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Original Research Article

Effect of the combination of respiratory care with bronchodilators on pulmonary function, psychological well-being, and health behaviors in COPD patients

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Abstract

Purpose: *To investigate the effect of combining respiratory care with bronchodilators on pulmonary function, psychological well-being, and health behavior in patients with Chronic Obstructive Pulmonary Disease (COPD).*
Method: *A retrospective analysis was conducted with 90 COPD patients treated in the First People's Hospital of Fuyang, Hangzhou, China between January 2021 and January 2023. Patients were divided into budegopher group (26 patients), symbicor group (28 patients), and combination group (36 patients treated with budegopher plus respiratory care). Lung function, psychological state (Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS), Health Behavior Scale (HPL), and any observed adverse reactions among these groups were recorded.*
Results: *Significant differences were observed in lung function such as forced expiratory volume in 1 sec (FEV1) and forced vital capacity (FVC) among the three groups after treatment. Symbicor group showed superior results compared to budegopher group while combination group showed better improvement than budegopher group, and symbicor group ($p < 0.001$). Pairwise comparisons of psychological state (SAS and SDS) and health behavior (HPL) revealed variations among groups. Lung function parameters (FEV1, FVC) had negative correlations with negative psychological attitudes (SAS, SDS) and moderate positive correlations with health-promoting behaviors (HPL). Negative psychological attitudes (SAS, SDS) were moderately and negatively correlated with health-promoting behaviors (HPL).*
Conclusion: *Combining respiratory care with bronchodilators demonstrates notable potential to enhance pulmonary function, alleviate negative psychological states, promote healthful behaviors, and expedite the recovery process for COPD patients. However, subtle variations in the therapeutic effects of different drugs may exist, warranting further investigation.*

Keywords: *Budegopher, Symbicor, Respiratory care, COPD, Negative attitude, Health behavior*

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) has emerged as a prominent focus in clinical research, driven by rising incidence attributed to factors such as air pollution, tobacco consumption, and aging population [1]. Limited efficacy of singular drug interventions in COPD treatment has prompted concerns over increased burden on the lungs of affected individuals [2,3]. Consequently, the integration of respiratory care has become imperative. Symbicor, a bronchodilator employed in COPD management, comprises two components, budesonide and formoterol, known for their capacity to relax bronchial smooth muscle and enhance ventilatory function [4,5]. Additionally, budegopher has demonstrated efficacy in controlling disease progression and improving lung function in COPD patients. Nevertheless, the practice of combining respiratory care with bronchodilators in clinical treatment of COPD remains uncommon.

This study therefore aims to investigate the impact of combined respiratory nursing and bronchodilator therapy on lung function, psychological well-being, and health behavior of COPD patients.

METHODS

General information

Ninety patients diagnosed with COPD and treated at The First People's Hospital of Fuyang, Hangzhou, China between January 2021 and January 2023 constituted the study cohort. Patients were categorized into three groups based on treatment modalities: budegopher group (26 cases, administered with budegopher), symbicor group (28 cases, subjected to symbicor treatment), and combination group (36 cases, receiving a combined therapy of budegopher and symbicor). This study was approved by the ethical committee of The First People's Hospital of Fuyang, China (approval no. KY2021013), and was conducted according to the guidelines of Declaration of Helsinki [6]. Informed consent was obtained from patients before the commencement of study.

Inclusion criteria

Patients who met the diagnostic criteria outlined in "Guidelines for Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease in Primary Care (2018)" [7], were aged 18 years or older and had complete data.

Exclusion criteria

Patients with concurrent malignant tumors, severe intestinal, liver, kidney, heart, or lung diseases, a history of prior respiratory surgery, recent hormone therapy (within one month), or severe mental illness.

Treatments

Patients in budegopher group received budegopher (AstraZeneca AB, Chinese Medicine approval no. H20190063) treatment twice daily. Each administration consisted of two inhalations, each containing budesonide (160 μg), glycopyrronium (7.2 μg), and formoterol fumarate (4.8 μg).

Patients in symbicor group were treated with symbicor (AstraZeneca AB, Chinese Medicine approval no. H20140458) twice daily. Each dose comprised two inhalations, each containing 160 μg of budesonide and 4.5 μg of formoterol fumarate.

Combination group received combined therapy of budegopher and respiratory nursing.

