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Original Article / Özgün Araştırma

Prognostic importance of Mean Platelet Volume/ Platelet Ratio Before Treatment in Patients with Metastatic Pancreatic Cancer

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Abstract

Objectives: Pancreatic cancer (PC) is one of the cancers with the worst prognosis in the world. Despite protooncogenes such as BRCA and PALB2 , effective, inexpensive, and simple methods for predicting the prognosis of patients with metastatic PC are still lacking. We aim to investigate whether mean platelet volume/ platelet (MPV/PLT) and platelet indices such as MPV and plateletcrit (PCT) have a prognostic significance in patients with metastatic PC.

Methods: Patients diagnosed with metastatic PC in 3 centers in Turkey between 2016 and 2022 were analyzed retrospectively. We recorded patient's demographic data such as age, gender, performance status and platelet, MPV and PCT. Overall survival (OS) and progression-free survival (PFS) were also recorded. There were 80 patients in our study.

Results: Median PFS was found 6.2 months for MPV/PLT ratio <0.045 group and 6.3 months for MPV/PLT ratio >0.045 group retrospectively. The median PFS of the MPV/PLT ratio ≤0.045 groupwas shorter than MPV/PLT ratio >0.045 group, but there wasn't statistically meaningful difference between the groups (p:0,957). Median OS for the MPV/PLT ratio ≤0.045 groupwas 10.1 months and the MPV/PLT ratio for the >0.045 group was 9 months, but there wasn't statistically significant difference between the groups (p:0.506).There was nosurvival difference between the groups when comparing both MPV and PCT status.

Conclusion: MPV/PLT ratio is a cheap, simple and useful marker and can be used in our daily practice to predict the prognosis of patients with advanced PC, if confirmed by prospective studies and larger patient numbers.

Keywords: Metatatik pancreatic cancer, Mean platelet volume (MPV), Progression-free survival(PFS).

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Metastatik Pankreas Kanserli Hastalarda Tedavi Öncesi Bakılan Ortalama Trombosit Hacmi/ Trombosit Oranının Prognostik Önemi

Öz

Amaç: Pankreas malignneoplazmı, en kötü prognoza sahip kanserlerden biridir ve Amerika Birleşik Devletleri'nde kansere bağlı ölümlerde dördüncü sırada yer almaktadır. BRCA ve PALB2 gibi protoonkogenlere rağmen; metastatik pankreas kanserli hastaların prognozunu tahmin etmek için etkili, ucuz ve basit yöntemler hala eksiktir. Prognozu tahmin etmek için uygun bir biyobelirteç belirlemek esastır. Çalışmamızda metastatik pankreas kanserli hastalarda Ortalama Trombosit Hacmi/ Trombosit (MPV/PLT) oranı ve plateletcrit (PCT)'in prognostik bir önemi olup olmadığını araştırmayı amaçladık.

Yöntemler: 2016-2022 yılları arasında Türkiye'de metastatik pankreas kanseri teşhisi konan hastalar retrospektif olarak incelendi. Hastaların yaş, cinsiyet, performans durumu gibi demografik verilerini ve trombosit, MPV ve PCT gibi hemogram bilgileri kaydedildi.

Bulgular: Çalışmamızda 80 hasta vardı. Medyan PFS; MPV/PLT oranı <0.045 olan grup için 6.2 (%95 GA: 4.8-7.5) ay MPV/PLT oranı >0.045 grup için ise 6,3 (%95 GA: 5,3-7,4) ay olarak bulundu. MPV/PLT oranı <0.045 olan grubun medyan PFS'si MPV/PLT oranı >0.045 olan gruptan daha kısaydı, ancak gruplar arasında istatistiksel olarak anlamlı bir fark yoktu (p:0,957). MPV/PLT oranı <0.045 olan grubun medyan OS'si 10,1 (%95 CI: 6.8-13.5) ay MPV/PLT oranı >0.045 OS 9 (%95 CI: 8,2-9,8) ay olan gruba göre daha uzundu ancak gruplar arasında istatistiksel olarak anlamlı bir fark yoktu (p:0,506). Ayrıca MPV ve PCT istatistiksel anlamlı olarak PFS'yi ve OS'yi etkilemedi. Hem MPV hem de PCT ile yapılan istatistiksel analizde sağkalım farkı yoktu.

