CORRESPONDENCE

Airway anatomy as a risk factor of COPD

We read with interest the study of Smith and colleagues,[1] because besides their counterintuitive result of thinner airways in COPD, another important result is their smaller airway lumen areas of the whole bronchial tree. Their Table E4 shows that adjusted values of areas for confounding factors are significantly reduced from trachea to the sixth airway generation in COPD.

Based on theoretical arguments, the whole human bronchial tree anatomy can be described by only two factors: the tracheal cross-sectional area and the homothety factor (diameter of daughter bronchus over diameter of parental bronchus), which describes the reduction of calibre at each subsequent generation.[2] The airway sections are highly variable from person to person, and gender and height explain only a minor part of this variance,[2] but it justifies the statistical approach of Table E4. One may hypothesise that pre-existing lung anatomy constitutes a risk factor for COPD and asthma, an argument for their early origin. Along this line, we recently showed that airway anatomy, crudely assessed by tracheal section, is an independent predictor of asthma.[3] Thus, a reduced tracheal section, as observed in this study in COPD, leads to a reduction of the lumen areas of the whole bronchial tree for a given homothety factor. We suggested that the remodelling process may affect the homothety factor,[2] and further showed that a decrease in this factor may explain the shift in airway resistance towards the periphery in COPD.[4] This remodelling of bronchiolar tissue results from a process that first narrows and then removes a large number of bronchioles from the lung.[5] Hogg and colleagues have shown that although the total volume of bronchiolar tissue increases in moderate COPD, it may decrease in severe COPD with a relative increase in collagen-3 over collagen-1 during this process.[5] Due to spatial limitations of CT scan, there is an inherent selection bias of larger airway segments at each bronchial generation (see their Table 1[1] and Table A.1[2]). One may hypothesise that narrowing and removal of the smallest bronchioles occurs first, leaving the largest airways, in which a change in wall composition may have already occurred, available for CT scan analysis, bringing back together the results of Hogg and colleagues[5] and Smith and colleagues.[1]

In conclusion, the recognition that airway anatomy is a risk factor for airway diseases is an important issue.

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REFERENCES

1 Smith BM, Hoffman EA, Rabinowitz D, *et al*. Comparison of spatially matched airways reveals thinner airway walls in COPD. The Multi-Ethnic Study of Atherosclerosis (MESA) COPD Study and the Subpopulations and Intermediate Outcomes in COPD Study (SPIROMICS). *Thorax* 2014;69:987–96.
2 Bokov P, Mauroy B, Revel MP, *et al*. Lumen areas and homothety factor influence airway resistance in COPD. *Respir Physiol Neurobiol* 2010;173:1–10.
3 Bokov P, Chevalier-Bidaud B, Al Dandachi G, *et al*. Tracheal section is an independent predictor of asthma in patients with nasal polyposis. *Respir Physiol Neurobiol* 2014;203:15–18.
4 Bokov P, Mauroy B, Mahut B, *et al*. Homothety ratio of airway diameters and site of airway resistance in healthy and COPD subjects. *Respir Physiol Neurobiol* 2014;191:38–43.
5 Hogg JC, McDonough JE, Gosselink JV, *et al*. What drives the peripheral lung-remodeling process in chronic obstructive pulmonary disease? *Proc Am Thorac Soc* 2009;6:668–72.