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Non-offender Vascular Disease in Patients with Coronary Ceart Disease after PCI

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Abstract: *MVD patients still have a high incidence of adverse cardiovascular events after PCI, which is closely related to the progression of NCCLs. The correlation between the level of inflammation and risk factors of coronary heart disease in MVD patients after PCI and the progression of NCCLs lesions can be used as a basis for accurate assessment and early intervention of MVD patients after PCI. Our purpose is to reduce the incidence of adverse cardiovascular events, thereby reducing patient mortality and improving patient outcomes.*

Keywords: *Coronary heart disease, Percutaneous coronary intervention, Progression of non-offender vascular disease, Multi-vessel disease*

1. Introduction

Coronary atherosclerotic heart disease refers to coronary artery atherosclerosis caused by lumen stenosis or occlusion, leading to myocardial ischemia, hypoxia or necrosis caused by heart disease, referred to as coronary heart disease (CHD), also known as ischemic heart disease. Atherosclerotic disease, represented by coronary heart disease, is currently the leading cause of human death. According to the official website of the World Health Organization, 17.9 million people die from cardiovascular disease every year, of which an estimated 7.4 million die from coronary heart disease. [1]At present, the number of patients with coronary heart disease in China has reached 11 million, and the mortality rate has reached 113/100 000, which has continued to increase since 2012. [2-3]With changes in lifestyle, environmental conditions and the aging trend of the population, the trend of coronary heart disease is developing from single-vessel disease to Multivesseldisease (MVD), which refers to the stenosis of more than 50% in the diameter of at least two major coronary arteries or[4] their main branches. Recent studies have found that the incidence of MVD has increased significantly, and about 40%-60% of patients have multivessel disease on coronary angiography. [5]The coronary artery conditions of MVD patients are more complex, and the vascular lesions are often diffuse, often combined with chronic occlusion, calcification, bifurcation lesions, and some vascular lesions are difficult to open. MVD patients often have the characteristics of severe condition, difficulty in treatment, poor prognosis, high risk of sudden death, and more complications. The prognosis is worse than that of patients with single vessel disease. The mortality rate within one year increases by more than 2 times, which has always been a difficult problem in[6] the comprehensive treatment of coronary heart disease in clinical work.

2. Pathological basis of MVD

The pathological basis of MVD is the same as atherosclerosis, which is due to age, smoking, obesity, hypertension (EH), hyperlipidemia and diabetesmellitus. DM), hyperuricemia, hyperhomocysteinemia, family history and other risk factors. However, with the in-depth study of the pathological basis, people have gradually found that atherosclerosis is a comprehensive inflammatory disease, and the damage of the arterial intima caused by various risk factors is the initial link of coronary atherosclerosis. Under the stimulation of various factors, the arterial intima causes intimal damage, and further fibroplasia occurs, and then develops into atherosclerosis. A large number of growth factors, inflammatory factors, inflammatory cells and vascular regulatory molecules are involved[7-8] in this process. In this process, immune mechanisms interact with metabolic risk factors to initiate, propagate, and activate atherosclerotic lesions[9].

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3. Treatment options for MVD

The undisputed core of the treatment for patients with MVD is long-term oral medication, and in addition, treatment with MVD patients still need reascularization, reconstruction strategies include incomplete reascularization (IncompleteRevascularization, IR), and completely reascularization (CompleteRevascularisation, CR)[10]. CR has obvious advantages over IR, which can not only reduce or eliminate the risk of local myocardial ischemia, but also reduce mortality, angina pectoris attack frequency, re-myocardial infarction and repeat operation rate[11]. However, in practice, due to patients' willingness, vascular calcification, vascular tortuous, and diffuse vascular lesions, IR is more common [12]than CR. Reascularization way includes two kinds: percutaneous coronary intervention (percutaneouscoronaryintervention, PCI) and coronary artery bypass surgery (coronaryarterybypassgraft, CABG). IR and percutaneous coronary interention (percutaneouscoronaryintervention, PCI) as the main treatment. With the development of PCI technology, it has become the most effective and direct method for the treatment of CHD because of its minimally invasive and rapid opening of blood vessels, and it has been widely used clinically in China. As Mehta.SR, Ibanez.B, James.S and other foreign scholars have found in recent years that in patients with acute ST-segment elevation myocardial infarction complicated with multivessel disease and hemodynamic stability, the detailed strategy of complete revascularization is better than the strategy of only open the culprit vessel. A class IIa recommendation [13-14] is given for revascularization of nonculprit vessels. However, the optimal timing of nonculprit-vessel PCI in STEMI patients with MVD has not been determined in two large meta-analyses, and whether the benefits of complete revascularization outweigh the associated risks remains to be determined[15-17]. On the one hand, complete revascularization may limit the extent of myocardial infarction and prevent recurrent myocardial ischemia by relieving severe coronary artery stenosis. On the other hand, completely revascularizationing of the nonculprit vessels typically requires a longer procedure time and more contrast material and thus ， in this way，that may increase the risk of acute kidney injury and acute left ventricular volume overload. In addition, Elgendy IY, Mahmoud AN and other scholars have found in related studies that early intervention of non-culprit vessels is better than only intervention of culprit vessels, which will make patients benefit more. At the same time, domestic scholars also confirmed in their studies that early completely revascularizationing can reduce the incidence of adverse outcomes significantly, such as all-cause mortality and heart failure, so that patients can benefit in clinical practice and improve their prognosis. Because myocardial injury is in the most dangerous state, and non-infarctive stenosis may also lead to myocardial injury, based on relevant research at home and abroad, the current guidelines do not encourage the prophylactic treatment of non-culprit vessels during primary PCI in patients with acute myocardial infarction unless the patient is in cardiogenic shock.

