CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
http://doi.org/10.5281/zenodo.4413591

Avalable online at: http://www.iajps.com *Research Article*

VALUATION OF NEUTROPHIL-TO-LYMPHOCYTE AND PLATELET-TO-LYMPHOCYTE RATIOS IN OPEN SURGERY AND LAPAROSCOPY

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Article Received November 2020 **Accepted:** December 2020 **Published: January** 2021

Abstract:
Introduction: *The treatment of inflammation is of great importance in both laparoscopy and open surgery. In these surgical applications, assessment of the neutrophil to lymphocyte ratio (NLR) and the platelet to lymphocyte ratio (PLR), which are markers of inflammatory events, may be useful for the surgeon.*
Place and Duration: *In the West Surgery Department of Mayo Hospital, Lahore for one-year duration from June 2019 to June 2020.*
Methods: *A post-hoc analysis of data obtained from 74 patients by means of abdominal laparoscopy was performed. Preoperative characteristics, types of lesions, NLR and PLR values, and postoperative status were recorded for each patient.*
Results: *A total of 30 patients (44.8%) experienced profound organic abdominal trauma. 74 cases were transferred to open surgery due to inadequate or incompatible laparoscopy. In the correlation analysis of all continuous variables, NLR showed a positive correlation with PLR ($r = 0.932$; $p < 0.00001$), but this correlation was not observed with lactate values. Both NLR and PLR increased significantly in open surgery compared to laparoscopic cases ($p = 0.029$ and $p = 0.047$, respectively).*
Conclusion: *Assessment of NLR and PLR levels in patients with penetrating abdominal trauma can provide cost-effective and user-friendly information on abdominal inflammation. Higher NLR and PLR values suggest that open surgery is required rather than laparoscopic surgery.*
Key words: *neutrophil / lymphocyte ratio; Platelet / lymphocyte ratio; Penetrating abdominal trauma; Laparoscopy*

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Please cite this article in press Faiza Zaheer et al, ***Valuation Of Neutrophil-To-Lymphocyte And Platelet-To-Lymphocyte Ratios In Open Surgery And Laparoscopy.,*** *Indo Am. J. P. Sci, 2021; 08(01).*

BACKGROUND:

Laparoscopic procedures performed by an experienced surgeon give good results in abdominal surgery. In many types of surgery, laparoscopy has fewer side effects, especially in terms of bleeding and infection. Less tissue damage at the surgical site makes recovery easier and faster. Intra-abdominal adhesions that can develop after open surgery and cause many patients lifelong suffering are less frequent after laparoscopic surgery. Recent studies have shown that the platelet count (PLR) and the neutrophil to lymphocyte count (NLR) ratio indicate systemic inflammation. It is also associated with the prognosis of many chronic and systemic inflammatory diseases and cancer. These markers have been reported to be associated with parameters such as TNF-alpha and interleukins, which play a key role in the inflammatory process. These haematological parameters are believed to provide strong preliminary information on the surgical approach to the case. The sensitive inflammatory properties of these parameters can help guide the decision to use open or closed surgical access. The aim of the study is to assess the preoperative NLR and PLR values of patients hospitalized due to an abdominal injury and undergoing open or laparoscopic surgery.

METHODS:

This study was held in the West Surgery Department of Mayo Hospital, Lahore for one-year duration from June 2019 to June 2020. Approval for this retrospective single-center study has been given by the Local Ethics Committee. Informed consent was obtained from all patients. Seventy-four patients were enrolled in the study who had no significant systemic disease and underwent unscheduled surgery due to injuries to the abdominal cavity, stomach, liver, pancreas, intestine or large intestine. Pre-operative data (blood pressure, heart rate, etc.) and NLR and PLR values (1 day before surgery) for each patient, lactate (indicative of ischemia or hypoxemia) and other hemogram parameters (neutrophils, WBC, etc.) and fluid leakage, perioperative data such as administering fluids and going to hospital. To count blood cells, venous blood samples were analyzed on a fully automatic hemogram analyzer (Abbott Cell-Dyn 1800 Automatic Hematology Analyzer, Illinois, USA). After measuring lymphocytes, platelets and neutrophils, the NLR and PLR were manually calculated using these values. A CARE Diagnostics device was used to measure the lactate level. The data obtained in the study was analyzed using SPSS vn.21.0 for Windows. All normally distributed variables were expressed as mean ± standard deviation (SD), those not in agreement with a normal distribution were expressed as percentages and median values. Data containing the demographic characteristics of the groups studied using the Mann-Whitney U test. The Kruskal-Wallis test was used in the post hoc analysis of tests for the types of changes. Pearson's correlation analysis was used to assess the linear relationship between two continuous variables in the NLR and PLR correlation analyzes. A p value of <0.05 was considered statistically significant.

