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Research Article

Comparison of Lp-PLA2 Activity, Lp-PLA2 Mass and Lp-PLA2 mRNA in Acute Coronary Syndrome Patients

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ABSTRACT

Background: Lipoprotein-associated phospholipase A2 (Lp-PLA2) is a risk predictor for cardiovascular diseases (CVD). Generally, plasma Lp-PLA2 was thought to be secreted by circulatory inflammatory cells. Lp-PLA2 mRNA expression of PBMC may also be a risk predictor.

Methods: A total of 104 subjects angiographically verified ACS patients were enrolled, including 73 unstable angina pectoris (UAP) patients and 31 acute myocardial infarction (AMI) patients. Plasma lipids, Lp-PLA2 activity and Lp-PLA2 mass were measured. Lp-PLA2 mRNA expression of PBMC was relatively quantified by real-time fluorescence PCR.

Results: Plasma Lp-PLA2 activity was increased in AMI patients compared to UAP patients (395.21±145.91 vs. 328.53±127.03 U/L, p=0.024). Lp-PLA2 mass of AMI patients was also higher than UAP patients (136.43±45.46 vs. 119.16±44.19 ng/mL, p=0.093), while PBMC mRNA expression was not statistically different [1.07 (0.74, 1.57) vs. 0.88(0.49, 1.99), p=0.453]. Comparing Lp-PLA2 mRNA by groups, Lp-PLA2 mRNA level was higher in male ACS patients and smoking ACS patients (p=0.008, p=0.048, respectively). Multivariate logistic regression analysis showed that Lp-PLA2 activity was an AMI risk predictor (OR=5.224, 95% CI 1.687-16.181, p=0.004), after smoking, systolic blood pressure, diabetes and hyperlipidemia were adjusted. Recurrent ACS patients were older (p=0.035), but they showed lower levels of Lp-PLA2 mass and Lp-PLA2 activity (p=0.014, p=0.045, respectively), compared to primary ACS patients.

Conclusion: Smoking may be an important regulatory factor for Lp-PLA2 mRNA expression in PBMC. Among three Lp-PLA2 indexes, Lp-PLA2 activity was the best marker indicating AMI risk, while Lp-PLA2 mass maybe play better role as a predictor in avoiding ACS recurrence.

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Introduction

Coronary artery disease arising from atherosclerosis is a leading cause of death and morbidity worldwide. The underlying pathogenesis involves an imbalanced lipid metabolism and a maladaptive immune response entailing a chronic inflammation of the arterial wall [1]. Oxidized low-density lipoprotein (oxLDL) plays a prominent role in the formation of atherosclerotic lesions [2]. Moreover, lipoprotein-associated phospholipase A2 (Lp-PLA2) primarily acts on oxLDL to generate proinflammatory mediators such as lysophosphatidylcholine (LPC) and oxidized nonesterified fatty acids. Increased Lp-PLA2 activity correlates with proatherogenic lipids and cardiovascular risk in humans [3]. To date, many studies have suggested that both plasma Lp-PLA2 activity and Lp-PLA2 mass appear to be associated with cardiovascular diseases (CVD) [4, 5].

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Lp-PLA2, also known as platelet-activating factor acetylhydrolase (PAF-AH), is mainly secreted by monocytes, macrophages, T-lymphocytes, and mast cells and is enriched in the atherosclerotic plaque, particularly in macrophages and foam cells in the vascular intima [6-8]. In the past decade, several studies have investigated the gene expression level in cells such as peripheral blood mononuclear cells (PBMC). However, fewer studies addressed three Lp-PLA2 indexes together (Lp-PLA2 activity, mass and mRNA). One aim of our study is to make a comparison among the enzyme activity, enzyme mass and mRNA expression in PBMC of Lp-PLA2 in acute coronary syndrome (ACS) patients. Nowadays, recurrence remains a significant threat to acute myocardial infarction (AMI) survivors. Classifying patients according to their risk of recurrent AMI may be helpful in efforts to prevent the next AMI [9]. Therefore, another aim of our study is to compare three Lp-PLA2 indexes (activity, mass and mRNA level) as AMI recurrence predictor.

