

Images in Allergy and Immunology

Qutayba Hamid, MD, PhD (Editor),^a
Manuel Cosio, MD,^a and Sam Lim, MD^b

Inflammation and remodeling in chronic obstructive pulmonary disease

Editor's note: This feature, Images in allergy and immunology, is designed to highlight current concepts of the immunopathology of allergic diseases and other common immunologically mediated diseases. The presentation will appear as sets of images that involve cross-pathology, histopathology, and molecular pathology and will cover a range of topics of interest to allergists and immunologists.

Inflammation has long been recognized as a major pathologic feature of the airways and lung parenchyma in chronic obstructive pulmonary disease (COPD)^{1,2} (Figs 1-3). Increased numbers of T cells have been demonstrated by many groups in the small and large

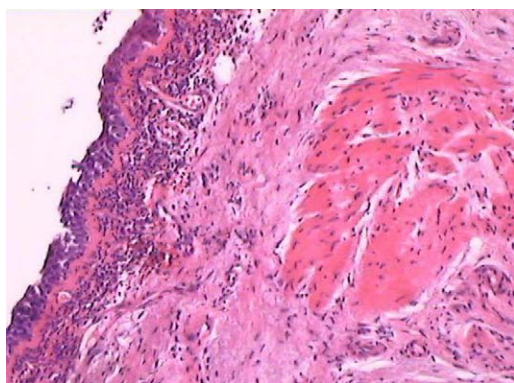


FIG 1. Section from an endoscopic biopsy specimen of a patient with COPD shows inflammatory infiltrate at the upper part of the submucosa. These cells are mostly T cells. (Hematoxylin and eosin, original magnification $\times 200$.)

From ^athe Meakins-Christie Laboratories, Montreal, Quebec, Canada, and ^bGlaxoSmithKline, United Kingdom.

Received for publication October 5, 2004; revised October 5, 2004; accepted for publication October 14, 2004.

Reprint requests: Qutayba Hamid, MD, PhD, FRCP, McGill University, Meakins-Christie Laboratory, 3626 St Urbain Street, Montreal H2X 2P2, Canada. E-mail: qutayba.hamid@mcgill.ca.

0091-6749/\$30.00

© 2005 American Academy of Allergy, Asthma and Immunology
doi:10.1016/j.jaci.2004.10.016



FIG 2. Small airway in a smoker with centrilobular emphysema. Thickened wall and abundant muscle contribute to the markedly narrowed and deformed lumen.

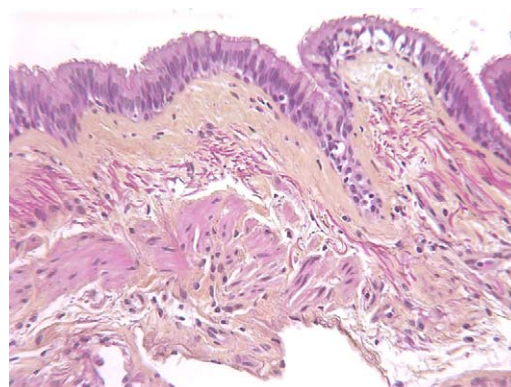


FIG 3. Wall of an airway less than 2 mm. in diameter in a smoker with centrilobular emphysema. The epithelium shows goblet cells, not normally found in airways of this caliber; the wall is thickened with infiltration of T cells and increase in smooth muscle mass.

