A Preliminary Study of TCM Stage-Oriented Treatment of Atherosclerosis

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Based on the combination of the traditional TCM theory and the idea and results of modern medical research on atherosclerosis (AS), the authors understand the pathology of AS in three stages and have studied the stage-oriented differential treatment of AS, namely, 1) the formation stage of AS plaque treated with the principle of regulating the liver, nourishing the kidneys and strengthening the spleen; 2) the stable stage of AS plaque treated with the principle of clearing away heat and toxic materials; and 3) the breaking stage of AS plaque treated with the principle of promoting blood circulation and removing blood stasis. We propose that the TCM treatment of AS should be based on the achievements of modern medical research, utilizing stage-oriented treatment according to the different stages of the formation and development of AS plaque, so as to improve the therapeutic effects.

Atherosclerosis (AS) is the main pathologic change resulting from coronary heart disease. Modern medical knowledge about the pathologic processes of AS plaque has provided very good stage-oriented ideas for the combined Chinese and Western medical prevention and treatment of AS, which may broaden the approach of research into TCM treatment of AS.

The development of AS tends to be a dynamic process. At different stages of AS, there may appear different clinical manifestations. Along with the formation, maturation and breaking of AS plaque, other pathologic changes, such as qi-insufficiency and blood stasis, yin-deficiency of the liver and kidneys, or stagnation of toxic heat in the collaterals, occur during the process of AS. The processes of auto-adaptation of the body and treatment can also influence the changing character of AS. Therefore, it is suggested that based on the present research achievements, we should adjust our static views on the etiology and pathology of AS to study the different characteristics of AS at different stages as it develops, and examine differing treatment techniques corresponding with different stages of the disease.

For this purpose, the authors’ TCM knowledge about the stage-oriented treatment of AS is introduced in the following.

1. The Formation Stage of AS Plaque and the TCM Treatment Principle of Regulating the Liver, Nourishing the Kidneys and Strengthening the Spleen

The formation of AS plaque is a complicated dynamic process,¹ which involves injury of the vascular endothelium and vasomotor disturbance, the lipid and mononuclear cells in the plasma entering and accumulating in the sub-endothelial space, the low density lipoprotein cholesterol (LDL-C) being oxidized and modified into peroxide low density lipoprotein (ox-LDL), and the single nuclear cells becoming foam cells after phagocytizing lipid and accumulating into lipid nucleus, thus the AS plaque is initially formed. In this process, abnormal lipid metabolism is the important factor in the formation of AS plaque. Being able to absorb the excessive serum cholesterol in the peripheral tissues, including those on the arterial wall, and send them adversely to the
liver to be discharged, the high density lipoprotein cholesterol (HDL-C) performs the function of a 'street cleaner' in the body. The decrease of HDL-C and the increase of LDL-C results in an imbalanced proportion between the two, leading to the formation of AS plaque.

The first causative factor for atherosclerosis is disturbance of lipid metabolism, while the clinical manifestations of hyperlipemia can be classified into the TCM category of turbid phlegm. The formation of turbid phlegm should be attributed to the spleen, kidney and the liver, with the failure of the liver to promote an unrestrained flow of *qi* being the main causative factor for the spleen and kidney producing phlegm. In Ling Shu (灵枢 Miraculous Pivot), it is said that man has fat, oil and flesh, excesses of which can cause man change in appearance and physique. Nei Jing (内经 Internal Classic) calls such man ‘fat man’, and ‘oily man’, and that insufficient fat and oil can make ‘the body lack of oil nourishment’. Oil-fat and the body fluids are of the same source, and the former is the thick form of the latter; and when entering blood after transformation, the former can make blood lipids rise to form turbid phlegm.

Dysfunction of the endothelium is another causative factor of atherosclerosis. Lining the blood vessels and flowing along with blood circulation, the endothelial cells spread all over the body and are involved in the complete interchange process of various materials in the blood, realizing the nourishment of the spleen, which is the acquired basis. One being the acquired basis and one being the congenital basis, the spleen and kidney are of the same origin and are interacting. In middle age, a man’s essential-*qi* of the kidney is in decline, and a deficiency of kidney-yin can result in the generation of interior deficient fire, which burns the body fluids, forming turbid phlegm. Insufficiency of kidney-*qi* may result in *qi* failing to transform body fluid and make it turn turbid, leading to an interior accumulation of phlegm-damp. If water fails to nourish wood, the liver will fail to promote the free flow of *qi*, and if the wood fails to promote earth, the spleen will fail to perform its normal function in transformation and transportation, which may further lead to undigested food accumulating to form phlegm, and the essence failing to be transported, instead accumulating and forming turbid phlegm. Turbid phlegm obstructing the blood vessels and mixing with blood will lead to disrupted transportation of heart-*qi*, gradually forming the plaque.

In short, at the early stages of atherosclerosis, dysfunction of the liver, spleen and kidneys for any reason can cause the formation of AS plaque. Therefore, treatment at the stage of plaque formation should be based on the treatment for the three organs of the liver, kidneys and spleen, so as to prevent the formation of turbid phlegm. Soothing the liver is aimed at restoring the liver’s function in promoting fluency, so as to benefit the elimination of free lipids; nourishing the kidneys is aimed at consolidating the kidney-*qi*, so as to promote normal distribution of body fluid; and strengthening the spleen is aimed at strengthening the spleen in promoting *qi* flow in the middle-jiao, so as to promote normal transportation of water and body fluid, by means of which to prevent the formation of plaque. At the plaque-forming stage, the liver, kidneys and spleen are not properly regulated, the toxic lipids, toxic-sugars, turbid-toxins, and toxic stasis produced in the body may accumulated and combine to form pathogenic toxic heat. That heat is produced by toxins, pathogenic change is caused by toxins, and blood stasis resulting from the stagnation of toxins.

