Research Paper

Effect of Early Application of Neoactive on Short-Term Prognosis in Elderly Patients with Acute Myocardial Infarction after Percutaneous Coronary Intervention

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Recombinant human brain natriuretic peptide titanium is an endogenous peptide hormone synthesized using modern gene recombination technology. It has the same amino acid sequence, spatial structure, and biological activity as endogenous brain natriuretic peptide synthesized in ventricular muscle. Clinically, it is mainly used to treat acute decompensated heart failure. We aim to analyze its impact on the short-term prognosis of elderly patients with acute myocardial infarction after percutaneous coronary intervention. Elderly patients with acute myocardial infarction who underwent percutaneous coronary intervention treatment were divided into a recombinant human brain sodium titanium group and a control group based on whether to use recombinant human brain sodium titanium. The analysis indicators include cardiovascular risk factors, cardiac function indicators, incidence of major adverse cardiac events, and adverse drug reactions at admission and 2 w after treatment. A total of 72 patients were included, with an average age of (67.4±6.7) y, of which 69.04 % were male. After 2 w of treatment, the B-type natriuretic peptide levels in both groups of patients were lower than before treatment, with a significant decrease in the recombinant human brain natriuretic titanium group. However, the left ventricular ejection fraction of the recombinant human brain natriuretic titanium group was lower than before treatment in the same group, while the left ventricular ejection fraction level of the control group was higher than before treatment in the same group, and the differences were not statistically significant. Two patients in the recombinant human brain sodium urinary titanium group experienced hypotension, with an adverse reaction rate of 5 % (2/40); one patient in the control group stopped using dopamine due to palpitations and sinus tachycardia, one patient stopped using nitroglycerin due to headache, and one patient stopped using nitroglycerin due to hypotension. The adverse reaction rate was 9.38 % (3/32). Recombinant human brain natriuretic titanium is safe and effective for patients with acute myocardial infarction, while also improving cardiovascular disease risk factors.

Key words: Recombinant human brain natriuretic titanium, acute myocardial infarction, heart failure, sinus tachycardia, palpitations

Heart failure includes coronary heart disease, valvular disease and metabolic heart disease, and the final stage is heart failure. More precisely, it refers to the limitation of the heart's systolic and diastolic functions, leading to a significant decrease in the heart's ejection function or active absorption of blood into the ventricle. Patients can experience left or right heart failure. The main manifestations of left heart failure are upright breathing, coughing pink foam sputum, and decreased activity tolerance; right heart failure often manifests as varicocele of the jugular vein, discomfort in the liver area, lower limb edema, and decreased appetite. According to the time of onset, it can be divided into acute heart failure and chronic heart failure, and can be divided into left heart failure and right heart failure according to the location of the onset. The treatment of heart failure is a systematic project that requires careful medication adjustments at the hospital. The elderly have a high incidence of Acute Myocardial Infarction (AMI) is also one of the most common diseases in the elderly[1]. Percutaneous Coronary Intervention (PCI) is currently the most commonly used and effective means for the treatment of AMI,

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which can significantly improve ischemic symptoms, significantly reduce interstitial mortality, and provide a good long-term prognosis[2]. However, even if the criminal blood vessels are opened in time, the damaged myocardium cannot be recovered, and AMI often leads to myocardial damage, ventricular remodeling, hemodynamic and systolic dysfunction, which is easy to cause or aggravate heart failure. However, AMI combined with heart failure has a great impact on the life safety of patients, and the disease progresses rapidly, with high mortality and poor prognosis. At present, although conventional clinical treatment can alleviate the condition to a certain extent, it has little improvement on the prognosis and is difficult to correct the cardiac function of patients[3,4]. Therefore, it is very important to choose a reasonable treatment plan to improve the curative effect.

