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Observation of Clinical Treatment Efficacy in Severe Heart Failure of Geriatric Cardiology

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Abstract: Objective: To explore the clinical treatment efficacy of severe heart failure in geriatric cardiology. **Methods:** A total of 122 cases of severe heart failure patients admitted to our hospital from January 2022 to December 2023 were selected as the research subjects. The patients were divided into two groups using digital random grouping method, with 61 cases in each group. The control group was treated with metoprolol, while the experimental group was treated with metoprolol combined with eplerenone hydrochlorothiazide. The occurrence rate of adverse reactions and treatment efficacy of clinical indicators were compared between the two groups.**Results:** There was no significant difference in the incidence of adverse reactions ($P > 0.05$); the clinical indicators of the experimental group were better than those of the control group, and the total effective rate of treatment was higher than that of the control group. The difference in comparison results was statistically significant ($P < 0.05$). **Conclusion:** For the treatment of severe heart failure in geriatric patients in cardiology, metoprolol combined with eplerenone hydrochlorothiazide can be used, which can significantly improve the clinical signs of patients, increase the total effective rate of treatment, and will not significantly increase the risk of adverse reactions. It is worth further promotion and application.

Keywords: Cardiology; Severe heart failure; Geriatric patients

The physiological functions of the elderly deteriorate rapidly, leading to a decrease in the working capacity of tissues and organs, and making them prone to various functional disorders[1]. Heart failure is a common disease among elderly patients, which is a cardiac condition caused by left ventricular dysfunction. It often manifests as symptoms such as difficulty breathing, fatigue, and coughing up blood. When aggravated, it can lead to acute events such as cardiac arrest and death. Medication is an important method for treating heart failure, as it helps alleviate the burden on the heart and improves the function of myocardial cells. Currently, combination therapy is widely used in clinical practice for treating severe heart failure, such as dual and quadruple drug regimens. By combining different types of anti-heart failure drugs, better treatment outcomes can be achieved compared to using single or multiple drugs alone. Some studies have suggested that the combination of metoprolol and valsartan-hydrochlorothiazide has a good effect in treating severe heart failure. To gain a deeper understanding of this, further research has been conducted.

1. Data and Methods

1.1 General Information

A total of 122 cases of severe heart failure patients admitted to our hospital from January 2022 to

December 2023 were selected as the research subjects. The patients were divided into two groups, with 61 patients in each group, using digital random grouping method: control group and experimental group. The ages ranged from 60 to 81 years old, with a mean age of (67.59±3.48) years. Inclusion criteria: ① meeting the diagnostic criteria for severe heart failure [3]; ② severe respiratory distress with pink frothy sputum; ③ age ⩾ 60 years old; ④ signing informed consent. Exclusion criteria: ① cognitive, mental, and communication disorders; ② hepatic or renal dysfunction; ③ concurrent malignant tumors and major infections; ④ patients who died midway. There was no statistically significant difference in general patient data ($P > 0.05$).

1.2 Methods

Control group: Treatment with metoprolol. Metoprolol 50mg tablets, 1 tablet each time, twice daily, with the dose adjusted according to the condition, not exceeding 150mg/d, for continuous treatment for 4 weeks.

Experimental group: Treatment with metoprolol combined with valsartan-hydrochlorothiazide. Same dose of metoprolol as the control group, combined with valsartan-hydrochlorothiazide 150mg/12.5mg tablets, taken before breakfast daily, with the dose adjusted according to the condition, not exceeding 300mg/25mg, for continuous treatment for 4 weeks.

1.3 Observation Indicators

Clinical indicators: Before and after treatment, examination of left ventricular ejection fraction, systolic blood pressure, and B-type natriuretic peptide in patients. Adverse reactions: Recording adverse reactions such as nausea, spasms, fatigue, and vomiting. Incidence rate = number of adverse cases / sample size × 100%. Treatment effect: Marked effect: improvement of left ventricular function by 2 grades, with ejection fraction increased by more than 10%; effective: improvement of left ventricular function by 1 grade, with ejection fraction increased by more than 10%; ineffective: unclear improvement in left ventricular function, and insignificant increase in ejection fraction. Overall effective rate = (marked effect + effective) / sample size × 100%.

