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ORIGINAL RESEARCH

Predictive Value of Albumin to Fibrinogen Ratio and CALLY Index for Diagnosis of Ulcerative Colitis and Mucosal Healing After Vedolizumab Treatment

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Purpose: The albumin to fibrinogen ratio (AFR), a biomarker associated with inflammatory, nutritional, and coagulation status, and the CALLY index, a biomarker combining C-reactive protein, albumin, and lymphocyte count, have been suggested to correlate with prognosis in a variety of diseases in previous studies; however, studies of these two markers in ulcerative colitis (UC) are lacking. The aim of this study was to evaluate the clinical significance of AFR and CALLY index in UC.

Methods: The study included 109 UC patients and 126 healthy controls. For UC patients treated with Vedolizumab (50 patients), they were categorized into mucosal healing group (MH group) and non- mucosal healing group (non-MH group) based on Mayo endoscopic score (MES) after 14 weeks of treatment. The differences in AFR and CALLY index were compared between the UC group and the healthy control group, and between the MH group and the non-MH group. Then, the correlation of the AFR and CALLY index with UC activity was assessed, and the predictive value of the AFR and CALLY index was evaluated using the receiver operating characteristic (ROC) curve.

Results: The results showed that both AFR and CALLY index were significantly decreased in the UC group compared with the healthy control group (both $p<0.001$); the area under the curve (AUC) of the AFR and CALLY index differentiating between the healthy control group and the UC group were 0.782 and 0.773, respectively. For Vedolizumab treatment, the non-MH group had significantly lower baseline AFR and CALLY index compared to the MH group; the AUC for baseline AFR and CALLY index discriminating the MH group from the non-MH group were 0.665 and 0.721, respectively. In addition, AFR and CALLY index were negatively correlated with the MES and inflammatory load of UC. The results of multivariate logistic regression analysis showed that the CALLY index was an independent predictor of UC diagnosis and mucosal healing after 14 weeks of Vedolizumab treatment.

Conclusion: AFR and CALLY index can be used as novel serologic markers for diagnosing UC and predicting the efficacy of Vedolizumab treatment.

Keywords: albumin to fibrinogen ratio, CALLY index, ulcerative colitis, Vedolizumab, mucosal healing, biomarkers

Introduction

Ulcerative colitis (UC) is a chronic nonspecific inflammatory disease of the intestinal tract, the incidence and prevalence of which continue to rise worldwide, and the clinical course of alternating relapses and remissions not only seriously affects the physical and mental health of patients, but also imposes a huge health and economic burden.[1] The primary objective of UC treatment is to induce and sustain remission, avert complications, and enhance the quality of life.

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Mucosal healing (MH) has been demonstrated to be associated with an improved long-term prognosis, including a reduction in the rates of recurrence, hospitalization, surgical intervention, and the risk of developing colorectal cancer when compared to clinical remission.[2,3] There are no known curative drugs for UC. Conventional pharmacological treatments comprise 5-aminosalicylic acid, glucocorticoids, and immunosuppressants, and novel therapies include biologics and small molecule drugs. Vedolizumab (VDZ), an anti-α4β7 integrin antibody that selectively inhibits intestinal inflammation, offers a new option for patients with UC who have not responded well to conventional treatments, but a subset of patients will be non-responsive or poorly responsive to it, so timely and accurate assessment of disease activity and prediction of efficacy are critical for guiding therapy.[4,5] Although endoscopy is the gold standard for diagnosing UC and identifying mucosal inflammation, it is invasive, inconvenient, and can lead to serious complications such as perforation. Furthermore, the high cost and discomfort of the examination can affect patient compliance, leading to limitations in its clinical application, especially in long-term follow-up.[6,7] Therefore, the search for reliable and easily accessible non-invasive biomarkers is necessary.

C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) are the most commonly used serum biomarkers in the assessment of UC, but they are also elevated in other inflammatory diseases and thus lack specificity.[8] Due to the limitations of single indicators, biomarkers combining several parameters have been increasingly studied in recent years. Albumin is a marker that responds to nutritional status, and because of malabsorption due to recurrent inflammation of the intestinal tract, patients with UC often have decreased albumin.[9,10] Fibrinogen is an acute-phase reactant associated with thrombosis, and study has found significantly elevated fibrinogen levels in patients with active UC.[11] The albumin to fibrinogen ratio (AFR), a new biomarker, has been shown to be an indicator of disease activity in rheumatoid arthritis.[12] The CALLY index is a biomarker that combines CRP, albumin, and lymphocytes to reflect a patient's level of inflammation, nutritional status, and immune function. It has been demonstrated to correlate with the prognosis of a variety of diseases, including hepatocellular carcinoma, colorectal carcinoma, gastric carcinoma, and nasopharyngeal carcinoma.[13–17] To the best of our knowledge, no study has evaluated the clinical significance of the AFR and CALLY index in UC.

The objective of our study was to assess the predictive value of the AFR and CALLY index in diagnosing UC and evaluating mucosal healing after VDZ treatment.

