Cardiovascular Reviews, 2025, Volume 3, Issue 4
http://ojs.bbwpublisher.com/index.php/CR
Online ISSN: 2981-8109
Print ISSN: 3083-4880

The Impact of Combined Application of Bisoprolol and Rivaroxaban on Cardiac Function in Patients with Coronary Heart Disease

Ziyue Wu

Department of Cardiology, The First Affiliated Hospital of Soochow University, Suzhou 215006, Jiangsu, China

**Author to whom correspondence should be addressed.*

Abstract: *Objective*: To investigate the impact of the combined application of bisoprolol and rivaroxaban on cardiac function in patients with coronary heart disease. *Methods*: This study employed a retrospective design, including 90 patients diagnosed with coronary heart disease and treated in our hospital from January 2022 to June 2024. The patients were divided into a combination group (receiving both bisoprolol and rivaroxaban, n = 44) and a control group (receiving bisoprolol alone, n = 46) based on their medication regimen. Baseline data, cardiac ultrasound indicators (left ventricular ejection fraction, left ventricular end-diastolic diameter), serum N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels, 6-minute walk test distance, and the occurrence of major adverse cardiovascular events were collected through the electronic medical record system. *Results*: After treatment, the left ventricular ejection fraction in the combination group was significantly higher than that in the control group ($P < 0.05$), and the left ventricular end-diastolic diameter in the combination group was significantly lower than that in the control group ($P < 0.05$). The combination group had a significantly lower NT-proBNP level compared to the control group ($P < 0.05$). The 6-minute walk test distance in the combination group was significantly higher than that in the control group ($P < 0.05$). No significant statistical difference was observed in the occurrence of major adverse cardiovascular events between the two groups ($P > 0.05$). *Conclusion*: The combined treatment of bisoprolol and rivaroxaban for patients with coronary heart disease can better improve cardiac function and enhance exercise tolerance in patients.

Keywords: Coronary heart disease; Bisoprolol; Rivaroxaban; Cardiac function

Online publication: December 31, 2025

1. Introduction

Coronary heart disease is a common condition in the cardiovascular department, often caused by coronary artery stenosis or obstruction leading to ischemia and hypoxia of myocardial tissue. Its main symptoms include chest pain, fatigue, palpitations, and shortness of breath. In severe cases, it can result in sudden death in patients,

posing a threat to life safety [1]. Drug therapy is a commonly used treatment plan for coronary heart disease and serves as the foundation for controlling the condition. However, how to administer medications is a key research focus in clinical practice [2]. Bisoprolol is frequently used for lowering blood pressure and improving cardiac blood supply [3]. Rivaroxaban is primarily used for anticoagulant therapy, exerting a direct inhibitory effect on coagulation factor Xa to achieve antithrombotic effects. There is a lack of clinical research on the combined application of bisoprolol and rivaroxaban. Therefore, this study selected 90 patients with coronary heart disease as subjects to analyze the therapeutic effects of combined medication.

2. Materials and methods

2.1. General information

This study was a retrospective analysis involving 90 subjects who were diagnosed with coronary heart disease and received hospitalization treatment in our hospital from January 2022 to June 2024. Based on their medication regimens, they were divided into a combined group (n = 44) and a control group (n = 46).

The details of combined group are as listed:

(1) Gender: 28 males and 16 females;
(2) Age: Ranging from 40 to 78 years old, with an average age of (59.37 ± 5.42) years;
(3) Disease duration: Ranging from 1 to 8 years, with an average duration of (4.78 ± 1.21) years;
(4) Disease types: 18 cases of angina pectoris, 16 cases of myocardial infarction, and 10 cases of ischemic cardiomyopathy;
(5) Body mass index: Ranging from 19.12 to 28.65 kg/m², with an average of (23.88 ± 1.23) kg/m².

The details of control group are as listed:

(1) Gender: 26 males and 18 females;
(2) Age: Ranging from 42 to 77 years old, with an average age of (59.90 ± 5.56) years;
(3) Disease duration: Ranging from 1 to 7 years, with an average duration of (4.35 ± 1.06) years;
(4) Disease types: 20 cases of angina pectoris, 15 cases of myocardial infarction, and 11 cases of ischemic cardiomyopathy;
(5) Body mass index: Ranging from 19.00 to 28.23 kg/m², with an average of (23.61 ± 1.08) kg/m².

