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Original Article

The impact of asthma-exclusive nursing scheme on the treatment effect of asthma patients

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Abstract: Objective: To investigate the impact of the asthma-exclusive nursing scheme on the treatment effect of asthma patients. Methods: A total of 120 asthma patients treated in our hospital from January 2019 to June 2019 were included for the research, with 60 patients in Group A from January 2019 to March 2019, and 60 patients in Group B from April 2019 to June 2019. Montelukast combined with formoterol lyophilized powder was employed as the treatment for all patients. An asthma-exclusive nursing scheme was given to Group A, and conventional nursing was applied to Group B. The analysis and comparison of symptom relief time (SRT), pulmonary function indicators (PFI), 6-minute walking distance (6MWD), adverse drug reactions (ADRs), levels of inflammatory factors (LIF), and overall efficacy between the two groups were conducted. Results: After the treatment, Group A yielded a more promising outcome of SRT than Group B ($P<0.001$). Moreover, a notable increase of PFI and LIF of both groups of patients was observed, in which Group A garnered more promising results than Group B ($P<0.001$), and similar results were also demonstrated with regard to 6MWD ($P<0.001$). Neither abnormal metabolism in patients nor significant difference of ADRs between the two groups was detected ($P>0.05$). The overall efficacy and compliance rate of Group A were higher than those of Group B, and the 6-month recurrence rate was lower than that of Group B ($P<0.05$). Conclusion: With the aid of an asthma-exclusive nursing scheme, montelukast combined with formoterol can safely and substantially optimize the PFI and LIF of asthma patients and enhance their exercise capacity, which is of application value in clinical practice.

Keywords: Montelukast, formoterol, asthma

Introduction

Asthma is a chronic airway inflammation, for which no radical cure can be provided in clinical practice at present. To date, drugs such as β2 receptor agonists are frequently used for the control and remission of the disease. Formoterol, one of the commonly used β2 receptor agonists, is able to allay the smooth muscle spasm in patients, and leukotriene receptor antagonists represented by montelukast can abate airway inflammation. The above-mentioned drug effects can be jointly achieved by the oral administration of the two drugs [1-3]. Furthermore, since medication compliance of asthma patients would invariably taper off in the course of long-term administration, it is paramount to provide patients with scientific and efficient nursing methods. In light of the fact that both therapeutic effect and medication compliance can be strengthened through asthma-exclusive nursing, drug therapy combined with personalized nursing has been a clinical focus in recent years. The development of personalized nursing can substantially enhance the compliance of patients and their families, improve the knowledge system of nurses, and realize the uniform distribution of medical resources. Thus, we assessed the efficacy of the combination of montelukast and formoterol in the treatment of asthma and the feasibility of the nursing schemes. The innovation of this research is that the combination of the two drugs achieved the dual effects of anti-inflammatory and anti-asthmatic. At the same time, with exclusive nursing, scientific and tar-

Table 1. Comparison of general information

Groups	Group A (n=60)	Group B (n=60)	t/χ^2	P
Sex			0.034	0.855
Male	32	33		
Female	28	27		
Age (year)				
Range	34-70	34-70		
Mean age	55.1±7.8	55.3±6.9	0.149	0.882
Course of disease (year)				
Range	1-18	1-18		
Mean course of disease	6.5±2.1	6.6±2.3	0.249	0.804
Severity of illness			0.034	0.853
Mild	35	34		
Moderate	25	26		

geted personalized nursing substantially reduced adverse reactions in the treatment process and improved the overall curative effect.

Materials and methods

General information

A total of 120 asthma patients treated in our hospital from January 2019 to June 2019 were included in the research, with 60 patients in Group A from January 2019 to March 2019, and 60 patients in Group B from April 2019 to June 2019. No apparent difference was detected regarding general information between the two groups (P>0.05, **Table 1**). Patients or their family members were fully informed of the research process and signed a consent form. This study was approved by the hospital ethics committee (NCT01121017).

Inclusion criteria

The inclusion criteria: The patients met the diagnostic criteria in the "Guidelines for Prevention and Treatment of Bronchial Asthma" [8-11]; Recurrent wheezing, shortness of breath, chest tightness or coughing, especially at night and in the morning; Exhalation dyspnea, complicated with symptoms such as nasal itching, sneezing, itchy eyes, and dry cough in some cases.

