Original Article

Change of Inflammatory Factors in Patients with Acute Coronary Syndrome

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Abstract

Background: Acute coronary syndrome (ACS) is closely related to unstable plaques and secondary thrombosis. The inflammatory cells in plaques and their inflammatory products may be the cause for plaque instability and ruptures. The study aimed to disclose the changes of inflammatory factors including serum intracellular adhesion molecule-1 (ICAM-1), chitinase-3-like protein 1 (YKL-40), and lipoprotein-associated phospholipase A2 (Lp-PLA2) in patients with ACS and its clinical significance.

Methods: A total of 120 patients with coronary heart disease (CHD) were categorized into 2 groups: 69 with ACS and 51 with stable angina pectoris (SAP); 20 patients with chest pain and normal angiography served as a control group. The 120 patients with CHD were categorized into single-vessel disease group, double-vessel disease group, and three-vessel disease group based on the number of coronary artery stenosis. The severity of coronary artery stenosis was quantified based on coronary angiography using Gensini score. They were further divided into mild CHD group with its Gensini score <26 ($n = 36$), moderate CHD group with its Gensini score being 26–54 ($n = 48$) and severe CHD group with its Gensini score >54 ($n = 36$). Serum levels of ICAM-1, YKL-40, and Lp-PLA2 of different groups were determined by enzyme-linked immunosorbent assay. Correlation between ICAM-1, YKL-40, Lp-PLA2, and Gensini score was analyzed.

Results: The levels of serum inflammatory factors ICAM-1, YKL-40, and Lp-PLA2 were significantly higher in the ACS group than those in control group and SAP group (all $P < 0.05$); and compared with control group, no significant difference was observed in terms of the serum ICAM-1, YKL-40, and Lp-PLA2 levels in the SAP group ($P > 0.05$).The levels of serum ICAM-1, YKL-40, and Lp-PLA2 were not significantly different among control group, single-vessel disease group, double-vessel disease group, and three-vessel disease group (all $P > 0.05$). The levels of serum ICAM-1, YKL-40, and Lp-PLA2 were not significantly different among control group, mild CHD group (Gensini score <26), moderate CHD group (Gensini score 26–54), and severe CHD group (Gensini score >54) (all $P > 0.05$). Nonparametric Spearman correlation analysis showed that the levels of serum ICAM-1, YKL-40, and Lp-PLA2 were not correlated with the Gensini score in CHD patients ($r = 0.093$, $r = –0.149$, and $r = –0.085$, all $P > 0.05$; respectively).

Conclusions: The serum levels of ICAM-1, YKL-40, and Lp-PLA2 were correlated with different clinical types of CHD, but not well correlated the severity and extent of artery stenosis, suggesting that ICAM-1, YKL-40, and Lp-PLA2 might be involved in occurrence of instability of atherosclerotic plaque, and might reflect the severity of CHD mostly through reflecting the plaque stability.

Key words: Acute Coronary Syndrome; Chitinase-3-Like Protein 1; Coronary Heart Disease; Intracellular Adhesion Molecule-1; Lipoprotein-Associated Phospholipase A2

Introduction

Recently, a number of studies have indicated the essential role of inflammatory factors, which are participated in the progression and formation of atherosclerosis, in the occurrence and development of coronary heart disease (CHD). The occurrence of acute coronary syndrome (ACS) is closely related to the presence of unstable plaques and secondary thrombosis. The inflammatory cells in plaques

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and their inflammatory products may be the cause for plaque instability and ruptures.[1] Studies found three novel inflammatory markers, including lipoprotein-associated phospholipase A2 (Lp-PLA2), intracellular adhesion molecule-1 (ICAM-1), and chitinase-3-like protein 1 (YKL-40), which were involved in the clinical prognosis and pathogenesis of CHD.[2-10] Nevertheless, the association between these three inflammatory markers and plaque stability and the severity degree of coronary artery stenosis need to be further studied.

In the study, enzyme-linked immunosorbent assay (ELISA) was applied to determine the levels of serum inflammatory factors ICAM-1, YKL-40, and Lp-PLA2 in CHD patients. This study aimed to explore the association between the inflammatory markers and CHD and its different clinical types, plaque stability and severity of coronary lesions, and the role of the inflammatory markers in the pathogenesis mechanism of ACSs, so as to build a reliable basis for clinical practice.