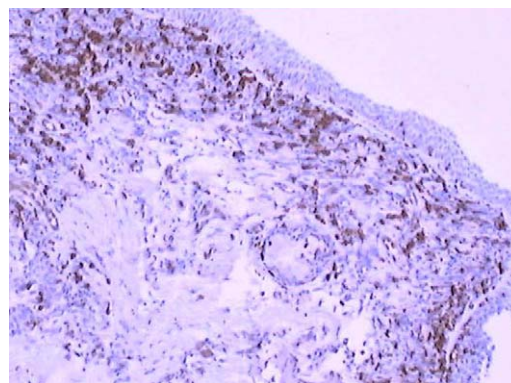


FIG 4. Immunostaining of section from a biopsy specimen of a patient with COPD using antibodies to CD8. Note the large number of CD8⁺ cells in the upper mucosa. (ABC, original magnification $\times 200$.)

airways in all forms of COPD. CD8⁺ cells, the most predominant T-cell subtype, usually invade the submucosa but can also be demonstrated within the epithelium, mucous glands, and the smooth muscle

1479

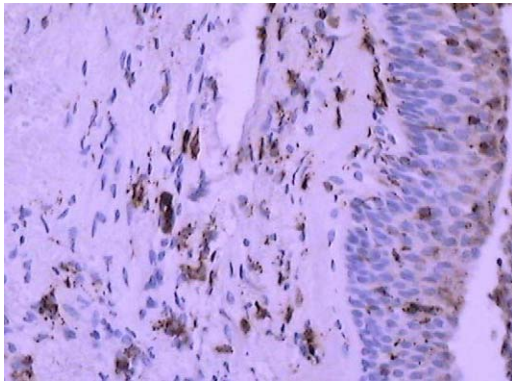


FIG 5. Section from a proximal airway in COPD showing CD68 immunoreactivity.

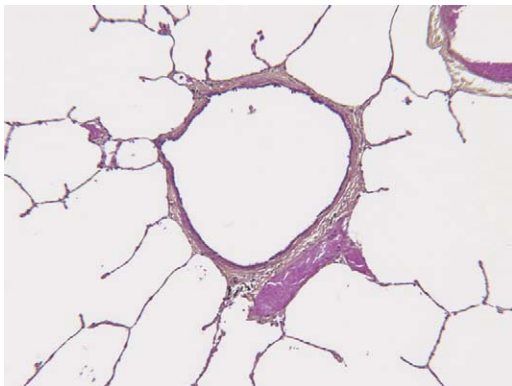


FIG 6. Small airway in panlobular emphysema (PLE). The abnormalities in the small airways are less prominent in PLE than in centrilobular emphysema, and the wall of the airways shows significant less remodeling.

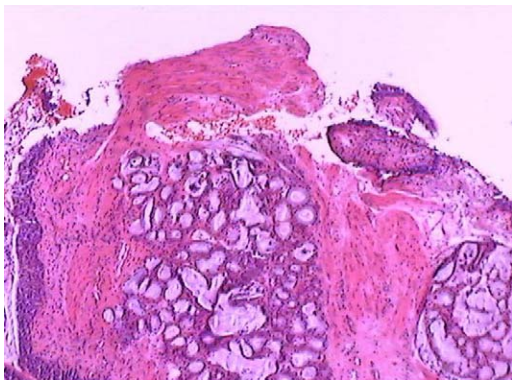


FIG 7. Biopsy specimen from a patient with COPD shows mucous gland hyperplasia. (Hematoxylin and eosin, original magnification $\times 200$.)

layer (Fig 4). The other types of cells that have been reported to be increased in COPD are macrophages; these are mainly visualized in small airways and lung parenchyma (Fig 5). Different cytokines and chemokines were reported to be highly expressed in COPD, including IL-8, TNF- α , and MCPs. Recent studies

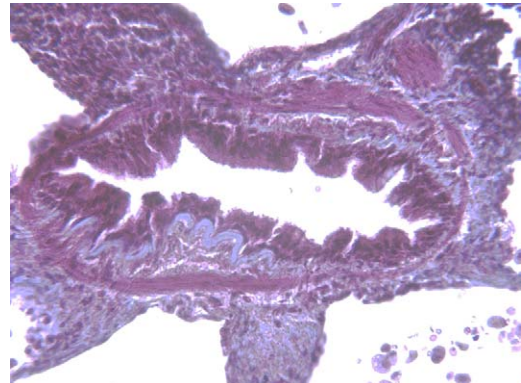


FIG 8. Masson-Trichrome stain of an airway wall in a smoker with centrilobular emphysema showing a thickening of basement membrane.

