

The comparison of cetirizine, levocetirizine and placebo for the treatment of childhood perennial allergic rhinitis

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Cetirizine (Zyrtec) is a potent and long-acting second-generation histamine H₁-receptor antagonist for the treatment of allergic disease, such as allergic rhinitis and chronic idiopathic urticaria, in adult and child. It is a racemic mixture of levocetirizine (Xyzal) and dextrocetirizine. The purpose of this present study was to compare the efficacy of cetirizine, levocetirizine and placebo for the treatment of pediatric perennial allergic rhinitis. 74 perennial allergic rhinitis patients, aged 6 to 12 years old, assigned to 1 of 3 treatment groups for 12 weeks randomly. The effects of the three agents were compared with the Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ) and Total Symptom Score (TSS) by diary. Nasal peak expiratory flow rate (nPEFR) and laboratory examinations including serum immunoglobulin E level, eosinophil cationic protein (ECP), blood eosinophil counts and eosinophil percentage in a nasal smear were evaluated among the three groups. The results revealed that both cetirizine and levocetirizine improved TSS in comparison with the placebo group, and cetirizine appeared to be more efficacious than levocetirizine at week 8 and week 12. The PRQLQ score showed significant decreased both in cetirizine and levocetirizine group, but there was no statistic significant difference between both groups. The eosinophil proportion in a nasal smear significantly decreased among the cetirizine in comparison with the placebo group but there was no statistic significant in levocetirizine groups. Both cetirizine and levocetirizine showed significant improvement in nPEFR in comparison with the placebo group, and cetirizine appeared to be more efficacious than levocetirizine. The 12-week treatment program showed that cetirizine was more effectious than levocetirizine.

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Allergic rhinitis is a common childhood disease its prevalence is increasing worldwide (1–3). The disease is chronic and persists lifelong if untreated and may result not only in loss of school days for the child but also in lost productivity of parents or caregivers, who may miss work. Treatment should be effective in these young patients and not adversely affect their activity and ability to learn.

Studies evaluating newer antihistamines in children are few. This study compares the efficacy and safety of cetirizine and levocetirizine in treating pediatric perennial allergic rhinitis in children aged from 6 to 12.

Cetirizine (Zyrtec) is a potent and long-acting second-generation histamine H₁-receptor antagonist for the treatment of allergic disease, such as allergic rhinitis and chronic idiopathic urticaria

in adults and children, respectively. It is a racemic of equal parts of levocetirizine and dextrocetirizine.

Levocetirizine (Xyzal) is a new-generation selective H1-antihistamine approved for the treatment of allergic rhinitis and chronic idiopathic urticaria. Published studies have demonstrated its efficacy, safety, and anti-inflammatory properties in treating perennial allergic rhinitis in adults (4–7) and some studies have demonstrated that the antihistaminergic activity of the racemic is primarily due to levocetirizine (8–10). However, comparisons of cetirizine and levocetirizine in children with allergic rhinitis are few.

Therefore, we designed this clinical trial to compare the efficacy and safety of cetirizine and levocetirizine for the treatment of pediatric perennial allergic rhinitis.

Materials and methods

Participants

Eighty children aged from 6 to 12 yr fulfilled the criteria for the study and they were with moderate to severe perennial allergic rhinitis [according to the Allergic Rhinitis and its Impact on Asthma (ARIA) classification] for at least 1 yr. All were allergic to the house dust mite, which was confirmed by skin prick-test response and a positive reaction to mite specific IgE (Pharmacia, Uppsala, Sweden). Exclusion criteria were positive, response to other allergens or deformities of the ear, nose, or throat or infection during the 2 wk preceding the initial visit, or having taken medicine which may have affected any allergy symptoms such as antihistamine, decongestant or any form of steroid within seven days before the study. Participants were excluded if they had a respiratory tract infection or took the above medicine during the study period. A washout of seven days was required for patients taking leukotriene antagonist. The study was approved by Chung Shan Medical University Hospital Institutional Review Board. Written parental informed consent was obtained before commencing the study.

