Pakistan J. Zool., pp 1-3, 2021. **DOI**: https://dx.doi.org/10.17582/journal.pjz/20190926090912

Short Communication

Changes in Serum Endothelin, Brain Natriuretic Peptide and High Sensitive C-Reactive Protein Levels in Patients with Coronary Heart Disease

Zheng Tan*, Li Li, Yuxin Song, Meirong Tian and Fan Jia

Second Department of Cardiovasology, Tangshan Gongren Hospital, Tangshan, 063000, China

Article Information
Received 26 September 2019
Revised 30 October 2019
Accepted 14 January 2020
Available online 09 February 2021

Authors' Contribution
ZT collected the samples. LL and YS analysed the data. MT and FJ conducted the experiments and analysed the results. All authors discussed the results and wrote the manuscript.

Key words
Coronary heart disease, Serum endothelin, Brain natriuretic peptide, High sensitivity, c-reactive protein

ABSTRACT

In this study, 150 patients diagnosed with coronary heart disease (CHD) were divided them into three groups, each containing 50 patients, namely stable angina pectoris (SAP) group, unstable angina pectoris (UAP) group, and acute myocardial infarction (AMI) group. Fifth healthy people were enrolled as control. The changes in serum endothelin, brain natriuretic peptide and high sensitive c-reactive protein in patients with CHD were observed and analyzed. The levels of serum endothelin, brain natriuretic peptide and high-sensitivity c-reactive protein were significantly higher in AMI group compared to UAP group, SAP group and the control group, $p<0.05$. The level of indicators in the UAP group was higher than that in the SAP group and the control group, $p<0.05$. Compared with the control group, all indicators in SAP group were significantly higher, $p<0.05$. The serum endothelin, brain natriuretic peptide and high sensitive c-reactive protein levels were significantly increased during the clinical diagnosis of CHD, which indicates that these three indicators play a key role in the pathogenesis and can be used as indicators for clinical risk stratification of CHD.

The heart is a vital organ of the human body which acts like a pump that never stops working. With each contraction of the heart, blood carrying oxygen and nutrients is transported through the aorta to the whole body to supply the tissues and cells for metabolism. Risk factors of coronary heart disease (CHD) include changeable risk factors and unchangeable risk factors. Understanding and intervening risk factors are conducive to the prevention and treatment of CHD (Wang *et al*., 2015; Chen *et al*., 2017).

The main manifestations of CHD include coronary artery injury, stable angina pectoris (SAP), unstable angina pectoris (UAP), and acute myocardial infarction (AMI). The pathophysiological basis of CHD is atherosclerosis, and each link (formation, development and clinical symptoms) involves endothelial dysfunction. As a key factor in the regulation of cardiovascular function, endothelin can actively maintain basic vascular tension and cardiovascular system homeostasis. If endothelial function is obstructed, the level of endothelial cord will be increased accordingly (Hara *et al*.,2017; Alfaddagh *et al*., 2017; Xu *et al*., 2016). During the onset of CHD, cerebral natriuretic peptide and hypersensitive c-reactive protein (hs-CRP) can trigger local inflammatory reaction, leading to the formation of thrombosis, and increase in the level of cerebral natriuretic peptide and hs-CRP, all of which are closely related to acute ischemic injury, infarction and cardiac function impairment of myocardium. This study analyzes the changes in serum endothelin, brain natriuretic peptide and high-sensitivity c-reactive protein levels in patients with CHD.

Material and method

In this study, 200 patients treated for CHD from January 2016 to May 2019 were enrolled as research objects. The patients meeting inclusion criteria were those who accepted ECG, echocardiography, myocardial markers, coronary angiography and clinical diagnosis for CHD and met the criteria of diagnosis and classification of CHD by the World Health Organization and the Chinese Medical Association in 1979 (Chen *et al*., 2018). The patients meeting exclusion criteria were those with acute or chronic infection, trauma, rheumatic diseases, malignant tumors, or severe liver and kidney dysfunction.

* Corresponding author: profacademic33@gmail.com
0030-9923/2021/0001-0001 $ 9.00/0

The patients (150) were divided into SAP, UAP and AMI groups according to their actual conditions, each containing 50 patients. On the other hand, 50 healthy patients were enrolled as control. In SAP group, there were 28 males and 22 females, with an average age of 60.25±1.22 years. There were 24 males and 26 females in the UAP group, with an average age of 58.69±1.35 years. In the AMI group, there were 25 males and 25 females with an average age of 59.13±1.70 years. There were 24 males and 26 females in the control group, with an average age of 58.07±1.20 years.