Methods

Ethical approval

The study was approved by the Ethics Committee of the Beijing Anzhen Hospital Affiliated to Capital Medical University (No. 2015031) and signed informed consent was obtained.

Patients

In total, 120 patients aged 35–75 years and diagnosed with CHD by coronary arteriography from July 2015 to September 2016 in the Department of Cardiology, Beijing Anzhen Hospital Affiliated to Capital Medical University were included in this study. Sixty-nine cases were categorized into an ACS group and 51 cases into a stable angina pectoris (SAP) group. The CHD patients with ≥50% stenosis in at least one main coronary artery confirmed by coronary arteriography were enrolled. Twenty patients with chest pain symptom but normal coronary arteriograms were used as the control group. The 120 CHD patients were categorized into a single-vessel lesion group (45 cases), a double-vessel lesion group (38 cases), and a triple-vessel lesion group (37 cases) according to the number of lesion vessels. The Gensini score was used to evaluate the severity of coronary artery stenosis. The CHD patients were categorized into a mild lesion group (<26 scores, 36 cases), a moderate lesion group (26–54 scores, 48 cases), and a severe lesion group (>54 scores, 36 cases) according to the Gensini score.

Criteria for diagnosis

The ACS was diagnosed according to two guidelines. The first one is the American College of Cardiology Foundation and the American Heart Association Guideline, which was issued in 2013 and used for managing ST-elevation myocardial infarction.[11] The second one is the "Non-ST elevation-ACS diagnosis guideline" which was issued in 2012 by the Chinese Society of Cardiology of Chinese Medical Association.[12]

Criteria for inclusion and exclusion

Patients were included if they met the following criteria: (1) 35–75 years old; (2) being diagnosed with acute ACS; and (3) being subjected to coronary angiography within 3 days. All patients have signed the informed consent. The patients were excluded if they had uncontrolled grade 3 hypertension, severe valvular heart disease, or severe cardiac insufficiency (ejection fraction <35%); if they had hematopoietic system disorders, thyroid disorder, severe liver diseases, nervous system diseases, renal dysfunction, psychiatric illness, serious infectious diseases, or malignant tumor; if they had diabetes with glycated hemoglobin of 9.5% and random blood glucose of 13.7 mmol/L; if they were breastfeeding women or pregnant; and if they were involved in other clinical trials.

Treatment

The patients were subjected to fasting elbow venous blood collection in the next morning after being admitted, followed by coronary angiography in 3 days. The following clinical data were recorded, including blood pressure, blood lipid, fasting blood glucose, liver and kidney functions, electrocardiograms, age, and gender.

Coronary stenosis assessment

The severity of coronary artery stenosis was assessed by quantitative coronary angiography using Gensini scores.[13] The Gensini scores of 1, 2, 4, 8, 16, and 32 points were given for the stenosis of 1–25%, 26–50%, 51–75%, 76–90%, 91–99%, and 100% (complete occlusion). A factor was given to each segment of the coronary artery. The higher the factor, the more important the lesion's location is. The second diagonal branch was given a factor of 0.5; the first diagonal branch, the distal segment of anterior descending, the obtuse marginal branch, the proximal, middle, or distal segment of the right coronary artery, the posterior descending artery, the distal segment of circumflex artery, and left ventricular posterior branch were given a factor of 1; the mid segment of anterior descending was given a factor of 1.5; the proximal anterior descending or circumflex artery was given a factor of 2.5; and the left main lesion was given a factor of 5. The coronary artery stenosis was assessed by the multiplication of the factor of each segment and the corresponding score. The score of each coronary artery lesion was summed to obtain the Gensini score for each patient.

Measurement of inflammatory mediators

Five milliliter of fasting venous blood was drawn from each patient in the morning after being admitted for the measurement of biochemical indicators such as blood glucose and blood lipids. Another 5 ml of venous blood was drawn and centrifuged at 3000 r/min for 10 min. The supernatant serum layer was collected and then stored at −80°C. The levels of soluble ICAM-1, Lp-PLA2, and YKL-40 were measured by ELISA. For ICAM-1 and Lp-PLA2, the kit from R&D Systems Corporation (USA) was used, and for YKL-40, the kit from Quidel Corporation (USA) was used.

Statistical analysis

The statistical analysis was performed using SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were presented

as mean ± standard deviation, and categorical variables were expressed as percentages. The mean values were compared using one-way analysis of variance, followed by *post hoc* tests including Mann–Whitney *U*-test and Kruskal–Wallis test; and the percentages were compared using Chi-square test. $P < 0.05$ was considered to be statistically significant.

