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Clinical Study of Different Statins in the Treatment of Acute Myocardial Infarction in Coronary Heart Disease

Shixin Kang

Department of Cardiology, Affiliated Hospital of Hebei University, Baoding, Hebei, 071000, China
1623977868qq.com

Abstract: *Premature coronary heart disease (PCHD or PCAD) is caused by abnormal lipid metabolism in the body. A kind of atherosclerotic lipid substance is generated on the smooth intima of the artery. Over time, white plaques are formed, namely acute myocardial infarction (AMI). Acute myocardial infarction is a serious threat to human health. This article took PCAD-AMI patients hospitalized from June 2020 to June 2021 as the research subjects. 80 cases were randomly selected and divided into two groups, with 40 cases in each group. They were evenly allocated to receive treatment with rosuvastatin (group B) and atorvastatin (group A), and their therapeutic effects were statistically analyzed and summarized. In the self-evaluation of patients in groups A and B, both groups had a satisfaction score of no less than 7 points with treatment, and their impact on quality of life was improved. Therefore, the prognosis of PCAD-AMI treated with different statins was relatively good.*

Keywords: *Premature Coronary Heart Disease, Acute Myocardial Infarction, Statin Drugs, Treatment Satisfaction, Statistical Analysis*

1. Introduction

PCAD-AMI can cause acute myocardial infarction, which is closely related to diabetes, hypertension, smoking history, etc. Statins, as reductase inhibitors of hydroxymethylglutaryl CoA, can block the metabolic pathway of intracellular hydroxymethylglutarate, reduce the synthesis of total cholesterol (TC), improve cholesterol clearance in the blood, and effectively inhibit the synthesis of apolipoprotein. This article presents clinical studies on the treatment of PCAD-AMI with different statins.

At present, regulating blood lipids and inhibiting the formation of Congee have become the main treatment methods in clinic. This article focuses on PCAD-AMI patients and analyzes the short-term efficacy of various statin drugs. Firstly, all patients in this article meet the diagnostic criteria for PCAD-AMI and are voluntary. Next, atorvastatin and rosuvastatin drugs are divided into two groups to observe various indicators of patients before and after treatment, such as TC, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein (HDL), TG (triglyceride), etc. After 4 months, TC, low-density lipoprotein cholesterol (LDL-C), HDL, TG, etc. are rechecked, and finally, the results of pre - and post-treatment examinations are statistically analyzed.

2. Related Work

PCAD-AMI has the characteristics of long duration, acute onset, and dangerous condition, and has a high sudden death rate in clinical practice. Jiang Daming compared the efficacy of atorvastatin and rosuvastatin in the treatment of PCAD-AMI. The combination of atorvastatin and rosuvastatin has a definite therapeutic effect on PCAD-AMI, while the latter drug has a higher lipid-lowering rate [1]. Xu Hui evaluated the application value of monocyte/HDL ratio in early-onset coronary heart disease and coronary artery disease. The monocyte/HDL ratio may be an independent risk factor for coronary artery disease and is directly proportional to the severity of early-onset coronary heart disease [2]. Zhang Tangshuang believed that compared with atorvastatin, rosuvastatin has a better effect on adjusting blood lipids and left ventricular ejection fraction in the early treatment of coronary heart disease, and has a better improvement effect on the patient's heart function [3]. Zhao Qilei believed that the diagnosis and treatment level of acute myocardial infarction is constantly improving, and coronary

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heart disease patients receiving reperfusion therapy such as percutaneous coronary intervention have received more and more attention. The occurrence time of pathological Q waves is closely related to the prognosis of acute myocardial infarction [4]. Wang Qing believed that in recent years, the number and hospitalization rate of early-onset coronary heart disease patients have been continuously increasing. Their sudden onset and high rate of recurrent myocardial infarction should be taken seriously by doctors. The incidence rate of premature coronary heart disease is increasing year by year, and its acute incidence and high recurrence rate deserve clinicians' attention. He planned to fully leverage the characteristics and advantages of traditional Chinese medicine under the guidance of the "Shangshoushen" theory, and achieve the goal of treating both the symptoms and the root cause by regulating qi and blood, supporting the right and eliminating evil, providing ideas and references for the diagnosis and treatment of early coronary heart disease [5]. However, their research is not very effective in treating early-onset coronary heart disease.

