

Jet-nebulized beclomethasone dipropionate in the management of bronchial asthma

Topical steroids for asthmatic children younger than 4 years

W. PEDERSEN,¹ and P. PRAHL²

¹Paediatric Department, University Hospital, Gentofte, ²Paediatric Department G, University Hospital, Copenhagen

The efficacy of jet nebulized beclomethasone dipropionate (BDP) in the management of asthma was evaluated in 18 children, 2-26 months old (mean 10 months). The children were selected on the basis of the severity of their symptoms and the lack of effect of conventional treatment. The effect of BDP was evaluated by comparing clinical data before and after the initiation of treatment. Fifteen of the 18 patients experienced a significant clinical improvement during treatment with BDP. BDP "nebulizer solution" is a valuable contribution to the management of severe asthma in young asthmatics.

Key words: bronchial asthma; beclomethasone dipropionate.

Accepted for publication 4 December 1986

The management of asthma in young children, especially those younger than 2 years, can be difficult. Children in this age group cannot cooperate well enough for efficient topical administration of antiasthmatic agents. Alternatively, the agents for topical use have to be nebulized and inhaled by means of a face mask.

The aim of the present study was to test the efficacy of jet-nebulized beclomethasone dipropionate (BDP) in young children with severe asthma poorly controlled by conventional therapy. In this group it was considered unethical to perform a placebo-controlled study or a randomized study. The efficacy was therefore evaluated by comparing clinical data before and after the initiation of regular steroid inhalation.

MATERIAL AND METHODS

Patients

Eighteen patients (10 boys and 8 girls) 2-26 months old (mean: 10 months) were admitted to the study. Their inclusion was based on the severity of symptoms and the lack of effect of treatment with beta₂-agonists, theophylline and

sodium cromoglycate. All patients were suffering from severe asthma with coughing and wheezing almost every day and night, reduced physical activity and frequent status asthmaticus requiring hospital admission. The initial treatment consisted of nebulized beta₂-agonist plus nebulized sodium cromoglycate four times daily and sustained release theophylline preparations twice a day. The treatment with conventional antiasthmatic medicine lasted 5-24 months (mean: 16 months). When treatment with BDP was introduced the patients were 13-42 months old (mean: 26 months). At the same time treatment with sodium cromoglycate was withdrawn.

Ten of the 18 patients had a first degree relative with allergic disease. Additionally, these 10 patients had eosinophilia and increased serum IgE. Six of these 10 patients showed signs of allergy both in skin test and RAST (allergy class 3 or 4). Eight patients showed no signs of atopy.

On entering the study (i.e. at the start of treatment with standard asthma medicine all patients underwent a survey for house dust mites and animal hair and dander by immu-

nochemical investigation of dust samples from their homes. In addition, we recommended twice or three times daily prophylactic physiotherapy with a positive expiratory pressure (PEP)-mask. Serum IgM, IgG, IgA and sweat tests were normal in all patients.

All parents gave informed consent for their children to enter the study, which was approved by the local Ethics Committee.

Treatment with BDP

BDP was administered as an isotonic solution containing 50 µg BDP/ml according to the following regimen:

150 µg was given 4 times daily until a clinically beneficial effect was obtained (4–8 weeks), followed by 150 µg 3 times daily (2–6 months). If the clinically beneficial effect continued the dosage was reduced to 150 µg given twice daily. The BDP solution was administered by means of an Opti-mist inhaler (Vingmed, Roskilde, Denmark) and a Pur-

tian-Bennett paediatric aerosol mask (Lenexa, Kansas, USA). BDP was given 10 min after the administration of jet-nebulized salbutamol (0.15 mg/kg). During asthmatic attacks and common colds the BDP dosage was doubled. This dosage was maintained until the patients became asymptomatic.

Because of the severity of their symptoms the patients were examined clinically monthly by one of the authors. At each visit the parents were questioned about the frequency and severity of their child's asthmatic symptoms (daily wheezing, daily coughing, exercise tolerance, and sleep disturbances at night because of wheezing and coughing).

Further hospital admission owing to asthmatic symptoms and additional treatment during the stay in hospital were registered.

RESULTS

The clinical effect of jet-nebulized BDP was evaluated by comparing clinical parameters for

Table 1

Clinical effect of jet nebulized beclomethasone dipropionate (BDP) in the treatment of 18 children with severe asthma

	Before treatment with BDP	During treatment with BDP
Age (months)	at onset of symptoms: mean 10 range 2–26	at start of BDP treatment: mean 26 range 13–42
Months of observation	mean 16 range 5–24	mean 16 range 5–24
No. of hospital admissions due to asthmatic attack	Total 127 0–2 admissions: 2 pts 3–5 admissions: 4 pts 6–10 admissions: 8 pts ≥ 11 admissions: 4 pts	Total 56 0–2 admissions: 10 pts 3–5 admissions: 5 pts 6–10 admissions: 2 pts ≥ 11 admissions: 1 pts
No. of days in hospital due to asthmatic attack	Total 857	Total 294
No. of status asthmaticus episodes requiring i.v. treatment with glucocorticoids and theophylline or salbutamol	Total 69 0–2 treatments: 5 pts 3–5 treatments: 10 pts 6–10 treatments: 1 pts ≥ 11 treatments: 2 pts	Total 20 0–2 treatments: 15 pts 3–5 treatments: 2 pts 6–10 treatments: 1 pts ≥ 11 treatments: 0 pts
No. of status asthmaticus episodes requiring treatment with a ventilator	Total 9	Total 0

periods of equal length immediately before and during treatment with BDP (range 5–24 months, mean: 16 months).

