

KAN BİYOKİMYASI VE HEMATOLOJİK PARAMETRELERİN PSÖDOANEVRİZMA GELİŞİMİNE ETKİSİ

THE EFFECT OF BLOOD BIOCHEMISTRY AND HEMATOLOGICAL PARAMETERS ON THE DEVELOPMENT OF PSEUDOANEURYSM

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ÖZ

AMAÇ: Koroner arter hastalığı halen önde gelen sağlık sorunlarından biridir. Bu durum, kalp hastalıkları için tanı ve tedavi prosedürlerinde artışa sebep olmaktadır. Bununla birlikte, bu prosedürlerle ilişkili komplikasyonlarda da artışa sebep olmaktadır. Bu komplikasyonlardan biri psödoanevrizmalardır. Bu çalışmada, kliniğimizde psödoanevrizma ameliyatı geçiren hastalarda koroner anjiyografiden önce alınan periferik tam kan sayımlarının sonuçlarına göre psödoanevrizmanın gelişimini öngörmeye hematolojik ve biyokimyasal parametrelerin yararlı olup olmayacağını tartışmayı amaçladık.

GEREÇ VE YÖNTEM: Ocak 2017-Aralık 2019 tarihleri arasında hastanemizde koroner arter hastalığı ön tanısı ile elektif koroner anjiyografi yapılan 7368 hastanın verileri retrospektif olarak incelendi. Çalışmamıza dahil edilme kriterlerini karşılayan 88 hastanın verileri incelendi.

BULGULAR: Psödoanevrizma erkek cinsiyet(%60), sağ alt ekstremite(%76.4) ve ana femoral arterde(%71.4) daha sıkı. Grup 1 ile karşılaştırıldığında psödoanevrizma gelişen Grup 2'de işlemden önce beyaz küre sayısı (WBC) (p: 0.042) ve Nötrofil lenfosit oranı (NLR) (p: 0.029) değerleri ve kan üre azotu (BUN) (p:0.050) yükseldi, Hemoglobin (Hb) (p<0.001), hematokrit htc(p<0.001), albumin(p: 0.026) değerleri düşüktü ve istatistiksel olarak anlamlı fark vardı. Platelet Pletekrit Oranı (PPR) (p: 0.205), Platelet Nötrofil Oranı (PNR)(p: 0.205), platelet(p: 0.103), total protein(p: 0.061), kreatin (p:0.060) ve Platelet(p: 0.151) değerleri arasında istatistiksel olarak anlamlı bir fark yoktu.

SONUÇ: Periferik vasküler müdahalenin yapılacağı riskli hasta gruplarında; işlem öncesi kan değerlerinden artmış NLR ve düşük albümin seviyeleri, psödoanevrizmanın gelişimini öngörmeye bir rehber olabilir.

ANAHTAR KELİMELEER: Psödoanevrizma, Koroner arter hastalığı, Damar yaralanması

ABSTRACT

OBJECTIVE: Coronary artery disease is still one of the leading health problems. This causes an increase in the diagnosis and treatment procedures for heart diseases. However, it also causes an increase in complications associated with these procedures. One of these complications is pseudoaneurysms. In this study, we aimed to discuss whether hematological and biochemical parameters can be useful in predicting the development of pseudoaneurysm according to the results of peripheral whole blood counts taken before coronary angiography in patients who underwent pseudoaneurysm surgery in our clinic.

MATERIAL AND METHODS: The data of 7368 patients who underwent elective coronary angiography with a preliminary diagnosis of coronary artery disease in our hospital between January 2017 and December 2019 were retrospectively reviewed. Data of 88 patients who met the inclusion criteria in our study were examined.