Methods

Participants

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethical Review Committee of the Clinical Research Institution of the Second Affiliated Hospital of Xi'an Jiaotong University. Our study retrospectively collected data from 109 patients with UC who attended our hospital from March 2021 to September 2023. In addition, 126 healthy controls with gastrointestinal symptoms but no endoscopic abnormalities were included in the study during the same period. Inclusion criteria for the UC group: patients with UC diagnosed on the basis of clinical presentation, laboratory examination, endoscopy, and histologic biopsy, and aged between 18 and 80 years. Inclusion criteria for the healthy control group: normal endoscopic findings, between the ages of 18 and 80 years. Exclusion criteria: excessive alcohol consumption, hepatobiliary diseases, coagulation abnormalities, malignancies, severe infections, hematopoietic disorders, presence of other autoimmune diseases; lack of laboratory data needed for this study. Of the 109 patients with UC, 50 received VDZ at weeks 0, 2, 6, and 14. Mucosal healing was defined as a Mayo endoscopic score (MES) of 0. Based on the 14-week endoscopic examination results, the patients were divided into mucosal healing group (MH group) and non-mucosal healing group (non-MH group).

Data Collection

The clinical data, laboratory parameters, and endoscopic findings of the study subjects were meticulously gathered from the electronic medical record database of our hospital. For patients treated with VDZ, laboratory data were collected and AFR and CALLY index were calculated within one week prior to the treatment. AFR= albumin level (g/L) / fibrinogen (g/L). CALLY index was calculated as follows based on previous study:[18] CALLY index = albumin level (g/L) × lymphocyte count (10^9/L) / CRP level (mg/L) x 10.

Statistical Analysis

All statistical analyses were performed with SPSS software 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were tested for normality, and those that conformed to normal distribution were expressed as mean ± SD, with independent samples *t*-test for comparison between groups, and those that did not conform to normal distribution were expressed as median (P25, P75), with Wilcoxon rank sum test for comparison between groups. Categorical data were analyzed by Chi-square test or Fisher's exact test. The relationship between serum biomarkers and MES and inflammatory cytokines was examined using Spearman correlation analysis. In addition, the discriminatory ability of the AFR and CALLY index was assessed by the receiver operating characteristic curve (ROC). P<0.05 was considered statistically significant.

Results

Basic Characteristics and Clinical Parameters of the Participants

As shown in Table 1, 109 patients with ulcerative colitis (60 males and 49 females) and 126 healthy controls (61 males and 65 females) were included in our study. The mean age of the UC group was 47.84 ± 15.12 years, and the duration of the disease was 3 (1, 7.5) years. The disease extent of UC was determined according to the Montreal classification system: 9 patients had proctitis (E1), 43 patients had left-sided colitis (E2), and 57 patients had extensive colitis (E3); the mean age of the healthy control group was 48.12 ± 11.96 years. There were no statistically significant differences in age (p=0.858), gender (p=0.31), or smoking status (p=0.097) between the UC and the healthy control groups. The results of serum biomarker analysis showed a significant increase in CRP, ESR, and fibrinogen and a significant decrease in albumin in the UC group compared with the healthy control group (all p<0.001), whereas lymphocyte count was not

Table 1 Basic Characteristics and Clinical Parameters of UC Patients and Healthy Controls

	UC patients	**Healthy controls**	***P*-value**
Number of subjects (n)	109	126	-
Age (year)	47.84±15.12	48.12±11.96	0.858
Gender (n)			
Male/Female	60/49	61/65	0.31
Disease duration (year)	3(1, 7.5)	-	-
Disease extent (n)			
E1/E2/E3	9/43/57	-	-
Smoking Status (n)			
Never/past smoker/current	90/10/9	96/8/22	0.097
CRP (mg/L)	4.95(1.16, 11.9)	0.51(0.50, 3.16)	<0.001
ESR (mm/H)	16(10, 32.5)	7(2, 11)	<0.001
ALB (g/L)	40.9(36, 45)	44.8(42.68, 46.55)	<0.001
FIB (g/L)	3.52±1.08	2.61±0.59	<0.001
Lym (10^9/L)	1.48(1.26, 1.85)	1.66(1.29, 2.02)	0.185
AFR	12.24(8.71, 16.12)	17.52(14.87, 20.90)	<0.001
CALLY index	1.28(0.38, 5.95)	9.33(2.12, 17.57)	<0.001

Abbreviations: UC, ulcerative colitis; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; ALB, albumin; FIB, fibrinogen; Lym, lymphocyte; AFR, albumin to fibrinogen ratio; CALLY, C-reactive protein–albumin–lymphocyte.