The study lasted for 12 weeks. In case of notable symptoms such as cough, expectoration, or fever during the medication period, appropriate antibiotics and oxygen inhalation were administered. Symptomatic treatment was provided for adverse reactions such as headache, palpitation, or liver and kidney function impairment, and drug discontinuation was initiated when necessary.

All patients, regardless of treatment group, received respiratory care, primarily consisting of respiratory training encompassing five steps. Firstly, patients assumed an upright posture, closed their eyes, and practiced abdominal breathing, repeating the process three times. Subsequently, they placed their hands at their sides, arms hanging naturally, stood with their feet together, inhaled into the abdomen, and then slightly leaned forward, using their hands to apply pressure to the abdomen during exhalation, repeating the sequence three times. The third step involved raising the arms overhead while inhaling, followed by a slow lowering of the arms during exhalation, and this process was repeated three times. Patients then lifted their arms from the front of their bodies to shoulder level, performed abdominal inhalation, lowered their arms, and applied hand pressure to the abdomen during exhalation, and this process was repeated three times. Finally, patients extended one foot forward to facilitate chest movement, pursed their lips during inhalation, retracted the foot, and exhaled naturally, and this process was repeated three times.

Respiratory training was conducted under the supervision of medical personnel, ensuring patients followed the guidance for both inhalation and exhalation. In cases of hypoxemia, timely and adequate oxygen therapy was administered. Additionally, measures were taken to ensure the indoor environment featured fresh air, minimizing the presence of airborne particles or chemical irritants potentially affecting patients' respiratory systems.

Evaluation of parameters/indices

Psychological states

Assessment of negative psychological states in the three groups was conducted using the SDS (Self-Rating Depression Scale) and SAS (Self-Rating Anxiety Scale). Higher scores on these scales indicate more severe levels of depression and anxiety among patients.

Health Behavior Scale

The Health Behavior Scale (HPL) encompassed six dimensions, including health responsibility, physical activity, nutrition, health psychology, interpersonal communication, and stress regulation, with a total of 52 items. Each item was assessed using a Likert 4-point scale, resulting in a total score ranging from 52 to 208. Higher scores indicate better health behavior.

Statistical analysis

Data analysis was performed using IBM's Statistical Package for Social Science (SPSS) version 25.0 software. Continuous variables were expressed as mean ± standard deviation (SD), and multiple group comparisons were conducted using analysis of variance (ANOVA) with F-test. Categorical data were presented as n (%), and chi-square test was employed for cross-tabulation analysis. Correlation analysis was performed using Pearson's correlation coefficient, with significance levels categorized as follows: $r > 0.95$ for a significant correlation, $r \geq 0.8$ for a strong correlation, $0.5 \leq r < 0.8$ for a moderate correlation, $0.3 \leq r < 0.5$ for a weak correlation, and $r < 0.3$ indicating a very weak relationship. Statistical significance was defined as $p < 0.05$.

RESULTS

Baseline characteristics of patients

There was no statistically significant difference in gender distribution, age, or disease duration among these groups ($p < 0.05$; Table 1).

Pulmonary function

Before treatment, there were no significant differences in FEV1 and FVC among three groups ($p > 0.05$). Following treatment, FEV1 values differed significantly among the three groups, with symbicor group exhibiting higher values, followed by combined group, and budegopher group. These differences were statistically significant ($p < 0.001$). Similarly, there was statistical difference in FVC values among the groups, with combined group having higher values, followed by budegopher group, and symbicor group ($p < 0.001$) (Table 2, Figure 1).

Table 1: Baseline data of the three groups of patients (mean ± SD; n (%))

Parameter	Budegopher group (*n*=26)	Symbicor group (*n*=28)	Combined group (*n*=36)	χ^2/F	*P*-value
Gender					
Male	8(30.77)	11(39.29)	13(36.11)	0.435	0.805
Female	18(69.23)	17(60.71)	23(63.89)		
Age (years)	68.46±7.94	66.21±7.21	67.50±7.43	0.611	0.545
BMI (kg/m^2)	23.62±2.23	22.54±2.53	23.72±2.47	2.158	0.122
The course of disease (day)	10.08±2.67	9.82±2.29	10.06±2.07	0.106	0.899