RESULTS: Pseudoaneurysm was more frequently located in the male gender (% 60), right lower externity (% 76.4) and the common femoral artery (%71.4). When compared to Group 1, in Group 2, which developed pseudoaneurysm, The patients in group 2 who developed pseudoaneurysm compared to group 1, white blood cell count (WBC) (p: 0.042), Neutrophil to Lymphocyte Ratio (NLR) (p: 0.029) and blood urea nitrogen (BUN) (p: 0.050) values were higher before the procedure, Hemoglobin (Hb) (p<0.001), Hematocrit (htc) (p<0.001), and albumin (p: 0.026) values were lower and there was a statistically significant difference. There was no statistically significant difference between Platelet to Platecrit Ratio (PPR) (p: 0.205), Platelet to Neutrophil Ratio (PNR) (p: 0.205), platelet (p: 0.103), total protein (p: 0.061), creatine (p:0.060) and Platecrit (p: 0.151) values.

CONCLUSIONS: In risky patient groups where a peripheral vascular intervention will be performed; elevated levels of NLR and decreased albumin from the pre-procedure blood values may be a guide in predicting the development of pseudoaneurysm.

KEYWORDS: Pseudoaneurysm, Coronary artery disease, Vascular injury

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INTRODUCTION

The rapid changes and advances in technology in recent years are also reflected in the health system. As a result of these developments and changes, it is known that there is an increase in the number of quality and complications of the interventional procedures. The prolonged life expectancy has made coronary artery disease one of the leading health problems. The increase in interventional procedures applied in the diagnosis and treatment of coronary artery disease also brings an increase in the number and type of complications. One of these complications is pseudoaneurysms (1).

The term "pseudoaneurysm" is described as a clinical condition caused by the disruption of the arterial wall integrity due to an iatrogenic, traumatological or inflammatory cause, and trapping blood out of the arteria by surrounding tissues. The outer wall of the pseudoaneurysm is fibrous and it is called as pseudo capsule. As a result of the fact that the pseudoaneurysm cannot be confined to the surrounding tissues and the enlargement continues, various findings may occur. These are rupture, compression of the venous system and neighboring nervous structures or arterial embolization (2).

Current studies have reported that trauma and postoperative complication have been the main reasons for the development of pseudoaneurysm in previous years. However, nowadays the advances in health technology and the increase in the number of interventional procedures are prominent (3,4).

As a result of the widespread use of ultrasonography (USG) in daily practice, iatrogenic pseudoaneurysm in the extremities can be diagnosed more easily and quickly (5,6). In the treatment of pseudoaneurysm, compression, thrombin or collagen injection, and coil embolization can be applied with USG. In addition, surgical stent or graft implantation and primary surgical repair can be performed (2,7-10).

Until now, there is still no diagnostic test to predict which patient may develop a pseudoaneurysm. In the literature, studies are carried out on platelet to lymphocyte, neutrophil to

lymphocyte, platelet to neutrophil ratios based on Complete Blood Count (CBC) for use to predicting cardiovascular pathology with inflammation parameters (11-13).

In this study, we aimed to discuss whether PPR, NLR, and PNR will be helpful in predicting the development of pseudoaneurysm in our clinic based on the result of peripheral CBC taken before the intervention.

MATERIAL AND METHOD

Our study started with the approval of the local ethics committee, dated 11.12.2019 and numbered 2019/829. The date of patients who underwent elective coronary angiography with a preliminary diagnosis of coronary artery disease in our hospital between January 2017 to December 2019 was retrospectively reviewed.

It was found that the coronary angiography procedure was applied to 1205 of the patients who were scanned retrospectively by the same team. Of 1205 patients, the data of 735 patients whose catheters were found to be withdrawn by the same person were examined.

As the exclusion criteria of our study; regardless of whether pseudoaneurysm developed or not, all patients who decided to undergo a percutaneous coronary intervention (PCI) in their coronary artery lesions, or those who had coronary angiography in a different center within the last month, or those who had lesions in their coronary arteries and were followed-up with medical treatment and did not develop pseudoaneurysm. After the exclusion criteria, 88 of 735 patients were included in our study.

The patients included in the study were divided into two groups. In group 1, there were 25 patients whose coronary arteries were evaluated as normal after coronary angiography and who did not develop pseudoaneurysm. In Group 2, it consisted of 63 patients who were surgically repaired who developed pseudoaneurysm during hospitalization after coronary angiography.

Demographic data of the patients in the groups, CBC, biochemistry results taken before angiography were examined.

