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ORIGINAL RESEARCH

The Relationship Between Advanced Lung Cancer Inflammation Index and Adverse Clinical Outcomes in Patients with Myocardial Infarction with No-Obstructive Coronary Arteries

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Background: The advanced lung cancer inflammation index (ALI) has been suggested as a reliable prognostic indicator for cardiovascular disease. However, the association between ALI and the prognosis of patients with myocardial infarction with no-obstructive coronary arteries (MINOCA) remains undetermined.

Methods: In the present study, we consecutively included 437 MINOCA patients. All the patients received a follow-up at 1 week, 1, 3, 6, and 12 months and annually after discharge. The major adverse cardiovascular and cerebrovascular events (MACCE) defined as a composite of all-cause mortality, coronary revascularization, non-fatal stroke, AMI, heart failure or readmission for angina pectoris were recorded. The predictors for MACCE were explored. The ROC analysis was used to determine the predictive value of ALI for MACCE in MINOCA patients.

Results: Patients with MACCE had a decreased level of body mass index, albumin and ALI, while an increased level of white blood cell count, neutrophils count, N-terminal proB-type natriuretic peptide, neutrophil-to-lymphocyte ratio, peak cardiac troponin I ($P<0.05$). When the patients were divided into three groups according the tertiles of ALI, we discovered that patients with a lower level of ALI tended to suffer an increased risk of readmission for angina pectoris and accumulative MACCE ($p<0.05$). The multivariate Cox hazard proportional model showed that a higher NT-proBNP (HR: 1.014, 95% CI: 1.004–1.023, P=0.005) and a lower ALI (HR: 0.997, 95% CI: 0.995–0.998, $P<0.001$) were independent predictors for MACCE in MINOCA patients ($p<0.05$). When ALI≤256.97, the specificity was 0.659 and the sensitivity 0.629 (AUC, 0.662; 95% CI, 0.611–0.714, P=0.026).

Conclusion: A lower ALI was an independent predictor for MACCE in MINOCA patients. As a quite easily calculated indicator in clinical practice, ALI can be used in risk stratification and prognostic assessment in MINOCA patients.

Keywords: advanced lung cancer inflammation index, myocardial infarction with no-obstructive coronary arteries, predictor, major adverse cardiovascular and cerebrovascular events

Introduction

Myocardial infarction with no-obstructive coronary arteries (MINOCA) represents quite a unique subtype of myocardial infarction (MI), which is characterized as MI with normal or nearly normal coronary arteries.[1–3] As a matter of fact, MINOCA is not uncommon in the era of rapid development of interventional cardiology. According to the ESC working group position paper on MINOCA, the incidence of MINOCA varied from 1% to 13%.[3] Evidence suggested that patients with MINOCA tended to be younger with fewer cardiovascular risk factors.[2,4] Due to the heterogenous pathogenesis and varied clinical presentation, the management of MINOCA is quite challenging. It is reported that nearly three quarters of the MINOCA patients are discharged without a definitive diagnosis possibly responsible for the clinical events.[5,6] Consequently, these patients were not optimally and appropriately managed.[6] Compared with patients with MI and obstructive coronary arteries, the optimal treatment strategies of MINOCA patients remains debated and undetermined.[7]

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Therefore, it is important to investigate the potential prognostic indicators, so as to better screen the high risk patients and improve the prognosis of these patients. Although the exact physiopathological mechanism of MINOCA remains unclear, evidence suggests a significant association between increased inflammatory response and the presence of MINOCA.[8–10] So in the present study we aimed to explore an easily acquired prognostic parameter so as to better screen the high risk patients, an therefore improve the management of these patients.

The advanced lung cancer inflammation index (ALI) was first reported to relate to the poor outcome in patients with advanced non-small cell lung cancer.[11] Accumulating studies suggest that a lower ALI is a reliable prognostic indicator for overall survival in various cancer related diseases.[12–14] In recent years, ALI was also used to evaluate the prognosis in cardiovascular diseases. As a nutritional and inflammatory indicator, ALI showed a reliable prognostic value in acute coronary syndrome,[15,16] ST-elevation myocardial infarction (STEMI),[17] hypertension,[18] and heart failure.[19,20] A more recent study suggested that ALI was associated with the severity of coronary artery disease (CAD) evaluated by SYNTAX score.[21] However, the relationship between ALI and the prognosis of MINOCA was unclear. Considering the inflammatory components of ALI (albumin, BMI, and neutrophil-to-lymphocyte ratio) and the close association between inflammation and MINOCA, we speculated that ALI may play a role in the presence and development of MINOCA. Therefore, in the present study, we aimed to explore the prognostic value of ALI in the patients with MINOCA.

