Effect of Low Dose Lyophilized Recombinant Human Brain Natriuretic Peptide on Patients with Severe Heart Failure Complicated with Hypotension after Emergency PCI in Acute Anterior Wall AMI

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Abstract: Objective: To study the effect of low-dose lyophilized recombinant human brain natriuretic peptide on patients with severe heart failure complicated with hypotension after emergency PCI in acute anterior wall AMI. **Methods:** 48 patients with severe heart failure complicated with hypotension after emergency percutaneous coronary intervention (PCI) for acute anterior myocardial infarction (AMI) from September 2020 to September 2021 were included in the study. They were randomly divided into reference group and study group, with 24 cases in each group. The reference group was treated with general treatment, and the study group was treated with low-dose lyophilized recombinant human brain natriuretic peptide on the basis of the reference group. The brain natriuretic peptide, blood pressure and left ventricular ejection fraction of the two groups were observed before and after treatment. **Results:** The level of brain natriuretic peptide in the study group was lower than that in the reference group, the left ventricular ejection fraction was higher than that in the reference group, and the systolic and diastolic blood pressure were higher than that in the reference group ($P < 0.05$). The improvement effect of LVEDd (50.43 ± 6.87) mm and LVESD (45.37 ± 7.16) mm in the observation group was better than that in the control group ($P < 0.05$). The clinical treatment of 22 patients in the observation group was effective, accounting for 91.67%, and that of 17 patients in the control group was effective, accounting for 70.83%, which was statistically significant ($P < 0.05$). **Conclusions:** The effect of low-dose lyophilized recombinant human brain natriuretic peptide in the treatment of patients with severe heart failure complicated with hypotension after emergency PCI of acute anterior wall AMI is satisfactory, which is helpful to improve cardiac function and hypotension symptoms.

Keywords: Lyophilized recombinant human brain natriuretic peptide; Acute anterior wall AMI; PCI; Heart failure; Hypotension

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1. Introduction

As a critical disease, AMI refers to myocardial necrosis caused by persistent and acute ischemia and hypoxia of coronary artery. It is often complicated with heart failure and arrhythmia, which is life-threatening. The clinical symptoms of most patients are sudden onset, with squeezing pain or suffocation in the precordial area for more than 30 minutes. A few patients have symptoms such as palpitation, shortness of breath and fatigue before the onset of the disease. The precordial pain occurs first, mostly in the morning, during activity or rest [1,2]. PCI is often used in clinical treatment of AMI to dredge the coronary artery lumen with stenosis or occlusion and alleviate myocardial perfusion. However, this treatment has great potential safety hazards and is easy to cause various complications. In this regard, lyophilized recombinant human brain natriuretic peptide can improve cardiac function, but excessive can cause hypotension [3,4]. In view of this, this paper selects 48 patients with severe heart failure complicated with hypotension after emergency percutaneous coronary intervention (PCI) for acute anterior wall AMI from September 2020 to September 2021 as the research object. The patients are divided into two groups

and treated with different clinical methods respectively, and the improvement of various clinical indexes in the treatment is collected. To study the improvement effect of low-dose lyophilized recombinant human brain natriuretic peptide in clinical treatment, the detailed report is as follows.

2. Object and Method

2.1 Object

48 patients with severe heart failure complicated with hypotension after emergency percutaneous coronary intervention (PCI) for acute anterior wall AMI from September 2020 to September 2021 were included in the study. They were randomly divided into reference group and study group, with 24 cases in each group. In the reference group, there were 13 males and 11 females, aged 68-83 years, with an average of (74.26 ± 1.02) years. There were 12 males and 12 females in the study group, aged 68-84 years, with an average of (74.31 ± 1.04) years. There was no significant difference in the basic information of all patients ($P > 0.05$). The inclusion criteria were: 1) the diagnostic criteria of acute anterior wall AMI heart failure complicated with hypotension; 2) Voluntary participation in the study; 3) The medical ethics Association agreed with the study; 4) All patients underwent emergency PCI. Exclusion criteria: 1) history of drug allergy; 2) Unwilling to participate in research; 3) Patients with severe valve stenosis and liver and kidney dysfunction.

