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Original Article

Complete Blood Count parameters could predict malignancy in breast lesions

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Abstract

Aim: Inflammatory response plays an important role in the development and progression of various cancers, including breast cancer. The aim of present study is determining Complete Blood Count parameters as possible predictors of malignancy in breast lesions.

Material and Methods: Patients with BI-RADS-4 breast disease were studied between 2010 and 2017 retrospectively. Patients with lesions detected radiologically were included in the study. According to the histopathological results, the study cohort was divided into two groups, either benign or malignant. Final blood counts of the patients before pre-biopsy were evaluated in preoperative peripheral blood measurements. When blood was taken, care was taken not to have other causes of leukocytosis in the patient. Complete Blood Count parameters were compared in these groups.

Results: A total of 331 women with BI-RADS 4 lesions enrolled to the study. Mortality and morbidity were not observed after breast biopsy in patients. Platelet (p=0.04), platelet to lymphocyte ratio (p=0.006) and red cell distribution width to platelet ratio (p=0.032) values of the patients with BI RADS 4A were found significantly different in the malignant group compared to benign BI RADS 4A group. In total BIRADS 4 lesions, the ratio of PLT and RPR was significant in malignant group (p=0.047, p=0.002) in Complete Blood Count parameters compared benign and malignant group.

Conclusion: Studies have shown that cancer affects peripheral blood cells positively or negatively. In our study, among peripheral blood cells, platelets were found to be the most affected in cancer patients. The PLT, PLR and RPR values could be valuable in predicting malignant BIRADS 4 breast lesions.

Keywords: Breast lesions; platelet; platelet to lymphocyte ratio

INTRODUCTION

Cancer is one of the most important health problems that can happen to a person's life. Breast cancer is one of the most common cancers seen in women. Many risk factors for breast cancer development and precancerous lesions are not fully explained and the etiology cannot be prevented. The early stage of breast cancer is one of the most important parameters for the prognosis of the disease. Inflammatory response plays an important role in the development and progression of various cancers, including breast cancer (1-3). Cancer-associated inflammatory response assists in the proliferation and survival of malignant cells and is associated with angiogenesis and metastasis of breast cancer (4). Peripheral blood tests before diagnosis and treatment may predict inflammatory conditions in the tumor.

In this study, we aimed to investigate the Complete Blood Count parameters to predict malignant lesions of the Breast BI-RADS 4(Breast Imaging Reporting and Data System) which were detected radiologically.

MATERIALS AND METHODS

Patients with breast disease between January 2010 and June 2017 were studied retrospectively in General Surgery Department. Patients with BI-RADS 4 lesions detected radiologically were included exclusively in the study. This study was approved by the directorate of the institution with the permission number 33443051-929 on 15/10/2019. All research was carried out in compliance with the Helsinki Declaration. Patients with systemic inflammatory disease, on medicines that could affect platelet functions (i.e. aspirin), and any kind of anemia from the study. We mentioned that issue in the methodology. were excluded from the study. The BI-RADS radiological reporting system was used in the classification of the patients (5). BI-RADS 4 has three categories as BI-RADS

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A, BI-RADS B and BI-RADS C. Histopathologic verification of BI-RADS 4 lesions were done by sonography guided tru-cut biopsy (in palpable masses), or by sonography guided wire marking excisional biopsy (in nonpalpable masses). According to the histopathological results, the study cohort was divided into two groups, either benign or malignant. Final blood counts of the patients before pre-biopsy were evaluated in preoperative peripheral blood measurements. When blood was taken, care was taken not to have other causes of leukocytosis in the patient. Parameters viewed from Complete Blood Count measurements; WBC (leukocyte), NEU (neutrophil), LYM (lymphocyte), HGB (hemoglobin), HCT (hematocrit), PLT (platelet), MCV (average size of oxygen-carrying cells), RDW (red cell distribution width) , PDW (distribution range of platelets), MPV (mean platelet volume), NLR value (divided by NEU/LYM), PLR value (divided by PLT/LYM), MPR value (divided by MPV/PLT), RPR value (divided by RDW/PLT) was calculated. These Complete Blood Count parameters were compared between benign and malignant patients.

Data were analyzed by SPSS software (SPSS 15.0 for Windows, IBM Inc., Chicago, IL, USA). Distribution of variables between malignant and benign groups were assessed by Kolmogorov-Smirnov test. Variables that homogenously distributed were analyzed by independent samples test. Mann Whitney U test used for the comparison of non-homogenously distributed variables between study groups. Pearson's square test used the comparison of categorical parameters. A p value lower than 0.05 was set for significance.

RESULTS

A total of 331 women with BI-RADS lesions enrolled to the study. Mortality and morbidity were not observed after breast biopsy in patients. In 157 patients, the lesion was found in the right breast while in 174 patients the lesion was found in the left breast. There was no significant difference between lesions in right and left breast placement and malignancy (p=0.631). The patients were classified by ultrasonography(USG); 208 patients BI-RADS 4A, 42 patients BI-RADS 4B and 81 patients were as BI-RADS 4C. Two hundred patients (60.4%) had benign and 131 (39.6%) had malignant lesions. Among the lesions, 46 (22.1%) were malignant in BI-RADS 4A group, 23 (54.8%) were malignant in BI-RADS 4B group and 62 (76.5%) were malignant in BI-RADS 4C group. The malignancy rates of the lesions were significant (p = 0.000) when BI-RADS 4 advanced from A to C. The mean age of the benign patients in the group of BI-RADS 4 was 43.88 while 52.13 in the malignant patients and the relation between the ages was significant (p<0.001). There were no significant difference between malignant and benign groups in terms of HGB (p=0.942), HCT (p=0.624), WBC (p=0.641), MCV (p=0.743), PDW (p=0.167), RDW (p=0.089), MPV (p=0.345), NLR (p=0.699), PLR (p=0.159), MPR (p=0.253).