Sonuç: MPV/PLT oranı ucuz, basit ve kullanışlı bir belirteçtir ve prospektif çalışmalar ve daha fazla hasta sayıları içeren çalışmalarla doğrulanırsa metastatik pankreas kanserli hastaların prognozunu öngörmek için günlük pratiğimizde kullanılabilir.

Anahtar kelimeler: Metastatik pankreas kanseri, Ortalama trombosit Hacmi (MPV), Progresyonsuzsağkalım (PFS).

INTRODUCTION

Pancreatic cancer (PC) is one of the cancers with the worst prognosis and ranks fourth in cancer-related deaths in the United States of America[1]. PC ranks among the top 10 and ranks sixth among cancer-related cancers in China[2]. When PC is diagnosed, most of patients is in the advanced stage. The only curative treatment option are surgical resection. However, the number of patients who can undergo surgery is 20%[3]. PC is one of the cancers that spreads most rapidly locally or systemically. Although treatment approaches such as immunotherapies, chemotherapy, targeted therapies and palliative therapies have been tried to be developed, the 5-year overall survival (OS) ratio is less than %5. Despite protooncogenes such as BRCA and PALB2 and some molecular tests such as tumor mutational burden; effective, inexpensive, and simple methods for predicting the prognosis of patients with advanced PC are still lacking. Identifying an appropriate biomarker is essential to predict prognosis[4-6].

Platelets (PLT) play a important role in the physiological and pathological mechanisms in the development of thrombosis, immunological defense, hemostasis and inflammation. Chemokines, proinflammatory cytokines, growth factors and platelets play a role in inflammation-mediated cancer development[7]. In one study, it was found that inflammatory markers play a role in the prognosis of metastatic PC. In addition, there is evidence that platelets play a role in angiogenesis, metastasis, tumor growth, and platelets in tumor cell growth[8]. Thrombocytosis is common in patients with malignancy, stimulated platelets play a very important role in cancer metastasis by increasing the release of chemokines and cytokines[9]. Mean platelet volume (MPV) reflects the mean volume of platelets. Some

hematological devices calculate plateletcrit (PCT), with platelet count and MPV . MPV has recently become a significant indicator for inflammation. MPV and platelet count are frequently used to predict cerebrovascular and cardiovascular disease prognosis[10].

In recent studies, the Mean Platelet Volume/ Platelet (MPV/PLT) ratio plays an important role in determining the prognosis in some cancers. Non small cell lung cancer (NSCLC), cervical cancer, soft tissue sarcoma, hepatocellular carcinoma[11-14]. Data showing the prognosis with MPV/PLT ratio in metastatic PC are limited. In addition studies conducted in different solid cancers; such as colon, papillary thyroid carcinoma, osteosarcoma, non small cell lung cancer in recent years; MPV, PCT can evaluate the prognosis of cancer patients[11,15-18]. Studies in early stage locally confined PC have shown that platelet indices play a role in prognosis[19,20]. There is limited data in the literature on the prognostic importance of the platelet indices in metastatic PC.

In our study, we aimed to show the prognostic role of MPV/PLT ratio in metastatic PC as the primary hypothesis and whether the platelet indices have a prognostic significance as the secondary hypothesis.

METHODS

Patients diagnosed with metastatic PC in three hospitals; Mardin Training and Research Hospital, BitlisTatvan State Hospital, Aydın Ataturk State Hospital, from Turkey between 2016-2022 years were retrospectively analyzed. We retrospectively reviewed patient's databases, hospital files and recorded patients' demographic data such as age, gender, Ecog, and complete blood count information such as PLT, MPV and PCT.Overall survival (OS), progression-free survival (PFS) and were also recorded.

Patients with these criteria were excluded from the study: patients with a history of other cancer, known autoimmune disease, or corticosteroid use for any other reason, using antiaggregant or anticoagulant, a history of cranial metastasis, infection at the time of diagnosis, and data not available.

