

Asthma in young children

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Highlights / Hoogtepunte

- Understand the pathophysiology and causes of wheezing in children, and make a better and quicker asthma diagnosis.
- A practical and stepwise approach to the management of chronic asthma in young children.
- Can childhood asthma be outgrown? Is bone growth significantly reduced with inhaled corticosteroids? Should children with chronic chest complaints be treated with regular courses of antibiotics?
- Verstaan die patofisiologie en oorsake van 'n fluitbors in kinders, en maak 'n beter en vroeër diagnose van brongiale asma.
- 'n Praktiese en stapsgewyse benadering tot die hantering van asma in jong kinders.
- Kan kinderasma ontgroeï word? Onderdruk inhalasiesteroïede beengroei betekenisvol op lange duur? Moet kinders met chroniese longklagtes met gereelde kursusse antibiotika behandel word?

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1. INTRODUCTION

Transient wheezing in infancy is more likely to be a function of small airways, and wheezing in the first year of life does not persist as asthma in two-thirds of those afflicted. The bottom line, however, is that no infant or child should be treated with regular courses of antibiotics for chronic chest symptoms, as is currently the vogue. A second misconception is that real asthma in childhood is frequently outgrown. This is not the case: on average only about one third of patients have some symptom relief at the time of puberty. The principles of treatment of young asthmatic children are the same as in the older child and adult. However, there are some special situations, which are discussed in the article.

2. PATHOPHYSIOLOGY

Asthma may develop at any age. The younger the child, however, the more difficult the diagnosis and treatment. Even the definition of the disease is more complex in this age-group. The broad outline of the definition employed by the Global Initiative for Asthma (GINA), namely that "asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation causes an

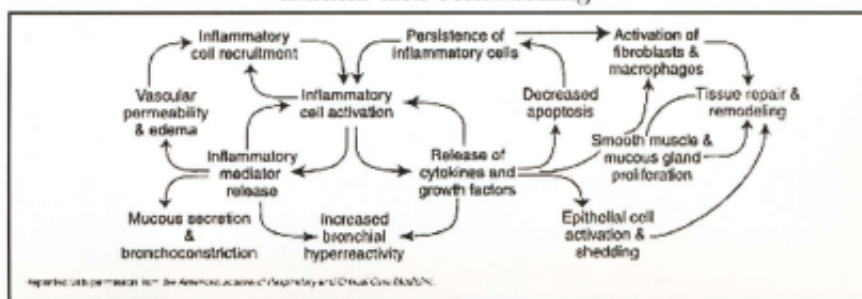
associated increase in airway reactivity that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment."¹ still applies but, since the diagnosis rests almost entirely on clinical parameters, special care needs to be taken to exclude other diagnoses.

There is no question that in true asthma the process of chronic inflammation is well established, even in young children and mild cases.^{2,3} Today, this process is more important than ever, since it is intimately connected with the processes of tissue repair and remodelling (figure 1).⁴ Hence, the young child who wheezes and coughs is critically balanced

between two narrow extremes of over-treatment and under-treatment. For most asthmatics the process has begun before going to school,¹ and childhood asthma is closely linked to the development of atopy,⁵ rather than small airway calibre.

Transient wheezing in infancy is more likely to be a function of small airways,⁶ and wheezing in the first year of life does not persist as asthma in two-thirds of those afflicted.⁷ The close relationship between atopy and viruses is such that atopy probably predisposes to a **sensitivity of the airway to viruses**, which are the most important triggers of acute exacerbations of asthma in younger children and infants.⁸ There are, however, not more infections, but infections are more severe. The wheezy infant is thus usually not asthmatic and the pathophysiology of this condition is not one of inflammation but rather of anatomically small airways.

Figure 1: Mechanisms of acute and chronic inflammation in asthma and remodelling¹



However, it is important to remember that true asthma with inflammation occurs at any age, including infancy.

3. THE AETIOLOGY OF ATOPY

There is a clear association of genetic influence and origin of asthma and atopy, although the exact genetic loci are still being determined. Of particular interest to the epidemiological trend of rising prevalence of allergic diseases is the so-called "Hygiene Hypothesis." There are indications that improvements in hygiene, together with reduction in rates of respiratory infections in infancy, are strongly associated with increasing prevalence of atopic diseases in Western countries.¹ The mechanism of this finding is through influence on the Th₁/Th₂ cellular pathways of the immune system. Interferon gamma (IFN- γ) drives Th₁ development away from the Th₂ or atopic pathway. Greater exposure to bacteria or bacterial products during early life increases IFN- γ , which is normally present in lower circulating levels in atopic infants. It can be postulated that the artificial reduction in bacterial exposure, through improvements in public health and hygiene, changes in infant diets, early use of antibiotics and smaller family size, contributes to a reduction in IFN- γ .⁹

4. THE PROGRESSION OF THE DISEASE

The usual presentation of asthma in infancy is wheezing but since not all wheezing in this age group is asthma, care should be taken with a differential diagnosis. (Table 1) The first episode of wheezing in this group of patients is

likely to be labelled "bronchiolitis", a specific acute inflammatory disease of the bronchi caused by the Respiratory Syncytial Virus (RSV) and, much less commonly, other viruses.¹⁰ (Table 2) This condition is short-lived, associated with a mild upper respiratory tract infection, low-grade fever and hyperinflation of the chest and may be quite profound. RSV infection can predispose to asthma, but this may be due to a pre-existing immune disorder predisposing to allergy and infection.¹

Recurrent wheezing in infancy may be atopy-associated asthma or small-airway disease. The latter category is more likely but again the disease has important quality of life issues and may be quite severe, hence a trial of anti-asthma therapy is usually indicated. A chronic cough in a young child will create the same diagnostic dilemma, and again a differential diagnosis is

important (Table 3), especially in the child who is failing to thrive, has a cardiac murmur or vomits regularly. The bottom line, however, is that no infant or child should be treated with regular courses of antibiotics for chronic chest symptoms as is currently the vogue.¹¹ In addition to being a complete waste of time (as almost all respiratory tract infections in childhood are viral in aetiology), their abuse may be contributing to the rising prevalence of allergic diseases (see the hygiene hypothesis) and to increasing drug resistance.