Results

General information

There was no statistical difference in terms of age, gender, hypertension history, diabetes history, smoking history, admission blood pressure, fasting blood sugar (FBS), triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) among the control group, the SAP group and the ACS group [all $P > 0.05$, Table 1]. There was no significant difference in terms of age, gender, hypertension history, smoking history, admission blood pressure, FBS, TG, TC, HDL-C, and LDL-C among the control group, the single-vessel lesion group, the double-vessel lesion group, and the triple-vessel lesion group [all $P > 0.05$, Table 2], but the number of patients with diabetes history in the double-vessel lesion group and triple-vessel lesion group were significantly more than that in the control group or the single-vessel lesion group [$P < 0.05$, or $P < 0.01$, Table 2]. The above indicators were not statistically different among the control group, the mild lesion group, the moderate lesion group, and the severe lesion group [all $P > 0.05$, Table 3].

Comparison of the concentration of inflammatory factors for patients with different types of coronary heart disease

The serum inflammatory factors ICAM-1, YKL-40, and Lp-PLA2 levels were significantly higher in the ACS group than those in control group and SAP group ($P < 0.05$ or $P < 0.01$ for each comparison); and compared with control group, no significant difference was observed in terms of the serum ICAM-1, YKL-40, and Lp-PLA2 levels in the SAP group [$P > 0.05$, Figure 1].

Comparison of the concentration of inflammatory factors for different numbers of coronary artery lesions

The serum ICAM-1, YKL-40, and Lp-PLA2 levels were no significant difference among control group, single-vessel disease group, double-vessel disease group, and three-vessel disease group [$P > 0.05$ for each comparison, Figure 2].

Comparison of the concentration of inflammatory factors for groups with different Gensini score

The serum ICAM-1, YKL-40, and Lp-PLA2 levels were no significant difference among control group, mild CHD group with its Gensini score <26, moderate CHD group with its Gensini score being 26–54, and severe CHD group with its Gensini score >54 [$P > 0.05$ for each comparison, Figure 3].

Correlation between inflammatory mediators and Gensini score

Nonparametric Spearman correlation analysis showed that serum ICAM-1, YKL-40, and Lp-PLA2 were not related the Gensini score in CHD patients ($r = 0.093$, $r = –0.149$, and $r = –0.085$, $P > 0.05$, respectively).

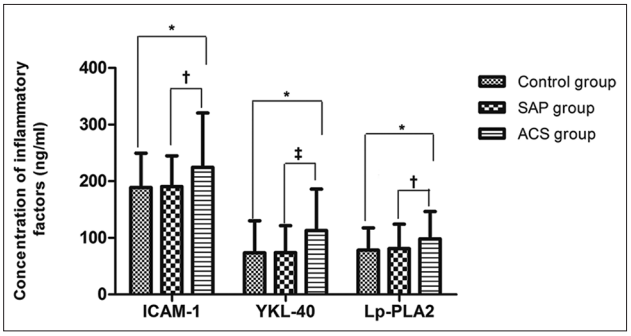

Figure 1: Comparison of the concentration of inflammatory factors for patients with different types of CHD. SAP: Stable angina pectoris; ACS: Acute coronary syndrome; ICAM-1: Intracellular adhesion molecule-1; YKL-40: Chitinase-3-like protein 1; Lp-PLA2:Lipoprotein-associated phospholipase A2 CHD: Coronary heart disease. *$P<0.05$, compared with control group; †$P<0.05$, ‡$P<0.01$, compared with SAP group.

Table 1: Comparison of clinical characteristics among the control group, SAP group, and ACS group

