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A COMPARISON OF CLINICAL USE OF FLUTICASONE PROPIONATE AND BECLOMETHASONE DIPROPIONATE IN PEDIATRIC ASTHMA

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Inhaled steroids play a very important role in the prevention and treatment of asthma. Previous studies indicated that fluticasone propionate (FP) had low bioavailability and high local potency . However, the laboratory data in these studies were not obtained among Taiwan population. It is very important that native data should be established. Thus a 12-week research program was designed, involving 77 patients, 51 for FP group and 26 for beclomethasone dipropionate (BD) group. The objects were victims of moderate to severe asthma and their age ranged from 4 to 14 years old. An open, comparative and randomized method was adopted. Except for the 4-week-later daytime symptom score(P=0.033, BD group was better), no other significant differences were found between the two groups in the symptom score improvement(P>0.05). All the P-values for the daytime & night-time scores were lower than 0.001 , which means obvious improvement after treatment in both groups. P-value for PEF improvement was 0. 003 after 4 weeks (BD group was better) and 0.943 after 8 weeks; for FEV1 improvement, it was 0.005 after 4 weeks(BD group was better) and 0.252 after 8 weeks; and for FEV1/FVC improvements, it was 0.067 after 4 weeks and 0.097 after 8 weeks. There was no statistic significance in total eosinophil count (TEC), IgE, eosinophil cationic protein (ECP) serum level changes after 4 or 8 weeks. Adverse effects were all anticipated and no statistic significance showed up, either, between the two groups or in the cortisol levels (P>0.05). In conclusion, native data indicated that the potency of 100 μg of FP was equal to that of 200 μg of BD and that few side effects were noted in FP group. It is recommended that this drug be introduced for clinical use.

Key words: asthma, inhaled steroids, fluticasone propionate, beclomethasone dipropionate

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Children with asthma often suffer from interruptions during exercise, shortness of breath after serious laughing, bouts of poor sleeping caused by night-time asthma attacks and consequent concentration impairment at school the following day[1]. In addition, the victims of childhood asthma are frequent visitors to hospital emergency rooms, which is expensive and troublesome for the families involved[1-3]. Thus, the effective prevention of asthma is very important. With a good anti-inflammatory effect and fewer systemic side effects than oral forms of steroids, early use of inhaled corticosteroid stands out as the best choice for the prevention and treatment of asthma[4,5].

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Fluticasone propionate (FP) is a trifluorinated glucocorticoid with chemical modification. It has high topical potency[6,7] because its hepatic extraction ratio is almost 100%. In other words, its oral bioavailability is less than 1%. On the other hand, the oral bioavailability of beclomethasone dipropionate (BD) is almost 20%[7-9]. Therefore, with the lower bioavailability, FP has fewer systemic side effects[7-9]. The extensive first pass of hepatic metabolism to inactive metabolites[7-9] indicates that FP has a wide margin between its therapeutic effects and its adverse systemic effects.

The aim of this research was to evaluate the similarities and differences between FP and BD. We compared not only the "Symptom Scores", pulmonary function (forced expiratory volume in one second (FEV1), FEV1/FVC(forced vital capacity: FVC) and peak expiratory flow rate(PEF)), eosinophil cationic protein (ECP), immunoglobulin E (IgE), total eosinophil count (TEC), daily medication, state inhaled beta-2 agonist use, but also oral candidiasis, sore throat, hoarseness and changes in cortisol levels.

MATERIALS AND METHODS

The sample of this study was a total of 77 patients from the age of 4 to 14. They were victims of moderate to severe asthma, bothered by daytime symptoms more than once every day and by nighttime symptoms more than once every week[10]. They received beta-2 agonist, ketotifen, sodium cromoglycate, and inhaled corticosteroids (200 - 400 ug/day) followed up at out patient department (OPD). Beta-2 agonist therapy was sometimes necessary for all of them. For one month before this research, none of the subjects changed their daily inhaled or oral medications.

Study design

An open, comparative and randomized method was adopted. Seven visits were planned during the 12-week period of actual research. A 2-week pretrial period was necessary to make sure that the patients were able to collect the baseline data and complete a daily record card satisfactorily. Then, 4 x 2 weeks of treatment period began (The patients visited OPD 4 times, one OPD every 2 weeks.). Two weeks after the treatment stopped, the patients followed up at OPD again. During the 2-week run-in period, they stopped their regular inhaled bronchodilators, and inhaled Salbutamol was given if necessary. Apart from the daily corticosteroid therapy, they were permitted to use their daily asthma medication throughout the pre-trial or the research periods. Two weeks after withdrawal from the research medication, the subjects were asked to return to our OPD.

