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LONG-TERM RESULTS WITH BECLOMETHASONE DIPROPIONATE AEROSOL IN CHILDREN WITH BRONCHIAL ASTHMA: WHY DOES IT SOMETIMES FAIL?

C.M. GWYNN & J. MORRISON SMITH
Central Asthma Clinic, 85 Newhall Street, Birmingham 3, UK

1 Beclomethasone dipropionate aerosol has been shown to be a highly effective treatment for asthma in childhood, with virtual absence of side effects at this age.

2 When treatment is unsuccessful, this is usually due to failure to take it correctly and regularly.

3 A good response is usually associated with an improvement in ventilatory function and a marked increase in growth velocity.

Introduction

Early attempts to treat asthmatic children with corticosteroid preparations by inhalation were unsuccessful (Morrison Smith, 1958). Beclomethasone dipropionate aerosol (BDA) has, however, proved to be a highly effective form of treatment (Brown *et al.*, 1972; Morrison Smith, 1973). No adrenal suppression has been reported at the usual therapeutic levels (Harris *et al.*, 1973), no *Candida albicans* infection has been observed after a year of use (Gwynn & Morrison Smith, 1974), and many children have been able to change from oral to inhaled corticosteroid without deterioration in their asthma. The long-term results may, however, be less satisfactory, and it is clear that some patients respond less well than expected. The results of treatment for 1–4 yr in 148 children with serious asthma attending the Central Asthma Clinic in Birmingham have been examined in an attempt to discover why poor results are obtained in some cases.

Methods

The 148 children were attending the Clinic regularly. They had all previously been treated with sodium cromoglycate without adequate response, and 96 had required oral corticosteroids. Forty-two of these children had attended residential schools or other institutions for asthmatic children in England and Switzerland. The total population was divided into good, fair and poor 'responders' to BDA according to the following criteria: reduction in severity and frequency of attacks; ability to reduce the dose of oral corticosteroids, or to stop such treatment; improvement in ventilatory function; and improvement in quality of life, such as ability to sleep undisturbed, attend ordinary school and join in exercise and games.

Results

On the above criteria, it was decided that 79 children (53%) had had a good response, 41 (28%) a fair response and 28 (19%) a poor response. Those who responded poorly were comparable in length of treatment, average daily dose, age on starting BDA therapy and sex distribution, with those who showed a fair or good response (Table 1). The reduction in use of oral corticosteroids reflected the degree of response to BDA (Table 2). There was, however, a difference in the response to BDA of children in different ethnic groups (Table 3). Relatively more children with a poor response belonged to families whose parents had immigrated to England: 41% of the children who responded well came from immigrant families (this reflects the general distribution of children attending the Clinic), whereas 79% of the children who responded poorly came from immigrant families. A separate study of asthma in children of various races has shown that in other respects, including the overall severity of the asthma, there was no difference between racial groups.

The Registrar General's criteria of social class were used to subdivide the children in this study (Figure 1). A much higher proportion of poor responders came from social classes IV and V than was the case for those with a better response. Families to which the poor responders belonged were often large, and lived in crowded conditions. The forced expiratory volume in one second (FEV_1) before treatment, showed a similar distribution in the three groups, but it usually

Table 1 Response to BDA

	Patients with good response to BDA	*Patients with fair response to BDA*	*Patients with poor response to BDA*
Male	75.4%	64.8%	68.4%
Female	24.6%	35.2%	31.6%
Average age on starting BDA (yr)	8.3 (range 4–19)	9.6 (range 4–17)	10.2 (range 5–19)
Average daily dosage	300 μg (range 150–400 μg)	300 μg (range 150–400 μg)	350 μg (range 150–800 μg)
Average duration of follow-up (yr)	2.9 (range 1–4)	2.6 (range 1–4)	2.3 (range 1–4)

Table 2 Oral corticosteroid treatment before and after introduction of BDA

	Patients with good response to BDA	*Patients with fair response to BDA*	*Patients with poor response to BDA*
Number having regular oral corticosteroids at beginning of study	52	23	21
Number having regular oral corticosteroids now	3	12	27
Number able to reduce daily dose of oral corticosteroids	3	8	9