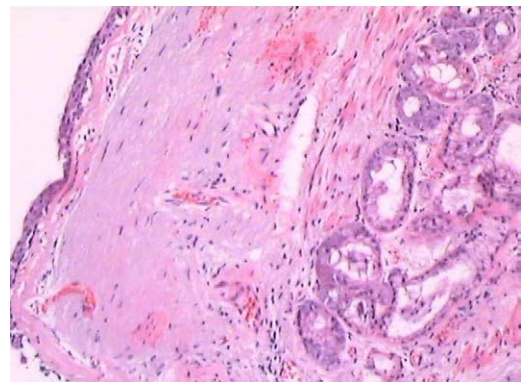


FIG 9. Section from the proximal airway of a patient with COPD showing an extensive subepithelial fibrosis. (Hematoxylin and eosin, original magnification $\times 200$.)

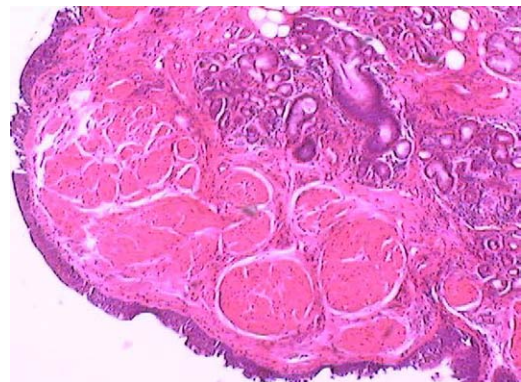


FIG 10. Section from the proximal airway of a patient with COPD shows an impressive increase in smooth muscle mass that extends close to the epithelium.

have shown that extensive airway remodeling is a feature of COPD pathology (Figs 6-10). Increased smooth muscle mass, mucous gland hyperplasia, and subepithelial fibrosis are also features of large and small airways pathology in COPD.³ Lymphoid aggregation containing follicles has recently been described

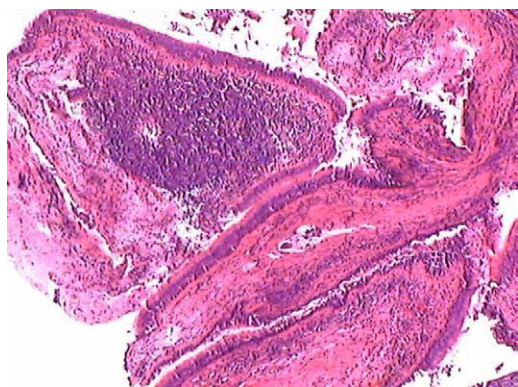


FIG 11. Section from a patient with COPD shows a lymphoid aggregation containing a follicle in a proximal airway. (Hematoxylin and eosin, original magnification $\times 200$.)

in COPD⁴; this feature is not restricted to small airways and can be demonstrated in large and intermediate-sized airways (Fig 11).

REFERENCES

1. van den Berge M, Polosa R, Kerstjens HAM, Postma DS. The role of endogenous and exogenous AMP in asthma and chronic obstructive pulmonary disease. *J Allergy Clin Immunol* 2004;114:737-46.
2. Sutherland ER. Outpatient treatment of chronic obstructive pulmonary disease: comparisons with asthma. *J Allergy Clin Immunol* 2004;114:715-24.
3. Hirst SJ, Martin JG, Bonacci JV, Chan V, Fixman ED, Hamid QA, et al. Proliferative aspects of airway smooth muscle. *J Allergy Clin Immunol* 2004;114:S2-17.
4. Hogg JC, Chu F, Utokaparch S, Woods R, Elliott WM, Buzatu L, et al. The nature of small-airway obstruction in chronic obstructive pulmonary disease. *N Engl J Med* 2004;350:2645-53.