

Study on Hypertension and Risk of Hypertension and Cardiovascular Disease

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Abstract: Cardiovascular diseases are diseases related to blood vessels, heart and surrounding tissues which affect one's health and normal life. Cardiovascular diseases include heart disease, stroke, endocarditis, arrhythmia, and more. The main causes of cardiovascular diseases are drinking, smoking, obesity, hypertension, diabetes, hyperlipidemia, and so on. In addition, there also are environmental factors and dietary factors. At present, the most basic disease treatment methods are life intervention and clinical intervention. When the disease is severe, it needs to be treated by surgical intervention. The effect of hypertension on patients' health is very significant, which is closely related to the incidence rate of cardiovascular disease. Therefore, this paper investigated and studied the development of hypertension and its impact on the risk of cardiovascular disease, and analyzed and summarized it in the form of review to provide references for clinical research.

Keywords: Hypertension; Cardiovascular disease; Incidence risk

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1. Introduction

Hypertension is a chronic disease with high pathogenicity. Its main feature is that the blood pressure is higher than 140/90 mmhg for more than three consecutive days before taking antihypertensive drugs. A long period of high blood pressure will lead to headache, fatigue, anxiety, arrhythmia and other symptoms. If not treated in time, patients may have a variety of more serious complications such as stroke, coronary heart disease, heart failure and even myocardial infarction ^[1]. Therefore, hypertension must be discovered, treated and controlled early in order to delay the development of the disease. In particular, we should pay attention to maintenance of several aspects in daily life, such as maintaining emotional stability, eating light, quitting smoking and drinking, and properly regulating stress ^[2]. For people with a family history of hypertension, the prevalence rate is higher than that of ordinary people, so we should take preventive measures to avoid the disease. Cardiovascular diseases are the main complications caused by hypertension. There are no early signs of the diseases, but is mainly related to chest tightness, palpitation, fatigue, dizziness and other symptoms caused by hypertension, which are easy to be ignored. With the gradual development of the disease, patients will gradually develop symptoms such as dyspnea, chest pain, edema, cough, nausea and vomiting. According to clinical research, the etiology of cardiovascular disease is comprehensive, and many influencing factors interrelate with each other causing adverse effects on human cardiovascular system. However, hypertension is one of the high-risk factors. The data show that more than 70% of patients with cardiovascular diseases have hypertension at the same time, and the probability of cardiovascular diseases in patients with hypertension in the later stage is more than three times that of those

without hypertension. Therefore, it can be seen that, the relationship between the two is very close [3]. According to literature, the risk of cardiovascular disease in malignant hyperthermia (MH) patients is 1.5-3.0 times higher than those with normal blood pressure or well controlled blood pressure, and its risk is similar to that of persistent hypertension [4].

High blood pressure level will affect the patient's vascular pressure. In addition, abnormal blood lipids will affect the patient's blood cholesterol to deposit in the blood vessels, causing blockage, leading to heart ischemia and hypoxia, resulting in atherosclerosis. In fact, in addition to hypertension, the probability of cardiovascular disease in patients with diabetes is also gradually increasing, which is alarming. This article only reviews the risk relationship between hypertension and cardiovascular disease [5].

