

The Platelet to Lymphocyte Ratio in Severity Assessment of Ulcerative Colitis

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Received: 19-05-2023 / Revised: 30-06-2023 / Accepted: 28-07-2023

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Conflict of interest: Nil

Abstract:

Objectives: The outcomes of coronary artery disease and some cancers are already determined by platelet-to-lymphocyte ratio (PLR), two markers of subclinical inflammation. The aim of this study was to evaluate the role of platelet to lymphocyte ratio (PLR) as biomarker in diagnosing and assessing disease activity in ulcerative colitis (UC).

Methods: A total of 110 individuals were enrolled in the trial, of whom 72 had active UC, and 38 were in remission. Using parameters from a complete blood count, the PLR was determined.

Results: The mean PLR for UC patients in active and remission were respectively 209.52 and 131.27 ($p=0.005$). Using ROC analysis, the cut-off value for PLR to distinguish an active phase in UC patients was determined to be ≥ 133.87 (sensitivity: 63%; specificity: 68%).

Conclusion: In summary, patients with active UC had PLRs that were considerably greater than those in remission. The PLR could be a noninvasive, independent indicator of disease activity in UC.

Keywords: Platelet-to-lymphocyte ratio, ulcerative colitis, mucosal disease.

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Introduction

Chronic inflammatory bowel disease (IBD) known as ulcerative colitis (UC) diffusely affects different sections of the colon [1, 2]. The entire colon may be affected by the disease, or it may only affect the rectum. Bloody diarrhoea and abdominal pain are the patients' primary complaints [3]. The primary method of diagnosis is mucosal examination via colonoscopy, which also serves as a tool for patient follow-up and disease activity monitoring [4].

The aetiology of UC is assumed to be a result of a mix of hereditary and environmental variables; a central role has been proposed for the induction of an immune response and an imbalance between pro- and anti-inflammatory cytokines [1]. The lymphocytes and macrophages in the mucosal membrane are more numerous and activated in active IBD, causing them to secrete a large quantity of cytokines [2]. Platelets are now thought to be crucial players in inflammatory disorders [3, 4]. The extensive relationship between platelets and inflammation has been highlighted by the discovery of a correlation between platelet indices and

inflammatory markers such as white blood cell (WBC) count and C-reactive protein (CRP) [5]. The average size of a platelet, or mean platelet volume (MPV), which represents the production rate and activation of platelets, is a metric of platelet activation [6]. In several rheumatologic conditions, there is an inverse relationship between disease activity and MPV levels [7, 8].

Since the currently employed biomarkers are vague, a suitable biomarker to measure mucosal activity in IBD has not yet been found. Therefore, there is an unmet clinical need to find biomarkers that can measure mucosal disease activity without the requirement for an endoscopy. A measure of gut inflammation called faecal calprotectin (FC) exhibits a strong connection with endoscopic inflammation in UC. However, compared to endoscopic findings, its connection with clinical indicators is poorer. The total blood count makes it simple to compute the platelet to lymphocyte ratio (PLR). The purpose of this study was to analyse the platelet to lymphocyte ratio (PLR)'s potential as a

biomarker for the diagnosis and monitoring of ulcerative colitis (UC) disease activity.

Methods

This is a single-center prospective study which involved a total of 110 patients with ulcerative colitis. All these patients had been consecutively followed up in the Department of Medical Gastroenterology, Madras Medical College/ Rajiv Gandhi Government General Hospital, Chennai between July 2022- June 2023.

Inclusion criteria: Patients > 18 yrs of age diagnosed with UC attending Institute of medical gastroenterology- Madras medical college Rajiv Gandhi government general hospital.

Exclusion criteria: Previous bowel resection, infection, neoplastic disorders, hematologic disease, indeterminate colitis, heart disease, renal failure, hepatosplenic illness, autoimmune disease, and pulmonary disease were among the exclusion criteria.

Laboratory investigation: The PLR, WBC, CRP, ESR, HGB, PLT were measured among the patients. The sensitivity and specificity of PLR in the diagnosis of active ulcerative colitis were evaluated as well. Furthermore, the disease activity was assessed by TLW and UCEIS scoring system, the differences of PLR and other inflammatory markers were analyzed, meanwhile the correlation between PLR and ESR, CRP in patients with UC were assessed. The relationship between PLR and the extent of lesions of UC was also examined.

Statistical Analysis

Epi-Info version 6.0 will be used for analysis, with Microsoft Excel for data feeding. For quantitative variables, the results will be presented in the text as Mean and Standard Deviation (S.D.), and for qualitative variables, as percentages. To compare proportions/percentages between groups using the Chi-Square test and the student's t-test (unpaired) for quantitative variables such as mean and standard deviation. Calculate and compare AUROCs with 95% confidence intervals. Only p-values of 0.05 are regarded as significant in all statistical analyses.