Table 3 Response of various ethnic groups to BDA

Ethnic group	*Good response to BDA*	*Fair response to BDA*	*Poor response to BDA*
Total numbers	79	37	28
UK parentage	47 (61.1%)	26 (70.2%)	6 (21.6%)
West Indian parentage	16 (20.8%)	5 (13.5%)	12 (43.2%)
Asian parentage	8 (10.4%)	2 (5.4%)	2 (7.2%)
Irish parentage	7 (9.1%)	4 (10.8%)	7 (25.2%)
West Indian/Irish	1 (1.3%)	–	1 (3.6%)

Of the six children of UK parentage in the poor response group, two came from one-parent families and one had an educationally subnormal mother.

increased in direct relationship to the clinical response to treatment (Figures 2 and 3). Eleven children, however, even in the group with a good clinical response, showed a fall in the percentage of predicted FEV_1 after treatment (Table 4). All of these children had been able to stop taking regular oral steroids (Table 4).

When growth velocity over the year before starting BDA treatment, and over the past calender year, was measured in children who had a good response, a marked increase in growth velocity occurred in all but three (Figures 4 and 5). In these cases, however, the growth spurt observed after stopping oral steroids, may have resulted in a lower figure for the percentage of predicted FEV_1, when growth had outstripped the natural increase in FEV_1 during the same period.

No case of oropharyngeal candidiasis was noted in any of the children treated.

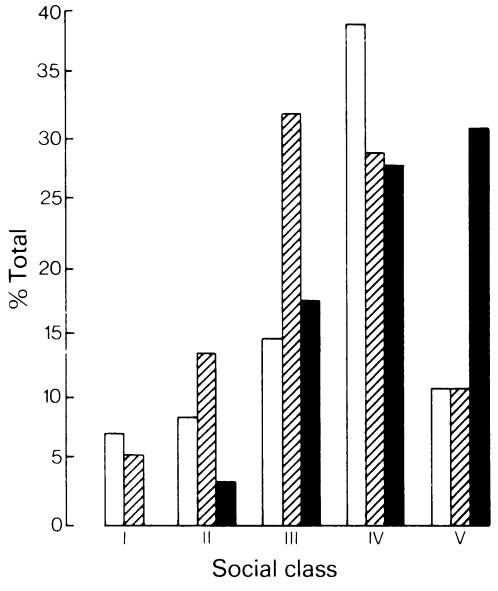

Figure 1 Social class and response to BDA. Open columns, good response; hatched columns, fair response; solid columns, poor response.

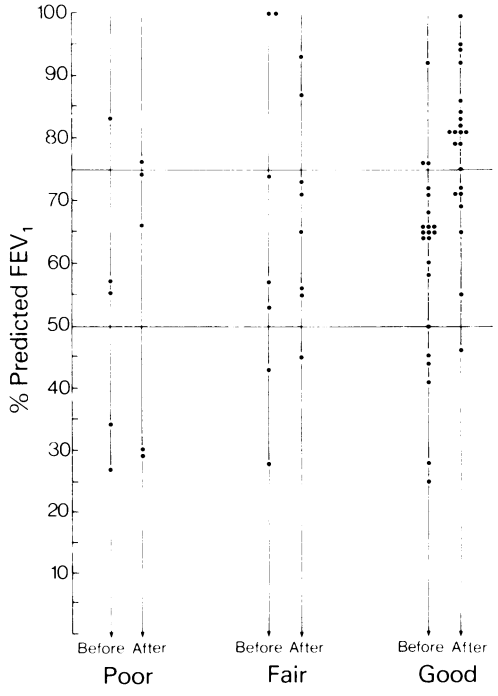

Figure 2 Percentage predicted FEV_1 before and after treatment with BDA in children who had a poor, fair or good response.

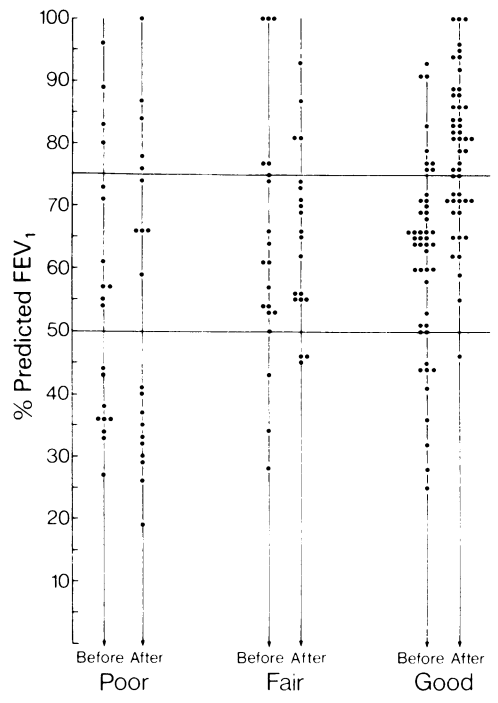

Figure 3 Percentage predicted FEV_1 before and after treatment with BDA for 3–4 yr.

