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ARTICLE

Impact of Fluticasone Propionate and Salmeterol Combined with Pulmonary Rehabilitation on Pulmonary Function, Exercise Tolerance, and Quality of Life in Elderly Patients with Stable Chronic Obstructive Pulmonary Disease

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Abstract

Aims/Background Chronic obstructive pulmonary disease (COPD) is a common respiratory disease characterized by persistent respiratory problems. COPD has become a major public health concern worldwide as the population ages. Therefore, we investigated the impact of fluticasone propionate and salmeterol inhalation combined with pulmonary rehabilitation on pulmonary function, exercise tolerance, and quality of life in elderly patients with stable COPD.

Methods This retrospective study included 102 elderly patients with stable COPD who were treated between January 2021 and October 2023. Based on previous treatment regimens, patients were divided into a fluticasone propionate and salmeterol inhalation combined with a pulmonary rehabilitation group (n = 58) and a pulmonary rehabilitation alone group (n = 44). We collected baseline data upon admission and other relevant data after 3 months of follow-up. Furthermore, we evaluated pulmonary function [forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), peak expiratory flow (PEF)], inflammatory markers [interleukin-8 (IL-8), interleukin-6 (IL-6), tumour necrosis factor-α (TNF-α), tumour necrosis factor-β (TNF-β)], exercise tolerance [6-minute walk test (6MWT)], and quality of life [COPD Assessment Test (CAT), and St. George's Respiratory Questionnaire (SGRQ)] between the two experimental groups. Additionally, the recurrence rate and adverse events during the 3-month follow-up were examined.

Results Compared to baseline, FEV1, FVC, PEF, and 6MWT levels were significantly improved in both groups at the 3-month follow-up, with the combined treatment group performing better than the pulmonary rehabilitation alone group ($p < 0.05$). CAT and SGRQ scores decreased significantly, with the combined treatment group scoring lower than the pulmonary rehabilitation alone group ($p < 0.05$). Inflammatory markers, such as IL-8, IL-6, TNF-α, and TNF-β were significantly reduced in the combined treatment group and were lower than in the pulmonary rehabilitation alone group ($p < 0.05$). The recurrence rate in the combined treatment group was significantly lower than in the pulmonary rehabilitation alone group ($p = 0.018$), with no significant difference in the incidence of adverse events between the two groups ($p > 0.05$).

Conclusion Fluticasone propionate and salmeterol inhalation combined with pulmonary rehabilitation can reduce recurrence rates, and improve pulmonary function, inflammatory status, and exercise tolerance, thereby significantly enhancing the quality of life for elderly patients with stable COPD.

Key words: fluticasone propionate; salmeterol; rehabilitation; aged; COPD

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Introduction

Chronic obstructive pulmonary disease (COPD) is a common respiratory condition characterized by dyspnea, chronic cough, and excessive sputum production (Ritchie and Wedzicha, 2020). Approximately 328 million people suffer from COPD globally (López-Campos et al, 2016). However, the death ratio is higher among older patients due to compromised immunity and reduced organ function (Hurst et al, 2022). COPD is a progressive and irreversible illness, with its severity closely associated with the frequency of acute exacerbations. During acute infection episodes of COPD, the primary treatment objective is to stabilize the patient's condition, prevent disease progression, and reduce mortality. Moreover, during the stable phase, the objective of the treatment shifts to symptom management, reducing acute exacerbations, and improving the patient's quality of life (Terry and Dhand, 2021).

For older patients in the stable phase, comprehensive pulmonary rehabilitation therapy, which combines respiratory rehabilitation (Kahnert et al, 2023), exercise training, and medication, has proven effective (Troosters et al, 2023). Fluticasone propionate and salmeterol (Seretide), administered through inhalation, is a relatively new drug, which targets the lungs directly by dilating the bronchi and reducing inflammation, thereby alleviating symptoms like dyspnea and coughing (Maneechotesuwan et al, 2022). Compared to other treatments, Seretide inhalation offers faster and more substantial relief, efficiently improving patient comfort (Calverley et al, 2007). However, Wedzicha et al (2016) reported that increased eosinophilic counts may be linked to corticosteroid inhalation. Therefore, combining pulmonary rehabilitation with Seretide treatment may have a synergistic effect, reducing the frequency of acute exacerbations and significantly improving the overall health of patients.

