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Original Article

Evaluation of hemogram parameters in diabetic patients with coronary artery ectasia

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ABSTRACT

Aim: To compare the importance of hemogram parameters in predicting the disease in diabetic patients with coronary artery ectasia (CAE) and normal coronary artery.
Methods: The records of 7287 patients who underwent coronary angiography between January 2017 and October 2019 were reviewed. After appropriate exclusions, diabetic patients were divided into coronary artery ectasia and normal coronary artery groups. A total of 248 patients were included in the study and hemogram parameters of these two groups were compared.
Results: Compared to control group white blood count (WBC) *[8 (4-13) vs. 7 (5-12) u/mm3, p=0.023]*, hemoglobin *[13 (10-16) vs. 14 (10-20) gr/dL, p=0.015]*, red cell distribution width (RDW) *[16 (14-20) vs. 15 (12-19) %, p=0.026]*, neutrophil *[4.5 (2.1-11.4) vs. 4.0 (0.2-7.5) u/mm3, p=0.003*], platelet counts (Plt) *[266 (196-450) vs. 236 (163-362) k/mm3 p<0.001]*, platelet distribution width (PDW) *(17.9 (16.2-20.4) vs. 17.7 (15.9-19.7) % p=0.011)*, mean platelet volume (MPV) *[8.4 (6.4-11.2) vs. 7.9 (6.6-10.1) Fl, p=0.015*], plateletcrit (PCT) *[0.20 (0.14-0.32) vs. 0.19 (0.13-0.26), p<0.001]*, and neutrophil lymphocyte ratio (NLR) *[2.1 (1.0-9.7) vs. 1.6 (0.2-5.7), p=0.002]* were significantly higher in CAE patients.
Conclusion: The results of this study suggest that the increased some hemogram parameters may be useful in predicting disease in diabetic patients with CAE.
Keywords: Coronary artery ectasia, diabetes mellitus, hemogram parameters.

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Introduction

Coronary artery ectasia (CAE) is defined as the dilation of the coronary artery lumen. The term “ectasia" is defined as the widespread expansion of a coronary artery, whereas focal coronary expansion is called “coronary aneurysm” [1]. CAE is a disease of the coronary arteries with abnormal dilatation of the coronary arteries [2]. The diameter of the dilated segment is 1.5 times the diameter of the normal adjacent segment [3]. CAE is a form of coronary atherosclerosis characterized by internal and external elastic lamina disorder [4, 5]. The incidence of CAE ranges from 0.3 to 4.990 [6, 7]. CAE can be seen due to genetics, Kawasaki disease, mycotic or septic emboli, Marfan syndrome, polyarthritis nodosa arthritis, Takayasu disease, systemic lupus erythematosus, hypertension, smoking, cocaine use, percutaneous transluminal coronary

angioplasty, stent, and directional coronary atherectomy. CAE is also related to apical hypertrophic cardiomyopathy [8].

The etiopathogenesis of CAE is not fully understood [9, 10]. Although the main cause of coronary artery ectasia is unknown, atherosclerosis has been the most accused pathogenesis [11]. One of the most important indicators of atherosclerotic processes is endothelial dysfunction [12, 13]. CAE has commonly been evaluated as a variant of atherosclerotic heart disease. However; more intense inflammation has been detected in CAE than obstructive coronary artery disease (CAD) [14]

Histology is usually due to chronic vascular inflammation that shows thickened fibrotic intima with lipid accumulation [15]. The thinning of the tunica media environment associated with chronic inflammation is considered to be the main pathogenesis of extensive remodeling [10]. Ectasia can lead to slow flow in the coronary arteries, dissection, thrombus formation, and vasospasm [16, 17]. The primary symptom of CAE is chest pain. Ectasia can cause the acute coronary syndrome, ventricular arrhythmias and sudden cardiac death without severe coronary artery stenosis [7]. Coronary angiography is the gold standard test for the diagnosis of coronary artery ectasia [8].

Diabetes mellitus (DM) is an important public health problem due to high morbidity and mortality from microvascular and macrovascular complications [18]. Endothelial dysfunction is the basis for the development of long-term complications of diabetes [19]. The activity and aggregation of platelets are important in terms of thrombus during the atherogenesis process [20, 21]. Therefore, in this study, we aimed to evaluate the hemogram parameters of diabetic CAE patients.