There were no significant differences in general data between the two groups ($P > 0.05$).

The inclusion criteria are as follows:

(1) Meeting the diagnostic criteria for coronary heart disease outlined in the "Guidelines for Primary Care Diagnosis and Treatment of Stable Coronary Artery Disease (2020)" [4];
(2) Confirmed diagnosis via electrocardiogram, cardiac ultrasound, coronary angiography, etc.;
(3) All patients having indications for medication;
(4) Informed consent for participation in the study.

The exclusion criteria are as follows:

(1) Severe organ dysfunction;
(2) Concomitant other serious organic diseases;
(3) Concomitant mental abnormalities;
(4) Concomitant immune disorders;
(5) Failure to take medication as prescribed.

2.2. Methods

All included patients received various conventional treatments such as cardiac strengthening, blood pressure reduction, and diuresis. The control group was treated solely with bisoprolol. Bisoprolol tablets (manufactured by Chengdu Yuandong Biopharmaceutical Co., Ltd., packaging specification: 5mg*18 tablets, National Medical Products Administration Approval Number H20083008) were administered orally once daily at a dose of 5mg for 4 weeks. If the patient's condition improved and the drug was tolerated, the dosage was increased to 7.5mg once daily. Observation continued for another 4 weeks, and if the patient's tolerance remained good, the dosage was further increased to 10mg once daily, which was maintained for treatment. Patients were treated for a total of 12 weeks. The combination group received rivaroxaban in addition to the aforementioned treatment. Rivaroxaban tablets (manufactured by CSPC Ouyi Pharmaceutical Co., Ltd., specification and dosage form: 10mg, National Medical Products Administration Approval Number H20203077) were administered orally once daily at a dose of 15mg for 12 weeks.

2.3. Observation indicators

The observation indicators are as outlined:

(1) Cardiac ultrasound indicators, including left ventricular ejection fraction and left ventricular end-diastolic diameter, were measured via cardiac color Doppler ultrasound;

(2) Serum N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels were measured by collecting 3mL of fasting elbow venous blood, which was then processed routinely and analyzed using a biochemical immunoanalyzer;

(3) For the 6-minute walk test distance, prepare a straight path and record the longest distance walked by the patient in 6 minutes. Running or jogging is prohibited. Conduct the test three times consecutively and record the average value;

(4) Occurrence of major adverse cardiovascular events, including bleeding, acute myocardial infarction, recurrent angina, and arrhythmia.

2.4. Statistical methods

Data were compared using SPSS 27.0 software. Continuous variables were tested for normality using the Shapiro-Wilk test and expressed as mean ± standard deviation (SD), with t-tests performed. Categorical variables were expressed as frequencies (percentages), and chi-square (χ^2) tests were conducted. A *P*-value of less than 0.05 was considered statistically significant.

3. Results

3.1. Comparison of cardiac ultrasound indicators between the two groups

As shown in **Table 1**, after 12 weeks of treatment, the combined treatment group exhibited a higher left ventricular ejection fraction ($P < 0.05$) and a lower left ventricular end-diastolic diameter ($P < 0.05$) compared to the control group.

Table 1. Cardiac ultrasound indicators in the two groups (mean ± SD)

Group	n	LVEF (%)		LVEDD (mm)	
		Pre-treatment	12 weeks post-treatment	Pre-treatment	12 weeks post-treatment
Combination group	44	40.17 ± 4.32	52.38 ± 4.98[a]	61.87 ± 3.67	53.02 ± 3.05[a]
Control group	46	40.56 ± 4.58	47.27 ± 4.82[a]	61.32 ± 3.50	56.87 ± 3.27[a]
t		0.415	4.947	0.728	5.770
P		0.679	< 0.001	0.469	< 0.001

Note: Compared with the same group before treatment, [a]$P < 0.05$.

3.2. Comparison of NT-proBNP and 6-minute walk test distance between the two groups

As shown in **Table 2**, at 12 weeks post-treatment, the combination therapy group demonstrated significantly lower NT-proBNP levels and a greater 6-minute walk distance compared to the control group (both $P < 0.05$).