Methods

I Study Population

The ACS patients from September 2016 to July 2018 were enrolled in this study. The main discharge diagnosis of ACS was the inclusion criteria. The exclusion criteria were as follows: history of previous heart failure, dilated cardiomyopathy, hypertrophic cardiomyopathy, valvular heart disease, cerebral infarction, recent trauma, malignancy, acute and chronic inflammation, severe liver disease, end-stage kidney disease, and autoimmune disease with immunosuppressive treatment.

Unstable angina pectoris (UAP) was defined by typical chest pain lasting less than 20 minutes, new-onset or increasing frequency. Acute myocardial infarction (AMI) was defined by typical chest pain duration more than 30 minutes, the ST-segment elevation/depression to a value of above 0.1 mV. The recurrent patients were determined according to the disease history and the other diagnosis in medical record. The recurrence time was not restricted in one year.

II Data Collection

Standardized spreadsheet was used to collect information including age, gender, smoking, hypertension, diabetes mellitus, hyperlipidemia, systolic blood pressure (SBP), diastolic blood pressure (DBP), Gensini score, lipids levels and heart disease history. Subjects who smoked within one year before registration were defined as smokers.

The severity of coronary artery lesions in patients underwent a CAG examination was evaluated by the Gensini score. Degree of stenosis: <25% of 1 point, 26% to 50% of 2 points, 51% to 75% of 4 points, 76% to 90% of 8 points, 91% to 99% of 16 points, 100% count 32 points. Lesion: 5 points for left main coronary artery, 2.5 points for the near section of left anterior descending branch (LAD) or left circumflex branch (LCX), 1.5 points for the middle section of LAD, 1 point for far section of LAD, 1 point for middle or far section of LCX, 1 point for near, middle or far section of right coronary artery, and 0.5 points for the remaining branches. The score for each lesion is the stenosis score multiplied by the lesion score, and the score for each patient is the sum of all lesion scores.

III Plasma Lipids Profiles

Blood was drawn in the morning when patients under a fasting condition. Plasma was obtained from EDTA-K2 anticoagulated blood samples and frozen in -70℃ fridge. Total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) levels were measured using commercially available kits on an AU5400 Autoanalyser (Beckman). Plasma oxLDL was measured using an enzyme immunoassay kit (Mercodia, Uppsala, Sweden).

IV Lp-PLA2 Activity and Mass

Plasma Lp-PLA2 activities were measured using a commercially available kit (Dyasis, Germany) on an AU5400 Autoanalyser (Beckman). Plasma Lp-PLA2 masses were measured by Weigao reagent on WEGO Autolumis 3000 analyser (Weihai, China).

V Lp-PLA2 mRNA Measurement

PBMC in EDTA-K2 anticoagulant blood were isolated by density centrifugation with Ficoll according to the manufacturer's instructions. Total RNA in PBMC was extracted by Qiagen RNeasy Mini Kit 74104 (Germany). First loosen the pelleted PBMC by flicking the tube. Add 600 μl Buffer RLT, vortex to mix. Add 1 volume of 70% ethanol to the lysate and mix well by pipetting. Immediately transfer up to 700 μl of the sample, including any precipitate, to a RNeasy Mini spin column placed in a 2 ml collection tube. Centrifuge for 15 s at 8000 g. Discard the flow-through. Transfer the rest sample to the same RNeasy spin column, centrifuge, and discard the flow-through. Add 700 μl Buffer RW1 to the RNeasy spin column. Close the lid gently, and centrifuge for 15 s at 8000 *g* to wash the spin column membrane. Discard the flow-through. Add 500 μl Buffer RPE to the RNeasy spin column. Close the lid gently, and centrifuge for 15 s at 8000 g. Discard the flow-through. Add 500 μl Buffer RPE to the RNeasy spin column. Close the lid gently, and centrifuge for 2 min at 8000 g. Place the RNeasy spin column in a new 1.5 ml collection tube. Add 35 μl RNAse-free water directly to the spin column membrane. Close the lid gently, and centrifuge for 1 min at 8000 g to elute the total RNA.