Those who matched the criteria for our study were randomly allocated to receive either FP 100 μg (Accuhaler, Glaxo Wellcome, UK) or BD 200 μg (traditional pressurized metered dose inhaler: PMDI) twice per day. Both were administered for eight weeks.

Measurement

The subjects had to measure and record their peak expiratory flow rate (PEFR) at home with the Mini-Wright peak flow meter within the same one-hour period twice every day — once in the morning and the other in the evening (e.g. 7 a.m. to 8 a.m. and 6 p.m. to 7 p.m.). The PEFR had to be measured preferably not within four hours after bronchodilator therapy. Both the morning and evening PEFR measurements were done three times and the highest reading was recorded. In addition, the subjects were instructed to record their daytime and night-time symptoms for evaluation of the disease severity.

The daytime symptoms were recorded as:

0 = no asthma, able to do normal activity without restriction;
1 = a few symptoms, able to do daily work without impairment;
2 = troublesome asthma, able to do daily work with some impairment;
3 = severe asthma, unable to perform usual activities or daily routines

The nighttime symptoms were recorded as:

0 = nice sleep without asthma attack
1 = nice sleep well but waking up early in the morning or waking up only once during the night because of asthma or cough;
2 = waking up two or three times because of asthma or cough
3 = poor sleep, awake almost all night because of asthma or cough

Daily regular medication, rescue Salbutermol use, adverse effects (e.g. sore throat, yellowish sputum) and others (recorded by the patients) were also recorded.

Pulmonary function

Pulmonary function (PEFR, FEV1 and FVC) was measured with spirometry (Model-2450 SENSOMEDICS, U.S.A) at the first visit, four weeks after the first visit, and at the last visit. The inhaled bronchodilator

was avoided within four hours of the pulmonary function test, and the test was done before blood sampling for other tests.

ECP, IgE, TEC

ECP (Eosinophil cationic protein) (mg/dl)was measured with fluoroenzymeimmunoassay method (Unicap,Pharmacia, Uppsala, Sweden). The principle of the procedures is as follows: Anti-ECP, covalently coupled to immunoCAP, reacts with the ECP in the patient serum specimen. After washing enzyme labelled antibodies against ECP are added to form a complex. After incubation, unbound enzyme-anti-ECP is washed away and the bound complex is then incubated with a developing agent. When the reaction stops, the fluorescence of the eluate is measured. The fluorescence is in proportional to the concentration of ECP in the serum sample. To evaluate the results, the response of the patients' samples is compared directly to that of the calibrators.

IgE(IU/ml) was measured with the immunoradiometrique method (Immunoradiometric assay kit, Immunotech, France). The principle of the procedure is as follows: the immunotech's IgE assay is a two-site immunoradiometric solid phase method using two different mouse monoclonal antibodies. The test samples react first with the monoclonal antibody coated on the tube. Then, after being washed, bound IgE is revealed by the I^{125} radiolabelled monoclonal antibody. Bound radioactivity measured in a Gamma counter is directly proportional to the IgE level of the sample. These levels are obvious on the standard curve.

TEC(total eosinophil count /cumm) was measured with Automatic blood counter (SYSMEXXE 2100,XE-2100, Japan). XE-2100 illuminates the specimen with a semiconductor laser beam, and distinguishes cells with three signals from each cell, i.e., the forward scattered light, the lateral scattered light and the lateral fluorescence. The forward scattered light intensity indicates the cell volume, while the lateral scattered light indicates the cell contents such as nucleus and granules. The lateral fluorescence indicates the amount of DNA and RNA present. In the DIFF channel of XE-2100, the specific binding of an organic acid in STROMATOLYSER-4DS to eosinophil granules enhances lateral scattered light intensity, sharply distinguishing neutrophils from eosinophils.

All these were measured three times - at the first visit, four weeks after the first visit, and at the last visit.