Based on these observations, we conducted a retrospective study involving elderly COPD patients in the stable phase. This analysis included two categories of patients—those receiving Seretide inhalation combined with pulmonary rehabilitation therapy and those receiving pulmonary rehabilitation therapy alone. This study aims to assess the long-term effects of these treatment regimens on pulmonary function, inflammatory markers, exercise tolerance, and quality of life. Additionally, it seeks to explore their clinical significance in decreasing disease progression, reducing acute exacerbations, and enhancing quality of life. Our findings intend to provide evidence-based guidelines for optimizing the clinical management of elderly COPD patients.

Methods

Study Population

This retrospective study included 102 elderly patients with stable COPD who were treated at Zhabei Central Hospital between January 2021 and October 2023. The stable phase COPD patients qualifying the diagnostic criteria (Chronic Obstructive Pulmonary Disease Group and Respiratory Disease Branch of the Chinese Medical Association, 2007), aged $\geq$65 years, and presented with symptoms like dyspnea, wheezing, coughing, and sputum production were recruited for the

subsequent analysis. However, individuals with known allergies to fluticasone propionate and salmeterol, having acute lung infections, comorbid conditions such as bronchial asthma or tuberculosis, severe mental disorders, and incomplete clinical data were excluded from this study.

Baseline Data Collection and Study Variables

Upon admission to the hospital, baseline characteristics, including age, gender, duration of COPD, smoking history, drinking history, pulmonary function parameters, inflammatory markers, exercise tolerance, and quality of life, were collected from each patient. Different variables evaluated during this study were as follows:

• Pulmonary function parameters such as forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), and peak expiratory flow (PEF) were measured using a spirometer.

• Inflammatory markers, including interleukin-8 (IL-8, CAT. JYM0139Hu, ColorfulGene Biological Technology Co., Ltd., Wuhan, China), interleukin-6 (IL-6, CAT. JYM0140Hu, ColorfulGene Biological Technology Co., Ltd., Wuhan, China), tumour necrosis factor-α (TNF-α, CAT. JYM0110Hu, ColorfulGene Biological Technology Co., Ltd., Wuhan, China) and tumour necrosis factor-β (TNF-β, JY M0109Hu, ColorfulGene Biological Technology Co., Ltd., Wuhan, China) were assessed using corresponding enzyme-linked immunosorbent assay kits. In brief, 5 mL fasting venous blood samples were obtained from the patients and analyzed following the manufacturer's instructions. Optical density (OD) was measured at 450 nm, and the concentrations of these inflammatory markers were calculated according to the standard curve.

• Exercise tolerance was assessed using the 6-minute walk test (6MWT). Patients were guided to walk back and forth as quickly as possible on a flat, straight 30-meter surface. The test was stopped immediately if they experienced unbearable symptoms, with the walking distance and the reason for stopping recorded. Longer walking distances showed better exercise tolerance and milder COPD symptoms (Batista et al, 2023).

• Quality of life was assessed by experienced physicians using the COPD Assessment Test (CAT) and the St. George's Respiratory Questionnaire (SGRQ) (Liu et al, 2011; Gil et al, 2021). The CAT includes 8 items, with a total score of 0–40; where higher scores indicate poorer quality of life. Furthermore, the SGRQ consists of 50 items, with a total score of 0–100, where higher scores indicate a poorer quality of life.

Grouping of the Study Participants

The COPD patients were divided into two groups based on their previous treatment regimens: the fluticasone propionate and salmeterol inhalation combined with the pulmonary rehabilitation therapy group (n = 58) and the pulmonary rehabilitation alone group (n = 44).

Patients in the pulmonary rehabilitation group received pulmonary rehabilitation therapy during their hospital stay, which included basic conventional measures such as antibiotics, anti-inflammatory medications, oxygen therapy, and bron-

chodilators, with mechanical ventilation provided when necessary. Individualized rehabilitation plans were developed by physicians based on the condition and physical capacity of each patient. This rehabilitation plan included:

• Upper limb muscle training: Twice daily, each session lasting 5–10 minutes, involving upper limb stretching exercises.

• Lower limb muscle training: Twice sessions daily, each lasting 10–15 minutes of cycling, maintaining a cadence of 40–70 revolutions per minute.

• Walking training: A 30-minute daily walking session at a pace of 70 steps per minute. Patients were instructed to stop immediately if shortness of breath or an increased heart rate occurred.

• Breathing training: Three daily sessions of diaphragmatic breathing and pursed-lip breathing, each lasting 10 minutes.