First strand cDNAs were synthesized from total RNA using Tiangen FastKing gDNA Dispelling RT SuperMix KR118 (Tiangen Inc., China). The reaction procedures were 42℃ for 15 min followed by 95℃ for 3 min. The cDNA level was analysed by real-time PCR using Talent qPCR PreMix (SYBR Green) FP209 (Tiangen Inc., China). *GAPDH* gene was used as normalizer. All the reactions were run in duplicates. To account for between-sample differences, mRNA levels were normalized to *GAPDH* for each sample and relative expression of the Lp-PLA2 mRNA was analysed by ΔΔCt and fold change was calculated using $2^{-\Delta\Delta Ct}$ method. The specific primers are as follow: Lp-PLA2 forward primer-attcttttggtggagcaacg, reverse primer-ttcatcacccagtggaaaca; *GAPDH* forward primer-gagtcaacggatttggtcgt, reverse primer-gacaagcttcccgttctcag.

VI Statistical Analysis

The demographic and clinical characteristics of the participants were described by percentages, means or median as appropriate. Comparisons of two or more groups were performed by t test, χ^2 test or nonparametric tests. Regression coefficients were calculated based on 'Pearson' or

'Spearman' product moment. Multivariate logistic regression analyses were performed to examine whether Lp-PLA2 activity/mass/mRNA was an independent risk predictor of AMI. Statistical significance was assumed for $p<0.05$.

Results

I Comparison of Clinical Characteristics between UAP and AMI Patients of Study Population

Clinical characteristics and Lp-PLA2 indexes of UAP (n=73) and AMI (n=31) patients were compared. Smoking percentage, Lp-PLA2 activity, and hyperlipidemia percentage were significantly higher in AMI group than in UAP group ($p<0.05$). The recurrence rate was significantly different between those two groups ($p<0.05$). SBP, Lp-PLA2 mass and diabetes were not significantly different ($p<0.10$). Other variables including age, gender, DBP, Gensini score, TC, LDL-C, oxLDL, Lp-PLA2 mRNA and hypertension percentage were not statistically different ($p>0.05$). The expression of Lp-PLA2 mRNA in AMI patients was not statistically higher than the level of UAP patients [1.07 (0.74, 1.57) vs. 0.88 (0.49, 1.99), $p>0.05$] (Table 1).

Table 1: Comparison of clinical characteristics between UAP and AMI patients.

Variables	UAP (n=73)	AMI (n=31)	p value
Age (years)	59.25±9.49	60.16±10.94	0.669
Male (%)	71.2% (52)	80.6% (25)	0.317
Smoking (%)	41.7% (30)	63.3% (19)	0.046*
SBP (mmHg)	130±18	124±15	0.072†
DBP (mmHg)	76±11	75±10	0.746
Gensini score	19 (8, 51)	33 (12, 68)	0.161
TC (mmol/L)	4.10±1.14	4.23±0.95	0.575
LDL-C (mmol/L)	2.37±0.98	2.58±0.81	0.309
OxLDL (U/L)	49.73 (39.36, 68.05)	50.20 (39.80, 64.35)	0.852
Lp-PLA2 activity (U/L)	328.53±127.03	395.21±145.91	0.024*
Lp-PLA2 mass (ng/mL)	119.16±44.19	136.43±45.46	0.093†
Lp-PLA2 mRNA	0.88 (0.49, 1.99)	1.07 (0.74, 1.57)	0.453
Hypertension (%)	71.2% (52)	67.7% (21)	0.722
Diabetes (%)	37.5% (27)	19.4% (6)	0.070†
Hyperlipidemia (%)	56.2% (41)	77.4% (24)	0.041*
Recurrence (%)	34.2% (25)	12.9% (4)	0.026*

UAP: Unstable Angina Pectoris; AMI: Acute Myocardial Infarction; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; TC: Total Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; oxLDL: oxidized LDL; Lp-PLA2: Lipoprotein-Associated Phospholipase A2.
*$p<0.05$; †$p<0.10$.