Methods

Study Population

The study flowchart and the inclusion as well as exclusion criteria are shown in Figure 1. A total of 437 MINOCA patients from October 2016 to February 2023 in our hospital were consecutively included in the present study. AMI was diagnosed according to the recent guideline of the Fourth Universal Definition of myocardial infarction.[22] The coronary angiography (CAG) was performed by experienced interventional cardiologists according to the relevant guidelines. The patients were prescribed dual antiplatelet therapy and blood lipid lowering agent of statins on admission before the procedure. Informed consent was obtained before participation. This study was approved by the ethics committee of The People's Hospital of Liaoning Province and conformed to the Declaration of Helsinki.

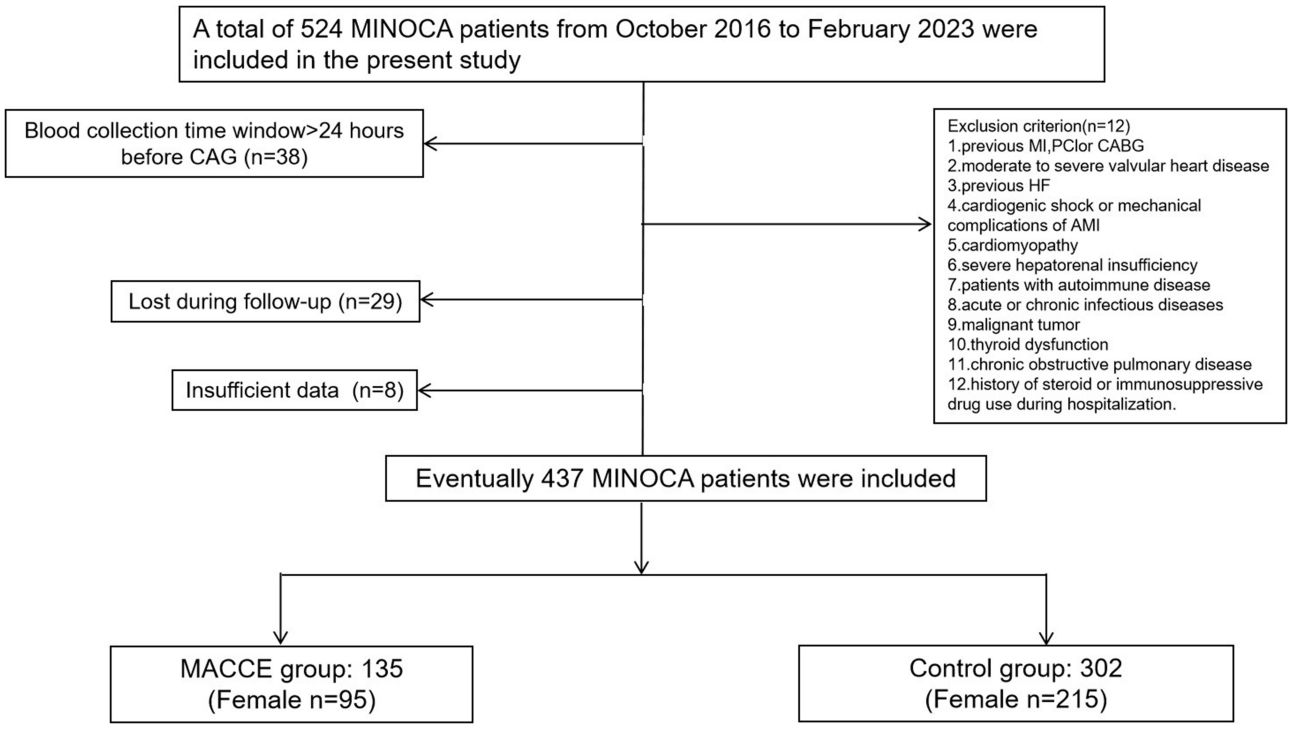

Figure 1 Study flow chart.