ETHICAL COMMITTEE

The study started with 11.12.2019 date and 2019/829 number of the Erciyes University ethics committee's approval.

Ultrasonography Study

Patients with suspicion of pseudoaneurysm and giving thrill and murmur on physical examination were evaluated for ultrasonography.

The diagnosis of all patients was made with the Siemens brand, acuson s300, Helx Evolution ultrasound system. In the ultrasound evaluation of the entrance area, patients with Ying-yang phenomenon and hematoma were accepted as pseudoaneurysm. The widest neck diameter and pseudoaneurysm diameter were recorded.

Surgical Procedure

Surgical repair was performed under local or general anesthesia, depending on the general condition of the patient and the operator's preference. For the local anesthesia, 2% prilocaine was used. The surgical procedure was performed under the incision made from the femoral region. The pseudoaneurysm was reached by opening the skin and subcutaneous tissue.

The pouch was opened, and the femoral artery was reached. The primary femoral artery lesion was repaired using a 6-0 8mm 3/8 round monofilament polypropylene suture. The posterior and lateral branches of the femoral artery were checked. Areas with additional lesions were repaired. The subcutaneous and skin was closed with a 3/0 polydioxanone absorbable surgical suture using a continuous suturing technique. Patients were given prophylactic two times of cefazolin sodium 1 g IV infusion at the postoperative and preoperative 12th hour.

STATISTICAL METHODS

Parametric variables are presented as average and standard deviations, non-parametric variables median and quarter-to-quarter intervals (bottom and parent quarters). Kolmogorov Smirnov test and histogram analysis were used to determine whether continuous variables were dispersed normally. The number of cases and percentages were used for categorical va-

riables. Two groups of independent parametric variables were compared using the Student t-test. Mann-Whitney U test was administered for non-parametric variables.

In multivariate analysis, independent predictors in predicting the outcome of treatment using possible factors determined in previous analyses were examined using logistic regression analysis. P.05 was interpreted statistically significantly.

RESULTS

A total of 88 patients were included in the study. The average age was 54.88 ± 12.2 in Group 1 and 62.35 ± 14.1 in Group 2. There was a statistically significant difference between groups ($p < 0.005$).

In Group 1, 10 patients (40%) were female and 15 (60%) were male. In Group 2, 28 (44.4%) patients were female and 35 (55.6%) patients were male. There was no statistically significant difference between the groups in terms of gender.

The demographic data of the patients are summarized in (Table 1).

Table 1: Comparison of demographic and blood parameters between groups

	Group 1 (n:25)	Group 2 (n:63)	p
Age (mean \pm SD)	54.8 \pm 12.2	62.3 \pm 14.1	0,023
Female	10 (40)	28 (44.4)	0,704
DM, n(%)	8 (32)	24 (38.1)	0,592
HT, n (%)	21 (84)	37 (58.7)	0,024
CRF, n(%)	3 (12)	25 (39.7)	0,012
WBC	8.36 \pm 2.24	10.49 \pm 4.94	0,042
Hb	14.45 \pm 2.42	11.28 \pm 2.50	<0,001
Htc	43,70 \pm 5.96	34,99 \pm 7.32	<0,001
Neutrophils	5.16 \pm 2.26	7.37 \pm 4.63	0,025
Lymphocytes	2.37 \pm 0.72	1.94 \pm 0.94	0,047
Platelets	234.12 \times 10 ³ \pm 64,043	264.43 \times 10 ³ \pm 82,55	0,103
Platecrit	0,24 \pm 0.061	0,27 \pm 0.07	0,151
NLR	2.53 \pm 2.03	4.75 \pm 4.81	0,029
PPR	932.08 \pm 62.87	959.87 \pm 101.03	0,205
PNR	932.08 \pm 62.87	959.87 \pm 101.03	0,205
Bun	18.05 \pm 5.85	25.68 \pm 18.73	0,050
Creatine	0.85 \pm 0.17	1.52 \pm 1.73	0,060
GFR	91.97 \pm 20.63	68.39 \pm 35.47	0,003
Total Protein	6.77 \pm 0.65	6.42 \pm 0.84	0,061
Albumine	4.18 \pm 0.5	3.85 \pm 0.66	0,026

HT: Hypertension, DM: Diabetes Mellitus, CRF: Chronic renal failure NLR: neutrophils to lymphocytes ratio, PLR: platelets to lymphocytes ratio, PPR: platelets to pletecris ratio, PNR: platelets to neutrophils ratio,

Group1: Patients with normal coronary arteries and no pseudoaneurysm after coronary angiography.