Study design

In the initial screening visit, a comprehensive medical and allergy history was taken on all participants and they were administered skin prick tests. Daily activity diaries were given to participants with the instructions to record all symptoms in the diary card every day from seven days before treatment started. Medication history was

reviewed to ensure that participants had not used an H1-antagonist, decongestant or any form of steroid during the preceding seven days.

Nasal peak expiratory flow rate (nPEFR) tests and nasal smear examinations were performed and patients requested to complete the Pediatric Rhinoconjunctivitis Quality of Life Questionnaires (PRQLQ) at the baseline visit. The serum eosinophil cationic protein (ECP) level, total IgE level, and total eosinophil count were checked, and the patients' preceding seven-day activity diaries reviewed. This was a randomized, double-blind, placebo-controlled study. Participants were assigned to one of three treatment groups: 27 patients took cetirizine (10 mg daily), 26 patients took levocetirizine (5 mg daily) and 27 patients were given the placebo. The assigned medication was taken once daily at bedtime for 12 wk after the baseline visit. All patients were followed up every 4 wk during this period. A physical examination and nPEFR were performed at each visit, and all daily diary cards were collected.

At the final visit, the symptoms diaries were reviewed and patients were requested to complete the PRQLQ again. The nPEFR test and laboratory tests, including nasal smear, ECP, total eosinophil count and total IgE level, were also repeated.

Daily diary of nasal symptom score

Rhinitis symptoms were measured using a four-grade scale, with scores ranging from 0 to 3 as follows: 0, none (symptom not noticeable); 1, mild (symptom noticeable but not bothersome); 2, moderate (symptom noticeable and bothersome some of the time); and 3, severe (symptom bothersome most of the time and/or very bothersome some of the time). Four nasal symptoms (rhinorrhea, nasal stuffiness/congestion, nasal itching, and sneezing) and four non-nasal symptoms (eye itching/burning, eye tearing/watering, eye redness, itching of ears/or palate) were recorded by the patients themselves every day. Some younger age (around 6- or 7-yr old) children may record the symptoms with the help of their parents. The Total Symptom Score (TSS) was the sum of the eight recorded symptom scores. Baseline TSS and each symptom score was calculated as the mean of the daily scores during the baseline period of seven days. Patients were followed up at weeks 4, 8, and 12 after treatment.

PRQLQ

The PRQLQ have 23 items in the five areas of nasal symptoms, ocular symptoms, practical

problems, other symptoms, and activity limitations. Each item is scored using a seven-point scale from 0 to 6 (11). The questionnaire can be completed within 5 min by children. Some younger aged children may record the score with the help of their parents.

nPEFR

Nasal peak expiratory flow rate (nPEFR) was performed with a Mini-Wright peak expiratory flow meter equipped with a purpose-built face mask, incorporating a good seal with the face, placed on the patient during tests. Patients were instructed to blow the nose forcefully after a deep inspiration while sitting with their mouth firmly closed. This test was performed three times and the highest value recorded.

Nasal smear

The underside of the patient's inferior turbinate was rubbed with a cotton wool bud and then smeared on a glass slide. The slides were stained with Leu stain and examined with a light microscope. An experienced cytologist, blinded to the subjects' clinical status, performed this assay. The nasal smear was recorded by counting a minimum of 100 leukocytes and the eosinophil count expressed as a proportion of the total number of leukocytes.

Assessment of safety

The investigators physically examined the subjects at each visit and assessed safety and tolerability for each treatment group. All adverse events and any change of vital signs were recorded.

Statistical analysis

Analyses were made using SPSS/PC 12.0 software (SPSS, Inc., Chicago, IL, USA). All collected data were expressed as a mean $\pm$ s.d. One-way analysis of variance was used to compare demographics and baseline characteristics among the three groups. A *p* value less than 0.05 was considered to be significant.

