Effect of Shensong Yangxin capsule in combined with metprolol succinate on the hemodynamics and heart rate variability in patients with arrhythmia of coronary heart disease

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1. Introduction

Coronary heart disease (CHD) is a kind of disease characterized by myocardial ischemia, anoxia, or necrosis caused by coronary artery stenosis or occlusion due to atherosclerosis (AS)[1]. Myocardial ischemia and anoxia in CHD patients will often cause arrhythmia in different degrees, resulting in a further deterioration, alteration of hemodynamics, and even major adverse cardiovascular events[2]. Arrhythmia is caused by the organic or functional lesions of cardiac pacemaker conduction system, while myocardial ischemia and anoxia is a main cause for arrhythmia[3]. Inhibition of myocardial conduction system is mainly involved in the treatment of arrhythmia in patients with CHD in the clinic through improving the hemodynamics to enhance the therapeutic effect[4]. The study is aimed to explore the effect of Shensong Yangxin capsule in combined with metprolol succinate on the hemodynamics and heart rate variability (HRV) in patients with arrhythmia of CHD.
2. Materials and methods

2.1. General materials

A total of 90 patients with arrhythmia of CHD who were admitted in our hospital from October, 2016 to September, 2017 were included in the study and randomized into the observation group and the control group. In the observation group, there were 45 cases, among which 28 were male, and 17 were female; aged from 55 to 76 years old, with an average age of (66±9) years old; course from 3 to 12 years old, with an average course of (6±1) years; 20 had ventricular premature beat (VPB), 14 had atrial premature beat (APB), and 11 had junctional premature beat (JPB). In the control group, there were 45 cases, among which 27 were male, and 18 were female; aged from 56 to 78 years old, with an average age of (65±9) years old; course from 3 to 13 years old, with an average course of (6±1) years; 21 had VPB, 15 had APB, and 9 had JPB. The comparison of age, gender, premature beat type, and course between the two groups was not significantly different (P>0.05).

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) those who were in accordance with the diagnostic criteria of CHD merged with arrhythmia[5]; (2) those who were confirmed by the cardiogram, cardiac ultrasound, and cardiac markers; (3) those who had signed the informed consents. Exclusion criteria: (1) those who had arrhythmia caused by drugs; (2) those who had bradycardia, liver and renal insufficiency, atrioventricular block, myocardial infarction, acute coronary syndrome, thyroid disease, acid-base imbalance, and electrolyte disturbance; (3) those who were allergic to related drugs and had incomplete medical materials.

2.3. Methods

The patients in the two groups were given routine heart strengthening, lipid lowering, nitrates, diuretics, ACEI, myocardial nourishing, and positive inotropic action. The patients in the control group were given Shensong No. 20150044), 1 time/d, initial dose of 3.75 mg/time, increasing to 47.5 mg/time after 2 weeks, gradually adjusting to 95 mg/time according to the blood pressure and heart rate. On the above basis, the patients in the observation group were given Shensong Yangxin capsule (produced by Beijing Yiling Pharmaceutical Co. Ltd, Approval No. Z20103032), 3 tablets/time, 3 times/d. After a continuous 4-week treatment, the efficacy was evaluated. During the therapeutic process, the patients were guided to abandon the unhealthy living habit, cultivate the regular bowl evacuation habit, understand the disease cause and matters needing attention to obtain their positive partner treatment in order to reduce the unhealthy phenomenon. The medical workers should actively communicate with the patients, give their comforts and encouragement, help them establish the confidence to overcome the disease, and explain the importance of drug adherence in order to enhance the medication compliance and inhibit a further myocardial damage. According to the actual situation, the principal of step by step was followed. The patients are guided to take appropriate aerobic exercise.

2.4. Observation indicators

The morning fasting venous blood before and after treatment was collected and centrifuged for the serum. The non-invasive hemodynamics detector was used to detect ESR, HCT, np, nbh, and nbl. The blood was centrifuged for the serum. ELISA was used to detect VEGF. The scattering turbidimetry was used to detect CRP and BNP, and 24 h ECG monitoring was performed before and after treatment. Premature beat number and HRV indicators, including SDNN, SDANN, RMSSD, SDNNI, and PNN50 were detected.

2.5. Statistical analysis

SPSS 19.0 software was used for the statistical analysis. Chi-square test was used for the enumeration data. The measurement data which were conformed to the normal distribution were expressed as mean ± SD. The independent t test (homogeneity of variance) and t test (heterogeneity of variance) were used for the comparison between the two groups. P<0.05 was regarded as statistically significant.