Clinical and Laboratory Data Assessments

The demographic characteristics and comorbidities were carefully inquired and recorded. The blood samples were collected before CAG and tested within 2 hours. The cardiac function was assessed by Killip class. All the patients received a transthoracic echocardiography examination within 24 hours before the procedure and the left ventricular ejection fraction (LVEF) were evaluated with Simpson derived measurements using GE Vivid S60N. ALI was calculated as body mass index (BMI)*albumin/neutrophil-to-lymphocyte ratio (NLR). BMI is calculated as the weight (kg)/ height (m)^2.[11]

Follow-up

The follow-up data were collected via telephone, online medical service, or clinic visits at 1 week, 1, 3, 6, and 12 months and annually thereafter. The MACCE were defined as a composite of all-cause mortality, coronary revascularization, non-fatal stroke, AMI, heart failure or readmission for angina pectoris. The cumulative incidence of MACCE were calculated and compared. The data were collected by trained investigators and examined by the principal investigator.

Statistical Analysis

The Kolmogorov–Smirnov test was used to examine the data distribution status (normal distribution or not). Continuous data with normal distribution were presented as mean±standard deviation, which were compared by Student *t* test. While, data with non-normal distribution were expressed as median and interquartile range, which were compared using Mann–Whitney test. Categorical variables were expressed as rates or percentages, which were compared using the chi-square test or Fisher's exact test. The baseline parameters with $p<0.1$ or the clinical factors associated with MACCE were included in the multivariable cox regression analysis. The Cox proportional hazards model was used to evaluate the long term prognosis of the different tertiles of ALI. The receiver operating characteristic (ROC) curves was used to determine the cut off value as well as the predictive value of ALI for MACCE in MINOCA patients. Pearson or Spearman correlation analysis, as appropriate, was performed to investigate the correlation between ALI and the factors associated with CAD. A two side $P<0.05$ was considered statistical significance.

Results

Baseline and Clinical Characteristics

The study flowchart and the inclusion as well as exclusion criteria are shown in Figure 1. A total of 437 MINOCA patients were consecutively included in the present study. The demographic characteristics, comorbidities and cardiac function assessed by LVEF are shown in Table 1. During the median follow-up of 27.4 months, 135 individuals suffered MACCE (MACCE group). Compared with the controls, patients with MACCE had a lower level of BMI ($P<0.05$) (Table 1). The age, gender, current smoking, Diabetes Mellitus, hypertension, Killip≥2, and the clinical presentation (NSTEMI and STEMI) were comparable between the two groups. The medication in hospital was also similar between the two groups ($p>0.05$) (Table 1).

Table 1 Clinical Characteristics of Study Population

Variables	MACCE Group (n=135)	Control Group (n=302)	P-value
Age (years)	58.00(49.00,67.75)	58.8(49.00,67.75)	0.966
Gender(female), n (%)	95(70.37)	215(71.19)	0.909
BMI (kg/m2)	24.56(22.41,27.04)	25.39(23.66,27.70)	0.009
Current smoker, n (%)	42(31.11)	95(31.46)	0.943
Diabetes Mellitus, n (%)	31(22.96)	53(17.55)	0.191
Hypertension, n (%)	62(45.93)	112(37.09)	0.091
Killip≥2	4(2.96)	11(3.64)	0.719

(*Continued*)

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Table 1 (Continued).

Variables	MACCE Group (n=135)	Control Group (n=302)	P-value
Clinical presentation			
NSTEMI	33(24.44)	89(29.47)	0.301
STEMI	102(75.56)	213(70.53)	
Medication history			
Aspirin, n (%)	130(96.30)	295(97.68)	0.413
Clopidogrel, n (%)	52(38.52)	133(44.04)	0.280
Ticagrelor, n (%)	83(61.48)	169(55.96)	
ACEI/ARB/ARNI, n (%)	64(47.41%)	132(43.71%)	0.473
b-blocker, n (%)	61(45.19)	144(47.68)	0.629
Statines, n (%)	135(100.00)	301(99.67)	0.504
Calcium channel blockers, n (%)	32(23.70)	70(23.18)	0.905
SGLT-2i, n (%)	31(22.96)	92(30.46)	0.107
Diuretics, n (%)	5(3.70)	12(3.97)	1.000
LVEF (%)	57.00(56.00, 59.00)	57.00(56.00, 59.00)	0.340

Abbreviations: BMI, body mass index; STEMI, ST-segment elevation myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; ACEI, angiotensin converting enzyme inhibitors; ARB, angiotensin II receptor blocker, ARNI, angiotensin receptor enkephalinase inhibitor; SGLT-2i, sodium-glucose co-transporter type-2 inhibitors; LVEF, left ventricular ejection fraction.

