

Budesonide and terfenadine, separately and in combination, in the treatment of hay fever

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Background: While hay fever is a very common experience, its treatment in primary care setting has been little reported in controlled studies.

Objective: This study sought to evaluate the patient's assessment of efficacy of an intranasal steroid spray (budesonide) alone or in combination with an antihistamine (terfenadine) against terfenadine alone or placebo alone.

Methods: A double-blind parallel group, placebo-controlled trial design was used, comparing the four groups. Each group used an active or placebo spray and active or placebo tablets. Symptom scores were recorded daily in diaries over a 21-day period.

Results: Overall assessment of efficacy by the 106 patients was significantly greater ($P < .05$) for budesonide versus terfenadine or placebo alone. There was a 40% placebo response. Budesonide was more effective than terfenadine for all individual symptom scores, particularly nasal blockage, against which terfenadine was ineffective. Adverse effects were mild and transient for all groups.

Conclusions: Budesonide alone is a highly effective treatment for hay fever with few side effects.

INTRODUCTION

It has been estimated that 10% to 17% of North Americans experience allergic rhinitis¹ and that hay fever, an allergy to pollen resulting in rhinitis and conjunctival symptoms, is one of the most common forms of the disease. Following exposure to the allergen, IgE-mediated stimulation of mast cells results in the release of allergy mediators such as histamine, which cause increased vascular permeability, mucous secretion, and stimulation of neural reflexes (resulting in pruritus and sneezing). Late-phase inflammatory reactions² include the attraction and infiltration of inflammatory cells, such as mast cells, eosinophils, basophils, neutrophils and lympho-

cytes into the mucosa.³ The increased irritability of the nose observed during the allergy season is largely due to this inflammatory reaction. The result of these processes is the characteristic nasal symptoms of hay fever including pruritus, nasal congestion, runny nose, and sneezing.

Treatment of hay fever includes antihistamines, decongestants, sodium cromoglycate,⁴ topical (intranasal),⁵ or systemic⁶ steroids and immunotherapy.⁷ Antihistamines are well-established in the treatment of hay fever, reflecting the role of histamine release in its pathogenesis, but their usefulness has until recently been limited because of their anticholinergic, central nervous system and sedative side effects,⁸ which are potentiated by sedatives, hypnotics, antidepressants, and alcohol. More recent H₁-receptor antagonists produce a much lower incidence of sedation⁸; however, terfenadine, the most widely prescribed antihistamine, and a second compound in this group, as-

temizole, have both been shown to cause ventricular arrhythmias in overdose^{9,10} or when used in combination with erythromycin or other macrolide antibiotics and the antifungal preparation ketoconazole.¹¹ Although clinical trials have shown antihistamines to relieve symptoms such as sneezing, itchy nose and runny nose, in general they are not thought to be effective in relieving nasal blockage, and thus may be formulated in combination with a decongestant.¹²

Systemic treatment with corticosteroids can be used in hay fever, but is usually reserved for the most severe and persistent cases because of the risk of adverse effects associated with the long-term use of this type of therapy.¹³ Intranasal corticosteroids, on the other hand, provide one of the most potent therapies for hay fever^{7,14} and their local mode of application avoids the adverse effects associated with systemic corticosteroids while at least equalling their efficacy.¹⁵ They also lack the sedative effects of antihistamines. The limitations of intranasally applied steroids are that, due to their localized action, they may not be effective in controlling eye symptoms and that some patients experience nasal irritation or mild epistaxis as a result of using them.¹⁶

In the current study, the efficacy of intranasal budesonide, a corticosteroid preparation, was compared with that of terfenadine and a combination of the two in the treatment of hay fever, in a double-blind, parallel-group, placebo-controlled study.

MATERIALS AND METHODS

Patients

Men and women aged 15 years or

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over at entry were recruited from a primary care setting into the trial. All patients had experienced symptoms of hay fever between May 1 and August 31 for at least 2 years preceding the study, and at the time of recruitment were suffering from two or more of the following symptoms: blocked nose, runny nose, itching nose, or sneezing. Any patients who were taking oral corticosteroids, were suffering from respiratory tract infections (bacterial, viral, or fungal) at the time of recruitment, had taken desensitization therapy during the previous 12 months or who suffered hay fever symptoms outside the specified period were excluded from the study, as were pregnant women.

