Relationship between chronic nasal and respiratory symptoms in patients with COPD


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Summary

The relationship between the upper and lower airways in chronic obstructive pulmonary disease (COPD) is unknown. We examined the prevalence of chronic nasal symptoms and the correlation with lower respiratory symptoms and parameters of severity of COPD such as exacerbation frequency and spirometry. 61 COPD patients from the East London COPD cohort were studied. [Mean (SD) age 70(6.96) years, FEV1 0.98 (0.38) l, FVC 2.45(0.72) l, FEV1%Pred 37.0 (12.3), and 47.6 (31.8) smoking pack years, 14 current smokers, 36 males] COPD patients had a high prevalence of nasal symptoms (75%), more than half reporting nasal discharge (52.5%) and sneezing (45.9%). Associations were found between nasal score and daily sputum production ($P = 0.005$) and post-nasal drip and sputum production ($P = 0.046$) with a trend to increased nasal symptoms in frequent exacerbators compared to infrequent exacerbators. No significant relationship was found between nasal symptoms and FEV1 or any other lower respiratory airway symptom. Associations between nasal and respiratory symptoms were found suggesting that there is a relationship between the upper and lower airway in COPD.

KEYWORDS

COPD; Nasal symptoms; Exacerbation frequency; Cigarette smoking

Introduction

The upper and lower airways form one contiguous and functionally related organ, and are frequently exposed to similar inflammatory stimuli. There is increasing interest in the possibility that disease processes in one part of the airway may be reflected or manifest in another, thereby providing opportunities for dual diagnosis and therapy. The relationship between rhinitis and asthmatic bronchial hyperresponsiveness is well recognised.1,2 Studies have shown that up to 88% of asthmatic patients display symptoms of rhinitis and about 50% of rhinitic patients experience bronchial hyperresponsiveness.3,4 It has been suggested that upper respiratory tract disease can lead to or exacerbate chronic inflammation of the lower airways.5 Chanez et al.6 has proposed that although changes occur in both the upper and lower airways when perennial rhinitis and asthma coexist, the nasal and bronchial epithelium may behave differently. However, similarities have also been described between bronchial and nasal epithelial cells morphologically, histologically and functionally.7 Cigarette smoking increases lower airways inflammation as well as affecting the upper airways.8–10 There is little information on the long-term effects of cigarette smoking on the upper airways in patients with chronic obstructive pulmonary disease (COPD). Up to now, only

Abbreviations: COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; FEV1-%Pred, percent predicted forced expiratory flow in 1 s; FEV1/FVC, forced expiratory flow in 1 s forced vital capacity ratio

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one study has investigated the prevalence of nasal symptoms in patients classified as having chronic bronchitis or emphysema. This study found that 40% of patients had chronic nasal symptoms. However, lung function data was not available and the study did not examine relationships between upper airway symptoms and clinical characteristics of COPD such as chronic sputum production and exacerbation frequency. The aim of the present study was to determine the prevalence of nasal symptoms in a well-characterised group of COPD patients and study the relationship to lower airway clinical and physiological parameters in particular the role of exacerbation frequency.

Methods

Study subjects

Information about the prevalence of nasal symptoms was obtained from 61 patients in the East London COPD study (ELCOPD) cohort with a diagnosis of moderate-to-severe COPD. COPD was diagnosed using the BTS guidelines. These patients are part of a rolling cohort of patients with COPD who have been followed up since October 1995 in the ELCOPD study, during this study period 80 patients were enrolled in the cohort, of which 61 agreed to take part in this study. The remaining 19 (24%) from the ELCOPD cohort who did not participate in the study were not significantly different from the 61 patients studied. [Mean (SD) age 66.6 years (9.79); years in study 1.76 (1.79); FEV1 0.88 (0.39); FEV1 (% predicted) 35.4 (11.74); FVC 2.12 (0.83); FEV1/FVC 42.6 (11.9); pack years smoked 47.6 (31.8); six current smokers; years since last smoked 4.3 (8.30)]. COPD was defined as forced expiratory volume in 1 s (FEV1) of less than 70% predicted, reversibility to 400 μg of salbutamol via a metered dose inhaler of less than 15% or 200 ml and FEV1/FVC less than 70%. Reversibility was assessed on recruitment to the ELCOPD cohort. Patients with a history of asthma, bronchiectasis, carcinoma of the bronchus or other significant respiratory disease were excluded. Records from the East London COPD study were used to ascertain smoking history and exacerbation frequency. Current smoking or past smoking was assessed by pack years of consumption.