Exclusion criteria

The exclusion criteria for patients in this study were as follows: (1) The patients had mental problems or failed to conduct a successful communication; (2) The patients had other organic diseases; (3) The patients were allergic to the drugs under study; (4) The patients had received similar treatment before the study; (5) The patients were pregnant or in lactation period; (6) The patients had other respiratory diseases.

Methods

Apart from oxygen inhalation and cough relief treatment, all patients were also given montelukast and formoterol for oral administration. The specific steps were as follows: (1) Patients took montelukast (Hangzhou MSD Pharmaceutical Co., Ltd., NMPA Approval Number J2013004) once a day, 10 mg before sleep; (2) The patients inhaled formoterol lyophilized powder (Chiatai Tianqing Pharmaceutical Group Co., Ltd., NMPA Approval Number H20103179) twice a day, a dose of 5.0 μg each time.

Group B was given routine nursing care: The patients were given hospital admission guidance, health education, and medication guidance.

Group A was given an asthma-exclusive nursing scheme. The specific steps were as follows: (1) The nursing staff must master the knowledge of asthma, well understand the features of asthma patients and the mechanism and side effects of montelukast and formoterol. Only staff who passed the test of the above knowledge could be included in the nursing project [12-15]. (2) The staff had to go through the patients' information carefully to understand the patients' condition before the treatment for drawing up a personalized nursing scheme. Moreover, the nursing staff should also explain related knowledge of montelukast and formoterol to patients, inform them of the positive effects of the drugs and possible adverse reactions, to help them realize the capability of long-term medication in restraining disease deterioration and cultivate a positive attitude towards long-term medication. (3) The staff provided the patients with oxygen inhalation instruction and briefed them necessary information before performing various examinations, so as to alleviate the patients' doubts

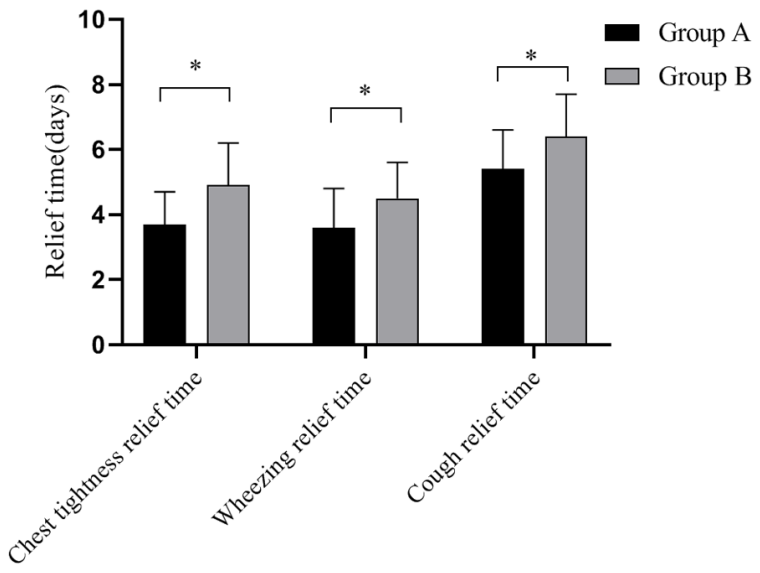

Figure 1. Comparison of SRT between the two groups ($\bar{x}$±sd, d). Note: symptom relief time, SRT. From left to right, the horizontal axis in **Figure 1** is the chest tightness relief time, the wheezing relief time, and the cough relief time, and the vertical axis is the relief time (days); the black area refers to group A, and the gray area refers to group B. The chest tightness relief time in group A was 3.7±1.0 days, and in group B was 4.9±1.3 days. The wheezing relief time was 3.6±1.2 days in group A, and 4.5±1.1 days in group B. The cough relief time was 5.4±1.2 days in group A, and 6.4±1.3 days in group B. * refers to P<0.001.

and diminish their disinclination to seeking medical treatment. (4) The nursing staff provided oral administration care under the doctor's advice, instructed the patients about powder inhalation and breathing for expectoration, and demoed the whole process in front of the patients' families to ensure a better following home nursing. (5) When the patients were discharged from the hospital, an asthma prevention and treatment manual was distributed to remind them to stick to the medication and to seek help from doctors immediately if they feel unwell.