Laboratory Parameters of the Two Groups

The laboratory characteristics are displayed in Table 2. We found that patients with MACCE showed increased levels of white blood cell (WBC) count, neutrophils count, N-terminal proB-type natriuretic peptide (NT-proBNP), NLR, peak cardiac troponin I (cTnI), while decreased levels of plasma albumin and ALI ($P<0.05$) (Table 2). No differences in other indicators were discovered including C-reactive protein (CRP), lymphocytes count, fasting blood glucose, creatinine, uric acid, lipid parameters and peak creatine kinase-myocardial band (CK-MB) ($p>0.05$) (Table 2).

Table 2 Laboratory Analysis of Study Population

Variables	MACCE Group (n=135)	Control Group (n=302)	P-value
CRP, mg/dL	3.09(0.54,10.85)	3.37(0.60,9.08)	0.749
WBC count, 109/L	9.30(7.50,11.08)	8.200(6.79,9.93)	0.001
Neutrophils count, 109/L	6.80(5.20,9.10)	5.63(4.42,7.14)	<0.001
Lymphocytes count, 109/L	1.58(1.26,2.07)	1.69(1.30,2.11)	0.181
FBG, mmol/L	5.02(4.81,5.57)	5.18(4.89,5.74)	0.150
Cr, mmol/L	71.50(60.60,82.80)	69.85(59.78,82.20)	0.480
Uric acid, mmol/L	332.00(266.00,387.00)	330.00(276.25,385.75)	0.893

(*Continued*)

Table 2 (Continued).

Variables	MACCE Group (n=135)	Control Group (n=302)	P-value
ALB, g/L	38.50(36.30,40.30)	38.85(37.03,41.00)	0.042
TC, mmol/L	4.55(3.86,5.36)	4.56(3.80,5.22)	0.624
TG, mmol/L	1.60(1.04,2.53)	1.62(1.13,2.36)	0.767
LDL-C, mmol/L	2.86(2.37,3.54)	2.91(2.25,3.47)	0.561
HDL-C, mmol/L	0.97(0.80,1.12)	0.95(0.81,1.13)	0.944
NT-proBNP, pg/mL	737.70(398.00,1770.00)	639.75(338.90,1308.50)	0.046
Peak CK-MB, U/L	19.00(14.35,34.00)	17.50(13.70,29.83)	0.098
Peak cTnI, (ng/L)	5.21(2.86,10.70)	4.12(0.87,7.24)	<0.001
NLR	4.04(3.32,5.70)	3.18(2.42,4.91)	<0.001
ALI	211.67(151.54,338.72)	306.84(188.49,436.82)	<0.001

Abbreviations: CRP, C-reactive protein; WBC, white blood cell; FBG, fasting blood glucose; Cr, creatinine; ALB, albumin; TC, total cholesterol; TG, triglyceride; LDL-C, lowdensity lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol; NT-proBNP, N-terminal proB-type natriuretic peptide; CK-MB, creatine kinase-myocardial band; cTnI, cardiac troponin I; NLR, neutrophil-to-lymphocyte ratio; ALI, advanced lung cancer inflammation index.

The Clinical Outcomes of the Studied Patients

The patients were divided into three groups according to the tertiles of ALI so as to better explore the incidence of MACCE in different levels of ALI. In the present study, a total of 135 patients (30.89%) with 152 MACCE were recorded, including 8 cases (1.83%) of all-cause death, 19 (4.35%) of non-fatal AMI, 14 (3.20%) requiring revascularization, 4 (0.92%) of non-fatal stroke, 15 (3.43%) of heart failure, and 92 (21.05%) readmission for angina pectoris. As is shown in Table 3, patients with a lower tertile of ALI tended to suffer an increased risk of readmission for angina pectoris and MACCE ($p<0.05$) (Table 3). In addition, the Cox proportional hazard model also showed this significant differences (Figure 2).