Item	Control group (n = 20)	SAP group (n = 51)	ACS group (n = 69)	Statistics	P
Age (year)	58.60 ± 10.45	58.33 ± 8.27	61.18 ± 6.74	0.322*	0.725
Male, n (%)	13 (65.0)	32 (62.7)	49 (71.0)	0.127†	0.938
Smoke, n (%)	6 (30.0)	22 (43.1)	28 (40.6)	1.676†	0.433
History of hypertension, n (%)	13 (65.0)	31 (60.8)	46 (66.7)	0.470†	0.791
History of diabetes, n (%)	3 (15.0)	12 (31.6)	24 (63.2)	3.523†	0.172
Systolic BP (mmHg)	128.10 ± 10.27	128.41 ± 13.54	130.63 ± 15.57	1.630*	0.200
Diastolic BP (mmHg)	78.10 ± 8.38	76.35 ± 7.91	76.79 ± 8.92	0.547*	0.580
FBS (mmol/L)	5.60 ± 0.92	5.82 ± 1.34	5.98 ± 1.84	0.275*	0.760
TG (mmol/L)	2.21 ± 1.20	1.72 ± 0.99	1.67 ± 0.86	4.657*	0.051
TC (mmol/L)	4.07 ± 1.32	4.08 ± 1.17	3.90 ± 1.07	0.408*	0.666
HDL-C (mmol/L)	1.17 ± 0.67	0.99 ± 0.33	1.06 ± 0.27	2.556*	0.082
LDL-C (mmol/L)	2.48 ± 1.13	2.49 ± 1.04	2.35 ± 0.84	0.079*	0.924

Data are reported as mean ± SD or n (%). *F value; †χ^2 value. SD: Standard deviation; SAP: Stable angina pectoris; ACS: Acute coronary syndrome; BP: Blood pressure; FBS: Fasting blood sugar; TG: Triglyceride; TC: Total cholesterol; HDL-C: High-density lipoprotein cholesterol; LDL-C: Low-density lipoprotein cholesterol; 1 mmHg=0.133 kPa.

Table 2: Comparison of clinical characteristics among the control group, the single-vessel lesion group, the double-vessel lesion group, and the triple-vessel lesion group

Item	Control group (n = 20)	Single-vessel disease group (n = 45)	Double-vessel disease group (n = 38)	Three-vessel disease group (n = 37)	Statistics	P
Age (year)	58.60 ± 10.45	61.22 ± 7.51	59.05 ± 7.45	59.43 ± 7.56	0.764*	0.516
Male, n (%)	13 (65.0)	31 (68.9)	25 (65.8)	24 (64.9)	0.188†	0.980
Smoke, n (%)	6 (30.0)	19 (42.2)	19 (50.0)	12 (32.4)	3.392†	0.335
History of hypertension, n (%)	13 (65.0)	24 (53.3)	28 (73.7)	25 (67.6)	3.991†	0.262
History of diabetes, n (%)	3 (15.0)	6 (13.3)	15 (39.5)‡,§	15 (40.5)‡,§	11.882†	0.008
Systolic BP (mmHg)	128.10 ± 10.27	127.82 ± 15.24	129.84 ± 13.34	131.51 ± 15.42	0.527*	0.664
Diastolic BP (mmHg)	78.10 ± 8.38	75.38 ± 8.16	75.76 ± 6.06	79.05 ± 10.37	1.688*	0.173
FBS (mmol/L)	5.60 ± 0.92	5.46 ± 1.29	6.23 ± 1.84	5.94 ± 1.66	2.001*	0.117
TG (mmol/L)	2.21 ± 1.20	1.61 ± 0.69	1.78 ± 0.94	1.69 ± 0.99	2.043*	0.111
TC (mmol/L)	4.07 ± 1.32	3.79 ± 0.92	3.94 ± 1.36	3.87 ± 1.07	0.296*	0.829
HDL-C (mmol/L)	1.17 ± 0.67	1.06 ± 0.26	1.01 ± 0.29	1.08 ± 0.32	0.891*	0.448
LDL-C (mmol/L)	2.48 ± 1.13	2.24 ± 0.76	2.67 ± 1.13	2.31 ± 0.78	1.645*	0.182

Data are reported as mean ± SD or n (%). *F value; †χ^2 value; Compared with the control group, ‡P<0.05; compared with single-vessel lesion group, §P<0.01. SD: Standard deviation; BP: Blood pressure; FBS: Fasting blood sugar; TG: Triglyceride; TC: Total cholesterol; HDL-C: High-density lipoprotein cholesterol; LDL-C: Low-density lipoprotein cholesterol; 1 mmHg=0.133 kPa.

