Effects of Ginkgo Biloba Extract Pills on Hemorheology Indexes of Coronary Atherosclerosis．

Liu Lihong1 ，Cao Hua2 ， Li Peng1， et al． 1． Department of Cardiology，Meishan People' s Hospital，Meishan，Sichuan 620010; 2． Chongqing Ninth People' s Hospital，Chongqing 400700，China

【Abstract】**Objective** To observe the effect of Ginkgo biloba extract pills on hemorheology indexes in patients with coronary atherosclerosis． **Methods** 100 patients with coronary artery disease were randomly divided into two groups: the combined treatment group and the conventional treatment group， each group had 50 patients． Two groups were given conventional drug treatment． On the basis of conventional medicine， the combined treatment group was treated with Ginkgo biloba pills． Two groups of patients were treated continuously for 12 weeks． The hemorheology indexes were compared between the two groups before and after treatment． Ｒesults Before treatment， there was no statistically significant difference between the comparison of hemorheology indexes(whole blood viscosity， whole blood viscosity， plasma viscosity， erythrocyte deformation index， fibrinogen) in two groups of patients($P > 0.05$) ． However， the hemorheology indexes of the conventional treatment group and the combined treatment group were significantly higher than those of the normal control group($P < 0.05$) ． After treatment， the whole blood viscosity， whole blood low shear viscosity， plasma viscosity， erythrocyte deformation index， fibrinogen of combined treatment group decreased significantly compared with before treatment($P < 0.05$) ． **Conclusion** Ginkgo biloba pills can effectively improve the hemorheology indexes of patients with coronary atherosclerosis， and has certain clinical application value．

Coronary atherosclerosis is the early pathological basis of coronary heart disease [1]. Preventing and treating the formation of coronary atherosclerotic plaques and avoiding the vascular stenosis or direct occlusion of the inner wall of the blood vessel as a result of excessive plaque atherosclerosis, are the most fundamental measures to prevent the occurrence and development of coronary heart disease. In recent years, the prevention and treatment of coronary heart disease has gradually become a research hotspot. There has been study showing that hemorheology plays an important role in the occurrence and development of coronary atherosclerosis [2]. Ginkgo biloba extract pills are the fifth generation of Ginkgo biloba preparation. This study is aimed at adding Ginkgo biloba extract pills on the basis of routine treatment to observe the effect of this drug on hemorrheology in patients with coronary atherosclerosis and exploring the clinical value of Ginkgo biloba extract pills for treating the coronary atherosclerosis.

1 Materials and Methods

1.1 General Information: 100 patients with coronary atherosclerosis who were hospitalized in our hospital from 2014 to 2016 were selected. All the patients had undergone coronary angiography and were diagnosed clearly (the degree of coronary stenosis ranged from 20% to 49%). Medical history was asked in detail, and physical examination, biochemical test, ECG and Doppler ultrasound examination were performed. Exclusion Criteria were: Patients who had progressed to coronary heart disease, those complicated with bundle-branch heart-block, atrial fibrillation, electrolyte disturbance, or other heart diseases or those who took drugs that affected hemorheology. According to the different medication regimens, patients were divided into the conventional treatment group and the combined treatment group. Each group had 50 patients. In the conventional treatment group, there were 27 males and 23 females, with an average age of (57 ± 8) years old; in the combined treatment group, there were 25 males and 25 females, with an average age of (59 ± 6) years old. There were no statistically significant differences (P>0.05) in the clinical characteristics, age, and gender between the two groups. Another 50 patients aged (58 ± 5) years old with no gender differences, with normal coronary angiography, without hypertension and diabetes-free were selected as normal controls. This trial was discussed by the Ethics Committee of our hospital. All the participants voluntarily participated in the trial and signed the Informed Consent Forms.

1.2 Methods: The conventional treatment group was given aspirin (100mg) once a day and atorvastatin (20mg) once a day; the combined treatment group was given 8 Ginkgo biloba extract pills (40mg) orally, 3 times a day. The treatment duration was 12 weeks. Before and after the trial, heparin sodium anticoagulation tubes were used to draw the blood from the subjects. In total 3 tubes of blood sample were collected: 1 tube was sent for tests of blood lipid, blood glucose and other items, 1 tube was sent for fibrinogen test, and 1 tube was used for testing hemorheology. All the tests were carried out in the Inspection Department of Chengdu Third People's Hospital, and all the assays were completed within 4h.

1.3 Statistical Methods: SPSS 17.0 software was used for statistical analysis. Data were expressed in ($\bar{x} \pm s$). Unpaired Student's t-test was used for comparisons within and between groups. P<0.05 was deemed as statistically significant.

2 Results

2.1 Comparison of Basic Information: A total of 100 patients with coronary atherosclerosis were included in this study. There was no statistically significant difference between the comparison of basic data such as age, sex, smoking, hypertension, diabetes, dyslipidaemia, and use of drugs in the conventional treatment group and the combined treatment group (P> 0.05). See Table 1.

