cross-sectional area of the vasculature and loss of alveoli septa were obtained for all subjects.

Results: The 2D cross-sectional area of the vasculature on CT imaging was associated with the histological vascular cross-sectional area (r=0.69; p=0.001). The arterial small vessel volume assessed by CT correlated with the histological vascular cross-sectional area (r=0.50; p=0.04), a relationship that persisted even when adjusted for CT-derived measures of emphysema in a regression model.

Conclusions: Loss of small vessel volume in CT imaging of smokers is associated with histological loss of vascular cross-sectional area. Imaging-based quantification of pulmonary vasculature provides a noninvasive method to study the multiscale effects of smoking on the pulmonary circulation.