

Peak Expiratory Flow Monitoring to Screen for Asthma in Patients With Allergic Rhinitis

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■ Abstract

Aim: To investigate the benefit of using peak expiratory flow (PEF) monitoring to screen for asthma in allergic rhinitis patients.

Methods: Eighty-nine consecutive patients with allergic rhinitis but never assessed for asthma were included in this prospective study. Their allergic status was determined by skin prick tests. All of the subjects filled in a questionnaire on asthma-like symptoms. If they reported such symptoms, pulmonary function tests were carried out. Then, PEF was checked twice daily for 3 weeks.

Results: Thirty-six percent of our study group were male and 64% were female patients with a mean (SD) age of 36.3 (14.0) years. Skin prick tests were positive to grass mixture in 71 (79.8%) patients, to tree mixture in 51 (57.3%), to mite in 46 (51.7%), and to epidermal mix in 26 (29.2%) patients. Thirty-six patients (41%) reported 3 or more asthma symptoms. Lung function test results for these 36 patients showed obstruction for 11.1% (4 patients); the remaining patients (88.9%) had normal function parameters. The subjects who reported 3 or more asthma symptoms but had normal lung function monitored their PEF for 3 weeks. Sixteen (50%) patients from this group and the 4 patients with demonstrated airway obstruction had more than 20% diurnal variation in PEF. These 20 patients' asthma symptoms disappeared after they received 3 months of low-dose inhaled corticosteroid therapy.

Conclusion: It is necessary to look for asthma in patients suffering from allergic rhinitis. PEF monitoring is a low-cost, objective approach to asthma diagnosis that can be performed by a patient with allergic rhinitis even if spirometry is normal. Knowledge of this technique is of utmost importance because delay in diagnosis will result in the unsatisfactory treatment of the disease.

Key words: Allergic Rhinitis. Asthma. Peak expiratory flow (PEF). Peak flow meter.

■ Resumen

Objetivo: Investigar la ventaja de utilizar el control del flujo espiratorio máximo (FEM) para detectar el asma en pacientes con rinitis alérgica.

Métodos: Participaron en este estudio clínico 89 pacientes consecutivos con rinitis alérgica, pero que nunca se habían examinado para determinar si padecían asma. Su estado alérgico se determinó a partir de pruebas cutáneas. Todos los pacientes respondieron a un cuestionario sobre síntomas parecidos a los del asma. Si presentaban dichos síntomas, se realizaron pruebas de función respiratoria y, a continuación, se comprobó el FEM dos veces al día durante tres semanas.

Resultados: Un 36% del grupo del estudio eran hombres y un 64%, mujeres. La media (desviación estándar) de edad era de 36,3 (14,0) años. Las pruebas cutáneas dieron positivo a la mezcla de gramíneas en 71 pacientes (79,8%), a la mezcla de alérgenos de árboles en 51 pacientes (57,3%), a los ácaros en 46 (51,7%) y a la mezcla epidérmica en 26 pacientes (29,2%). Treinta y seis pacientes (41%) refirieron haber padecido tres o más síntomas de asma. Los resultados de la prueba funcional respiratoria de estos 36 pacientes revelaron que un 11,1% (4 pacientes) presentaban obstrucción. El resto de los pacientes (88,9%) presentaban parámetros de función normales. Los pacientes que informaron padecer tres o más síntomas de asma, pero cuya función pulmonar era normal, controlaron su FEM durante tres semanas. Dieciséis pacientes (50%) de este grupo y cuatro pacientes con obstrucción comprobada de las vías respiratorias presentaban una variación diurna de más de un 20% en el FEM. Los síntomas del asma de estos 20 pacientes desaparecieron tras seguir una terapia de dosis bajas de corticoesteroides inhalados durante tres meses.

Conclusión: Es necesario comprobar si los pacientes con rinitis alérgica presentan síntomas de asma. El control del FEM es un método objetivo y económico para diagnosticar el asma, que pueden llevar a cabo los pacientes con rinitis alérgica, aunque la espirometría sea normal. El conocimiento de esta técnica es de suma importancia, porque las demoras en el diagnóstico tienen como consecuencia el tratamiento insatisfactorio de la enfermedad.

Palabras clave: Rinitis alérgica. Asma. Flujo espiratorio máximo (FEM). Espirómetro.