Table 3: Comparison of clinical characteristics among the control group, mild CHD group, the moderate group, and the severe CHD group

Item	Control group (n = 20)	Mild CHD group (n = 36)	Moderate CHD group (n = 48)	Severe CHD group (n = 36)	Statistics	P
Age (year)	58.60 ± 10.45	60.78 ± 7.54	60.25 ± 8.39	58.83 ± 6.18	0.555*	0.646
Male, n (%)	13 (65.0)	24 (66.7)	29 (60.4)	27 (75.0)	1.983†	0.576
Smoke, n (%)	6 (30.0)	15 (41.7)	17 (35.4.)	18 (50.0)	2.795†	0.424
History of hypertension, n (%)	13 (65.0)	19 (52.8)	36 (75.0)	22 (61.1)	4.639†	0.200
History of diabetes, n (%)	3 (15.0)	8 (22.2)	15 (31.3)	13 (36.1)	3.709†	0.295
Systolic BP (mmHg)	128.10 ± 10.27	124.92.10 ± 11.60	132.88 ± 15.53	129.92 ± 15.39	2.317*	0.078
Diastolic BP (mmHg)	78.10 ± 8.38	74.31 ± 7.41	77.08 ± 9.84	78.36 ± 6.94	1.667*	0.177
FBS (mmol/L)	5.60 ± 0.92	5.88 ± 1.82	6.06 ± 1.79	5.54 ± 1.03	0.962*	0.413
TG (mmol/L)	2.21 ± 1.20	1.70 ± 0.78	1.78 ± 1.10	1.58 ± 0.61	2.023*	0.114
TC (mmol/L)	4.07 ± 1.32	4.07 ± 1.32	4.07 ± 1.32	4.07 ± 1.32	1.688*	0.173
HDL-C (mmol/L)	1.17 ± 0.67	1.03 ± 0.22	1.10 ± 0.36	1.02 ± 0.24	0.936*	0.425
LDL-C (mmol/L)	2.48 ± 1.13	2.22 ± 0.76	2.32 ± 0.98	2.68 ± 0.91	1.699*	0.170

Data are reported as mean ± SD or n (%). *F value; †χ^2 value. SD: Standard deviation; CHD: Coronary heart disease; BP: Blood pressure; FBS: Fasting blood sugar; TG: Triglyceride; TC: Total cholesterol; HDL-C: High-density lipoprotein cholesterol; LDL-C: Low-density lipoprotein cholesterol; 1 mmHg=0.133 kPa.

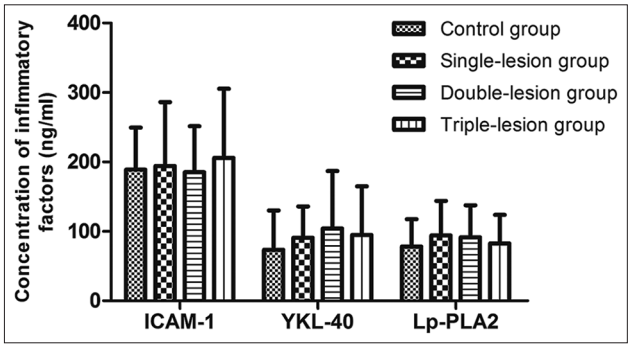

Figure 2: Comparison of the concentration of inflammatory factors for different numbers of coronary artery lesions. ICAM-1:Intracellular adhesion molecule-1; YKL-40:Chitinase-3-like protein 1; Lp-PLA2:Lipoprotein-associated phospholipase A2.

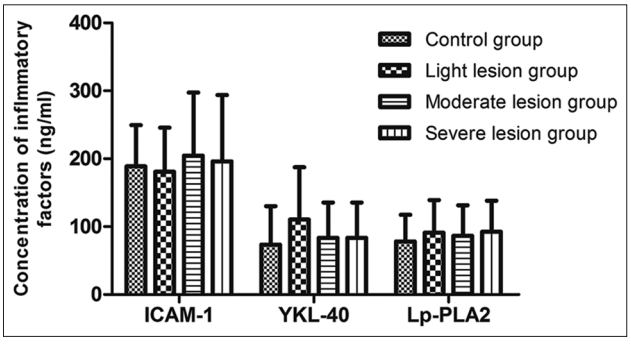

Figure 3: Comparison of the concentration of inflammatory factors for groups with different Gensini scores. ICAM-1:Intracellular adhesion molecule-1 ; YKL-40:Chitinase-3-like protein 1; Lp-PLA2:Lipoprotein-associated phospholipase A2.

