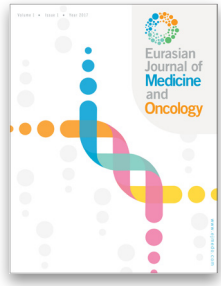
EJMO

DOI: 10.14744/ejmo.2017.30075
EJMO 2017;1(4):224–227



Research Article

Assessment of Platelet-to-Lymphocyte Ratio and Neutrophil-to-Lymphocyte Ratio in Ulcerative Colitis: A Retrospective Study

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Abstract

Objectives: The neutrophil-to-lymphocyte ratio (NLR) and the platelet-to-lymphocyte ratio (PLR) are markers of subclinical inflammation already used to determine outcomes in coronary artery disease and some malignancies. The aim of this study was to investigate the NLR and the PLR as possible indicators of ulcerative colitis (UC) disease activity.
Methods: Of a total of 67 patients included in the study, 36 had active UC and 31 were in a remission period. The NLR and the PLR were calculated using complete blood count parameters. The modified Truelove-Witts Severity Index was used to group the patients: remission (n=31), mild activation (n=21), moderate activation (n=6), and severe activation (n=9).
Results: The mean NLR of the active and remission UC patients was 4.78 and 2.01, respectively (p<0.002). The cut-off value for NLR to discriminate an active phase in UC patients was calculated to be ≥2.2 using receiver operating characteristic (ROC) analysis (sensitivity: 62%; specificity: 70%). The mean PLR of the active and remission UC patients was 209.52 and 131.27, respectively (p=0.005). The cut-off value for PLR to discriminate an active phase in UC patients was calculated to be ≥133.87 using ROC analysis (sensitivity: 63%; specificity: 68%).
Conclusion: The NLR and the PLR of active UC patients were significantly higher than those of remission patients. The NLR and the PLR may be independent, noninvasive markers of disease activity in UC.
Keywords: Neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, ulcerative colitis
Cite This Article: *Fidan K, Kocak M. Assessment of Platelet-to-Lymphocyte Ratio and Neutrophil-to-Lymphocyte Ratio in Ulcerative Colitis: A Retrospective Study. EJMO. 2017; 1(4): 224-227*

Ulcerative colitis (UC) is one of the 2 major forms of inflammatory bowel disease (IBD), along with Crohn's disease.[1] The classification of UC based on disease activity is important in patient management. Early detection of disease activity in severe UC reduces the rate of surgery and mortality.[2] Clinical features, laboratory parameters, imaging tests, endoscopic parameters, and histopathology are used to determine disease activity.[3] Noninvasive tests, such as erythrocyte sedimentation rate (ESR), white blood cell (WBC) count, platelet count, and levels of C-reactive protein (CRP), acid glycoprotein, and albumin are being recognized as important markers for initial diagnosis and disease activity detection.[4] Since these parameters are not specific for UC disease activity, adjunctive use of additional serum markers is required to monitor disease activity.

The neutrophil-to-lymphocyte ratio (NLR) is a marker of subclinical inflammation used to determine outcomes in coronary artery disease and some malignancies.[5, 6] Unlike

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Submitted Date: June 26, 2017 **Accepted Date:** September 29, 2017 **Available Online Date:** November 07, 2017

some other inflammatory markers, it is easy and inexpensive to determine the NLR.[7, 8] The platelet-to-lymphocyte ratio (PLR) has been shown to be an independent risk factor for chronic inflammation and is more sensitive than the NLR.[9, 10] Its association with prognosis reported in other related studies may be based on an elevated platelet count being an indicator of the severity of inflammation.[10] The mechanism of the NLR as an indicator of inflammation can be explained as follows: assessment of the NLR illuminates 2 separate immune pathways, since neutrophils are responsible for continued inflammation and lymphocytes have a regulatory function.[10, 11]

To our knowledge, there is no study of the PLR and the NLR as activation indicators in UC in the literature. Therefore, the aim of this study was to investigate the potential role of the NLR and the PLR as indicators of disease activity in UC.