After the patients were selected, the PLT, MPV and PCT were calculated with the initial hematological parameters of the patients on the date just before the onset of chemotherapy. Laboratory variables were recorded as platelet (10^3), MPV (fL), PCT (%) and MPV/PLT ratio was calculated.

IBM SPSS 20 (Statistics Program for Social Scientists) (USA) program was used for statistical analysis. Continuous variables were given as mean±standard deviation, and categorical data as frequency (percent). Independent sample t-test was used to compare parametric data between groups. Fisher's Exact test or Chi-square were used to compare independent categorical variables. Median survival times were calculated by the Kaplan-Meier method. Cut-off for MPV was determined as 0.045 with X-tile program. The MPV/PLT ratio and PCT were calculated as follows, the median value was found, then they were divided into two groups as below and above the median value.

PFS was determined as the time between the day treatment was started and the daydisease progressed or the daydisease died from any cause or death had not occurred. If progression or death did not occur, the last follow-up date was noted. Univariate analyzes for OS and PFS were determined by log-rank test and Kaplan-Meier method. Independent prognostic factors were determined by creating a Cox regression model with variables with a p value of <0.05 in the univariate analysis. In this study, statistical analyzes were applied in two ways and $p<0.05$ was considered to be statistically significant.

This research was properly conducted and designed with and the Declaration of Helsinki and Good Clinical Practice and was approved by the Diyarbakir GaziYasargil Training and Research Hospital ethics committee (Approval Date-No: 30.09.2022-2022/193).

RESULTS

There were 80 patients in our study. Median age was 63 (52-74) and 48 (%60) patients were male. Most of the patients included in the study were 65 (81.3%) denovo metastatic. More than half of the patients 49 (62%) had primary pancreatic head. The most common site of metastasis was the liver 57 (71,3). FOLFIRINOX or nab-paclitaxel plus gemcitabin combination was chosen in 33 patients as chemotherapy options. The general characteristics and demographic information of the patients are shown in detail in Table I.

Table I: Demographic and clinicopathological characteristics of the patients

		Total
Age, year, median (IQR)		63±10,7
Gender, n (%)		
	Female	32 (40,0)
	Male	48 (60,0)
ECOG PS, n (%)		
	0	7 (8,8)
	1	51 (63,7)
	2	22 (27,5)
Smoking, n (%)		
	Never	29 (36,3)
	Former/Active	51 (63,7)
BMI		
	<20	21 (26,3)
	>20	59 (73,8)
De-novo metastasis, n (%)		
	Yes	65 (81,3)
	No	15 (18,8)
Tumor location, n (%)		
	Head	49 (62,0)
	Body	15 (19,0)
	Tail	15 (19,0)
Liver metastasis, n (%)		
	No	23 (28,7)
	Yes	57 (71,3)
Peritoneal metastasis, n (%)		
	No	51 (63,7)
	Yes	29 (36,3)
Lung metastasis, n (%)		
	No	59 (73,8)
	Yes	21 (26,3)
MPV		
	≤11.0	60 (75,0)
	>11.0	20 (25,0)
MPV/PLT		
	≤0.045	39 (48,8)
	>0.045	41 (51,2)
PCT		
	≤0.23	41 (51,2)
	>0.23	39 (48,8)

n: number, performance status BMI: Body mass index, MPV: Mean platelet volume, PLT: Platelet, PCT: Plateletcrit BMI: Body mass index, IQR: interquartile range, MPV: Mean platelet volume , n: number, PS: performance status, PLT: Platelet, PCT: Plateletcrit