Discussion

Inflammation plays an essential role in the development, progression, and prognosis of CHD, and has been widely concerned as an independent risk factor for the development of CHD.[14,15] It is involved in the formation and progression of atherosclerosis, and the activation of inflammatory responses may be a major contributor to plaque instability. Ross *et al*.[16] pointed out that atherosclerosis is a chronic inflammatory disease, and many inflammatory cells and factors participate in its occurrence and development process. The pathogenesis of the disease is as follows: vascular endothelial cells are damaged at the early stage of atherosclerosis, the endothelial cells adhere to monocytes with each other, and the monocytes adhere to the endothelial surface and pass through to the subcutaneous region to participate in the local inflammatory response. Under the stimulation of various substances, endothelial cells express a variety of pro-inflammatory molecules[17,18] which play an important role in cell recruitment, migration, cell proliferation, and lipid and protein synthesis regulation together with nitrogen oxide and lipid mediators. Macrophages express the scavenger receptors under the action of oxidized low-density lipoprotein, which mediate the macrophages to swallow a large amount of lipid and concert to foam cells. The activated macrophages can secrete and mediate acute inflammatory reactions and can synthesize and secrete a variety of growth factors and stimulate the migration and proliferation of smooth muscle cells and fibroblasts. The activated T cells release cytokines such as interferon-γ and tumor necrosis factor-alpha. The activation of pro-inflammatory cells and the expression of cytokines promote the thickening or rupture of atherosclerotic plaques, and then the lipid pool enters the blood vessel to cause thrombosis, which then leads to the occurrence and development of ACS. ICAM-1, YKL-40, and Lp-PLA2 are newly discovered inflammatory markers in the pathogenesis and clinical prognosis of CHD. However, the relationship between these inflammatory markers and plaque stability and the severity degree of coronary artery stenosis need to be further studied.

ICAM-1 is mainly expressed on endothelial cells and immune cell membranes. It is a cell surface transmembrane glycoprotein and can mediate the intercellular interactions and the interactions between cells and extracellular matrix. As an essential biomarker of the activation of vascular endothelial cells, ICAM-1 can mediate the leukocyte-blood vessel wall adhesion, and the expression of ICAM-1 was found to be increased in plaques in CHD.[9,19] In addition, the single nucleotide polymorphism rs281432 of ICAM-1 was found to be an independent factor for the prediction of the progression of CHD.[3]

YKL-40 is expressed in smooth muscle cells, macrophages, endothelial cells, and several types of tumor cells. It is also an inflammatory glycoprotein involved in the formation of atherosclerotic plaques. The underlying mechanism might be that, as an endothelial dysfunction marker, YKL-40 can promote cell adhesion, chemotaxis/migration, and proliferation of vascular endothelial cells, resulting in neovascularization and vascular stenosis.

Nøjgaard *et al*.[20] showed that the expression level of YKL-40 in the ACS group was significantly higher than that in the SAP group, but there was no significant difference between the control group and the SAP group. In a study involving 200 patients undergoing coronary angiography, Kucur *et al*.[21] found that the expression level of YKL-40 increased with the increase of the number of coronary artery lesions. Zheng *et al*.[4] indicated that YKL-40 was involved in the plaque injury of CHD and was a predictor of plaque injury. The level of YKL-40 was gradually increased with the increase of the number of coronary artery lesions and had a positive correlation with the Gensini score, and was a good predictor of plaque injury.[22] However, it was suggested that there was no correlation between YKL-40 level and the severity of coronary artery lesions.[23]

As an important biomarker for inflammation and vascular endothelial dysfunction, Lp-PLA2 was extensive studied in recent years. It is mainly secreted by smooth muscle cells, endothelial cells, and macrophages, and is regulated by mediators of inflammation.[24] A number of studies disclosed the biological role of Lp-PLA2 in the formation and development of atherosclerosis plaques, and in the increase of the instability of the plaques,[25] so that it was regarded as a new inflammatory response marker of atherosclerosis. Lp-PLA2 is not easy to be affected by rheumatic diseases, hypertension, blood pressure, body mass index, diabetes, infections, and other systemic factors. In addition, Lp-PLA2 is a more specific inflammatory marker, not such as fibrinogen, C-reactive protein, and other traditional non-specific ones, and exhibits a higher association with cardiovascular diseases. Furthermore, studies also discovered a number of other contributions of Lp-PLA2, including evaluation of the activity of coronary artery lesions,[5] independent prediction of coronary events or other adverse cardiovascular events,[26,27] and determination of the severity of CAD and identification of patients at high risk for risk stratification.[28]