Observation criteria

(1) SRT (symptom relief time): Comparison of the chest tightness relief time, wheezing relief time, and cough relief time between the two groups. (2) PFI (pulmonary function indicators): Comparison of the peak expiratory flow rate (PEFR), forced expiratory volume in one second (FEV1), and the forced vital capacity (FVC) of the two groups before and after treatment. (3) 6MWD (6-minute walking distance): Comparison of the six-minute walking distance of the two groups before and after treatment. (4) ADRs (adverse drug reactions): Collection of the cases of dizziness, nausea, arrhythmia, hoarseness, and abnormal metabolism in the two groups. (5) LIF (levels of inflammatory factors): Comparison of the levels of interleukin-6 (IL-6), C-reactive protein (CRP), and tumor necrosis factor-α (TNF-α) in the two groups. (6) Overall efficacy: Excellent: the patient's clinical symptoms and signs disappeared, and the PFI was significantly improved; Good: The patient's clinical symptoms and signs were improved but did not disappear; Poor: The above criteria were not met. (7) Recurrence rate and treatment compliance. All patients had been followed up for 6 months. The recurrence rate of 1-month, 3-month, and 6-month was collected. The treatment compliance was evaluated at 6-month after treatment and divided into high, ordinary, and poor. High compliance indicated that patients were adhered to medication and never interrupted; ordinary indicated that patients took medication intermittently; poor indicated that patients stopped the medicine. The compliance rate = (high + ordinary)/all cases × 100%.

Statistical processing

Data management and analysis were performed by using SPSS20.0, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was employed to plot the graphics. χ^2 test and t-test were performed for analyzing the count data and measurement data collected in this study. A difference was considered significant when a *P* value was less than 0.05.

Results

Comparison of SRT between the two groups

After the treatment, Group A yielded a more promising outcome of SRT than Group B (P< 0.001). See **Figure 1**.

Table 2. Comparison of pulmonary function indicators between the two groups ($\bar{x}$±sd)

Groups	Group A		Group B		t	P
PEFR (L/s)	Before treatment	4.2±0.5	Before treatment	4.2±0.6	0.000	1.000
	After treatment	6.4±0.6	After treatment	5.6±0.5	7.934	0.000
	t	21.819	t	13.885		
	P	0.000	P	0.000		
FVC (L)	Before treatment	2.2±0.3	Before treatment	2.1±0.3	1.826	0.070
	After treatment	3.2±0.3	After treatment	2.7±0.2	10.742	0.000
	t	18.257	t	12.890		
	P	0.000	P	0.000		
FEV_1 (L)	Before treatment	1.7±0.2	Before treatment	1.7±0.3	0.000	1.000
	After treatment	2.9±0.3	After treatment	2.3±0.1	14.697	0.000
	t	25.780	t	14.697		
	P	0.000	P	0.000		

Note: peak expiratory flow rate, PEFR; forced vital capacity, FVC; forced expiratory volume in one second, FEV1.

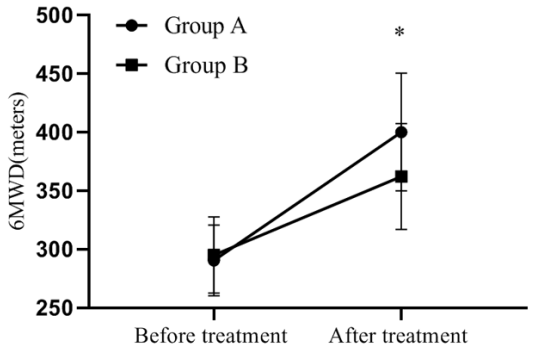

Figure 2. Comparison of 6MWD between the two groups ($\bar{x}$±sd, m). Note: 6-minute walking distance, 6MWD. In **Figure 2**, the horizontal axis from left to right is before and after treatment, and the vertical axis is 6-minute walking distance (meters); the dotted line is group A, and the square line is group B. The 6MWD of patients in group A before treatment was 290.5±30.2 m, and group B was 295.1±32.5 m; The 6MWD of patients in group A was 400.2±50.3 m after treatment, and that of group B was 362.1±45.2 m. *refers to P<0.001.

