CHEST

Chronic Bronchitis Is Associated With Worse Symptoms and Quality of Life Than Chronic Airflow Obstruction

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BACKGROUND: COPD includes the chronic bronchitis (CB) and emphysema phenotypes. Although it is generally assumed that emphysema or chronic airflow obstruction (CAO) is associated with worse quality of life (QOL) than is CB, this assumption has not been tested.

METHODS: The current study's analyses from the Lovelace Smokers' Cohort (LSC) were validated in the COPD Gene Cohort (COPDGene). CB without CAO (CB only) was defined as self-reported cough productive of phlegm for ≥ 3 mo/y for 2 consecutive years and postbronchodilator $FEV_1/FVC \geq 70\%$. CAO without CB (CAO only) was defined as a postbronchodilator $FEV_1/FVC < 70\%$ with no evidence of CB. QOL outcomes were obtained from the St. George's Respiratory Questionnaire (SGRQ) and the 36-Item Short Form Health Survey (SF-36) questionnaires. A priori covariates included age, sex, pack-years of smoking, current smoking, and FEV_1.

RESULTS: Smokers with CB without CAO (LSC = 341; COPDGene = 523) were younger and had a greater BMI and less smoking exposure than did those with CAO only (LSC = 302; COPDGene = 2,208). Compared with the latter group, QOL scores were worse for those with CB only. Despite similar SGRQ Activity and SF-36 Role Physical and Physical Functioning, SGRQ Symptoms and Impact scores and SF-36 emotional and social measures were worse in the CB-only group, in both cohorts. After adjustment for covariates, the CB-only group remained a significant predictor for "worse" symptoms and emotional and social measures.

CONCLUSIONS: To our knowledge, this analysis is the first to suggest that among subjects with COPD, those with CB only present worse QOL symptoms and mental well-being than do those with CAO only.

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ABBREVIATIONS: CAO = chronic airway obstruction; CAT = COPD Assessment Test; CB = chronic bronchitis; COPDGene = COPD Gene Cohort; GOLD = Global Initiative for Chronic Obstructive Lung Disease; LSC = Lovelace Smokers' Cohort; QOL = quality of life; SF-36 = 36-Item Short Form Health Survey; SGRQ = St. George's Respiratory Questionnaire

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COPD, which limits airflow and gas exchange, is one of the leading causes of morbidity, disability, and death worldwide,[1] and is the third most common cause of death in United States.[2] COPD is characterized by two phenotypes involving hypersecreted mucus and occlusion of the conducting airways (chronic bronchitis [CB]) and an enlargement, destruction, or both of the walls of peripheral airspaces with the presence of chronic airflow obstruction (CAO). CB was depicted classically as the "blue bloater" with greater mucus and cough but less shortness of breath than the "pink puffer" with primarily emphysema. Over the past several years, it has become clear that the line between classic major symptoms may be blurred, and careful examination of symptoms with characterization of physiologic changes is needed.[3,4]

Previous studies reported that patients with CB in the COPD Gene Cohort (COPDGene) had worse respiratory symptoms and a higher risk of exacerbations compared with those without CB.[3] Further, male sex, white race, lower FEV_1 %, allergic rhinitis, history of acute bronchitis, current smoking, and increased airway wall thickness as measured by quantitative CT scan increased the odds for CB.[5] Another study compared subjects with CB but normal lung function ($FEV_1/FVC \geq 0.70$) with nonobstructed subjects without CB.[6] Although these studies compared patients with and without CB, comparison of the overall quality of life (QOL) among patients with CB and those with CAO has not been tested rigorously. There has been some assertion that those with CAO have worse disease impact than do those with CB.[7] Based on findings from initial analyses of the QOL in smokers with and without CB and those without CAO, we noticed a dramatic effect of symptoms in patients with CB. Therefore, we analyzed the QOL relationships between smokers with CB without CAO (CB only) and those with CAO without CB (CAO only) in the Lovelace Smokers' Cohort (LSC) and validated our findings in the COPDGene.

Materials and Methods

Study Population

Our study population was drawn from eligible participants, primarily women, from a cohort of current and former smokers in New Mexico (LSC) recruited since March 2001 with a median follow-up period of approximately 6 years. At initial and follow-up examination visits that occurred at 18-month intervals, subjects completed questionnaires (including and in particular, the Medical Outcomes Study 36-Item Short Form Health Survey [SF-36] and the St. George's Respiratory Questionnaire [SGRQ]) and underwent phlebotomy, anthropometry, and spirometry by trained study personnel, as published previously.[8,9]

Validation Population

Our study validation population was drawn from eligible participants from the multicenter COPDGene cohort (www.COPDGene.org), and none of the subjects was represented in both cohorts.

Inclusion and Exclusion Criteria

Participants were included if they were aged 40 to 75 years and were former or current smokers with ≥ 20 pack-years of smoking history at baseline examination for the LSC and ≥ 10 pack-years for the COPDGene. Subjects with a self-reported history of asthma at baseline examination were excluded, because asthma is an established confounder for QOL measures and may coexist with either CAO or CB.[10-14] Exclusion of subjects with a history of asthma reduced the eligible population for the LSC and the COPDGene to 1,895 and 7,341, respectively.

Questionnaires

Demographic information such as age, smoking history, environmental exposure history, and history of respiratory disease were obtained using the adult American Thoracic Society Division of Lung Disease-78 questionnaire.[15] The SGRQ and SF-36 questionnaires were used to evaluate QOL and symptoms, the SGRQ to evaluate respiratory-specific health status, with higher scores indicating worse health status,[16] and the SF-36 to evaluate general physical and mental function, with lower scores indicating worse health status.

Dependent (Outcome) Variables

Dimension scores from the SGRQ and the SF-36 were used as outcome variables for the analysis. In the LSC, individual items of the SGRQ Symptom dimension and the sleep question from the Impacts dimension were used in the univariate and multivariate analysis to explore differences in the symptom expression. In addition, individual items from the SF-36 that were characteristic of depressive mood changes were examined for differences. These specific items and derived scores are described in e-Appendix 1. In the COPDGene, only the SGRQ and SF-36 dimension scores were used as dependent variables.

Group Definition

In the first analysis, all participants with CB were compared with those without CB (Fig 1). CB was defined as self-reported cough productive of phlegm for ≥ 3 mo/y for at least 2 consecutive years. The second analysis also compared those with CB with those without CB, but was restricted to those participants who had no CAO. CAO was defined as a baseline ratio of postbronchodilator $FEV_1/FVC < 70\%$. The third analysis compared participants with CB but no CAO (CB only) with participants with CAO without CB (CAO only) (Fig 1). This third analysis involved a total of 634 LSC subjects with about equal numbers of those with CB only ($n = 341$) and those with CAO only ($n = 302$). To further test the hypothesis that individuals with CB only present with worse QOL than do patients with CAO only, the multivariate analysis focused on the third analysis and examined individuals with CB only and those with CAO only. This third analysis is the only one that is discussed further; however, the findings of analyses 1 and 2 are available in e-Appendix 1.

Statistical Approach

Summary statistics including means, SDs, and SEs for continuous variables and proportions for categorical variables were determined. Cross-sectional analyses used logistic and linear regression techniques for categorical and continuous dependent variables, respectively. The analyses were performed overall and after stratification into the two baseline disease categories. All statistical analyses were done using SAS software, version 9.3 (SAS Institute Inc). A two-sided P value of $< .05$ was considered statistically significant. Multivariable analysis was carried out with the covariates of self-reported age, sex, pack-years of smoking, current