METABOLOMICS-A NEW TECHNOLOGY IN EARLY DIAGNOSIS OF CORONARY HEART DISEASE

Yue Han, Aihua Zhang, Guangli Yan, Ying Han, Xijun Wang*

Sino-America Chinmedomics Technology Collaboration Center, National TCM Key Laboratory of Serum Pharmacochemistry, Chinmedomics Research Center of State Administration of TCM, Laboratory of Metabolomics, Department of Pharmaceutical Analysis, Heilongjiang University of Chinese Medicine, Heping Road 24, Harbin, 150040, China.
E-mail: xijunwangls@126.com

Abstract Due to the 'golden standard for diagnosing' (coronary arteriography) of coronary heart disease (CHD) was invasive, and the subjective judgment of doctor was used to distinguish different syndrome type of tradition Chinese medicine. So the article was reviewed which the new technology of metabolomics cloud discover the diagnostic biomarker reflecting the biological essence and the distinction between phlegm syndrome and blood-stasis syndrome of CHD. The pathway of amino metabolism, pyrimidine metabolism and purine metabolism were disturbed in patients of CHD. The level of L-tryptophan, uridine, urine acid was different between phlegm syndrome and blood-stasis syndrome of CHD. So the technology of metabolomics would be contributed to the early diagnosis of coronary heart disease and identification of different tradition Chinese medicine (TCM) syndromes.

Key words: coronary heart disease, syndrome type, diagnosis, metabolomics

Coronary heart disease (CHD) which had a high mortality rate was a main reason for death in the word. So the early diagnosis was very important for CHD. However, the coronary angiography with invasive surgery which had a lot of side effects was still the gold standard for the diagnosis of CHD. The reliable, sensitive, and non-invasive diagnostic techniques were needed for the early diagnosis of CHD.

In tradition Chinese medicine (TCM), the CHD had been belonged to the category of "chest impediment and heart pain". There were different symptomatic elements of TCM in CHD including phlegm turbidity, blood stasis, qi stagnation, congealing cold, qi deficiency, deficiency of yin, and deficiency of yang. The method depended on the experience of doctor which would affect its accuracy. In order to better identified and treated the different TCM syndromes of CDH, an objective, quantitative and comprehensive indicator of syndrome also were needed.

Based the high-throughput and innovative technology of liquid chromatograph and mass spectrometer (LC-MS), metabolomics could discover the change of small molecules metabolites of biological sample including the urine and serum due to the pathology change. So the metabolomics technology which had a non-invasive, sensitive, and covered characteristic could understand the biomarker of different syndrome types in same disease. This paper would review how distinguish and diagnose the different syndrome types of CHD using the method of metabolomics.

Objective In order to better understand the syndrome types of TCM of CHD and early diagnose the disease, the method of metabolomics had been used to discover the disease-related biomarkers.

Materials and methods The participants including patients of CHD which confirmed by coronary angiography and healthy person were hired to the study of metabolomics profiling. All serum sample of participant were collected and dealt with using the same method. These serum samples were separated and detected performing on LC-MS. All LC-MS date were normalized and analyzed by the software of Masslyx and SIMCA-13.0 cooperating with KEGG database and human metabolome database [1].

Results and discussion Phlegm syndrome and blood-stasis syndrome was the TCM syndrome by the basic diagnosis method of inspection, auscultation-olfaction, interrogation and palpation. However the biological essence of different syndrome still was a 'black box' which didn't have an objective indicator. So the possible material basis of different syndrome was discovered by the scholar of china. These metabolites of amino metabolism, pyrimidine metabolism and purine metabolism not only could be distinguished between CHD patients and healthy volunteers, but also could be distinguished between phlegm syndrome and blood-stasis syndrome of CHD patients [1]. Immune activation was an important pathogenic mechanism of CHD associating with amino acid metabolism. If the level of tryptophan was reduced, the atherosclerotic fibrous plaque would be found in the arterial wall [2]. Due to the myocardial ischemia, the energy metabolism was disturbed. So the nucleotide was broken down into uridine and urine acid which regarded as a material basis of CHD [3].

References

[1] Linlin Zhao, Ling Wan, Metabonomics profiling study on phlegm syndrome and blood-Stasis syndrome in coronary heart disease patients using liquid chromatography/quadrupole time-of-flight mass spectrometry. Evid Based Complement Alternat Med.

[2] Qiongxin Wang, Danxia Liu, Tryptophan-kynurenine pathway is dysregulated in inflammation, and immune activation. Front Biosci (Landmark Ed). 2015, 20: 1116-1143.

[3] Burakowski S, Smoleński RT, Exercise stress test and comparison of ST change with cardiac nucleotide catabolite production in patients with coronary artery disease. Cardiol J. 2007, 14:573-579.