Jinekoloji - Obstetrik ve Neonatoloji Tıp Dergisi
The Journal of Gynecology-Obstetrics and Neonatology

ÖZGÜN ARAŞTIRMA / ORIGINAL ARTICLE

DOI: 10.38136/jgon.1348980

The predictive value of preoperative inflammatory markers / lymphocyte ratios for endometrial cancer; what does the eosinophil to lymphocyte ratio means for survival?

Endometrial kanser tahmininde peoperatif inflamatuar belirteçlerin lenfosite oranının önemi; eozinofil'in lenfosit oranı sağkalım için ne anlama geliyor?

Zafer KOLSUZ[1], Aysegul GULBAHAR[2], Alpay YILMAZ[3], Ezgi OZSOZ KOLSUZ[4], Serpil AYDOGMUS[5]

[1]Department of Obstetrics and Gynecology, University of Health Sciences, Kutahya, Turkey
[2]Department of Obstetrics and Gynecology, Katip Celebi University Ataturk Training and Research Hospital, Izmir, Turkey
[3]Department of Gynecologic Oncology, Katip Celebi University Ataturk Training and Research Hospital, Izmir, Turkey
[4]Department of Obstetrics and Gynecology, Ankara University, Faculty of Medicine, Ankara, Turkey
[5]Department of Gynecology and Obstetrics, Katip Celebi University, Izmir, Turkey

ABSTRACT

Aim: In various solid tumors, cancer-associated inflammation is associated with adverse long-term outcomes. The purpose of this study was to examine the influence of the preoperative neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR) and other systemic inflammatory markers on lymph node metastasis and 5-year survival in endometrial cancer.

Materials and Methods: A total of 379 female patients at the Gynecology and Obstetrics Clinic of the University Hospital with a final postoperative pathology of endometrial cancer were included in the 5-year survival study. The preoperative total neutrophil, monocyte, eosinophil, and platelet counts were divided by the lymphocyte count to obtain the NLR, monocyte-to-lymphocyte ratio (MLR), eosinophil-to-lymphocyte ratio (ELR), and PLR values. All patients underwent bilateral pelvic paraaortic lymph node dissection and omentectomy in addition to total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH + BSO). The pathology lab at our university evaluated all cytology and postoperative specimens. The staging system used was the FIGO 2009 surgical staging system.

Results: The results of our study showed significant correlations between lymph node metastasis and NLR, eosinophil-to-lymphocyte ratio (ELR), and PLR. Only a significant correlation between ELR and survival was discovered when the relationship with 5-year survival was examined. Additionally significant correlations existed between NLR and cervical stromal involvement, cytology positivity, and stage.

Conclusion: The prognostic factors for lymph node metastasis are NLR, PLR, and ELR. Only ELR is predictive of 5-year survival, but more prospective studies on ELR survival prediction are needed.

Keywords: Neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, eosinophil-to-lymphocyte ratio, endometrial cancer

ÖZ

Amaç: Kansere bağlı inflamasyonlar çeşitli solid tümörlerde uzun süreli kötü sonuçlarla ilişkilidir. Bu çalışmada endometrial kanserde preoperative nötrofil lenfosit oranı, platelet lenfosit oranı ve diğer sistemik inflamatuar belirteçlerin oranlarının lenf nodu metastazını ve 5 yıllık sağ kalımı öngörmedeki etkisinin araştırılması amaçlanmıştır.

Gereç ve Yöntemler: Hastanemizde post operatif patolojisinde endometrium kanseri tanısı olan 379 olgunun preoperative nötrofil lenfosit, platelet lenfosit, monosit lenfosit, eozonofil lenfosit oranlarının lenf nodu metastazı ve 5 yıllık sağ kalım ile ilişkisi araştırıldı. Hastaların preoperatif tam kan sayımından elde edilen lökosit, nötrofil, lenfosit, monosit, eozinofil, platelet sayılarının lenfosit ile oranı değerlendirildi. Bütün hastalara total abdominal histerektomi ve bilateral salpingo-ooforektomi (TAH+BSO) uygulanmış olup gerekli vakalara bilateral pelvik ± paraaortik lenf nodu diseksiyonu ve omentektomi de yapıldı. Bütün sitoloji ve postoperative materyaller üniversitemizin patoloji laboratuvarında değerlendirildi. Evrelemede ise FIGO 2009 cerrahi evreleme sistemi kullanıldı.

