Cellular and Molecular Biology
E-ISSN : 1165-158X / P-ISSN : 0145-5680
www.cellmolbiol.org

Original Research

Effects of oral desloratadine citrate disodium combined with physiological seawater nasal irrigation on IgE levels, IL-4, IL-6, IL-13 and IFN-γ expression and treatment of intermittent allergic rhinitis

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Received March 2, 2020; **Accepted** May 23, 2020; **Published** July 31, 2020

Doi: http://dx.doi.org/10.14715/cmb/2020.66.5.11

Abstract: This experiment was performed to explore the effect of oral desloratadine citrate disodium combined with physiological seawater nasal irrigation in the treatment of intermittent allergic rhinitis and its effect on serum inflammatory factors and peripheral blood Th1 and Th2. For this purpose, 100 patients of intermittent allergic rhinitis admitted to our hospital from January 2018 to January 2020. Randomly divided into a control group (n=50) and an observation group (n=50). The control group was given oral desloratadine citrate disodium. The observation group was given physiological seawater nasal irrigation based on the control group. Both groups were treated for one month. Compare the effect of treatment, symptom and sign scores pre and posttreatment, serum immunoglobulin E (IgE) levels, serum interleukin 4 (IL-4), IL-6, IL-13 and interferon-gamma (IFN-γ) levels, peripheral blood helper T cells 1 (Th1) and Th2 and the recurrence rate of patients after 1 year between two groups. Results showed that after one month of continuous treatment, the total effective rate of the observation group was significantly higher than that of the control group (P <0.05). The symptoms and signs scores and serum IgE levels of the two groups pretreatment (before treatment) were not significantly different (P > 0.05). The symptoms and signs scores and serum IgE levels of the two groups decreased significantly posttreatment (after treatment) (P <0.05), and the observation group was significantly lower than the control group (P <0.05). Pretreatment, the levels of serum inflammatory factors (IL-4, IL-6, IL-13, and IFN-γ) and the ratio of peripheral blood Th1 and Th2 to $CD4^+$T cells were not significantly different (P> 0.05). After one month of continuous treatment, the levels of serum IL-4, IL-6, IL-13, and the ratio of peripheral blood $CD4^+IL\text{-}4^+/CD4^+$ in the observation group and the control group were significantly reduced and the ratio of $CD4^+IFN\text{-}\gamma^+/CD4^+$ was significantly increased (P <0.05). Compared with the control group, those changes were more obvious in the observation group (P <0.05). The one-year recurrence rate of the observation group was 4% (2/50), which was significantly lower than that of the control group, which was 20% (10/50). There was a statistical difference between the two groups (P <0.05). It was concluded that oral desloratadine citrate disodium combined with physiological seawater nasal irrigation can effectively improve the symptoms and signs of intermittent allergic rhinitis and reduce the recurrence rate. This may be related to balancing T cell responses, promoting systemic Th1 responses and inhibiting Th2 responses, and down-regulating inflammatory response.

Key words: Desloratadine citrate disodium; Intermittent allergic rhinitis; Physiological sea; Nasal irrigation.

Introduction

Allergic rhinitis is an inflammation of the nasal mucosa caused by an allergic reaction. When a person with a sensitive immune system breathes allergens such as pills, pesticides, pollen, or dust, the allergic reaction begins. This reaction occurs in the nose as a runny nose. Allergic rhinitis is a common chronic immunoglobulin E (IgE) - mediated respiratory disease. The main symptoms include rhinorrhea, sneezing, nasal obstruction, and pruritus (1). About 20% to 30% of adults and up to 40% of children have allergic rhinitis (2-3). Among them, more than 70% of allergic rhinitis belong to intermittent allergic rhinitis (4). Research shows that in 100 patients with moderate and severe allergic rhinitis, about 66% of adults and 43% of children have sleep disorders, which seriously affect the quality of life of patients (5-6). Early treatment is an effective way to prevent the development of the disease. The increased histamine release induced immune inflammatory response is an important pathogenesis of allergic rhinitis (7-8). Histamine H1 receptor antagonists can reduce the inflammatory response of allergic rhinitis, which is a commonly used therapeutic drug (9-10). Although single medication has a certain curative effect, there is still great room for improvement in the treatment of allergic rhinitis. In recent years, physiological seawater nasal irrigation has been widely used in clinical practice and is a non-pharmaceutical method for the treatment of allergic rhinitis (4). This study mainly explores the clinical efficacy of desloratadine citrate combined with physiological seawater nasal irrigation in the treatment of intermittent allergic rhinitis, providing a theoretical basis for the treatment and clinical test of intermittent allergic rhinitis.

Materials and Methods

Information

From January 2018 to January 2020, 100 patients with intermittent allergic rhinitis admitted to our hospital were randomly divided into the control and observa-

tion group, with 50 cases in each group.