Table 1 Comparison of the Basic Data of the Three Groups

| Index | The Normal Control Group (n = 50) | Coronary Atherosclerosis | | P |
		The Conventional Treatment Group (n = 50)	The Combined Treatment Group (n = 50)	
Age (years)	58 ± 5	57 ± 8	59 ± 6	P>0.05
Male	26	27	25	P>0.05
Smoking	18	20	18	P>0.05

Hypertension	0	22	24	P>0.05
Diabetes	0	10	12	P>0.05
Dyslipidaemia	26	31	27	P>0.05
β-blocker	-	12	16	P>0.05
ACEI/ARB	-	14	15	P>0.05

2.2 Hemorheology comparison: Before treatment, there was no statistically significant difference between the comparison of hemorheology indicators in the conventional treatment group and the combined treatment group (P>0.05), while the hemorheology indicators of the two groups (Whole Blood High Tangent Viscosity, Whole Blood Low Tangent Viscosity, Plasma Viscosity, Erythrocyte Deformation Index, Fibrinogen) were significantly higher than the Normal Control Group, and the differences were statistically significant (P<0.05). After treatment, the Whole Blood High Tangent Viscosity, Whole Blood Low Tangent Viscosity, Plasma Viscosity, Erythrocyte Deformation Index, Fibrinogen of the Combined Treatment Group decreased significantly compared with before treatment, and the differences were statistically significant (P<0.05), while Whole Blood High Tangent Viscosity of the Conventional Treatment Group decreased significantly compared with before treatment, and the differences were statistically significant (P<0.05). The changes in the other hemorheology indicators were not statistically significant (P>0.05). See Table 2.

Table 2 Comparison of Hemorheology Indicators ($\bar{x} \pm s$)

Index	The Coronary Atherosclerosis Group				The Normal Control Group
	The Conventional Treatment Group		The Combined Treatment Group		
	Before Treatment	After Treatment	Before Treatment	After Treatment	
Whole Blood High Tangent Viscosity (mPa s)	4. 83 ±0. 93①	4. 15 ±0. 54②	4. 80 ±1. 01①	3. 75 ±0. 37②	3. 53 ±1. 04
Whole Blood Low Tangent Viscosity (mPa s)	19. 46 ±3. 31①	18. 01 ±3. 84	19. 14 ±3. 85②	15. 49 ±2. 98②	14. 31 ±2. 32
Plasma Viscosity (mPa s)	1. 81 ±0. 32①	1. 62 ±0. 22	1. 78 ±0. 29①	1. 49 ±0. 17②	1. 40 ±0. 14
Erythrocyte Deformation Index	1. 19 ±0. 21①	1. 01 ±0. 19	1. 21 ±0. 17	1. 9 ±0. 24②	0. 65 ±0. 12
Fibrinogen	4. 4 ±1. 05①	3. 7 ±1. 36	4. 6 ±1. 30①	3. 2 ±1. 92②	2. 9 ±0. 57

Notes: Compared with the control group, ①P<0.05; before and after the treatment comparison, ②P<0.05

3 Discussion

Atherosclerosis mostly occurs in the large blood vessels of the human body. Vascular stenosis can cause serious clinical complications.. The treatment of coronary atherosclerosis is of great significance to the prevention and treatment of coronary heart disease. Numerous epidemiological and clinical trial studies have shown that coronary atherosclerosis and thrombosis are closely related to changes in hemorheology [3-6]. On the basis of coronary atherosclerosis, elevated blood viscosity, decreased blood flow velocity and reduced microcirculation perfusion can all promote thrombosis [7], and thrombosis can lead to blood occlusion, induce angina pectoris and acute myocardial infarction; microthrombosis may also cause sudden cardiac arrest and sudden death [8]. Therefore, changes in hemorheological indicators can be used as independent risk factors for cardiovascular disease [9-11]. Changes in hemorheological indicators can lead to changes in cardiac microcirculation and increased cardiac load [2], and abnormal hemorheological indicators appear earlier than clinical symptoms and thus can be used as a preliminary detection method for cardiovascular disease.

Ginkgo biloba extract pills are the fifth generation of ginkgo biloba preparation. Its active ingredients are ginkgo biloba flavonoids and ginkgolides [12], which have the features of high bioavailability, good effects on the relief of angina, small gastrointestinal irritation, and no obvious adverse reactions. It has been widely used in coronary heart disease, arteriosclerosis, cerebral infarction and other cardiovascular and cerebrovascular diseases [13-15]. Studies have confirmed that ginkgolides can reduce the extent of cerebral infarction in rats with middle cerebral artery occlusion, reduce the plasma viscosity, inhibit the conversion of fibrinogen to fibrin, and inhibit thrombosis [16-17]. The study by Han Biaoding et al. has also confirmed that Ginkgo biloba extract pills can effectively expand the blood vessels, promote coronary blood circulation, and inhibit platelets and thrombosis [18].

This study showed that, there was no statistically significant difference in the hemorheological indicators (whole blood high-shear viscosity, whole blood low-shear viscosity, plasma viscosity, erythrocyte deformation index, fibrinogen) between two groups before treatment (P>0.05), while the hemorheological indicators of the Conventional Treatment Group and the Combined Treatment Group were significantly higher than those of the Normal Control Group (P<0.05). After treatment, Whole Blood High Tangent Viscosity, Whole Blood Low Tangent Viscosity, Plasma Viscosity, Erythrocyte Deformability Index and Fibrinogen of the Combined Treatment Group were significantly lower than before treatment, and the differences were statistically significant (P<0.05), while except for the significantly reduced Whole Blood High Tangent Viscosity, the hemorheological indicators of the Conventional Treatment Group decreased than before treatment but the differences were not statistically significant. These suggest that Ginkgo biloba extract pills can further improve the hemorheological indicators of patients with coronary heart disease on the basis of conventional treatment. In summary, the combined treatment of Ginkgo biloba extract pills and conventional drugs can effectively improve the abnormal hemorheology in patients with coronary atherosclerosis, and has the potential to reduce the risk of coronary heart disease. However, the sample size of this trial was relatively small, and the follow-up period was short. Long-term follow-up of large samples is required for further study to ascertain.