Bulgular: Çalışmamızın sonuçları, lenf nodu metastazı ile NLR, eozinofil-lenfosit oranı (ELR) ve PLR arasında anlamlı korelasyonlar olduğunu gösterdi. 5 yıllık sağkalım incelendiğinde sadece ELR ile sağkalım arasında anlamlı bir ilişki mevcuttu. Ek olarak, NLR ile servikal stromal tutulum, sitoloji pozitifliği ve ever arasında anlamlı bir korelasyonlar vardı.

Sonuç: Lenf nodu metastazı için prognostic faktörler NLR, PLR veELR'dir. Yalnızca ELR, 5 yıllık sağkalımı öngörmektedir, ancak ELR sağkalım tahmini konusunda daha fazla prospektif çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Nötrofil-lenfositoranı, trombosit-lenfositoranı, eozinofil-lenfositoranı, endometriyal kanser

Cite as: Kolsuz Z, Gulbahar A, Yılmaz A, Ozsoz Kolsuz E, Aydogmus S. The predictive value of preoperative inflammatory markers / lymphocyte ratios for endometrial cancer; what does the eosinophil to lymphocyte ratio means for survival?. Jinekoloji-Obstetrik ve Neonatoloji Tıp Dergisi 2024;21(3):211–217.

Geliş/Received: 24.08.2023 • **Kabul/Accepted:** 02.03.2024

Sorumlu Yazar/Corresponding Author: Aysegul GULBAHAR, Department of Obstetrics and Gynecology, Izmir Katip Celebi University, Ataturk Training and Research Hospital, Bozyaka 35170, Izmir, Turkey
E-mail: draysegulgulbahar@gmail.com

Çevrimiçi Erişim/Available online at: https://dergipark.org.tr/tr/pub/jgon

INTRODUCTION

In developed nations, endometrial cancer is the type of gynecological cancer that is diagnosedmost frequently. The majority of patients are diagnosed early, with 80% diagnosed in stage 1, and the reported mean age of patients at the time of diagnosis is 63 years. The survival rates at 5 years are 95% in patients diagnosed in the early stages of the disease, 68% of patients with local metastasis, and 17% of patients with distant metastasis (1, 2). Patients frequently seek treatment because they experience abnormal and persistent bleeding and spotting (3).

The presence of an excessive amount of estrogen, either endogenous or exogenous, in the absence of a corresponding amount of progestin is considered the primary risk factor for endometrioid endometrial adenocarcinoma. Tamoxifen therapy, obesity, and a lack of previous children are three additional risk factors. In addition, it has been discovered that women who have Lynch syndrome have a significantly higher risk of developing endometrial cancer.

Endometrial cancer prognostic markers include myometrial invasion, the type 2 subtype, advanced stage of the illness, deep anorectal metastases, and lymph node metastasis (4, 5). Recent research has shown that a high ratio of peripheral neutrophils to lymphocytes (also known as NLR) is a poor prognostic indicator in a variety of cancers (6-8). It has been demonstrated that biomarkers of systemic inflammation, such as a high NLR, platelet-to-lymphocyte ratio (PLR), and absolute monocyte count, have the potential help direct the clinical management of cancer patients of various sorts. It has been demonstrated that high preoperative NLR and PLR values are related with poor prognosis in malignancies (9). The tumor microenvironment, in particular the inflammatory response, has a significant role in the development and progression of cancer, and this role may be associated with inflammation throughout the body. In light of the aforementioned context, The study's goal is to see if preoperative NLR, PLR, and other systemic inflammatory response indicators can predict lymph node metastases and 5-year survival in patients with endometrial cancer in the final pathology.

MATERIALS AND METHODS

A total of 379 patients who underwent hysterectomy and were later diagnosed with endometrial cancer on final pathology between 2006 and 2017 in a tertiary healthcare facility were included in this retrospective study. The study excluded patients whose final pathology did not reveal endometrial cancer, whose information could not be obtained, and who were not followed up.