3. Results

3.1. Comparison of the hemodynamic change before and after treatment

The comparison of ESR, HCT, np, nbh, and nbl before treatment between the two groups was not significantly different (P>0.05). ESR, HCT, np, nbh, and nbl after treatment were significantly reduced when compared with before treatment (P<0.05). ESR, HCT, np, nbh, and nbl after treatment in the observation group were significantly lower than those in the control group (P<0.05) (Table 1).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
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<td>13.84±4.78</td>
<td>55.26a±5.94</td>
<td>30.74±6.23</td>
<td>2.11±0.28</td>
<td>1.12±0.15</td>
<td>6.28±1.15</td>
<td>4.07±0.79</td>
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*P<0.05, when compared with before treatment.
Comparison of HRV indicators before and after treatment between the two groups.

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*P<0.05, when compared with before treatment.

Comparison of HRV indicators before and after treatment between the two groups.

<table>
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3.2. Comparison of CRP, VEGF, and BNP before and after treatment between the two groups

The comparison of CRP, VEGF, and BNP before treatment between the two groups was not significantly different (P>0.05). CRP, VEGF and BNP after treatment were significantly reduced when compared with before treatment (P<0.05). CRP, VEGF and BNP after treatment in the observation group were significantly lower than those in the control group (P<0.05) (Table 2).

3.3. Comparison of HRV indicators before and after treatment between the two groups

The comparison of SDNN, SDANN, SDNNI, RMSSD, and PNN50 before treatment between the two groups was not significantly different (P>0.05). SDNN, SDANN, SDNNI, RMSSD, and PNN50 after treatment were significantly elevated when compared with before treatment (P<0.05). SDNN, SDANN, and PNN50 after treatment in the observation group were significantly higher than those in the control group (P<0.05). The comparison of SDNNI and RMSSD after treatment between the two groups (P>0.05) (Table 3).

4. Discussion

CHD is a common cardiovascular disease with myocardial ischemia and anoxia as the main pathological change, while ischemia and anoxia are the important pathological basis for arrhythmia. Myocardial ischemia and anoxia can cause the excitement of cardiac vagus-sympathetic nerve afferent fiber to induce the abnormal regulation of autonomic nervous system, which is associated with the sudden cardiac death, while the ventricular premature beat is a potential risk factor for arrhythmia, predicting that the risk of sudden is greatly increased in patients with asymptomatic myocardial ischemia[7]. Some researches demonstrate that[8] myocardial ischemia and anoxia can increase the stress sensitivity of myocardial cells and strengthen the activity of sympathetic nerves, which can induce arrhythmia and increase the death risk; therefore, CHD merged with arrhythmia should be positively treated in the clinic in order to enhance the living quality, and reduce the case fatality rate.

Metroprolol succinate sustained release tablet is a high selective β1 receptor blocker, can increase the myocardial contractility, correct the expression of abnormal genes, inhibit the activity of sympathetic nerves, reduce the myocardial oxygen consumption, delay the myocardial remodeling, and improve the myocardial energy metabolism and myocardial ischemia[9]. Metroprolol succinate sustained release tablet can delay the progression of AS, resist AS independent of statins, weaken the effect of catecholamine correlated with the physiological and psychological load, reduce the heart rate, blood pressure, and cardiac output, limit the internal flow of Ca2+, lower the spontaneous depolarization speed in the relaxation period, inhibit the autorhythmicity of myocardial cells, restrain the impulse conduction factors, and contribute to delay the effective refractory period in order to effectively eliminate the arrhythmia[10]. It is reported that[11] the autonomic nervous system function damage in patients with asymptomatic myocardial ischemia is closely associated with the cardiac sudden death. Metroprolol succinate sustained release tablet can effectively improve the myocardial ischemia state, recover the balance of autonomic nerves, and contribute to prevent the occurrence of arrhythmia and sudden death. It is argued by the traditional Chinese medicine that[12] CHD merged with arrhythmia is caused by weak qi collateral due to deficiency of both qi and yin, and venation malnutrition, which
is similar to arrhythmia caused by insufficient myocardial blood supply and autonomic nervous dysfunction, with blood activating, blood stasis dispersing, yin nourishing, qi tonifying, and Dingqi as the main treatments. Shensong Yangxin capsule is mainly composed of ginseng, Radix ophiopogonis, Radix paeoniae rubra, Salvia miltiorrhiza, evodia rutacearpa, spikenard, dragon bone, Coptis chinensis, and parched wild jujube seed, and has efficacies of Qi supplementing and blood circulation promoting, blood circulation promoting and blood stasis removing, heart calming and mind tranquilizing, and Yin nourishing and lung tonifying. The modern pharmacological researches demonstrate that[13] Shensong Yangxin capsule can improve the myocardial metabolism, increase the myocardial oxygen-resistant and anoxia ability, inhibit the internal flow of Ca$^{2+}$, reduce the cell autorhythmicity, regulate the autonomic nervous function, lower the serum lipid level, inhibit the blood platelet aggregation, improve the micro-circulation, and has a favorable effect in regulating the various arrhythmia. The results in the study showed that ESR, HCT, np, nbh, and nbl after treatment in the two groups were significantly reduced when compared with before treatment (P<0.05); ESR, HCT, np, nbh, and nbl after treatment in the observation group were significantly lower than those in the control group (P<0.05), indicating that Shensong Yangxin capsule can effectively improve the hemodynamics in patients with arrhythmia of CHD.