The nature and purpose of the study were explained to the patients in both oral and written form, and their written consent to participation in the study was obtained. The study was approved by the local ethics committee and was performed in accordance with the Declaration of Helsinki.

Study Procedures

Patients visited their general practitioner on entry to the study, at which time demographic details and the patient's assessment of hay fever symptoms during the previous 24 hours were recorded. The symptoms assessed were blocked nose, runny nose, itchy nose, sneezing bouts, runny eyes, and sore eyes. Symptoms were scored using a 4-point system where 0 = no symptoms, 1 = mild symptoms (present but not troublesome), 2 = moderate symptoms (some discomfort experienced), and 3 = severe symptoms (discomfort experienced during most of the waking hours). A minimum score of 2 was required for entry into the study.

On entry to the study, patients were randomized to one of four parallel groups receiving (1) intranasal budesonide (Rhinocort, Astra Draco AB, Lund, Sweden), 200 μ g bid, plus terfenadine (Triludan, Marion Merrell Dow, Uxbridge,

Middlesex, UK), 60 mg bid; (2) terfenadine, 60 mg bid, plus a placebo nasal spray (identical to the budesonide nasal spray but delivering propellant and lubricant only); (3) intranasal budesonide, 200 μ g bid, plus placebo tablets identical in appearance to the terfenadine tablets; and (4) placebo nasal spray plus placebo tablets. Patients were instructed to deliver two puffs from the nasal spray into each nostril morning and evening, and to take one tablet in the morning and one in the evening, for 21 days. The use of other medications for hay fever, particularly oral corticosteroids and antihistamines, was forbidden but in the event of troublesome eye symptoms patients were permitted to use xylometazoline or metazoline eye drops.

Patients were supplied with diary booklets and asked to record, at the end of each day, symptom scores experienced during the day for blocked nose, runny nose, sneezing, itchy nose, runny eyes and sore eyes, using the same scoring system as on entry to the study. The number of eye drops used during each 24 hours was also recorded, as were any comments about the symptoms or treatment.

Patients visited their general practitioner after seven days' treatment, and were reminded of their option to withdraw from the study if the previous week's treatment had been ineffective. The diary booklets were checked for accuracy and completeness, and any comments made by the patients were recorded. At the final visit, after 21 days of treatment, comments by either the patient or the physician were recorded, any inconsistencies in the diary booklets clarified, and patients were asked to make a global assessment of the efficacy of treatment according to a 4-point scale where 0 = ineffective, 1 = slightly effective, 2 = noticeably effective, and 3 = very effective.

Statistical Analysis

Mean weekly symptom scores for

each patient who completed the study were determined from the diary booklets and overall means for each treatment group calculated from these. One-way analysis of variance (using pooled variance) was carried out on the 3-week treatment mean, the last week of treatment and weeks 1, 2, and 3 separately. Where statistically significant treatment differences were indicated by the F-ratio, linear contrasts were used to determine the statistical significance of individual treatment differences.

Global assessment and eye drop use were subjected to Kruskal-Wallis one-way analysis of variance followed by the Wilcoxon rank sum-W test where appropriate.

RESULTS

Efficacy

One hundred forty-three patients reporting to their general practitioner with symptoms of hay fever were recruited into the study. Records from six patients were unusable because of confused numbering (five patients) and lost data (one patient). Twenty patients withdrew because of lack of treatment efficacy, the majority of these (12) being in the placebo group A further three patients withdrew as a result of adverse events and five patients failed to return for assessment on one or more occasions. Three patients severely violated the protocol during the trial, and were withdrawn. Table 1 shows demographic characteristics and symptom severity at baseline for the 106 patients who were evaluated for efficacy. On entry to the study, the four treatment groups were well matched with respect to symptom severity and demographic characteristics, with the exception of the placebo group which had a higher proportion of men than the other groups.