Introduction

Epidemiological studies have consistently provided evidence for an association between asthma and allergic rhinitis [1-7]. Several studies have also suggested that allergic rhinitis usually precedes asthma and that rhinitis may be an important risk factor for the development of asthma [3,8]. Asthma may affect up to 40% of patients with allergic rhinitis, a percentage significantly higher than that in the general population [3,9-11].

Although the relation between allergic rhinitis and asthma has received increasing attention, the impact of rhinitis on lower airway disease remains largely unexplored. Despite attention to the "united airways" concept, lower airway disease is still underdiagnosed in patients with rhinitis [12]. Studies mostly rely on postal questionnaires or are retrospective. In addition, general practitioners and ear, nose, and throat (ENT) specialists, who do not generally possess suitable equipment for measuring pulmonary function, see the majority of patients affected. It is possible, however, that early recognition of asthma with appropriate treatment would reduce asthma severity in these patients.

There is therefore a gap in our understanding of how to diagnose asthma easily among allergic rhinitis patients and whether appropriate early treatment might reduce asthma severity and symptoms. We conducted this prospective study to investigate the benefit of monitoring peak expiratory flow (PEF) rate to indicate a diagnosis of asthma in allergic rhinitis patients and to explore the potential effect of early inhaled corticosteroid therapy on reducing asthma symptoms amongst patients with diurnal PEF variability.

Material and Methods

Eighty-nine consecutive patients with allergic rhinitis were included in this prospective study, which was approved by the institutional review board of our hospital.

The diagnostic criteria used for allergic rhinitis were those defined by the Joint Task Force on Practice Parameters in Allergy, Asthma and Immunology [13] and included watery nasal discharge, nasal itch, sneezing, nasal blockage, excessive tearing or conjunctival redness when exposed to allergens, in combination with positive skin test reactions to suspected allergens.

Skin prick testing was performed on all subjects to determine sensitivity to common allergens. We used a 0.1% histamine solution as the positive control of the skin prick test and used the diluent media for allergens as the negative control. Skin prick tests were regarded as positive if the mean wheal diameter was more than 3 mm [8].

Patients with a previous diagnosis of asthma were excluded from the study. All of the subjects filled in a questionnaire containing 9 questions about the presence of asthma-like symptoms [14]. The 9 questions assessed the presence or absence of such symptoms (cough, wheeze, chest tightness, difficulty with breathing) in the last 4 weeks at different moments and in different situations (eg, running or climbing stairs fast, while sleeping, in the morning,

while in a smoky or dusty place). According to the results of studies by Demoly et al [15,16], patients who had 3 or more positive answers were evaluated with further tests for the diagnosis of asthma. Our questionnaire also included patient characteristics (age, sex, occupation) and the clinical history of their rhinitis (date of first symptoms, frequency and intensity of symptoms in relation to the classification of the World Health Organization workshop on allergic rhinitis and its impact on asthma [17]).

Allergic rhinitis patients who described 3 or more asthma-like symptoms underwent pulmonary function tests performed according to American Thoracic Society criteria [18]. The forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), PEF, and forced expiratory flow at 25% to 75% of FVC (FEF₂₅₋₇₅) were determined by spirometry (Spirobank-G, MIR, Rome, Italy).

All patients who described 3 or more asthma-like symptoms also recorded PEF measurements every day for a period of 3 weeks with a full-range peak flow meter (Personal Best, Respironics Inc, Cedar Grove, New Jersey, USA). The PEFs recorded were the best of 3 measurements in the morning and again in the evening. A patient's diurnal PEF variability between morning and evening, expressed as a percentage, was assessed using the following formula [19]:

$$\% \text{ PEF variability} = \frac{(\text{daily maximum} - \text{daily minimum})}{\text{daily mean}} \times 100$$

Patients who had a diurnal variation in PEF of more than 20% and/or obstructive disease confirmed by spirometry received 100 µg of inhaled fluticasone propionate twice daily for 3 months. The patients answered the symptoms questionnaire again after the therapy.

Statistical analysis was performed with the SPSS statistical software (Chicago, Illinois, USA). Sample demographics, clinical characteristics, and laboratory results were described in frequencies and means (SDs). A χ^2 test was used to compare asthma development in patients with and without positive skin tests. A *P* value less than .05 defined statistical significance.