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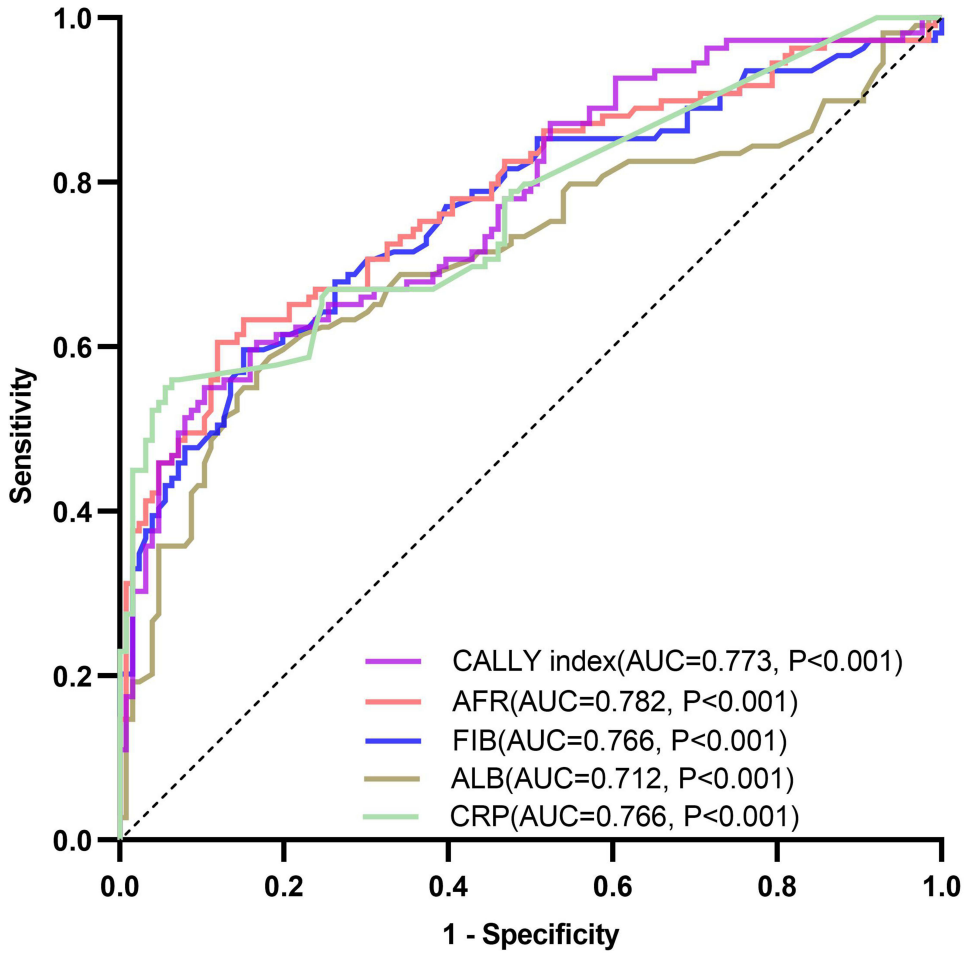

Figure 1 Receiver operating characteristic (ROC) curves of serum biomarkers for the differentiation of the UC group from healthy controls. P<0.05 was considered significant.

statistically different between the two groups (p=0.185). Next, the AFR and CALLY index were calculated, revealing a notable decline in both indices in the UC group compared to the healthy control group (both p<0.001). Furthermore, we performed receiver operating characteristics (ROC) curve analysis to evaluate the ability of AFR and CALLY index to discriminate the UC group from healthy controls. As shown in Figure 1, the area under the curve (AUC) was greater for the AFR (AUC=0.782) and CALLY index (AUC=0.773) compared to CRP (AUC=0.766), albumin (AUC=0.712), or fibrinogen (AUC=0.766) alone. These data suggest that the AFR and CALLY index may be promising biomarkers for the diagnosis of UC.

We included AFR, CALLY index and other 6 common clinical indicators (erythrocyte sedimentation rate (ESR), white blood cell (WBC), hemoglobin (Hb), red blood cell distribution width (RDW), platelets (PLT), and total bilirubin (TB)) in a univariate logistic regression analysis, and those with P<0.1 were further included in the multivariate regression analysis. The results of univariate logistic regression analysis in the UC group and the healthy control group showed that all indexes except total bilirubin were associated with the diagnosis of UC (Table 2), and the results of further multivariate analysis showed that the CALLY index, ESR, WBC, and PLT could be used as independent predictors for the diagnosis of UC (Figure 2A).

Correlation of AFR and CALLY Index with MES and Inflammatory Load in UC Patients

To further evaluate whether AFR and CALLY index could be used as biomarkers of disease activity, we assessed endoscopic disease activity using the Mayo endoscopy score (MES) and collected serum pro-inflammatory cytokine

Table 2 Logistic Regression Analysis of UC Group and Healthy Control Group

Biomarkers	Univariable analyses			Multivariable analyses		
	OR	95% CI	*P* value	OR	95% CI	*P* value
CALLY index	0.899	0.863–0.937	<0.001	0.949	0.911–0.989	0.014
AFR	0.802	0.750–0.857	<0.001	1.025	0.870–1.208	0.769
ESR	1.136	1.085–1.190	<0.001	1.078	1.004–1.157	0.038
WBC	1.342	1.165–1.547	<0.001	1.311	1.037–1.657	0.024
Hb	0.858	0.944–0.972	<0.001	0.996	0.973–1.019	0.734
RDW	1.479	1.215–1.801	<0.001	1.286	0.933–1.771	0.124
PLT	1.012	1.007–1.016	<0.001	1.007	1.001–1.014	0.031
TB	0.964	0.927–1.002	0.062	0.992	0.958–1.028	0.671

Abbreviations: OR, odds ratio; CI, confidence interval; CALLY, C-reactive protein–albumin–lymphocyte; AFR, albumin to fibrinogen ratio; ESR, erythrocyte sedimentation rate; WBC, white blood cell; Hb, hemoglobin; RDW, red blood cell distribution width; PLT, platelet; TB, total bilirubin.

expression levels in UC patients. The results of Spearman correlation analysis are shown in Table 3. The AFR and CALLY index demonstrated a negative correlation with MES (AFR, R=−0.571, p<0.001; CALLY index, R=−0.592, p<0.001) (Figure 3A). Regarding to inflammatory cytokines, the AFR and CALLY index exhibited a negative correlation with IL-6 (AFR, R=−0.531, p<0.001; CALLY index, R=−0.673, p<0.001), while no significant correlation was observed with IL-8, IL-1β, and TNF-α. Furthermore, we observed that the CALLY index had a more intimate association with IL-6 compared to the individual parameters (Figure 3B).