Previous studies have found that hypertension, obesity, lipid metabolism disorders, smoking, and other factors are important risk factors for the early onset of coronary heart disease. These risk factors can lead to endothelial damage through inflammatory reactions, oxidative stress, and other pathways, thereby inducing PCAD-AMI [6]. Therefore, in treatment, active decompression, lipid-lowering, and control of environmental risk factors should be taken. Currently, compared with atorvastatin, rosuvastatin, which is widely used in clinical practice, has a more significant lipid-lowering effect. However, its mechanism of action is not yet clear, and its mechanism may be related to factors such as diet and metabolism.

3. Clinical Exploration Methods of PCAD-AMI

3.1 Early Onset Coronary Heart Disease and Acute Myocardial Infarction

Currently, research has shown that the pathogenesis of coronary heart disease is related to abnormal lipid metabolism in the body [7-8]. In recent years, the incidence rate of CHD (coronary heart disease) in China is increasing year by year, and the number of deaths caused by CHD is also increasing year by year [9]. AMI is the most common clinical symptom of coronary heart disease. Because of coronary artery stenosis, atherosclerotic plaque is formed in the coronary artery, which blocks the coronary artery, temporarily stops blood flow, and causes myocardial ischemia and local myocardial ischemia and necrosis [10]. Acute myocardial infarction is mainly characterized by pain behind the sternum, high fever, increased erythrocyte sedimentation rate, increased white blood cells, abnormal myocardial enzymes, etc. In severe cases, arrhythmia, shock, and even sudden death may occur. Therefore, in clinical practice, more in-depth research is needed on PCAD-AMI in order to find better treatment options and reduce patient mortality. At present, the treatment of PCAD-AMI mainly involves reperfusion, medication, etc. [11-12]. Reperfusion therapy can be divided into two types: coronary intervention therapy and thrombolysis therapy. Its function is to open the blocked coronary artery, promote blood flow, and thus exert therapeutic effects. Among them, coronary intervention therapy has obvious therapeutic effects, but the operational risk is high, and strict control of treatment time is required.

In recent years, some scholars have adopted the new perspective of "early coronary heart disease", which is that early coronary artery disease develops rapidly and the risk of developing PCAD-AMI increases. Previous studies have confirmed that hypertension, diabetes and lipid metabolism disorder are important risk factors for coronary heart disease. Therefore, this paper intends to study the influencing factors of PCAD-AMI to provide theoretical basis for clinical prevention and treatment of PCAD-AMI [13]. Disorders in lipid metabolism, hypertension, smoking, and alcohol consumption can all cause damage to the endothelial cells, thereby affecting their structure and function, and are important factors in the occurrence and development of CHD [14-15].

3.2 Statins

Nitroglycerin and β-receptor blockers are commonly used drugs in clinical practice. Statins are inhibitors of hydroxymethylglutaryl CoA reductase, which have lipid-lowering and anti AMI effects. Statins inhibit the proliferation of VSMCs (vascular smooth muscle cells), inhibit AMI, improve endothelial function, and effectively inhibit the process of myocardial fibrosis, the release of inflammatory mediators, and the infiltration of inflammatory cells, thereby achieving the goal of antiplatelet aggregation, reducing thrombosis, adjusting blood lipids, and exerting therapeutic effects.

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Currently, rosuvastatin is the most commonly used drug in clinical practice, while atorvastatin is the two most commonly used drugs with similar therapeutic effects. Atorvastatin is a lipid soluble lipid-lowering drug with better transmembrane transport ability, which can better enter the cytoplasm and even enter the nucleus to exert therapeutic effects. Compared with atorvastatin, rosuvastatin has advantages such as smaller passive diffusion and harder entry into the liver, but its metabolic rate is lower; its selectivity towards the liver is stronger, and it has smaller hydrophilicity and fewer advantages in binding to cytochrome P450.

Risk ratio formula:

$$\mathrm{HR} = \mathrm{plow}/\mathrm{phigh} \tag{1}$$

Among them, phigh represents the probability of adverse events occurring in patients receiving high-intensity statin treatment after treatment, and plow represents the probability of adverse events occurring in patients receiving low-intensity statin treatment after treatment.