Results

Of the eighty patients initially entered into the study, 74 completed the study. Twenty-six patients were assigned to the cetirizine group (10 mg daily), 24 to the levocetirizine group (5 mg daily) and 24 to the placebo group. Six of

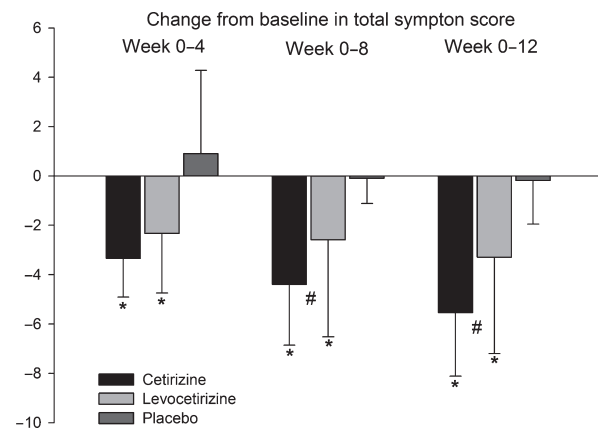


Fig. 1. Change from baseline in mean total symptom score. Significant change compared with placebo (**p* < 0.05), cetirizine compared with levocetirizine (#*p* < 0.05). Both cetirizine and levocetirizine significantly reduced TSS scores compared with the placebo group at weeks 4, 8, 12 (*p* $\leq$ 0.005). Cetirizine appeared to be more efficacious than levocetirizine at week 8 (*p* = 0.039) and week 12 (*p* = 0.015).

Table 1. Demography of characteristics and baseline data of the three groups

	Cetirizine	Levocetirizine	Placebo
Number	26	24	24
Male/female ratio	15/11 (58%)	15/9 (62.5%)	13/11 (54%)
Age, (mean $\pm$ s.d.) (yr)	8.19 $\pm$ 2.15	8.79 $\pm$ 1.61	8.12 $\pm$ 1.68
Body weight, (mean $\pm$ s.d.) (Kg)	29.04 $\pm$ 7.25	30.23 $\pm$ 6.59	29.79 $\pm$ 6.18
Height, (mean $\pm$ s.d.) (cm)	128.35 $\pm$ 9.69	131.89 $\pm$ 8.09	129.25 $\pm$ 8.23
TSS, (mean $\pm$ s.d.)	8.78 $\pm$ 2.01	7.73 $\pm$ 2.94	8.49 $\pm$ 2.02
PRQLQ, (mean $\pm$ s.d.)	48.65 $\pm$ 17.71	52.09 $\pm$ 16.57	41.54 $\pm$ 8.83
Serum IgE, (mean $\pm$ s.d.) (IU/ml)	502.81 $\pm$ 334.35	557.50 $\pm$ 539.84	452.66 $\pm$ 277.28
ECP level, (mean $\pm$ s.d.) (ng/l)	10.55 $\pm$ 5.05	17.85 $\pm$ 12.44	9.64 $\pm$ 4.86
Blood eosinophil counts, (mean $\pm$ s.d.) (per μ l)	502.81 $\pm$ 334.35	557.50 $\pm$ 539.84	452.66 $\pm$ 277.28
nPEFR, (mean $\pm$ s.d.)	74.00 $\pm$ 42.60	95.50 $\pm$ 39.61	78.25 $\pm$ 19.82
Eosinophil % in nasal smears, (mean $\pm$ s.d.)	44.80 $\pm$ 21.08	39.71 $\pm$ 10.37	37.22 $\pm$ 18.55

TSS, total symptom score; PRQLQ, Pediatric Rhinoconjunctivitis Quality of Life Questionnaire; ECP, eosinophil cationic protein; nPEFR, nasal peak expiratory flow rate; s.d., standard deviation.

Table 2. Changes from baseline (presented with mean $\pm$ s.d.)

