“Acute” asthma in adults

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ABSTRACT Forty-four adult patients with acute severe asthma were studied on admission to a general hospital to determine the mode of presentation and clinical severity of the acute illness. Most patients described poorly controlled wheezing for a mean period of five weeks before a more rapid deterioration, usually over 24 hours, caused them to seek medical attention. The clinical severity of the acute attack was not related to the duration of acute wheezing before admission to hospital. Recovery, studied in 11 of the patients, was slow, and most had reached only 70% of their predicted spirometric values after seven days’ treatment in hospital. The rate of recovery was not influenced by the antecedent history of acute wheezing. Very sudden deterioration from a background of good control appears to be uncommon in adults with asthma who present to hospital as emergencies, and it is likely that improvement in the standard of routine management of asthmatics at home would prevent many such admissions.

It has been customary to assume that severe exacerbations of asthma are usually sudden in onset (Croften and Douglas, 1975). In a severe exacerbation of asthma the relative contributions of each of the different mechanisms causing airflow obstruction, including mucosal swelling, smooth muscle contraction, plugging of the lumen, and air trapping may vary between patients and particularly may be influenced by the speed and mode of onset of the exacerbation. The present study was designed to examine the relationship, in adult patients, between the patterns of onset and deterioration in acute severe asthma and the subsequent manner of recovery.

Methods

Over a 12-month period 44 adult patients admitted consecutively to a general hospital with acute asthma were interviewed and examined in the accident and emergency department or within 24 hours of their admission to hospital. An acute asthmatic attack was defined as severe airflow obstruction that had become unresponsive to the patient’s normal bronchodilator treatment. The details sought from the history were the duration of acute wheezing before presentation and the period during which patients had been less severely symptomatic with wheezing or cough that had not

been adequately controlled by their maintenance treatment—defined as the period of poor control. Information on precipitating factors, atopy, family history, and medication were recorded and wherever possible confirmed by investigation.

The severity of the acute attack was assessed on the basis of a clinical examination, spirometry, and grading on the indices of Rees *et al* (1968) and Jones (1971) (table 1). Forced expired volume in one second (FEV₁) and forced vital capacity (FVC) were recorded using a Vitalograph and peak expiratory flow rate was recorded with a Wright’s Peak Flow meter.

Patients taking part in the study were admitted to a general hospital without a special respiratory unit under the care of several physicians, among whom there was no consensus on the treatment of acute asthma. We were unable therefore to in-

Table 1 Grading the severity of acute asthma

After Rees (1968)		After Jones (1971)	
Grade 1	Too breathless to speak	Grade I	Able to carry out housework or job with difficulty
2	Speech restricted to monosyllables or groups of words	II	Confined to a chair or bed but able to get up with moderate difficulty (IIA) or with great difficulty (IIB)
3	Able to speak in complete sentences	III	Totally confined to a chair or bed
		IV	Moribund

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fluence treatment except in a subgroup of 11 patients, who formed part of a clinical trial of steroid treatment and were followed until recovery on a standardised regimen of bronchodilators (Britton *et al.*, 1976). In this group the speed of onset could be related to the duration of recovery, as the different steroid regimens made little difference to the speed of recovery themselves.

Results

Forty-four episodes of acute severe asthma were examined in 39 patients—24 men (mean age 39.8 years, range 18–73) and 15 women (mean age 34.3 years, range 13–67)—all of whom were drawn from the local community. The length of history of asthma was a mean of 12.8 years (range 1 month to 59 years). Twenty of the 39 patients were deemed to have extrinsic asthma on the basis of more than one positive skin prick test or a history of atopy, 16 patients were skin test negative, and the remaining three patients were not tested.

Attempts were made in history taking to determine the factors that may have precipitated the acute attack. The most common presenting symptom other than wheezing was a cough, which was present in 84% of admissions. The cough was productive in 81% of this number. Half of the patients had a nasal discharge, but only 18% complained of a sore throat. Overall, half of the patients gave a history of cough and nasal discharge, which might be interpreted as symptoms of an upper respiratory tract infection. In very few instances, however, was a causative agent identified. Fifteen per cent of the patients had been recently exposed to allergens which they had in the past associated with acute wheezing. Only 7% gave a history to suggest that their present exacerbation was related to a psychological disturbance. One patient deteriorated after withdrawal of corticosteroids. In 30% of patients no obvious precipitating factor could be identified.