Methods

A total of 67 patients, 36 with active UC (24 male, 12 female) and 31 (18 male, 13 female) in a remission period, were included in the study, which was conducted at Selçuk University gastroenterology clinic. Patient data are summarized in Table 1. A complete blood count, and measurement of CRP and ESR were determined. WBC, neutrophil, and lymphocyte counts were noted, and the NLR and PLR were calculated from those parameters. The modified Truelove-Witts Severity Index (MTWSI) was used to group the patients: remission (n=31), mild activation (n=21), moderate activation (n=6), and severe activation (n=9). Clinical active disease was defined as an estimated MTWSI score of 4 or more. Patients with a score of less than 4 were considered to be in remission.

Statistical Analysis

The data were analyzed using SPSS software (SPSS for Windows, Version 16.0; SPSS Inc., Chicago, IL, USA). Definitive values were expressed as median (min-max). Normal distribution of continuous variables was determined using the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare non-homogeneous distributed variables. Correlation analysis was performed with the Spearman correlation test. A p value <0.05 was considered statistically significant. Receiver operating characteristic (ROC) curves were plotted to determine the sensitivity and specificity of the NLR and the PLR for a diagnosis of active UC.

Results

In all, 67 patients were included in the study. The active UC group comprised 36 patients (24 male, 12 female) and there were 31 (18 male, 13 female) in the remission group.

Table 1. Clinical characteristics of patients with ulcerative colitis

	Active / Remission	N	Mean±SD
ESR			
	Active	36	36.50±18.34
	Remission	31	13.12±8.83
CRP			
	Active	36	14.07±19.32
	Remission	31	5.06±3.20
HGB			
	Active	36	12.38±1.97
	Remission	31	14.23±1.36
WBC			
	Active	36	8.86±3.31
	Remission	31	7.39±1.78
Neutrophil			
	Active	36	6.00±2.93
	Remission	31	4.13±1.05
Lymphocyte			
	Active	36	1.94±74
	Remission	31	2.05±60
Platelet			
	Active	36	311.47±94.94
	Remission	31	246.87±38.55
NLR			
	Active	36	4.78±7.94
	Remission	31	2.01±84
PLR			
	Active	36	209.52±193.40
	Remission	31	131.27±45.75

SD: Standart deviation; CRP: C-reactive protein; ESR: Erythrocyte sedimentation rate; HGB: Hemoglobin; NLR: Neutrophil-to-lymphocyte ratio; PLR: Platelet-to-lymphocyte ratio; WBC: White blood cell.

The mean NLR of the active and remission UC patients was 4.78 and 2.01, respectively (p<0.002). The NLR of the active disease patients was significantly higher than that of those in remission. The ROC cut-off value for NLR to discriminate an active phase in UC patients was ≥2.2 (sensitivity: 62%; specificity: 70%; area under the curve [AUC]: 0.722 (0.601-0.843); p<0.05; Fig. 1). The mean PLR of the active and remission UC patients was 209.52 and 131.27, respectively (p=0.005). The PLR of the active UC patients was significantly higher than that of those in remission. The cut-off value for PLR to discriminate active UC was calculated to be ≥133.87 using ROC analysis (sensitivity: 63%; specificity: 68%; AUC: 0.700 (0.574-0.825); p<0.05; Fig. 2). The ESR, hemoglobin, platelet, neutrophil, and CRP levels of the active UC patients were significantly higher than those of inactive patients (p<0.05). The NLR was positively correlated with the PLR (r=0.944) and the WBC (r=0.370) in active UC patients, and both correlations reached the significance level

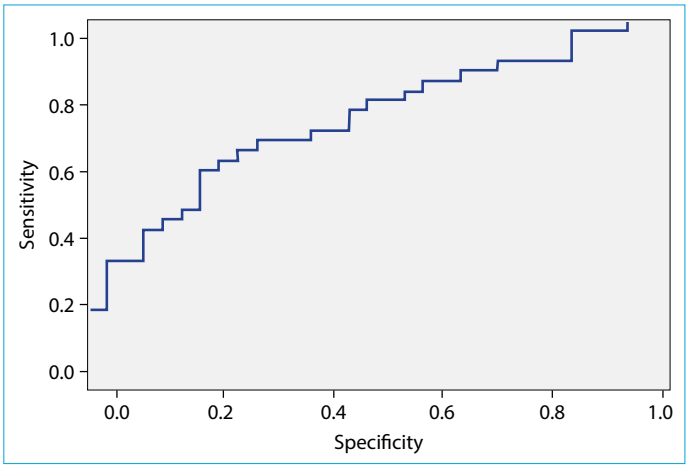

Figure 1. NLR ROC curve.