II PBMC Lp-PLA2 mRNA Level in ACS Patients

ACS patients were grouped according to gender, smoking and their comorbidities. Male patients had a significantly higher Lp-PLA2 mRNA expression compared to female patients ($p=0.008$). Smoking patients also had a higher Lp-PLA2 mRNA level than non-smoking patients ($p=0.048$). ACS patients with a history of hypertension, diabetes, and hyperlipidemia had the similar levels of PBMC Lp-PLA2 mRNA compared to ACS patients without those common comorbidities ($p>0.05$) (Table 2).

Table 2: Lp-PLA2 mRNA comparison between groups according to clinical characteristics.

Grouping variables		Lp-PLA2 mRNA	p value
Gender	Male	1.20 (0.61, 2.12)	0.008*
	Female	0.61 (0.45, 0.90)	
Smoking	Yes	1.11 (0.71, 2.06)	0.048*
	No	0.70 (0.44, 1.47)	
Hypertension	Yes	0.88(0.50,1.58)	0.095
	No	1.52(0.58,2.38)	
Diabetes	Yes	0.85(0.50,2.01)	0.723
	No	1.07(0.53,1.71)	
Hyperlipidemia	Yes	0.89(0.54,2.08)	0.954
	No	1.03(0.47,1.67)	
Recurrence	Yes	0.70(0.47,1.71)	0.304
	No	1.07(0.54,1.91)	

Lp-PLA2: Lipoprotein-Associated Phospholipase A2.
*$p<0.05$.

III Correlation between Continuous Variables and Lp-PLA2 Indexes

Spearman's correlation test revealed that Lp-PLA2 mRNA expression of PBMC had no correlations with Lp-PLA2 activity or Lp-PLA2 mass ($r=0.121$, $p=0.310$; $r=0.109$, $p=0.369$). But Lp-PLA2 activity showed significant positive correlation with Lp-PLA2 mass ($r=0.942$, $p<0.001$) (Figure 1). Age, SBP, DBP, Gensini score, TC, LDL-C and oxLDL were not correlated with Lp-PLA2 mRNA (all $p>0.05$). Lp-PLA2 mass was positively correlated with TC, LDL-C and oxLDL ($p<0.001$). Besides TC, LDL-C and oxLDL ($p<0.001$), Lp-PLA2 activity had a significant correlation with Gensini score ($r=0.202$, $p=0.049$) (Table 3).

Table 3: Lp-PLA2 indexes correlations with other clinical parameters.

	Activity (U/L)		Mass (ng/mL)		mRNA	
Variables	r	p	r	p	r	p
Age (years)	-0.169	0.091	-0.150	0.139	-0.147	0.211
SBP (mmHg)	0.047	0.653	0.082	0.433	-0.159	0.186
DBP (mmHg)	0.135	0.190	0.180	0.083	0.005	0.966
Gensini score	0.202	0.049*	0.152	0.146	-0.075	0.538
TC (mmol/L)	0.593	<0.001	0.484	<0.001	-0.022	0.852
LDL-C (mmol/L)	0.634	<0.001	0.538	<0.001	0.022	0.849
OxLDL (U/L)	0.567	<0.001	0.527	<0.001	-0.014	0.922

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; TC: Total Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; oxLDL: oxidized LDL.

*p<0.05.