Median follow-up time for all patients 8.5 (range: 1.0-54.2) months. All patients median PFS and OS were found 6.3 (95% CI: 5.7-7) months and 9.6 (95% CI: 98.4-10.9 months), respectively. Median PFS was found 6.2 (95% CI:4.8-7.5) months MPV/PLT ratio ≤0.045 group and 6.3 (95% CI:5.3-7.4) months for MPV/PLT ratio >0.045 group respectively. The median PFS of the MPV/PLT ratio ≤0.045 group was shorter than MPV/PLT ratio >0.045 group, but there was no statistically meaningful difference between the groups (p:0,957) (Figure-1). Median PFS was found 6.5 (95% CI: 5.9-7.1) months PCT ≤0.23 group and 6.2 (95% CI:5.5-6.8) months for PCT > 0.23 group respectively. The median PFS of the PCT ≤0.23 group was longer than PCT > 0.23group, but there was no statistically significant difference between the groups(p:0,265). Median PFS was found 6.8 (95% CI: 6-7.6) months MPV ≤11 group and 4.9 (95% CI:1.6-8.2) months for MPV >11 group respectively. The median PFS of the MPV ≤11 group was statistically significantly longer than MPV >11 group (p:0,031).

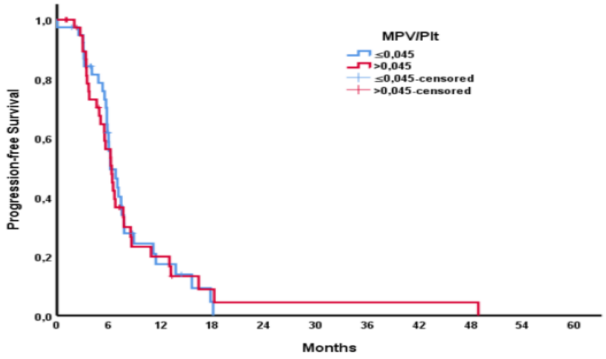

Figure 1: Progression-free survival of patients based on MPV/PLT ratio ≤ 0.045 group and MPV/Plt ratio >0.045 group

Median OS was found 10,1 (95% CI:6.8-13.5) months MPV/PLT ratio ≤0.045 group and 9 (95% CI:8,2-9,8) months for MPV/PLT ratio >0.045 group respectively. The median OS of the MPV/PLT ratio ≤0.045 group was longer than MPV/PLT ratio >0.045 group but there was no statistically significant difference between the groups (p:0,506) (Figure-2). Median PFS

was found 9.6 (95% CI: 8-11,3) monthsPCT ≤0.23 group and 9.5 (95% CI: 7.9-11.2) months for PCT > 0.23 group respectively. The median PFS of the PCT ≤0.23 groupwas longer than PCT > 0.23 group but there was no statistically meaningful difference between the groups(p:0,938). Median OS was found 10,1 (95% CI: 7.3-13) months MPV ≤11 group and 7.3 (95% CI:4-10.6) months for MPV >11 group respectively. The median OS of the MPV ≤11 group wasstatistically significantly longer than MPV >11 group (p:0,035).

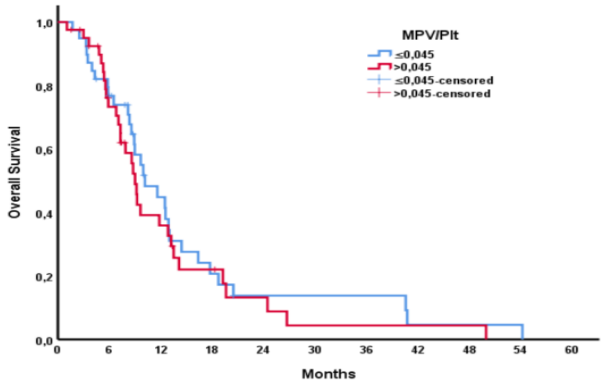

Figure 2: Progression-free survival of patients based on MPV/PLT ratio ≤ 0.045 group and MPV/Plt ratio >0.045 group

Median PFS was statistically more significant in males than females, and it was 6.8 months (%95 CI: 5.5-8) and 6.2 months (%95 CI: 5.4-6.9) respectively (p:0.038). Morever median OS was statistically more significant in males than females, and it was 12.8 months (%95 CI: 8.8-16.9) and 8.3 months (%95 CI: 6.2-10.4) respectively (p:0.001). In addition PFS and OS were significantly higher in those given anab-paclitaxel plus gemcitabine or FOLFIRINOXin the first line compared to those who received other chemotherapies (p:0.001) and (p:0.003), respectively. Univariate analyses of PFS and OS were shown detail in Table in II.