Risk Factor Analysis for MACCE

The univariate Cox proportional hazard model showed that a higher peak CK-MB (HR: 1.003, 95% CI: 1.000–1.006, P=0.037), cTnI (HR: 1.021, 95% CI: 1.004–1.038, P=0.017), NT-proBNP (HR: 1.019, 95% CI: 1.009–1.028, P<0.001) and a lower level of ALI (HR: 0.996, 95% CI: 0.995–0.998, P<0.001) were risk factors for the presence of MACCE in MINOCA patients. Then we selected these factors in the multivariate Cox hazard proportional model. The result showed that a higher NT-proBNP (HR: 1.014, 95% CI: 1.004–1.023, P=0.005) and a lower ALI (HR: 0.997, 95% CI: 0.995–0.998, P<0.001) were independent predictors for MACCE in MINOCA patients ($p<0.05$) (Table 4). In addition, patients in tertile 1 (lowest in ALI) showed a 2.566-fold increased risk of MACCE compared with those in tertile 3 (HR, 2.566; 95% CI 1.889–6.208; P=0.021)

Table 3 Incidence of Clinical Outcomes in the Overall Population During Follow-up

Variables	Tertile 1 (n=146)	Tertile 2 (n=146)	Tertile 3 (n=145)	P-value
All cause death, (%)	2(1.37)	3(2.05)	3(2.07)	0.873
AMI	8(5.48)	5(3.42)	6(4.14)	0.686
Revascularization	6(4.11)	4(2.74)	4(2.76)	0.756
Stroke	1(0.68)	2(1.37)	1(0.69)	0.790
Heart failure	8(5.48)	5(3.42)	2(1.38)	0.139
Readmission for angina pectoris	41(28.08)	27(18.49)	24(16.55)	0.035
Cumulative MACCEs, (%)	66(45.21)	46(31.51)	40(27.59)	0.004

Abbreviations: AMI, acute myocardial infarction; MACCE, major adverse cardiovascular and cerebrovascular events.

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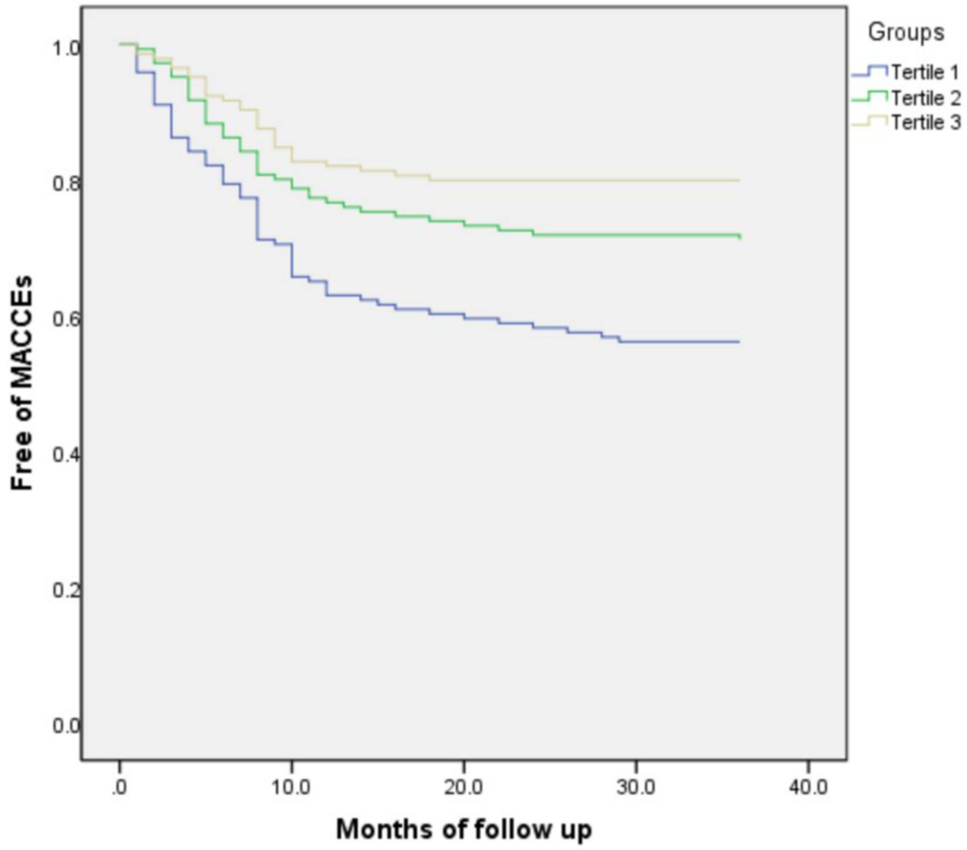

Figure 2 The Cox proportional hazards model in different tertiles of ALI.