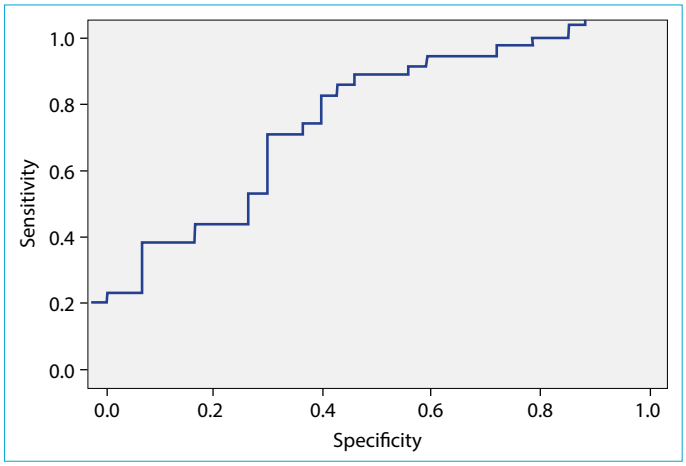

Figure 2. PLR ROC curve.

($p<0.05$). There was no correlation between PLR and other parameters. Based on the MTWSI, disease activity was remission in 31 patients, mild in 21, moderate in 6, and severe in 9. There was no statistically significant difference between disease severity classification and the PLR or the NLR ($p>0.05$).

Discussion

UC and Crohn's disease are the 2 main forms of IBD.[1]Studies have demonstrated that appropriate and effective treatment can significantly control symptoms, promote remission, prevent relapse, improve quality of life, and reduce mortality.[12] Therefore, early diagnosis of the disease and detection of disease activity is important.[13] While invasive techniques, including endoscopic, radiological, and histopathological methods, are routinely used for diagnostic decisions and disease activity monitoring, there is no ideal noninvasive test for initial diagnosis and identification of the disease.[14] The TWSI was the first index used to measure disease activity in UC. The disadvantages of this index are that it is difficult to classify some patients in the appropriate disease category and it is also difficult to determine changes in disease activity over time.[15] Following intestinal inflammation, symptoms and a clinical examination are required, along with endoscopy and histology. Because endoscopy is invasive, various laboratory markers have been evaluated for usefulness. The most commonly used inflammatory indices to determine UC activity in routine clinical practice are the WBC, CRP, and ESR, although there is no single serum marker that can be used to assess the severity of the disease. These parameters may vary according to the degree of inflammatory condition, and due to low sensitivity and specificity for intestinal inflammation, they do not adequately reflect disease activity.[16] The NLR, easily calculated using a complete blood count with differential, is a common marker of inflammation. The NLR is used already in the risk classification of patients with various cardiovascular diseases, many solid tumors, sepsis, and infectious conditions.[10, 11, 17] The PLR is a novel biomarker that can demonstrate the presence and severity of inflammation.[18] Thrombocytosis is thought to be caused by the stimulation of megakaryocytes by proinflammatory cytokines [19], and its association with prognosis demonstrated in other related studies may be explained based on an elevated platelet count being an indicator of the severity of inflammation [10]. An elevated PLR level has been reported as an independent risk factor for reduced survival in cancers such as pancreatic cancer and colorectal cancer.[10, 20]. The presence of both neutrophilia and thrombocytosis is likely to represent a nonspecific response to inflammation and its associated release of cytokines. The NLR and the PLR can provide information about 2 different immune pathways, as neutrophils are responsible for ongoing inflammation and lymphocytes perform a regulatory function.[10, 11]

Like all retrospective observations, our study has some limitations. First, the retrospective design could induce selection bias. Second, the study cohort was relatively small. These two limitations may make our results different to interpret. The objective of this study was to determine whether the NLR and the PLR, were independent, noninvasive markers of disease activity in UC. Our results demonstrated that the NLR and the PLR were higher in patients with active UC than in patients with UC in remission.

Disclosures

Ethics Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship contributions: Concept – K.F.; Design – M.Z.K.; Supervision – K.F.; Materials – K.F.; Data collection &/or processing – K.F.; Analysis and/or interpretation – M.Z.K.; Literature search – M.Z.K.-K.F.; Writing – M.Z.K.; Critical review – K.F.

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