	Cetirizine	Levocetirizine	Placebo
TSS			
0–4	$-3.34 \pm 1.57^*$ $p < 0.001$	$-2.33 \pm 2.41^*$ $p < 0.001$	0.91 ± 3.37
0–8	$-4.40 \pm 2.46^{*\dagger}$ $*p < 0.001, \dagger p = 0.039$	$-2.59 \pm 3.93^*$ $p = 0.005$	-0.09 ± 1.03
0–12	$-5.54 \pm 2.58^{*\dagger}$ $*p < 0.001, \dagger p = 0.015$	$-3.30 \pm 3.90^*$ $p = 0.001$	-0.18 ± 1.77
PRQLQ			
0–12	$-19.73 \pm 11.04^*$	$-24.09 \pm 16.82^*$	1.63 ± 5.13
nPEFR			
0–4	$13.20 \pm 7.85^*$	6.54 ± 30.98	-1.00 ± 6.61
0–8	$33.90 \pm 20.42^{*\dagger}$	$16.92 \pm 22.96^*$	-1.8 ± 8.33
0–12	$59.35 \pm 32.92^{*\dagger}$	$21.67 \pm 46.38^*$	-2.5 ± 5.74
Serum IgE			
0–12	-33.56 ± 204.23	7.72 ± 339.52	71.00 ± 211.68
ECP			
0–12	-2.68 ± 7.02	$-13.56 \pm 21.56^{*\dagger}$	1.11 ± 3.09
Blood eosinophil counts, 0–12	$-118.15 \pm 272.44^*$	-45.38 ± 241.41	56.50 ± 214.14
Eosinophil % in nasal smears, 0–12	$-23.47 \pm 19.83^{*\dagger}$	-6.50 ± 17.81	-2.85 ± 11.95

TSS, total symptom score; PRQLQ, Pediatric Rhinoconjunctivitis Quality of Life Questionnaire; ECP, eosinophil cationic protein; nPEFR, nasal peak expiratory flow rate.

*Significant change compared with placebo ($p < 0.05$).

$\dagger$ Cetirizine compared with levocetirizine ($p < 0.05$).

the original 80 patients were excluded from the study because their TSS recordings had not been completed during the treatment period (one in the cetirizine group; two in the levocetirizine group; and three in the placebo group). There were no significant differences in baseline demographics and health characteristics among the patients of the three groups, including: age, sex, height, body weight, and disease characteristics: ECP, total IgE, total eosinophil count, eosinophil proportion of nasal smear, nPEFR, and total symptom score (Table 1).

Medication efficacy

The mean TSS change from the baseline of the diary cards are illustrated in Fig. 1 and Table 2. Both cetirizine and levocetirizine significantly reduced TSS scores compared with the placebo group at weeks 4, 8, 12 ($p \leq 0.005$). Compared with levocetirizine, cetirizine appeared to be more efficacious than levocetirizine at week 8 ($p = 0.039$) and week 12 ($p = 0.015$) (Table 2, Fig. 1).

Individual symptom scores changes from the baseline of the diary cards are illustrated in Table 3. Cetirizine significantly improved rhinorrhea, nasal congestion, nasal itching, sneezing, eye itching, tearing, and conjunctiva hyperemia. Levocetirizine significantly improved nasal congestion, nasal itching, sneezing, eye itching,

Table 3. Change from baseline of individual symptom items (presented with mean $\pm$ s.d.)

