Annotation

What is asthma?

While almost every paediatrician would agree that asthma is a very common condition in childhood, often underdiagnosed despite being a major cause of absence from school,¹ it has never been satisfactorily defined. True, there have been a number of more or less satisfactory attempts by august bodies such as the Ciba Guest Symposium² and the American Thoracic Society,³ and one of the most lucid attempts to explain the definition of asthma was that of Professor J G Scadding.⁴ He made the point that the disease should be characterised by its functional effect:

'Asthma is a disease characterised by wide variations over short periods of time in resistance to flow in intrapulmonary airways'.

Professor Scadding went on to point out that the definition can be amplified by comments on causative mechanisms where known. With typical clarity he also tackled the difficult question as to what constitutes 'wide variations' by suggesting that this means changes that are symptomatically and therapeutically important. This being so, what is the problem in defining asthma and why the need for this annotation?

Physicians treating adult patients have long been troubled by the fact that chronic airflow obstruction can be due to chronic bronchitis, emphysema, asthma, or any combination of these conditions, and that it is often very difficult to separate the components. Many patients with these types of chronic obstructive lung disease have symptomatic and therapeutic variations in their airflow obstruction without ever reverting to normal or near normal lung function. To make matters worse, adults with asthma not infrequently smoke or reside in polluted areas, and add an irreversible component to their disease. Finally, there are the occupational asthmas that can occur in anyone without any special predisposition to the disease⁵ and resolve after removal from the offending environment. For all these reasons and others, those treating adult patients can rarely agree on what constitutes asthma.

We paediatricians often feel rather smug about asthma and tell our colleagues that we cannot see what all the fuss is about since the diagnosis is perfectly straightforward in children. But is it? If we

accept Professor Scadding's definition⁴ as a good starting point and also that the adult type of chronic obstructive lung disease probably never occurs in childhood,⁶ what paediatric conditions could be confused with asthma and in what ways can asthma seem to be something else?

The wheezy infant

Wheezing in the first few months of life is even more common than asthma in later childhood,⁸ and various epidemiological surveys have put the incidence at 11 to 12% or more of all infants, especially among those in day care centres.^{9 10} The disease often seems to be caused by an initial viral infection, and recent surveys suggest little if any relation to a family predisposition to asthma or allergic diseases.¹¹⁻¹⁴ The problem for us is that clinically and radiologically the infant looks exactly like a little asthmatic, and most patients recover largely or completely over a week or so. Functionally, they have appreciable airways obstruction and this too has been shown to reverse.¹⁵ To complicate matters a considerable proportion—some 40 to 50%—of bronchiolitic infants continue to have further episodes of wheeze during early childhood,^{12 14 16} and many of them display a moderate increase in bronchial reactivity to exercise or histamine.^{12-14 16}

So are these infants with bronchiolitis, especially those with recurrent wheezing, just little asthmatics and should they be treated as such? For the reasons discussed above and summarised more fully elsewhere⁸ there seem to be epidemiological differences between these ex-bronchiolitic infants and classic, asthmatic children, though it must be admitted that the distinction is not as clear as one would wish. Therapeutically, the picture is much clearer, at least as far as the infants in the acute phase are concerned, since there is general agreement that they rarely if ever respond to bronchodilators or steroids.¹⁷⁻²⁰ Recently, we have found (data in preparation) a considerable improvement in lung function in infants less than 1 year old with persistent wheezing after bronchiolitis who were treated with nebulised beclomethasone for two weeks in a randomised, double blind, crossover

trial. Thus it seems fair to conclude that the infant with acute viral bronchiolitis is not an asthmatic, and is most unlikely to respond to antiasthmatic medication, but we must be cautious about our definition and approach to those infants who continue to wheeze subsequently. Following Scadding's approach⁴ we could say that they have 'asthma following bronchiolitis' and we should use those clinical and laboratory criteria that we use for asthma when deciding on treatment. What is certainly needed are further well conducted prospective follow up studies.