Inclusion criteria

① age ≥ 18 years; ② following the guidelines for the diagnosis and treatment of allergic rhinitis (11); ③allergen-specific IgE positive; ④obtain informed consent.

Exclusion criteria

① use of antiallergic drugs, hormones or immunosuppressants in the first week before inclusion in the study; ② Medloratadine allergy; ③ nasal polyps or severe nasal deformities; ④ severe organic dysfunction of heart, lung, liver, kidney, etc.; ⑤ malignant tumor and blood disease; ⑥ communication disorder and mental illness.

Treatment plan

The control group was taken orally medeciloratadine tablets (Yangzijiang Pharmaceutical Group Guangzhou Ruihai Pharmaceutical Co., Ltd., national pharmaceutical standard No. h20090138) 8.8mg each time once a day for one month. Observation group: based on the control group given physiological seawater washing nasal cavity in the morning and evening. Specific methods: patient to sitting, insert the tip of the nasal cavity irrigator slowly side nasal vestibular, instruct patients head back later, slow injection side nasal cavity, liquid flow through the mouth and the other side of the nasal cavity, the same method to flush the other side of the nasal cavity. The patient took the sitting position, nursing staff slowly inserted the nozzle of the nasal irrigator into the vestibule of one side of the nose, instructed the patient to tilt his head back later, slowly injected into the nasal cavity on one side. The liquid flowed out through the mouth and the other side of the nasal cavity, and the other side of the nasal cavity is flushed in the same way.

Observation indicators

① Comparison of the treatment effect of the two groups: according to the diagnosis and treatment guidelines of allergic rhinitis, determine the treatment effect. Significant effect: the nasal symptoms significantly improve or disappear, the improvement rate of symptom and sign score is more than 80%; Effective: the nasal symptoms have improved, the improvement rate of symptom and sign score is 50% - 80%; Ineffective: the nasal symptoms have not improved or worsened, the improvement rate of symptom and sign score is less than 40%. Total effective rate = (number of effective cases + number of effective cases) / total cases × 100%. ② Comparison the scores of symptoms and signs of the two groups pre and posttreatment; ③ Comparison the levels of serum IgE of the two groups pre and posttreatment; ④ Comparison the levels of serum inflammatory factors IL-4, IL-6, IL-13, and IFN - γ pre and posttreatment; ⑤ Comparison the levels of peripheral blood helper T cell 1 (Th1) of the two groups. ⑥The recurrence rate of the two groups was 1 year after follow-up.

Statistical analysis

SPSS 19.0 was used for data analysis, mean ± SD was used for measurement, and an independent sample t-test was used. The counting data were expressed by frequency (n) and percentage (%), and the χ^2 test was used. $P < 0.05$, there was statistical difference.

Results

Comparison of general conditions between the two groups

As shown in Table 1, there was no significant difference in age, gender, body mass index (BMI), and course of disease between the control group and the observation group ($P > 0.05$), which was comparable.

Comparison of therapeutic effect between the two groups

As shown in Table 2, after one month of continuous treatment, the total effective rates of the control group and the observation group were 82% and 96%, respectively, with the statistical difference ($P < 0.05$).

Comparison of the scores of symptoms and signs between the two groups pre and posttreatment

As shown in Table 3, pretreatment, there was no statistical difference in the scores of symptoms and signs between the control group and the observation group ($P > 0.05$). After one month of continuous treatment, the scores of symptoms and signs in the observation group and the control group were significantly reduced ($P < 0.05$), and the scores in the observation group were significantly lower than those in the control group ($P < 0.05$).

Table 1. Comparison of general data between two group.

Variables	Control	Observation
Age(year)	34.29±4.27	37.24±4.65
Male (case)	22 (44%)	21 (42%)
Female(case)	28 (56%)	29 (58%)
BMI (kg/m²)	29.05±3.59	28.92±3.78
duration of disease	4.82±0.11	4.44±0.35

Table 2. Comparison of clinical treatment effect between two group.

Groups	Markedly effective	Effective	Ineffective	Total effective rate(%)
Control	12 (24)	29 (58)	9 (18)	41 (82)
observation	20 (40)	28 (56)	2 (4)	48 (96)#

Compared with the control group, #$P<0.05$

Table 3. Comparison of symptom and sign scores pre and posttreatment between two group.

Groups	Pretreatment	Posttreatment
control	11.29±2.27	5.94±1.65*
observation	11.82±2.11	2.44±0.85*#

Compared with pretreatment, *P<0.05; Compared with control group, #P<0.05

Comparison of serum IgE levels between the two groups pre and posttreatment

There was no significant difference in serum IgE between the two groups pretreatment ($P > 0.05$). After one month of continuous treatment, the serum IgE level of the two groups was significantly lower ($P < 0.05$), and the observation group was significantly lower than the control group ($P < 0.05$). As shown in Figure 1.