Adverse events

All adverse events, such as sore throat, hoarseness, cough, rhinitis, headache, upper respiratory tract infection symptoms and oral candidiasis, were recorded in the "Daily Record Card" and the safety was evaluated on each visit. Because cortisol is the systemic marker used most commonly to monitor effects on the hypothalamus-pituitary-adrenal (H-P-A) axis in human [11], we checked the sera cortisol levels(mg/dl)[1,12] with immunoradiometrique (Radioimmunoassay kit,DSL-2100 Active TM cortisol coated-tube DSL, Texas, USA) at the first visit, four weeks after the first visit, and at the last visit. The procedure follows the basic principle of radioimmunoassay by which there is competition between the radioactive and the non-radioactive antigen for a fixed number of antibody binding sites. The amount of I^{125} -labeled antigen bound to the antibody is inversely proportional to the concentration of the unlabeled analyte present. Separation of free and bound antigen is achieved by decanting or aspirating the antibody-coated tubes.

Asthma exacerbation

The necessity of using the rescue therapy other than the inhaled Salbutamol was defined as asthma exacerbation. The drugs used at this stage were recorded and this condition was not a dropout criterion for this research. Those in worsened conditions were instructed to increase the use of beta-2 agonist and to inform the hospital within 24 hours. The doctor decided whether the subject should continue or drop out of the research.

Analysis

The data gathered in the completed daily record cards during the 2-week pre-run-in period were established as a baseline. Those collected in the treatment period days 0-21 and days 0-42 were analyzed.

The patients had to measure the peak expiratory flow rate (PEFR) three times before medication every morning and every evening , preferably not within four hours of bronchodilator therapy. Of each three measurements, the highest value was recorded. Each patient's mean morning and evening PEFR in each period was calculated, expressed as absolute values, and then subjected to analysis on covariance. The improving changes of PEFR were calculated as the real data of PEFR, which in turn, would be subtracted from the calculated predicted PEFR.

As the standard formula by sex, age and height was adopted, we arrived at the pulmonary function as predicted . The changes from the baseline to the present one were analyzed with covariance.

The same method of covariance was used again to get the mean of the cortisol level calculation. The average symptom scores(mean ± standard deviation) were analyzed with Wilcoxon rank sum test [1,13]. Mantel-Haenszel test and Fisher's exact test were used for adverse events and withdrawals, while Wilcoxon rank sum test was for exacerbation report [1,10]. P-values for the differences of PEFR, pulmonary function, cortisol level change, TEC changes, IgE changes, and ECP changes between FP and BD groups were based on the Mann-Whitney test.

RESULTS

Patients

Initially there were 51 patients in FP group and 26 in BD group, but because of fear of blood sampling, poor compliance with the pulmonary function test, loss of follow up, etc, only 41 patients in FP group and 19 in BD group completed the study.

Male predominance exists. The average age was around 8-9 years old. About 30% to 40% of the patients had a history of atopy. There were similarities between the daily medications in the two groups (Table 1).

Daily record card

Table 1. The baseline data of the FP group and BD group

Group / Item	FP Group (Number=41)	BD Group (Number=19)	P- value
Male/Female	28/13	11/8	0.562
Average age:mean±SD	8.51±2.22	8.47±2.80	-
(range)	(5-12)	(4-14)	
Allergic family history(A)	22(54%)	11(58%)	0.788
Allergic rhinitis (B)	17(41%)	8(42%)	1.000
Atopic dermatitis or eczema (C)	14(34%)	7(37%)	1.000
(A+C)	10(24%)	4(21%)	1.000
(A+B+C)	8(20%)	3(15%)	1.000
Years of asthma*			0.824
<1	1	0	
1-5	21	10	
6-10	17	8	
>10	2	1	
Daily medication condition before this research:			
Inhaled β_2-agonist	39(95%)	16(84%)	0.314
Oral form β_2-agonist	5(12%)	3(16%)	0.699
Theophylline	7(17%)	5(26%)	0.493
Ketotifern	11(27%)	6(32%)	0.763
Sodium cromoglycate	25(61%)	10(53%)	0.583
Inhaled corticosteroid	36(88%)	16(84%)	0.699

Test based on Fisher's exact test

* Test based on Cochrin-Mantel-Haenszel test

Even though the clinical condition improved (lower daytime & night-time symptom scores and less frequent use of the rescue Salbutamol therapy), and both the laboratory data and, under the doctor's guidance, the pulmonary function test in the hospital showed obvious improvement, exaggerated changes were found in PEFR done by the patients themselves at home. These data contributed few statistic values.