The patients' postoperative final pathologies, preoperative complete blood counts and CA 125, CA 19-9, CA 15-3 values were collected. The hospital's computer program, Probel (Probel Yazılım ve Bilişim Sistemleri A.Ş., İzmir, Türkiye), was used to assess the patients' 5-year survival rates, and the patients were contacted using the phone numbers stored in the system. For the survival analysis, patients who were not followed up, were not reachable by phone and dead cases due to non-cancer disease were excluded.

Patient age, obstetric history (gravida, parity counts), leukocyte, neutrophil, lymphocyte, monocyte, eosinophil, and platelet counts, surgical stage, grade of hysterectomy specimen, tumor size, presence of lymphovascular invasion, presence of cervical stromal invasion, myometrial invasion status and degree, lymph node metastasis, and lymph node type were all the considered factors.

The preoperative total neutrophil, monocyte, eosinophil, and platelet counts were divided by the lymphocyte count to obtain the NLR, monocyte-to-lymphocyte ratio (MLR), eosinophil-to-lymphocyte ratio (ELR), and PLR values.

All patients underwent bilateral pelvic paraaortic lymph node dissection and omentectomy in addition to total abdominal hysterectomy and bilateralsalpingo-oophorectomy (TAH + BSO). The pathology lab at our university evaluated all cytology and postoperative specimens. The staging system used was the FIGO 2009 surgical staging system.

Ethics Statement

Our institutional review board granted approval for the study (No. 271/Date: 29.11.2017). Due to the study's retrospective nature, the need for formal informed consent was waived. The 1964 Helsinki Declaration of Principles served as the guide for this study's conduct.

Statistical Analysis

IBM SPSS v23 was used to analyze the data. The Kolmogorov-Smirnov test was used to determine if quantitative data conformed to the normal distribution. The Mann-Whitney U test was used to compare non-normally distributed parameters between non-survivors and survivors. Spearman rank correlation was used to analyze the relationship between variables. Quantitative data analysis results are presented as the mean and standard deviation or the median with minimum and maximum. All categorical variables are expressed in terms of the frequency and percentage. The level of significance was determined to be $P<0.05$. The data were analyzed using the Mann-Whitney U test as a statistical technique.

RESULTS

The mean age of 379 patients diagnosed with endometrial cancer as a result of postoperative pathology was 60.6 years (SD ± 9.9; age range 32-91). The mean gravida of the patients was 3.2 (SD ± 0.1; range 0-16). The mean parity value of the patients was 2.6 (SD ± 1.7; range 0-16).

When the patients were evaluated according to the results of CA 125, CA15-3, and CA19-9, the average CA 125 was 58.5U/ml (SS ± 202.1U/ml; CA 125 distribution 3-2180 U/ml), CA 15-3 was 20.8U/ml (SS ± 17.0U/ml; CA 15-3 distribution 3-110 U/ml) and CA19-9was 43.8U/ml (SS ± 173.7U/ml; CA19-9 distribution1-2338 U/ml).

The demographic data of the patients and the values obtained from the preoperative complete blood count are shown in Table 1.

Table 2 showsthe postoperative pathology findings and 5-year survival of the patients.

In Table 3, the postoperative pathology findings and preoperative systemic inflammatory response markers are compared.

DISCUSSION

NLR and PLR are popular options because they are frequently gathered before surgery. However, the predictive power of these markers are still unclear. Research on other cancers, such as esophageal squamous cell carcinoma (10), ovarian cancer (11), and gastric cancer (12), has provided the vast majority of information regarding the prognostic significance of NLR and PLR. Although a few studies (13-15) examined NLR or PLR in a small cohort of hepatocellular-carcinoma (HCC) patients, no study has examined the impact of both NLR and PLR on long-term outcomes in a sizable population of patients with various HCC malignancies. Additionally, small amount of research has been executed on how NLR and PLR work together to predict outcomes. Our study was notable as we included substantial cohort HCC patients who under went pancreatic and hepatic surgery. Even though NLR and PLR were not associated with immediate outcomes, such as the chance of perioperative problems, they were associated with long-term prognosis.Elevated NLR or PLR was specifically linked to 1.9-fold or 1.8-fold greater risk of long-term death, respectively. We also showed that combining NLR and PLR could provide significant prognostic differentiation because patients with low NLR and PLR values also had the greatest long-term results, whereas with elevated NLR and PLR values had the worst survival. Like other preoperative prognostic markers, NLR