Table 2: Pulmonary function before and after treatment

Group	FEV1(L)		FVC(L)	
	Pre-treatment	***Post-treatment***	***Pre-treatment***	***Post-treatment***
Budegopher (*n* = 26)	1.72±0.24	2.33±0.30	1.76±0.30	3.52±0.33
Symbicor (*n* = 28)	1.73±0.20	2.71±0.32	1.74±0.42	3.69±0.34
Combined (*n* = 36)	1.77±0.23	3.55±0.25	1.67±0.37	4.17±0.46
F-value	0.39	148.249	0.485	24.625
P-value	0.678	<0.001	0.618	<0.001

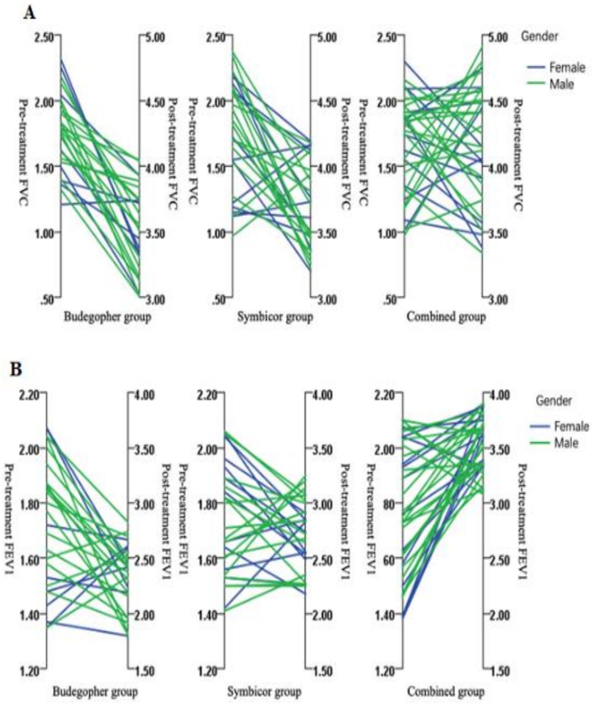

Figure 1: Comparison of lung function before and after treatment in the three groups. (A): Forced vital capacity (FVC) before and after treatment (p < 0.001). (B): Forced expiratory volume in 1 sec (FEV1) before and after treatment (p < 0.001)

Three groups of negative mentality

Prior to treatment, there were no significant differences in SAS (Self-Rating Anxiety Scale) and SDS (Self-Rating Depression Scale) scores among the three groups (p > 0.05). Following treatment, comparative analysis of SAS (p < 0.001) and SDS (p < 0.001) scores was conducted and pairwise comparisons revealed statistically significant differences, with budegopher group displaying higher scores than symbicor group. Budegopher group surpassed combined group, and symbicor group outperformed the combined group (Table 3).

Health behavior of patients

Prior to treatment, there was no significant difference in HPL (Health Behavior scale) among the three groups (p > 0.05). After treatment, a pairwise comparison of HPL scores among the three groups indicated that combined group exhibited higher scores than symbicor group, which in turn had higher scores than budegopher group. These differences were statistically significant (p < 0.001) (Table 4, Figure 2).

Correlation Analysis of pulmonary function, negative psychological state, and health behavior

Pulmonary function parameters, including FEV1 and FVC, exhibited a moderate negative correlation with negative psychological states measured by SAS and SDS. Simultaneously, there was positive correlation between pulmonary function and health behavior assessed by HPL. Furthermore, negative psychological attitudes as measured by SAS and SDS displayed a negative correlation with health behavior assessed by HPL (Figure 3).

Adverse reactions

There was no significant difference in adverse reactions such as nausea vomiting, headache and abdominal pain among the three groups (p > 0.05) (Table 5).

Table 3: Negative state of mind of three groups

Group	SAS (score)		SDS (score)	
	Pre-treatment	***Post-treatment***	***Pre-treatment***	***Post-treatment***
Budegopher (*n* = 26)	69.35±3.29	60.58±2.79	69.92±4.91	64.04±4.17
Symbicor (*n* = 28)	70.46±3.97	55.11±3.63	68.68±4.69	57.07±3.30
Combined (*n* = 36)	68.75±3.10	44.36±3.79	67.39 ± 5.02	45.81 ± 5.04
F-value	1.97	176.343	2.052	141.86
P-value	0.146	<0.001	0.135	<0.001