VEGF can promote the proliferation and differentiation of endothelial cells, facilitate the generation of new blood vessels, improve the myocardial micro-circulation, alleviate the myocardial edema, and improve the prognosis of CHD. BNP is a heart and brain neurohormone released by the ventricle, and can be synthetized and secreted by the stimulation of myocardial ischemia and anoxia, and the increasement of ventricular pressure load and volume. CRP is a symbolic cytokine of systemic inflammatory reaction, can activate the inflammatory cells to cause anoxia and vasospasm, and independently regulate the cardiac function[14]. Some scholars argue that metoprolol succinate sustained release tablet can effectively alleviate the inflammatory reaction, and better control the symptoms of arrhythmia[15]. The results in the study showed that CRP, VEGF, and BNP after treatment were significantly reduced when compared with before treatment (P<0.05); CRP, VEGF, and BNP after treatment in the observation group were significantly lower than those in the control group (P<0.05), indicating that Shensong Yangxin capsule in combined with metoprolol succinate can better alleviate the inflammatory reaction in patients with arrhythmia of CHD, which is significantly superior to that in the control group. HRV refers to the change of the difference between the successive heartbeat cycle, is an important indicator to reflect the tension and balance of sympathetic nerve and parasympathetic nerve, reflect the mutual balance relationship between the cardiac nerve conduction and internal and external environment with the highest cardiac pacemaker, and show the change of central nervous system in regulating the related factors[16]. The stability of cardiac electrocardiogram is dependent on the balance regulation of body fluid, vagus, and sympathetic nerve, while the mean standard deviation of HRV is representative of the heart rate change degree, reflect the sympathetic nerve function, the total standard deviation can reflect the total heart rate variability degree, PNN50 and D-value root are representative of the rapid change degree of heart, and reflect the vagus function; therefore, HRV is an important indicator to reflect the autonomic nerve tension[15,17]. Arrhythmia in patients with CHD is mainly caused by the elevation of sympathetic nerve excitability and the reduction of vagus excitability, while the change of autonomic nerve excitability will inevitably change HRV; therefore, HRV can be indirectly served as an indicator to predict the sudden death caused by the cardiovascular disease[18]. Some researches demonstrate that[9] the cardiac autonomic nerve function is damaged in patients with long-term myocardial ischemia, the parasympathetic nerve activity is reduced, the plasma and cardiac catecholamine level is elevated, and the sympathetic nerve tension is hyperactive, resulting in the reduction of HRV. The results in the study showed that SDNN, SDANN, SDNNI, RMSSD, and PNN50 after treatment were significantly elevated when compared with before treatment (P<0.05); SDNN, SDANN, and PNN50 after treatment in the observation group were significantly higher than those in the control group (P<0.05), indicating that the vagus disorder is mainly involved in the autonomic nervous dysfunction in patients with arrhythmia of CHD; Shensong Yangxin capsule in combined with metoprolol succinate can significantly improve HRV and enhance the cardiac function.

In conclusion, Shensong Yangxin capsule in combined with metoprolol succinate can effectively improve the hemodynamics in patients with arrhythmia of CHD, alleviate the inflammatory reaction, improve HRV, and enhance the therapeutic effect.

References