Results

110 patients in total were enrolled in the study. There were 72 patients (48 men, 24 women) in the active UC group and 38 patients (22 men, 16 women) in the remission group. The mean PLR for UC patients in active and remission were respectively 210.52 and 131.27 ($p=0.005$). Patients with active UC had PLRs that were noticeably higher than those with remission. Using ROC analysis, the cut-off value for PLR to distinguish between active UC was determined to be 133.87 (sensitivity: 63%; specificity: 68%; AUC: 0.700 (0.574-0.825); $p<0.05$).

The active UC patients had substantially higher ESR, haemoglobin, platelet, and CRP levels than the inactive patients ($p < 0.05$). PLR and other metrics lacked any association. Disease severity categorization and the PLR did not differ statistically significantly ($p>0.05$).

Table 1. Clinical characteristics of patients with ulcerative colitis

Active/Remission	Frequency	Mean \pm SD
WBC		
Remission	38	7.39 \pm 1.78
Active	72	8.86 \pm 3.31
Platelet		
Remission	38	246.87 \pm 38.55
Active	72	311.47 \pm 94.94
PLR		
Remission	38	131.27 \pm 45.75
Active	72	209.52 \pm 193.40
HGB		
Remission	38	14.23 \pm 1.36
Active	72	12.38 \pm 1.97
Lymphocyte		
Remission	38	2.05 \pm 60
Active	72	1.94 \pm 74
ESR		
Remission	38	13.12 \pm 8.83
Active	72	36.50 \pm 18.34
CRP		
Remission	38	5.06 \pm 3.20
Active	72	14.07 \pm 19.32

Discussion

The two main types of IBD are UC and Crohn's disease [9, 10]. Studies have shown that successful treatment can dramatically reduce mortality, improve quality of life, promote remission, avoid relapse, and control symptoms [11, 12]. This makes early disease diagnosis and disease activity detection crucial [13]. There currently needs to be an ideal noninvasive test for initial diagnosis and illness identification, even though invasive procedures such as endoscopic, radiographic, and histopathological approaches are frequently utilised for diagnostic choices and disease activity monitoring [14]. The first index used to gauge disease activity in UC was the TWSI. The limitations of this index include the inability to place some patients in the correct illness group accurately and the inability to track changes in disease activity over time [15]. After intestinal inflammation, symptoms, a clinical examination, endoscopy, and histology are all necessary. Endoscopy is an intrusive procedure; hence the usefulness of many laboratory indicators has been examined. Although there isn't a single serum test that can be used to gauge the severity of the disease, the WBC, CRP, and ESR are the most often utilised inflammatory indices to estimate UC activity in typical clinical practice. Due to their low sensitivity and specificity for intestinal inflammation, these indicators may fluctuate depending on the severity of the inflammatory state and do not accurately reflect disease activity [16, 17].

The PLR is a new biomarker that can show whether inflammation is present and how severe it is [18]. Proinflammatory cytokines are hypothesised to stimulate megakaryocytes, resulting in thrombocytosis [19]. The link between

thrombocytosis and prognosis found in previous relevant research may be explained by the idea that a high platelet count is a sign of severe inflammation [10]. According to research, having a higher PLR level independently increases the risk of dying from diseases like colorectal and pancreatic cancer [10, 20]. Since lymphocytes are regulatory in the immune system, the PLR can reveal information about two distinct immunological pathways [10, 11].

Our study has some limitations, just like other prospective observations. First, selection bias could be brought on by the retrospective design. Second, the study cohort was relatively small. These two restrictions can make it difficult to understand our results. This study aimed to ascertain whether the PLR was a reliable, non-invasive indicator of disease activity in UC. Our findings showed that patients with active UC had greater PLRs than those whose UC was in remission.

Conclusion

As a result, we have demonstrated for the first time in the literature that these simple-to-calculate and minimally invasive criteria are reliable in predicting endoscopically active disease in UC and may notify the clinician of an active disease prior to colonoscopy. In cases of disease activation, mucosal assessment is crucial in addition to clinical evaluation. PLR may be used to detect endoscopically active illness. Its use can also forecast the severity of endoscopic disease. The clinician may perform a more thorough inspection during the colonoscopy if they are informed of the amounts of those parameters prior to the procedure. If a colonoscopy cannot be conducted for any reason, PLR may be able to provide information about disease activity and the severity of mucosal injury.

Table 1: Master chart

Age	Sex	Duration	Platelet	ESR 1	ESR2	HB1	HB 2	CRP 1	CRP2
54	f	2	1.5	7	8	11.7	11.9	6	7
60	f	3	2.3	10	12	11	10.8	2	8
30	f	3	1.8	11	11	10.8	11	8	8
63	f	0.5	1.9	30	10	8.7	8.5	11	5
47	f	2	2.4	120	37	6.6	9.5	13	7
25	f	3	4.8	60	28	9.3	10	24	11
60	f	3	1.9	20	12	12	11.8	5	6
30	f	1	1.6	23	10	11	11.7	7	3
42	f	2	1.9	97	34	11.8	12.8	13	7
38	f	12	2.6	12	7	14.3	11.8	3	5
38	f	48	2.8	13	10	12.5	12.9	8	4
64	f	0.25	1.7	11	8	13.2	13	4	6
22	f	24	2.8	28	16	10.3	12	98	17
42	f	4	3	21	11	11	11.8	5	3
54	f	3	1.9	12	12	12.9	12	6	6
31	f	3	3.1	39	21	10	11.3	5	3
16	f	4	2.1	11	11	14	13.8	3	5