Subject curve formula T_S:

$$T_S = \int \mathrm{TPR}(1 - \mathrm{TNR})\,\mathrm{dThres} \tag{2}$$

Among them, TPR represents the true positive rate; TNR represents the true negative rate; Thres represents the threshold. This formula is used to evaluate the efficacy of different statin drugs in the treatment of PCAD-AMI, and can comprehensively evaluate the recall and accuracy.

Survival analysis formula based on proportional risk model:

$$\mathrm{h(t)} = \sum_{k=0}^{n} \mathrm{h}_0(\mathrm{t})\beta\mathrm{X} \tag{3}$$

$\mathrm{h(t)}$ represents the risk rate of an event occurring at time t; $\mathrm{h}_0(\mathrm{t})$ is the baseline risk rate, and β is the independent variable. This formula is used for survival analysis to evaluate the prognostic effects of different statin drugs on PCAD-AMI patients.

Correlation coefficient:

$$\mathrm{x_g} = \ln(\mathrm{xi} - \bar{\mathrm{x}})(\mathrm{yi} - \bar{\mathrm{y}}) \tag{4}$$

Among them, xi and yi represent the serum lipid levels of the i-th patient and the serum lipid levels after receiving statin therapy, respectively, while $\bar{\mathrm{x}}$ and $\bar{\mathrm{y}}$ represent the mean of x and y, respectively. This formula is used to evaluate the regulatory effect of different statins on serum lipid levels in patients with acute myocardial infarction, in order to further evaluate the preventive effect on cardiovascular disease.

3.3 PCAD-AMI Treatment Plan

Table 1: Basic information of some patients

Serial number	Age	Gender	Body mass index	Disease duration (months)
1	51	Male	25.3	6
2	62	Female	23.8	7
3	59	Male	27.1	5
4	65	Female	24.6	5
5	56	Male	26.2	7
6	61	Female	22.9	5
7	57	Male	28.3	5
8	68	Female	25.1	6

(1) Research object

This article took PCAD-AMI patients hospitalized from June 2020 to June 2021 as the research subjects, randomly selecting 80 cases and dividing them into two groups, with 40 cases in each group. The male to female ratio of experimental groups A and B was 1:1, with an age range of 51-68 and an average of 60 years old. All patients were diagnosed with PCAD-AMI and obtained the consent of the hospital. All participants voluntarily participated, and the general data of the two groups of patients were not comparable. The basic information of some patients is shown in Table 1. The difference in disease course between patients did not exceed 2 months.

Inclusion and exclusion criteria: All patients met the diagnostic criteria for early coronary heart disease AMI and were voluntary. Patients with severe systemic diseases, immune disorders, acute infections, tumors, vascular diseases, hematological disorders, bleeding risks, and allergies to statins

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were excluded.

(2) Case grouping

1) Research group A

Group A was treated with atorvastatin medication, with the patient taking 1 tablet daily (as instructed by the physician), once a day, and orally. During the use of atorvastatin medication, patients should strictly control their diet, with a focus on low cholesterol. They should take atorvastatin 8 mg orally for the first time and gradually increase the dose, but not exceed 50 mg per day. After one month of taking medication, blood lipids should be monitored, and the dosage of medication should be adjusted according to specific circumstances. If the patient has symptoms such as constipation, gastrointestinal bloating, and indigestion, it is considered normal.

2) Research group B

The use of rosuvastatin in control group B is as follows: patients take it orally once a day before nighttime sleep, with an initial dosage of 10-20 mg, which can gradually increase to 40 mg. Three months before medication, a liver function test should be performed. If the liver enzyme blood test value exceeds three times the normal level, the test should be performed immediately. If it is caused by medication, the medication should be stopped immediately.

(3) Observation indicators

The various indicators of two groups of patients before and after treatment were observed, such as TC, LDL-C, HDL, TG, etc. After 4 months, TC, LDL-C, HDL, TG, etc. were reexamined, and the efficacy of the two treatment plans was compared.