Table 1. Age, parity, gravida, tumor markers, and preoperative hemogram values of the patients

	n	Minimum	Maximum	Mean ± Standard deviation
Age	379	32	91	60.6 (9.93)
Parity	378	0	16	2.6 (1.72)
Gravida	379	0	16	3.2 (2.06)
Total leukocyte count	379	2490	20790	8355.3 (2593.71)
Total neutrophil count	379	600	16580	5388.4 (2206.48)
Total lymphocyte count	379	270	15700	2747.9 (8007.82)
Total monocyte count	379	20	1190	467.9 (162.26)
Total eosinophil count	379	0	780	149.6 (115.96)
Total number of platelets	379	90500	691000	301112.1 (82352.04)
Hemoglobin	379	7.80	16.30	12.6 (1.58)
NLR	379	0.04	29.00	2.7 (2.45)
MLR	379	0.00	0.87	0.2 (0.12)
ELR	379	0.00	0.70	0.07 (0.07)
PLR	379	1.34	1666.67	151.1 (111.40)
CA 125	251	3	2180	58.5 (202.11)
CA 15-3	166	3	110	20.9 (17.03)
CA 19-9	198	1	2338	43.8 (173.70)

Table 2. Distribution of postoperative pathology results

		N	%
5-year survival	Alive	210	90.5
	Dead	22	9.5
Lymph node metastasis	Positive	63	16.6
	Negative	316	83.4
Tumor diameter	0-1 cm	29	7.7
	1-2 cm	75	19.8
	2-4 cm	159	42
	>4 cm	116	30.6
Histological type	Type 1	278	73.4
	Type 2	101	26.6
Lymphovascular invasion	Positive	79	20.8
	Negative	300	79.2
Cervical stromal invasion	Positive	61	16.1
	Negative	317	83.9
Myometrial invasion	<%50	234	61.7
	≥%50	145	38.3
Grade	Grade 1	176	48
	Grade 2	147	40.1
	Grade 3	44	12
Cytology	Benign	338	92.4
	Malignant	28	7.6
Lymph node type in lymph node-positive patients	Pelvic	32	50.8
	Paraaortic	2	3.2
	Pelvic + Paraaortic	29	46
Histological type	Endometrioid	309	81.5
	Mucinous	4	1.1
	Serous	10	2.6
	Mix	44	11.6
	Others	12	3.2
Stage	1a	211	55.8
	1b	67	17.7
	2	23	6.1
	3a	11	2.9
	3b	2	0.5
	3c1	11	2.9
	3c2	30	7.9
	4a	9	2.4
	4b	14	3.7

and PLR can be used to assess the relative benefits of surgery, the treatment alternatives (such as neoadjuvant therapy), and the rigor of follow-up surveillance programs. It is noteworthy that the effects of NLR and PLR were observed for each type of HCC cancer studied.

The most important discovery made in our study was the correlation between preoperatively high NLR, ELR, and PLR values and the presence of lymph node metastasis. There was no discernible connection between MLR and the presence of pathological lymph nodes. There are studies that have been published on the evaluation of preoperative hematological markers in the diagnosis of endometrial cancer, cervical stromal invasion, and lymph node metastasis. These studies can be found in the relevant academic literature (16-19). According to the findings of several studies, NLR, PLR, and MLR are all associated with a lower likelihood of endometrial cancer survival. It was determined that the combination of these markers increases their prognostic value (20). A retrospective study was conducted in which the researchers

Table 3. Comparison of postoperative pathology findings and survival in terms of preoperative systemic inflammatory response markers