Comparison of the levels of IL-4, IL-6, IL-13 and IFN - γ and the ratio of Th1 and Th2 in the blood of the two groups pre and posttreatment

There was no significant difference in the levels of IL-4, IL-6, IL-13 and IFN - γ between the two groups pretreatment ($P > 0.05$). After one month of continuous treatment, the serum levels of IL-4, IL-6 and IL-13 in the two groups were significantly reduced, and the levels of IFN - γ were significantly increased, among which the serum levels of IL-4, IL-6 and IFN - γ were significantly different ($P < 0.05$). Compared with the control group, the levels of IL-4, IL-6 and IL-13 in the observation group decreased more significantly ($P < 0.05$), and the levels of IFN - γ in the observation group increased more significantly ($P < 0.05$). As shown in Figure 2.

Further, we detected the changes of Th1 ($CD4^+$ IFN-γ^+) and Th2 ($CD4^+$ IL-4^+) ratio in peripheral blood, as shown in Table 4. Pretreatment, there was no statistical difference in the ratio of Th1 and Th2 to $CD4^+$ T cells, respectively ($P > 0.05$). After one month of treatment, the ratio of $CD4^+$ IFN - γ^+ / $CD4^+$ in the control group and the observation group increased significantly ($P < 0.05$), and the ratio of $CD4^+$ IL-4^+ / $CD4^+$ decreased significantly ($P < 0.05$). Compared with the control group, the ratio of $CD4^+$ IFN - γ^+ / $CD4^+$ in the observation group increased more significantly ($P < 0.05$), and the ratio of $CD4^+$ IL-4^+ / $CD4^+$ decreased more significantly ($P < 0.05$).

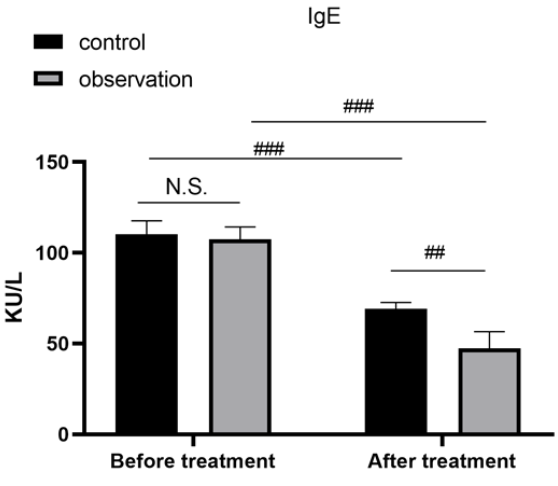

Figure 1. Comparison of serum IgE levels before and after treatment between two groups.

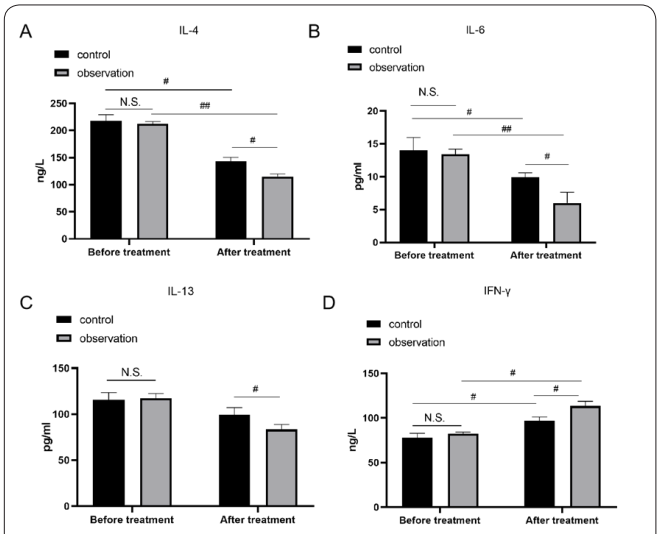

Figure 2. Comparison of serum IL-4, IL-6, IL-13 and IFN-γlevels before and after treatment between two groups.

Comparison of recurrence between the two groups

After one-year follow-up, the recurrence rate of the control group was 20% (10 / 50), and that of the observation group was 4% (2 / 50). There was a statistical difference between the two groups ($P < 0.05$), as shown in Figure 3.

