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Title: Computer tomography lung density in smokers is correlated to measures of local inflammation in the lung

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Body: Cigarette smoking causes an inflammatory response in the lungs. CT imaging provides means of quantifying pulmonary structure and function. We hypothesized that the inflammation in smokers may be mirrored both by an altered attenuation on CT and by measures inflammation in the lungs. Materials: Healthy smokers (20 men, 20 women, mean age 54, 35±12 pack years, 40 healthy never-smokers, age 57 and 40 COPD, age 59 (38±11 PY, 31 current smokers, 9 ex-smokers) performed inspiratory CT scans. Values between -500 and -750 HU were considered as high attenuation area. BAL, was performed. Cell concentration were measured. Result: Attenuation for smokers (44% ± 5.7) and never-smokers (38% ± 5.6), COPD ex-smokers (33% ± 4.5) (p<0.001 and p<0.05 respectively). COPD smokers (41% ± 5.0) did not differ from that of healthy smokers. Both smoker groups (healthy smokers: 556±259 x 10⁶/L (mean±SD); COPD smokers: 458±263) had higher cell concentration in BAL compared to never-smokers (121±50) and COPD ex-smokers (100±29). The difference between the smoking and non-smoking groups were significant (p<0.001). There was a significant correlation (p<0.0001) between cell concentration in BAL and CT attenuation, There was no significant correlation between cell concentrations in BAL and CT attenuation in never-smokers and COPD ex-smokers. Conclusion: The increased lung density in smokers compared to non-smokers may mirror an inflammatory response induced by cigarette smoke. This hypothesis is strengthened by a positive correlation between lung attenuation and cell concentration in the lower respiratory tract. Our results provide a quantitative approach for measuring smoke-related structural changes in the lung.