Wheezing with other diseases of childhood

As with adults, there is no doubt that a reversible component of airflow obstruction accompanies other diseases of children. Thus many children with cystic fibrosis can improve their lung function very considerably in response to conventional treatment over a period of time, and some respond to bronchodilators or steroids in the rapid manner seen in asthma.²¹ In fact, it is fairly certain that some children with cystic fibrosis also have asthma, which is hardly surprising given the high frequency of asthma.²² The infant with cystic fibrosis not infrequently presents with a bronchiolitic type of illness and is often given antiasthmatic medications, despite evidence that theophyllines may produce adverse responses.²³

A more difficult problem diagnostically arises in those infants and children who seem to suffer major chronic impairment of lung function, usually as a result of an adenoviral infection, and who have pathologic bronchiolitis obliterans.²⁴⁻⁶ These patients have chronic airflow obstruction which resembles that seen in adults with chronic obstructive lung disease and are often very badly handicapped. Since the clinical picture resembles severe, persistent asthma, they are almost inevitably submitted to repeated treatment trials of various combinations of antiasthmatic medications, including steroids, all with little or no effect,²⁶ although the occasional child, like the adult with chronic obstructive lung disease, may respond partially. It is important to recognise these patients for what they are, and to realise that they do not have asthma in view of their failure to respond to proper antiasthmatic measures. In many cases, a lung biopsy is required to establish the correct diagnosis, and this is probably a small price to pay in order to avoid years of useless antiasthmatic medication.

Although beloved of every paediatric resident when faced with a troublesome wheezy child, α_1 antitrypsin deficiency is very rare in childhood with only a very few reports of children with this type of chronic

obstructive lung disease,²⁷⁻⁹ although it may cause neonatal liver disease. The Wilson-Mikity syndrome and bronchopulmonary dysplasia cause chronic airflow obstruction which improves slowly with time, but they do not readily get confused with asthma owing to their relation to prematurity and neonatal intensive care. It must be admitted that the most persistent wheezers with these disorders rarely escape a trial of antiasthmatic medication. On the whole they do not seem to respond to bronchodilators but there is some recent evidence that steroids may help some children with bronchopulmonary dysplasia.³⁰ Congenital lobar emphysema may be confused with asthma unless chest radiography is performed, and other rare congenital bronchial anomalies such as bronchomalacia³¹ are often confused for a time with asthma since the children are often wheezy on and off. Likewise, syndromes associated with defective mucus clearance and recurrent respiratory illness³² can easily be confused with asthma because the clinical picture is often variable and most 'chesty' children do indeed have asthma.

In some parts of the world where the eating of nuts is popular, a common and dangerous problem is the misdiagnosis of an inhaled foreign body in the belief that the child has asthma. It must not be forgotten that the child who has inhaled a foreign body often wheezes, the wheeze may be heard equally well over both lungs and can be variable, especially if the foreign body is in the trachea. All these features can mimic asthma to some extent and the paediatrician who lightly diagnoses asthma in a child with a sudden onset of persistent symptoms who has never had any respiratory problems in the past does so at grave risk to the patient.

The child with a cough

In young children cough is a very prominent feature of asthma and may be far more obvious to the family than the wheeze. Very typical of cough due to asthma is that it is almost always more obvious at night and may also be noticed after exercise (exercise induced cough). If the doctor only accepts wheeze as indicating asthma many of these patients will be misdiagnosed as having 'bronchitis' or 'pneumonia', and this is probably responsible for much of the underdiagnosis of asthma shown in recent surveys of children.^{1 33} Those patients presenting with cough who are able to undertake lung function tests, show changes in response to exercise indistinguishable from asthmatics.³⁴ Scadding's definition of asthma⁴ refers to functional changes and does not mention symptoms, but many young children are unable to cooperate with lung

function tests, and so we may have to rely on a careful history instead.

Many children suffering from asthma are misdiagnosed as having pneumonia because the attack often starts in response to a viral infection that causes fever, and because cough and auscultatory signs in the chest are considered to be the hallmark of pneumonia. To make matters worse the chest radiograph, if taken, may show transient infiltrates or atelectasis especially in the middle lobe or lingula and this may be misread as confirming pneumonia. Now, while any child may have one or possibly two attacks of pneumonia, recurrent pneumonia suggests a serious underlying pathology such as cystic fibrosis, sick cilia syndrome, immunodeficiency, inhaled foreign body, etc. Most children who are well built and have 'recurrent pneumonia' with periods of normal health between have asthma that has been overlooked.