22	f	6	2.3	52	22	8	9	5	8
22	f	3	2.7	12	21	10	11.2	8	4
38	f	24	2.6	23	22	11	12	4	11
42	f	1	2.2	43	6	10.7	11.8	76	5
36	f	3	2	17	11	11.3	11.8	5	5
54	f	2	3.6	30	8	10.4	11	55	3
30	f	6	1.8	34	5	12	11	13	5
35	f	0.5	1.6	12	6	11.4	10.6	7	5
20	f	6	1.5	21	6	12	11	5	6
57	f	2	1.8	54	11	7.9	8.5	17	12
28	f	36	1.9	43	9	6	9.8	43	9
52	f	18	2	13	14	11	11	4	4
55	f	12	2.8	17	11	10.7	11.9	4	6
60	f	3	3	10	21	12	11	6	5
33	f	12	1.8	23	9	8.6	9.7	16	8
41	f	6	4.5	83	18	9.6	10.6	23	6
28	f	3	1.6	12	11	11.8	11.7	5	3
45	f	12	1.9	23	8	12	11.9	7	3
37	f	6	1.7	21	16	11	12	5	4
22	f	4	1.6	43	35	7.8	9.7	12	7
32	f	24	3.6	23	12	9.8	10.7	8	5
36	f	3	3.2	34	22	9.7	10.8	8	3
38	f	12	3.7	12	11	10	11	5	6
28	m	24	3.4	32	19	7.9	9.6	12	7
45	m	7	2.3	40	11	12.3	12	6	4
40	m	2	2.6	45	12	10.5	11	6	7
21	m	6	9.6	23	12	11	11	7	4
41	m	4	1.8	82	40	9.2	10	10	7
38	m	6	1.9	34	15	9.4	10.2	9	3
31	m	60	2.4	25	17	9.8	10	5	7
28	m	3	4.9	23	21	9.7	11	12	7
25	m	12	1.8	64	34	7.3	8.9	54	10
36	m	4	1.8	43	21	9.4	10	12	7
43	m	24	1.9	40	21	12.4	11	5	3
34	m	3	1.6	21	12	9.8	11	4	5
28	m	7	1.8	32	17	11	10.7	7	2
54	m	2	1.5	7	8	11.7	11.9	6	7
60	m	3	2.3	10	12	11	10.8	2	8
30	m	3	1.8	11	11	10.8	11	8	8
63	m	0.5	1.9	30	10	8.7	8.5	11	5
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22	m	24	2.8	28	16	10.3	12	98	17
42	m	4	3	21	11	11	11.8	5	3
54	m	3	1.9	12	12	12.9	12	6	6
31	m	3	3.1	39	21	10	11.3	5	3
16	m	4	2.1	11	11	14	13.8	3	5
22	m	6	2.3	52	22	8	9	5	8
22	m	3	2.7	12	21	10	11.2	8	4
38	m	24	2.6	23	22	11	12	4	11
42	m	1	2.2	43	6	10.7	11.8	76	5
36	m	3	2	17	11	11.3	11.8	5	5

54	m	2	3.6	30	8	10.4	11	55	3
30	m	6	1.8	34	5	12	11	13	5
35	m	0.5	1.6	12	6	11.4	10.6	7	5
20	m	6	1.5	21	6	12	11	5	6
57	m	2	1.8	54	11	7.9	8.5	17	12
28	m	36	1.9	43	9	6	9.8	43	9
52	m	18	2	13	14	11	11	4	4
55	m	12	2.8	17	11	10.7	11.9	4	6
60	m	3	3	10	21	12	11	6	5
33	m	12	1.8	23	9	8.6	9.7	16	8
41	m	6	4.5	83	18	9.6	10.6	23	6
28	m	3	1.6	12	11	11.8	11.7	5	3
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28	m	24	3.4	32	19	7.9	9.6	12	7
45	m	7	2.3	40	11	12.3	12	6	4
40	m	2	2.6	45	12	10.5	11	6	7
21	m	6	9.6	23	12	11	11	7	4
41	m	4	1.8	82	40	9.2	10	10	7
38	m	6	1.9	34	15	9.4	10.2	9	3
31	m	60	2.4	25	17	9.8	10	5	7
28	m	3	4.9	23	21	9.7	11	12	7
25	m	12	1.8	64	34	7.3	8.9	54	10
36	m	4	1.8	43	21	9.4	10	12	7
43	m	24	1.9	40	21	12.4	11	5	3
34	m	3	1.6	21	12	9.8	11	4	5
28	m	7	1.8	32	17	11	10.7	7	2
60	m	3	3	10	21	12	11	6	5
33	m	12	1.8	23	9	8.6	9.7	16	8
41	m	6	4.5	83	18	9.6	10.6	23	6
28	m	3	1.6	12	11	11.8	11.7	5	3

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