

## Original Article

# Curative effect of Danhong injection on the clinical symptoms, adverse reactions and electrocardiogram of angina pectoris of coronary heart disease

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**Abstract:** Objective: To investigate the improvement effect of Danhong injection on the clinical symptoms, cardiac function, adverse reactions and electrocardiogram of patients with angina pectoris of coronary heart disease. Methods: One hundred and sixty patients with angina pectoris of coronary heart disease treated in our hospital from January 2013 to December 2016 were selected as the subjects. The patients were divided into treatment group and control group randomly, 80 cases in each group. The control group received routine comprehensive anti-anginal therapy. Danhong injection was added to the treatment group and other medications were the same as the control group. The treatment effect of angina pectoris, improvement of cardiac function and the occurrence of adverse reactions were analyzed and compared between the two groups. Results: Compared with the control group, the duration and seizure frequency of angina pectoris were significantly reduced in the treatment group ( $P=0.000$ ). Besides, the total effective rate in the treatment group was 93.75%, significantly higher than that in the control group (77.5%) with statistically significant difference ( $P=0.012$ ). In addition, the total effective rate of electrocardiogram improvement in the treatment group (85%) was also significantly higher than that in the control group (65%) ( $P=0.016$ ). And the improvement of cardiac function in the treatment group was obviously better than that in the control group with statistically significant difference ( $P=0.000$ ). However, there was no significant difference in the incidence of adverse reactions between the two groups. Conclusion: The clinical effect of Danhong injection was obvious in the treatment of angina pectoris of coronary heart disease, with high safety and without any adverse reactions. And the improvement of ischemic electrocardiogram changes and cardiac function were remarkable. Therefore, Danhong injection was an effective drug for the treatment of angina pectoris of coronary heart disease.

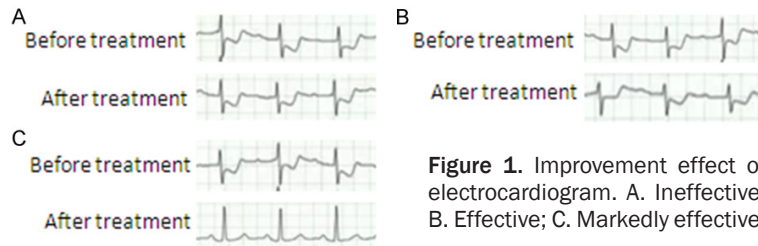
**Keywords:** Danhong injection, improvement effect, angina pectoris of coronary heart disease

## Introduction

Coronary heart disease, at present, is the most common cardiovascular disease. Its morbidity and mortality have been increasing year by year, threatening human health seriously [1, 2]. The pathological basis of coronary heart disease is the insufficiency of myocardial blood supply caused by coronary stenosis, resulting in the transient hypoxic-ischemic precordialgia. It is also called stable angina pectoris [3, 4]. In recent years, the incidence of angina pectoris of coronary heart disease is comparatively higher and shows an increasing trend. Meanwhile, this disease becomes more prevalent among a younger age group. The treatment principle of angina pectoris of coronary heart disease is to

actively improve myocardial blood supply and reduce oxygen consumption. Danhong injection belongs to Chinese herbal medicine compound preparation. The main ingredients include *salviae miltiorrhizae radix*, safflower and so on, which have important effects in promoting blood circulation to remove blood stasis, dredging the channels and so on. Thus, Danhong injection could improve myocardial ischemia and prevent atherosclerosis lesion [5, 6]. However, there is still some controversies about the application of Danhong injection in the treatment of angina pectoris at present. Therefore, this study intended to observe the curative effects of Danhong injection on angina pectoris of coronary heart disease.

## Curative effect of Danhong injection



**Figure 1.** Improvement effect of electrocardiogram. A. Ineffective; B. Effective; C. Markedly effective.

### Materials and methods

#### Study subjects

One hundred and sixty patients who were definitely diagnosed as angina pectoris of coronary heart disease and treated in our hospital from January 2013 to December 2016 were selected in this study. All patients met the diagnostic criteria for angina pectoris of coronary heart disease [7]. This study had been approved by the Ethics Committee of the hospital. All patients had signed informed consent forms.

