Original research

PROGNOSTIC VALUE OF FIBRINOGEN/ALBUMIN IN ACUTE CORONARY SYNDROME PATIENTS WITH MULTIPLE CORONARY ARTERY BRANCH LESIONS

Tran Quoc Bao[2], Doan Chi Thang[1], Mai Xuan Anh[1], Hoang Anh Tien[3]

[1]Cardiovascular Center, Hue Central Hospital
[2]General Hospital of Quang Nam province
[3]Hue University of Medicine and Pharmacy

ABSTRACT

Acute coronary syndrome (ACS) comprises a pathophysiological spectrum of cardiovascular diseases related to atherosclerotic coronary plaque erosion. Oxidative stress and inflammation play pivotal roles in the development and progression of atherosclerosis, which affects circulatory proteins, including albumin and fibrinogen, thereby causing an imbalance in albumin-to-globulin and fibrinogen - to - albumin ratios. This study aimed to evaluate the characteristics and prognostic value of fibrinogen/albumin index (FAR) in ACS patients with multiple coronary artery branch lesions after 3 months follow-up. In this cross-sectional description and follow-up study, the major blood proteins in ACS patients were evaluated using standard methods. Out of 76 ACS patients, prognostic indicators such as hs - troponin T, pro - BNP, ejection fraction and GRACE scale were all much higher in high FAR group, the difference was significant (p < 0.05). More major cardiovascular events (MACE) occurred significantly in the high FAR group than in the low FAR group. ROC curve analysis showed that the FAR index can predict events occurring during the 3-month period after discharge from the ACS group (AUC = 0.681; p < 0.05), but the predictability was not high. During the follow-up of MACE, the Kaplan-Meier analysis showed that patients with FAR > 10.3 had a higher risk of MACE than the FAR ≤ 10.3 (p < 0.05). Overall, FAR could be used as a routine prognostic factor in ACS with multiple coronary artery branch lesions with percutaneous coronary artery intervention.

Keywords: Fibrinogen/albumin, acute coronary syndrome, multiple coronary artery branch lesions.

I. INTRODUCTION

Cardiovascular disease is the leading cause of death in the world. An estimated 17.9 million people die from cardiovascular disease each year, accounting for 31% of all deaths [1]. Acute coronary syndrome is a severe, emergency event of coronary artery disease, which is the leading cause of cardiovascular death and severe complications later. There have been many advances in the effective diagnosis and treatment of acute coronary syndrome, but it is still a very serious disease and needs attention [2]. Therefore, the study of indicators and scales capable of predicting, stratifying risks and prognosis for patients with acute coronary syndrome

is always interesting by clinical researchers to help classify, manage and plan early treatment to minimize possible events in this group of patients. The scales commonly used in the prognosis of acute coronary syndrome are the TIMI, GRACE scales [3]. However, the scoring of the scales is relatively complex and there is limited data on the effectiveness of the scale in predicting prognosis in patients with acute coronary syndrome with multiple coronary artery branch lesions while this group accounts for up to 50% of acute coronary syndrome patients undergoing coronary angiography [4].

More recently, studies of the fibrinogen/albumin ratio (FAR) that is part of the inflammatory response

and thrombosis - related processes are also two important mechanisms in the progression of acute coronary syndrome have shown value in predicting the prognosis of major cardiovascular events as well as severity in acute coronary heart disease [5], the main cardiovascular events that patients with acute coronary syndrome may experience are death, stroke, readmission due to heart failure, myocardial infarction, coronary artery reintervention. Studies have also shown that fibrinogen/albumin scores are more strongly associated with major cardiovascular events than fibrinogen and albumin alone [6]. Fibrinogen/albumin levels have also been associated with major cardiovascular events in patients with ST myocardial infarction with multiple coronary artery branch lesions [7]. Therefore, it has been hypothesized in this study that fibrinogen/albumin scores are related to the prognosis of patients with acute coronary syndrome with multiple coronary artery branch lesions.