Patients were divided into three groups based on the duration of acute symptoms before presentation to hospital. Group 1 (18 patients) had noted severe persistent wheezing for less than 24 hours; group 2 (15) wheezing for 24 to 72 hours; and group 3 (11) wheezing for longer than 72 hours. Thus in 65% of episodes patients had had persistent wheezing for longer than 24 hours before admission. The length of time during which patients experienced inadequate control of symptoms before the acute attack was compared in the three groups. The mean duration of poor control was 5.1 weeks, 4.8 weeks, and 5.3 weeks for

groups 1–3 respectively. There was no significant difference between the group means or standard deviations.

The clinical severity of asthmatic attacks as assessed by measurement of heart rate, spirometry, and grading on the Rees and Jones indices at admission, was related to the duration of the acute illness using the same three groups (table 2). Each group showed a tachycardia, but there was no significant difference between the groups. The maximum heart rate recorded was 160 beats/min and in only four instances was the initial heart rate below 100 beats/min. The spirometric levels, expressed as a percentage of predicted values, and the mean Rees and Jones scores were also not significantly different between any two groups. No patient developed a pneumothorax, and none required intubation or mechanical ventilation. There thus appeared to be no recognisable connection between the clinical severity on admission to hospital and the speed of onset of the acute attack. Age, duration of asthma, and previous drug treatment did not differ between the groups, though overall only 30% of patients were taking steroids.

A subgroup of 11 patients was followed to recovery on a standardised treatment regimen of bronchodilators and corticosteroids (Britton *et al.*, 1976). Clinical improvement was assessed by spirometry. The rate of recovery was compared with the speed of onset in the three groups (table 3). Initial improvement in peak flow was fairly rapid, but thereafter all groups improved slowly. The pattern of recovery was similar for each group. The number of patients in this part of the study is too small to permit valid statistical analysis. A trend is indicated, however, in that recovery on a standardised treatment regimen ap-

Table 2 *Clinical severity of asthmatic attacks and Rees and Jones indices at admission related to the duration of acute illness*

Clinical details		Group 1	Group 2	Group 3
No of patients		18	15	11
Age (mean) years		34.2	38.8	34.3
Heart rate per minute	Mean	111.6	114.1	109.6
	SD	17.8	16.0	10.9
FEV ₁ (% predicted value)	Mean	23.0	20.3	22.7
	SD	9.9	10.9	13.3
Peak flow rate (% predicted value)	Mean	29.5	26.9	23.1
	SD	14.2	9.6	7.8
Rees Grade	Mean	2.24	2.07	2.55
	SD	0.56	0.62	0.52
Jones Grade (No of patients)	I	4	2	2
	IIA	7	4	7
	IIB	3	4	2
	III	3	4	0
	IV	0	0	0

Table 3 Mean peak flow rates, expressed as a percentage of predicted values, in a subgroup of 11 patients treated on a standardised treatment regimen in hospital

		Admission	24 hours	Day 2	Day 4	Day 7
Group 1 (n=4)	Mean	15.2	47.7	62.9	53.1	61.1
	SD	5.6	22.6	29.3	14.1	10.4
Group 2 (n=4)	Mean	17.3	38.2	54.5	69.9	72.6
	SD	7.4	29.2	30.4	22.3	20.7
Group 3 (n=3)	Mean	14.9	54.1	61.0	67.7	68.6
	SD	6.1	24.3	24.4	28.8	21.7

peared to occur at comparable rates irrespective of the duration of the acute illness. This is perhaps no surprise since all the groups had prolonged poor control before the acute deterioration.

Discussion

Asthma is a disease with a highly variable clinical pattern. The aetiological factors causing airflow obstruction and the mechanisms by which they act are still poorly understood. It has been suggested that most attacks of acute asthma are sudden in onset (Crofton and Douglas, 1975). Patients admitted by the Edinburgh Emergency Asthma Service (Crompton and Grant, 1975) tended to have a very short history of acute symptoms. However, these were a highly selected group of known high risk patients with a previous history of status asthmaticus who were urged to report to hospital as soon as a deterioration in symptoms occurred.

Several groups (Speizer *et al*, 1968; Macdonald *et al*, 1976) have described the suddenness of onset of the final episode in cases of asthma death. In a report from Cardiff the duration of the fatal attack in 61% of a group of 74 patients who died outside hospital was less than eight hours (Macdonald *et al*, 1976). Many of these patients were not attended by a doctor immediately before death, and those that were seen tended to be inadequately treated by present standards or died on their way to hospital. In a subsequent study (Macdonald *et al*, 1976a) of 53 patients admitted to hospital, the mean duration of acute wheezing before the final admission was 11 days. The authors commented that most of these patients were severely ill on admission with severe tachycardia, hypercapnia, and exhaustion. They suggested that many of the hospital deaths could have been avoided with more intensive treatment, earlier assisted ventilation, and frequent spirometric and clinical measurements to assess the degree of severity. Cochrane and Clark (1975) came to similar conclusions in a smaller study,

although a higher proportion of the deaths they observed in hospital occurred more suddenly and unexpectedly, especially at night.