Table 2. NT-proBNP and 6-minute walk test distance in the two groups (mean ± SD)

Group	n	NT-proBNP (pg/mL)		6-minute walk distance (m)	
		Pre-treatment	12 weeks post-treatment	Pre-treatment	12 weeks post-treatment
Combination group	44	569.87 ± 45.83	320.18 ± 32.17^a	308.23 ± 35.67	512.56 ± 49.67^a
Control group	46	575.92 ± 46.71	379.45 ± 36.78^a	315.28 ± 36.82	428.67 ± 45.32^a
t		0.620	8.123	0.922	8.376
P		0.537	< 0.001	0.359	< 0.001

Note: Compared with the same group before treatment, [a]$P < 0.05$.

3.3. Comparison of the incidence of major adverse cardiovascular events between the two groups

As shown in **Table 3**, within 12 weeks of treatment, there was no statistically significant difference in the incidence of major adverse cardiovascular events between the two groups ($P > 0.05$).

Table 3. Incidence of major adverse cardiovascular events in the two groups (n/%)

Group	Combination group	Control group	χ^2	P
n	44	46	0.623	0.430
Bleeding	0 (0.00)	1 (2.17)		
Acute myocardial infarction	0 (0.00)	1 (2.17)		
Recurrent angina	1 (2.27)	1 (2.17)		
Arrhythmia	1 (2.27)	1 (2.17)		
Incidence of Major Adverse Cardiovascular Events (MACE)	2 (4.55)	4 (8.70)		

4. Discussion

Coronary heart disease (CHD) is a highly prevalent cardiovascular disease with extremely high morbidity,

disability, and mortality rates [5]. With the increasing number of elderly individuals in China, socioeconomic development, and changes in dietary and lifestyle habits, the prevalence of chronic diseases such as CHD has risen. Clinical studies have indicated that abnormal lipid metabolism leads to the extensive deposition of lipids in the intimal layer of the coronary arteries, triggering coronary atherosclerosis and stenosis or occlusion of the vascular lumen [6]. This is the primary cause of impaired cardiac blood flow and the development of CHD. If the disease is not diagnosed early and its progression is not promptly controlled, it can lead to various issues such as angina pectoris, shortness of breath, palpitations, and chest pain, ultimately threatening the patient's life safety.

CHD is primarily treated with medications, among which bisoprolol is commonly used. It can antagonize β1 adrenergic receptors with high selectivity and is applied in the treatment of various cardiovascular diseases [7]. When used in the treatment of CHD, it can promote rapid vasodilation, lower blood pressure levels, improve myocardial function, and alleviate symptoms such as chest pain and palpitations. However, some studies have found that most patients with CHD have complex conditions and are of advanced age [8]. While bisoprolol alone can exert certain effects, it cannot meet the treatment needs and is difficult to rapidly achieve the expected goals. Therefore, it is necessary to combine it with other medications to enhance efficacy and promptly control symptoms and the disease progression. In the past, anticoagulant therapy was often combined with warfarin to improve efficacy, but warfarin has safety concerns and a higher risk of bleeding, thus limiting its clinical application. Rivaroxaban, a novel anticoagulant drug available in oral form, exhibits stable anticoagulant effects compared to warfarin and is less likely to induce bleeding issues, hence its widespread clinical use [9]. As an anti-Xa factor agent, rivaroxaban has a drug half-life of up to 7–11 hours. It achieves anticoagulation by selectively inhibiting coagulation factor Xa, typically reaching peak plasma concentration 4 hours after oral administration. During treatment, continuous monitoring of coagulation function is not required, and there is no risk of bleeding, allowing it to play a significant role in preventing thrombus formation.

In this study, compared with the control group, the combination therapy group demonstrated more significant improvements in cardiac ultrasound parameters, NT-proBNP levels, and 6-minute walk test distance ($P < 0.05$). Bisoprolol can inhibit β1 adrenergic receptors, thereby slowing heart rate, ventricular conduction, and myocardial contraction, as well as lowering blood pressure. This effectively controls heart rate and reduces myocardial oxygen consumption. Rivaroxaban can inhibit the activity of coagulation factor Xa, interfere with normal platelet activation, affect the binding of coagulation proteins, achieve effective anticoagulation, prevent thrombus formation, reduce platelet aggregation, inhibit platelet activation, alleviate blood coagulation, ensure continuous vascular patency, prevent abnormal cardiac pumping, and protect cardiac function. Rivaroxaban offers outstanding efficacy and extremely high safety, with a stable anticoagulation process and pharmacokinetics. Therefore, it can prevent adverse reactions and events while ensuring therapeutic efficacy, leading to better patient tolerance [10]. Combined medication can enhance therapeutic effects and better improve cardiac function and exercise tolerance. In this study, the incidence of major adverse cardiovascular events was comparable between the two groups, suggesting that combined medication can stabilize therapeutic effects and prevent various adverse events.