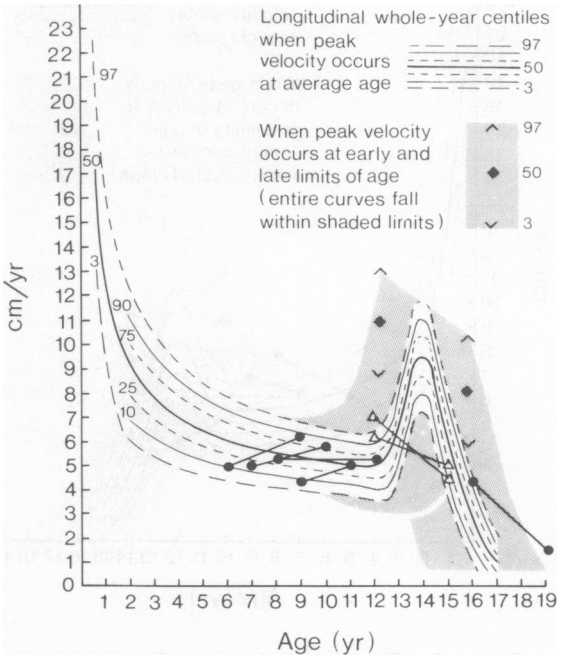

Figure 4 Growth velocity over the year before starting BDA treatment, and over the past calender year, measured in boys who had a good response.

Table 4 Patients whose FEV_1 was lower than predicted after taking BDA for 1–4 yr

	Good clinical result	*Fair clinical result*	Poor clinical result
Number receiving oral corticosteroids before BDA	11	5	12
Number receiving reduced dose of oral corticosteroids now		3	3
Number stopping oral corticosteroids	11	1	1
Number requiring same dose now as before		1	4
Number requiring increased doses			4
Number who have never received oral corticosteroids		4	

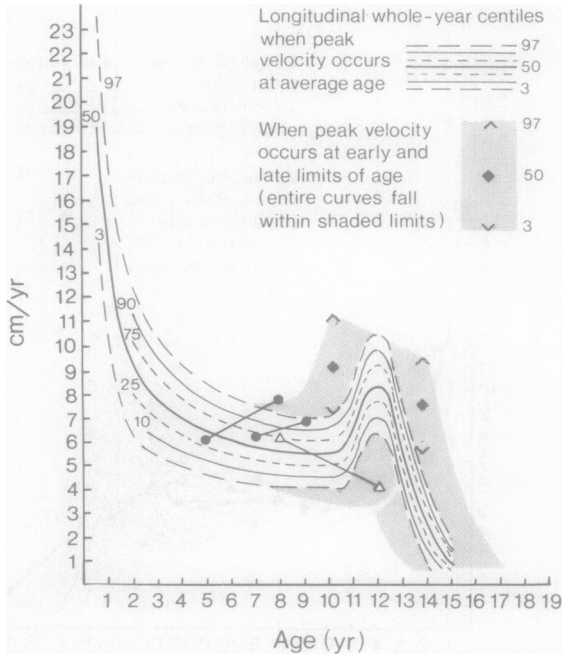

Figure 5 Growth velocity over the year before starting BDA treatment, and over the past calender year, measured in girls who had a good response.

Discussion

Failure to respond to BDA was frequently associated with low social status, crowded homes and the communication difficulties associated with immigrants to this country. It is likely that failure to inhale the corticosteroid aerosol properly and regularly is often responsible for a poor response. When apparent success is not reflected in an increase in FEV_1 proportionate to that expected for age and height, this may in some cases be related to the growth spurt observed in many children on changing from oral to inhaled corticosteroid.

The treatment did not produce any side-effects. No case of oropharyngeal candidiasis was observed in these or any other children treated with BDA.

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