Results

Our study group comprised 89 consecutive patients with allergic rhinitis (64% female and 36% male) who had never been assessed for asthma before. The mean age was 36.3 (14.0) years.

Skin prick tests to grass mixture were positive in 71 (79.8%) patients, to tree mixture in 51 (57.3%), to mite in 46 (51.7%), and to epidermal mixture in 26 (29.2%). There was no significant relationship between the type of positive prick test and the development of asthma. Forty-three of the 89 patients (48.3%) reported a family history of allergy in their questionnaires. Nasal polyps were present in 25 (28.1%) allergic rhinitis patients.

Thirty-six (41%) subjects reported 3 or more asthma symptoms. Four (11.1%) of these 36 subjects had spirometry results showing obstruction and 32 (88.9%) had normal lung function. Sixteen of the 32 (50%) patients who had asthma-like symptoms but normal lung function values had a diurnal

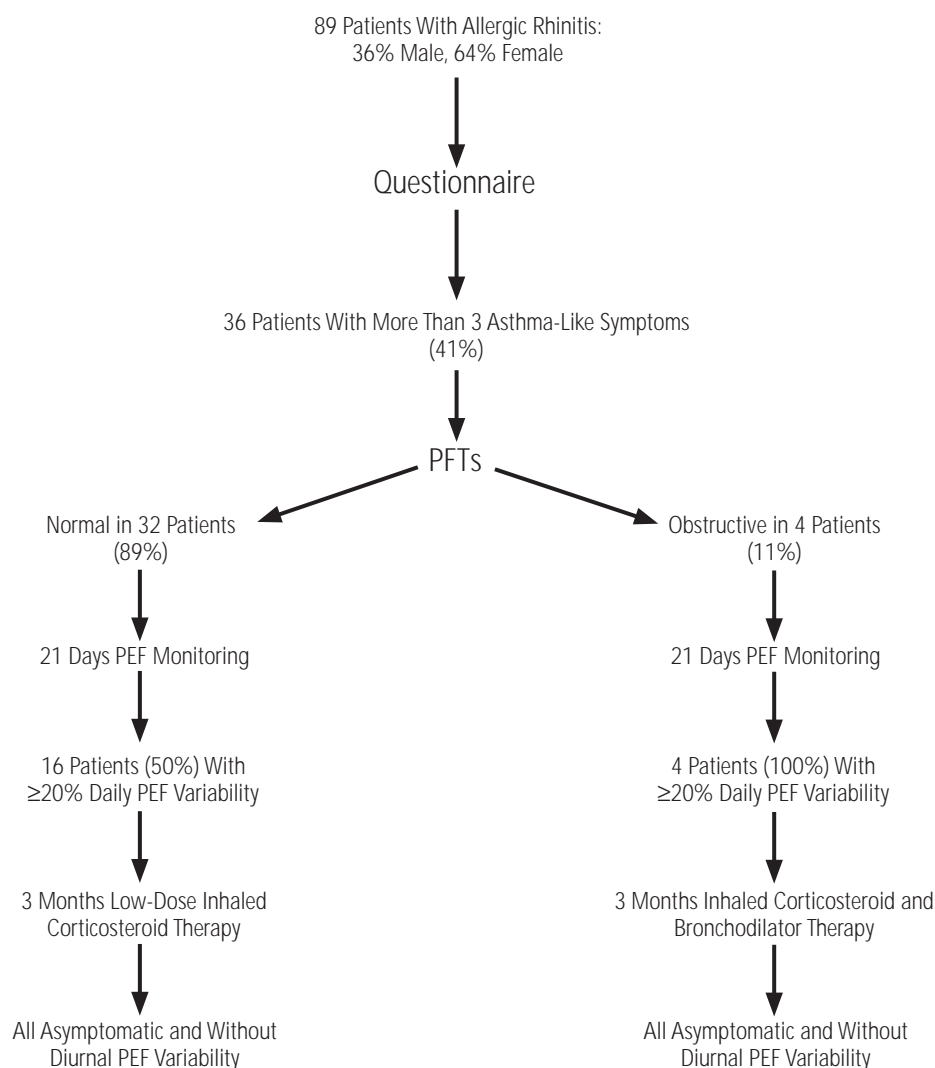
variation in PEF of more than 20%. The 4 obstructive patients also had diurnal PEF variation. Those 16 patients with positive PEF results and the 4 patients with obstructive pulmonary function results were diagnosed with asthma [19]. The mean age of asthma patients was 37.55 (11.34) years (75% female and 25% male). They underwent 3 months of low-dose inhaled corticosteroid therapy, after which their asthma symptoms disappeared and PEF monitoring showed no diurnal variation (figure).