Figure 1 shows the results of the patients' overall assessment of the efficacy of treatment, whereas Figure 2 shows the analysis of individual symptom scores derived from

Table 1. Demographic Characteristics and Baseline Mean Symptom Scores (\pm SD) of Patients Assessed for Efficacy

	Placebo	Treatment Group		
		Budesonide	Terfenadine	Budesonide + Terfenadine
Demographic characteristics				
Number of patients	21	30	23	32
Men/women (%)	71/29	43/57	53/47	41/59
Age, yr (mean \pm SD)	27.7 (\pm 12.2)	26.8 (\pm 12.4)	29.7 (\pm 11.7)	25.7 (\pm 7.8)
Mean symptom scores				
Blocked nose	1.6 \pm 1.1	1.9 \pm 0.9	1.6 \pm 1.2	1.8 \pm 1.0
Sneezing bouts	2.3 \pm 0.6	2.1 \pm 0.8	1.9 \pm 1.1	1.9 \pm 0.7
Nasal itching	1.1 \pm 1.1	1.2 \pm 1.0	1.4 \pm 1.1	1.2 \pm 1.1
Runny nose	2.0 \pm 0.9	1.9 \pm 1.1	1.7 \pm 1.2	1.6 \pm 0.8
Sore eyes	1.8 \pm 1.2	1.8 \pm 1.1	1.7 \pm 1.1	1.3 \pm 1.3
Runny eyes	1.5 \pm 1.3	1.5 \pm 1.2	1.3 \pm 1.2	1.3 \pm 1.1

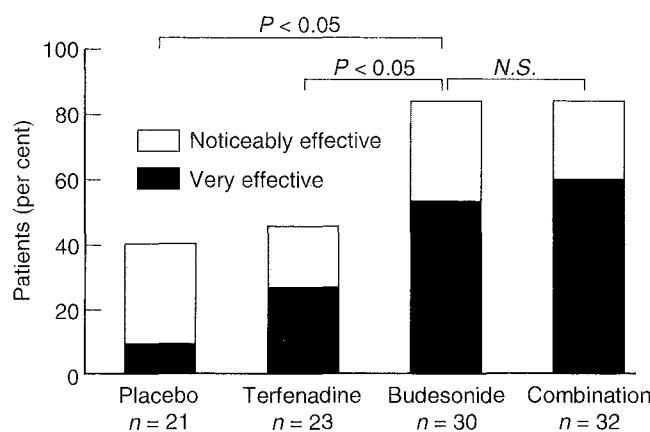


Figure 1. Patients' overall assessment of the efficacy of treatment. Percentage of patients in each treatment group who reported the global efficacy of their treatment at week 3 as noticeably effective or very effective, with statistical comparison between groups (Wilcoxon rank sum-W test). NS = not significant.

patient booklets. Forty percent of patients in the placebo group and 46% of patients treated with terfenadine alone rated the overall efficacy of their treatment as noticeably effective or very effective, in comparison to 85% of patients receiving budesonide alone or in combination with terfenadine (Fig 1). A comparison between groups showed statistically significant ($P < .05$) differences in the patients' overall assessment of treatment efficacy between budesonide versus terfenadine and budesonide versus placebo, but no significant difference was observed between terfenadine versus placebo

or between budesonide alone versus budesonide in combination with terfenadine.

Figure 2 shows that treatment with terfenadine alone resulted in statistically significant ($P < .05$) reductions in symptom scores for runny nose and itchy nose as compared with placebo. Terfenadine, however, had no effect on nasal blockage. Treatment with budesonide alone reduced all mean nasal symptom scores as compared with placebo, the differences being statistically significant ($P < .05$). Budesonide also reduced mean symptom scores more than terfenadine for all

nasal symptoms, the difference being statistically significant in the case of nasal blockage. The combination of budesonide and terfenadine produced symptom scores similar to budesonide alone for blocked nose, itchy nose and runny nose, and reduced the mean sneezing score by more than either terfenadine or budesonide alone, the differences being statistically significant ($P < .05$). Figure 3 shows changes in mean total nasal symptom scores during the first week of treatment. Terfenadine used alone achieved its maximum efficacy within one to two days. After two to three days, the symptom scores with budesonide were lower than with terfenadine, and symptoms continued to improve over days 3 to 7. Budesonide and terfenadine combination treatment produced a similar effect to treatment with budesonide alone.

Analysis of diary records of eye symptoms and eye drop use revealed that there were no statistically significant differences in eye symptom scores between treatment groups, although the scores tended to be lower in the active treatment groups than in the placebo-treated patients. Eye drop use in all groups remained relatively constant throughout the study; although use in the budesonide group was higher than that in the terfenadine group, this did not reach statistical significance.