(Table 4). We used the ROC analysis to determine the cut off value as well as the predictive value of ALI for MACCE in MINOCA patients. We discovered that when ALI≤256.97, the specificity was 0.659 and the sensitivity 0.629 (AUC, 0.662; 95% CI, 0.611–0.714, P=0.026) (Figure 3). Although ALI suggested a larger AUC than albumin (AUC, 0.561; 95% CI,

Table 4 Univariate and Stepwise Multivariate Cox Regression Analysis of MACCE

	Univariate Analysis			Multivariate Analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age	1.002	0.989–1.016	0.759			
Hypertension	0.749	0.534–1.050	0.094			
Diabetes Mellitus	1.383	0.930–2.057	0.109			
LDL-C	1.115	0.928–1.339	0.244			
HDL-C	0.935	0.493–1.776	0.837			
FBG	1.006	0.827–1.223	0.955			
Peak CK-MB	1.003	1.000–1.006	0.037	1.001	0.997–1.006	0.550
Peak cTnI	1.021	1.004–1.038	0.017	1.014	0.991–1.038	0.243
LVEF	1.020	0.973–1.068	0.417			

(*Continued*)

Table 4 (Continued).

	Univariate Analysis			Multivariate Analysis		
	HR	**95% CI**	**P value**	**HR**	**95% CI**	**P value**
Uric acid	1.000	0.998–1.002	0.874			
NT-proBNP/100	1.019	1.009–1.028	<0.001	1.014	1.004–1.023	0.005
ALI	0.996	0.995–0.998	<0.001	0.997	0.995–0.998	<0.001
Tertile 3	Reference					
Tertile 2	1.926	1.334–4.102	0.035			
Tertile 1	2.566	1.889–6.208	0.021			

Abbreviations: LDL-C, lowdensity lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol; FBG, fasting blood glucose; CK-MB, creatine kinase-myocardial band; cTnI, cardiac troponin I; LVEF, left ventricular ejection fraction; NT-proBNP, N-terminal proB-type natriuretic peptide; ALI, advanced lung cancer inflammation index.

0.503–0.619; p=0.042), BMI (AUC, 0.578; 95% CI, 0.520–0.637; p=0.009) or NLR (AUC, 0.655; 95% CI, 0.604–0.706; p=0.026), however, no significant differences were found between ALI and NLR (Figure 3).

Correlation Between the ALI and Risk Factors for MACCE

The Spearman correlation test was performed to explore the potential relationships between ALI and other risk factors for MACCE. There was no significant correlation between ALI and the indicators including low density lipoprotein cholesterol, high-density lipoprotein cholesterol, fasting blood glucose, uric acid, peak CK-MB, cTnI, NT-proBNP, LVEF in patients with MINOCA (Table 5).