During training, blood oxygen saturation and heart rate were monitored based on medical records, with pulmonary rehabilitation therapy lasting 3 months. Patients in the fluticasone propionate and salmeterol inhalation combined with pulmonary rehabilitation therapy group received inhalation therapy using Seretide (National Drug Approval No.: HJ20140404, Glaxo Wellcome Production, Evreux, France) in addition to the pulmonary rehabilitation therapy. Patients inhaled using a dry powder inhaler (Ellipta™, GlaxoSmithKline plc., Brentford, UK). They inhaled one dose daily, followed by mouth rinsing to reduce the risk of oral candidiasis, with treatment continuing for 3 months.

Follow-Up and Data Collection

At the 3-month follow-up, pulmonary function parameters (FEV1, FVC, and PEF) were reevaluated, and inflammatory markers (IL-8, IL-6, TNF-α, TNF-β) were assessed. Furthermore, the 6MWT, CAT, and SGRQ were re-examined. A monthly telephonic follow-up was performed, to document recurrences during the follow-up period, and adverse events, including upper respiratory tract infections, dizziness, headaches, and nasopharyngitis, were recorded. The total adverse event rate was calculated. These data were analyzed to assess differences in terms of pulmonary function improvement, inflammatory response, exercise tolerance, and quality of life between the two study groups.

Statistical Analysis

Statistical analysis was performed using Statistical Product and Service Solutions (SPSS) software (version 22.0, IBM-SPSS Statistics, Chicago, IL, USA). Continuous data were expressed as mean ± standard deviation ($\bar{x} \pm s$), and the Shapiro-Wilk test was used to assess the normality of a continuous variable. Group-wise comparison was performed using independent sample *t*-tests, and paired sample *t*-tests were applied for within-group comparisons at different time points. Categorical data were expressed as n (%) and analyzed using a chi-square test. A *p*-value of less than 0.05 was considered statistically significant.

Table 1. Comparison of baseline between the two experimental groups clinical data [$\bar{x} \pm s$, n (%)].

Experimental group	n	Gender		Mean age (years)	Mean disease duration (years)	Smoking	Drinking
		Male	Female				
Fluticasone propionate and salmeterol combined treatment group	58	31 (53.4%)	27 (46.6%)	70.32 ± 10.51	7.71 ± 1.59	43 (74.1%)	38 (65.5%)
Pulmonary rehabilitation alone group	44	22 (50.0%)	22 (50.0%)	69.98 ± 10.47	7.68 ± 1.63	35 (79.5%)	31 (70.5%)
t/χ^2		0.119		0.162	0.094	0.407	0.279
p-value		0.730		0.871	0.925	0.524	0.598

Table 2. Comparison of exercise tolerance and quality of life between the two groups ($\bar{x} \pm s$).

Experimental group	n	6MWT (m)		CAT (points)		SGRQ (points)	
		Baseline	3 months	Baseline	3 months	Baseline	3 months
Fluticasone propionate and salmeterol combined treatment group	58	203.51 ± 42.37	432.47 ± 49.14*	29.16 ± 6.31	8.68 ± 2.42*	72.25 ± 11.35	24.59 ± 5.25*
Pulmonary rehabilitation alone group	44	206.49 ± 39.41	408.59 ± 53.20*	28.64 ± 6.27	10.43 ± 2.46*	73.32 ± 10.38	27.98 ± 5.23*
t		0.362	2.346	0.413	3.591	0.489	3.235
p-value		0.718	0.020	0.680	<0.001	0.626	0.001

Note: Compared with baseline in the same group, $^*p < 0.05$. 6MWT, 6-minute walk test; CAT, COPD Assessment Test; SGRQ, St. George's Respiratory Questionnaire.

Results

Comparison of Baseline Characteristics between the Two Groups

Table 1 presents the comparison of general clinical data between the fluticasone propionate and salmeterol combined treatment group and the pulmonary rehabilitation alone group. There were no significant differences between the two groups regarding gender, age, disease duration, smoking history, or drinking history ($p > 0.05$), indicating that the groups were comparable.

Comparison of Exercise Tolerance and Quality of Life between the Two Experimental Groups

Table 2 shows the changes in exercise tolerance (6-minute walk test, 6MWT) and quality of life (CAT and SGRQ scores) for the two groups at baseline and after 3 months of follow-up. At baseline, there were no significant differences between the two groups in 6MWT distance, CAT scores, or SGRQ scores ($p > 0.05$). However, after 3 months of follow-up, both groups showed significant improvements in all these parameters compared to baseline ($p < 0.05$). Specifically, the 6MWT distance in the combined treatment group increased substantially from 203.51 ± 42.37 meters at baseline to 432.47 ± 49.14 meters, while in the pulmonary rehabilitation alone group, it increased from 206.49 ± 39.41 meters to 408.59 ± 53.20 meters. The improvement in the combined treatment group was significantly greater than in the pulmonary rehabilitation alone group ($p = 0.020$).