AFR and CALLY Index Predict Response to VDZ Treatment in UC Patients

To assess whether AFR and CALLY index could predict mucosal healing after VDZ treatment, we collected clinical data from 50 UC patients treated with VDZ and categorized them into a mucosal healing group (MH group) and a non-mucosal healing group (non-MH group) based on the MES score at 14 weeks of treatment. The basic characteristics of the patients are shown in Table 4. There were 26 patients in the MH group and 24 patients in the non-MH group. There were no significant differences between the two groups in terms of age, gender, smoking status, disease duration, disease extent, previous treatment, and baseline MES. We compared the differences in baseline laboratory parameters between the MH group and the non-MH groups, and the results are shown in Figure 4. Compared with the non-MH group, CRP

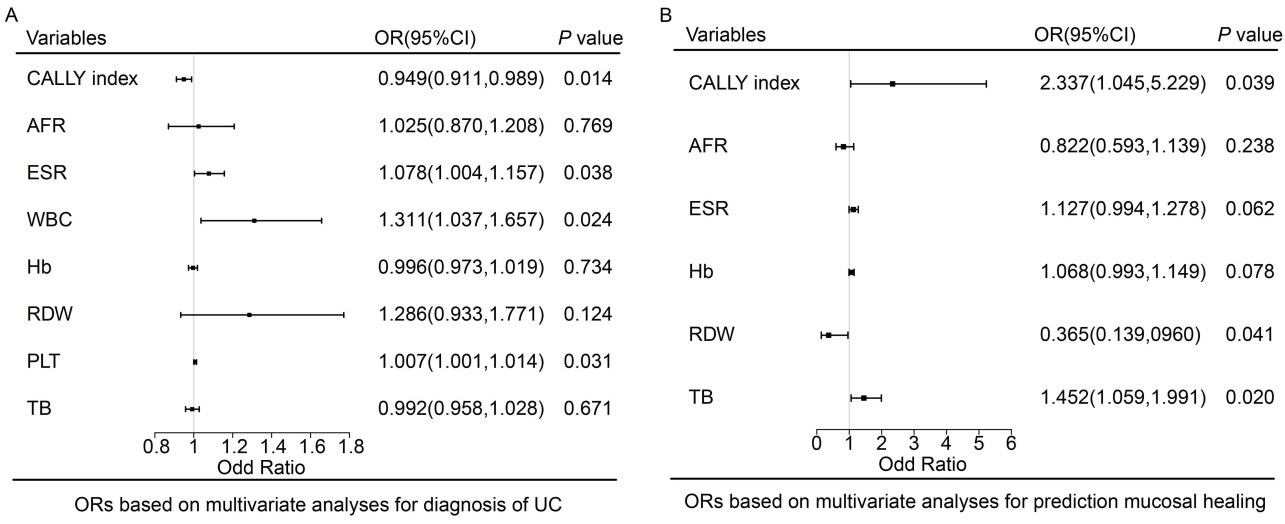

Figure 2 Multivariate logistic regression analysis to identify independent predictors of UC diagnosis (**2A**) and mucosal healing after 14 weeks of Vedolizumab treatment (**2B**).

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Table 3 Correlation of Serum Biomarkers with MES and Inflammatory Load in UC Patients (Spearman)

	MES		IL-6		IL-8	IL-1β	TNF-α
	R	*P*-value	R	*P*-value	*P*-value	*P*-value	*P*-value
CRP (mg/L)	0.616	<0.001	0.652	<0.001	0.307	0.116	0.097
ALB (g/L)	−0.495	<0.001	−0.631	<0.001	0.023	0.887	0.799
FIB (g/L)	0.502	<0.001	0.433	0.001	0.544	0.302	0.179
AFR	−0.571	<0.001	−0.531	<0.001	0.267	0.584	0.322
CALLY index	−0.592	<0.001	−0.673	<0.001	0.202	0.237	0.266

Abbreviations: CRP, C-reactive protein; ALB, albumin; FIB, fibrinogen; AFR, albumin to fibrinogen ratio; CALLY, C-reactive protein–albumin–lymphocyte; MES, Mayo endoscopic score; IL, Interleukin; TNF, Tumor necrosis factor.

was significantly lower ($p<0.05$), AFR ($p<0.05$), and CALLY index ($p<0.01$) were significantly higher in the MH group, whereas there were no significant differences in albumin, fibrinogen and lymphocyte count. Next, we compared the differences in AFR and CALLY index between the two groups of patients at baseline and at 14 weeks of VDZ treatment, respectively, and the results are shown in Figure 5, which showed that compared with baseline, AFR and CALLY index were significantly higher in the MH and non-MH groups at 14 weeks after VDZ treatment. In addition, the ROC curve confirmed the ability of baseline AFR and CALLY index to predict mucosal healing, with the AFR and CALLY index discriminating the AUC of 0.665 and 0.721 in the MH and non-MH groups, respectively (Figure 6).

Perform univariate logistic regression analysis as described above and include indicators with $P<0.1$ in further multifactorial regression analysis. The results of univariate logistic regression analysis in the MH and non-MH groups showed that AFR, Hb, and TB were protective factors for mucosal healing, and RDW was a risk factor for mucosal healing (Table 5), and the results of further multivariate analysis showed that CALLY index, RDW, and TB could be independent predictors of mucosal healing after 14 weeks of VDZ treatment (Figure 2B).