Blood samples (3 mL) were collected from all selected patients as well as healthy subjects in the control group in the early morning under fasting state to separate serum. Radioimmunoassay was used to detect serum endothelin by using Access automatic biochemical analyzer (Beckman Corporation, USA) and the kit provided by the Northern Institute of Immunoreagents of China Isotopes Corporation. Quantitative determination of serum cerebral natriuretic peptide was carried out by fluorescence immunoassay, and serum hs-CRP was determined by turbidimetric method with 7170 biochemical instrument (Hitachi, Japan). By strictly following the standard operating procedure, one-time measurement was carried out when the instrument was in good condition and the quality control was sound. Hitachi 7170 automatic biochemical analyzer was used to test fasting blood glucose (FBG), total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), body mass index (BMI) and other indicators.

Statistical analysis software SPSS21.0 was used to process data. The measurement data were expressed by mean ± average ($\bar{x}$ ± s), with 't' test conducted for intergroup comparison. Enumeration data were expressed by number (n) and percentage (%), with chi-square used for intergroup comparison. The intergroup difference was considered statistically significant when $p<0.05$.

Results

Table I shows the levels of serum endothelin, brain natretin and hs-CRP of patients in AMI group were significantly higher than those in UAP, SAP and control groups, $p<0.05$. The levels of these indicators in the UAP group were significantly higher than those in the SAP and the control groups, $p<0.05$. Compared with the control group, the levels of all indicators in SAP group were significantly higher, $p<0.05$.

According to Table II, no significant differences were found in the levels of FPG, TC, TG, HDL-C and BMI among the 4 groups, $p>0.05$. In terms of measured HDL-C value, AMI group was significantly lower than other three groups, and SAP and UAP groups were significantly lower than the control group, $p<0.05$. The value of GDF-15 showed significant differences among four groups, which followed the rank as AMI group > UAP group > SAP group > control group, $p<0.05$.

Discussion

Endothelin is a vasoconstrictive active peptide which is isolated and purified from vascular endothelial cells. Moreover, it is an acidic peptide composed of 21 amino acids, which plays an important role in maintaining normal blood pressure. Endothelin is the most potent vasoconstrictor currently, which is present in the endothelium and acts on nearby smooth muscle cells by paracrine. When endothelial function is blocked, endothelin levels increase and nitric oxide production decreases, and coronary arteries are the most sensitive to endothelin level. Due to myocardial ischemia, hypoxia and large amount of free radicals released by patients, endothelial cytokines are stimulated to release, and the activity of the nervous system is enhanced to release large amount of catecholamines, leading to the improvement of endothelin level (Edlinger *et al*., 2017; Fang *et al*., 2018).

Brain natriuretic peptide consisting of 32 amino acids originates primarily from the ventricle. Brain natriuretic peptide can promote sodium excretion and urination, exerting significant effect of vascular relaxation. Heart can activate the natriuretic peptide system. The main factors stimulating brain natriuretic peptide to release include ventricular pressure, ventricular, heart, load capacity. On one hand, these indicators can be used to diagnose heart failure and risk stratification, guide treatment and assess prognosis; on the other hand, they also play a key role in risk stratification and prognosis evaluation of AMI.

As one of the acute reactive proteins, CRP is extremely low in the serum of healthy people, and the extent of its increase is closely related to the degree of infection. When the disease is cured, the content of CRP will be significantly reduced, and then return to the normal state within 7 days. For the routine measurement of common CRP, the detection limit is generally 3-200mg/L. Due to the lack of high sensitivity, the risk of cardiovascular events cannot be well predicted. The CRP measured in this model was hyper-sensitive or high sensitive CRP. The results showed that through development and application of the high-sensitivity c-reactive protein detection method, serum CRP level previously considered normal can be closely related to the occurrence of cardiovascular and cerebrovascular diseases.

The results of this study showed that the levels of serum endothelin, brain natretin and hs-CRP in AMI group were significantly higher than those in UAP, SAP and control groups, $p<0.05$. The indicators of UAP were higher than those of SAP and

Table I. Comparison of endothelin, brain natriuretic peptide and high sensitive c-reactive protein levels in the four groups ($\bar{x}$ ±s). ($\bar{x}$ ±s). Authors: Is it SEM or SD?