Furthermore, the combined treatment group showed a significant decrease in CAT scores from 29.16 ± 6.31 at baseline to 8.68 ± 2.42, while decreased compared to a decrease from 28.64 ± 6.27 to 10.43 ± 2.46 in the pulmonary rehabilitation alone group. The reduction in CAT scores was significantly greater in the combined treatment group ($p < 0.001$). For SGRQ scores, the combined treatment group showed a significant reduction from 72.25 ± 11.35 at baseline to 24.59 ± 5.25, while decreased compared to a decrease from 73.32 ± 10.38 to 27.98 ± 5.23 in the pulmonary rehabilitation alone group. The improvement in SGRQ scores was significantly greater in the combined treatment group compared to the pulmonary rehabilitation alone group ($p = 0.001$).

Comparison of Changes in Pulmonary Function between the Two Groups

The changes in pulmonary function (FEV1, FVC, PEF) between the two groups at baseline and after 3 months of follow-up are detailed in Table 3. At baseline, there were no significant differences in FEV1, FVC, and PEF between the combined treatment group and the pulmonary rehabilitation alone group ($p > 0.05$). After 3 months of follow-up, FEV1 in the combined treatment group increased significantly from 1.62 ± 0.37 L at baseline to 2.18 ± 0.41 L, while in the pulmonary rehabilitation alone group, FEV1 increased from 1.59 ± 0.40 L to 1.92 ± 0.43 L. The FEV1 in the combined treatment group was significantly higher than the pulmonary rehabilitation alone group ($p = 0.002$).

Similarly, in the case of FVC, the combined treatment group demonstrated a significant improvement after 3 months (2.11 ± 0.32 L), which was higher than the pulmonary rehabilitation alone group (1.94 ± 0.40 L) ($p = 0.019$). Further-

Table 3. Comparison of changes in pulmonary function between the two groups ($\bar{x} \pm s$).

Group	n	FEV1 (L)		FVC (L)		PEF (L/s)	
		Baseline	3 months	Baseline	3 months	Baseline	3 months
Fluticasone propionate and salmeterol combined treatment group	58	1.62 ± 0.37	2.18 ± 0.41*	1.54 ± 0.26	2.11 ± 0.32*	2.15 ± 0.29	3.13 ± 0.23*
Pulmonary rehabilitation alone group	44	1.59 ± 0.40	1.92 ± 0.43*	1.60 ± 0.32	1.94 ± 0.40*	2.12 ± 0.34	2.97 ± 0.27*
t		0.392	3.106	1.044	2.385	0.479	3.221
p-value		0.696	0.002	0.299	0.019	0.632	0.002

Note: Compared with baseline in the same group, $^{*}p < 0.05$. FEV1, forced expiratory volume in the first second; FVC, forced vital capacity; PEF, peak expiratory flow.

more, PEF showed significant improvement in the combined treatment group after 3 months (3.13 ± 0.23 L/s) compared to the pulmonary rehabilitation alone group (2.97 ± 0.27 L/s) ($p = 0.002$).

Comparison of Inflammatory Markers between the Two Groups

Table 4 shows the changes in inflammatory markers, including IL-8, IL-6, TNF-α, and TNF-β, between the two groups at baseline and after 3 months of follow-up. After 3 months of follow-up, IL-8 levels in the combined treatment group decreased significantly from 19.88 ± 3.84 pg/mL at baseline to 11.32 ± 2.10 pg/mL, while in the pulmonary rehabilitation alone group, IL-8 levels decreased from 20.07 ± 3.69 pg/mL to 12.97 ± 2.36 pg/mL. However, the reduction in the combined treatment group was significantly greater ($p < 0.001$). Furthermore, IL-6 levels in the combined treatment group decreased from 28.01 ± 6.11 pg/mL to 9.56 ± 1.79 pg/mL, whereas in the pulmonary rehabilitation alone group, IL-6 levels decreased from 27.87 ± 6.18 pg/mL to 11.23 ± 1.57 pg/mL. The combined treatment group showed a significantly greater reduction in IL-6 levels ($p < 0.001$). For TNF-α and TNF-β, the combined treatment group had a TNF-α level of 1.18 ± 0.37 mmol/L after 3 months, significantly lower than the 1.45 ± 0.41 mmol/L in the pulmonary rehabilitation alone group ($p < 0.001$). TNF-β levels in the combined treatment group were 0.32 ± 0.07 mmol/L, significantly lower than the 0.39 ± 0.08 mmol/L in the pulmonary rehabilitation alone group ($p < 0.001$).