Safety

The six patients whose records were lost or confused were excluded from the safety assessment. Nineteen of the 137 patients evaluated for safety experienced adverse events. These events were generally mild and transient, the most common being local effects related to use of the nasal spray, such as sneezing and nasal irritation after its use. One patient treated with combined budesonide and terfenadine experienced palpitations one hour after taking the tablets, as she had previously when taking chlorpheniramine maleate (Piriton) tablets. Three patients

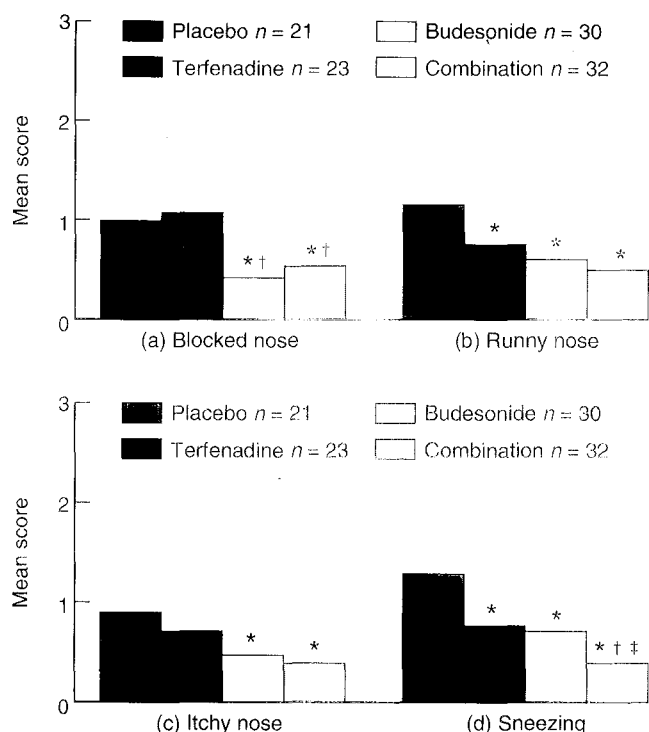


Figure 2. Assessment of nasal symptom scores at week 3 as derived from patients' diary booklets. * Statistically significant difference versus placebo ($P < .05$). † Statistically significant difference versus terfenadine ($P < .05$). ‡ Statistically significant difference versus budesonide ($P < .05$).

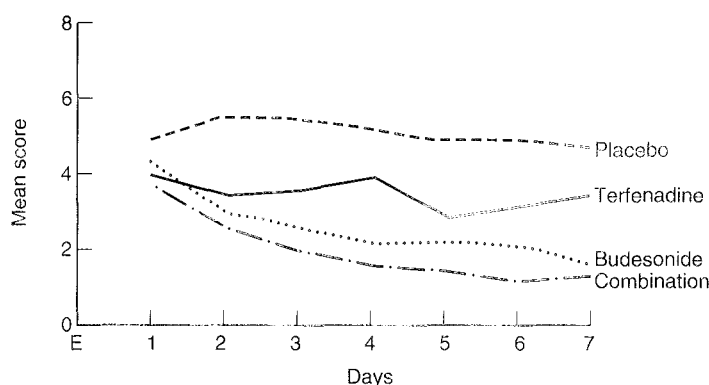


Figure 3. Changes in mean total nasal symptom scores in each treatment group during the first week of treatment.

withdrew from the study as a result of adverse events; these were one placebo-treated patient who suffered from nausea after taking the tablets, one budesonide-treated patient who suffered from fatigue, and one patient on combination therapy who experienced intolerable sneez-

ing and headache after using the nasal spray. A summary of adverse events is shown in Table 2.

DISCUSSION

The current study demonstrates that both intranasal budesonide and oral terfenadine were more effective

than placebo in the treatment of hay fever symptoms. This confirms previous studies with budesonide¹⁷ and terfenadine.¹⁸ Budesonide, however, was found to control all nasal symptoms of hay fever whereas terfenadine did not significantly affect nasal blockage. The lack of efficacy of terfenadine against nasal blockage has been observed in other studies^{19,20} and is likely to be clinically significant, as 59% of patients in the present study complained of nasal blockage. Scores for eye symptoms were similar on treatment with budesonide or terfenadine, separately or in combination, and lower than scores in the placebo group, although the difference was not statistically significant. More xylometazoline or metazoline eye drops were used by patients in the budesonide group, which may indicate better control of eye symptoms with terfenadine.