**Inclusion criteria:** Patients with clinical manifestations of precordial paroxysmal or crush pain, which is located in the posterior sternum and accompanied by radiating pain; each attack lasts 3 to 5 minutes and can be relieved after having rest or taking nitric acid ester preparation; objective evidence of myocardial ischemia is inclusive of ECG ST-T changes, positive exercise test or positive coronary angiography.

**Exclusion criteria:** Patients who had subsequent myocardial ischemia diseases resulted from aortic stenosis, hyperthyroidism, anemia and hypertrophic cardiomyopathy; patients who had diseases characterized by changes in the ST-T segment of the electrocardiogram induced by myocardial hypertrophy, ion disorder and bundle branch block; patients who had acute myocardial infarction, severe cardiac arrhythmia and severe hepatic and renal dysfunction.

#### Treatment method

According to random number table method, the selected patients were divided into treatment group and control group. There were 80 cases in each group. The control group received routine comprehensive anti-anginal therapy, including bed rest, oxygen inhalation, oral Betaloc to control ventricular rate, oral Bayaspirin for anti-coagulation, oral Lipitor to adjust blood lipid lev-

els and stabilize atherosclerotic plaques. The blood pressure of patients with hypertension was controlled by oral Norvasc and other drugs. The blood sugar levels of patients with diabetes mellitus were controlled by oral Metformin and other drugs. Under the same medication as the control

group, the treatment group was additionally treated with Danhong injection (produced by Jinan Buchang Pharmaceutical Co., Ltd.). The 30 ml of Danhong injection was added to 250 ml of normal saline or 5% glucose injection for intravenous drip infusion, which conducted once a day and lasted for two weeks.

#### Observation indexes

After 2 weeks of treatment, the treatment effects, improvement effect of cardiac function and adverse reactions of drug were observed in the two groups.

**Criteria of clinical efficacy:** The duration and seizure frequency of angina pectoris were compared between the two groups. If the seizure frequency of angina pectoris decreased less than 50%, it meant ineffective. If the seizure frequency of angina pectoris decreased between 50% and 80%, it meant effective. If the seizure frequency of angina pectoris decreased more than 80%, it meant markedly effective. Total effective rate = (effective cases + markedly effective cases)/total cases of the disease \*100%.

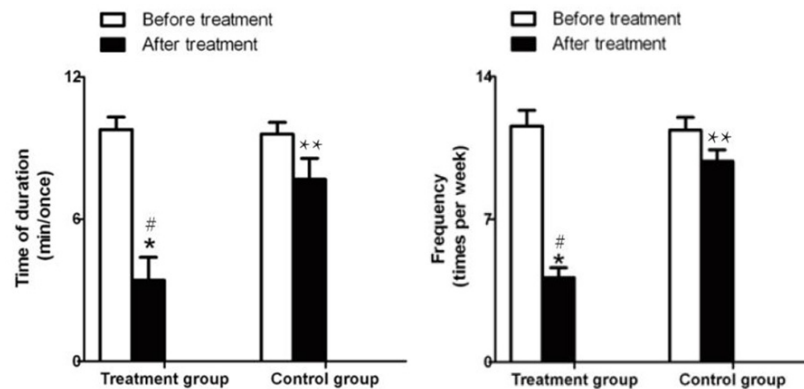
**Electrocardiogram improvement criteria:** In resting state, if the electrocardiogram did not change or worsened compared with before treatment, it meant ineffective (**Figure 1A**); if the recovery of ST segment in electrocardiogram was more than 0.05mV compared with that before treatment, and inverted T waves turned to flat or upright, and the flat T wave turned to upright, it meant effective (**Figure 1B**). If the ST segment depression in the electrocardiogram returned to normal, it meant markedly effective (**Figure 1C**). Total effective rate of electrocardiogram improvement = (effective cases + markedly effective cases)/total cases of the disease \*100%.