In Vietnam, there is currently no research project on the characteristics and prognostic value of fibrinogen/albumin index in acute coronary syndrome with multiple coronary artery branch lesions, so we carried out this study to evaluate the characteristics and prognostic value of fibrinogen/ albumin index in patients with acute coronary syndrome with multiple coronary artery branch lesions after 3 months of follow-up.

II. MATERIALS AND METHODS

A cross - sectional descriptive study was conducted on 76 patients who were diagnosed with acute coronary syndrome with multiple coronary artery branch lesions. The patients underwent percutaneous coronary artery intervention at Quang Nam General Hospital from February 2022 to July 2023.

Inclusion criteria were patients diagnosed with acute coronary syndrome include:

- Unstable angina (newly occurring coronary-type angina, progressive angina, or angina occurring after events or procedures such as after myocardial infarction, coronary intervention, coronary artery bypass graft surgery) [2] or

- Myocardial infarction by global consensus [8]: Increase or decrease in biomarker values

(our study used Troponin T enzyme) with at least one value reaching 99% percentile of the upper limit with at least one of the following criteria: Symptoms of myocardial ischemia. New clear ST-T transform appears, or new left branch block appears. Appearance of pathological Q waves on an electrocardiogram. Evidence of new alive myocardial imaging or new regional dyskinesia. Coronary thrombosis is identified by coronary angiography or autopsy. Based on coronary artery imaging and intervention: Significant lesions ($\geq$ 70%) from two or more coronary artery branches and the culprit coronary artery intervention.

The data collection tool is a sample of research medical documents that includes information on administrative, medical history, clinical, subclinical, major cardiovascular events (MACE) after 3 months of follow-up.

Subclinical parameters taken from the time of admission include: hs-troponin (ng/ml), proBNP (pg/ml), cholesterol (mmol/l), leukocyte count (G/l), blood fibrinogen concentration (g/l), blood albumin concentration (g/l). Fibrinogen/albumin index = fibrinogen concentration/albumin concentration x 100. Using 2D echocardiography to investigate left ventricular ejection fraction (EF) using the Simpson method [9].

The patients were followed 15 days, one month, two months, three months post-intervention. Evaluation of major cardiovascular events including all-cause mortality, readmission to heart failure, coronary artery reintervention, cerebral stroke.

Process data using Excel and SPSS 20.0 software.

III. RESULTS

Prognostic indicators such as hs - troponin T, pro - BNP, ejection fraction and GRACE scale were all much higher in the group with high FAR, the difference being significant ($p < 0.05$). Major cardiovascular events occurred significantly more in the high FAR group than in the low FAR group (table 1). ROC curve analysis showed that the FAR index can predict events occurring during the 3-month period after discharge from the ACS group ($p < 0.05$), but the predictability is not high (Figure 1).

Table 1: The relationship between FAR and the clinical and subclinical indicators of the research group

| Character	Q1(FAR < 8.13) N= 19	Q2 (FAR: 8.13-10.87) N = 38	Q3 (FAR > 10.87) N = 19	p
Age (years)	63.78 ± 11.04	60.28 ± 10.99	68.84 ± 12.15	> 0.05
BMI (kg/m²)	22.13 ± 2.47	20.88 ± 2.31	21.12 ± 1.86	> 0.05
Systolic Blood Pressure (mmHg)	121.05 ± 19.97	124.21 ± 23.08	118.42 ± 19.79	> 0.05
Heart rate (beat/min)	74.89 ± 15.11	78.26 ± 17.2	81.36 ± 22.99	> 0.05
Leukocytes (109/l)	8.76 ± 3.23	8.82 ± 3.46	10.05 ± 3.97	> 0.05
Hs-TroponinT (ng/ml)	145 ± 325	204.93 ± 582.04	1165 ± 2043	< 0.05
proBNP (pg/ml)	931 ± 1395	1136 ± 2048	6211 ± 9035	< 0.05
Cholesterol (mmol/l)	5.09 ± 1.21	5.05 ± 1.08	5.57 ± 1.09	> 0.05
EF (%)	59.68 ± 10.93	58.73 ± 7.23	49.31 ± 10.95	< 0.05
Grace	108.26 ± 21.09	113.1 ± 30.09	131.1 ± 37.23	< 0.05
MACE	1	7	7	< 0.05