The initial values of the daytime & night-time symptom scores showed no significant difference between the two groups.(P=0.214/0.766 daytime/ nighttime symptom score). The average(mean ± standard deviation) baseline daytime symptom score was 1.72±0.34 in FP group and 1.80±0.22 in BD group. Four weeks later, the average score was 1. 54±0.30 in FP group and 1.52±0.28 in BD group. Eight weeks later, it was 0.42±0.26 in FP group and 0.50 in BD group. Greater improvement was noticed in BD group after 4 weeks (P=0.033), but the improved P-value of the two groups was 0.621 after 8 weeks(Table 2). Therefore, in terms of daytime symptom scores, no significant difference in improvement was found between the two groups except that of 4 weeks later.

The average(mean±standard deviation) baseline night-time symptom score was 1.85±0.32 in FP group and 1.82±0.14 in BD group. Four weeks later, the average score was 1.42±0.25 in FP group and 1. 34±0.29 in BD group. Eight weeks later, it was 0. 47±0.30 in FP group and 0.42±0.27 in BD group . The improved P-value between the two groups was 0.431 after 4 weeks and 0.957 after 8 weeks (see Table 2). Again, in improvement in the night-time symptom score, no significant difference was found between the two groups.

On the other hand, significant difference between the initial value and that of 8 weeks later was obvious in both groups. In FP group, the average baseline daytime symptom score was 1.72 ±0.34 and that of 8 weeks later was 0.42 ±0.26 (P<0.001). In BD group, the average baseline daytime symptom score was 1.80±0.22 and that of 8 weeks later was 0.50 ±0.21 (P<0.001). As for night-time symptom scores, in FP group, the average baseline was 1.85 ±0.32 and that of 8 weeks later was 0.47 ±0.30 (P <0.001). In BD group, the average baseline score was 1.82±0.14 and that of 8 weeks later was 0.42±0. 27 (P<0.001). For average daytime and night-time symptom scores, P-value between the baseline and the 8-week-later score was lower than 0.0001 in FP group. In the BD group, it was lower than 0.0001, too. Therefore, much improvement was evident in the Symptom Scores in both groups. These obvious changes indicated that the clinical conditions had indeed improved.

TEC, IgE, ECP levels

Both groups showed obvious improvement in

Table 2. Average symptom scores

Group	FP Group		BDGroup		
Medication duration	Score (Number)	Difference (Number)	Score (Number)	Difference (Number)	P-value[a]
Daytime					
Baseline	1.72±0.34(41)		1.80±0.22(19)		
4 weeks later	1.54±0.30(41)	-0.18(41)	1.52±0.28(19)	-0.28(19)	0.033*
8 weeks latter	0.42±0.26(39)	-1.31(39)	0.50±0.21(16)	-1.33(16)	0.621
Night-time					
Baseline	1.85±0.32(41)		1.82±0.14(19)		
4 weeks later	1.42±0.25(39)	-0.44(39)	1.34±0.29(18)	-0.48(18)	0.431
8 weeks later	0.47±0.30(39)	-1.38(39)	0.42±0.27(17)	-1.41(17)	0.957

Average: mean±standard deviation

Test statistics based on Mann-Whitney Test

* means p<0.05 between the baseline and the score after treatment in each group

TEC and IgE, but no significant differences were found between them (P>0.05). On the other hand, eight weeks later, the improvement of ECP was more obvious in FP group than in BD group (P>0.05).

Pulmonary function

There were no significant differences between the two groups in the initial values of PEF,FEV1, and FEV1/FVC (P-value=0.426 / 0.253 / 0.823). However 4 weeks later, the BD group displayed more obvious improvement in PEF and FEV1 (Table 3, P=0.003 in PEF and P=0.005 in FEV1), and from the baseline to the 8-week-later score, much improvement in the pulmonary function could be seen (P-value $\leq$ 0.05). No other significant differences were found between them.

Adverse effects

There were higher percentages of sore throat and rhinitis in FP group, no oral candidiasis in either group, and no other significant differences between them (see Table 4, all P-value >0.05).

No significant cortisol change from the baseline to the value of 8 weeks later was found in either group (P=0.829 in FP group, and P=0.575 in BD group), and neither showed significant difference between them (P=0.946 after 4 weeks, and P=0.508 after 8 weeks).

DISCUSSION

Fluticasone Propionate has approximately twice the potency of Beclomethasone Diapropionate in the treatment of mild to moderate childhood asthma[1,6,8, 14]. Our short-term research confirmed this conclusion, too.