Table II: Univariate analysis of PFS and OS

		mPFS (95% CI)	p-value	mOS (95% CI)	p-value
		6.3 (5.7-7.0)	-	9,6 (8,4-10,9)	-
Age, year					
	≤60	6.3 (4.8-7.8)	0.821	10,1 (5,9-14,4)	0,061
	>60	6.4 (5.9-6.7)		9,0 (7,5-10,5)	
Gender					
	Female	6.2 (5.4-6.9)	0.038	8,3 (6,2-10,4)	0,001
	Male	6.8 (5.5-8.0)		12,8 (8,8-16,9)	
ECOG PS					
	0	6.5 (5.7-7.3)	0.947	9,6 (8,4-10,8)	0,249
	1	6.2 (5.7-6.7)		11,6 (7,6-15,6)	
	2	6.7 (4.3-9.0)		7,3 (3,3-11,2)	
Smoking					
	Never	6.4 (5.6-7.2)	0.500	9,2 (8,0-10,5)	0,397
	Former/Active	6.2 (5.4-7.0)		11,6 (7,2-15,9)	
BMI					
	<20	5.8 (3.6-8.0)	0.131	7,1 (2,0-12,1)	0,083
	>20	6.4 (5.7-7.1)		9,6 (8,1-11,1)	
De-novo metastasis, n (%)					
	Yes	6.7 (5.9-7.5)	0.995	9,2 (6,0-12,3)	0,878
	No	5.8 (5.3-6.2)		9,6 (8,8-10,5)	
Tumor location, n (%)					
	Head	6.3 (5.5-7.2)	0.255	9,0 (7,9-10,2)	0,850
	Body	6.2 (5.7-6.8)		13,0 (8,1-17,9)	
	Tail	8.5 (5.3-11.8)		12,5 (2,7-22,3)	
First Line					
	FOLFIRINOX	8.5 (6.4-10.6)	<0.001	12,5 (7,0-18,1)	0,003
	FOLFOX	3.3 (2.0-4.7)		5,4 (NA)	
	KAPOX	4.8 (2.2-7.4)		9,7 (8,0-11,2)	
	Gemsitabin	3.5 (2.6-4.3)		5,6 (1,4-9,8)	
	Gem-kap	7.8 (5.4-10.2)		5,2 (1,3-21,9)	
	Nab pakli-gem	13.0 (1.1-25.0)		12,9 (3,7-22,1)	
	Sis-gem	5.8 (4.6-7.1)		8,6 (7,9-9,2)	
N					
	No	7.5 (5.9-9.2)	0.214	9,9 (8,5-11,4)	0,797
	Yes	6.2 (5.7-6.6)		9,2 (8,1-10,3)	
Peritoneal metastasis					
	No	6.7 (5.9-7.4)	0.480	9,2 (7,9-10,4)	0,896
	Yes	6.2 (5.5-6.8)		9,9 (5,9-14,0)	
Lung metastasis					
	No	6.2 (5.7-7.8)	0.519	9,2 (8,1-10,4)	0,989
	Yes	6.7 (5.5-7.9)		9,6 (2,3-17,0)	
MPV					
	≤11.0	6.8 (6.0-7.6)	0.031	10,1 (7,3-13,0)	0,035
	>11.0	4.9 (1.6-8.2)		7,3 (4,0-10,6)	
MPV/PLT					
	≤0.045	6.2 (4.8-7.5)	0.957	10,1 (6,8-13,5)	0,506
	>0.045	6.3 (5.3-7.4)		9,0 (8,2-9,8)	
PCT					
	≤0.23	6.5 (5.9-7.1)	0.265	9,6 (8,0-11,3)	0,938
	>0.23	6.2 (5.5-6.8)		9,6 (8,0-11,3)	