2. Main risk factors of cardiovascular disease in patients with hypertension

2.1. Changes of plasma atherosclerotic index (AIP) in hypertensive obese patients

Cardiovascular diseases can lead to hemorrhagic or ischemic diseases in the heart, brain and other parts involving vascular tissue due to vascular obstruction. The causes of cardiovascular disease are closely related to the patient's own physical state, eating habits and lifestyle. This includes obesity, hypertension, smoking, alcoholism, diabetes and so on. Yang Fei [6] studied the correlation between AIP and cardiovascular disease. According to the research, it is pointed out that triacylglycerol is an important determinant of cholesterol lipidization, transport and high-density plasma lipoprotein formation. Besides, abnormal lipid metabolism is also the main factor of coronary artery disease. According to the results of Yang Fei's experiment, the AIP index of obese hypertensive patients was significantly higher than that of ordinary hypertensive patients. At the same time, comparing the results of waist hip fat ratio, blood glucose index, triglycerides (TG) and total count (TC), the data of obese hypertensive patients had no advantage and significant difference compared with ordinary hypertensive patients ($P < 0.05$). We should know that obese people themselves will cause greater pressure and burden on the cardiovascular system. In addition, they also suffer from hypertension, which will further promote the formation of coronary atherosclerosis, thus increasing the rate of incidence of cardiovascular diseases. Therefore, properly increasing exercise, controlling diet, quitting smoking and alcohol, improving physical fitness and reducing weight can reduce the fat content in the body, reduce the burden on cardiovascular and related organizations, improve the metabolism of blood lipids, and reduce the incidence of cardiovascular diseases and complications as much as possible.

2.2. Increase of blood lipid level

For patients with hypertension and cardiovascular disease along with acute coronary atherosclerosis, the basic clinical symptoms can no longer be used as a typical feature to judge the patients. According to the clinical research data, compared with patients with a single disease, the index levels of blood glucose and fibrin of patients with hypertension and cardiovascular disease are significantly higher than those of patients with a single disease, The main mechanism is that the blood pressure level of patients with acute coronary atherosclerosis will show a downward trend, and the blood lipid level after cardiovascular disease will also change due to physical stress response. Therefore, the increase of blood lipid is one of the main influencing factors of cardiovascular disease in patients with hypertension. In addition, according to the literature, Xing Liying [7] analyzed the indicators of blood lipid and glucose metabolism in patients with hypertension, and discovered that the two factors with high correlation with cardiovascular disease have a high probability of combination, leading to the gradual increase of the probability of cardiovascular disease in patients with hypertension.

2.3. Changes in uric acid level

There is also a certain difference in uric acid value between patients with a single disease and patients with cardiovascular diseases. Uric acid value is mainly caused by abnormal purine metabolism in patients. Hyperuricemia will increase the content of uric acid in patients' blood and have a serious impact on patients' bodies. However, there is no obvious clinical data indicating a significant relationship between the two. Therefore, further research is needed to provide clearer results. However, it is also shown that there are various risk factors for cardiovascular diseases in patients with hypertension, which interrelated with each other. Some literatures have specially studied that the risk score of vascular disease in patients with simple hypertension is much lower than that in patients with abnormal blood lipid, blood glucose and uric acid [8].

2.4. Cardiovascular disease risk assessment system

The cardiovascular disease risk assessment system is a relatively mature clinical practice at present. Through the comparative study of the patient's physical state and big data, the patient's risk index of cardiovascular disease can be determined by investigating the patient's age, gender, race, total cholesterol level, high-density lipoprotein cholesterol level, systolic/diastolic blood pressure, blood pressure reduction measures, blood glucose level of diabetes and smoking. Based on the research and analysis of a large number of sample data, it is known that the probability and risk of cardiovascular disease in patients with hypertension will be greatly increased compared with the general population. For example, Xu Jiachun et al. conducted an overview study on the three models of cardiovascular risk assessment, PCE (ACC/AHA cardiovascular disease risk assessment model), FRS (Framingham cardiovascular disease risk assessment model), and ICVE (Chinese ischemic cardiovascular disease risk assessment model), and elaborated on their respective characteristics, advantages and disadvantages. Among them, PCE is a risk assessment system for cardiovascular disease (atherosclerosis) events in the past 10 years established by relevant U.S. agencies in 2013. The system aims to predict whether people will fall sick and identify high-risk groups. The system involves many observation indicators and has obvious advantages. However, because the samples established at the beginning of the system are limited by region, population and local living conditions, the disease prediction of people in other regions is not very accurate except for Americans and whites. Next, FRS is an evaluation system developed by Framingham Heart Disease Research Center in 2008. It involves more comprehensive risk factors and predicts more types of cardiovascular diseases. It can also directly convert the heart and vascular age of subjects, so as to improve their awareness of prevention and reduce the incidence rate of cardiovascular diseases. There are also limitations, which do not apply to the population in every country and region. The third test, RCVD, is a risk assessment system first developed by China in 2003 and improved in 2016. Although this assessment model discards the difference in the prevalence probability among ethnic groups, its basic model is still dominated by some people, so it lacks universality and is relatively simplistic [9]. Therefore, when selecting the evaluation system, we should select the optimal method according to the actual situation in order to predict and evaluate the risk more accurately and take preventive measures to reduce the probability of disease. In addition, there are literature studies that show that the size of neck circumference of patients with hypertension or people with blood pressure higher than normal is highly correlated with cardiovascular disease risk factors [10].