**NYHA grading criteria for the improvement of cardiac function:** effective: NYHA grading of

## Curative effect of Danhong injection

**Table 1.** Comparison of general data of the patients in two groups

	Treatment group (n=80)	Control group (n=80)	P value
Age (years)	56.8±11.4	58.9±12.3	0.135
Gender (cases)			0.428
Male	53	55	
Female	27	25	
Course of disease (years)	3.5±1.7	3.0±1.5	0.319
Combined basic disease (cases)			
Hypertension	22 (27.5%)	20 (25%)	0.284
Hyperlipidemia	6 (7.5%)	5 (6.25%)	0.295
Diabetes	12 (15%)	14 (17.5%)	0.411
NYHA grading of cardiac function (cases)			
II grade	58 (72.5%)	60 (75%)	0.217
III grade	14 (17.5%)	13 (16.25%)	0.323
IV grade	8 (10%)	7 (8.75%)	0.191



**Figure 2.** Comparison of the duration and seizure frequency of angina pectoris between the two groups. \*Compared with the patients in the treatment group before treatment,  $P < 0.001$ ; \*\*compared with the patients in the control group before treatment,  $P < 0.001$ ; #compared with the patients in the control group after treatment,  $P < 0.001$ .

cardiac function did not change or worsened. Effective: NYHA grading of cardiac function rose up one grade. Markedly effective: the cardiac function improved obviously, and the NYHA grading increased by two grades. Total effective rate of cardiac function improvement = (effective cases + markedly effective cases)/total cases of the disease  $\times 100\%$ .

**Adverse reactions:** The incidence of adverse reactions in two groups was observed during the treatment period.

### Statistical analysis

Software SPSS19.0 was used to analyze all the data in this study. The enumeration data was

expressed as rate and examined by chi-square test; paired  $\chi^2$  test was used to compare the changes of indexes before and after treatment;  $\chi^2$  test was used for the comparison of before and after treatment between two groups. The measurement data were presented as mean  $\pm$  standard deviation; independent sample t-test was used to examine the comparison between the two groups.  $P < 0.05$  meant the difference was statistically significant.

## Results

### Comparison of general data of the two groups

There were 80 patients in the treatment group, including 53 males and 27 females, with an average age of  $56.8 \pm 11.4$  years. The average course of disease was  $3.5 \pm 1.7$  years. There were 12 cases with diabetes, 22 cases with hypertension, 6 cases with hyperlipidemia. According to the NYHA grading of cardiac function,

58 patients were in grade II, 14 cases were in grade III, 8 cases were in grade IV (see **Table 1**).

There were also 80 patients in the control group, including 55 males and 25 females, with an average age of  $58.9 \pm 12.3$  years. The average course of disease was  $3.0 \pm 1.5$  years. There were 14 cases with diabetes, 20 cases with hypertension, 5 cases with hyperlipidemia. According to the NYHA grading of cardiac function, 60 patients were in grade II, 13 cases were in grade III, 7 cases were in grade IV. There was no significant difference in age ( $P = 0.135$ ), gender ( $P = 0.428$ ), course of disease ( $P = 0.319$ ) and combined basic diseases

## Curative effect of Danhong injection

**Table 2.** The treatment effect of angina pectoris of the patients in two groups

Group	Cases	Ineffective	Effective	Markedly effective	Total effective rate (%)	$\chi^2/P$ value
Control group	80	5	29	46	93.75	6.189/0.012
Treatment group	80	18	27	35	77.5	

**Table 3.** The electrocardiogram improvement rate of patients in two groups

Group	Cases	Ineffective	Effective	Markedly effective	Total effective rate (%)	$\chi^2/P$ value
Control group	80	12	40	28	85	6.028/0.016
Treatment group	80	28	29	23	65	

**Table 4.** The improvement rate of cardiac function of patients in two groups

Group	Cases	Ineffective	Effective	Markedly effective	Total effective rate (%)	$\chi^2/P$ value
Control group	80	4	14	62	95	12.375/0.000
Treatment group	80	31	13	36	61.25	

(all  $P>0.05$ ) in two groups. These data were comparable (see **Table 1**).

### *Comparison of clinical efficacy between two groups*

Compared with before treatment, the duration and seizure frequency of angina pectoris in both groups after treatment were significantly reduced (both  $P<0.05$ ). There was no statistically significant difference in the duration and seizure frequency of angina pectoris between two groups before treatment. After 2 weeks of treatment, the duration and seizure frequency of angina pectoris in the treatment group were significantly lower than those in the control group ( $P=0.000$ ), see **Figure 2**.

The total effective rate was 93.75% in the treatment group and 77.5% in the control group. The difference between the two groups was statistically significant ( $\chi^2=6.189$ ,  $P=0.012$ , **Table 2**).

The total effective rate of electrocardiogram improvement was 85% in the treatment group and 65% in the control group. The difference between the two groups was statistically significant ( $\chi^2=6.028$ ,  $P=0.016$ , **Table 3**).