BMI: Body mass index, CI: Confidence interval, MPV: Mean platelet volume , n: number OS: Overall Survival, PS: performance status, PLT: Platelet, PCT: Plateletcrit, PFS: Progression-free survival

Multivariate Cox regression analysis was performed to find independent prognostic factors that would determine PFS and OS and are shown in Table III. OS was better in men than in women (HR: 0.390, 95% CI: 0.218-0.698) (p: 0.002). Moreover; PFS was found to be more significant in those who received FOLFIRINOX,nab-paclitaxel plus gemcitabin combination compared to those who did not (HR: 0.401, 95% CI: 0.226-0.713) (p: 0.002), OS was found to be more significant in those who received FOLFIRINOX,nab-paclitaxel plus gemcitabin combination compared to those who did not (HR: 0.423 , 95% CI: 0.230- 0.776)(p:0.005) respectively. Multivariate Cox regression analysis was performed to determine independent prognostic factors to affect PFS and OS. Low-MPV was not independent prognostic factor affecting PFS and OSin a patient with metastatic PCrespectively (HR: 1,418, 95% CI: 0,773-2,603) (p: 0,260) and (HR :95% CI: 0,811-2,965)(p: 0,185).

Table III: Cox proportional hazards regression model for PFS and OS

		HR (%95 CI)	p-value	HR (%95 CI)	p-value
Gender					
	Female	Ref		Ref	
	Male	0,667(0,388-1,147)	0,143	0,390(0,218-0,698)	0,002
Chemotherapy					
	The Others	Ref		Ref	
	FOLFIRINOX or Nabpakli-gem	0,401 (0,226-0,713)	0,002	0,423(0,230-0,776)	0,005
MPV					
	≤11.0	Ref		Ref	0,185
	>11.0	1,418(0,773-2,603)	0,260	1,551(0,811-2,965)	

CI: Confidence interval, MPV: Mean platelet volume, HR: Hazard ratio

DISCUSSION

Many prognostic factors have been defined for the clinical course of patients with PC, but most of themhave not been used in clinical practice. To our knowledge, this is the first study to evaluate the MPV/PLT ratio in metastatic PC. In our current trial, we tried to show the negative effect of MPV/PLT ratio on prognosis in patients with metastatic PC.

We evaluated the survival effect of metastatic first line chemotherapy preference. In addition, OS was 12.5 (95% CI: 7.0-18.1 months) in the first line in those who received FOLFIRINOX, and 12.9 (95% CI: 3.7-22.1 months)in those who received nab-paclitaxel plus gemcitabin combination. Those using FOLFIRINOX or nab-paclitaxel plus gemcitabin combination had better results than those using other chemotherapy (p: 0.003).The general characteristics and median survival of our patients are similar and reliable with the literature data[21-23].

Median PFS were 6.2 (95% CI:4.8-7.5) months and 6.3 (95% CI:5.3-7.4) months for MPV/PLT ratio ≤0.045 group and MPV/PLT ratio >0.045 group, respectively. The median PFS of the MPV/PLT ratio ≤0.045 groupwas shorter than MPV/PLT ratio >0.045 group, but there was no statistically meaningful difference between the groups (p:0,957).The median OS of the MPV/PLT ratio ≤0.045 group was longer than MPV/PLT ratio >0.045 group but there was no statistically meaningful difference between the groups (p:0,506). Previous studies on this subject for PC generally covered the perioperative period. In a study by Gong et al. involving 124 patients receiving neoadjuvant therapy, high MPV/PLT ratio predicted poor survival[24]. In patients with locally limited cervical cancer, including 283 patients, prognosis is evaluated after radical surgery. It was found that the prognosis was better in the group with a high MPV/PLT ratio[13]. As far as we know, there are no studies on metastatic PC. In a study by Noriko et al. involving 268 patients with metastatic NSCLC, univariate analysis showed that OS was significantly shorter in the group with low MPV/PLT ratio (median survival time: 10.3 months vs. 14.5 months). , log-rank, P = 0.0245)[25].In the study of Omar et al. in patients with metastatic NSCLC, the