Comparison of Recurrence and Adverse Reactions between the Two Groups

The recurrence rate in the fluticasone propionate and salmeterol combined treatment group was substantially lower than the pulmonary rehabilitation alone group ($p = 0.018$), indicating that the combined treatment may be more effective in reducing the recurrence rate.

Regarding adverse reactions, the incidence rates of upper respiratory tract infection, dizziness and headache, and nasopharyngitis in the combined treatment group were 5.2%, 3.4%, and 3.4%, respectively. However, in the pulmonary reha-

Table 4. Comparison of inflammatory markers between the two groups ($\bar{x} \pm s$).

Group	n	IL-8 (pg/mL)		IL-6 (pg/mL)		TNF-α (mmol/L)		TNF-β (mmol/L)	
		Baseline	3 months	Baseline	3 months	Baseline	3 months	Baseline	3 months
Fluticasone propionate and salmeterol combined treatment group	58	19.88 ± 3.84	11.32 ± 2.10*	28.01 ± 6.11	9.56 ± 1.79*	3.71 ± 0.74	1.18 ± 0.37*	0.58 ± 0.12	0.32 ± 0.07*
Pulmonary rehabilitation alone group	44	20.07 ± 3.69	12.97 ± 2.36*	27.87 ± 6.18	11.23 ± 1.57*	3.64 ± 0.81	1.45 ± 0.41*	0.61 ± 0.19	0.39 ± 0.08*
t		0.252	3.725	0.115	4.917	0.456	3.483	0.974	4.703
p-value		0.802	<0.001	0.909	<0.001	0.650	<0.001	0.332	<0.001

Note: Compared with baseline in the same group, $^*p < 0.05$. IL, interleukin; TNF, tumour necrosis factor.

Table 5. Comparison of recurrence and adverse reactions between the two groups [n (%)].

Experimental group	n	Recurrence	Adverse reactions			
			Upper respiratory tract infection	Dizziness and headache	Nasopharyngitis	Total adverse reaction rate
Fluticasone propionate and salmeterol combined treatment group	58	3 (5.2%)	3 (5.2%)	2 (3.4%)	2 (3.4%)	7 (12.1%)
Pulmonary rehabilitation alone group	44	9 (20.5%)	2 (4.5%)	3 (6.8%)	3 (6.8%)	8 (18.2%)
χ^2		5.629				0.745
p-value		0.018				0.388

bilitation alone group, the corresponding incidence rates were 4.5%, 6.8%, and 6.8%, respectively. The overall adverse reaction rate was 12.1% (7/58) in the combined treatment group and 18.2% (8/44) in the pulmonary rehabilitation alone group, suggesting that the incidence of adverse reactions was comparable between the two treatment regimens. The comparison of recurrence and adverse reactions between the two groups during the 3-month follow-up is detailed in Table 5.

Discussion

With the advancement of society and improvement in medical care, population aging has become increasingly prominent, leading to a continuous rise in the number of elderly patients with COPD (Yang et al, 2022). This trend poses significant challenges to the healthcare system and increases the burden of disease on patients. Therefore, identifying more effective treatment strategies to improve the quality of life for elderly COPD patients during the stable phase has become a research priority.

This retrospective study revealed that a combination of fluticasone propionate as well as salmeterol inhalation and pulmonary rehabilitation therapy significantly improves lung function and reduces recurrence rates in elderly patients with stable COPD. At baseline levels, patients showed low FEV1, FVC, and PEF values, indicating insufficient respiratory muscle strength and airway obstruction, leading to dyspnea and restricted lung function. After treatment with fluticasone propionate and salmeterol combined with pulmonary rehabilitation, significant improvement in FEV1, FVC, and PEF was found, demonstrating the effectiveness of this approach in enhancing lung function, while pulmonary rehabilitation alone alleviates some symptoms, its effects are limited. Fluticasone propionate and salmeterol enhance outcomes by dilating the bronchi, reducing airway resistance, and alleviating dyspnea, while pulmonary rehabilitation further and enhances respiratory muscle function, improving exercise tolerance and overall respiratory efficacy (Pitrez et al, 2023).

