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Prognostic marker of red cell distribution width (RDW) correlates with survival outcomes in metastatic ovarian cancer patients

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Abstract

Red cell distribution width (RDW) measures red cells' size variability. Metastatic ovarian cancer displays poor chemotherapy response without an effective prognostic predictor address. we investigated whether RDW correlates independently with survival outcomes in metastatic ovarian cancer treated by chemotherapy. Subsequently, it has been specified that RDW can be likewise utilized as a prognostic marker of metastatic ovarian cancer patients. Venous blood was collected from each patient in the morning. RDW was obtained directly by the hematology analyzer from 55 patients with metastatic ovarian cancer and were retrospectively analyzed between 2018 and 2022. Survival time was calculated from the date of chemotherapy initiation until the date of death.

Keywords: Red cell distribution width (RDW); metastatic ovarian cancer; chemotherapy

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Introduction

In 2020, there were roughly 21,750 new ovarian disease cases, which contains 1.2% of all malignant growth cases [1]. The assessed number of passings connected with it are 13,940 [2]. The expected relative survival rate over the next five years is 48.6%. Ovarian cancer is diagnosed at the local stage in approximately 15.7% of cases, and at the metastasized stage in approximately 58% of cases, where the 5-year survival rate drops to 30.2% rather than 92.6 percent if detected at an early stage of local spread [3]. From 2012 to 2016, the incidence rate was 11.1 per 100,000 adjusted for the 2000 standard US population [4]. The occurrence is most noteworthy in non-Hispanic whites (11.6 per 100,000), trailed by Native Americans and The Frozen North Locals (10.3 per 100,000), Hispanics (10.1 per 00,000), non-Hispanic blacks, and Asian and Pacific Islanders [5]. A lot of ovarian malignant growths are epithelial, with the serous subtype being the most widely recognized [6]. Age-changed paces of new ovarian malignant growth cases are on a decreasing pattern in light of measurable models of analysis [7].

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In the last decade, attention was paid to identifying other prognostic markers which are expected to give more specific information regarding the stage and extent of the disease during the preoperative workup [8]. Amongst these, red blood cell distribution width (RDW) is a parameter that reflects the size heterogeneity of red blood cells and is normally used to differentiate various types of anemia. More recently, RDW has surged as a biochemical marker in several chronic inflammatory and cardiovascular diseases [9]. Recent reports have shown how it can be used as a prognostic marker in various cancers such as lung, liver, esophagogastric, and breast [10]. RDW has been studied as a potential prognostic marker also in ovarian cancer [11-16]. In the context of this malignancy, however, its role remains unclear, as reports so far published have shown inconsistent results.

This retrospective study aimed to evaluate the prognostic value of red blood cell distribution width in a large cohort of patients with metastatic ovarian cancer.

Patients and Methods

55 patients with metastatic ovarian cancer were retrospectively analyzed between 2018 and 2022. Survival time was calculated from the date of chemotherapy initiation until the date of death. Venous blood (2 mL) was collected from each patient in the morning and placed in EDTA-K2 anticoagulation tubes and drying tubes. Whole blood cell parameters were determined using a Beckman Coulter LH 780 hematology analyzer (Beckman Coulter, Brea, CA, USA). The white blood cell count, absolute neutrophil count, absolute lymphocyte count, absolute monocyte count, hemoglobin concentration (Hb), blood platelet count (PLT), MPV, platelet distribution width (PDW), and RDW were obtained directly by the hematology analyzer. Serum CA125 levels were detected using a Roche E6000 analyzer (Roche Diagnostics, Basel, Switzerland).

Finally, there were 55 patients with histopathologically confirmed diagnoses of metastatic ovarian cancer who were submitted to surgery with curative intent during this period, and 50 cases in which the final diagnosis was of benign ovarian lesions as control.

Statistical analysis

All data were analyzed using SPSS 20.0 software (IBM Corp., Armonk, NY). Continuous variables are expressed as mean ± standard deviation or median (interquartile range), and categorical variables are expressed as numbers and percentages. Differences in baseline characteristics among the three groups were analyzed by one-way ANOVA. Differences in relevant indicators between two groups were compared using Tukey's test. Correlations between RDW and PDW and cancer stage in patients with ovarian cancer were analyzed by Spearman's correlation. Sensitivity and specificity were defined by receiver-operating characteristic curves, and differences in the area under the curve (AUC) were detected using MedCalc version 15.0. A P value of < 0.05 was considered statistically significant.

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Results

Between 2018-2022, 55 patients with presumed metastatic ovarian cancer were submitted to surgery. After analyzing the histopathological reports these cases were classified into two groups: cases diagnosed with benign ovarian tumors [50 cases] and respectively cases diagnosed with metastatic ovarian cancer [55 cases]; the mean age in the first group was of 44 years [range 37-60 years]. When it comes to the most commonly encountered histopathological subtypes, there were represented by cystadenoma [23 cases] followed by mucinous cysts [14 cases] and endometrioid cysts [in 8 cases] while in the second group, the most frequently encountered histopathological subtype was represented by serous adenocarcinoma [in 35 cases] followed by mucinous carcinoma [10 cases] and endometroid carcinoma [10 cases]. When studying the RDW values, we found a significant difference between cases diagnosed with benign versus malignant lesions [0.13 versus 0,16], p=0,0012. Moreover, when analyzing the distribution of RDW among cases diagnosed with ovarian cancer we also observed that patients diagnosed with advanced stages of the disease reported significantly higher values of RDW when compared to cases diagnosed with earlier stages [0,17 for stages III-IV versus 0,145 for stages I-II]. As expected, cases presenting higher RDW values needed more extended resections to achieve no residual disease and reported a significantly higher rate of severe postoperative complications as in Table 1.