Budesonide was found to be considerably more effective than terfenadine, according to the overall assessment of treatment effect by the patients. In the budesonide group, 85% of patients rated their treatment as noticeably effective or very effective compared with 46% in the terfenadine group and 40% in the placebo group, a level of placebo response that emphasizes the importance of adequate control groups in hay fever studies. Indeed, placebo nasal spray can produce a substantial reduction in symptoms.²¹ Although the scores for individual nasal symptoms tended to be lower with combined budesonide and terfenadine treatment than with either drug used alone, the global assessments of combination therapy and budesonide alone were very similar, indicating that the lower scores for individual symptoms were not perceived by patients as improvements in their overall condition. Terfenadine, budesonide, and combination therapy all had a good safety profile; adverse effects were minor and infrequent with all treatments, and patients on active treatments expe-

treatment of hay fever confirms previous studies with budesonide¹⁷ and terfenadine, how-
ever whereas terfenadine significantly affected the lack of efficacy of budesonide in the placebo group, budesonide did not significantly affect the lack of efficacy of terfenadine in the placebo group. The lack of efficacy of terfenadine and other antihistamines in the treatment of nasal congestion in hay fever may be an indication of the inflammatory nature of the late-phase response in allergic rhinitis; anti-inflammatory agents such as corticosteroids could be considered as a more rational solution than antihistamines for the nasal symptoms of hay fever, especially given the excellent safety profile when applied intranasally. Budesonide has been shown to be more effective than beclomethasone dipropionate in the treatment of hay fever^{22,23} and thus represents an excellent choice for the treatment of this condition.

In conclusion, symptoms of runny or itchy nose and sneezing could be improved by terfenadine or budesonide administered alone or in combination, but blocked nose was only improved when budesonide was included in the treatment regime. Budesonide, alone or in combination with terfenadine, was perceived by patients as being significantly more effective in alleviating symptoms than terfenadine alone.

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Table 2. Number of Patients Reporting Adverse Events

Event	Placebo (n = 36)	Terfenadine (n = 29)	Budesonide (n = 35)	Budesonide + Terfenadine (n = 37)
Nasal adverse events				
Sneezing after use of				
Nasal spray	3	2	2	2
Nasal irritation*	1	0	1	1
CNS adverse events				
Headache	0	0	0	2
Fatigue	0	0	2	0
Other adverse events				
Nausea	1	0	1	0
Dry mouth	0	0	0	1
Palpitations	0	0	0	1

* Described as stinging, itching, or irritation.

experienced no more adverse effects than those taking placebo.

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LONG-TERM TREATMENT OF CHILDREN WITH INHALED BUDESONIDE IMPROVES CONTROL OF ASTHMA WITH NO ADVERSE EFFECT UPON GROWTH

To evaluate effects of inhaled budesonide the authors studied 278 children with mild or moderate asthma at initial ages of 3 to 11 years. After having been followed for 1-3 years during which they received no corticosteroid for more than 2 weeks per year, 216 children received inhaled budesonide, 800 μ g/day via Nebuhaler for 6 to 8 weeks. After establishment of optimal control the dosage was gradually by reduced 25% at monthly intervals as tolerated. These children continued to receive inhaled budesonide for 2 to 6 years (mean 3.7 years). Sixty-two children whose parents did not want them to receive an inhaled corticosteroid because of fear of adverse effects served as controls and were followed for 3 to 7 years (mean 5.2 years).

During treatment with budesonide the mean daily dose decreased from 710 to 430 μ g with no evidence of tachyphylaxis. The number of annual hospital admissions for acute severe asthma decreased from 0.03 to 0.004 per child ($P < .001$) and FEV₁ improved significantly as compared with both the run-in period and the control group. There was a significant relationship between the duration of asthma at initiation of treatment with budesonide and the annual increase in FEV₁ during treatment with budesonide. Children who started treatment more than 5 years after the onset of asthma had significantly lower FEV₁ (96% predicted) after 3 years of treatment with budesonide than those who received budesonide within the first 2 years after onset of asthma (101% predicted, $P < .05$). There were no significant changes in growth velocity or weight gain during treatment with budesonide as compared with the run-in period or controls.

These data indicate inhaled budesonide at doses of 400 μ g per day does not inhibit linear growth in most children with mild or moderate asthma. Early treatment with inhaled corticosteroid may be more effective than treatment more than 5 years after the onset of asthma.

-RMS

Agertoft L, Pedersen S. Effects of long-term treatment with an inhaled corticosteroid on growth and pulmonary function in asthmatic children. *Respir Med* 1994;88:373-81.