A further misconception is that asthma in childhood is frequently outgrown. This is, however, not the case and on average only about one third of patients have some symptom relief at the time of puberty.¹² Many of these children, however, develop symptoms again in later life.^{13,14} For this reason it may be possible, and even essential, to reduce or stop therapy in adolescence, but the patient and his/her parents should be alerted to the possibility of recurring symptoms. This point is especially important since the patient frequently changes his asthma doctor at this age; continuity of care is necessary to avoid delays in time and costly diagnostic procedures.

Asthma is more common in boys in childhood, probably related to smaller airways and greater frequency of atopy in males at this age.¹⁵⁻¹⁸ Although quality of life and socio-economic factors are difficult to quantify in young children, this is an age group when recurrent illness and decreased activity will have a profound impact on development and socialisation of the child. In a study conducted in the Nordic countries,

Table 1: Causes of persistent wheezing in young children

- Asthma
- Small airways
- Aspiration syndromes
- Cystic fibrosis
- Bronchiectasis
- Bronchopulmonary dysplasia
- Foreign body
- Enlarged lymph nodes
 - Tuberculosis
 - HIV
- Mediastinal tumour
- Congenital anatomical disorders
 - Tracheo-bronchomalacia
 - Vascular ring
 - Cysts
 - Lobar emphysema

Table 2: Respiratory viruses and respiratory conditions associated with them¹

Virus type	Serotypes	Common Cold	Asthma exacerbation	Pneumonia	Bronchitis	Bronchiolitis
Rhinovirus	1-100 (plus)	+++	+++		+	+
Coronavirus	229E and OC43	++	++	-	-	-
Influenza	A, B, and C	+	+	++	+	
Parainfluenza	1, 2, 3, and 4	+	+		++ (laryngotracheo-bronchitis)	+
Respiratory	A and B	+	+	+	+	+++
Adenovirus	1-43	+	+	++	+	+

Table 3. Differential diagnosis of a chronic cough by nutritional status

Nutritional status	Clinical pointer	Probable cause
NORMAL	<ul style="list-style-type: none"> Exercise, nocturnal symptoms with/without wheeze Upper airway symptoms Whoop Right middle lobe (RML) syndrome 	<ul style="list-style-type: none"> Asthma Post nasal drip Chronic sinusitis Non-infectious rhinitis Pertussis-like syndrome Foreign body
VARIABLE ANTHROPOMETRIC MEASUREMENTS	<ul style="list-style-type: none"> Vomiting (GORD, in co-ordination with swallowing and trachea-oesophageal fistula) Recurrent respiratory and other systemic illnesses GI signs (abnormal stools) Prolonged oxygen exposure Cardiac signs 	<ul style="list-style-type: none"> Aspiration syndromes Immune deficiency Cystic fibrosis Broncho-pulmonary dysplasia (BPD) Cardiac pathology Cardiac failure
FAILURE TO THRIVE	<ul style="list-style-type: none"> Lower socio-economic circumstances Chronic diarrhoea, candida Lymphadenopathy Productive cough, abnormal stools Progressive dyspnoea 	<ul style="list-style-type: none"> Tuberculosis HIV infection Cystic fibrosis (Bronchiectasis) Interstitial lung disease

children less than 2 years of age accounted for 44% of annual inpatient asthma costs and children 2-5 years old for 31% of such costs, even though the former group made up only 1% of the asthma population and the latter group 27%.¹⁹ (Figure 2)

5. DIAGNOSING ASTHMA IN CHILDREN

In chronic asthma, a definite diagnosis

may be difficult to obtain in young and older children. If the diagnosis is unclear, specialist assistance should be sought. Asthma should be suspected in any child with wheezing (ideally heard by a health care professional on auscultation and distinguished from upper airway noises), dry cough, breathlessness and noisy breathing. A detailed history and physical examination is mandatory, and the physician should pay specific attention to the pattern of

disease, severity and control, and differential clues. In schoolchildren, bronchodilator responsiveness and PEF variability may be used to confirm the diagnosis. Although allergy is not essential in the diagnosis of asthma, allergy tests may be helpful in seeking causal factors and making the diagnosis of atopy. The absence of allergy in a schoolchild with symptoms suggestive of asthma should prompt consideration of another diagnosis.

Indications for specialist referral are the following²⁰:

- Whenever the diagnosis is unclear or in doubt.
- Symptoms present from birth, or perinatal lung problems.
- Excessive vomiting or possetting.
- Severe upper respiratory tract infection.
- Persistent wet cough.
- Family history of unusual chest disease.
- Failure to thrive.
- Unexpected clinical findings (e.g. focal signs in the chest, abnormal voice or cry, dysphagia, inspiratory stridor.)
- Failure to respond to conventional treatment (Particularly to inhaled corticosteroid therapy above 400mcg per day or frequent use of oral steroid therapy.)
- Parental anxiety or need for reassurance.

Figure 2: Percentage of 1999 inpatient costs vs. proportion of the population by age group.