5. Conclusion

In summary, the combined application of bisoprolol and rivaroxaban in patients with coronary heart disease can effectively improve cardiac function, NT-proBNP levels, and exercise tolerance, ensuring treatment safety and warranting clinical promotion. However, this study has certain limitations, including a short observation period and a lack of indicators such as thrombus formation factors, vascular endothelial function, and coagulation

function. Therefore, it is unable to comprehensively analyze the value of combined medication. Clinical studies should extend the observation period and enrich observation indicators based on the current situation to analyze the value of combined medication treatment from multiple aspects.

Disclosure statement

The author declares no conflict of interest.

References

[1] Shen J, Wang D, Wang Z, et al., 2025, The Efficacy of Trimetazidine Combined with Clopidogrel in Treating Patients with Coronary Heart Disease and Angina Pectoris and its Impact on the Expression of cTnI, CK-MB, and NT-proBNP. Chinese Journal of Hospital Pharmacy, 25(7): 835–838.

[2] Zhao T, Ren Y, Cheng T, 2025, The Impact of Hyperbaric Oxygen Combined with Atorvastatin Treatment on Vascular Endothelial Function, Coagulation Function, and Inflammatory Response in patients with Coronary Heart Disease After PCI. Chinese Journal of Nautical Medicine and Hyperbaric Medicine, 32(3): 271–276.

[3] Lin Z, Tu Y, Teng Z, et al., 2024, A Randomized Controlled Study on the Treatment of Cardiac Dysfunction after Percutaneous Coronary Intervention in Patients with Coronary Heart Disease using Kuanxiong Aerosol. Chinese Journal of Integrated Traditional and Western Medicine, 44(12): 1431–1436.

[4] Chinese Medical Association, Journal Office of Chinese Medical Association, General Practice Branch of Chinese Medical Association, et al., 2021, Guidelines for Primary Care of Stable Coronary Artery Disease (2020). Chinese Journal of General Practitioners, 20(3): 265–273.

[5] Zhang Y, Nie Y, 2023, A Comparative Study on the Impact of Bisoprolol Fumarate and Freeze-Dried Recombinant Human Brain Natriuretic Peptide on Cardiac Function Recovery in Patients with Coronary Heart Disease Undergoing PCI. Journal of Health Medicine Research and Practice, 20(4): 21–24.

[6] Zhang H, Zhang H, Xu X, et al., 2023, Clinical Study on the Treatment of Stable Angina Pectoris with Yinzhan Xinmai Dripping Pills Combined with Bisoprolol. Modern Drugs & Clinical Practices, 38(3): 630–634.

[7] Liang H, Li Z, Chen X, et al., 2025, Clinical Observation on the Treatment of Coronary Heart Disease Complicated with Paroxysmal Atrial Fibrillation (Syndrome of Phlegm-Fire Disturbing the Heart) with Modified Huanglian Wendan Decoction Combined with Rivaroxaban. Journal of Emergency in Traditional Chinese Medicine, 34(6): 1046–1050.

[8] Ma L, Shi R, He J, et al., 2025, Efficacy of Different Doses of Rivaroxaban Combined with Rosuvastatin in Patients with Atrial Fibrillation Complicated with Coronary Heart Disease. Chinese Journal of Drug Application and Monitoring, 22(5): 934–937.

[9] Liu Y, Li Y, Zhou T, et al., 2025, Analysis of the Efficacy and Safety of Clopidogrel Combined with Rivaroxaban and Aspirin in Elderly Patients with Coronary Heart Disease Complicated with Gastrointestinal Diseases. Journal of Clinical Military Medicine, 53(8): 785–790.

[10] Shang Z, Xu Y, 2024, Therapeutic Effect of Rivaroxaban Combined with Indobufen on Patients with Atrial Fibrillation Complicated with Coronary Heart Disease. Journal of Cardiovascular Rehabilitation Medicine, 33(6): 674–678.