### *Comparison of the improvement rate of cardiac function*

In the treatment group, there were 64 patients in NYHA grade I, 14 patients in NYHA grade II, 2 patients in NYHA grade III. In the control group, there were 49 patients in NYHA grade I, 22 patients in NYHA grade II and 9 patients in

NYHA grade III. The total effective rate of cardiac function improvement was 95% in the treatment group and 61.25% in the control group. The difference between the two groups was statistically significant ( $\chi^2=12.375$ ,  $P=0.000$ , **Table 4**).

### *Comparison of adverse reactions between the two groups*

There was no serious adverse reaction in the two groups. In the treatment group, 2 cases had facial flushing, and one patient had dizziness. The symptoms improved after continuous medication, which did not affect the observation process of the Danhong injection treatment. The difference of the incidence rate of adverse reactions between the treatment group and the control group was not statistically significant ( $P=0.272$ ).

## Discussion

In recent years, Chinese medicine treatment of angina pectoris of coronary heart disease has attracted more and more attention. Danhong injection is only consist of Chinese medicines prepared by modern processing of salviae miltiorrhizae radix, safflower extract and salvianolic acid in scientific proportion [8, 9]. The clinical studies have showed that salviae miltiorrhizae radix could reduce the level of cholesterol, low-density lipoprotein and high-sensitivity C-reactive protein in the body, reduce the formation of deposition and plaques of blood lipids in the vascular intima, protect vascular endothe-

lial cells and induce the secretion of plasma endothelin [10, 11]. Studies also have showed that *salviae miltiorrhizae radix* had apparently protective effects on the heart, mainly because it could reduce the infiltration of inflammatory factors, reduce the activation of inflammatory cells and the formation of free radicals and relax coronary arteries [12, 13]. Other studies have showed that *salviae miltiorrhizae radix* could inhibit platelet aggregation, dilate coronary arteries, increase coronary blood flow and then to increase coronary perfusion and improve myocardial ischemia [14, 15]. The main ingredient of safflower extract is the safflower yellow, which can inhibit platelet aggregation, mildly excite heart, reduce blood viscosity, prevent lipid deposition, improve fibrinolytic activity, dilate capillary, improve microcirculation, reduce the tension of vascular smooth muscle and so on. Thus, safflower extract can increase coronary blood flow, provide adequate nutrition to the heart, and have a good effect on the treatment of heart disease [16, 17]. Salvianolic acid can also significantly affect the platelet function and lipid metabolism, inhibit the formation of atherosclerotic plaques, and have a protective effect on the heart [18]. Therefore, it is clear that the combination of these Chinese medicinal ingredients has a more evident clinical effect in dilating coronary artery, inhibiting platelet aggregation, improving microcirculation and so on, thus preventing the occurrence and development of angina pectoris of coronary heart disease.

The results of this study showed that the total clinical effective rate of Danhong injection treatment (93.75%) and the total effective rate of electrocardiogram improvement (85%) in the treatment group were significant higher than those in the control group. After 2 weeks of treatment, the duration and seizure frequency of angina pectoris in the treatment group were significantly lower than those in the control group. Besides, the cardiac function of the patients improved significantly after treatment compared with the control group. During the treatment period, there were no obvious adverse reactions in the two groups. This study showed that the curative effect of Danhong injection was obvious in the treatment of angina pectoris of coronary heart disease. It could improve the electrocardiogram, reduce the duration and seizure frequency of angina pectoris and improve the cardiac function levels of

the patients. It had no adverse reaction and was really safe. The results of this study were in line with previous reports [19-21].

The exact mechanism of Danhong injection in preventing angina pectoris of coronary heart disease is not clear now, which needs further studies to clarify. This study still has some limitations, such as the small sample size, some interference factors cannot be ruled out and so on. Therefore, multicenter and random studies with large sample are needed to confirm the results in this study.

To sum up, Danhong injection is a kind of Chinese herbal medicine compound preparation which has a certain therapeutic effect in treating angina pectoris of coronary heart disease by improving the myocardial ischemia and significantly relieving the symptoms of angina pectoris. Besides, it is a safe and effective drug preparation in treating angina pectoris of coronary heart disease and is worthy of extensive application in clinic. The results of this study have great significance for clinical drug selection.

### Disclosure of conflict of interest

None.

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## Curative effect of Danhong injection

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