3. The relationship between the changes of cardiovascular disease indicators and hypertension and cardiovascular disease

3.1. C-reactive protein (CRP)

The increase of C-reactive protein is one of the specific indicators of inflammatory infection. Generally, the increase of C-reactive protein proves that there is inflammatory infection in the body. It has the same function as interleukin and IL-1 factor which indicate whether there is acute infection or injury in the body.

In the study of patients with hypertension, it was found that when the blood pressure was rising, the C-reactive protein index was also rising, and the level of C-reactive protein was significantly related to whether the patients had cardiovascular disease. Further in-depth studies have shown that high-sensitivity C-reactive protein (hs-CRP) is one of the main high-risk factors to predict whether patients will have symptoms of cardiovascular disease. When studying the incidence rate of coronary heart disease, it was found that the increase of high-sensitivity C-reactive protein index will also increase the incidence rate of coronary heart disease.

3.2. High sensitivity troponin (hs-cTn)

Troponin is a protein that plays an essential role in myocardial contraction in human body. It is also one of the main substances for clinical research on the life activities of myocardial cells. It and tropomyosin can coordinate to regulate the interaction between Ca^{2+} ions and adenosine triphosphatase (ATPase) at transverse actin. High sensitivity troponin, which is highly sensitive and purposeful, is also the most important index for clinical diagnosis of acute coronary syndrome. In addition, according to the research, the cardiovascular system of patients with hypertension or people with normal blood pressure can also be predicted by troponin test, which can not only help patients with hypertension in clinical treatment and prevention, but also expand its application in the diagnosis of cardiovascular diseases ^[11]. Although the current exact research data on troponin and high-sensitivity troponin can support their use as indicators to evaluate the risk of cardiovascular disease, they can also be combined with other clinical data such as electrocardiogram (ECG) and clinical symptoms to determine whether the increase of troponin and high-sensitivity troponin levels is due to organ damage caused by hypertension or myocardial ischemia, resulting in cardiovascular disease. For example, once a patient has myocardial ischemia, the level of troponin will increase several times or tens of times ^[12].

3.3. Brain natriuretic peptide (BNP) or N-terminal proBNP (NT proBNP)

Brain natriuretic peptide (BNP) is a hormone secreted by the ventricle and has the function of protecting the ventricle. It is mainly beneficial to the sodium ion and urine in the normal process of ventricular function. The activity of blood vessels ensures the normal progress of life activities. However, according to the clinical data, in case of pathological changes or abnormalities in the ventricle, as a protective hormone, it will increase the secretion to reduce the tension and pressure of the ventricular wall and avoid the damage to the normal cardiac activity caused by overload operation ^[13]. Because of this mechanism, BNP or NT proBNP is also the main basis for judging whether patients have heart failure, and can also be used as the diagnostic basis for whether the treatment of heart failure is effective. However, the etiology of brain natriuretic peptide index changes needs to be determined in combination with clinical symptoms and the results of cardiac color doppler ultrasound and ECG, which cannot be generalized ^[14].

4. Summary

Hypertension is closely related to the incidence of cardiovascular disease. Although hypertension is not the only influencing factor of cardiovascular disease, it does put more pressure blood vessel wall, which is directly related to whether cardiovascular damage will occur and lead to disease ^[15]. However, because the relationship between the two is too complex and involves more, it needs to be further studied.

Disclosure statement

The authors declare no conflict of interest.

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