



Review

Pediatric Asthma and Viral Infection[☆]


 M. Luz Garcia-Garcia,^{a,*} Cristina Calvo Rey,^a Teresa del Rosal Rabes^b
^a Servicio de Pediatría, Hospital Universitario Severo Ochoa, Leganés, Madrid, Spain

^b Servicio de Pediatría, Hospital Universitario La Paz, Leganés, Madrid, Spain

ARTICLE INFO

Article history:

Received 9 October 2014

Accepted 9 November 2015

Available online 26 March 2016

Keywords:

Bronchiolitis

Asthma

Respiratory viruses

Respiratory syncytial virus

Rhinovirus

Human bocavirus

Human metapneumovirus

ABSTRACT

Respiratory viral infections, particularly respiratory syncytial virus (RSV) and rhinovirus, are the most importance risk factors for the onset of wheezing in infants and small children. Bronchiolitis is the most common acute respiratory infection in children under 1 year of age, and the most common cause of hospitalization in this age group. RSV accounts for approximately 70% of all these cases, followed by rhinovirus, adenovirus, metapneumovirus and bocavirus. The association between bronchiolitis caused by RSV and the development of recurrent wheezing and/or asthma was first described more than 40 years ago, but it is still unclear whether bronchiolitis causes chronic respiratory symptoms, or if it is a marker for children with a genetic predisposition for developing asthma in the medium or long term. In any case, sufficient evidence is available to corroborate the existence of this association, which is particularly strong when the causative agent of bronchiolitis is rhinovirus.

The pathogenic role of respiratory viruses as triggers for exacerbations in asthmatic patients has not been fully characterized. However, it is clear that respiratory viruses, and in particular rhinovirus, are the most common causes of exacerbation in children, and some type of respiratory virus has been identified in over 90% of children hospitalized for an episode of wheezing. Changes in the immune response to viral infections in genetically predisposed individuals are very likely to be the main factors involved in the association between viral infection and asthma.

© 2016 Published by Elsevier España, S.L.U. on behalf of SEPAR.

Asma y virus en el niño

RESUMEN

Las infecciones por virus respiratorios, especialmente virus respiratorio sincitial (VRS) y rinovirus, suponen el mayor factor de riesgo para la aparición de episodios de sibilancias en lactantes y niños pequeños. La bronquiolitis es la infección respiratoria aguda de vías respiratorias inferiores más común en menores de un año y constituye la causa más frecuente de hospitalización en este grupo de edad. El VRS causa aproximadamente el 70% de todas ellas, seguido por rinovirus, adenovirus, metapneumovirus o bocavirus. La asociación entre bronquiolitis por VRS y desarrollo de sibilancias recurrentes y/o asma ha sido descrita hace más de 4 décadas, aunque en la actualidad se desconoce con exactitud si la bronquiolitis es la causa de los síntomas respiratorios crónicos o si, más bien, es un marcador que señala a los niños con predisposición genética a desarrollar asma a medio o largo plazo. En cualquier caso, existe evidencia suficiente como para afirmar que esta asociación existe y que es especialmente intensa si el agente asociado a la bronquiolitis es el rinovirus.

El papel patogénico de los virus respiratorios como desencadenantes de exacerbaciones en el paciente asmático no está totalmente aclarado, pero sin duda los virus respiratorios, y en especial el rinovirus, son el desencadenante más frecuente de exacerbaciones asmáticas en los niños, llegando a identificarse algún virus respiratorio hasta en el 90% de los niños hospitalizados por un episodio de sibilancias. Muy probablemente, las alteraciones en la respuesta inmune frente a las infecciones virales en sujetos genéticamente predisuestos sean los principales implicados en la asociación virus-asma.

© 2016 Publicado por Elsevier España, S.L.U. en nombre de SEPAR.

Palabras clave:

Bronquiolitis

Asma

Virus respiratorios

Virus respiratorio sincitial

Rinovirus

Bocavirus humano

Metapneumovirus humano

[☆] Please cite this article as: Luz Garcia-Garcia M, Calvo Rey C, del Rosal Rabes T. Asma y virus en el niño. Arch Bronconeumol. 2016;52:269–273.

* Corresponding author.

E-mail address: marialuz.hso@gmail.com (M. Luz Garcia-Garcia).

Introduction

Asthma is a chronic inflammatory disease of the airways characterized by bronchial hyperresponsiveness to a wide variety of stimuli, recurrent episodes of wheezing, respiratory distress, and cough, associated with reversible airway obstruction. Asthma is one of the most prevalent chronic diseases worldwide, affecting more than 155 million individuals, so the impact of asthma is severe, and incidence is growing, particularly in developed countries.^{1,2}

Respiratory viruses are one of the most common causes of asthma exacerbations in both adults and children.^{3–6} Furthermore, increasing evidence is emerging to suggest that viral respiratory infections in early life are related with the medium and long-term development of asthma.^{7,8}

This article aims first to review the role of viruses as precipitating factors for asthma, and then to summarize the current state of knowledge on their role in asthma exacerbations.

