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Pollen count and exhaled nitric oxide levels in a seasonal allergic rhinitis patient

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Abstract

The subject was a 52-year-old man with Japanese cedar pollinosis, which developed between February and May. He had no history of asthma and was an ex-smoker. He underwent fractional exhaled nitric oxide (FeNO) measurements twice a week from 2010 to 2012. The pollen counts in 2010 were the lowest during the last decade, and the FeNO level was less than 30 ppb for the whole year. In contrast, the mean pollen count in 2011 was very high and the patient's FeNO level rose to more than 100 ppb. The mean pollen count in 2012 was comparable with that of 2010; however, high counts were detected in April and May, and the FeNO level rose to 70 ppb during the latter stages of the pollen season. These results indicate that pollen counts should be taken into consideration during the interpretation of FeNO data in asthma or allergic rhinitis.

Introduction

The measurement of fractional exhaled nitric oxide (FeNO) levels is a quantitative, noninvasive, simple, and safe method of evaluating eosinophilic airway inflammation in asthma patients. However, allergic rhinitis and being a current smoker can act as significant confounding factors in such evaluations [1], and patients with seasonal allergic rhinitis were found to exhibit increased FeNO levels compared with normal controls both during and outside of the pollen season [2]. Previous studies have found that natural exposure to pollen during the pollen season causes significant increases in the FeNO level [3, 4]; however, the effect of the pollen count on FeNO levels has not been fully elucidated. Here, we assess the relationship between the pollen count and FeNO levels over a 3-year period in a patient with seasonal allergic rhinitis.

Case Report

The subject was a 52-year-old man with seasonal allergic rhinitis caused by the Japanese cedar (*Cryptomeria japonica*) pollen. Japanese cedar pollinosis, which tends to develop between February and May, is one of the most common allergic respiratory diseases in Japan, and its prevalence among the Japanese population has been reported to be > 16% [5]. The Japanese Ministry of the Environment provides Japanese cedar pollen count data (in m^3 of air) for each pollen season, which are measured using real-time pollen counters (Hanako-san: KH-3000-01, Yamato Manufacturing Co., Ltd., Yokosuka, Japan). One of the 141 nationwide pollen count measurement sites is located next to our hospital. The patient developed allergic rhinitis at the age of 30 and has exhibited rhinitis symptoms almost every year since; however, he rarely displays these symptoms during periods when the Japanese cedar pollen count is low. Accordingly, he was administered H_1-blockers or intranasal corticosteroids on an as-needed basis. He had no history of asthma and was an ex-smoker, having quit smoking 20 years ago. The total IgE level was 170 IU/mL and specific IgE to Japanese cedar pollen was positive (17.4 U/mL, class 3). He underwent FeNO measurements twice a week from 2010 to 2012. FeNO was measured using an online method at a flow rate of 50 mL/s using an NO analyzer (Sievers NOA 280i; GE