2.2 Method

The reference group was treated with general treatment. After PCI, anticoagulation and antiplatelet aggregation were performed. For the symptoms of hypotension, dopamine was applied by continuous intravenous pumping to control the blood pressure within a reasonable range, that is, the systolic blood pressure was not less than 90 mmHg and the diastolic blood pressure was not less than 60mmhg [5].

The study group was treated with low-dose lyophilized recombinant human brain natriuretic peptide on the basis of the reference group. On the premise of not using the load dose of lyophilized recombinant human brain natriuretic peptide, the lyophilized recombinant human brain natriuretic peptide (approval No.: gyzz s20050033, manufacturer: Chengdu nordikang biopharmaceutical Co., Ltd., specification: 0.5mg) was injected intravenously, and the blood pressure was 0.0013-0.0040 according to the specific blood pressure level of the patient μG/(kg·min^{-1}) was adjusted. Both groups were treated for 3 days [6].

2.3 Observation Indicators

Brain natriuretic peptide, blood pressure and left ventricular ejection fraction of the two groups before and after treatment [7]. 5mL venous blood was taken before and after treatment, brain natriuretic peptide was measured by immunoradiometry, left ventricular ejection fraction was checked by cardiac color Doppler ultrasound, and diastolic and systolic blood pressure were measured by professional instruments [8,9].

The improvement differences of clinical indexes under different treatment methods were compared, and the changes of clinical indexes before and 4 weeks after treatment were recorded. The improvement differences of left ventricular end diastolic diameter (LVEDd) and left ventricular end systolic diameter (LVESD) were recorded by cardiac color Doppler ultrasound [10].

The clinical efficacy of patients under different treatment methods was compared and evaluated by Killip standard. After treatment, the clinical symptoms of patients completely subsided, and the Killip grade of cardiac function was enhanced by 2 grades compared with that before treatment; After treatment, the clinical symptoms of the patients were partially improved, and the Killip grade of cardiac function was enhanced by 1 grade compared with that before treatment [11,12]. After treatment, the patient's clinical symptoms have not been improved, and the assessment of Killip cardiac function level has not been alleviated, which is invalid (total effective rate = significant effect + effective).

2.4 Statistical Analysis

The calculation software spss21.0 is used for analysis and comparison. The measurement data are represented by (x ± s), t shows that the result is $p < 0.05$, which proves that there is obvious difference [13,14].

3. Results

3.1 Comparison of Brain Natriuretic Peptide, Blood Pressure and Left Ventricular Ejection Fraction between the Two Groups before and after Treatment

Before treatment, there was no significant difference in brain natriuretic peptide, blood pressure and left ventricular ejection fraction between the study group and the reference group ($P > 0.05$). After treatment, the brain natriuretic peptide level in the study group was lower than that in the reference group, the left ventricular ejection fraction was higher than that in the reference group, and the systolic and diastolic blood pressure were higher than that in the reference group ($P < 0.05$). As shown in Table 1.

3.2 Compare the Improvement of Clinical Indicators under Different Treatment Methods

Before treatment, there was no significant difference in left ventricular end diastolic diameter and left ventricular end systolic diameter between the two groups (P > 0.05). After treatment, the overall improvement effect of LVEDd (50.43 ± 6.87) mm and LVESD (45.37 ± 7.16) mm in the observation group was better than that in the control group (P < 0.05), as shown in Table 2:

3.3 Compare the Clinical Efficacy of Patients under Different Treatment Methods

22 patients in the observation group were effective, accounting for 91.67%, and 17 patients in the control group were effective, accounting for 70.83%, which was statistically significant (P < 0.05). See Table 3:

Table 1. Comparison of brain natriuretic peptide, blood pressure and left ventricular ejection fraction between the two groups before and after treatment ($\bar{x}$ ±s)

Group	Number of cases	Brain natriuretic peptide (ng/mL)		Left ventricular ejection fraction (%)		Systolic pressure (mmHg)		Diastolic pressure (mmHg)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Research Group	24	1149.02±712.25	537.82±263.74	37.12±0.56	48.95±2.03	80.72±7.14	109.33±2.15	51.78±3.15	72.34±0.86
Reference group	24	1150.05±711.34	895.72±287.91	36.99±0.51	42.18±1.01	80.69±7.12	94.17±2.08	51.77±3.13	63.14±0.46
t	-	0.005	4.491	0.841	14.627	0.014	24.826	0.011	46.212
P	-	0.996	0.001	0.405	0.001	0.988	0.001	0.991	0.001