Discussion

This study is the first to investigate the clinical significance of AFR and CALLY index in patients with UC. First, we found that both AFR and CALLY index were significantly lower in patients with UC compared to healthy controls; second, AFR and CALLY index showed significant correlations with MES and inflammatory cytokines; and finally, AFR and CALLY index demonstrated potential predictive capabilities in differentiating between patients who

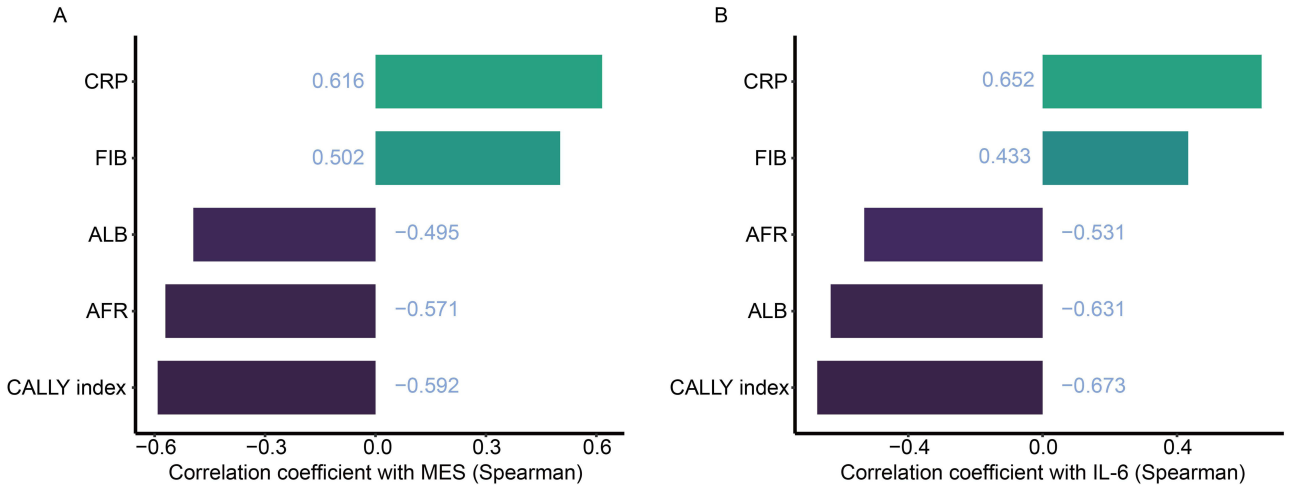

Figure 3 Bar plots of Spearman correlation coefficients. (**A**) Correlation of serum biomarkers with MES; (**B**) Correlation of serum biomarkers with IL-6.

Table 4 Basic Characteristics of UC Patients Treated with VDZ

	MH group	Non-MH group	*P*-value
Number of subjects (n)	26	24	
Age (year)	42.77±14.97	45.04±16.68	0.614
Gender (n)			
Male/Female	17/9	10/14	0.093
Smoking Status (n)			
Never/past smoker/current	22/3/1	20/3/1	0.992
Disease duration (year)	4 (2.25, 8)	3 (1.13, 7.13)	0.453
Disease extent (n)			
E1/E2/E3	1/8/17	0/6/18	0.539
Past treatment			
Corticosteroids	14	12	0.786
Immunomodulators	1	0	0.52
Infliximab	1	4	0.299
Adalimumab	0	1	0.48
MES			
2/3	8/18	7/17	0.902

achieved mucosal healing and those who did not after VDZ treatment, with CALLY index serving as an independent predictor of mucosal healing.

As a chronic, lifelong disease, assessment of disease activity and treatment efficacy is essential for the long-term management of UC. Although endoscopy is the gold standard, the complexity of the bowel preparation process and the discomfort of the operation have led to its underutilization in disease monitoring, results from a retrospective study of 15,490 patients with UC showed that only 14.2% of patients underwent endoscopy within the first 3 to 6 months of medical therapy.[7] Fecal calprotectin reflects the extent of neutrophil migration into the gastrointestinal tract and is one of the most valuable biomarkers for monitoring intestinal mucosal inflammation and predicting therapeutic outcome in patients with UC.[19] However, the interchangeability or equivalence between different assays for fecal calprotectin has not been fully evaluated, and in clinical practice, we have found that a significant proportion of patients refuse to retain samples for fecal calprotectin measurement, which may be related to their unwillingness to collect and dispose of fecal samples or to the higher cost of the test. In addition, fecal calprotectin testing programs are not yet available in some less developed regions. Therefore, for long-term management and frequent monitoring, blood-based biomarkers are simple, cost-effective, and accessible to most patients and are easily available during outpatient follow-up. Timely adjustment of treatment regimens based on clinical symptoms and biomarkers has been shown to improve disease prognosis.[20,21]

Albumin is a widely used marker of nutritional status. In addition, it has antioxidant, anti-inflammatory, anticoagulant and anti-platelet aggregation activities.[22] Studies have shown that albumin levels are significantly lower in patients with UC than in healthy individuals, that albumin levels correlate with disease activity, and that lower albumin levels may also affect the efficacy of medications and increase the risk of surgery.[9,10,23] However, albumin has a relatively long half-life (19–21 days) and is therefore less sensitive to acute changes.[24] Fibrinogen is an acute phase reactant associated with thrombosis, and it has been suggested that hypercoagulable states may be associated with the development of IBD.[25,26] The coagulation system is a dynamic participant in multiple aspects of chronic intestinal inflammation, fibrinogen