4. The impact of NCCLs on the prognosis of MVD patients

However, with the development of PCI technology, it is found that the relative incidence of adverse cardiovascular events after PCI is still high. The reason may be closely related[18] to the local inflammatory response of the vascular intima after PCI and the inflammatory response aggravated by ischemia-reperfusion injury. A variety of inflammatory factors and inflammatory cells, such as C-reactive protein, interleukin-6, white blood cells, lymphocytes, platelets and so on, are involved in this inflammatory reaction process. In practical clinical work, these indicators can help to predict the future risk of high-risk patients. In 2014, HuB,YangXR and other scholars proposed a new parameter index [19]named "Systemic immune inflammation index" (SII: Platelet count × neutrophil/lymphocyte ratio), SII is a new indicator that integrates three inflammatory peripheral cell counts. It was originally used for risk prediction [20]in the field of oncology, and high SII has been reported to be associated [21]with poor prognosis of cancer patients. Since then, some scholars have found that SII may also be related [22] to the poor prognosis of chronic heart failure. Based on the in-depth study of the above research results, SII has a certain clinical value [23]in evaluating the level of vascular inflammatory response in patients with CHD after PIC.

Through the analysis of PCI postoperative follow-up results MVD patients found that success in the blood vessels of criminals after PCI, and law under the condition of secondary prevention of coronary heart disease medication, appear serious adverse cardiovascular events (MACE, majoradversecardiacevents) risk is high, need to be hospitalized or again reascularization. Continuous studies have found that the progression of non-culprits lesions (NCCLs) is closely[24 -25] related to MACE. Progression of NCCLs was defined as: (1) a stenosis increase of ≥20% in diameter of at least one lesion and/or complete occlusion of any lesion in patients undergoing repeated coronary angiography

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at an interval of 6 months or more; (2) New stenosis [26] (≥20%) in a previously normal vessel. In most cases, when MVD patients underwent PCI for the first time, the lesions of NCCLs were mild, which was not an indication for stent implantation. However, it was found in clinical work that a considerable number of MVD patients had different degrees of progress [27] of NCCLs in coronary angiography after PCI for ≥6 months. This will greatly increase the incidence of adverse cardiovascular events in patients with MVD.

5. Factors associated with the progression of NCCLs

Studies in recent years have found that during the treatment of PCI, balloon dilatation and stent implantation, artificial reasons lead to plaque rupture, which destroys the balance between the original inflammatory factors. Some studies have confirmed that the degree of inflammation after PCI is related[22] to clinical prognosis. Some studies have shown that myocardial injury occurs in patients after PCI, which is directly caused by the increase of cardiac troponin 1 (CTNI) due to the length of balloon pre-expansion time, the number of pre-expansion times, and the expansion pressure. The excessive pressure and expansion time lead to the rupture of unstable plaques and the infiltration of lipid components in plaques into the lumen of patients. It has the effect of promoting inflammatory factors, which can increase inflammatory factors, has a strong procoagulant effect, can activate the patient's platelets, and promote thrombosis[28, 29]。.After coronary angiography (CAG) again after PCI interval of 3 to 6 months in patients with MVD, it is found that, in these patients, NCCLs lesions gradually develop from borderline lesions to severe lesions, NCCLs lesions gradually aggravates, and from stable plaques to unstable plaques, leading to an increased incidence of adverse cardiovascular events, which has become an important reason [30,31]for the poor prognosis of MVD patients after PCI. The progression of NCCLs significantly affects the prognosis of MVD patients undergoing PCI, and its rapid progression is an important problem [32-33]after PCI. At present, many scholars at home and abroad have found that based on the research on the progress of NCCLs. The mechanism may be related to lipid metabolism disorder, inflammatory response theory, oxidative stress theory, renal insufficiency, hyperplatelet function theory, thrombosis theory, abnormal immune function, medication compliance and catheter and other related devices during PCI on NCCLs endothelial cell damage. The inflammatory response caused by foreign body implantation can increase the level of C-reactive protein. Some scholars believe that it can promote the progress of AS. The disorder of lipid metabolism factors is closely related to cardiovascular diseases. Reddan et al. found that abnormal renal function also affected the prognosis of MVD patients to varying degrees. Platelet activation can be involved in the occurrence and development of AS, and these risk factors have attracted everyone's attention[34,35]. These results can lead to different degrees of lumen obstruction (mainly microembolism of plaque and thrombus fragments), inflammation, and myocardial edema and necrosis, which can cause transient microvascular dysfunction[36]. This microvascular damage is not limited to culprit vessels, but may also extend to non-culprit vessels. The plaque location, plaque characteristics and plaque types of non-culprit vessels also affect the progression of non-culprit vessels together with the upper tree factors.

6. Summary

In conclusion, the comprehensive treatment of multivessel disease of coronary heart disease has always been a complicated and difficult problem in clinical work. On the basis of regular secondary drug prevention of coronary heart disease, patients with multivessel disease still have a high incidence of adverse cardiovascular events and a very poor long-term prognosis after PCI, which is closely related to the progress of non-culprit vessels. In the future research direction, we should explore the correlation between the level of inflammation, the level of coronary heart disease risk factors, and the progression of non-culprit vascular disease in patients with multivessel disease after PCI. Based on this, we should conduct accurate evaluation and early intervention for patients with multivessel disease after PCI, which is in line with the precision principle in cardiovascular treatment. This is in line with the precision principle of cardiovascular treatment, so as to reduce the incidence of adverse cardiovascular events, thereby reducing the mortality of patients, and even improve the prognosis of patients.

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