Brain natriuretic peptide is an active substance secreted by heart muscle cells and has beneficial effects on the cardiovascular system, including sodium reduction and diuretic to remove excess water from the body. In addition, it has a certain vasodilation effect, which can reduce the load of the heart before and after, and has a certain protective effect on patients with cardiac dysfunction. Because brain natriuretic peptide was first found in the pig brain a substance, with little relationship to the brain, is secreted by cardiomyocytes active substances, mainly on the cardiovascular system. Brain natriuretic peptide can be tested by drawing venous blood for testing levels in the body. In patients with heart failure, the midbrain natriuretic peptide will increase compensatory secretion, i.e. in the case of the heart feeling the burden is increased; more brain natriuretic peptide will be secreted to reduce the heart burden and improve the heart function as much as possible, which is a compensatory response. Therefore, recombinant human brain natriuretic peptide was produced by recombinant Deoxyribonucleic Acid (DNA) technology using *Escherichia coli* (*E. coli*) and has the same amino acid sequence as endogenous brain natriuretic peptide produced by ventricular muscle. Recombinant human brain natriuretic titanium (neoptin) is a high-purity sterile powder for injection produced by *E. coli* and using DNA gene recombination technology. It is combined with endogenous brain natriuetic peptide secreted by heart ventricles. B-Type Natriuretic Peptide (BNP) has the same amino acid sequence, stereo configuration and biological activity, so it has the same mechanism of action, and is also a new drug for the treatment of acute heart failure[5-7].

MATERIALS AND METHODS

Research object:

AMI patients who underwent PCI treatment in our hospital from April 2022 to March 2024 were selected as the study subjects, and were divided into a recombinant human brain natriuretic titanium group and a control group according to different treatment methods.

Inclusion criteria:

According to the relevant criteria established by the European Society of Cardiology (ESC), i.e., the myocardial necrosis marker Creatine Kinase Isoenzyme (CKMB) or troponin is elevated and exceeds the upper limit of the reference range (99th percentile), the ECG with or without ST segment elevation, and the duration of myocardial ischemia symptoms is ≥20 min and age ≥60 y.

Exclusion criteria:

With organic heart valvular disease, myocarditis, constrictive pericarditis, non-ischemic cardiomyopathy and other serious heart diseases; patients with other organ failure, abnormal coagulation dysfunction, malignant tumors, and autogenous immune system diseases; patients with acute pulmonary embolism; other patients who cannot tolerate emergency PCI surgery or refuse emergency PCI treatment and patients who cannot tolerate treatment with relevant drugs.

Research methods:

After 72 h, sarcobactril valsartan sodium tablets (Novartis Spharmaschweizag; Registration No: Sinopod J20171054; specification of 100 mg) treatment, initial dose of 50 mg, twice/d, 2 w interval plus a double dose, the maximum is not >200 mg/d.

Control group: Postoperative administration of dopamine/nitroglycerin/sacubactril valsartan sodium tablets (Novartis SpharmaschweizAG; Registration No: Sinop Optical Density (OD) J20171054; Specification: 100 mg) treatment, initial dose of 50 mg, twice/d, 2 w interval plus a double dose, the maximum is not >200 mg/d.

Statistical methods:

Statistical Package for the Social Sciences (SPSS) 19.0 software was used to analyze the data in this

study. Normal distribution measures (such as heart rate, blood pressure, Body Mass Index (BMI), estimated Glomerular Filtration Rate (eGFR), Left Ventricular Ejection Fraction (LVEF), Low-Density Lipoprotein (LDL) level, creatinine level, endogenous creatinine clearance, BNP level) were expressed as x±s, and t-test was used for comparison between groups. $p<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

A total of 72 people were included, including 40 cases in the recombinant human brain natriuretic titanium group and 32 cases in the control group. Heart rate (84.95±4.840 times/min *vs*. 87.67±4.581) times/min), SBP (133±5.329 mmHg *vs*. 139.81±4.863 mmHg), DBP (82.05±2.740 mmHg *vs*. 80.33±3.3534 mmHg), blood glucose level (7.324±0.644 mmol/l *vs*. 8.667±1.173 mmol/l), Blood creatinine level (95.98±14.678 mmol/l *vs*. 91.75±14.054 mmol/l), TG (4.886±0.233 mmol/l *vs*. 4.566±0.317 mmol/l), LDL-C ((3.305±0.865) mmol/l *vs*. (2.790±0.893) mmol/l), BNP (4893±2134) ng/l *vs*. (3502±981) ng/l), LVEF ((58.4±23.2) % *vs*. (58.2±21.2) %), the difference was not statistically significant ($p>0.05$), as shown in Table 1.