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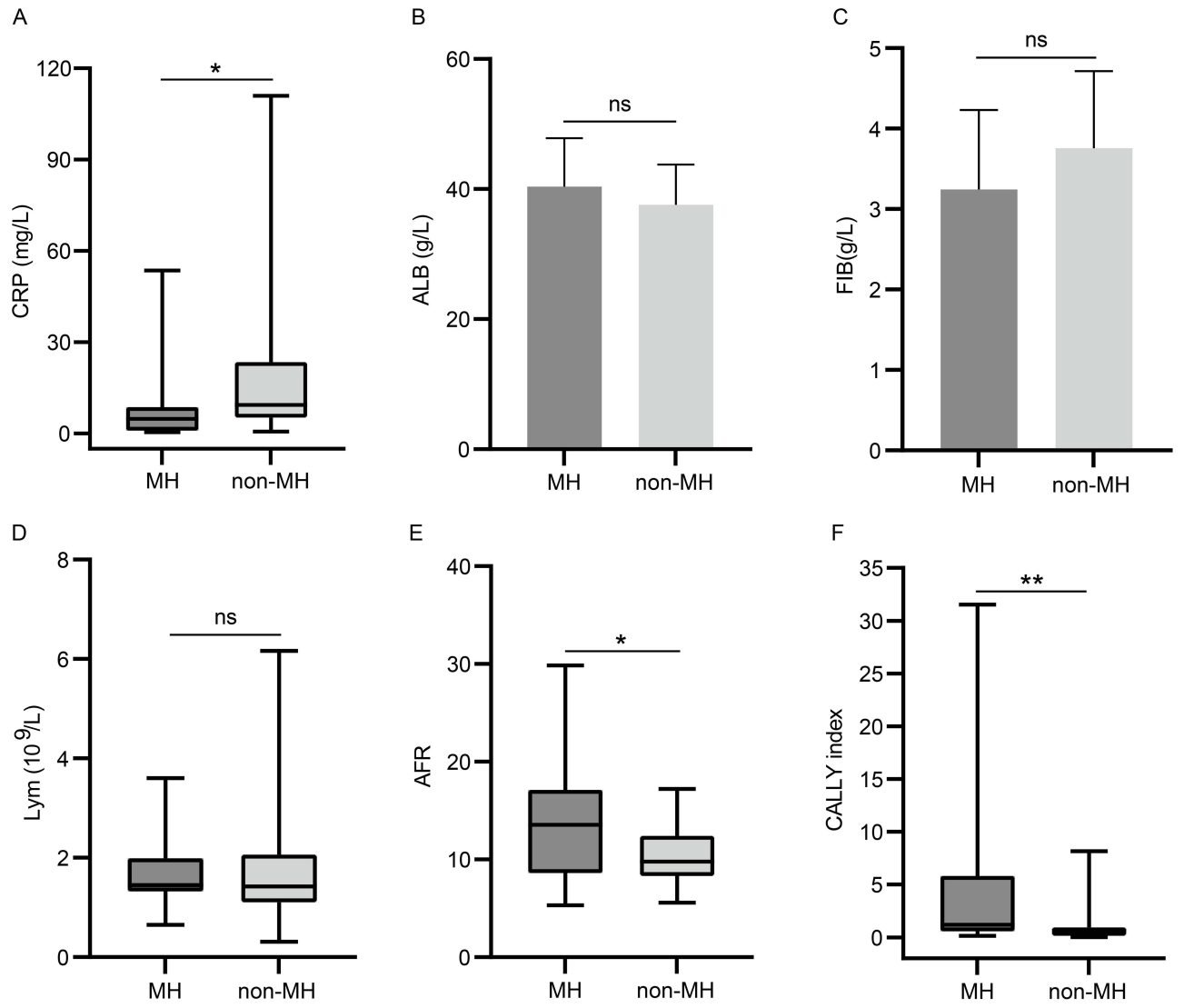

Figure 4 Differences in baseline biomarkers between the MH and non-MH groups. (**A**) CRP, C-reactive protein; (**B**) ALB, albumin; (**C**) FIB, fibrinogen; (**D**) Lym, lymphocyte count; (**E**) AFR, albumin to fibrinogen ratio; (**F**) CALLY index, C-reactive protein–albumin–lymphocyte index. ns, no significant statistical difference, *P<0.05, **P<0.01.

promotes the synthesis of pro-inflammatory cytokines (IL-6, TNF-α, and IL-1β), and the study by Zhang et al also found that fibrinogen may promote the development of UC through activation of AKT kinase and increased vascular permeability.[27,28] Study has found that fibrinogen levels were significantly elevated in patients with active UC compared with remission, and that fibrinogen was an independent predictor of disease activity and positively correlated with Mayo score.[11] We combined albumin and fibrinogen (albumin-to-fibrinogen ratio, AFR), and while previous studies[24] have found no significant difference in AFR between UC and healthy controls, our results showed that fibrinogen levels were significantly higher and AFR levels were significantly lower in patients with UC compared to healthy controls, and that the area under the curve of the AFR identifying UC was better than that of CRP, but the correlation with MES and IL-6 was weaker than that with CRP.