Table 4: Health behaviors of three groups before and after treatment

Group	HPL Score	
	Pre-treatment	***Post-treatment***
Budegopher (*n* = 26)	82.96±13.14	133.58±4.67
Symbicor (*n* = 28)	80.32±12.56	140.61±9.34
Combined (*n* = 36)	79.17±12.92	162.19±10.82
F-value	0.667	87.889
P-value	0.516	<0.001

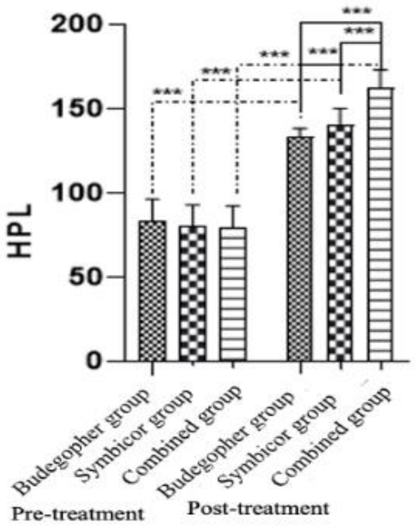

Figure 2: Bar chart for comparison of health behaviors before and after treatment among the three groups

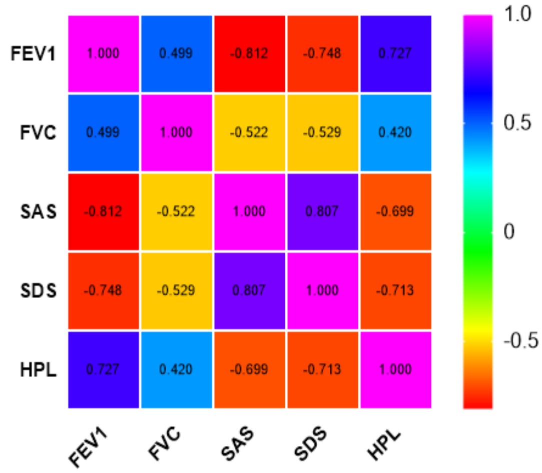

Figure 3: Correlation heat map

Table 5: Adverse reactions in the three groups

Adverse event	Response	Budegopher group (n = 26)	Symbicor group (n = 28)	Combined group (n = 36)	Total	χ^2/F	*P*-value
Nausea and vomiting	No	22(84.62)	25(89.29)	35(97.22)	82(91.11)	3.13	0.209
	Yes	4(15.38)	3(10.71)	1(2.78)	8(8.89)		
Headache	No	26(100.00)	27(96.43)	35(97.22)	88(97.78)	0.877	0.645
	Yes	0(0.00)	1(3.57)	1(2.78)	2(2.22)		
Celialgia	No	26(100.00)	27(96.43)	34(94.44)	87(96.67)	1.453	0.484
	Yes	0(0.00)	1(3.57)	2(5.56)	3(3.33)		

DISCUSSION

In this study, improvements in lung function were observed across all three treatment groups, with combination therapy yielding the most significant advantages. Forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) serve as critical parameters for evaluating lung function in COPD patients. Typically, COPD patients experience reduced FEV1 due to an obstructed airflow resulting from narrowed airways within the lungs [8]. A greater decline in FEV1 indicates more severe lung stenosis. Additionally, FVC is often diminished, which can be attributed to structural lung changes like emphysema and alveolar rupture or impaired respiratory muscle function, preventing patients from achieving their full vital capacity [9,10]. Clinically, FEV1 and FVC measurements are instrumental in assessing the extent and severity of lung function impairment in COPD patients, and guiding selection of optimal treatment strategies.

Symbicor and budegopher are both widely utilized medications in COPD management, and can effectively be used in combination. Symbicor contains budesonide and formoterol, which are highly effective in alleviating respiratory symptoms and preventing asthma attacks [11]. In contrast, budegopher mitigates COPD symptoms by reducing inflammatory responses and expanding airways. Budegopher effectively controls airway inflammation and constriction, thus reducing COPD symptoms, while respiratory care assists patients in enhancing respiratory function, increasing physical activity, and alleviating dyspnea. Combined therapy harnesses the synergistic benefits of these interventions, resulting in superior outcomes.