		NLR	P	MLR	P	ELR	P	PLR	P
Myometril invasion	<%50	2.2(1.6-2.9)	0.142	0.20(0.15-0.25)	0.152	0.05(0.03-0.08)	0.001	125.5(102.46-163.91)	0.045
	≥%50	2.3(1.8-3.0)		0.21(0.16-0.27)		0.07(0.03-0.10)		134.38(108.62-182.47)	
Lympho vascular invasion	Negative	2.2(1.6-2.9)	0.382	0.20(0.15-0.25)	0.758	0.05(0.03-0.08)	0.001	126.06(102.42-165.10)	0.044
	Positive	2.3(1.8-3.1)		0.20(0.17-0.27)		0.07(0.04-0.10)		140.38(111.49-182.10)	
Cervical stromal invasion	Negative	2.1(1.6-2.8)	0.005	0.19(0.16-0.25)	0.213	0.05(0.03-0.08)	0.064	125.64(103.00-164.88)	0.054
	Positive	2.6(1.9-3.9)		0.21(0.17-0.28)		0.07(0.03-0.10)		141.25(109.20-195.01)	
Cytology	Benign	2.2(1.7-2.8)	0.018	0.20(0.16-0.25)	0.207	0.05(0.03-0.09)	0.034	126.81(102.85-165.38)	0.014
	Malignant	2.7(2 -7.1)		0.21(0.17-0.52)		0.08(0.05-0.10)		154.21(118.72-259.37)	
Stage	Stage 1	2.2(1.6-2.8)	0.010	0.19(0.15-0.24)	0.012	0.05(0.03-0.08)	0.005	125.61(102.46-164.66)	0.037
	Stage 2	2.4(1.9-3.1)		0.23(0.17-0.27)		0.05(0.03-0.10)		129.30(97.82-195.65)	
	Stage 3	2.2(1.8-2.9)		0.20(0.15-0.27)		0.07(0.03-0.10)		131.69(111.97-163.92)	
	Stage 4	2.9(1.9-7.2)		0.26(0.20-0.55)		0.09(0.04-0.13)		164.76(115.50-307.83)	
Type	Type 1	2.2(1.6-2.9)	0.556	0.20(0.16-0.25)	0.389	0.06(0.03-0.08)	0.930	127.29(102.42-167.61)	0.263
	Type 2	2.3(1.8-2.9)		0.21(0.16-0.27)		0.05(0.03-0.09)		134.23(107.56-168.56)	
Grade	Grade 1	2.1(1.6-2.8)	0.216	0.20(0.15-0.25)	0.339	0.05(0.03-0.85)	0.932	124.80(98.05-163.03)	0.053
	Grade 2	2.3(1.7-3.1)		0.21(0.17-0.26)		0.06(0.02-0.09)		131.93(104.83-182.76	
	Grade 3	2.2(1.7-2.8)		0.21(0.16-0.28)		0.05(0.02-0.10)		141.48(111.90-166.32)	
Lymph node metastasis	Negative	2.2(1.6-2.8)	0.003	0.20(0.16-0.25)	0.226	0.05(0.03-0.08)	0.002	125.61(102.16-163.81)	0.003
	Positive	2.5(1.9-4.0)		0.21(0.16-0.33)		0.07(0.04-0.11)		141.92(113.64-184.43)	
Survival	Alive	2.3(1.7-3.1)	0.672	0.21(0.16-0.26)	0.882	0.05(0.03-0.09)	0.039	127.82(102.85-170.02)	0.888
	Dead	2.1(1.6-3)		0.21(0.14-0.30)		0.09(0.04-0.11)		140.89(113.49-160)	
Tumor diameter	0-1	1.9(1.6-2.4)	0.053	0.16(0.13-0.27)	0.072	0.04(0.03-0.07)	0.005	119.37(96.80-162.20)	0.063
	1-2	2.2(1.6-2.9)		0.20(0.16-0.24)		0.04(0.02-0.07)		126.55(109.16-163.82)	
	2-4	2.2(1.6-2.8)		0.20(0.16-0.25)		0.05(0.03-0.08)		124.12(98.54-162.69)	
	>4	2.5(1.9-3.2)		0.22(0.17-0.27)		0.06(0.04-0.10)		140.82(110.54-193.84)	
Histological type	Endometrioid	2.2(1.7-2.9)	0.748	0.20(0.16-0.25)	0.563	0.05(0.03-0.08)	0.614	128.12(103.14-167.21)	0.411
	Mucinous	3.4(1.8-6.2)		0.23(0.19-0.41)		0.04(0.01-0.08)		162.54(134.07-304.55)	
	Serous	2.4(1.8-3.2)		0.20(0.14-0.26)		0.06(0.02-0.10)		127.09(108.57-179.56)	
	Mix	2.2(1.7-3.0)		0.23(0.15-0.30)		0.05(0.03-0.09)		122.99(103.03-171.22)	
	MMMT	2.2(1.5-2.7)		0.19(0.15-0.25)		0.06(0.03-0.09)		119.76(92.83-141.36)	