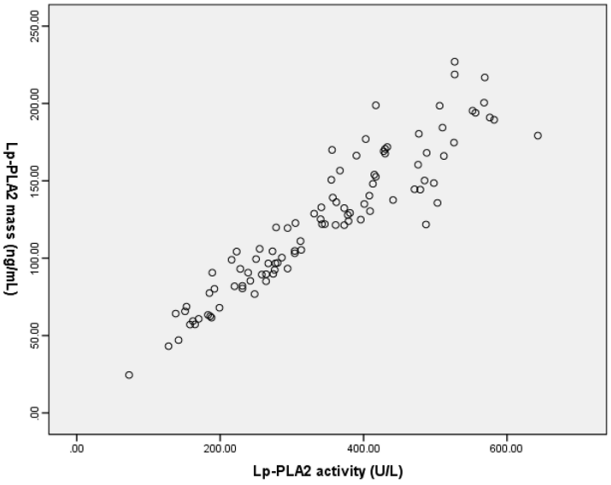

Figure 1: The strong correlation between Lp-PLA2 activity and Lp-PLA2 mass in plasma.

IV Multivariate Analyses for Risk Factors of AMI

According to (Table 1) results, smoking, SBP, diabetes and hyperlipidemia were statistically different between UAP and AMI patients, so these variables were included in the multivariate logistic regression analysis for risk prediction of AMI. And three Lp-PLA2 indexes were included in the multivariate analysis, respectively (Table 4). SBP and three Lp-PLA2 indexes were transformed to category variables according to their medians. As shown in (Table 4), the model 1 (including Lp-PLA2 activity) was statistically significant. Lp-PLA2 activity≥344 U/L was a strong risk predictor for AMI occurrence (OR=5.224, 95% CI 1.687-16.181, p=0.004). However, the model 2 (including Lp-PLA2 mass) or the model 3 (including Lp-PLA2 mRNA) was not statistically significant (p=0.152, p=0.863, Table 4).

Table 4: Multivariate logistic regression analyses for risk factors of AMI.

Model	Variables	Odds Ratio	95% CI	p value
Model 1	Smoking	4.831	1.330-17.554	0.017
	SBP≥130 mmHg	0.298	0.092-0.964	0.043
	Diabetes	0.356	0.096-1.328	0.124
	Hyperlipidemia	7.564	1.923-29.762	0.004
	Lp-PLA2 activity≥344 U/L	**5.224**	**1.687-16.181**	**0.004***
Model 2	Smoking	3.556	1.062-11.903	0.040
	SBP≥130 mmHg	0.369	0.121-1.127	0.080
	Diabetes	0.409	0.118-1.418	0.159
	Hyperlipidemia	5.887	1.578-21.954	0.008
	Lp-PLA2 mass≥122 ng/mL	**2.153**	**0.755-6.143**	**0.152**
Model 3	Smoking	2.686	0.725-9.948	0.139
	SBP≥130 mmHg	0.549	0.175-1.720	0.304
	Diabetes	0.372	0.098-1.406	0.145
	Hyperlipidemia	2.535	0.723-8.889	0.146
	Lp-PLA2 mRNA≥0.95	**1.108**	**0.348-3.531**	**0.863**

Three models' common variables: smoking, SBP≥130 mmHg, diabetes and hyperlipidemia.

AMI: Acute Myocardial Infarction; SBP: Systolic Blood Pressure; Lp-PLA2: Lipoprotein-Associated Phospholipase A2.

*p<0.05.

V Levels of Lp-PLA2 Indexes in Recurrent ACS Patients

In the study, 27.9% of ACS patients were recurrent patients. Univariate analysis showed that age, Lp-PLA2 activity and Lp-PLA2 mass were statistically different (Table 5). The age of recurrent ACS patients was older than primary patients (p=0.035). Lp-PLA2 activity and Lp-PLA2 mass were both lower in recurrent ACS patients, and Lp-PLA2 mass was more statistically significant (p=0.014). Lp-PLA2 mRNA level was lower, but the difference was not statistically significant (p=0.304). The differences of TC, LDL-C and oxLDL levels between two groups were

all not statistically significant, especially oxLDL (p=0.435, 0.168, 0.984, respectively).