Comparative analysis of negative psychological states among the three patient groups revealed reductions in SAS and SDS scores accompanied by significant improvements in health behavior. Observed improvements are attributed to the mechanisms of budegopher and Symbicor. Budegopher acts by targeting β2-adrenergic receptors on lung smooth muscle, leading to relaxation and subsequent airway dilation [12]. Furthermore, budegopher inhibits the release of cytokines and mediators, reducing airway inflammation and constriction, thereby alleviating respiratory symptoms. In this study, lung function improved significantly in both budegopher and combination therapy groups. Symbicor, on the other hand, stimulates β2-adrenergic receptors in the lungs, initiating a cascade of intracellular events. This stimulation triggers the activation of adenylate cyclase, which converts ATP into cyclic adenosine monophosphate (cAMP) [13]. Cyclic adenosine monophosphate (cAMP), in turn, leads to activation of cAMP-dependent protein kinase A (PKA) within myocytes, triggering multiple signaling pathways. These pathways include α-actin dissociation, calcium reduction, and membrane depolarization, all of which collectively relax bronchial smooth muscles. Consequently, airway patency improves, bronchospasm is reduced, and expiratory flow rates and maximal ventilatory volumes increase [14,15].

In this study, correlation analysis was conducted, revealing a negative correlation between lung function parameters (FEV1 and FVC) and negative psychological states (SAS and SDS) in COPD patients. Forced expiratory volume in 1 s (FEV1), which represents the volume of air exhaled in the first second at maximum expiratory rate and forced vital capacity (FVC), which represents maximum lung volume, serve as essential clinical indicators of pulmonary function. These values are significantly affected by factors such as airway stenosis and airflow limitation, with lower FEV1 and FVC values indicative of more pronounced respiratory dysfunction and compromised lung function [16,17]. Treatment of COPD patients is often accompanied by physical and mental distress stemming from exacerbations, complex medication regimens, and other factors. This emotional plight frequently leads to negative feelings like depression and anxiety, and in turn, affects health behavior, diminishes medication adherence and self-directed engagement in breathing exercises as well as motivation for self-management. This ultimately results in reduced lung function. Clinical practice emphasizes the importance of addressing not only pharmacological aspects but also the psychological well-being of COPD patients. By promoting positive psychological states, patients actively engage in rehabilitation training, and disease management, which ultimately enhances lung function. Yang Li *et al* [18], advocated for motivational psychological interventions to boost patient compliance, alleviate negative attitudes, bolster self-care capabilities, and encourage patients to confront their condition with a positive outlook. Moreover, Yan Landi *et al* [19] highlighted the benefits of breathing training in ameliorating negative emotions among patients.

Respiratory training nursing is tailored to specific characteristics of airway obstruction in COPD patients. It focuses on enhancing respiratory muscle function, improving respiratory efficiency, and increasing tolerance to airway obstruction. Simultaneously, bronchodilators like budegopher and Symbicor play a vital role in alleviating symptoms such as dyspnea and asthma, enhancing airway patency, and shielding lungs from airway inflammation-induced damage. Through correlation analysis, a moderate positive correlation between lung function parameters (FEV1 and FVC) and Health behavior scale (HPL) was observed in COPD patients. Health behavior scale (HPL) serves as a widely employed scale for assessing various health behaviors, encompassing physical exercise, dietary habits, physical activity, nutrition, and more. These health behaviors play a pivotal role in effectively preventing the deterioration of COPD and enhancing patients' quality of life. To effectively enhance lung function in COPD patients and mitigate the negative effects of airway stenosis and airflow limitation, it is imperative to promote health behaviors such as regular physical activity and a balanced diet. These measures significantly contribute to controlling COPD progression.

Limitations of this study

There are several limitations in this study which include its single-center design and relatively small sample size. As a result, research findings should be further validated through larger-scale, multicenter studies to improve the robustness and generalizability of results.

CONCLUSION

The combination of respiratory care and bronchodilators represents a valuable approach for enhancing lung function in COPD patients. This combined therapy not only alleviates negative psychological states but also promotes positive health behaviors, ultimately facilitating early recovery among patients. However, subtle variations in the therapeutic effects of different drugs may exist, warranting further investigation and comparative analysis.

DECLARATIONS

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None provided.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

Ethical Approval

This study was approved by the ethical committee of The First People's Hospital of Fuyang, China (approval no. KY2021013).

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

***Use of Artificial Intelligence*/Large Language Models**

None provided.

Use of Research Reporting Tools

None provided.

Open Access

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