Q1: 25th percentile; Q2: median; Q3: 75th percentile
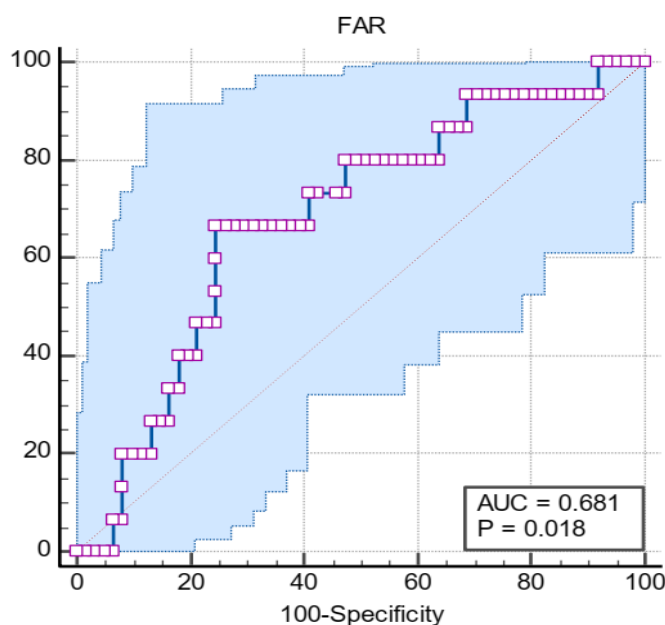
Figure 1: Ability to predict events of FAR index in patients with acute coronary syndrome.

During the follow-up of major cardiovascular events in our study, the Kaplan - Meier line analysis showed that patients with FAR > 10.3 had a higher risk of major cardiovascular events in the FAR ≤ group of 10.3 (p < 0.05) (Figure 2).
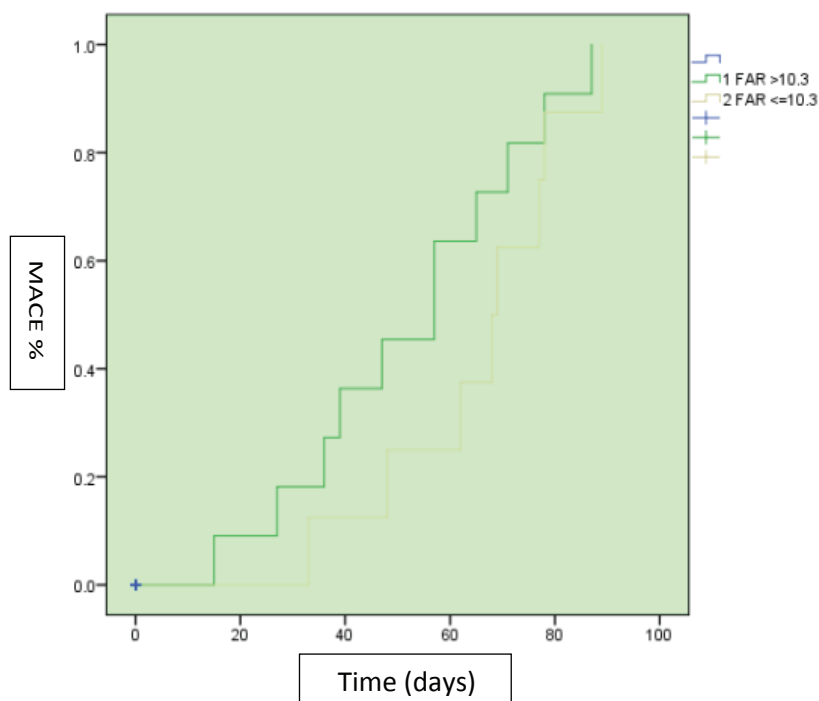
Figure 2: The Kaplan Meier line represents a comparison of event rates
in the group with FAR > 10.3 and the FAR group ≤ 10.3.