CRP, a marker of systemic inflammation and tissue damage, is an important indicator for assessing disease activity in UC,[29] but it is not specific and some studies have found that CRP levels may also be inconsistent with disease activity.[8] Lymphocytes are considered markers of the immune regulatory response and are influential in the pathogenesis of UC, particularly Th cells, which can be recruited to the gut by chemokines and exacerbate intestinal inflammation in UC.[30] Studies have demonstrated the presence of an impaired lymphocyte response in patients with UC, with significantly

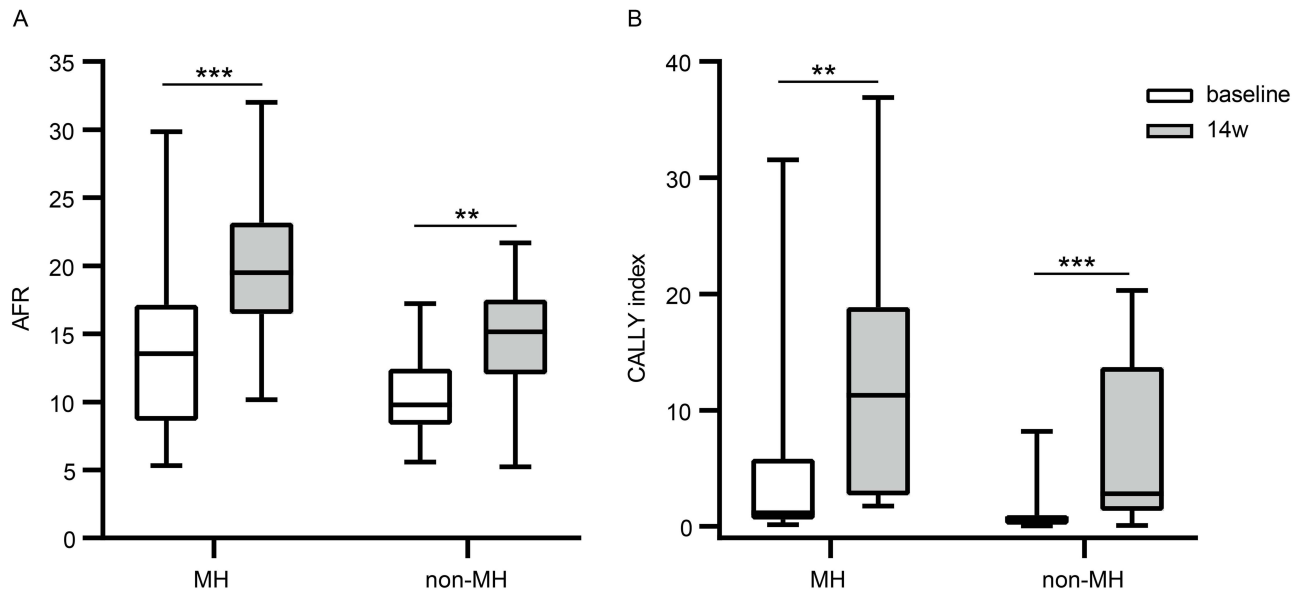

Figure 5 Differences in AFR and CALLY index at baseline and at 14 weeks after Vedolizumab treatment. (**A**) AFR, albumin to fibrinogen ratio; (**B**) CALLY index, C-reactive protein–albumin–lymphocyte index. **P<0.01, ***P<0.001.

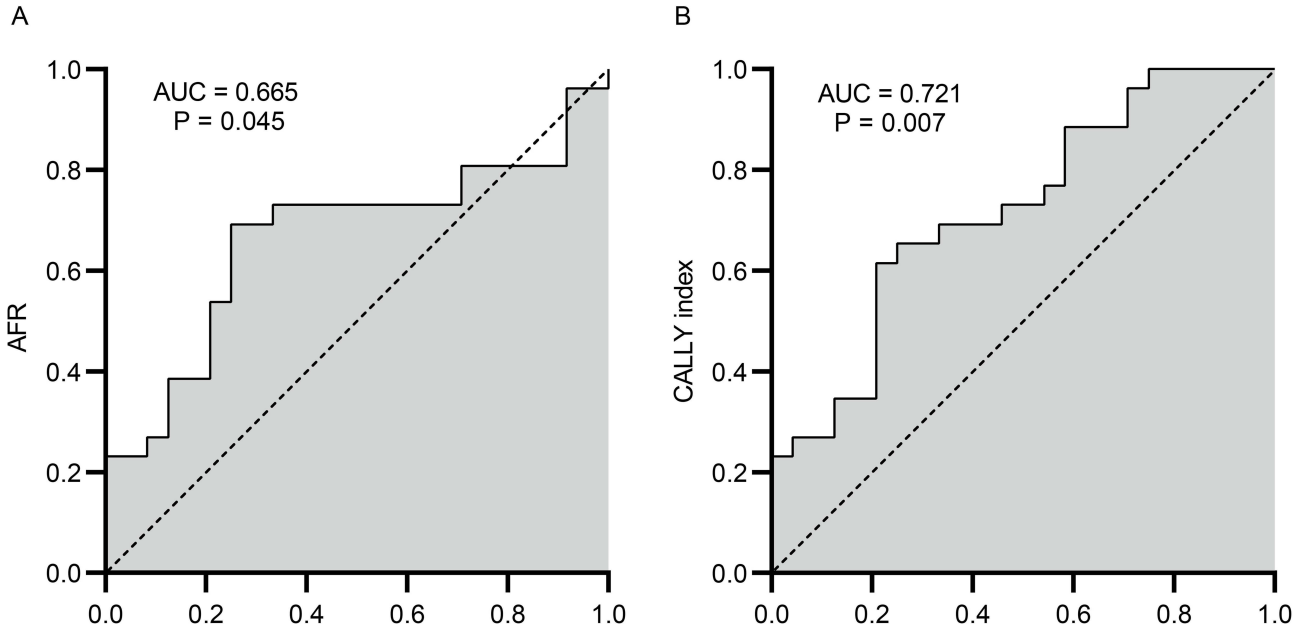

Figure 6 ROC curves of baseline AFR and CALLY index to differentiate the MH group from the non-MH group. (**A**) AFR, albumin to fibrinogen ratio, AUC=0.665; (**B**) CALLY index, C-reactive protein–albumin–lymphocyte index, AUC=0.721.