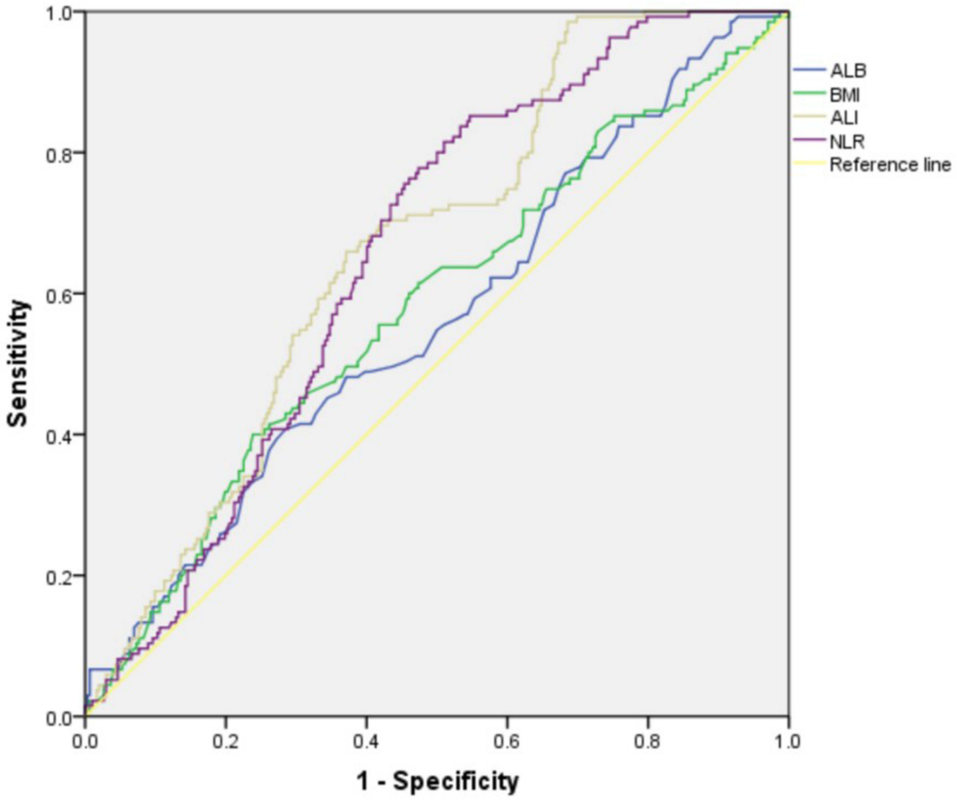

Figure 3 ROC curve analysis for the distinguishing ability of different indicators for the presence of MACCE in MINOCA patients.

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Table 5 Correlation Between the ALI and Other Variables

Variables	Coefficient	P-value
LDL-C	0.002	0.961
HDL-C	0.023	0.629
FBG	−0.014	0.629
Uric acid	0.109	0.022
Peak CK-MB	−0.026	0.593
Peak cTnI	−0.065	0.172
NT-proBNP	−0.043	0.126
LVEF	0.049	0.308

Discussion

The main findings of our study were as follows. First, low ALI was correlated with an increased risk of MACCE and was an independent risk factor for MACCE in MINOCA patients. Second, patients with low ALI tended to have a higher risk of MACCE and readmission for angina pectoris than the controls. Third, the incidence of MACCE and readmission for angina pectoris increased as the tertiles of ALI decreased. When taken Tertile 3 (highest group) as reference, patients in tertile 1 (lowest in ALI) showed a 2.566-fold increased risk of MACCE. These findings may provide a deeper insight in the development, risk stratification and optimal management of MINOCA.

Inflammation participates in the initiation and development of MINOCA.[23] As the gold standard indicator for evaluating the degree of inflammation, CRP has been suggested as a valuable parameter for the prediction of adverse outcomes in MINOCA patients.[10] In recent years, the composite parameters derived from the complete blood count and blood biochemical indicators have been widely discussed in CVD. During the acute phase of MI, the degree of inflammatory response increased. The different types of inflammatory cells in the complete blood count together with their combination showed a reliable prognostic value in MINOCA. A more recent study from China, including 259 MINOCA patients, investigated the association between a new combined inflammatory indicator and the prognosis of MINOCA. They discovered that systemic inflammation response index (SIRI) (calculated as neutrophil count *monocyte count /lymphocyte count) exhibited a significant correlation with adverse clinical outcome.[8] In addition, other composite parameters including systemic immune-inflammation index and aggregate index of systemic inflammation have also been proven to associate with the prognosis of MINOCA.[24]

The ALI was a composite indicator, which combined the inflammatory (NLR) and the nutritional parameters (BMI and serum albumin), was initially developed to evaluate the prognosis in non-small cell lung cancer.[11] Then this index was widely discussed in other diseases including cardiovascular diseases. In the present study, we discovered a close correlation between ALI and MACCE. ALI was an independent predictor for the presence of MACCE, therefore could be used as a indicator for risk stratification in MINOCA patients. The significant association between ALI and MACCE could be explained as follows. Firstly, during the phase of ACS, the total white blood cells, neutrophils, monocytes counts increased, while the lymphocyte counts decreased when compared with the healthy controls.[25] In addition, NLR has been suggested as a parameter for evaluating the degree of systematic inflammation, which has been proven to associate with adverse outcome in ACS patients.[26,27] Moreover, NLR was also suggested as an independent predictor for long-term risk of death in MINOCA patients.[8] Secondly, malnutrition is quite common in ACS patients, especially in elderly patients, and it is associated with the adverse outcome in ACS patients.[28–30] It was reported that up to half of the ACS were diagnosed as malnutrition according to different nutritional scores, and these with malnutrition suffered an increased risk of MACCE.[31] In the clinical practice, BMI and albumin were considered as the routine indicators for assessing the nutritional status of the patients. However, there is a "obesity paradox" for BMI in ACS. That is to say a higher BMI was associated with an increased risk of CAD, while ACS patients with higher BMI tended to have a more favorable outcome.[15] A recent study suggested that MINOCA patients with a BMI < 25 kg/m² suffered an increased risk of all cause mortality and cardiovascular death.[32] As the anti-inflammatory and antioxidant stress components in human