Upper and lower respiratory symptoms

Information was obtained from each patient at routine clinic visits between May and October 2001 regarding chronic nasal symptoms which they reported to suffer from when stable. Patients were asked to report chronic nasal symptoms (symptoms of chronic rhinitis) experienced on a regular basis not symptoms experienced during exacerbations. Five symptoms were assessed, three were obtained from a definition of rhinitis (symptoms of nasal discharge, sneezing and nasal congestion) and two clinically important symptoms were added; decreased sense of smell and post-nasal drip. Patients were asked if they experienced each of these symptoms individually and responses were recorded as an yes or no answer. Post-nasal drip was described to the patient as a discharge running down the back of the throat and responses recorded as an yes or no answer. The five nasal symptoms were also totalled to produce a nasal symptom score of between 0 and 5. At the same visit, patients were also asked whether, when stable they had daily respiratory symptoms of shortness of breath, cough sputum and wheeze. Stable FEV1 and FVC were also recorded at this visit by rolling seal spirometer (Sensor Medic Corp., Yorba Linda, CA, USA). If patients did not undergo spirometry at this clinic visit spirometry from a previous clinic visit (within the last 3 months) was used.

Exacerbation frequencies

Information regarding frequency of exacerbations experienced by patients was obtained from the ELCOPD study records. Briefly, patients previously recorded any increase above their normal respiratory symptoms on daily diary cards at 10 a.m. every morning. Exacerbations were diagnosed according to our previously validated criteria as at least 2 days duration of two major symptoms (increase in dyspnoea, sputum purulence, and increased sputum volume) or one major and one minor symptom (nasal discharge or nasal blockage, wheeze, sore throat, cough). Approximately 50% of the exacerbations were confirmed at clinic by the study team within about 48 h of onset. The exacerbation frequency was defined as the number of exacerbations experienced by each patient during a period of 18 months prior to completion of the questionnaire. Frequent exacerbators were defined as those with an exacerbation frequency greater than or equal to the median for the entire ELCOPD cohort (2.55 exacerbations per year); infrequent exacerbators as less than 2.55 exacerbations per year. Patients who had not been included in the cohort for 18 months or more were excluded from the frequent/infrequent exacerbation analysis.
Statistical methods

Positive responses were scored as one and negative as zero. Differences between frequent and infrequent exacerbator groups were tested by Mann–Whitney tests. Chi-squared tests and Spearman's rank correlations were used to determine relationships between the chronic nasal symptoms, stable lower airway symptoms and other clinical parameters such as current smoking, FEV₁ and FVC. The computer-based analysis program SPSS (Statistical Package for Social Science, 10.1 for PC, SPSS Inc, Chicago IL, USA) was used in all calculations. \( P < 0.05 \) was considered to be statistically significant.

Results

Information was obtained from 61 COPD patients (36 men, 25 female) from the ELCOPD cohort. The patients were assessed at outpatient clinics at the London Chest Hospital between May and October 2001. Characteristics of these patients are shown in Table 1.

Prevalence of nasal symptoms

The distribution of the nasal scores and the prevalence of each symptom are shown in Figs. 1 and 2, respectively. 75.4% of patients had at least one nasal symptom, more than half of the patients had two or more symptoms (52.4%) and 39.3% had three or more symptoms. Nasal discharge was the most prevalent symptom reported by more than half of the patients studied (52.5%), compared to sneezing attacks of which 45.9% of patients reported, post-nasal drip (39.3%), nasal blockage (34.4%) and decreased sense of smell (16.7%).

Relationship between nasal and respiratory symptoms

Table 2 illustrates the median number of nasal symptoms for patients with and without each respiratory symptom (sputum production, shortness of breath, wheeze and cough). Those with sputum production had a significantly higher number of total nasal symptoms \( (P = 0.005) \). Patients with

![Figure 1](https://example.com/figure1.png)

**Figure 1** Frequency of nasal symptoms found in COPD.
cough also show increased numbers of nasal symptoms \((P = 0.072)\). There were no significant relationship trends with the other respiratory symptoms of breathlessness and wheeze. Those patients that produced sputum daily were more likely to have nasal symptoms especially post-nasal drip \((P = 0.046)\), sneezing attacks \((P = 0.008)\) and a trend towards nasal discharge \((P = 0.081)\) and nasal blockage \((P = 0.097)\).

### Associations with nasal symptoms

Current smoking or past smoking did not influence the presence of these self-reported nasal symptoms. Current smoking did not increase the frequency of daily sputum production either (current smokers 30%; ex-smokers 28%). The current and ex-smokers were well matched (smokers 59.2 (SD 39.67), ex-smokers 44.1 (SD 28.69); \(P = 0.203\)) in terms of pack years of cigarettes smoked. Frequent exacerbators \((n = 29)\) reported a higher percentage of each nasal symptom compared to their infrequent counterparts \((n = 27)\), with a higher median number of symptoms (3 versus 1), but these differences were not statistically significant (nasal blockage, \(P = 0.140\); nasal discharge, \(P = 0.188\); sneezing, \(P = 0.774\); post-nasal drip, \(P = 0.379\); impaired smell \(P = 0.506\); nasal score \(P = 0.195\)). There was no relationship between the degree of airflow obstruction as measured by FEV\(_1\) or the FEV\(_1\)/FVC ratio and the frequency of nasal symptoms.