Inflammatory response plays a crucial role in the pathological mechanisms of COPD. This study showed that fluticasone propionate and salmeterol combined with pulmonary rehabilitation significantly reduced inflammation. IL-8, a vital chemokine, triggers the migration of inflammatory cells such as neutrophils, to the airways, participating in the airway remodeling process, and exacerbating inflammation (Lee et al, 2024). By reducing IL-8 levels, fluticasone propionate and salmeterol effectively inhibit inflammatory cell migration, thereby alleviating airway inflammation. Additionally, IL-6, a pro-inflammatory cytokine, stimulates the differentiation of CD4 T-cells, and induces the release of inflammatory mediators, such as TNF-α and IL-13, resulting in airway tissue damage (Edalatifard et al, 2023). This study demonstrated that fluticasone propionate significantly reduces IL-6 levels, mitigating airway tissue inflammation and improving respiratory function. Furthermore, TNF-α and TNF-β, vital mediators of the COPD inflammatory response, exacerbate airway inflammation and excessively released (Budroni et al,

2024). These findings indicated that fluticasone propionate inhalation significantly inhibits the release of TNF-α and TNF-β, reducing inflammation and effectively relieving symptoms.

Additionally, fluticasone propionate shows antioxidant and anti-fibrotic properties, which alleviates oxidative stress and airway fibrosis, contributing to the repair of damaged airway mucosa (Milara et al, 2022). Pulmonary rehabilitation complements these effects by enhancing physical fitness and immunity, improving overall health, and alleviating the risk of recurrence. Naz et al (2019) reported that pulmonary rehabilitation improves exercise tolerance and reduces the perception of dyspnoea in COPD patients. These mechanisms underscore the synergistic effects of the combined treatment in improving inflammatory markers and reducing recurrence risk in older COPD patients.

Combining fluticasone propionate and salmeterol inhalation with pulmonary rehabilitation therapy offers substantial advantages over pulmonary rehabilitation alone in improving lung function, exercise tolerance, and quality of life. This combined approach not only rapidly alleviates symptoms through medication but also enhances physical fitness through rehabilitation training, resulting in long-term outcomes. Clinically, combining moderate pharmacological treatment with regular pulmonary rehabilitation in stable elderly COPD patients can effectively improve their quality of life and overall physical fitness.

However, despite some promising outcomes, this study has some limitations. The small sample size may introduce sample selection bias. Additionally, the retrospective study design may lead to biases in data collection and recording, with potential confounders that cannot be completely excluded. Consequently, these findings may pose challenges in generalizability to other populations or settings. Therefore, further prospective studies are needed to validate the long-term effects of this treatment and promote its broader clinical application, ultimately enhancing outcomes for older COPD patients.

Conclusion

This study demonstrates that fluticasone propionate and salmeterol inhalation combined with pulmonary rehabilitation therapy may be a safe and effective treatment strategy, significantly improving lung function and reducing inflammation and recurrence risk.

Key Points

- The combination of fluticasone propionate and salmeterol with pulmonary rehabilitation significantly improves exercise tolerance and quality of life in COPD patients.
- The combination of fluticasone propionate and salmeterol with pulmonary rehabilitation significantly enhances pulmonary function in patients with COPD.
- The combination of fluticasone propionate and salmeterol with pulmonary rehabilitation reduces blood levels of inflammatory factors IL-8, IL-6, TNF-α, and TNF-β in patients with COPD.
- The combination of fluticasone propionate and salmeterol with pulmonary rehabilitation may significantly reduce the recurrence of COPD in patients.
- The combination of fluticasone propionate and salmeterol with pulmonary rehabilitation did not show significant adverse effects in patients with COPD.

Availability of Data and Materials

The data analyzed are available on the request for the corresponding author.

Author Contributions

YY was the sole author and was responsible for the design of the work, drafting and revision of content, and approval of the version to be published. YY have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was approved by the ethics committee of Zhabei Central Hospital (Ethics approval number: ZBLL2024032001001) and strictly adhered to the ethical principles stated in the Declaration of Helsinki. Due to the retrospective study design, data were obtained from the medical record system, ensuring patient privacy. Thus, informed consent was waived by the ethics committee of Zhabei Central Hospital.

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Conflict of Interest

The author declares no conflict of interest.

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