Initially, perhaps due to the FP group's poor skill of using the new device-Accuhaler (because traditional pressurized metered dose inhaler (PMDI) device was so common in these "old" asthma patients), the FP group displayed significantly less improvement than the BD group during the first 4 weeks, which was compatible with Daytime Symptom Scores (Table 2 ,P=0.033). However 8 weeks later, with the patients' improvement in the use of Accuhaler, no other factors could impair the true efficacy of either drug. P-value did not indicate any significant differences between 200ug FP and 400ug BD in pulmonary function improvement, physical and social disruption, or rescue beta-2 agonist use, and

Table 3. Improvement in pulmonary function

Group	FP Group		BD Group		
Medication Duration	Value (Number)	Difference (Number)	Value (Number)	Difference (Number)	P value
PEF(L/sec)					
(Average)					
baseline	2.878(39)	-	3.042(19)	-	-
4 weeks	3.151(37)	0.206(36)	3.599(19)	0.566(18)	0.003
8 weeks	3.290(33)	0.478(31)	2.764(12)	0.536(11)	0.943
FEV_1 (L)					
(Average)					
baseline	1.376(39)	-	1.463(19)	-	-
4 weeks later	1.503(37)	0.094(36)	1.697(19)	0.223(18)	0.005
8 weeks later	1.520(33)	0.198(31)	1.363(19)	0.335(11)	0.252
FEV_1/FVC					
(Average)					
baseline	0.785(39)	-	0.819(19)	-	-
4 weeks later	0.820(37)	0.035(36)	0.865(19)	0.051(18)	0.067
8 weeks later	0.842(33)	0.072(31)	0.855(12)	0.085(11)	0.097

Table 4. Adverse effects in FP and BD group

Group	FP Group (41 patients)		BD Group (19 patients)		P-value[a]
Adverse effect	Number	Percentage	Number	Percentage	
Sore throat	5	(13.2%)	1	(5.3%)	0.654
Hoarseness	1	(2.4%)	0	(0.0%)	1.000
Cough	4	(9.8%)	2	(10.5%)	1.000
Rhinitis	4	(9.8%)	1	(5.3%)	1.000
Headache	0	(0.0%)	1	(5.3%)	0.317
URI symptom	5	(12.2%)	3	(15.8%)	0.699
Oral Candidiasis	0	(0.0%)	0	(0.0%)	-

a.Test statistics based on Fisher's exact test

no significant difference was found in the decreasing ratio of IgE or TEC, either. On the other hand, the decrease in ECP ratio did become more obvious in FP group than in BD group, which means better therapeutic effects was working there.

Perhaps because of the patients' poor skill and lack of compliance, exaggerated changes in PEFR (done at home) were noted in spite of obvious improvement in clinical conditions (less physical disruption at daytime and less sleep disruption at nighttime), laboratory data, and the pulmonary function test (done under the doctor's guidance in the hospital).

The adverse effects in both groups were as anticipated — sore throat, hoarseness, cough, rhinitis, headache, and URI symptoms. However, no oral candidiasis was found, and fortunately, neither was suppression of adrenal function (P-value=0.829 /0. 575 in FP/ BD group) .

The fact that only about 20% of an inhaled dose of the drug reaches the airways while, without oral gargling after use, approximately 80% is swallowed [1,7-9,15-17] may lead to the systemic side effects. The oral bioavailability of FP has been measured in several studies and been found to be less than 1%, while that of BD is less than 20% [11,15]. In contrast to the marked difference in the oral bioavailability, all glucocorticoids, when administered by the inhaled rout, are equally completely absorbed by the lung and therefore approximately 20% of the administered dose. The sum of pulmonarily and orally absorbed fractions contributes to the blood cortisone concentration [11,15]. Therefore, the oral bioavailability is important to inhaled corticosteroid . Both groups showed little oral absorption and negligible oral bioavailability[1]. In addition, patients were told to gargle after using inhaled corticosteroid. Therefore, far less than 80% of the drug is really swallowed and thus, the oral bioavailbility did not have so much impact as we thought originally. In fact, longitudinal studies have demonstrated that there are no significant effects of inhaled corticosteroids, FP included, on statural growth in doses of up to 800 μg daily for up to 5 years of treatment[14,18]. A meta-analysis of 21 studies, including over 800 children, showed no effect of inhaled BD on statural height, even with higher doses and long duration of therapy[14,19], and in a large study of asthmatics treated with inhaled corticosteroids during childhood there was no difference in statural height compared with normal children, FP included [14,20-24]. In this study, few adverse effects were noted. However, further observation of the adverse effects of high dose inhaled corticosteroid (over 1000 μ g/day, for example) is recommended.