After 2 w of standardized treatment, the improvement of SBP (-4.88±1.25 mmHg *vs*. -2.12±1.17 mmHg), Serum Uric Acid (SUA) (3.21±0.62 $\mu mol \cdot l^{-1}$ *vs*. -2.63±1.34 $\mu mol \cdot l^{-1}$), eGFR (1.37±2.56 $ml \cdot min^{-1} \cdot 1.73^{-1} \cdot m^{-2}$ *vs*. -1.08±3.65 $ml \cdot min^{-1} \cdot 1.73^{-1} \cdot m^{-2}$) and other cardiovascular risk factors in the recombinant human brain natriuretic titanium group was more obvious than that in the control group (Table 2).

Comparison of BNP (208.32±59.67) ratio (184.58±88.76), LVEF (62.52±6.84) ratio (61.84±7.56) and LVEDD (45.62±3.88) ratio (45.36±3.16) between the two groups before treatment. There were no significant differences ($p>0.05$). After standardized drug treatment, BNP levels in both groups were improved, and BNP levels in recombinant human brain natriuretic titanium group were significantly higher than those in control group ((154.38±67.58) *vs*. (173.05±64.32)) ($p<0.05$). The level of LVEF in the recombinant human brain sodium titanium group was lower than that before treatment (62.08±5.39) *vs*. (62.15±6.06), and that in the control group was higher than that before treatment (46.23±4.03) *vs*. (46.17±3.95), but there was no statistical significance between the two groups ($p>0.05$) (Table 3). There were no symptoms of acute heart failure, aggravation of heart failure, malignant arrhythmia, angina pectoris and so on.

TABLE 1: COMPARISON OF BASIC CLINICAL DATA BETWEEN THE TWO GROUPS

Variable	Recombinant human brain natriuretic titanium group	Control group	T/Z	p
Heart rate (times/min)	84.95±4.840	87.67±4.581	0.407	0.686
SBP (mmHg)	133±5.329	139.81±4.863	0.83	0.410
DBP (mmHg)	82.05±2.740	80.33±3.3534	0.383	0.704
Blood glucose level (mmol/l)	7.324±0.644	8.667±1.173	1.003	0.322
Blood creatinine level (μmol/l)	95.98±14.678	91.75±14.054	0.208	0.836
TG (mmol/l)	4.886±0.233	4.566±0.317	0.814	0.42
LDL-C (mmol/l)	3.305±0.865	2.790±0.893	1.898	0.065
BNP (ng/l)	4893±2134	3502±981	0.592	0.557
LVEF (%)	58.4±23.2	58.2±21.2	0.061	0.952

TABLE 2: COMPARISON OF CARDIOVASCULAR RISK FACTORS BEFORE AND AFTER TREATMENT BETWEEN THE TWO GROUPS

Index increment	Recombinant human brain natriuretic titanium group	Control group	p
SBP/mmHg	-4.88±1.25	-2.12±1.17	0.006
DBP/mmHg	-1.88±2.56	1.27±2.33	0.157
SUA/($\mu mol \cdot l^{-1}$)	3.21±0.62	-2.63±1.34	0.045
eGFR/($ml \cdot min^{-1} \cdot 1.73^{-1} \cdot m^{-2}$)	1.37±2.56	-1.08±3.65	0.028