Discussion

In our sample of 89 patients with allergic rhinitis, 41% reported at least 3 asthma symptoms in their questionnaires. Lung function tests indicated obstructive disease in 11% (4 patients) of these symptomatic patients. Diurnal PEF variation of more than 20% was detected in half those who

reported asthma-like symptoms but had normal spirometry results. According to spirometry or PEF monitoring, 23% (20 patients) of those with allergic rhinitis also had asthma. In addition, these patients' asthma symptoms disappeared after they received 3 months of treatment with low-dose inhaled corticosteroid therapy.

Several studies have noted an association between allergic rhinitis and asthma [3,4,8,15,20,21], which has a prevalence between 19% and 38% in rhinitis patients [15,17,22-26]. Our results are consistent with the percentages in the literature. To the best of our knowledge there is only a single report from Turkey assessing pulmonary function in patients with allergic rhinitis [27]. The association of these conditions supports the "one airway, one disease concept." An additional point of interest of this study is that there is little information on the relation between allergic rhinitis and asthma from developing countries. It is known that diagnosing asthma is not easy and it cannot be established with a single lung function testing



Study Flow Diagram. PFT indicates pulmonary function test; PEF, peak expiratory flow rate.

session. In addition, general practitioners and ENT specialists, who see most of the patients affected, do not always have suitable spirometry equipment for testing pulmonary function or performing bronchial provocation. A PEF meter, on the other hand, is a cheap, easy and understandable test that a patient can apply alone at home without any professional help. Diurnal variation in PEF of more than 20% is considered to be diagnostic of asthma [19]. PEF follow-up would be more reliable and would present more objective values than questionnaires. To the best of our knowledge, our study is the first that evaluates patients with allergic rhinitis by PEF monitoring for diagnosis of asthma.

Allergen sensitization has been shown to be one of the main causes of asthma, and individuals with a predisposition to atopy are at higher risk. However, data from large population-based studies clearly show that rhinitis is a risk factor for asthma among subjects with positive, as well as, negative skin test responses, suggesting that rhinitis and asthma are not associated simply because they share atopy as a common risk factor [3,5,7,28]. Consistent with these findings, we were unable to identify a relationship between type of positive skin prick test and asthma, even though sensitization to *Parietaria judaica*, a widespread pollen in the Mediterranean area, has been reported to markedly increase the risk of developing asthma among patients with allergic rhinitis [8].

Our findings are also in agreement with the results from most studies of adults showing that asthma is more prevalent in women than in men [8,29,30]. In our study, there were more females among the asthmatics than the nonasthmatics.

The overall characteristics of asthma and allergic rhinitis and their treatment options are similar [8,17,31]. Moreover, a large multicenter study has reported that both upper and lower airways need to be treated in patients with asthma and rhinitis to ensure optimal quality of life [32]. In our study, asthma symptoms of patients disappeared after they received 3 months inhaled corticosteroid therapy.

One limitation of our study was that we could not perform bronchial challenge tests with either histamine or methacholine. In addition, the small number of patients studied precludes definitive conclusions. However, our study has the advantage of evaluating PEF monitoring as an aid for the diagnosis of asthma in this special population and to the best of our knowledge, this has been investigated here for the first time among patients with allergic rhinitis. Another advantage of this study is the fact that the subjects were examined by the same respiratory unit at baseline and at the 3-month follow-up visit, a design feature which is important for standardizing asthma diagnostic criteria in such a population.

In conclusion, it is necessary to look for asthma in patients suffering from allergic rhinitis. We suggest that PEF monitoring, which is a low-cost and objective approach to diagnosing asthma should be performed in these patients. Knowledge of this approach is of utmost importance for general practitioners, allergists, and ENT specialists because diagnostic delay will result in unsatisfactory treatment of the disease. Even when spirometry is normal, patients with allergic rhinitis should monitor PEF to detect asthma and create the possibility of better strategies for integral treatment.

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