Change from baseline (wk)	Zyrtec (mean $\pm$ s.d.)	Xyzal (mean $\pm$ s.d.)	Placebo (mean $\pm$ s.d.)
Rhinorrhea			
0–4	-0.47 ± 0.53 $p = 0.022^*$	-0.37 ± 0.58	-0.08 ± 0.73
0–8	-0.74 ± 0.51 $p = 0.004^*$	-0.45 ± 0.87	-0.11 ± 0.46
0–12	-0.92 ± 0.54 $p = 0.001^*$	-0.62 ± 0.95 $p = 0.019^*$	-0.14 ± 0.28
Nasal congestion			
0–4	-0.71 ± 0.43 $p = 0.006^*$	-0.39 ± 0.60	-0.22 ± 0.61
0–8	-0.91 ± 0.62 $p < 0.001^*$	-0.36 ± 0.81 $p = 0.122^*$	-0.05 ± 0.44
0–12	-1.00 ± 0.39 $p < 0.001^*$	-0.50 ± 0.65 $p = 0.003^*$	-0.05 ± 0.32
Nasal itching			
0–4	-0.43 ± 0.58	-0.37 ± 0.70	-0.02 ± 0.86
0–8	-0.56 ± 0.68 $p = 0.025^*$	-0.49 ± 0.92 $p = 0.040^*$	-0.01 ± 0.58
0–12	-0.73 ± 0.81 $p = 0.001^*$	-0.60 ± 0.95 $p = 0.004^*$	0.11 ± 0.47
Sneezing			
0–4	-0.60 ± 0.35 $p = 0.002^*$	-0.49 ± 0.59 $p = 0.008^*$	-0.03 ± 0.69
0–8	-0.52 ± 0.55 $p = 0.041^*$	-0.60 ± 1.05 $p = 0.013^*$	-0.04 ± 0.29
0–12	-0.71 ± 0.53 $p = 0.002^*$	-0.49 ± 0.74 $p = 0.034^*$	-0.12 ± 0.28
Throat itching			
0–4	-0.07 ± 0.15 $p = 0.025^*$	0.02 ± 0.24	0.16 ± 0.48
0–8	-0.05 ± 0.21	0.08 ± 0.39	-0.05 ± 0.12
0–12	-0.10 ± 0.35	0.08 ± 0.40	-0.06 ± 0.25
Conjunctiva itching			
0–4	-0.48 ± 0.54 $p = 0.006^*$	-0.43 ± 0.71 $p = 0.007^*$	0.26 ± 1.10
0–8	-0.78 ± 0.75 $p = 0.001^*$	-0.61 ± 0.94 $p = 0.006^*$	0.04 ± 0.48
0–12	-1.06 ± 0.95 $p < 0.001^*$	-0.82 ± 1.13 $p = 0.003^*$	0.01 ± 0.34
Tearing			
0–4	-0.14 ± 0.28 $p = 0.002^*$	-0.06 ± 0.13 $p = 0.008^*$	0.29 ± 0.68
0–8	-0.22 ± 0.34 $p < 0.001^*$	-0.04 ± 0.20 $p = 0.016^*$	0.08 ± 0.19
0–12	-0.22 ± 0.42 $p = 0.049^*$	0.01 ± 0.33	0.00 ± 0.28
Conjunctiva hyperemia			
0–4	-0.40 ± 0.39 $p = 0.004^*$	-0.21 ± 0.35	0.07 ± 0.70
0–8	-0.56 ± 0.49 $p < 0.001^*$	-0.31 ± 0.53 $p = 0.04^*$	-0.02 ± 0.29
0–12 (p-value with placebo)	-0.79 ± 0.51 $p < 0.001^*$	-0.42 ± 0.53 $p = 0.002^*$	0.02 ± 0.13
Zyrtec vs. xyzal	$p = 0.006^\dagger$		

*Significant change compared with placebo ($p < 0.05$).

$\dagger$ Cetirizine compared with levocetirizine ($p < 0.05$).

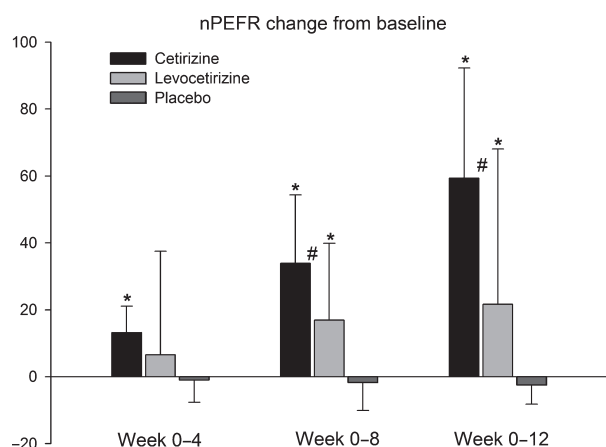


Fig. 2. Change from baseline in nPEFR. Significant change compared with placebo (* $p < 0.05$), cetirizine compared with levocetirizine (# $p < 0.05$). Cetirizine significantly improved nPEFR value compared with the placebo group at weeks 4, 8 and 12 ($p < 0.001$). Levocetirizine significantly improved nPEFR value compared with the placebo group for weeks 8 and 12 ($p < 0.05$). Cetirizine appeared to be more efficacious than levocetirizine at weeks 8 and 12 ($p < 0.05$).