Table 1.

Demographics of patients with values of RDW

Variables	ovarian cancer	benign ovarian tumors	*P*-value
Number	55	50	
Age(years)	41.13 ± 10.10	40.10 ± 1.25	0.411
W; (10^9/L)	7.22 ± 2.01	5.60 ± 1.20	<0.002
N; (10^9/L)	5.13 ± 5.02	4.02 ± 1.22	<0.003
L; (10^9/L)	1.07 ± 0.09	1.08 ± 0.06	<0.001
Mo; (10^9/L)	0.34 ± 0.02	0.41 ± 0.09	0.002
Hb; (g/L)	118.31 ± 18.13	131.14 ± 11.13	0.001
PLT; (10^{12}/L)	224.10 ± 110.1	240.18 ± 12.02	0.002
MPV; (fl)	7.11 ± 0.4	8.9 ± 0.87	0.001
PDW;(%)	0.13 ± 0.07	0.11 ± 0.01	0.001
RDW;(%)	0.14 ± 0.05	0.18 ± 0.07	0.001

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Discussion

Metastasis is the most significant step in cancer progression as it limits the curative surgical treatment for ovarian cancer [17]. Due to the essential nature of cell–to–cell adhesion, cell–to–matrix adhesion, and resistance to anoikis in successful metastatic progression, critical regulators that control these steps may play an important role in ovarian cancer dissemination. A better understanding of the regulators of various steps in omental/bowel metastasis in ovarian cancer is essential to clinically facilitate therapeutic approaches that will treat this deadly complication and improve patient prognosis [18]. More recently, increased RDW values are a negative predictor of survival in several types of malignancies. Some authors have reported correlations between H-RDW and decreased survival in lung [19] gastric, esophageal, hepatocellular cancers, and breast cancer [20]. A similar correlation also seems to apply to metastatic ovarian cancer.

In the last decade, particular interest has been given to the association between chronic inflammation and cancer, and a significant correlation has been demonstrated so far; therefore, in ovarian cancer patients, the presence of a chronic inflammatory status is translated through a high level of circulating cytokines which inhibit the stimulating effect of erythropoietin on bone marrow [21]. RDW is a mark of heterogeneity of red cell volume, and it has been utilized in the determination and separation of a few kinds of anemias as well as cardiovascular and irresistible illnesses [22].

In consequence synthesis, maturation, and apoptosis will be seriously affected leading to the apparition in the peripheral blood of heterogenous red cells with different aspects and therefore with increased RDW [23]. Therefore, in ovarian cancer patients increased levels of interleukin 1, interleukin 6, interleukin 17, and tumor necrosis factor alpha are responsible for a chronic inflammatory status and therefore an increased RDW [24]. Moreover, certain authors underlined the fact that the association between RDW and CA 125 levels in the preoperative setup might increase the chances to better identifying ovarian cancer patients; therefore in the study conducted by a recently published research manuscript, the authors underlined the fact that the area under the curve for the combination of CA125 and RDW is significantly larger than the one of CA125 and respectively RDW alone suggesting therefore that the combination of these two parameters is expected to offer a better diagnostic tool when compared to the one obtained by each parameter in part [25]. Moreover, it seems that RDW represents an important tool to differentiate malignant from benign cases and respectively stage from advanced-stage lesions in various pathologies; therefore, many oncologists demonstrated that patients with metastatic ovarian cancer are expected to have significantly higher values of RDW when compared to those with benign ovarian tumor [26], other demonstrated that higher RDW values are associated with more aggressive types of pulmonary cancer, while another demonstrated that RDW can also have a prognostic value in esophageal cancer patients and underlined the

fact that this parameter can distinguish between benign and malignant breast pathologies and might predict the long term outcome [27].

Conclusions

To better comprehend metastatic ovarian cancer's biological aggressiveness, RDW appears to be a promising parameter; hence patients with higher preoperative upsides of RDW appear to have a more forceful natural subtype and may be a fair possibility for additional customized treatments. Further profoundly fueled examinations are expected to explain the job of RDW in every particular harm. The presence of many puzzling elements in these patient's associates might deliver the meaning of the prognostic worth of RDW undeniably challenging to accomplish.

Conflict of Interest

No conflicts of interest were declared by the authors.

Financial Disclosure

The authors declared that this study has received no financial support.

Ethics Statement

Not applicable.

Authors' contributions

All authors shared in the conception and design and interpretation of data, drafting of the manuscript and critical revision of the case study for intellectual content and final approval of the version to be published. All authors read and approved the final manuscript.

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