Discussion

Intermittent allergic rhinitis has been known as the most common type of allergic rhinitis. It is a chronic inflammatory disease of the upper respiratory tract. It is involved by a variety of immune cells and cytokines (12). At present, it is mainly drug therapy, including H1 antihistamines, intranasal glucocorticoids, and leukotriene receptor antagonists. Because histamine plays a major role in the allergic reaction of the nose, blocking histamine is the main strategy for the treatment of intermittent allergic rhinitis (13). Medloratadine is a new long-acting histamine H1 receptor antagonist, which can more effectively and highly selectively antagonize peripheral histamine H1 receptor, reduce sneezing, rhinopruritus and rhinorrhea related to allergic rhinitis with higher potential (14-15), and will not cause central nervous system sedation, which applies to patients of any age (14). Physiological seawater nasal irrigation is a cheap non-drug treatment method with few side effects, and long-term use alone has no significant effect on allergic rhinitis (4). In this study, it was found that compared with the control group, desloratadine combined with physiological seawater nasal irrigation had significant efficacy, and the patients' symptom and sign scores and recurrence rate were lower. The results showed that desloratadine citrate combined with physiological seawater nasal irrigation was more effective in the treatment of intermittent allergic rhinitis.

In patients with allergic rhinitis, serum IgE mediates the release of histamine and leukotriene and other inflammatory mediums after exposure to allergens. The elevation of serum IgE is an important indicator for the

Table 4. Comparison of Th1 and Th2 in blood pre and posttreatment between two groups.

Group	$CD4^+IFN\text{-}\gamma^+/CD4^+$		$CD4^+IL\text{-}4^+/CD4^+$	
	Pretreatment	Posttreatment	Pretreatment	Posttreatment
Control	2.22±0.90	6.79±1.09*	12.30±2.79	8.03±2.26*
Observation	2.07±0.85	8.02±1.60*#	11.80±3.12	4.44±1.02*#

Compared with pretreatment, *P<0.05; Compared with control group, #P<0.05

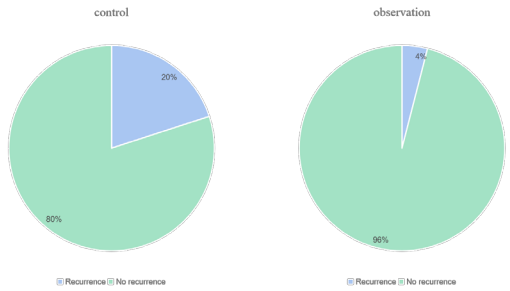

Figure 3. Comparison of recurrence rate between the two groups posttreatment one year.

diagnosis of allergic rhinitis and is positively correlated with the severity of the disease (16).In this study, it was found that after continuous treatment for one month, serum IgE levels in both the observation group and the control group were significantly reduced, and the observation group was significantly lower than the control group, indicating that desloratadine citrate combined with physiological seawater nasal irrigation could improve the severity of intermittent allergic rhinitis.

Studies have shown that the infiltration of inflammatory cells in the course of allergic rhinitis can release a large number of inflammatory factors and enzymes, which can lead to continuous inflammation and even tissue damage (10). The helper T cell (Th) subgroup plays a key role in the occurrence and development of allergic diseases, among which the imbalance between Th1 and Th2 cells is the main cause of the inflammatory response in allergic rhinitis (17-19). Studies have shown that compared with normal individuals, Th1 cells are significantly reduced and Th2 cells are significantly increased in patients with allergic rhinitis (20-21). Th1 cells can interact with exogenous pathogens to secrete IL-2 and IFN-γ (22). T-bet is a transcription factor of Th1 cells. Studies have demonstrated that t-bet deficient mice can spontaneously develop airway inflammation, mainly presenting with eosinophilic infiltration and airway hyperreactivity (23). Th2 cells not only produce immunoglobulin by regulating B cells but also secrete cytokines such as IL-4, IL-5, IL-10, and IL-13 (24-26). Among them, IL-4 and IL-13 can promote IgG conversion to IgE (22). In this study, compared with the control group, Th1 was significantly increased and Th2 was significantly decreased in the observation group. Inflammatory factor analysis showed significantly lower serum levels of IL-4, IL-6, and IL-13, and significantly higher serum levels of IFN- compared to the control group. The changes of TH1-related cytokines IFN- γ and TH2-related cytokines IL-4 and IL-13 were consistent with the changes of Th1 and Th2. It is suggested that desloratadine citrate combined with physiological seawater nasal irrigation may reduce the symptoms of allergic rhinitis by balancing T cell response, which may be related to promoting systemic Th1 response and inhibiting Th2 response. Il-6 is an inflammatory medium secreted by T cells and B cells, which can interact with TNF-α to form a cytokine network, inhibit the immune function of the body, and promote the inflammatory response (27-30). Studies have shown that histamine can increase the secretion of IL-6 by cultured human monocytes, while histamine H1 receptor antagonists can reduce the level of IL-6 (31). This was consistent with changes in serum il-6 levels in this study. The rate of expression of these inflammatory factors can also be assessed through gene editing technology (32).

In conclusion, desloratadine citrate combined with physiological seawater nasal irrigation can effectively improve the signs of intermittent allergic rhinitis, which may be related to balancing T cell response, promoting systemic Th1 response and inhibiting Th2 response, thereby downregulating body inflammation.

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