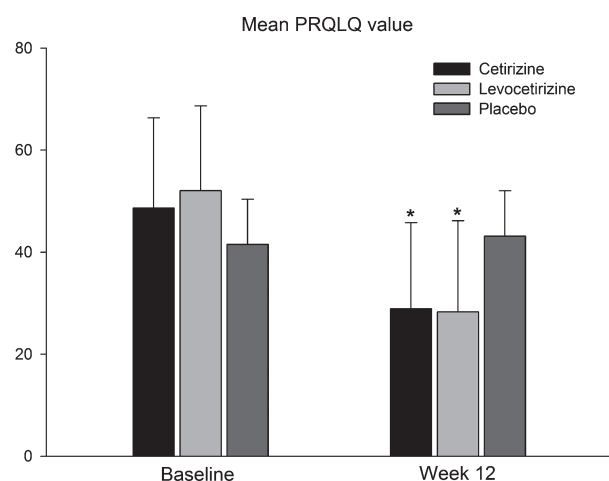


Fig. 3. Mean PRQLQ value in baseline and week 12. Significant change compared with placebo (* $p < 0.05$). Both cetirizine and levocetirizine significantly lowered the mean PRQLQ values compared with the placebo group after the three-month treatment ($p < 0.05$). There was no statistically significant difference in comparing both drugs ($p = 0.095$).

tearing, and eye redness. Comparing both medicines, cetirizine improved most symptoms better than levocetirizine, especially nasal congestion.

Cetirizine significantly improved the nPEFR value compared with the placebo group at weeks 4, 8 and 12 ($p < 0.001$). Levocetirizine significantly improved the nPEFR value compared with the placebo group for weeks 8 and 12 ($p < 0.05$). Comparing the two treatments, cetirizine appeared to be more efficacious than

levocetirizine at weeks 8 and 12 ($p < 0.05$) (Table 2, Fig. 2).

Both cetirizine and levocetirizine significantly lowered the mean PRQLQ values compared with the placebo group after the three-month treatment ($p < 0.05$). There was no statistically significant difference in comparing both drugs ($p = 0.095$) (Table 2, Fig. 3).

In nasal smears, cetirizine proved to significantly reduce the eosinophil proportion of cells post-treatment over the pre-treatment level ($p < 0.001$). This result suggests that recruitment of eosinophils in the nasal mucosa is inhibited after cetirizine treatment (Table 2).

In laboratory tests, cetirizine significantly decreased the total eosinophil count in peripheral blood after the 12-wk period treatment ($p < 0.05$) but levocetirizine did not show the same effect. Levocetirizine significantly reduced ECP after the 12-wk treatment ($p < 0.001$) but cetirizine did not show the same effect. The three groups showed no significant change in IgE levels after treatment.

Mild sedation in one patient treated with cetirizine, mild fatigue in levocetirizine was recorded during treatment. There were no serious adverse events noted.

Discussion

Oral antihistamines are the mainstay treatment for allergies in adults and children. Children, especially those of school age, need less sedative potential to mitigate the negative effects on daytime alertness and learning. First-generation antihistamines are associated with side effects such as sedation, dry mouth, and impaired psychomotor activity. Newer, second-generation antihistamines, such as cetirizine, loratadine, fexofenadine and levocetirizine, act quickly and exhibit fewer sedative and anticholinergic effects (5, 12–14).

We previously compared the efficacy of cetirizine, oxatomide, ketotifen and placebo in children aged 6 to 12 with perennial allergic rhinitis (15). Cetirizine was more efficacious in the control of PAR symptoms. In 2004 and 2006, we published our studies comparing the efficacy and safety of cetirizine and montelukast in children aged 6–12 yr (16) and 2–6 yr (17) with perennial allergic rhinitis. Cetirizine was more efficacious than montelukast in both groups. In the present comparison, cetirizine was superior to levocetirizine.

Most clinical trials have shown that cetirizine and levocetirizine are potent antihistamines that can relieve symptoms of allergic disorder (4–10).

However, clinical trials comparing cetirizine and levocetirizine in children with perennial allergic rhinitis are few.