IV. DISCUSSION

FAR is a new inflammatory indicator, which has recently been studied for its prognostic value in acute coronary heart diseases. Through examining the correlation between FAR and subclinical factors, our study has noted correlations between indicators such as troponin, pro-BNP, Grace score. They were higher statistically significant in high FAR group when compared to low FAR, and EF was descrease statistically significant in two compared groups. The study by Dongxu He and Mingkang Li also showed a significant difference between troponin and FAR (p < 0.05) levels [10, 11]. Mingkang Li's research also showed that FAR was positively correlated with indicators such as age, blood creatinine, blood leukocytes with p < 0.05 [11]. Zhenzhen Duan's study also showed that lower EF was significant with a high p < 0.05 in the high FAR group compared to the low FAR group [5].

In terms of Event Predictability of FAR index in ACS patients, we use statistics C to calculate the area under the ROC curve (AUC) and the results that FAR has AUC = 0.681 with p = 0.018 shows that the FAR index can predict events occurring during the 3 months after discharge in the ACS group. This result is similar to author M. Cetin when tracking events for 3 months, but the predictability is not high in both studies [6]. Elevated fibrinogen plays an important role in thrombus formation in embolic diseases, and albumin reduction has long been an independent prognostic factor for myocardial infarction and heart failure, and to increase prognostic values in acute coronary heart diseases, the ratio of fibrinogen to albumin has been studied and shown to have better prognostic values than fibrinogen and albumin alone [12]. During the follow-up of major cardiovascular events, our study was divided into two groups with a cut-off score of 10.3, finding that the ACS patient group with a FAR > 10.3 had a significantly higher event rate than the lower group. Gao Liu's study found that the ACS group with a FAR > of 9.56 had a higher event rate than the lower group. This result is also not significantly different from our study [12].

V. CONCLUSION

FAR may be used as a routine prognostic factor in acute coronary syndrome with multiple coronary artery branch lesions with percutaneous coronary artery intervention.

REFERENCES

1. Pham Manh Hung. Clinical Cardiology: History and burden of cardiovascular disease in the world and Vietnam. 2019: Medical publishing house.

2. Ministry of Health. Guidelines for diagnosis and treatment of acute coronary syndrome. 2019:1 - 35.

3. Nguyen Khanh Linh. Evaluating the Event Prediction Ability of Timi and Grace Scores in Patients with Acute Coronary Syndrome. 2021, Hanoi Medical University.

4. Rathod KS, Koganti S, Jain AK, Astroulakis Z. Complete Versus Culprit-Only Lesion Intervention in Patients With Acute Coronary Syndromes. J Am Coll Cardiol. 2018;72(17):1989-1999.

5. Duan Z, Luo C, Fu B, Han D. Association between fibrinogen-to-albumin ratio and the presence and severity of coronary artery disease in patients with acute coronary syndrome. BMC Cardiovasc Disord. 2021;21(1):588.

6. Çetin M, Erdoğan T, Kırış T. Predictive value of fibrinogen-to-albumin ratio in acute coronary syndrome. Herz. 2020;45:145–151.

7. Quinlan GJ, Martin GS, Evans TW. Albumin: biochemical properties and therapeutic potential. Hepatology. 2005;41(6):1211-9.

8. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR. Fourth Universal Definition of Myocardial Infarction (2018). Circulation. 2018;138(20):e618-e651.

9. Nguyen Anh Vu. Echocardiography diagnostic update. 2022: Hue University Publishing House.

10. He D, Jiao Y, Yu T, Song J WZ. Prognostic value of fibrinogen-to-albumin ratio in predicting 1-year clinical progression in patients with non-ST elevation acute coronary syndrome undergoing percutaneous coronary intervention. Exp Ther Med. 2019;18(4):2972-2978.

11. Li M, Tang C, Luo E, Qin Y WD. Relation of Fibrinogen-to-Albumin Ratio to Severity of Coronary Artery Disease and Long-Term Prognosis in Patients with Non-ST Elevation Acute Coronary Syndrome. Biomed Res Int. 2020:1860268.

12. Liu G, Fan CM, Guo H, Fan WN LM. Fibrinogen-to-albumin ratio predicts long-term outcomes for patients with ST-elevation myocardial infarction and multivessel disease: A prospective observational cohort study. Exp Ther Med. 2021;21(5):465.