Materials and Methods

We reviewed 7287 angiograms performed between January 2017 and October 2019, from Bolu Abant Izzet Baysal University Medical Faculty Hospital. "The Siemens Axiom Artis diagnostic device (Siemens Healthcare GmbH, Forchheim, Germany)" was used to perform coronary angiography. Coronary angiography (CAG) was performed to investigate ischemic heart diseases based on clinical indications. The study was conducted in accordance with the ethical approval of the University Ethics Committee. (Date: 24/10/2019; Decision number: 2019/217) Data about patients were obtained from the institution's database and patient files. CAG images recorded in digital format were evaluated visually by two blind cardiologists and patients diagnosed as CAE were included in the study. Patients included in the study were selected from patients with chronic coronary syndrome (CCS). Patients with clear CAE evidence were selected. The baseline demographic data and clinical cardiovascular risk factors; hypertension, diabetes mellitus, smoking or ex-smoking, family history of CAD, dyslipidemia weight and height were determined from hospital records. There was no significant difference in demographic parameters between CAE patients and the control group (normal coronary angiography). Subjects with a history of chronic diseases such as heart failure (ejection fraction <50%), acute coronary syndrome (ACS), previous coronary artery bypass grafting, percutaneous coronary intervention, significant valve disease, patients under 18 years of age, atrial fibrillation, hypertension, smoking, autoimmune diseases, pregnancy, iatrogenic ectasia, myocarditis, pericarditis, acute and chronic lung disease, obstructive sleep apnea, chronic inflammation, active infection, cancer, immunosuppressive therapy,

hypo/hyperthyroidism, stroke, mental retardation, delirium, dementia, any hematological abnormality (sickle cell anemia, thrombocytopenia etc.), and antiplatelet / anticoagulant agents and steroid users, liver or kidney failure and electrolyte imbalance were excluded from the study.

Statistical analysis

Statistical analysis was conducted with SPSS software (SPSS 22.0 for Windows, IBM Co, Chicago, IL, USA). Kolmogorov Smirnov test was used to determine distribution normality. Normal variables were compared with the T-test and expressed as mean ± standard deviation. Mann Whitney U test was used for variables showing the abnormal distribution and expressed as median (IQR: interquartile interval). A chi-square test was used for comparison of nonparametric variables. A p-value lower than 0.05 was considered statistically significant.

Results

We enrolled 248 individuals including 124 CAE patients (mean age: 61.4±10.9 years) and 124 control persons (mean age: 59.3±10.3 years). The mean age was 61.4±10.9 and 59.3±10.3 in the patient and the control groups, respectively. Frequencies of sex, and body mass index (BMI) were not significantly different between the patient and the control groups (Table 1). Compared to control group white blood count (WBC) [8 (4-13) vs. 7 (5-12) u/mm3, *p=0.023*], hemoglobin [13 (10-16) vs. 14 (10-20) gr/dL, *p=0.015*], red cell distribution width (RDW) [16 (14-20) vs. 15 (12-19) %, *p=0.026*], neutrophil [4.5 (2.1-11.4) vs. 4.0 (0.2-7.5) u/mm3, *p=0.003*], platelet counts (Plt) [266 (196-450) vs. 236 (163-362) k/mm3 *p<0.001*], platelet distribution width (PDW) (17.9 (16.2-20.4) vs. 17.7 (15.9-19.7) % *p=0.011*), mean platelet volume (MPV) [8.4 (6.4-11.2) vs. 7.9 (6.6-10.1) Fl, *p=0.015*], plateletcrit (PCT) [0.20 (0.14-0.32) vs. 0.19 (0.13-0.26), *p=0.001*], and neutrophil lymphocyte ratio (NLR) [2.1 (1.0-9.7) vs. 1.6 (0.2-5.7), *p=0.002*] were significantly higher in CAE patients. There was no significant difference between the two groups in terms of other biochemical and hemogram values (Table 2).

Table 1. General characteristics of the study groups.

Baseline characteristics	Diabetic patients with CAE (n=124)	Diabetic patients with NCA (n=124)	*P value*
Age (years)	61.4±10.9	59.3±10.3	*0.134*
Male/female	70/54	42/82	*0.447*
LVEF (%)	58.48±4.34	59.07±4.61	*0.297*
Heart rate	73,5 (50-100)	76 (57-107)	*0.352*
SBP (mmHg)	120 (100-150)	120 (90-158)	*0.577*
DBP (mmHg)	70 (63-94)	80 (60-100)	*0.210*
HbA1c (%)	7.3 (4.4-12.0)	6.9 (5.6-12.8)	*0.489*
BMI	32.0 (18.7-41.1)	31.2 (20.1-41.9)	*0.628*

CAE: Coronary artery ectasia, NCA: Normal coronary artery, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HbA1c (%): Hemoglobin A1c, BMI: Body mass index.