TABLE 3: COMPARISON OF CARDIAC FUNCTION INDEXES BETWEEN THE TWO GROUPS

Index increment		Recombinant human brain natriuretic titanium group	Control group	p
BNP (ng/l)	Before medication	208.32±59.67	184.58±88.76	0.842
	After 2 w of medication	154.38±67.58	173.05±64.32	0.038
LVEF (%)	Before medication	62.52±6.84	61.84±7.56	0.966
	After 2 w of medication	62.08±5.39	62.15±6.06	0.887
LVEDD (mm)	Before medication	45.62±3.88	45.36±3.16	0.684
	After 2 w of medication	46.23±4.03	46.17±3.95	0.754

Myocardial infarction is a serious acute heart disease in cardiovascular department, which seriously troubles the health of patients and even endangers the lives of patients at any time. Myocardial infarction is most common in patients with coronary heart disease, coronary heart disease patients have atherosclerosis in the coronary arteries, can also contain unstable plaque. The coronary artery is an important channel for supplying blood and oxygen to the heart. Once the unstable plaque rupture of the coronary artery occurs, acute thrombosis will occur in the coronary artery, resulting in acute interruption of the coronary blood flow. This causes a sudden loss of blood supply to the heart muscle, resulting in death of the heart muscle cells. If the heart muscle cells are dead, an AMI has occurred. The heart is the most important pump in the blood circulation, responsible for pumping arterial blood to the aorta and its important branches, supplying blood and oxygen to each important organ. If there is an AMI, it will lead to a sudden decline in the function of the pump, and it will cause an instant shortage of blood supply to important organs, and serious cases will endanger the life of the patient at any time. Therefore, if patients with coronary heart disease have a series of symptoms such as severe chest tightness, shortness of breath, chest pain, pale face, sweating, etc., they should go to the emergency department of the nearest hospital for treatment at the first time. Heart failure is caused by various cardiovascular diseases or other diseases that involve the heart and cause changes in the structure of the heart, which affects the normal systolic and diastolic functions after heart remodeling, and then the heart function declines. Heart failure is the manifestation of the heart when various diseases have developed to a certain extent, even to the end stage. After the occurrence of heart failure, there may be obvious clinical symptoms, without timely intervention and treatment, it may lead to poor prognosis, serious malignant arrhythmia, and even sudden death. The prominent manifestations of left heart failure are dyspnea, decreased activity tolerance, and inability to lie flat at night. If there is dysfunction of the right heart, the main manifestation is systemic circulation congestion, such as gastrointestinal congestion as abdominal distension, decreased appetite, significant edema of both lower limbs, liver congestion and pain, left heart and right heart failure usually occur at the same time, after the occurrence of such symptoms, through cardiac ultrasound, blood test BNP, can be a rapid diagnosis of heart failure. According to the ejection fraction in echocardiography, heart failure can be divided into different types, such as heart failure with reduced ejection fraction and heart failure with preserved median ejection fraction.

Human brain natriuretic peptide usually refers to freeze-dried recombinant human brain natriuretic peptide. Freeze-dried recombinant human brain natriuretic peptide can relieve dyspnea caused by acute decompensated heart failure; the disadvantage is that it is easy to cause hypotension. This product is a sterile lyophilized preparation produced by recombinant DNA technology using *E. coli*. The amino acid sequence has the same part as the endogenous brain natriuretic peptide produced by ventricular muscle. After injection into the body, it can rapidly reduce the front and back load of the heart, thus relieving the symptoms of dyspnea. However, the product can rapidly reduce arterial pressure throughout the body, so some people may experience low blood pressure such as dizziness, fatigue, and nausea after use. The drug belongs to the prescription class of drugs, so it needs to be used under the guidance of a doctor. During the medication, pay more attention to rest and keep the surrounding air circulation, which is conducive to the relief of symptoms. The functions of recombinant human brain natriuretic peptide include the following; it has the effect of promoting water discharge in the body,

alleviating the symptoms of urination discomfort, so as to reduce water and swelling. It can dilate blood vessels and promote blood circulation, which can achieve the effect of reducing blood pressure. After use, the cardiac output can be increased, which has the effect of reducing cardiac load, and can alleviate the symptoms of breathing difficulties after the patient is slightly active. Can dilate arteries and veins, thereby reducing the front and rear load of the heart, reduce the degree of breathing difficulties and systemic symptoms of heart failure patients. Recombinant human brain natriuretic peptide may be accompanied by symptoms of decreased kidney function. At this time, it is recommended that patients take furosemide tablets, torasemide tablets and other drugs to relieve symptoms as prescribed by a doctor[8-10].