Group 2: Patients who have detected a lesion in their coronary arteries after coronary angiography and decided to undergo medical treatment and developed a pseudoaneurysm during hospitalization.

The biochemical and hematological parameters of the patients are also indicated in Table 1.

Hypertension and Chronic Renal Failure was higher in Group 2. There was a statistically significant difference between the two groups ($p=0.024$ and $p=0.012$).

Hemoglobin and Hematocrit were lower in Group 2. There was a significant difference between the two groups ($p<0.001$ and $p<0.001$).

There was a significant difference between the two groups in terms of neutrophil, lymphocyte, N / L ratios, BUN and albumin ($p=0.025$, $p=0.047$, $p=0.029$, $p=0.050$, and $p=0.026$). There was a significant difference between the two groups.

The average pseudoaneurysm diameter was 35.16 ± 24.146 mm. As localization, pseudoaneurysm was in the right lower limb in 47 (74.6%) cases and in the left lower limb in 16 (25.4%) cases. Anatomically, 45 (71.4%) cases were in the common femoral artery and in 18 (28.6%) cases, superficial and profunda femoral artery. Primary repair was performed in 58 (92.1%) of the patients and graft interposition in five patients (7.9%). Data on the features of pseudoaneurysms, treatment methods are indicated in (Table 2).

Table 2: Psodoaneurysm treatment types and localization regions

		n	(%)	p
Localisation	Right	47	74.6	0,137
	Left	16	25.4	
Anatomic layout	CFA	45	71.4	
	SFA ve/veya PFA	18	28.6	
Applied surgery	Primary repair	58	92.1	0.001
	Graft interpoition	5	7.9	
Psodoaneurysm diameter		35.16±24.146		
Venture place	Anterior	28 (22-40)	66,7	
	Intentive initiative	21	33,3	

In regression collation analysis, cholera was detected in lower Glomerular Filtration Rate (GFR) and hemoglobin value, higher white blood cell value for the development of pseudoaneurysm (Table 3).

Table 3: Regression analysis of factors affecting the formation of psodoaneurysm

Variability	P volume	OR	95% CI Lower	Upper
Age	0,279	1,039	0,969	1,115
CRF	0,124	5,779	0,620	7,882
HT	0,283	2,505	0,468	3,398
GFR	0,027	0,998	0,996	1,000
WBC	0,052	1,226	0,999	1,506
Hb	0,082	0,800	0,622	1,028
Htc	0,387	0,971	0,908	1,038
NLR	0,119	0,845	0,683	1,044

CRF: Chronic renal failure, HT: Hypertension, GFR: glomerular filtration rate, NLR: neutrophils to lymphocytes ratio

DISCUSSION

Latrogenic pseudoaneurysms are the most common complication after interventional invasive procedures and anatomically are most seen in the femoral artery (10). Patients clinically have a pulsating mass, palpable thrill and murmur (8). Female gender, anticoagulant/antiaggregant drug use, intervention with a larger "sheath" than the vascular diameter, hypertension, obesity, inappropriate puncture technique, inadequate compression following the removal of the catheter, Calcification in the field of interference in arterial structures, simultaneous arterial and venous cannula and chronic renal failure which requires hemodialysis, can facilitate the development of pseudoaneurysm (1).

In our study, pseudoaneurysms were found to be more common in the male gender, with a rate of 55.6%, as opposed to the literature.