Respiratory Viruses as Precipitating Factors for Asthma

Viral bronchiolitis is a common feature in the clinical histories of children who go on to develop wheezing and asthma during childhood. The term bronchiolitis has been in use since 1940, but it has several different interpretations, and there is no general agreement on its definition. In this review, we will use the standard criteria of McConnochie, who describes bronchiolitis as the first acute episode of wheezing, preceded by a respiratory syndrome of rhinorrhea, cough, and tachypnea, occurring with or without fever, in children younger than 2 years of age.⁹

Bronchiolitis is the most common acute lower respiratory tract infection in children younger than 1 year, and accounts for 18% of all pediatric admissions.¹⁰ Respiratory syncytial virus (RSV) is the causative agent in approximately 70%–80% of cases, followed by rhinovirus, adenovirus, human metapneumovirus (HMPV), and human bocavirus (HBoV).^{11,12} The most common respiratory viruses are listed in Table 1.

Studies reporting global analyses of all patients with a history of bronchiolitis, irrespective of the causative agent, reveal a prevalence of recurrent wheezing that ranges from 75% in the first 2 years of life, 47%–59% between the ages of 2 and 4, and 25%–43% between 4 and 6 years,^{13–16} showing a clear trend to diminish with age. Only 2 prospective studies included a long-term follow-up of children hospitalized for bronchiolitis, irrespective of the causative virus. They found a prevalence of asthma at the age of 17–20 years of 41%–43% in patients with a history of bronchiolitis, compared to a rate of 11%–15% in controls; between 25 and 30 years of age, prevalence was 35%, with significant impact on health-related quality of life.^{17,18} These data suggest that recurrent wheezing occurs frequently in children after an episode of bronchiolitis, and also that respiratory symptoms frequently recur in young adults after a long symptom-free period during childhood and adolescence. This changes the previously held notion of a relatively good prognosis

for early childhood wheezing, and indicates that the risk of asthma and lung function changes can persist until adulthood.^{19,20}

RSV was the first virus to be associated with the development of asthma in children, although in recent years, other viruses, such as rhinovirus or the more recently described HMPV and HBoV, have also been studied in this context.

Respiratory Syncytial Virus

RSV is an RNA virus from the *Paramyxoviridae* family that often causes lower respiratory tract infections in infants and small children.²¹

In 1959, Wittig and Glaser²² first described the epidemiological association between viral bronchiolitis in childhood and the subsequent development of recurrent wheezing and/or asthma. Since then, numerous studies have evaluated this relationship, although the different methodologies employed made it difficult to draw conclusions that definitively proved this association. However, more recently, several prospective studies, now considered seminal,^{23–27} showed that a history of bronchiolitis caused by RSV is an independent risk factor for the development of recurrent wheezing and medically-diagnosed asthma. Of these authors, Sigurs et al.²⁷ performed the longest follow-up to date, with subjects reaching the age of 18 years in the last follow-up time point. The initial cohort consisted of 47 infants aged <1 year hospitalized with severe RSV bronchiolitis and 93 age- and gender-matched controls. Children who had been admitted for bronchiolitis had a higher prevalence of asthma/recurrent wheezing and allergic sensitizations at the ages of 3, 7 and 13 years, compared to the control group. At the age of 18, the bronchiolitis group maintained a significantly higher prevalence of asthma (39% vs 9%), allergic rhinoconjunctivitis (43% vs 17%), and perennial allergen sensitization (41% vs 14%). Moreover, at the age of 18, the bronchiolitis group had poorer lung function (FEV₁, FEV₁/FVC) than the control group, irrespective of whether they had concomitant asthma or not. They also had more prevalent bronchial hyperresponsiveness and bronchodilator response. Finally, the authors reported that the only 2 risk factors independently related with the diagnosis of asthma at 18 years of age were a history of severe RSV bronchiolitis and presence of allergic rhinoconjunctivitis. These results show that severe RSV bronchiolitis in the early months of life is associated with the development of asthma, bronchial hyperresponsiveness and allergic sensitization, and suggest that this association continues until adulthood.

The results of another reference follow-up study, Tucson Children's Respiratory Study, show that RSV bronchiolitis is an independent risk factor for the development of asthma up to the age of 11 years, but the association disappears after the age of 13.²⁴ This difference in the long-term prognosis may be related with varying severity of the acute episode, since in the Sigurs study, all patients needed to be hospitalized, while the Tucson cohort included mostly outpatients. The authors also observed a greater risk of asthma

Table 1
Classification of Respiratory Viruses.

Species	Family	Genus	Type	Subgroups
Syncytial respiratory virus	<i>Paramyxoviridae</i>	<i>Pneumovirus</i>	RNA	A, B
Parainfluenza 1, 3	<i>Paramyxoviridae</i>	<i>Respirovirus</i>	RNA	1, 3
Parainfluenza 2, 4	<i>Paramyxoviridae</i>	<i>Rubulavirus</i>	RNA	2, 4
Metapneumovirus	<i>Paramyxoviridae</i>	<i>Metapneumovirus</i>	RNA	1–4
Influenza	<i>Orthomyxoviridae</i>	<i>Ortomixovirus</i>	RNA	A, B, C
Rhinovirus	<i>Picornaviridae</i>	<i>Rhinovirus</i>	RNA	A, B, C
Adenovirus	<i>Adenoviridae</i>	<i>Mastadenovirus</i>	DNA	A to F
Human bocavirus	<i>Parvoviridae</i>	<i>Bocavirus</i>	DNA	1, 2, 3
Coronavirus	<i>Coronaviridae</i>	<i>Coronavirus</i>	RNA	I, II

Download English Version:

<https://daneshyari.com/en/article/4205237>

Download Persian Version:

<https://daneshyari.com/article/4205237>

[Daneshyari.com](https://daneshyari.com)