2. The Stable Stage of AS Plaque and the TCM Treatment Principle of Clearing Away Heat and Toxic Materials

The stability of the plaque is more important than the luminal stenosis, because breaking of the unstable plaque is the fundamental cause of the occurrence of acute coronary syndrome in clinics. The biological characteristics of the unstable plaque are: infiltration of the inflammatory cellular factors, formation of big lipid nuclei and degradation of the fibrous cap. Infiltration of large numbers of the inflammatory cellular factors in the plaque tissues is the fundamental cause of non-stability and final breaking
of the plaque. After activation, large numbers of the foam cells existing in the lipid nucleus and T lymphocytes can produce interleukin-1 (IL-1) and tumor necrosis factor α (TNF-α), which can induce the endothelial cells to produce the macrophage colony stimulating factors (MCSF) and to promote proliferation of the single nuclear macrophagocyte in the plaque and make it active. The number and activity of the inflammatory factors in the plaque play a very important role in the stability of the plaque. Besides, the increased activity of Matrix Metalloproteinases (MMPs) in the plaque will promote degradation of the connective tissues in the fibrous cap such as the collagenous fibril, making the fibrous cap become thinner and easy to break, which is one of the main reasons for non-stability of the plaque. The place where breakage of plaque is most likely to take place is at the shoulder area of the decentered plaque.

The clinical manifestations of sudden angina pectoris due to a sudden breakage of the plaque are very similar to the manifestations of diseases due to ‘heat’ and ‘toxin’ in TCM. However, the ‘heat’ and ‘toxins’ here are not the traditional symptomatologic ‘heat’ and ‘toxins’, they have more pathogenic meanings. As a pathogenic factor, pathogenic toxins can be divided into the exogenous and endogenous. The endogenous toxin is more related with the miscellaneous diseases due to internal injury, and is the result of an accumulation and mixture of various pathogenic factors. Diseases caused by pathogenic toxins tend to have a deep location and a severe and lingering condition of the illness, which corresponds to the severe condition and long duration of the plaque formation period due to dysfunction of the liver, kidneys and spleen, leading to formation of turbid phlegm. For instance, breakage of the plaque can give rise to acute coronary syndrome, with the condition swiftly aggravating, corresponding to the characteristics of diseases caused by pathogenic toxin, which can have abrupt onset and may even be fatal. 

Sheng Ji Zong Lu (圣济总录 General Collection for Holy Relief) said: “The heart pertains to fire and is adverse to heat. When the heart is sick, it may easily generate heat.” Heat is a milder expression of fire; fire is the extremity of heat; and toxins are the accumulation of fire. Accumulation and stagnation of pathogenic fire and heat form toxic heat. Therefore, under the guidance of the principle of clearing away heat and toxic materials, oral administration of the corresponding herbal drugs can prevent breakage of the plaque. The heat-eliminating drugs mentioned here may inhibit the inflammatory factors of the plaque. Experimental research has demonstrated that baicalein and baicalin of Huang Qin (黄芩 Radix Scutellariae), in the concentration of 1 mg/L, can markedly inhibit the inflammatory reaction induced by lipopolysaccharide (LPS). Like Simvastatin, Huang Qi (黄芪 Radix Astragali) and Panax Notoginseng Saponins can decrease MMPs. Decreases in the content and activity of MMPs in the plaque are beneficial to the stability of the plaque.

3. The Breaking Stage of AS Plaque and the TCM Treatment Principle of Promoting Blood Circulation and Removing Blood Stasis

The breakage of plaque sends a large number of tissue factors into the circulating blood, and the oxidized LDL is one of the tissue factors that induces a high expression of endothelial cells and mononuclear cells. The accumulated foam cells around the plaque, the composted blood platelets, the increase of local thromboxane (TXA₂), 5-hydroxytryptamine (5-HT), adenosine diphosphate (ADP) and platelet activating factors and the decrease in the content of local prostacyclin can all accelerate the breakage of plaque and induce thrombosis. A large number of the tissue factors start this endogenous blood coagulation mechanism, leading to the formation of blood clots.

Blood clots obstructing the collaterals can be shown by livid skin with local prickling pain, and cyanosis of the lips and finger nails. If the blood accumulating outside of the collaterals is not eliminated, the zang organs will lose nourishment; and if the blood stagnating inside the collaterals is not eliminated, new blood will not generate. Therefore, the drugs for promoting blood circulation and removing blood
Stasis should be used to stimulate the generation of new blood. At the same time, attention should be paid to softening, toning and nourishing the blood vessels. Experimental research has proved that Chinese drugs for promoting blood circulation and removing blood stasis can balance the level of prostacyclin PGI2 with TXA2 and prevent coagulation of blood platelets, which can act directly on thrombosis, alleviating the symptoms of blood stasis, and decreasing the damage at the acute stage. Therefore, the Chinese drugs for promoting blood circulation and removing blood stasis may show effects for breaking of AS plaque and thrombosis.

Along with the deepening of modern medical knowledge about AS, TCM should give proper and objective explanations for AS, with corresponding differential treatments given at the different stages. Of course, no hard and fast line can be drawn between the above-mentioned three stages, which cannot be determined by the appearance or disappearance of certain symptoms. The TCM knowledge about AS needs to be clarified by way of modern science and technology, so that we can further enhance the therapeutic effects.

References


(Translated by WANG Xin-zhong 王新中)