After AMI, the inflammatory system is activated in a cascade; the ventricular wall in the infarction area becomes thinner and elongated; the local swelling in the infarction area, and the myocardial hypertrophy in the non-infarction area. After (3-5) d, fibroblasts are highly expressed and ventricular and atrial scar deposition progresses, and pathological remodeling occurs due to compensatory activation of the sympathetic nervous system and the Renin-Angiotensin-Aldosterone System (RAAS). This can lead to or aggravate heart failure. Even after PCI reperfusion, 30 % of patients still have adverse cardiac remodeling 6 mo after surgery[11-13].

In this study, BNP levels in both groups after standardized drug treatment were lower than before. Recombinant human brain natriuretic peptide is a kind of endogenous peptide synthesized by genetically recombinant engineered bacteria starting from *E. coli*, which has the same composition, biological activity and action mechanism as endogenous peptides synthesized in ventricular muscle[14,15]. After binding to the receptor of type A natriuretic peptide, neoactivin is coupled to guanylate cyclase, and then plays a vasodilating role through cyclic Guanosine Phosphate/Protein Kinase G (cGMP/PKG) pathway. Its pharmacological effects are summarized as follows; improve hemodynamic parameters, balance integrated dilated lung circulation (arteries and veins), reduce the front and back load of the heart, rapidly improve dyspnea and fatigue symptoms, and no drug resistance; diuretic sodium discharge, reduce volume load, increase urine volume without affecting urine potassium and blood creatinine; multilink antagonism to cardiotoxicity caused by over activation of the neuroendocrine system (RAAS system, sympathetic nervous system, endothelin, and vasopressin). Therefore, early neoactivin in patients with AMI can antagonize the RAAS system and sympathetic nervous system in multiple stages in early stage, thereby delaying cardiac remodeling, avoiding myocardial hyperplasia and hypertrophy and interstitial fibrosis, and reducing the mortality of patients[16,17].

In addition, this study has shown that in addition to improving heart function, the recombinant human brain natriuretic titanium group can also improve cardiovascular risk factors, especially blood pressure and renal function damage[18-21]. Sacubitril+valsartan was the first dual inhibitor of angiotensin II receptor and enkephalase. It not only has a natriuretic peptide system that can protect the heart, but also can inhibit the over-activation of RAAS. It is a class I drug recommended by the current guidelines for heart failure and is widely used in clinical practice. However, there is limited experience in patients with severe renal impairment (eGFR <30 ml/min/1.73 m^2), which may aggravate renal impairment or lead to electrolyte disturbance. However, there is no evidence of limited use of recombinant human brain sodium titanum for renal damage, and its effects on improving hemodynamic parameters, reducing pressure load and volume load, and antagonizing RAAS system can also reduce Serum Creatinine (SCr) level and increase eGFR of patients after PCI[22-25].

In this study, no acute heart failure, aggravation of heart failure, renal function impairment, and acute coronary syndrome occurred during hospitalization. However, this study did not include AMI crime blood vessels and Door-To-Balloon (DTB) time in the analysis indicators. In the future, this study will gradually include the above two indicators in the analysis.

In conclusion, recombinant human brain natriuretic peptide group can improve the prognosis of elderly patients with AMI. However, the sample in this study is limited and the follow-up time is short. With the increase of the included population and the extension of the follow-up time, we may face new clinical problems.

Conflict of interests:

The authors declared no conflict of interests.

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