In adult practice it is very helpful to the clinician to undertake lung function and bronchial provocation tests to help with the diagnosis of asthma. In the typical patient, there will be some evidence of airways obstruction at rest which is considerably relieved after the inhalation of a bronchodilator. When challenged by exercise, hyperventilation, histamine, or methylcholine, the asthmatic shows a degree of hyper-reactivity far greater than that seen in normal subjects. In older children, the same types of test can be used but this may be impossible with younger children. At one time it was believed that asthma could be defined by this characteristic bronchial hyper-reactivity but experience has shown that this is too simplistic. Some patients with asthma may fail to develop exercise induced asthma on testing while other patients with upper respiratory tract allergy may show increased responsiveness to histamine. Recent respiratory infections and air pollution can also increase bronchial responsiveness, even in normal subjects.³⁵

Definition of childhood asthma

Taking the above discussion into consideration and accepting the general definition proposed by Scadding⁴ we can attempt to formulate a definition of childhood asthma based on clinical and physiological criteria:

'Asthma in childhood is a disease characterised by wide variations over short periods of time in resistance to flow in intrapulmonary airways and manifest by recurrent attacks of cough or wheeze separated by symptom free intervals. The airflow obstruction and clinical symptoms are largely or completely reversed by treatment with bronchodilator drugs or steroids.'

No definition of asthma is perfect and this one

must be interpreted with common sense. It is not intended to exclude the severe chronic asthmatic who never has symptom free intervals but whose airflow obstruction nevertheless fluctuates widely from time to time. Nor is it intended to include the child who has inhaled a foreign body just because he has stopped coughing for an hour or two. It should be noted that this definition would include most young children with recurrent post bronchiolitic wheezing, but not the infant during the initial attack. It is premature to be dogmatic about those with recurrent attacks in the first year of life until we know more about their response to treatment. The definition omits any mention of allergy since in some asthmatic children there is no evidence of an atopic predisposition, and often there is no evidence that allergic stimulation is responsible for the attacks. In conformity with Scadding's suggestion,⁴ a rider could be added about the aetiology of the asthma should it be definitely established. In the long run there is no substitute for clinical experience and sound judgement, but the working definition proposed above should help the paediatrician to consider the inclusion or exclusion of asthma as a likely diagnosis in the individual patient.

Does it matter?

When all is said and done, why bother to try to define a disease which most experienced paediatricians have little difficulty in recognising? There are a number of arguments in favour of having a standard working definition.

(1) The reported incidence of asthma in children varies very widely in different series,³⁶ and there is little doubt that much of this variability is due to different criteria being used to define asthma. Unless we have a standard definition, we cannot undertake proper comparative epidemiological surveys and we cannot reach logical conclusions about the extent of the problem or the adequacy of services for the child with asthma. Without standardisation we cannot use reported differences in the incidence of asthma as clues to the aetiology of the disease.

(2) Unless asthma is clearly defined clinically, many children will not be diagnosed correctly as having the disease and will suffer as a consequence. These children are likely to receive many unnecessary courses of antibiotics and may well suffer chronic ill health which could be prevented by proper treatment. It is not yet certain whether or not proper treatment of childhood asthma reduces the risk of chronic obstructive lung disease in adult life.

(3) Unless asthma is clearly differentiated from other diseases of childhood with airflow obstruction,

many children will receive unnecessary antiasthmatic medication, including steroids. Furthermore, the parents may not be given the true diagnosis and prognosis, which may well result in a great deal of anxiety. In some situations a mistaken diagnosis of asthma may be very dangerous.

No doubt there will be those who disagree with the approach to the definition of childhood asthma described, but if this annotation does nothing more than to stimulate constructive argument, our thinking about this difficult subject will have advanced.

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S GODFREY
Department of Paediatrics,
Hadassah University Hospital,
Jerusalem,
Israel