lower lymphocyte counts in patients with UC compared to healthy controls and patients with inactive UC, which may be associated with lymphocyte infiltration into intestinal tissues, apoptosis due to autoimmune disease, malnutrition, and leakage due to intestinal bleeding.[31–33] Lymphocyte-related biomarkers such as neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) have been shown to be valuable for assessing disease activity.[34,35] The CALLY index, which combines albumin, lymphocyte count, and CRP, has significant value in evaluating the prognosis of various cancers and is associated with major adverse cardiovascular events after interventional therapy in patients with ST-segment elevation myocardial infarction (STEMI).[14,16,36] This study is the first to investigate the clinical significance of the CALLY index in UC and found that the CALLY index was better than CRP alone in distinguishing between healthy

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Table 5 Logistic Regression Analysis of MH Group and Non-MH Group

Biomarkers	Univariable analyses			Multivariable analyses		
	OR	95% CI	*P* value	OR	95% CI	*P* value
CALLY index	1.254	0.978–1.608	0.074	2.337	1.045–5.229	0.039
AFR	1.151	1.011–1.312	0.034	0.822	0.593–1.139	0.238
ESR	0.964	0.927–1.003	0.068	1.127	0.994–1.278	0.062
WBC	1.172	0.938–1.465	0.163	–	–	–
Hb	1.048	1.020–1.077	0.001	1.068	0.993–1.149	0.078
RDW	0.621	0.450–0.857	0.004	0.365	0.139–0.960	0.041
PLT	0.999	0.995–1.004	0.806	–	–	–
TB	1.15	1.014–1.304	0.029	1.452	1.059–1.991	0.02

Abbreviations: OR, odds ratio; CI, confidence interval; CALLY, C-reactive protein–albumin–lymphocyte; AFR, albumin to fibrinogen ratio; ESR, erythrocyte sedimentation rate; WBC, white blood cell; Hb, hemoglobin; RDW, red blood cell distribution width; PLT, platelet; TB, total bilirubin.

controls and UC and was negatively correlated with MES and IL-6, indicating that it can reflect disease activity and inflammatory status.

The intestinal selectivity and safety of VDZ have expanded the therapeutic options for UC. A meta-analysis[37] synthesizing 48 studies showed a clinical remission rate of 40% on VDZ induction and 45% on VDZ maintenance, suggesting that there is still a significant proportion of patients who are unresponsive or poorly responsive to VDZ, and thus the search for biomarkers that can predict therapeutic efficacy prior to treatment is warranted. Mucosal α4β7+ lymphocytes and MAdCAM+ venules have been shown to predict treatment response to VDZ in UC,[38] but they require endoscopic biopsy, making them less convenient than serum biomarkers. Regarding serum biomarkers, a retrospective study showed that the neutrophil-platelet ratio (NPR) predicted loss of response after VDZ treatment, but the study had a small sample size and included only 19 patients treated with VDZ.[39] The AFR and CALLY index were easily obtained from blood tests, and our results showed that baseline AFR and CALLY index can predict mucosal healing at week 14 of VDZ treatment and are independent predictors of mucosal healing.

In conclusion, we have identified two novel biomarkers, AFR and CALLY index, both of which are useful for in diagnosing UC and predicting mucosal healing after VDZ treatment. However, there are limitations to our study: first, this is a retrospective, single-center study and the small sample size of patients treated with VDZ may have selective bias, so multicenter and larger prospective studies are needed for further validation; second, this study focused only on VDZ, and the AFR and CALLY index in other biologics (eg, Infliximab, Ustekinumab) have not been confirmed; In addition, due to the limited conditions, we did not compare with other biomarkers, and comparing with biomarkers such as fecal calprotectin may provide more insight into the advantages and disadvantages of prediction based on AFR and CALLY index, which may be the direction of our future research; Finally, as non-specific inflammatory markers, AFR and CALLY index may be influenced by infections and comorbidities, although in combination with the contraindications to VDZ, we excluded patients with liver disease, malignancies, hematologic disorders, severe infections, and other systemic autoimmune disease comorbidities that may affect the AFR and CALLY index, the significance of the AFR and CALLY index in patients not using biologics and with co-infections and other comorbidities needs to be further investigated. Nevertheless, our study provides a rationale for the use of AFR and CALLY index in the diagnosis of UC, monitoring of activity, and prediction of response to VDZ therapy.

Conclusion

The results of our study suggest that AFR and CALLY index can be used as potential biomarkers for diagnosing UC and predicting mucosal healing in UC patients treated with Vedolizumab.

Data Sharing Statement

Data will be made available on request.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethical Review Committee of the Clinical Research Institution of the Second Affiliated Hospital of Xi'an Jiaotong University. Informed consent was waived due to this study's retrospective nature and the anonymized processing of patient data.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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