Indicator	Control group (n=50)	SAP group (n=50)	UAP group (n=50)	AMI group (n=50)
Serum endothelin (pg/L)	40.6±14.7	60.8±12.3	91.2±325.6	105.4±11.5
Brain natretin (pg/mL)	81.3±25.4	375.3±188.6	554.9±465.0	1185.6±400.3
High-sensitivity c-reactive protein (mg/L)	1.1±0.86	5.1±1.3	9.4±7.8	13.2±6.5

SAP, stable angina pectoris; UAP, unstable angina pectoris; AMI, actual myocardial infarctio.

Table II. Comparison of blood lipid, blood glucose and other indicators in the four groups ($\bar{x}$± s). ($\bar{x}$ ±s). Authors: Is it SEM or SD?

Indicators	SAP group (n=50)	UAP group (n=50)	AMI group (n=50)	Control group (n=50)
FBG (mmol/L)	5.35±0.57	5.45±0.62	5.48±0.56	5.31±0.71
TC (mmol/L)	4.47±0.96	4.91±0.05	4.59±0.88	4.28±0.93
TG (mmol/L)	1.60±0.38	1.64±0.87	1.78±0.53	1.43±0.85
LDL-C (mmol/L)	2.48±0.60	2.56±0.52	2.58±0.96	2.36±0.62
HDL-C (mmol/L)	1.02±0.16	0.98±0.03	0.93±0.04	1.12±0.19
BMI (kg/m^2)	23.6±2.6	24.9±2.8	24.2±0.09	23.5±2.6
CDF-15 (pg/ml)	1408.5±224.6	2218.5±375.3	2879.7±502.3	347.6±98.6

FBG, fasting blood glucose; TC, total cholesterol; TG, triglyceride; LDL-C, low-density lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol; BMI, body mass index; CDF-15, for other abbreviations, see Table I.

control groups, p<0.05. Compared with the control group, all indicators in SAP group were significantly higher (p<0.05). The results of this study are consistent with those of other relevant studies.

Conclusion

In conclusion, serum endothelin, brain natriuretic peptide and hs-CRP levels in patients with coronary heart disease (CHD) are significantly higher than those in normal people, and the degree of increase of these cytokines is closely related to the degree of myocardial ischemia and damage. Therefore, the three kinds of cytokines can play a role in the occurrence and development of CHD. Through the detection of plasma endothelin, brain natriuretic peptide and hs-CRP levels in patients with CHD, the patient's condition, curative effect, prognosis judgment can be obtained. Serum levels of these three cytokines can be used as effective indicators to evaluate the degree of myocardial ischemia in patients with CHD.

Statement of conflict of interest

The authors have declared no conflict of interest.

References

Alfaddagh, A., Elajami, T.K., Ashfaque, H., Saleh, M., Bistrian, B.R. and Welty, F.K., 2017. *J. Am. Heart Assoc*., **12**: 235-240.

Chen, C.H., Bao, J. and Teng, M.Z., 2017. *Guizhou med. J*., **41**: 824-826.

Chen, H.G., Fu, X. and Lu, J., 2018. *Pract. Geriat*., **32**: 777-780.

Edlinger, M., Wanitschek, M., Dörler, J., Ulmer, H., Alber, H.F. and Steyerberg, E.W., 2017. *BMJ Open,* **74**: 188-190.

Fang, Y., Yang, K.P. and Jin, D., 2018. *Mod. J. Integr. Trad. Chinese West. Med*., **27**: 3964-3967.

Hara, T., Monguchi, T., Iwamoto, N., Akashi, M., Mori, K., Oshita, T., Okano, M., Toh, R., Irino, Y., Shinohara, M., Yamashita, Y., Shioi, G., Furuse, M., Ishida, T. and Hirata, K.I., 2017. *Arterioscl. Thromb. Vasc. Biol*., **79**: 15-19.

Wang, Y.Z., Gan, Y.R., Kou, Z.K., Guo, X.H., Huang, T.P., Wu, H.J. and Xie, D.X., 2015. *Chinese J. Gerontol*., **35**: 3564-3566.

Xu, H.F., Liu, H., Deng, J.Y., Jin, Y., Chen, Y.P. and Chen, H., 2016. *Chinese J. Nosocomiol*., **26**: 1333-1335.