evaluated patients with endometrial cancer. In this study, they examined the patients' preoperative NLR, PLR, MPV, and monocyte count in terms of clinicopathological prognostic factors and overall survival. Similar studies were conducted. In terms of advanced-stage diseases, the NLR, monocyte count, and PLR values were found to be statistically significant. However, the researchers discovered that only the monocyte count was significant in terms of the disease grade. A more advanced disease stage, deep myometrial invasion, cervical involvement, lymphovascular space invasion, and nodal involvement were found to be associated with higher NLR and PLR values (15, 17). On the other hand, Kadan et al. (21) conducted a retrospective study in which they compared lymph node-positive patients and lymph node-negative patients among 534 endometrial cancer patients who had undergone hysterectomy and lymph node dissection. These patients had been diagnosed with endometrial cancer. Univariate analysis showed that the lymph node-positive group had a higher mean NLR value than the lymph node-negative group (2-4, 9). Their multivariate analysis

results showed that a low body mass index (BMI) is an independent predictor of nodal metastasis. They concluded that having a low BMI is a risk factor for the involvement of lymph nodes in cases of low-risk endometrial cancer. According to their findings, the NLR value was able to accurately predict lymph node involvement (16). In their study of 197 patients with endometrial cancer, Aoyama et al. (22) reported that high preoperative NLR and PLR values were predictive of lymph node metastasis. These levels were measured before the patients underwent surgery (17, 23, 24).

When the NLR, MLR, and PLR values were compared for 5-year survival, our research did not uncover anystatistically significant differences. We found a correlation between high ELR values and a lower likelihood of survival. In a study by Holub and Biete (25) of 163 patients with endometrial cancer, the preoperative ELR and survival were compared, and they found that high ELR and eosinophil / neutrophil to lymphocytes ratio (ENLR) values were associated with poor survival ($p = 0.004$ and $p = 0.010$). This was the case regardless of which ratio was examined. This is the first study to suggest that the ratio of eosinophils to lymphocytes is a factor in determining whether a patient will survive endometrial cancer (25). Our study is the second one that has been done on this topic that has been published.

In the course of our research, we discovered that only the NLR value for cervical stromal involvement showed a statistically significant difference. NLR values were determined to be significantly higher in patients who had cervical involvement. The MLR, ELR, and PLR values did not show any significant differences in terms of cervical stromal involvement. Acikgoz et al.(26), on the other hand, explored whether preoperative NLR and PLR can accurately predict cervical stromal invasion in patients with endometrioid endometrial adenocarcinoma. They found no significant correlation between PLR and cervical stromal involvement, whereas NLR hadsignificant predictive value for cervical stromal involvement (26). According to the findings of Wang and colleagues, patients with endometrial cancer who have high preoperative NLR and PLR values ($p = 0.009$ and $p = 0.031$) are more likely to have cervical invasion (16).

According to the findings of our research, there was a statistically significant difference between ELR and PLR in terms of lymphovascular space invasion; however, there was no difference between NLR and MLR values in terms of lymphovascular invasion. According to the findings of a meta-analysis conducted byPergialiotis et al. (27), the NLR values of patients with endometrial cancer were significantly higher than those of controls. They also demonstrated an increase in PLR and NLR values in patients with advanced disease, which was characterized by the presence of positive lymph nodes, involvement of the lymphovascular space, and distant metastases. To obtain reliable findings in this field, additional research needs to be conducted, and those studies should focus specifically on patients with advanced disease (26, 27).

Immune markers such as NLR and PLR may aid in stratifying the prognosis of cancer patients undergoing surgery. Our study has a number of strengths, including a sufficient number of patients from a single center, the evaluation of a large number of systemic inflammatory response markers, and the analysis of survival rates. The fact that our study was only conducted at one location and used retrospective data are its primary limitations.