Table 2. Comparison of improvement differences of clinical indexes under different treatment methods ($\bar{x}$ ±s)

Group	Number of cases	LVEDD (mm)		LVESD (mm)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	24	68.13±9.45	50.43±6.87	56.43±7.55	45.37±7.16
Control group	24	68.22±9.07	58.96±7.92	56.52±7.68	53.26±6.59
t		0.034	3.986	0.041	3.972
P		0.973	0.000	0.968	0.000

Table 3. Comparison of clinical efficacy of patients under different treatment methods [cases, (%)]

Group	Number of cases	Remarkable effect	Effective	invalid	Total effective rate
Observation group	24	13 (54.17)	9 (37.50)	2 (8.33)	22 (91.67)
Control group	24	7 (29.17)	10 (41.67)	6 (25.00)	17 (70.83)
χ^2		12.857	0.364	14.254	14.254
P		0.000	0.547	0.000	0.000

4. Discussion

After the onset of AMI, various life indexes such as heart rate and blood pressure will change in varying degrees. In the early stage of the disease, because the myocardial perfusion is reduced and the oxygen supply is insufficient, the heart needs to improve the systemic blood supply to alleviate hypoxia, so there can be symptoms such as increased blood pressure and accelerated heartbeat. When the disease develops to the later stage, with the increase of the number of ischemic and necrotic myocardium and the continuous decline of cardiac function, heart failure can still occur even after PCI treatment [15,16]. Hypotension is a common complication after reperfusion in patients with acute myocardial infarction. Most patients show symptoms such as nausea and vomiting, pale complexion, bradycardia and sweating. Some patients with poor physical quality may have symptoms of cerebral hypoxia such as transient loss of consciousness. Nowadays, it is not clear in clinical treatment that the occurrence of hypotension after recanalization of arteries related to acute myocardial infarction and whether hypotension will affect the clinical efficacy and prognosis of patients. It is necessary to further track the long-term efficacy of patients in clinical treatment.

Brain natriuretic peptide is a B-type natriuretic peptide, which was first isolated from the pig brain. It comes from the ventricle and is synthesized and secreted by ventricular myocytes. Therefore, the changes of ventricular load and ventricular wall tension are of great significance for brain natriuretic peptide secretion [17]. It is an important synthetic vasodilator, which can regulate blood pressure, water salt balance and blood volume with cardiac natriuretic peptide, improve glomerular filtration rate and expand blood vessels, so as to reduce systemic vascular resistance and plasma volume and protect cardiac function [18]. Heart failure patients with acute anterior wall AMI after emergency PCI are complicated with hypotension because their myocardium has been seriously damaged and their blood pressure is generally lower than normal. The main component of lyophilized recombinant human brain natriuretic peptide is recombinant human brain natriuretic peptide. Human brain natriuretic peptide can bind to specific sodium peptide receptors, increase the concentration of cyclic guanosine monophosphate in cells, promote the relaxation of smooth muscle cells, quickly reduce systemic arterial pressure and pulmonary capillary wedge pressure, reduce cardiac load and alleviate heart failure related symptoms, such as dyspnea [19]. It should be noted that the blood pressure changes of patients must be strictly monitored during treatment. In case of hypotension, the dosage should be reduced or the medication should be stopped immediately [20]. Therefore, it is best to take a small dose of lyophilized recombinant human brain natriuretic peptide in the treatment of heart failure after emergency PCI in patients with acute anterior wall AMI to prevent adverse reactions. In this study, the brain natriuretic peptide, blood pressure and left ventricular ejection fraction of the study group after treatment were better than those of the reference group, indicating that low-dose lyophilized recombinant human brain natriuretic peptide has clinical application value.

In conclusion, the effect of low-dose lyophilized recombinant human brain natriuretic peptide in the treatment of patients with severe heart failure complicated with hypotension after emergency PCI of acute anterior wall AMI is satisfactory, which is helpful to improve cardiac function and hypotension symptoms.

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