Fifteen of the 18 patients experienced a significant improvement during treatment with BDP. Two patients remained unchanged and one exacerbated. As shown in Table 1, a reduction was seen in the number of 1) hospitalizations due to asthmatic attacks, 2) days spent in hospital due to asthma, 3) treatments for status asthmaticus with intravenous theophylline and glucocorticoids, and 4) number of treatments with a ventilator.

Before treatment with BDP all patients woke almost every night because of their coughing. During the daytime their physical activity was restricted because of exercise-induced wheezing and coughing. Within a month after start of treatment with BDP this picture was completely reversed in 15 patients. The coughing at night disappeared, and the thresholds of exercise-induced wheezing and coughing were raised significantly. Three patients, however, remained unchanged.

The patients were examined clinically once a month for oral candidiasis. One patient had oral candidiasis, and one experienced a slight hoarseness. Both side effects disappeared within a few months without dosage reduction. No further side effects were registered. The childrens' heights and weights were followed regularly during the study period. No differences from the predictable growth rates were seen (Table 2).

DISCUSSION

Inhaled corticosteroids have become the mainstay of treatment for chronic asthma. Older children and adults can use simple inhaler devices effectively, but before 5 years old administration is difficult. Jet-nebulized BDP has been shown to be safe and more effective than saline in the management of asthma in preschool children (mean 3.6 years) (6).

In the present study conventional anti-asthmatic drugs had been utilized before the introduction of BDP, but the children's symptoms had nevertheless continued with coughing and

Table 2

Sex, weight and height increments of 18 asthmatic children before and after treatment with nebulized beclomethasone dipropionate (BDP)

Pat. No.	Sex	At start of BDP treatment				After treatment with BDP			
		Weight (kg)	% MBW	Height (cm)	% MBH	Weight (kg)	% MBW	Height (cm)	% MBH
1	M	13.3	93	97.5	105	17.8	107	107.5	106
2	M	16.0	99	101.0	100	18.4	98	110.5	100
3	F	16.0	114	92.0	99	21.7	111	109.0	96
4	M	15.1	110	91.0	99	16.8	105	99.0	98
5	F	11.1	104	76.0	97	12.8	102	87.0	101
6	F	9.5	90	78.5	102	11.4	101	81.5	102
7	F	14.0	106	89.0	100	18.5	120	101.5	104
8	F	13.3	92	94.0	100	14.2	92	96.5	100
9	F	17.3	105	109.0	107	21.0	112	119.0	108
10	M	14.0	122	85.0	106	16.5	124	92.0	103
11	M	14.8	86	104.0	100	19.0	100	110.0	100
12	F	10.7	92	74.0	96	14.5	100	90.5	95
13	M	16.0	108	95.0	112	21.0	114	108.0	102
14	M	15.0	95	97.0	98	16.0	93	103.5	99
15	M	10.3	82	83.0	98	15.0	94	96.0	99
16	F	14.8	102	93.0	98	17.5	106	99.5	98
17	M	11.4	86	85.5	95	13.9	90	94.5	97
18	M	12.4	95	88.0	99	16.5	106	97.0	100
Mean			99		101		104		100

MBW and MBH: mean body weight and height for Danish children (1).

wheezing almost every day and night, and with frequent hospital admissions. The effect of BDP was evaluated by comparing the severity of the children's asthma symptoms for periods of equal lengths immediately before and during treatment with BDP. 15 patients experienced considerable improvement in the quality of their everyday lives and in the frequency and severity of their asthmatic attacks. Three patients showed no improvement on BDP. They did not differ from the other patients as to age, atopic disposition, signs of atopy or severity of symptoms. Only two patients experienced a few, transient side effects.

Similar clinical improvement was obtained with BDP when the period of observation was limited to 5 months. This suggests that the improvement is not only due to children getting older and thus "outgrowing" their illness. Furthermore, the improvement in children of different ages was in all cases temporally related to the introduction of BDP.

The dose chosen was based on the assumption that about 10% reaches the lungs (2). To optimize the effect of BDP, the treatment was initiated by inhalation 4 times a day (3). When clinical improvement became evident, the intervals between medication could be prolonged.

As the dosage of BDP in this study is small, there should be no impairment of adrenal function (1, 4). However, the children's weights and heights were followed throughout the study, and there were no signs of growth retardation.

BDP nebulized jet solution is a valuable contribution to the management of severe asthma in children younger than 5 years of age. This treatment should be considered when more conventional treatment fails to control asthma in a young child.

REFERENCES

1. Andersen, E., Hutchings, B., Jansen, J. & Nyholm, M.: Heights and weights of Danish children. *Ugeskr Læger* 1982, *144*, 1760-1765.
2. Ellul-Micalled, R. & Johansson, S.-Å.: Dose-frequency in chronic bronchial asthma with a new corticosteroid budesonide. In Johansson, S.-P. (ed.): *Evaluation of budesonide*, pp. V1-V19. Lund, 1983.
3. Francis, R. S.: Adrenocortical function during high-dose beclomethasone aerosol therapy. *Clin. Allergy* 1984, *14*, 49-53.
4. Newman, S. P. & Pavia, D.: Aerosol deposition in man. In Morén, F., Newhouse, M. T. & Dolovich, M. B. (eds.): *Aerosols in medicine. Principles, diagnoses and therapy*, pp. 193-217. Elsevier, Amsterdam, 1985.
5. Smith, M. H. & Hodson, M. E.: Effects of long term inhaled high dose beclomethasone dipropionate on adrenal function. *Thorax* 1983, *38*, 676-681.
6. Storr, J., Lenney, C. A. & Lenny, W.: Nebulized beclomethasone dipropionate in preschool asthma. *Arch. Dis. Child.* 1986, *61*, 270-273.

Address:

Palle Prahl, M. D.

Department of Pediatrics

University Hospital (Rigshospitalet)

Blegdamsvej 9

DK-2100 Copenhagen Ø

Denmark

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.