Discussion

Dyslipidemia is one of the main risk factors for the development and progression of cardiovascular diseases [10]. Especially, the role of LDL-C in inflammation and pathogenesis of atherosclerosis has been evaluated extensively since the beginning of the twenty-first century [11]. In our study, AMI patients showed similar concentrations of LDL-C, TC and oxLDL in comparison to UAP patients. However, they showed an increased enzyme activity and mass of Lp-PLA2 (p=0.024, p=0.093, respectively). Although correlation analysis revealed that there was a strong relationship between plasma Lp-PLA2 activity and mass (r=0.942), and these two indexes correlated with LDL-C, TC and oxLDL, respectively (p<0.001), LDL-C, TC and oxLDL showed no difference between AMI and UAP patients. This may be explained by which that the enrolled patients were not only ACS patients without common comorbidities. They probably take drugs for hypertension, hyperlipidemia and diabetes. So, plasma Lp-PLA2 activity seems to be a useful marker for many kinds of ACS patients. Furthermore, correlation analysis revealed that Lp-PLA2 activity had most correlations with lipids and Gensini score. We conducted multivariate logistic regression analysis to determine the risk indicators of AMI. As the (Table 4) showed, Lp-PLA2 activity≥344 U/L was an independent risk factor after smoking, SBP, diabetes and hyperlipidemia were adjusted. However, inhibition of Lp-PLA2 did not exhibit efficacy in reducing the risk of the primary composite end point of cardiovascular death in clinical trial [12].

Lp-PLA2 mRNA expression of PBMC was investigated. In male subjects, significantly elevated levels of Lp-PLA2 mRNA were found compared to female subjects. Smoking significantly up-regulated Lp-PLA2 mRNA expression of ACS patients. Hypertension did not affect Lp-PLA2 mRNA expression, as well as diabetes and lipid disorders. Seema Garg *et al.* reported that Lp-PLA2 mRNA expression in whole blood was higher in Indian undergraduate patients of metabolic syndrome, which correlated significantly with waist circumference and systolic blood pressure as well as high-density lipoprotein cholesterol [13]. Anna Fratta Pasini and colleges found that smokers showed increased plasma Lp-PLA2 mass together with up-regulation of Lp-PLA2 mRNA expression in PBMC [14]. This is partly in accordance with our comparison results by groups.

Lp-PLA2 mRNA level in cells may be a more sensitive biomarker than Lp-PLA2 protein. Li Bo *et al.* investigated the influence of serum amyloid A (SAA) on the expression of Lp-PLA2 in THP-1 cells and ApoE-deficient mice. SAA up-regulated Lp-PLA2 protein after 6 h and mRNA after 3 h [15]. Unexpectedly, Lp-PLA2 mRNA of PBMC was not associated with Lp-PLA2 activity or mass in our study. Lp-PLA2 mRNA was associated with gender and smoking. It is speculated that Lp-PLA2 is preferentially secreted by tissue macrophages rather than by circulating leukocytes [16]. Ablajan Mahmut *et al.* reported that the number of Lp-PLA2 transcripts within stenotic aortic valves significantly correlated with the plasma levels of ox-LDL and LDL-C, but tissue activity of Lp-PLA2 did not correlate with blood plasma enzyme activity [17]. Also in the present work, Lp-PLA2 protein (activity or mass) was not associated with Lp-PLA2 mRNA in PBMC. Christof Ulrich *et al.* found that the classical monocytes expressed the highest Lp-PLA2 mRNA levels as compared to intermediate and non-classical subsets. In chronic kidney disease stage 5-D patients Lp-PLA2 plasma activity most likely is not quantitatively derived from circulating monocyte subsets; the majority is derived from macrophages [18]. Besides, human adipose tissue and adipocytes appear active sources of Lp-PLA2, with expression induced by LDL-C and oxLDL [19]. In sum, we surmise that PBMC of ACS patients were not the main cells which secret Lp-PLA2 into blood. Lp-PLA2 mRNA expression should be studied in more different cell types comprehensively.