1.4 Statistical Analysis

The data of the study results were processed using statistical software SPSS 23.0. Measurement data and count data were represented by $\bar{x} \pm s$ and (n, %), respectively. T-test and chi-square test were used to test the differences. The standard for testing was $P < 0.05$, indicating statistical significance.

2. Results

2.1 Comparison of Clinical Indicators

The improvement in left ventricular ejection fraction, systolic blood pressure, and B-type natriuretic peptide in the experimental group was significantly better than that in the control group ($P < 0.05$), as shown in **Table 1**.

Table 1 Comparison of Clinical Indicators [n,$\bar{x} \pm s$]

Group	Number	Left Ventricular Ejection Fraction (%)		Systolic Blood Pressure (mmHg)		B-type Natriuretic Peptide (pg/ml)	
		Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Control Group	61	27.69±4.48	37.64±3.37	142.36±11.28	125.69±8.96	1075.36±61.35	789.64±46.32
Experimental Group	61	28.13±4.61	42.53±3.43	141.89±12.21	117.34±9.21	1083.29±63.57	532.69±51.87
t		0.535	7.943	0.221	5.075	0.701	28.858
P		0.594	0.000	0.826	0.000	0.485	0.000

2.2 Comparison of Incidence Rate of Adverse Reactions

The comparison of incidence rates of adverse reactions showed no significant difference ($P > 0.05$), as shown in **Table 2**.

Table 2: Comparison of Incidence Rate of Adverse Reactions [n, %]

Group	Number	Nausea	Cramps	Fatigue	Vomiting	Incidence Rate (%)
Control Group	61	2	1	1	1	8.20
Experimental Group	61	1	2	2	1	9.84
x^2						0.100
P						0.951

2.3 Comparison of Treatment Efficacy

The total effective rate of treatment in the experimental group was significantly higher than that in the control group ($P < 0.05$), as shown in **Table 3**.

Table 3: Comparison of Treatment Efficacy [*n*, %]

Group	Number of Cases	Remarkable Effect	Effective	Ineffective	Total Effective Rate (%)
Control Group	61	10	37	14	77.05
Experimental Group	61	9	48	4	93.44
x^2					6.517
P					0.038

