

ATS 2025 Highlights

Respiratory Structure and Function Early Career Professionals

Get to know members of the RSF Assembly



Naoya Tanabe, M.D., Ph.D.

Lecturer (he/him)

*Department of Respiratory Medicine, Kyoto
University Graduate School of Medicine, Japan*

ntana@kuhp.kyoto-u.ac.jp

Is your research clinical, basic science or translational?

Clinical and translational.

Tell us about your research?

In my research, I utilize advanced analytical techniques, incorporating chest computed tomography imaging, pathology, and lung physiological assessments, to investigate the clinical implications of airway structural changes, mucus plugs, parenchymal abnormalities, and extrapulmonary findings in chronic airway diseases such as asthma and COPD. My particular interest lies in the differences in pathogenesis and functional influences of airway mucus plugs in central and peripheral airways between type 2 and non-type 2 airway diseases.

Where do you see yourself in 5 years?

I look forward to continuing my academic work to understand the pathogenesis and functional outcomes of mucus plugs in relation to mucus imaging properties, inflammation, underlying lung structure, and the microbiome.

What do you find is the major benefit of RSF Assembly Membership?

The RSF Assembly has provided opportunities to join the international scientific community and has stimulated my research interests. I am excited to continue my research with support from the RSF Assembly.

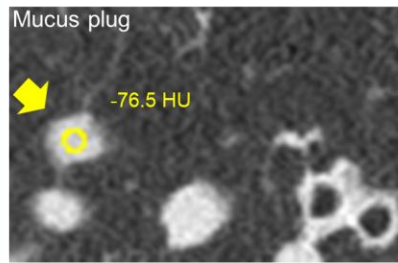
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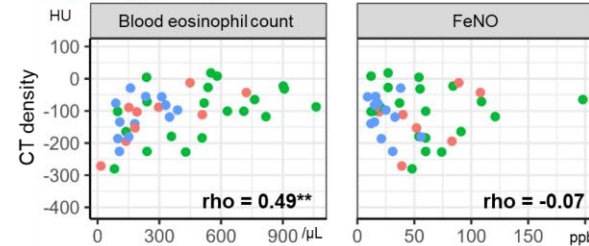
Lecturer (he/him)

Department of Respiratory Medicine, Kyoto University
Graduate School of Medicine, Japan

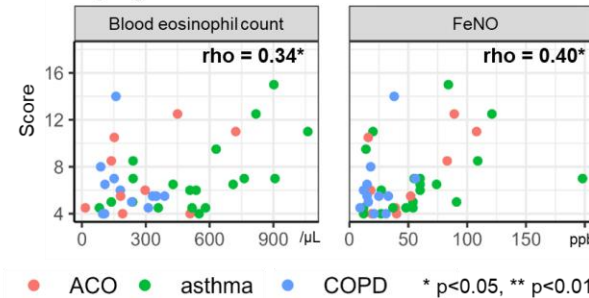


The density was measured in $\leq 7^{\text{th}}$ generation airways

Mucus plug density



Mucus plug score



Associations of airway mucus density on ultra-high-resolution CT with blood eosinophil count and fractional exhaled nitric oxide (FeNO)

Arrows indicate mucus plugs. A region of interest was placed on the middle part of mucus plugs to measure mean CT density.

Airway mucus plug density on ultra-high-resolution CT and type 2 inflammation in chronic airway disease

Objective: While mucus plug scores on CT have been associated with lower lung function and exacerbations in asthma and COPD, the quality of mucus plugs, including density, remains underexplored. This study hypothesized that greater type 2 inflammation could be associated with higher density of airway mucus plugs and examined whether the score and density of mucus plugs on ultra-high-resolution CT (U-HRCT) were associated with blood eosinophil count and fractional exhaled nitric oxide in patients with asthma and COPD.

Methods: Baseline data from two prospective cohorts at Kyoto University hospital were analyzed, including 255 patients with asthma, COPD, or asthma-COPD overlap who underwent U-HRCT imaging during exacerbation-free periods. Mucus plug scores (range 0-18) were assessed visually and CT density measurements were obtained by manually placing regions of interest on mucus plugs in patients with scores ≥ 4 .

Results: Among 41 patients with mucus plug scores ≥ 4 , higher blood eosinophil count was significantly associated with both higher mucus plug density ($\rho=0.49$, $p=0.001$) and longer mucus plug length ($\rho=0.31$, $p=0.04$). In contrast, FeNO showed no association with mucus plug density or length, while both blood eosinophil count and FeNO were associated with mucus plug scores.

Conclusion: This study provides the first in vivo evidence that eosinophilic inflammation is associated with dense airway mucus plugs in patients with asthma and COPD. Combined assessment of mucus plug score and density may facilitate more individualized treatment approaches in patients with severe mucus plugging.