### Discussion

It is well recognised that there is a strong association between asthma and nasal conditions such as allergic rhinitis and rhinosinusitis, with a similar inflammatory response occurring in both the upper and lower airways.\(^6,7\) Eighty-eight per cent of asthmatic patients have been shown to have rhinitis.\(^8\) In contrast, although rhinitis is very common in the general population approximately one in six people are affected.\(^9\) It is not clear, however, whether the same is found in patients with COPD. Thus, the objective of this study was to
investigate the prevalence of nasal symptoms in COPD patients and relate them to markers of respiratory disease such as daily symptoms, lung function and exacerbation frequency.

We found that patients with well-characterised COPD have a high prevalence of nasal symptoms (75%), with about half of the patients reporting nasal discharge and sneezing. There was a strong association between these nasal symptoms and daily sputum production, with these patients being significantly more likely to have symptoms of sneezing and post-nasal drip and consequently, a higher nasal symptom score. In addition, there was a trend for patients with daily cough to have a higher nasal symptom score compared to those without cough. There was no significant relationship with the other daily respiratory symptoms of wheeze and shortness of breath.

Mont Slun et al.11 also found an increase in nasal symptoms in subjects with respiratory diseases: 40% of subjects with self-reported chronic bronchitis/emphysema had recurrent or permanent nasal symptoms. However, the severity of the COPD in these subjects was not assessed. In comparison, our study found nearly double the prevalence of nasal symptoms with moderate or severe COPD (mean FEV1 37% predicted). Our study found no significant relationship between FEV1 and nasal symptoms or scores.

The inter-relationship between the symptoms of daily cough, sputum, post-nasal drip and sneezing in our study may have several explanations. The same chronic inflammatory process may be occurring in both the nasal and bronchial epithelium with airway neutrophilia and mucus hypersecretion leading to increased sputum and nasal secretions. In addition, the nasal symptoms could be contributing to the severity of the respiratory symptoms, for example nasal discharge may be in part, produce the symptoms of cough. The relationship between nasal symptoms and sputum production may also in part be due to some confusion by the patients between distinguishing post-nasal drip and sputum production. However, post-nasal drip has been shown to be a well-recognised cause of cough, which could also contribute to the volume of sputum expectorated.

There was little evidence that current smoking had any direct effect on nasal symptoms and respiratory symptoms in this study, though this analysis is limited due to the relatively small sample size. The current and ex-smokers were well matched in terms of pack years of smoking. This is in contrast to other larger epidemiological COPD studies, which have found significant differences between ex-smokers and current smokers in respiratory symptoms such as sputum production after as little as 5 years abstaining from smoking. In our study, both the smokers and ex-smokers had relatively high smoking pack year histories and this may explain the lack of differences seen between the groups. In addition, Rutgers et al.23 found that COPD patients who do not currently smoke still have higher levels of inflammatory cells compared to age-matched healthy subjects and this would explain the lack of interactions between smoking and symptoms in this study.

In this study, although patients documented as having frequent exacerbations of their COPD tended to have more nasal symptoms than those with infrequent exacerbations, the difference did not reach statistical significance. Previous work has shown that frequent exacerbators are more likely to have symptoms of cough and sputum and increased airway inflammation.15,24

A significant number of patients with COPD show evidence of lower airway bacterial colonisation.25 Stockley et al.26 have shown that patients who expectorate sputum are more likely to be colonised with bacteria. Our group has shown that COPD patients with bacterial colonisation have increased numbers of exacerbations.27 Bacterial colonisation has been shown to increase sputum production and airway inflammation in the lower airways, and thus may also affect the upper respiratory tract producing more nasal symptoms, as seen in the sputum producers and frequent exacerbator groups in this study. Alternatively, the upper airway may serve as a pool for contamination of the lower airways with bacteria and inflammatory mediators, contributing to the airway inflammation in COPD or vice versa. The importance of inflammatory mediators and bacteria in the upper respiratory tract and the effect on the chronic inflammatory process in COPD is currently unknown.

The high frequency of nasal symptoms in these patients requires further investigation. Prospective studies should be undertaken to characterise the time course of the nasal symptoms in relation to respiratory ones. Although this study has found a high frequency of nasal symptoms in this population, it is difficult to fully estimate the extent of these symptoms as a control population was not used. Further study should consider the prevalence of chronic nasal symptoms in the same season (May–October) in different patient types including controls to adequately assess the increase in symptoms. However, in this study, there is a significant increase in nasal symptoms in COPD, compared to the reported prevalence of rhinitis of one in six people.19
In conclusion, nasal symptoms are common in patients with COPD. Associations between lower respiratory and nasal symptoms have been found, suggesting a possible common airway inflammatory process. Information obtained about upper airways may be useful in predicting disease processes in the lower airway. The interaction between inflammatory processes in the upper and lower airways requires further study.

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References