Anatomically, pseudoaneurysms were mostly located in the common femoral artery with a rate of 71.4%; pseudoaneurysms in Group 2 found to be developed in patients with hypertension with ratio of 58.7% ($p=0.024$) and chronic kidney disease with 39.7% ($p=0.012$), which was found to be a statistically different. During surgical repair, there were 21 (33.3%) patients who were found to have an inappropriate area of intervention. When our findings were examined, it was found that pseudoaneurysms were compatible within the literature in terms of the risk of development by hypertension, chronic kidney disease and the inappropriate area of intervention (1,2,6). When we examine the literature (11-14), we see that there are studies on new markers aimed at supporting diagnosis in anticipating the follow-up, treatment and

complications of peripheral vascular, aorta and cardiac diseases. In particular, the number and ratio of various cell elements in CBC are used for this purpose. In these studies, it is aimed to predict complications based on the proportions of blood elements and to use them as a marker in diagnosis. These include NLR, LPR and NPR (11-13). In addition to these rates, PPR, which has not been studied before in the literature, has been examined in our study.

It is known that inflammatory response occurs in cases with Deep vein thrombosis (DVT) developed (12,14). In these patients, we have come across publications examining the relationship between inflammatory parameters such as C-reactive protein (CRP) and interleukin and platelet distribution range (PDW), mean platelet volume (MPV), red blood cell distribution width (RDW) with DVT (11,14-16).

In a study by Veliöglu et al., They reported that platelet/lymphocyte ratio(PLR) and platelet counts are a significant and new marker in predicting acute lower extremity DVT diagnosis (12).

There are several studies investigating the contribution of inflammation in the formation of aortic aneurysm and rupture pathogenesis (11,17). Sbarouni et al. (11) compared NLR, PLR rates in patients with acute aortic dissection (AAD) with control patients consisting of uncomplicated aortic aneurysms and healthy volunteers in a study they conducted. They found that NLR and PLR were higher in the AAD group than in patients with uncomplicated aortic aneurysms and the control group. However, they showed that PLR has high sensitivity and low specificity in predicting AAD. In the same study, it was shown that thrombocytopenia and platelet changes in patients with AAD (11).

Morello et al. reported that WBC and platelet count will help in risk assessment of patients with low diagnosis probability in predicting AAD (18). Kordzadeh et al.; reported that high NLR is an independent marker in predicting mortality in the first 30 days in cases with a ruptured abdominal aortic aneurysm (17). In our study, when compared to Group 1, it was found that the value of NLR ($p = 0.029$) was higher in

Group 2 and this situation had a statistically significant difference.

In addition, it was observed that the WBC values ($p = 0.042$) before angiography were high in the group that developed pseudoaneurysm.

This supports the relationship between inflammation and the development of pseudoaneurysm. It is also seen that our findings are compatible with other studies evaluating the presence of inflammation and different vascular pathologies. In contrast to the literature, in our study, there is no statistically significant difference was found between PLR, PNR and the development of pseudoaneurysm.

In a study reviewed by Stoppe et al. (19), it is stated that nutrition is an important condition in patients undergoing cardiac surgery, preoperative prolonged fasting or malnutrition leads to catabolic stress, insulin resistance and impaired immune function. There are also studies in the literature reporting that energy and protein metabolism are important in the early recovery period (20-24).

In our study, albumin level was found statistically lower ($p= 0.026$) in Group 2 than in Group 1. In the literature, there is no study investigating the development of pseudoaneurysm and the value of albumin has been encountered. We think that this finding may be related to the fact that nutritional status affects wound healing in the early period. In our study, no statistically significant difference was found between PPR and preterit value, which has not been studied in the literature before, and the development of pseudoaneurysm.

As a result, in the patient groups at risk for peripheral vascular intervention; higher levels of NLR and lower levels of albumin from the pre-procedure blood values may be a guide in predicting the development of pseudoaneurysm. The limitations of this study are; The low number of patients, being single-centered and not using USG during the intervention can be evaluated. Disclaiming the effect of factors such as age, kidney failure, HT; which may affect the vessel wall quality which differences between two groups preoperatively is between limitations. However, if this study is evaluated as a preli-

minary study, it is thought that more contributions will be made to the literature with more number of patients and multicenter studies.

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