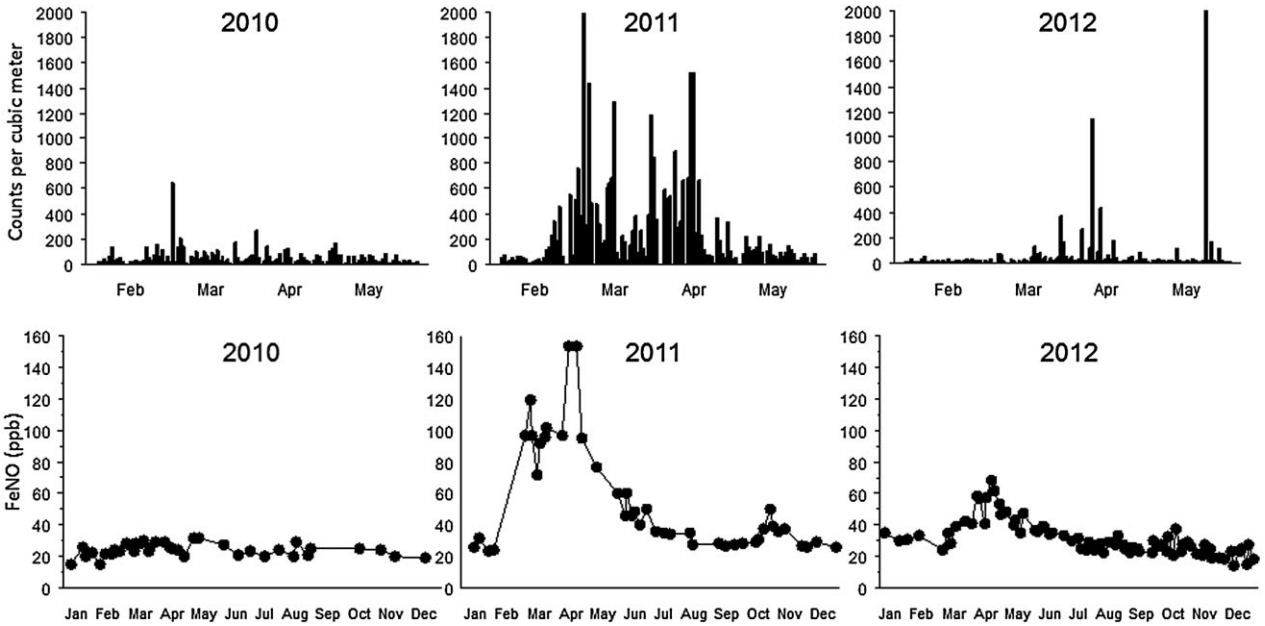

Figure 1. The maximum daily Japanese cedar (*Cryptomeria japonica*) pollen counts recorded between February and May (upper panels) and the annual changes in fractional exhaled nitric oxide (FeNO; lower panels) for 2010, 2011, and 2012 in a patient with seasonal allergic rhinitis. High FeNO levels were only detected during the pollen season that is when the pollen count was high.

Analytical Instruments, Boulder, CO, USA) according to the American Thoracic Society/European Respiratory Society recommendations. In 2013, we retrospectively analyzed the relationship between the pollen count and FeNO over the 3-year study period.

Figure 1 shows the maximum daily Japanese cedar pollen counts recorded between February and May (upper panels) and the annual changes in FeNO (lower panels) for 2010, 2011, and 2012. The pollen counts recorded in 2010 (mean, 57 counts per m^3) were the lowest recorded during the last decade, and the FeNO level was less than 30 ppb for the whole year. In contrast, the mean pollen count in 2011 was 500 counts per m^3; that is the pollen count was very high, particularly in March and April, during which the patient's FeNO level rose to more than 100 ppb. High FeNO values were maintained until June and then declined while exhibiting slight fluctuations. The mean pollen count in 2012 (64 counts per m^3) was comparable with that of 2010; however, high counts were detected in April and May, and the FeNO level rose to 70 ppb during the latter stages of the pollen season.

Discussion

In allergic rhinitis patients, elevated FeNO values reflect lower airway inflammation, which might be linked to a greater risk of asthma development later in life [2]. A previous study found that FeNO levels were significantly increased during the pollen season and were most strongly associated with the mean pollen count in the week before measurement [3]; however, no study has assessed the relationship between the pollen count and FeNO levels over a period of years. In this study, we found that FeNO levels were associated with the pollen count during the pollen season and reached the high levels as observed in untreated asthmatic patients. These results indicate not only that seasonal allergic rhinitis can act as a confounding factor during airway assessments based on FeNO measurements, but also that pollen counts should be taken into consideration during the interpretation of FeNO data in patients with asthma or allergic rhinitis.

The patient used more intranasal steroids in 2011 than in other years; however, this did not appear to affect the FeNO levels, suggesting that intranasal steroids, on an as-needed basis in particular, may not affect the lower airway inflammation. We think that systemic or inhaled rather than intranasal corticosteroids will suppress the lower airway inflammation.

Disclosure Statements

No conflict of interest declared.

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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