Our results showed that the levels of ICAM-1, YKL-40, and Lp-PLA2 in the ACS group were significantly higher than those in the SAP group and the control group, but there was no significant difference between the SAP group and the control group, indicating that ACS patients had more inflammation-related serum evidence reflecting the severity of the disease and plaque stability. Inflammation was involved in the development of atherosclerosis, especially promoted the formation of plaque instability, which is consistent with the previous findings. In addition, the study showed that the levels of ICAM-1, YKL-40, and Lp-PLA2 were not significantly different in the control group, the single-vessel lesion group, the double-vessel lesion group, and the triple-vessel lesion group. Therefore, the levels of ICAM-1, YKL-40, and Lp-PLA2 in the patients with coronary artery disease were not correlated with the range and severity of coronary artery stenosis. To further explore the correlation between ICAM-1, YKL-40, and Lp-PLA2 levels and the range and severity of coronary artery stenosis, we used a more

accurate Gensini scoring system to quantitatively evaluate the severity of coronary artery stenosis of the main coronary artery. The results showed that there was no significant correlation between serum ICAM-1, YKL-40, and Lp-PLA2 levels and Gensini scores. Therefore, this study shows that serum ICAM-1, YKL-40, and Lp-PLA2 levels are better indicators for the plaque instability than the range of severity of coronary artery stenosis, which is different from previous studies and needs to be further validated.

This study suggests that the changes in serum inflammatory cytokines ICAM-1, YKL-40, and Lp-PLA2 are involved in the development of coronary atherosclerosis and are associated with ACSs and plaque stability, but are not significantly associated with the range of severity of coronary artery stenosis of CHD patients, suggesting that they are better indicative of the plaque instability than the severity of the disease of CHD patients, which provides new ideas for the prevention, diagnosis and treatment of CHD. However, the number of cases in this study is small, and there are many *in vivo* factors that affect the ICAM-1, YKL-40, Lp-PLA2, and YKL-40 levels so that the results of the study need to be further confirmed by large-size clinical studies.

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Conflicts of interest

There are no conflicts of interest.

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急性冠状动脉综合征与相关炎性因子的临床研究

摘要

背景：探讨急性冠状动脉综合征（ACS）患者相关炎性因子可溶性细胞间粘附分子（ICAM-1）、几丁质酶-3样蛋白-1（YKL-40）、脂蛋白相关磷脂酶A2（Lp-PLA2）的变化及其临床意义。

方法：入选冠心病（CHD）患者120例，分为ACS组69例和稳定型心绞痛（SAP）组51例。另选同期有胸痛症状冠状动脉造影正常的患者20例为对照组。再将120例CHD患者按病变血管支数分为单支病变组（45例）、双支病变组（38例）和三支病变组（37例）。采用Gensini评分系统评定冠脉血管病变狭窄程度，按Gensini积分分为轻度病变组（<26分）36例、中度病变组（26~54分）48例和重度病变组（>54分）36例。用酶联免疫吸附试验（ELISA）法分别检测血清ICAM-1、YKL-40、Lp-PLA2水平，对各组进行比较分析，并分别与Gensini积分进行相关性分析。

结果：与对照组和SAP组相比，ACS组血清炎性因子ICAM-1、YKL-40、Lp-PLA2均明显升高（P均<0.05），SAP组与对照组比较，ICAM-1、YKL-40、Lp-PLA2差异均无统计学意义（P均>0.05）。单支病变组、双支病变组、三支病变组血清炎性因子ICAM-1、 Lp-PLA2、 YKL-40差异均无统计学意义（P均> 0.05）。轻度病变组、中度病变组和重度病变组血清炎性因子ICAM-1 、Lp-PLA2、 YKL-40差异均无统计学意义（P均> 0.05）。非参数Spearman相关分析显示血清炎性因子ICAM-1、YKL-40、Lp-PLA2水平与Gensini积分均无明显相关性（r=0.093，r=–0.149，r=–0.085，P均>0.05）。

结论：血清炎性因子ICAM-1、YKL-40、Lp-PLA2与CHD的临床类型有关，ACS组患者ICAM-1、YKL-40、Lp-PLA2较SAP组和对照组明显升高，提示三种炎症因子可能参与斑块不稳定性的发生，成为预测CHD患者发生ACS风险和病情严重程度的临床指标。CHD患者血清炎性因子ICAM-1、YKL-40、Lp-PLA2水平与冠状动脉病变狭窄的范围和程度相关性不明显，提示其反映冠心病患者病情严重程度主要与反映斑块的稳定性有关。