Comparison of PFI between the two groups

There was a sharp rise of PFI in both groups after interventaion as shown in **Table 2**, in which Group A garnered more promising results than Group B (P<0.001).

Comparison of 6MWD between the two groups

As shown in **Figure 2**, patients in Group A succeeded in walking a longer distance in six minutes than patients in Group B (P<0.001).

Comparison of ADRs between the two groups

Neither abnormal metabolism in patients nor significant difference of ADRs between the two groups was detected, as shown in **Figure 3** (P>0.05).

Comparison of LIF between the two groups

Table 3 presents a notable rise in the LIF in both groups after the treatment; furthermore, Group A yielded superior results than Group B with regard to all three dimensions of LIF (P<0.001).

Comparison of overall efficacy between the two groups

The overall efficacy of Group A was much better as compared to that of Group B (P<0.05). See **Table 4**.

Comparison of the recurrence rate between the two groups

At 6-month after treatment, the recurrence rate of Group A was lower thanthat of Group B (8.33% vs. 31.67%, P<0.05); while the recurrence rates in 1-month and 3-month after treatment were comparable between the two groups (P=0.154, 0.186). See **Table 5**.

Comparison of the compliance rate between the two groups

The compliance rate of Group A was superior to that of Group B (P<0.05). See **Table 6**.

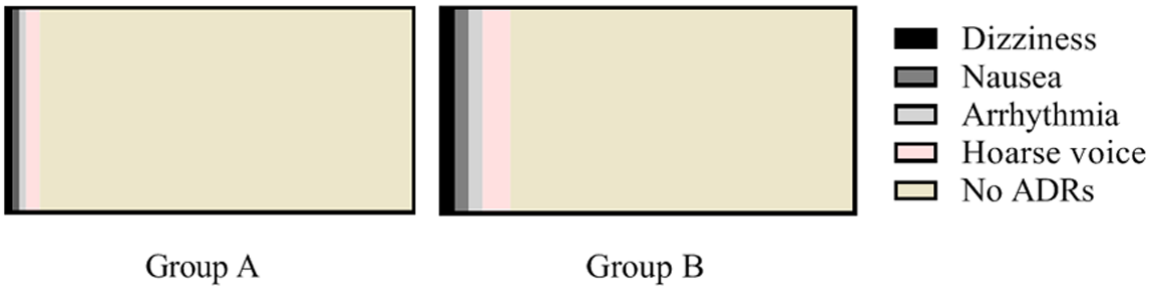

Figure 3. Comparison of ADRs between the two groups. Note: adverse drug reactions, ADRs. In **Figure 3**, the black area is dizziness, the dark gray area is nausea, the light gray area is arrhythmia, the pink area is hoarseness, and the yellow area is no ADRs. There was 1 case of dizziness in group A and 2 cases in group B. There was 1 case of nausea in group A and 2 cases in group B. There was 1 case of arrhythmia in group A and 2 cases in group B. There were 2 cases of hoarseness in group A and 4 cases in group B. There were 55 cases in group A without ADRs and 50 cases in group B.

Table 3. Comparison of levels of inflammatory factors between the two groups ($\bar{x}$±sd)

Categories	Group A		Group B		t	P
CRP (ng/L)	Before treatment	410.5±50.2	Before treatment	412.3±52.2	0.193	0.848
	After treatment	160.2±20.5	After treatment	189.5±20.6	7.809	0.000
	t	35.755	t	30.753		
	P	0.000	P	0.000		
IL-6 (ng/L)	Before treatment	14.2±2.6	Before treatment	14.3±2.5	0.215	0.830
	After treatment	4.5±1.0	After treatment	6.2±1.2	8.430	0.000
	t	26.972	t	22.625		
	P	0.000	P	0.000		
TNF-α (μg/L)	Before treatment	185.2±20.5	Before treatment	186.5±21.3	0.341	0.734
	After treatment	130.2±15.3	After treatment	142.2±15.3	4.296	0.000
	t	16.655	t	13.084		
	P	0.000	P	0.000		

Note: C-reactive protein, CRP; interleukin-6, IL-6; tumor necrosis factor-α, TNF-α.