Furthermore, the potency of inhaled corticosteroid may be influenced by its licensed powder system. In other words, a different inhaler-specific design feature may influence the lung deposition and contribute significantly to the failure rate[25-31]. As currently the most frequently prescribed administration form, PMDI is worldwide, with history of clinical use for over 30 years, but only about 50% of adult patients can use it efficiently if the only tuition is reading the manufacturer's instruction pamphlet[32]. Approximately 10% of PMDI enters the lung, and this fraction(which presumably exerts the therapeutic effect) may be absorbed into the systemic circulation[16, 32]. The necessity of the synchronous action of the inhaler with inspiration is another major problem[16,

32,33]. When the dose is released into the mouth, some patients cannot continue breathing in because of the sensation caused by the propellant. Furthermore, more than 10% of patients develop an inefficient inhalation technique simply using this device continuously[32-34]. Spacer devices overcome the problem of coordinating dose-release with inhalation, decrease oropharyngeal deposition, and increase pulmonary deposition of the drug [32,35-40]. They can be used by the vast majority of patients except for very young children[32,41]. Accuhaler, a new device of dry powder inhaler, depends upon the patient's inspiratory effort and is easier to use than conventional PMDI since it overcomes PMDI's main problem of synchronous dose release with inspiration. In addition, dry power devices are less bulky than spacers[32].The inspiratory flow required for the efficient use of each device is different. The best compromise instruction for the use of all dry powder devices is to breathe out fully and then breathe in through the inhaler as quickly and as forcefully as possible for as long a time as possible[32].In general, dry powder devices are easier to use than conventional PMDI. An inspiratory flow of at least 20L/min is required for efficient use of Accuhaler. Young children are unlikely to achieve the flows necessary for Accuhaler instead for PMDI with spacers, but PMDI without spacers is even less efficient than Accuhaler[32]. Using of a large volume spacer device can markedly reduce the oropharyngeal deposition [16,32,42], and for the use of dry powder inhalers, similar reductions in systemic effects may be achieved by washing the mouth and discarding the fluid [14]. Another advantage of Accuhaler is that it has a counter displaying the number of doses remaining, with the last five printed in a warning red color[16]. Meanwhile, patient's training should be taken into consideration in the provision of inhaler devices. Direct observation following expert instruction is necessary.

Since it is not yet possible to put both the molecules together into either of the powder devices, we can only compare the "whole devices-both the inhaled devices and the drugs", which is the major drawback in this research.

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Fluticasone propionate與Beclomethasone dipropionate在兒童氣喘臨床使用之比較

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吸入性類固醇,在治療及預防氣喘上扮演著極重要的角色。由過去研究顯示，Fluticasone propionate（FP）的生體可用率低及局部藥效高。然而這些數據並非源自台灣地區，爲建立本土數據，於是我們設計了爲期十二週的開放、隨機比較實驗。這些參與者是年齡約在4-14歲的中、重度氣喘患者，共77人。其中51人在FP組，26人在beclomethasone dipropionate（BD）組。結果發現，除了在第四週時，日間症狀分數（p=0.033，BD組較佳）之外，兩組之間的症狀分數的改善程度並無明顯差異（p>0.05）。所有的日間或夜間症狀之p值皆小於0.001，亦即兩組在治療後皆有明顯改善。PEF（尖峰呼氣流速）改善程度的p值在第四週爲0.003（BD組較佳），而在第八週爲0.943; FEV_1 改善程度的p值在第四週爲0.005（BD組較佳），而在第八週爲0.252；FEV_1／FVC改善程度的p值在第四週爲0.067，在第八週爲0.097。不論是在四週後或八週後，TEC（total eosinophil count），IgE，ECP(eosinophil cationic protein）血清濃度的變化皆無統計學上的差異。所有的副作用皆在預期之中，且包含cortisol值（$p > 0.05$），皆無統計學上的差異。

總之，台灣地區的資料顯示，100 μg的FP的藥效與200 μg的BD的藥效是相等的。而且在FP組幾乎沒有什麼副作用發生，這說明了Fluticasone propionate值得臨床使用。

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