RESULTS:

All patient details are given in Table 1 with p values. The mean age of the entire patient group was 30.4 ± 10.3 years (range 17 to 55 years). Thirty-three of 74 patients (44.8%) survived with profound organic abdominal damage (colon perforation, 10; small intestine perforation, 13; stomach, 5; liver injury, 5). Open surgery was performed in a total of 26 patients due to insufficient or incompatible laparoscopy. In the analysis of the correlation of all continuous variables, NLR showed a positive correlation with PLR ($r = 0.932$; $p < 0.00001$), this correlation was not observed in the lactate values. There was no significant correlation between other parameters and PLR or NLR. Both NLR and PLR were significantly higher in open surgery compared to laparoscopic cases ($p = 0.029$ and $p = 0.047$, respectively).

Table 1: Demographics with significance according to whether GIS injury existed or not.

Parameters	Yes	No	P
Age (years)	31 ± 11	29 ± 10	0,568
Gender (M/F)	25 / 8	32 / 9	0,258
SBP (mmHg)	121 ± 10	108 ± 10	0,001
DBP (mmHg)	79±3	76 ± 4	0,023
Pulse	88 ± 6	93 ± 6	0,016
WBC	11.8 ± 4,5	15 ± 5,7	0,166
NEUT	8.7 ± 3,1	11.2 ± 4,8	0,143
LYMP	2.3 ± 0,9	2 ± 1,3	0,258
PLT	254 ± 155	254 ± 70	0,907
Hematocrit	38.1 ± 3,9	35.5 ± 4,4	0,421
Lactate	1.91 ± 0,5	3.26 ± 1,5	0,009
PLR	128 ± 68	212 ± 99	0,245
NLR	5.1 ± 2,2	10.6 ± 4,9	0,161
Fluid leakage	272 ± 188	819 ± 449	0,001
Liquid Support	1906 ± 633	2423 ± 312	0,001
Hospital Stay	4 ± 1	7 ± 1	0,0001

Similar behavior was demonstrated for abdominal trauma observed at the highest levels of the stomach. This increase is not statistically significant due to the high values of the standard deviation.

DISCUSSION:

Open surgery and the laparoscopic approach provide two very different clinical outcomes that will be of great importance for patients in the future. Recent studies have shown that PLR and NLR may be useful in pinpointing inflammation-related diseases. This study may be considered valuable in demonstrating whether preoperative PLR and NLR values are potentially different between open surgery and laparoscopic surgery due to inflammation. Laparoscopy for gastrointestinal perforation has a shorter incision length compared to open surgery, resulting in less morbidity and a shorter hospital stay. Laparoscopic repair of the colon is probably the first clinical approach, especially if it is feasible in the experience of the surgeon. Intra-abdominal adhesions that can develop after open surgery and cause many patients lifelong suffering are less frequent after laparoscopic surgery. This is due to the difference in inflammatory responses observed during trauma in the two approaches. Bleir et al. Laparoscopic access was found to be beneficial due to shorter surgery time and hospital stay. Likewise, Coimbria reported shorter hospital stays for laparoscopy compared to laparotomy. In this study, the hospital stay after surgery was longer after open surgery than after laparoscopic surgery. It is known that hematological parameters indicate inflammation in the case of penetrating abdominal injuries. Recent reports have shown that NLR is a predictor of inflammation and is useful in predicting gastrointestinal problems. Markar et al. NLO has been proposed as a preventive parameter for possible appendicitis. In another study, elevated levels of NLR were measured in cases of childhood vasculitis accompanied by bleeding from the gastrointestinal organs. Park et al. suggested that gastrointestinal bleeding was associated with high NLR values. The results of this study support these NLR reports. Higher NLR values were found in patients with severe problems such as high levels of fluid loss requiring fluid support and an extended hospital stay. It was found that the NLR was significantly higher in patients treated with open surgery compared to patients treated with laparoscopy, which confirms the higher level of inflammatory events in open surgery. While there is little research on the subject, NLR has been reported to have greater diagnostic consistency than traditional laboratory diagnostic tests that only cover white blood cells. A high PLR value indicates a decreased lymphocyte count or an increased platelet count. In a wide variety of cases, platelets can secrete

inflammatory mediators such as growth factors and consequently stimulate both tumor angiogenesis and cell growth. Considering the inflammatory response, immune response, and coagulation status as a useful and cost-effective blood-derived marker, PLR has been extensively studied as a useful prognostic factor in the disease-related digestive system. In this study, NLR correlated positively with PLR, but this correlation was not observed in lactate values. Both NLR and PLR increased significantly in open surgery compared to laparoscopic cases. Higher NLR and PLR values were observed in cases with gastric lesions in all cases treated with open surgery compared to other regions of the gastrointestinal tract. The fact that the difference was not statistically significant in this study can be attributed to the small sample size. The limitations of this study can be considered a small number of patients and running in one state hospital. Therefore, although there was a difference in NLR and PLR values between the different types of lesions, there was no statistical significance. All of these results for NLR and PLR require robust validation studies with more patients.

CONCLUSION:

As a result, it was found that both NLR and PLR increased significantly in open surgery compared to laparoscopic cases. Patients with gastric lesions had higher NLR and PLR values than patients with other gastrointestinal perforation. Assessment of NLR and PLR levels in patients with penetrating abdominal trauma can provide cost-effective and user-friendly information about inflammation at the site of abdominal trauma. We believe that the higher the NLR and PLR values, the more open the operation is, rather than laparoscopic.

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