At last, all subjects were grouped according to the times of ACS. Recurrent ACS patients were older than primary ACS patients. Only Lp-PLA2 protein (activity or mass) was significantly decreased in recurrent ACS patients, compared to primary ACS patients. In the IMPROVE-IT trial for patients after ACS, ezetimibe added to statin therapy resulted in both greater LDL-C reductions and event reductions compared to statin therapy alone (LDL-C 53.7 vs. 69.5 mg/dL) [20]. 2018 REAL-CAD trial showed that high-dose pitavastatin therapy (4 mg/d) significantly reduced cardiovascular events compared to low-dose pitavastatin therapy (1 mg/d) in Japanese patients with stable coronary artery disease. The achieved LDL-C levels were 91.0 mg/dL and 76.6 mg/dL, respectively [21]. In our study, recurrent ACS patients had achieved lower levels of lipids such as TC and LDL-C, even Lp-PLA2 protein (Table 5). Lp-PLA2 activity or mass decreasing may be a beneficial condition for ACS patients. Lp-PLA2 mass possibly can be explored as an important risk predictor for ACS recurrence. Wang *et al.* demonstrated that hospitalizations after AMI were associated with the risk of a subsequent AMI. It is possible that the hospitalization is a marker for the presence and severity of comorbidities [9].

Table 5: Comparison of clinical characteristics between primary and recurrent ACS patients.

Variables	Primary (n=75)	Recurrent (n=29)	p value
Age (years)	58.3±9.5	62.8±10.2	0.035*
Male (%)	77.3% (58)	65.5% (19)	0.218
Smoking (%)	49.3% (37)	41.4% (12)	0.396
SBP (mmHg)	127±17	130±18	0.405
DBP (mmHg)	77±10	72±11	0.066
Gensini score	30 (10, 63)	18 (8, 41)	0.238
TC (mmol/L)	4.19±1.12	4.00±0.98	0.435
LDL-C (mmol/L)	2.51±0.96	2.22±0.84	0.168
oxLDL (U/L)	49.95 (38.89, 68.18)	48.61 (39.96, 64.57)	0.984
Lp-PLA2 activity (U/L)	364±129	305±144	0.045*

Lp-PLA2 mass (ng/mL)	130±44	106±42	0.014*
Lp-PLA2 mRNA	1.07 (0.54, 1.91)	0.70 (0.47, 1.71)	0.304
Hypertension (%)	70.7% (53)	69.0% (20)	0.865
Diabetes (%)	29.3% (22)	39.3% (11)	0.336
Hyperlipidemia (%)	65.3% (49)	55.2% (16)	0.337

ACS: Acute Coronary Syndrome; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; TC: Total Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; oxLDL: oxidized LDL; Lp-PLA2: Lipoprotein-Associated Phospholipase A2.
*p<0.05.

Conclusion

In the present study, three Lp-PLA2 indexes were investigated and compared for ACS patients. Male patients showed a significantly higher Lp-PLA2 mRNA level than female patients. Smoking patients also showed an up-regulated Lp-PLA2 mRNA of PBMC. However, it was plasma Lp-PLA2 activity but not Lp-PLA2 mRNA which increased in ACS patients and correlated with several factors (lipids and Gensini score). Multiple logistic regression analyses found that Lp-PLA2 activity was an AMI risk factor independent of smoking, SBP, diabetes and hyperlipidemia. Lp-PLA2 mass was less superior to Lp-PLA2 activity for primary ACS patients. But recurrent ACS patients showed a statically significant decreased plasma Lp-PLA2 mass, which may suggest Lp-PLA2 mass was a better indicator for ACS recurrence. Lp-PLA2 mRNA expression of PBMC was probably regulated by many factors including smoking, while Lp-PLA2 protein in plasma (activity or mass) was a valuable marker of systematic inflammation.

Limitation

There were some limitations of our study. First, the sample size was small, especially recurrent ACS group. Second, as stated in "study population", the recurrence time was not restricted in one year. Therefore, the recurrence reasons were not distinguished. A few recurrent patients resulted from platelet problem but not lipids and inflammation problems. The conclusion may be affected to some extent.

Ethical Approval

We have complied with the World Medical Association Declaration of Helsinki regarding ethical conduct of research.

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