In patients with endometrial adenocarcinoma, there were significant associations between preoperative NLR and cervical stromal involvement, cytology positivity, and stage in our study of systemic inflammatory response markers. Only ELR was significantly correlated with 5-year survival. However, additional prospective studies with factors that influence survival of cancer patient such as treatment modality, type of surgery and type of adjuvant therapy are necessary for the estimation of survival and to determine how ELR predicts survival

In addition, we discovered a significant correlation between NLR, ELR, and PLR levels and pathological lymph node positivity in our study. There was no correlation between MLR and pathological lymph nodes. The NLR, ELR, and PLR values werehigher in the group with positive lymph nodes. The high NLR and PLR values observed in our study in the lymph node metastasis-positive group are consistent with those of prior studies. Again, prospective studies are needed to confirm the predictive value of ELR for lymph node metastatic disease.

Disclosure Statement
Authors declare no conflict of Interests for this article.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contribution
ZK, SA : Conception, SA, AY : Supervision, ZK, AG, AY : Critical Review, ZK, AG : Analysis and Interpretation, ZK, AY : Data Collection, AY, AG : Design, ZK, AY, EOK : Findings, ZK, AY : Materials, ZK, AG : Writing, ZK, AG, EOK : Literature Review

REFERENCES

1. Lee NK, Cheung MK, Shin JYet al. (2007) Prognostic factors for uterine cancer in reproductive-aged women. Obstet Gynecol 109:655-662. https://doi.org/10.1097/01.AOG.0000255980.88205.15
2. Colombo N, Creutzberg C, Amant Fet al. Esmo-Esgo-Estro Endometrial Consensus Conference Working Group (2016) ESMO-ESGO-ESTRO consensus conference on endometrial cancer: diagnosis, treatment and follow-up. Int J Gynecol Cancer 26:2-30. https://doi.org/10.1097/IGC.0000000000000609