Table 4. Comparison of overall efficacy between the two groups

Groups	Excellent	Good	Poor	Good and beyond
Group A (n=60)	28 (46.7)	30 (50.0)	2 (3.3)	58 (96.7)
Group B (n=60)	18 (30.0)	34 (56.7)	8 (13.3)	52 (86.7)
χ^2	3.525	0.536	3.927	3.927
P	0.060	0.464	0.048	0.048

Table 5. Comparison of the recurrence rate of the two groups

Groups	1-month	3-month	6-month
Group A (n=60)	0	3 (5.00)	5 (8.33)
Group B (n=60)	2 (3.33)	7 (11.67)	19 (31.67)
χ^2	2.034	1.742	10.21
P	0.154	0.186	0.001

Discussion

In recent years, a trend of the steadily increasing incidence of asthma over the world has been witnessed. The number of patients who die from asthma each year is as high as hundreds of thousands, most of which are attributed to the lack of long-term medication. At present, long-term medication is needed as no radical cure can be found in clinical practice. However, patients' medication compliance invariably declines after being discharged from the hospital, which undermines the drug effects and the recovery of the disease, or even results in disease aggravation [16-19]. Asthma-exclusive care provides nursing staff with a platform to help the patients realize the signi-

Table 6. Comparison of the treatment compliance of the two groups

	high	ordinary	poor	compliance rate
Group A (n=60)	30 (50.00)	24 (40.00)	6 (10.00)	54 (90.00)
Group B (n=60)	10 (16.67)	27 (45.00)	23 (38.88)	37 (61.67)
χ^2	2.034	1.742		13.14
P	0.154	0.186		0.001

ficance of long-term medication through health education and to instruct them with the correct method of breathing, which is an excellent opportunity to help the patients equip themselves with asthma-related knowledge, to eventually ameliorate the patients' medication adherence and quality of life [20-23].

In this work, a stark increase of PFI and LIF of both groups was observed, in which Group A garnered more promising results than Group B. It emphasized that montelukast drives down the biological effects of leukotrienes and abates the patients' airway inflammation, while formoterol allays the patients' airway spasm and maintains a stable calcium level in the patients. The combination of these two drugs garners rosy vital signs of the patients [24, 25]. On this basis, Group A with an exclusive nursing scheme obtained an evidently shorter SRT than Group B (P<0.001). Similar results have also been obtained in the study conducted by other scholars who treated 260 asthma patients with montelukast combined with formoterol, offered asthma-exclusive care to half of the experimental group patients, and concluded that the PEFR of the experimental group after treatment are significantly higher than those of the control group (P<0.001) [25], indicating that asthma-exclusive care is able to enhance the drug effects.

In addition, patients in Group A succeeded in walking a longer distance than Group B in six minutes (P<0.001). The reason was that the improvement of lung function increased the patients' hypoxia tolerance, which reinstated the patients' partial exercise ability and also self-care ability consequently. Neither abnormal metabolism in patients nor significant difference of ADRs between the two groups was detected (P>0.05), indicating that montelukast combined with formoterol is comparatively safe with less possibility of adverse reactions. The overall efficacy and compliance rate of Group A were higher than those of Group B, and the 6-month recurrence rate was lower than that of Group B (P<0.05). In general, the efficacy of Group A was considered superior to that of Group B. The study of LU et al. [26] demonstrated that montelukast sodium also brings down the promotion of heparin-like growth factors on eosinophils and basophils, thereby mitigating airway inflammation. Compared with budesonide's effect residing in the initial stage of the entire inflammatory response, montelukast sodium mainly exerts its effect at the late-onset stage. Therefore, it can be noted that montelukast may be the only long-term control drug that can be used alone.

In conclusion, with the aid of an asthma-exclusive nursing scheme, montelukast combined with formoterol can safely and substantially optimize the PFI and LIF of asthma patients and enhance their exercise capacity, which is of high application value in clinical practice.

Disclosure of conflict of interest

None.

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