body, serum albumin decreased in malnutrition and inflammation. A lower albumin in turn promotes and aggravates the inflammatory response, which provokes the initiation and development of atherosclerotic disease.[33,34] A decreased level of albumin was associated with a higher incidence of long term MACCE in AMI patients after PCI.[35,36] Thirdly, ALI combined BMI, albumin and NLR, which could comprehensively reflect the nutritional and inflammatory status of the human body. Given the significant association between NLR, BMI, and the serum albumin, we could easily understand the correlation between ALI and MACCE in the present study.

In our study, we determined the optimal cut off value of ALI as 256.97. The MACCE increased as the tertile of ALI decreased. So ALI could be used in the clinical practice for the prediction of MACCE in MINOCA patients. Moreover, ALI could serve as a promising indicator for risk stratification as well as potential interventional target in MINOCA patients. Combined, the nutritional and the inflammatory parameters, ALI had a reliable prognostic value in patients with MINOCA.

NT-proBNP was widely used in clinical practice for evaluating the cardiac function in patients with heart failure and AMI. NT-proBNP exhibits a reliable predictive value in adverse outcome in patients with AMI.[37] A recent study from China suggested that NT-proBNP could be used as a parameter for the prediction of MACCE during long term follow up in patients with MINOCA.[8] Similar to previous studies, we also discovered that patients with MACCE tended to have an increased level of NT-proBNP, and NT-proBNP was an independent predictor for the presence of MACCE in MINOCA patients.

In 2017, European Society of Cardiology formulated the first authoritative international expert opinion regarding MINOCA.[3] However, the optimal management of MINOCA is still challenging due to the heterogeneous etiology.[38] Although the intro coronary functional test is important for the determination of the real etiology of MINOCA, however, in the clinical practice, few patients received the test. In addition, it is reported that nearly three quarters of MINOCA patients are discharged without a definitive diagnosis responsible for the clinical event.[5,6] Consequently, these patients were not optimally and appropriately managed.[6] So the risk stratification is quite important for the optimal management of this specific population. In the present study, we seek to investigate the prognostic value of ALI for the presence of MACCE in MINOCA patients. We firstly discovered the correlation between ALI and MACCE in MINOCA, which could provide deeper insights in the development, risk stratification, and optimal management of MINOCA.

Our study has several limitations. Firstly, the research efficiency has been limited by the single center study with a relatively small sample size. Secondly, the etiology of MINOCA are quite complex and varied including plaque rupture, vasospasm, microvascular dysfunction. We did not perform a intracoronary imaging examination or coronary function test. So we did not quite know ALI was better associated with which subtype of MINOCA. Thirdly, some data came from self-reported questionnaires, which may differ from the actual patient status. Fourthly, we were unable to obtain data dynamically, the admission and one time test may not exactly reflect the nutritional and inflammatory status of the patients.

Conclusion

We discovered that low ALI was correlated with an increased risk of MACCE. The incidence of MACCE and readmission for angina pectoris increased as the tertiles of ALI decreased. ALI showed a reliable predictive value in the presence of MACCE in MINOCA patients. As a nutritional and inflammatory indicator, ALI could be a promising parameter for the risk stratification and optimal management of MINOCA patients.

Abbreviations

AMI, acute myocardial infarction; ALI, advanced lung cancer inflammation index; MINOCA, myocardial infarction with no-obstructive coronary arteries; MACCE, major adverse cardiovascular and cerebrovascular events; ACS, acute coronary syndrome; NT-proBNP, N-terminal proB-type natriuretic peptide.

Data Sharing Statement

The data supporting the conclusions of this article will be made available by the corresponding author upon reasonable requests.

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Disclosure

The authors report no conflicts of interest in this work.

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