3. Kavurmaci SA, Gulbahar A (2020) Kadınların anormal uterin kanama hakkındaki bilgi durumlarının saptanması. Anadolu Hemşire Sağlık Bilim Derg 23:389-396
4. Di Saia PJ, Creasman WT (2012) Adenocarcinoma of the uterine corpus. Elsevier, Philadelphia
5. Tangjitgamol S, Anderson BO, See HT et al. (2009) Management of endometrial cancer in Asia: consensus statement from the Asian Oncology Summit 2009. Lancet Oncol 10:1119-1127. https://doi.org/10.1016/S1470-2045(09)70290-6
6. Grivennikov SI, Greten FR, Karin M (2010) Immunity, inflammation, and cancer. Cell 140:883-899. https://doi.org/10.1016/j.cell.2010.01.025
7. O'Callaghan DS, O'Donnell D, O'Connell F, O'Byrne KJ (2010) The role of inflammation in the pathogenesis of non-small cell lung cancer. J Thorac Oncol 5:2024-2036. https://doi.org/10.1097/jto.0b013e3181f387e4
8. Aggarwal BB, Vijayalekshmi RV, Sung B (2009) Targeting inflammatory pathways for prevention and therapy of cancer: short-term friend, long-term foe. Clin Cancer Res 15:425-430. https://doi.org/10.1158/1078-0432.CCR-08-0149
9. Clarke SJ, Chua W, Moore Met al. (2011) Use of inflammatory markers to guide cancer treatment. Clin Pharmacol Ther 90:475-478. https://doi.org/10.1038/clpt.2011.122
10. Feng JF, Huang Y, Chen QX (2014) Preoperative platelet lymphocyte ratio (PLR) is superior to neutrophil lymphocyte ratio (NLR) as a predictive factor in patients with esophageal squamous cell carcinoma. World J Surg Oncol 12:58. https://doi.org/10.1186/1477-7819-12-58
11. Asher V, Lee J, Innamaa A, Bali A (2011) Preoperative platelet lymphocyte ratio as an independent prognostic marker in ovarian cancer. Clin Transl Oncol 13:499-503. https://doi.org/10.1007/s12094-011-0687-9
12. Lee S, Oh SY, Kim SH et al. (2013) Prognostic significance of neutrophil lymphocyte ratio and platelet lymphocyte ratio in advanced gastric cancer patients treated with FOLFOX chemotherapy. BMC Cancer 13:350. https://doi.org/10.1186/1471-2407-13-350
13. Bertuzzo VR, Cescon M, Ravaioli M et al. (2011) Analysis of factors affecting recurrence of hepatocellular carcinoma after liver transplantation with a special focus on inflammation markers. Transplantation 91:1279-1285. https://doi.org/10.1097/TP.0b013e3182187cf0
14. Smith RA, Bosonnet L, Raraty M et al. (2009) Preoperative platelet-lymphocyte ratio is an independent significant prognostic marker in resected pancreatic ductal adenocarcinoma. Am J Surg 197:466-472. https://doi.org/10.1016/j.amjsurg.2007.12.057
15. Li X, Chen ZH, Ma XK et al. (2014) Neutrophil-to-lymphocyte ratio acts as a prognostic factor for patients with advanced hepatocellular carcinoma. Tumour Biol 35:11057-11063. https://doi.org/10.1007/s13277-014-2360-8
16. Wang D, Yang JX, Cao DY et al. (2013) Preoperative neutrophil-lymphocyte and platelet-lymphocyte ratios as independent predictors of cervical stromal involvement in surgically treated endometrioid adenocarcinoma. Onco Targets Ther 6:211-216. https://doi.org/10.2147/OTT.S41711
17. Suh DH, Kim HS, Chung HH et al. (2012) Pre-operative systemic inflammatory response markers in predicting lymph node metastasis in endometrioid endometrial adenocarcinoma. Eur J Obstet Gynecol Reprod Biol 162:206-210. https://doi.org/10.1016/j.ejogrb.2012.02.028
18. Acmaz G, Aksoy H, Unal D et al. (2014) Are neutrophil/lymphocyte and platelet/lymphocyte ratios associated with endometrial precancerous and cancerous lesions in patients with abnormal uterine bleeding? Asian Pac J Cancer Prev 15:1689-1692. https://doi.org/10.7314/apjcp.2014.15.4.1689
19. Ural UM, Sehitoglu I, Tekin YB, Sahin FK (2015) Neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios in patients with endometrial hyperplasia and endometrial cancer. J Obstet Gynaecol Res 41:445-448. https://doi.org/10.1111/jog.12536
20. Cong R, Kong F, Ma J, Li Q, Wu Q, Ma X (2020) Combination of preoperative neutrophil-lymphocyte ratio, platelet-lymphocyte ratio and monocyte-lymphocyte ratio: a superior prognostic factor of endometrial cancer. BMC Cancer 20:464. https://doi.org/10.1186/s12885-020-06953-8
21. Kadan Y, Calvino AS, Katz A, Katz S, Moore RG (2017) Predictors for lymph nodes involvement in low risk endometrial cancer. J Obstet Gynaecol 37:514-518. https://doi.org/10.1080/01443615.2017.1281895
22. Aoyama T, Takano M, Miyamoto M et al. (2019) Pretreatment neutrophil-to-lymphocyte ratio was a predictor of lymph node metastasis in endometrial cancer patients. Oncology 96:259-267. https://doi.org/10.1159/000497184
23. Muzykiewicz KP, Iwanska E, Janeczek M, Glanowska I, Karolewski K, Blecharz P (2021) The analysis of the prognostic value of the neutrophil/ lymphocyte ratio and the platelet/lymphocyte ratio among advanced endometrial cancer patients. Ginekol Pol 92:16-23. https://doi.org/10.5603/GP.a2020.0164
24. Ni L, Tao J, Xu J et al. (2020) Prognostic values of pretreatment neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios in endometrial cancer: a systematic review and meta-analysis. Arch Gynecol Obstet 301:251-261. https://doi.org/10.1007/s00404-019-05372-w
25. Holub K, Biete A (2018) New pre-treatment eosinophil-related ratios as prognostic biomarkers for survival outcomes in endometrial cancer. BMC Cancer 18:1280. https://doi.org/10.1186/s12885-018-5131-x
26. Acikgoz AS, Cakmak B, Tuten A et al. (2017) Can preoperative neutrophil to lymphocyte and platelet to lymphocyte ratios predict cervical stromal involvement in endometrioid endometrial adenocarcinoma? Eur J Gynaecol Oncol 38:20-24
27. Pergialiotis V, Oikonomou M, Damaskou V et al. (2018) Platelet to lymphocyte and neutrophil to lymphocyte ratio as predictive indices of endometrial carcinoma: findings from a retrospective series of patients and meta-analysis. J Gynecol Obstet Hum Reprod 47:511-516. https://doi.org/10.1016/j.jogoh.2018.08.016