3. Discussion

With the significant aging of our society, the elderly population has rapidly increased, leading to a higher risk and incidence of various diseases among the elderly, among which cardiovascular diseases, such as heart failure, are prevalent. Heart failure in the elderly is associated with a high risk of mortality and recurrence, posing a significant threat to their life and health. Most elderly heart failure patients start with left ventricular dysfunction, leading to decreased cardiac output due to impaired left ventricular ejection, resulting in blood stasis in the heart and increased workload. Heart failure often manifests as respiratory distress, fatigue, and coughing with blood, particularly exacerbated during exertion, and in severe cases, it can lead to acute events like cardiac arrest and death. Some patients experience nocturnal onset of symptoms, primarily characterized by paroxysmal nocturnal dyspnea, with patients often waking up at night with a feeling of suffocation, which typically resolves after about 30 minutes of rest. Nearly all patients with heart failure experience fatigue, weakness, and reduced stamina, especially after physical exertion. Some may also exhibit symptoms like cognitive decline, confusion, and hallucinations. Diagnosis of heart failure typically involves a combination of medical history and physical examination, with patients with conditions like hypertension and myocardial infarction being at higher risk. Symptoms often include respiratory distress, pallor, and coughing, with a few patients even presenting with pink frothy sputum. The mechanism of heart failure has long been a focus of research and is a critical aspect to overcome in developing treatment techniques. Although there is no unified theory on the mechanism of heart failure in medical research, myocardial remodeling is considered one of the significant causes. Myocardial remodeling is associated with abnormal gene expression, primarily involving changes in protein and calcium regulatory genes, resulting in altered myocardial contractility, thereby leading to decreased cardiac output. Therefore, improving myocardial cell function is crucial for treatment. Currently, various drugs are used clinically to treat heart failure, including diuretics, nitrates, vasodilators, and beta-blockers, all aimed at reducing the workload on the heart. Metoprolol, a beta-blocker also known as metoprolol tartrate, is commonly used to treat heart failure, with promising clinical outcomes. Its main function is to increase the number of beta receptors, providing the basis for myocardial contraction, while also reducing calcium ion influx and myocardial oxygen consumption, thereby controlling heart rate. Typically, the drug is initiated at the lowest dose, with adjustments made as tolerance increases and sensitivity decreases over time. Eplerenone/hydrochlorothiazide is a combination drug comprising eplerenone and hydrochlorothiazide, primarily used to treat hypertension. Eplerenone acts by blocking the binding of angiotensin II to AT1 receptors, limiting aldosterone secretion, promoting vasodilation, and reducing blood pressure. This drug can reverse left ventricular hypertrophy and alleviate the pumping burden on the heart. Hydrochlorothiazide is a diuretic that promotes the reabsorption of sodium and chloride ions by the kidneys, increasing urine output, which in turn reduces blood pressure and relieves the heart's burden. The combination of metoprolol and eplerenone/hydrochlorothiazide in the treatment of elderly heart failure can be highly effective. Since most elderly heart failure patients also have hypertension, which exacerbates the cardiac workload, these two drugs can work together to reduce vascular pressure and achieve anti-heart failure effects. The results of this study show that the improvement in left ventricular ejection fraction, systolic blood pressure, and B-type

natriuretic peptide in the experimental group were significantly better than those in the control group ($P < 0.05$), indicating that combination therapy has a significant effect on improving myocardial function and reducing systolic blood pressure, which is closely related to the action of antihypertensive drugs. Comparing the incidence of adverse reactions between the two groups, it was found to be 9.84% and 8.20% for the experimental and control groups, respectively ($P > 0.05$), indicating that the use of eplerenone/hydrochlorothiazide does not significantly increase the risk of adverse reactions in patients. Analysis of the total effective rate of treatment revealed that the total effective rate in the experimental group was significantly higher than that in the control group ($P < 0.05$). Clinical practice commonly adopts combination therapy because patients with heart failure often have multiple comorbidities, and heart failure is not caused by a single disease. Therefore, combination therapy can control multiple diseases, especially hypertension. Compared to single anti-heart failure drugs, combination therapy can reduce the risk of acute heart failure and avoid conditions such as myocardial infarction and cardiac arrest. However, when using combination therapy, attention must be paid to whether patients are allergic to relevant drugs or have renal insufficiency. The selection of drug types and dosages should be based on the patient's condition and physical condition to avoid adverse reactions due to excessive drug use. Although the results of this study show that the incidence of adverse reactions between combination therapy and monotherapy did not differ significantly, actual drug use may still result in various adverse reactions due to the patient's physical condition, so attention should be paid when using medications. Overall, combination therapy plays a positive role in controlling blood pressure and reducing the cardiac workload in patients, with 93.44% of patients experiencing significant changes in symptoms. In subsequent clinical treatment, this result can serve as a reference for designing more combination therapy regimens for the treatment of acute heart failure, further reducing the mortality rate of elderly patients with acute heart failure and safeguarding the life and health of the elderly.

In summary, for the treatment of elderly severe heart failure in the cardiology department, the use of metoprolol combined with eplerenone/hydrochlorothiazide can significantly improve clinical symptoms, increase the total effective rate of treatment, and does not significantly increase the risk of adverse reactions, thus worthy of further promotion and application.

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