When the patients in subgroups A, B and C of BI-RADS 4 lesions were compared with Complete Blood Count parameters as benign and malignant. The PLT (p=0.04), PLR (p=0.006) and RPR (p=0.032) values of the patients with BI-RADS 4A were found to be significant in the malignant group, although BI-RADS 4 B and C found insignificant in Complete Blood Count parameters between benign and malignant group. In total BI-RADS 4 lesions, the ratio of PLT and RPR was significant in malignant group (p=0.047, p=0.002) in Complete Blood Count parameters compared to benign and malignant group (Table 1).

Table 1. General characteristics of study groups

BI- RADS 4	Benign	Malignant	p
	Mean +/- SD		
Age	43.88 (12.45)	52.13 (11.5)	<0.001
Hemoglobin (g/dL)	12.85 (1.25)	12.84 (1.46)	0.942
Hematocrit (%)	38.84 (3.4)	38.63 (4.1)	0.624
	Median (min- max)		
Platelet (u/mm^3)	263 (51-614)	252 (135-518)	0.047
PDW (%)	17.1 (11.1-22.1)	17.1 (12.5-21.8)	0.167
RDW (%)	15.4 (11.4-38.7)	15.8 (12.1-50.5)	0.089
MPV (fL)	8.2 (5.4-12.4)	7.9 (5.5-11)	0.345
NLR (%)	1.88 (1.0-9.0)	1.90 (1.0-10.0)	0.699
PLR (%)	133 (30-307)	121 (38-1323)	0.16
MPR (%)	0.031 (0.01-0.16)	0.032 (0.01-0.07)	0.253
RPR (%)	0.058(0.03-0.29)	0.063(0.03-0.23)	0.002

PDW:distribution range of platelets; RDW :red blood cell distribution width; MPV:mean platelet volume; NLR : divided by NEU/LYM; PLR :divided by PLT/LYM; MPR :divided by MPV/PLT; RPR :divided by RDW/PLT; SD: Standard deviation

DISCUSSION

Breast cancer is the most common cancer noticed in women. Despite advancement in treatments and decreasing mortality, it keeps the first place in cancer related deaths in women (6). Increasing early diagnoses in breast cancer have led clinicians to search for ways to predict cancer with more minimal methods. In recent years, many studies on the proportions of Complete Blood Count and biochemical parameters have led to this pathway.

Inflammation plays an important role in the development and progression of multiple cancers by affecting the response to systemic treatment by inducing angiogenesis in tumor cells (7). The inflammatory response due to cancer, affects many factors in the circulation. Neutrophils, lymphocytes and platelets have been suggested to play an important role in tumor inflammation and immunology (8). An increase in peripheral neutrophils is thought to reflect an intrinsically aggressive nature of tumor cells because it mainly results from hematopoietic cytokines actively produced by tumor cells (9). In our study, the number of neutrophils in the BI-RADS 4 malignant group was found to be higher than that of the benign group, but this difference was insignificant.

Peripheral blood NLR is used as a parameter to inform the relationship between inflammatory milieu and physiological stress. High NLR causes imbalance in immune response and deterioration of anti-tumor mechanism (10-12). Therefore, it is considered to be a marker of inflammation that associated with poor prognosis. In our study, NLR in the malignant group of BI-RADS 4 lesions was higher than the benign group, but this difference was insignificant.

The RDW to platelet ratio (RPR) has been associated with gastrointestinal disorders (13) and rheumatologic conditions (14) in the literature. However, other authors found no association between RPR and inflammatory conditions (15). On the other hand, platelets play an important and versatile role in cancer progression. Thrombocytes may increase angiogenesis with cytokines and vascular endothelial growth factor and may stimulate tumor growth (16). Thrombocytosis contributes to tumor growth by increasing angiogenesis via vascular endothelial growth factor (VEGF). The increase in the number of platelet counts has also been identified as a negative prognostic factor in different malignancies (17). The PLR is another parameter that is indicative of the systemic inflammatory response and whose prognosis is indicative of poor prognosis in malignancies (12). In our study, the number of PLT in the Complete Blood Count parameters of the BI-RADS 4 lesions was significantly lower in the malignant group compared to benign group. However, the PLR ratio of study groups was not significantly different.

The inflammation related markers such as absolute white blood cell count, CRP(serum reactive protein), cytokines, PLR, and NLR have been shown the association with outcomes of cancer patients (18). In our study, no significant difference was found in the WBC, MCV, PDW, RDW, MPV, NLR, MPR, PLR ratios in the Complete Blood Count parameters compared with the benign and malignant groups in the BI-RADS 4 lesions, while the PLT number and RPR ratios were significant in the malignant group.

CONCLUSION

In conclusion, studies have shown that cancer affects peripheral blood cells positively or negatively. In our study, among peripheral blood cells, platelets were found to be the most affected in cancer patients. Prediction of the condition of cancer patients at the earliest stage of the disease is the most important curiosity. Least burden to the patient in cancer prediction is the most desirable situation. Predicting breast cancer in the body from peripheral blood cells is an easy and inexpensive method. We believe that our work will be beneficial to future researches in this regard.

Conflict of interest: The authors declare that they have no competing interest.

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Ethical approval: This study was approved by the directorate of the institution with the permission number 33443051-929 on 15/10/2019.

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