MPV/PLT ratio was associated with a specificity of 84.8% and sensitivity of 67.8% a presence of cranial metastasis at the time of diagnosis. Although the survival data are not significant due to immaturity, it predicts poor prognosis[11].Additionally, studies examining patients with cancer and healthy population examining the MPV/PLT ratio have been conducted.In a study involving hepatocellular carcinoma and healthy population, the MPV/PLT ratio was found to have a sensitivity of 74.5% and a specificity of 96.5% in patients with hepatoceluler carcinoma[14].In studies conducted in patients with soft tissue sarcoma and malignant bone tumors, the MPV/PLT ratio was found to be lower than in healthy volunteers, playing a predictive role in tumor shrinkage, but they could not reach their goals in predicting recurrence and survival[12,26]. Although it was not statistically significant in our study, mPFS was shorter in the group with low MPV/PLT ratio. As seen in other studies, MPV/PLT ratio was found to be lower in brain metastases and in the group with less tumor response. Therefore, we suggest that low MPV/PLT ratio is an independent predictor of poor prognosis in patients with metastatic PC and can be used in clinical routine if proven by prospective studies.

Recently, platelet parameters such as MPV, PCT have been evaluated in many cancers 17,27. The median PFS of the MPV ≤11 groupwasstatistically significantly longer than MPV >11 group (p:0,031) and The median OS of the MPV ≤11 groupwasstatistically significantly longer than MPV >11 group (p:0,035).Multivariate Cox regression analysis was performed to determine independent prognostic factors to affect PFS and OS. Low-MPV was not independent prognostic factor affecting PFS and OSin a patient with metastatic PC(HR: 1,418, 95% CI: 0,773-2,603) (p:0,260) and (HR :95% CI: 0,811-2,965)(p: 0,185) respectively . Median PFS was found 9.6 (95% CI: 8-11,3) monthsPCT ≤0.23 group and 9.5 (95% CI:7.9-11.2) months for PCT > 0.23 group respectively. The median PFS of the PCT ≤ 0.23 groupwas longer than PCT > 0.23group but there was no statistically meaningful difference between the groups (p:0,938).

In a meta-analysis of 9894 patients with breast, bladder and colorectal cancers, MPV was not found to be a significant prognostic factor for OS[28].

Another study conducted in breast cancer, PCT and MPV were found to be prognostically insignificant[16]. In a study evaluating early stage patients with osteosarcoma, MPV and PCT were found to be insignificant with prognosis[18]. As seen above, the data on whetherMPV and PCTpredicts survival is conflicting.When we look at the literature, studies on PC are contradictory. In a study of 411 patients, high MPV was found to be associated with poor survival[29]. In a study of 91 patients, low MPV was found to be significant with prognosis[20]. Likewise, in a study of 320 patients, while high MPV was correlated with poor prognosis, PCT did not affect the prognosis[30]. In our study, the effect of PCT on prognosis was found to be compatible with the literature. Unfortunately;in our study, although MPV elevation was significant in univariate analysis, it was not found in multivariate analysis.

The retrospective design of our study and the small number of patients are the most important limitations of our study. Based on some studies in the literature, we determined the appropriate value for MPV/PLT ratio as 0.045, but the ideal value is not yet known. Prospective studies with a larger number of patients are needed.

In conclusion, MPV/PLT ratio is a cheap, simple and useful marker and can be used in our daily practice to predict the prognosis of patients with advanced PC, if confirmed by prospective studies and larger patient numbers.

Authorship Contributions: Concept – O.Y.B,Y.I; Design – O.Y.B,Y.I; Supervision –O.Y.B. ; Materials – O.Y.B,Y.I; Data collection and/or processing – O.Y.B,Y.I; Literature search – O.Y.B,Y.I; Writing – O.Y.B.; Critical review: O.Y.B,Y.I

Ethics Committee Approval: This research was properly conducted and designed with and the Declaration of Helsinki and Good Clinical Practice and was approved by the Diyarbakir GaziYasargil Training and Research Hospital ethics committee (Approval Date-No: 30.09.2022-2022/193).

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