(4) Statistical methods

All the data in this study were analyzed using statistical software, including count data (x^2) and metric data (t-test). After data processing, using $P<0.05$ as the indicator, it is necessary to finally display a significant difference between the two groups.

4. Clinical Exploration Results of PCAD-AMI

4.1 Pre - and Post-treatment Examination Results

The pretreatment examination results of groups A and B are shown in Table 2. In the first test, TC was 5.80mmol/L; LDL-C was 3.95mmol/L; HDL was 1.21mmol/L; TG was 1.90mmol/L.

Table 2: Pre-treatment examination results for groups A and B

Number of tests	TC(mmol/L)	LDL-C(mmol/L)	HDL(mmol/L)	TG(mmol/L)
1	5.80	3.95	1.21	1.90
2	6.03	4.08	1.17	2.03
3	5.67	3.89	1.27	1.86
4	6.21	4.15	1.13	2.10
5	5.92	4.01	1.22	1.96
6	5.75	3.91	1.19	1.89
7	5.58	3.78	1.30	1.78
8	5.98	4.06	1.16	2.01

The examination results of group A after treatment are shown in Figure 1. In the first test, TC was 4.65mmol/L; LDL-C was 2.86mmol/L; HDL was 1.35mmol/L; TG was 1.45mmol/L.

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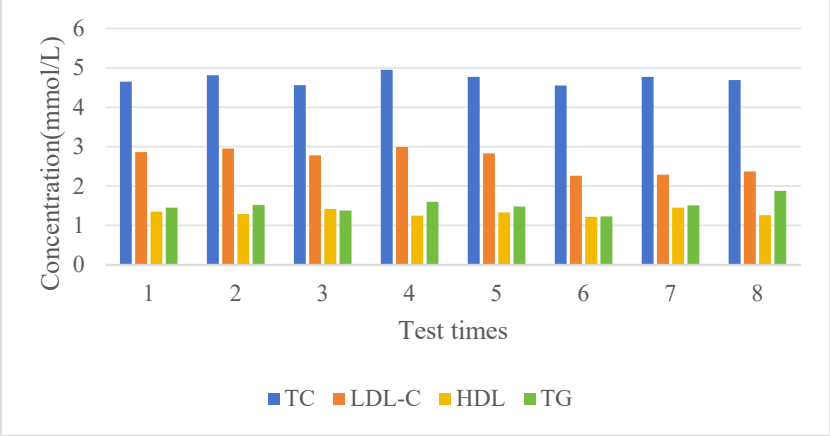

Figure 1: Examination results after treatment in group A

The examination results of group B after treatment are shown in Figure 2. In the first test, TC was 4.33mmol/L; LDL-C was 2.86mmol/L; HDL was 1.62mmol/L; TG was 1.43mmol/L.

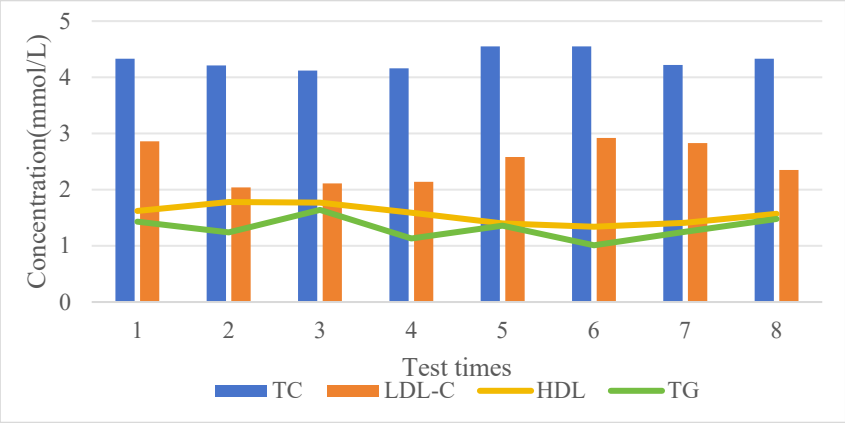

Figure 2: Post treatment examination results of group B

4.2 Patient Self-assessment

The self-assessment of patients in groups A and B is shown in Table 3. Both groups of patients had a satisfaction score of no less than 7 points with treatment, and their impact on quality of life was improved.

