Allergol Immunopathol (Madr). 2016;xxx(xx):xxx-xxx

Allergologia et immunopathologia

Sociedad Española de Inmunología Clínica, Alergología y Asma Pediátrica

www.elsevier.es/ai

ORIGINAL ARTICLE

Impact of rhinitis on lung function in children and adolescents without asthma

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Received 5 January 2016; accepted 1 April 2016

KEYWORDS
ARIA;
Classification;
Lung function test;
Rhinitis;
Spirometry

Abstract
Background: Subclinical spirometric abnormalities may be detected in patients with rhinitis without asthma, proportional to the severity established by ARIA (*Allergic Rhinitis and Its Impact on Asthma*) guidelines. New criteria of rhinitis classification were recently validated according to the ARIA modified (m-ARIA), which allow the discrimination between moderate to severe grades. The impact of rhinitis on lung function according to frequency and severity is unknown.
Objectives: To investigate subclinical spirometric impairment in children and adolescents with allergic and non-allergic rhinitis without overt symptoms of asthma, according to the frequency and severity criteria of rhinitis classified by m-ARIA.
Methods: An observational cross-sectional study, including children and adolescents aged 5–18 years with allergic and non-allergic rhinitis without asthma. We analysed the functional abnormalities and bronchodilator response with spirometry in relation to the grade of rhinitis established by m-ARIA using an adjusted logistic model. A value of $p < 0.05$ was considered statistically significant.
Results: We studied 189 patients; 22.2% showed spirometric abnormalities. Patients with persistent rhinitis had greater impairment of lung function compared to intermittent grade ($p = 0.026$). Lung functional impairment was more frequent in severe and moderate rhinitis than mild grade ($p = 0.005$) and was independent of the atopic status to both frequency ($p = 0.157$) and severity ($p = 0.538$). There was no difference in bronchodilator reversibility between groups ($p > 0.05$).

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http://dx.doi.org/10.1016/j.aller.2016.04.006

Please cite this article in press as: Saranz RJ, et al. Impact of rhinitis on lung function in children and adolescents without asthma. Allergol Immunopathol (Madr). 2016. http://dx.doi.org/10.1016/j.aller.2016.04.006

Conclusions: Impaired lung function was associated with persistence and severity of rhinitis and there was no significant difference between patients with moderate and severe rhinitis. The spirometric abnormality was demonstrated in patients with allergic and non-allergic rhinitis.

Introduction

Rhinitis is a chronic inflammatory disease of the nasal mucosa, characterised by nasal congestion, rhinorrhea, sneezing, and nasal itching, which becomes relevant because of its high prevalence and the negative impact in the patients' quality of life.[1–3]

The link between the upper and lower airways has been recognized since the beginning of the last century,[4] but has been investigated in depth only in the last two decades, with the model of relationship between rhinitis and asthma.[5,6] Epidemiological data indicate that over 80% of patients with asthma have rhinitis whereas asthma can affect up to 40% of patients with rhinitis; therefore, many authors have suggested the ''one airway one disease'' hypothesis as an expression of one indivisible anatomical and pathological entity.[1,2,7,8] Based on this concept, the relationship between the upper and lower airway relies not only in their epidemiological interest but also in their pathophysiological and clinical interest; it also has direct therapeutic implications.[6,9,10]

The ARIA (*Allergic Rhinitis and Its Impact on Asthma*) guidelines,[1,2] have proposed a clinical classification of rhinitis based on the frequency and severity of symptoms. Patients who develop symptoms for fewer than four days a week or fewer than four consecutive weeks, correspond to intermittent rhinitis whilst the presence of symptoms for more than four days a week and over four consecutive weeks, qualifies as persistent rhinitis.

The severity is determined by four items established in the ARIA guidelines: impairment in the school or work performance, daily activities, sleep disturbances and troublesome symptoms. It is considered mild when none of the items are affected and moderate to severe when one or more items are present (o-ARIA).

The PREDIAL multicentre study (*Pediatric Allergic Rhinitis*)[11] has recently validated a new classification of rhinitis modified from the original ARIA guideline (m-ARIA), which allows to differentiate the moderate from the severe rhinitis. Thus, mild rhinitis has no affected items, moderate rhinitis compromises one to three items and the severe form includes patients with all of the parameters affected.[12]

New evidence has detected subclinical abnormalities in lung function in patients with allergic and non-allergic rhinitis with no symptoms suggestive of asthma,[13–18] in a proportional way according to the original o-ARIA severity criteria[16] and with increased responsiveness to a bronchodilator[19,20]; these findings could be the expression of a common disease that affects the entire respiratory tract.

The impact of rhinitis on lung function is still unknown according to the new classification of m-ARIA and considering frequency (intermittent-persistent) and severity (mild, moderate and severe).

The aim of this study was to examine spirometric abnormalities and their potential bronchodilator reversibility in children and adolescents with allergic and non-allergic rhinitis without asthma, and its relationship with the symptoms frequency and severity.

Materials and methods

Study design: observational, cross-sectional analytical study.

Patients: inclusion and exclusion criteria

Children and adolescents, between 5 and 18 years old referred to the Allergy and Immunology Division of the Clínica Universitaria Reina Fabiola, Universidad Católica de Córdoba, Argentina, were recruited from December 30, 2011 to May 31, 2013. The main inclusion criterion was a clinical diagnosis of rhinitis based on the presence of two or more nasal symptoms (rhinorrhea, blocked nose, itching and/or sneezing). Patients with allergic and non-allergic rhinitis were consecutively included, according to the presence or absence of aeroallergens sensitivity (determined by skin prick tests) and classified according to the symptoms duration and severity.[11,12]

The exclusion criteria were as follows:

a. Prior history of asthma or equivalent symptoms (cough, dyspnoea and/or wheezing and shortness of breathing).
b. Acute or chronic upper and lower airways infection.
c. Anatomic nasal disorders, nasal polyposis, septum deviation, etc.
d. Previous or current use of allergen-specific immunotherapy (subcutaneous or sublingual).
e. Use of intranasal or systemic steroids, antihistamines, leukotriene antagonists and alpha-adrenergic (nasal or systemic) during the previous four weeks.
f. Active smokers and/or exposed to cigarette smoke at home.

Classification of rhinitis

Was established according to the m-ARIA criteria.[11,12] According to duration of the symptoms, patients with fewer than four days a week or fewer than four consecutive weeks were classified as suffering from intermittent rhinitis; the presence of symptoms for more than four days a week and over four consecutive weeks was considered as persistent rhinitis. The rhinitis severity was determined according to the number of affected items (limitations in school performance and daily activities, sleep disturbance or the existence of troublesome symptoms) as mild (no affected

Please cite this article in press as: Saranz RJ, et al. Impact of rhinitis on lung function in children and adolescents without asthma. Allergol Immunopathol (Madr). 2016. http://dx.doi.org/10.1016/j.aller.2016.04.006