In the present study most adult patients presenting to hospital with acute severe asthma had had persistent unrelenting symptoms for some weeks before a more rapid deterioration, usually over 24 hours, necessitated medical attention. An apparent upper respiratory tract infection was a common precipitating factor.

Thus two patterns of acute asthma seem to emerge—one of sudden onset that in some cases rapidly leads to death and usually occurs before patients reach hospital; and a gradual onset with a subsequent more rapid deterioration commonly seen in hospital. It is, however, possible that the Cardiff patients who died outside hospital may have had a period of poor control before their sudden deterioration that could not have been detected by the design of the study, and that they too might fall into the more gradual onset group. It also seems unlikely that the main necropsy finding of extensive mucous plugging in these and similar patients could develop in a time as short as 30 minutes.

Recovery from acute asthma in adults tends to be slow. Rebuck and Read (1971) found that arterial hypoxaemia persisted for days despite large doses of corticosteroids. There is reason to suspect, however, that the pattern of recovery may differ in children, since a study by Pierson *et al* (1974) showed a rapid improvement in arterial hypoxaemia to normal levels within 24 hours of starting treatment with corticosteroids. In our study the rate of recovery tended to be slow, and after seven days' full treatment most of the patients had reached only 70% of their predicted spirometric volumes. This finding was in accordance with the observations of Rebuck and Read (1971).

The considerable clinical variation of onset of acute asthma makes generalisation inadvisable, but most patients probably deteriorate over relatively few hours, and of those reaching hospital alive this deterioration is rarely from a background of good control. Further study is required regarding the onset of acute asthmatic attacks both with respect to aetiology and clinical presentation. Parallels can be drawn between sudden asthma deaths and acute myocardial infarction deaths in that both seem to occur predominantly before patients reach hospital. Efforts should therefore be made to educate patients to seek help earlier when a deterioration in symptoms occurs and to set up more self-admission services for patients at risk. The care of patients in hospital

should closely follow the recommendations of Jones (1971), Cochrane and Clark (1975), and Clark (1977) with patients being admitted to a special respiratory unit wherever possible. Many of the acute admissions to hospital could be prevented, however, if patients were properly managed at home.

References

- Britton, M G, Collins, J V, Brown, D, Fairhurst, N P A, and Lambert, R G (1976). High-dose corticosteroids in severe acute asthma. *British Medical Journal*, **2**, 73-74.
- Clark, T J H (1977). In *Asthma*, ed T J H Clark and S Godfrey, p 305. Chapman and Hall, London.
- Cochrane, G M, and Clark, T J H (1975). A survey of asthma mortality in patients between ages 35 and 64 in the Greater London hospitals in 1971. *Thorax*, **30**, 300-305.
- Crofton, J, and Douglas, A (1975). *Respiratory Diseases*, 2nd edn, p 439. Blackwell, Oxford.
- Crompton, G K, and Grant, I W B (1975). Edinburgh Emergency Asthma Admission Service. *British Medical Journal*, **4**, 680-682.
- Jones, E S (1971). The intensive therapy of asthma. *Proceedings of the Royal Society of Medicine*, **64**, 1151-1152.
- Macdonald, J B, Seaton, A, and Williams, D A (1976). Asthma deaths in Cardiff, 1963-1974: 90 deaths outside hospital. *British Medical Journal*, **1**, 1493-1495.
- Macdonald, J B, Macdonald, E T, Seaton, A, and Williams, D A (1976a). Asthma deaths in Cardiff 1963-1974: 53 deaths in hospital. *British Medical Journal*, **2**, 721-723.
- Pierson, W E, Bierman, C W, and Kelley, V C (1974). A double-blind trial of corticosteroid therapy in status asthmaticus. *Pediatrics*, **54**, 282-288.
- Rebuck, A S, and Read, J (1971). Assessment and management of severe asthma. *American Journal of Medicine*, **51**, 788-798.
- Rees, H A, Millar, J S, and Donald, K W (1968). A study of the clinical course and blood gas tensions in patients with status asthmaticus. *Quarterly Journal of Medicine*, **37**, 541-561.
- Speizer, F E, Doll, R, Heaf, P, and Strang, L B (1968). Investigation into use of drugs preceding death from asthma. *British Medical Journal*, **1**, 339-343.

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