Table 3: Self-assessment of patients in groups A and B

Number of tests	Group A		Group B	
	Satisfaction with treatment (1-10 points)	Impact on quality of life (improvement/deterioration)	Satisfaction with treatment(1-10 points)	Impact on quality of life (improvement/deterioration)
1	8	Improve	9	Improve
2	9	Improve	7	Improve
3	7	Improve	8	Improve
4	8	Improve	7	Improve
5	7	Improve	8	Improve
6	8	Improve	9	Improve
7	8	Improve	7	Improve
8	9	Improve	8	Improve

4.3 Proportion of Reduction in Myocardial Infarction Area

The comparison of the proportion of reduction in myocardial infarction area is shown in Figure 3. There was not much difference in the proportion of reduction in myocardial infarction area between groups A and B.

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Figure 3: Comparison of the proportion of reduction in myocardial infarction area

4.4 Discussion

Early onset coronary heart disease and acute myocardial infarction cases are not uncommon, with severe conditions and high mortality rates. Existing studies have shown that patients with early-onset coronary heart disease and acute myocardial infarction have more cardiovascular risk factors. Therefore, in clinical practice, corresponding preventive measures should be taken to reduce the risk of cardiovascular events and coronary heart disease. Statins are widely used in the prevention and treatment of cardiovascular diseases, with their main function being to inhibit the release of inflammatory mediators and lower blood lipids. Previous studies have found that statins can reduce the occurrence of primary and secondary cardiovascular events in coronary heart disease by regulating blood lipids.

The cause of coronary heart disease is atherosclerosis in the coronary artery, which leads to blockage and stenosis of the lumen, thus causing myocardial hypoxia and ischemic necrosis. Research has shown that lipid metabolism disorders play an important role in coronary heart disease patients. The disorder of lipid metabolism can lead to the deposition of lipids in the blood vessels, thus forming atherosclerosis. In recent years, the number of deaths due to coronary artery disease has increased. During the acute attack of coronary heart disease, the patient is likely to have acute myocardial infarction, which is due to the presence of atherosclerotic plates in the narrow coronary artery lumen, the blockage of coronary artery and the temporary interruption of blood flow, leading to the occurrence of disease. In clinical practice, the main symptoms of AMI are high fever, severe pain behind the sternum, as well as abnormal myocardial enzymes, increased white blood cell count, and accelerated red blood cell sedimentation. In severe cases, shock, arrhythmia, and even death may occur.

At present, the treatment of AMI in clinical practice mainly relies on drugs and reperfusion, but it carries great risks, so drug therapy is usually used. Statin is a hydroxymethylglutaryl CoA reductase inhibitor widely used in clinical practice, which can prevent and treat PCAD-AMI by reducing LDL-C. Statins can improve endothelial function and inhibit myocardial fibrosis. In addition, it can also regulate blood lipids by inhibiting the release of inflammatory mediators, reducing the infiltration of inflammatory cells, preventing platelet aggregation, and reducing the formation of blood clots. Atorvastatin, rosuvastatin, and other statin drugs are commonly used in clinical practice, among which atorvastatin is a lipid-lowering drug that is easier to penetrate through cell membranes. The active diffusion effect of rosuvastatin is not as strong as atorvastatin, but due to its low metabolic rate, high selectivity, and poor hydrophilicity, its effect on lipid regulation is more pronounced.

Therefore, this article selects PCAD-AMI patients as the research subjects to observe the short-term effects of statins on PCAD-AMI. The combination of atorvastatin and rosuvastatin has a good therapeutic effect on PCAD-AMI.

5. Conclusions

After using rosuvastatin and atorvastatin, the LDL-C, TC, and TG of patients were significantly lower than before the experiment, indicating that rosuvastatin and atorvastatin can improve blood lipids and reduce blood flow resistance and cardiac burden. Rosuvastatin and atorvastatin have significant therapeutic effects on PCAD-AMI, which can significantly reduce blood lipids and improve endothelial

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cell function and inflammatory response. However, their lipid-lowering effect is more significant and has good clinical application value. In the future, the therapeutic effects of other statin drugs on PCAD-AMI can be explored.

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