In 2005, Potter published a 4-wk clinical trial of the efficacy and safety of levocetirizine and health-related quality of life in children aged 6–12 yr with perennial allergic rhinitis (4). In his study, levocetirizine showed a significant improvement in 2- and 4-wk total four symptom scores compared with a placebo. The first 2 wk showed the biggest difference between levocetirizine and placebo. However, in the PRQLQ, there was no significant difference between levocetirizine and placebo in week 4.

In 2005, de Blic et al. published a 6-wk clinical trial of the efficacy and safety of levocetirizine in children aged 6 to 12 yr with seasonal allergic rhinitis (18). The effect of levocetirizine was statistically superior to the placebo and nasal congestion improved, as in our study.

Since cetirizine consists of 5 mg of levocetirizine and 5 mg dextrocetirizine, it would be beneficial to know the relative merits of these two elements. Several clinical trials have revealed that the antihistaminic properties of cetirizine are likely to be attributable to levocetirizine (8–10). If the efficacy of levocetirizine could be as good as cetirizine, the patient could dispense with taking an unnecessary drug. However, our 12-wk treatment program showed that cetirizine was more efficacious than levocetirizine, whether comparing total symptom score, PRQLQ score or nasal peak expiratory flow rate improvement.

Various individual factors would influence the absorption, distribution and metabolism of medicine. Race, genetic factors or age may influence the amount of histamine receptor in a human and receptor maturation and expression may also differ. Different ages may have different pharmacokinetic and pharmacodynamic profiles. In Canada, Simons, on behalf of the ETAC study group, reported an 18-month study of very young children aged 14–46 months (19). In this study, levocetirizine was well absorbed after oral administration, clearance rates were similar to or faster than in adults, and terminal elimination half-life values were similar to or shorter than in adults. These researchers recommended basing levocetirizine dosing in very young children on body weight and age, and suggested that twice daily dosing or relatively higher doses may be necessary. Both their and our studies suggest that population pharmacokinetic studies of levocetirizine are needed in children to determine optimal dosing. A 2005 Australian study by Cranswick examined the pharmacokinetics of levocetirizine

(20). This study revealed that twice daily dosing using 0.125 mg/kg levocetirizine was adequate pharmacokinetically and pharmacodynamically, and produced a good safety profile in 1- to 2-yr-old children. From these reports we wonder if twice daily use of levocetirizine may have a better effect on perennial allergic rhinitis in children 6 to 12. We will need larger and long-term studies to make this judgment.

Simons, on behalf of the ETAC (Early Treatment of the Atopic Child) study group, recently reported the pharmacokinetics and pharmacodynamics of levocetirizine in children ages 6 to 11 yr (21). He demonstrated that levocetirizine was highly selective for human histamine H₁-receptor and has twice the binding affinity of cetirizine. The study concluded that once-daily dosing may be optimal in children of this age group. However, the study used histamine-induced wheal-and-flare bioassay to evaluate the onset, amount, and duration of activity of H₁-antihistamine. As the author mentioned, whether skin test suppression correlates with events in the airways remains controversial.

Cotton swabs were commonly used to collect nasal smear specimens. It is simple and inexpensive, but false-positive and false-negative results are common. It may have been better and yielded more accurate results, if nasal smears had been taken with a rhinoprobe than with a cotton tip.

No serious adverse events were recorded for either cetirizine or levocetirizine. The principle pharmacological effects of cetirizine (Zyrtec) are mediated through selective inhibition of peripheral histamine H₁-receptors. The use of cetirizine is associated with a low incidence of anticholinergic effects such as dry mouth. It causes little sedation and has no cardiac adverse effects, unlike highly lipophilic antihistamine (22–25).

In conclusion, our 12-wk treatment program showed that cetirizine was more efficacious than levocetirizine. Twice daily for oral intake of levocetirizine may be an alternative way to well control the symptoms of perennial allergic rhinitis in age 6- to 12-yr-old children. There was no serious adverse event recorded for either cetirizine or levocetirizine. We may need larger, longer and extended studies to assess the conclusion.

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