Table 2. Laboratory data of the study groups.

Parameters	Diabetic patients with CAE (n=124)	Diabetic patients with NCA (n=124)	*p*
LDL-cholesterol (mg/dL)	112 (49-271)	122 (46-211)	*0.336*
Triglyceride (mg/dL)	162 (75-631)	166 (70-548)	*0.076*
Total cholesterol (mg/dL)	189 (126-586)	208 (95-294)	*0.637*
HDL-cholesterol (mg/dL)	44 (24-75)	46 (29-86)	*0.392*
Glomerular filtration rate (%)	84 (32-110)	87 (42-125)	*0.573*
ALT (u/l)	17 (9-50)	20 (9-132)	*0.277*
AST (u/l)	19 (12-42)	21 (7-48)	*0.256*
TSH	1.4 (0.3-4.5)	1.5 (0.3-4.2)	*0.054*
CRP (mg/L)	1 (0.10-18)	1 (0.01-11.2)	*0.012*
WBC, (u/mm^3)	8 (4-13)	7 (5-12)	*0.023*
Hemoglobin (gr/dL)	13 (10-16)	14 (10-20)	*0.015*
MCV	86 (64-99)	87 (79-97)	*0.918*
RDW (%)	16 (14-20)	15 (12-19)	*0.026*
Neutrophil, (u/mm^3)	4.5 (2.1-11.4)	4.0 (0.2-7.5)	*0.003*
Lymphocyte, (u/mm^3)	2.2 (1.2-3.2)	2.5 (0.1-3.6)	*0.102*
Monocyte, (u/mm^3)	0.5 (0.2-1)	0,5 (0.2-4.3)	*0.589*
Basophils, (u/mm^3)	0.06 (0.001-0.1)	0.07 (0.001-0.2)	*0.888*
Eosinophil, (u/mm^3)	0.143 (0.009-0.658)	0.138 (0.033-0.815)	*0.846*
Platelet counts (Plt) (k/mm^3)	266 (196-450)	236 (163-362)	*0.001*
PDW (%)	17.9 (16.2-20.4)	17.7 (15.9-19.7)	*0.011*
MPV (Fl)	8.4 (6.4-11.2)	7.9 (6.6-10.1)	*0.015*
PCT	0.20 (0.14-0.32)	0.19 (0.13-0.26)	*0.001*
Neutrophil lymphocyte ratio (NLR)	2.1 (1.0-9.7)	1.6 (0.2-5.7)	*0.002*
Platelet lymphocyte rate (PLR)	132.5 (71.2-371.9)	97.6 (64.8-4085.7)	*0.516*

CAE: Coronary artery ectasia, NCA: Normal coronary artery, GFR: glomerular filtration rate, ALT: alanine aminotransferase, AST: aspartate aminotransferase, PDW: Platelet distribution width; RDW: Red cell distribution width; MPV: Mean platelet volume; HDL: high-density lipoprotein; LDL: low-density lipoprotein; WBC: White blood count; PCT: plateletcrit.

Discussion

This study showed that hemogram parameter levels were different between CAE patients and controls. To the best of our knowledge, this is the first study to evaluate hemogram parameters in patients with diabetic coronary artery ectasia.

CAE has been related to rising morbidity and

mortality [15]. Angiographies performed to investigate ischemic heart disease indicate an average of 1-5% CAE [4]. CAE is thought an atypical variant of coronary atherosclerosis, that characterized by disruption of the elastic lamina [4, 5]. The key role of inflammation in the initiation and progression of atherosclerosis is well known [22, 23].

Inflammation plays a major role in the development of atherosclerosis and in all stages of CAD [24]. Chronic inflammation is considered to play a role in the etiology of CAE [25, 26]. In our study, as in previous studies[27], the level of inflammatory biomarker CRP was found to be high.

Circulating white blood cell count (WBC) and its subtypes and their relationship to cardiovascular outcomes have been evaluated in previous studies [28]. Leukocyte, monocyte, and neutrophil levels have found to be high in patients with isolated CAE [29]. Neutrophil lymphocyte ratio (NLR) is being evaluated as a new marker of inflammation. Recently, it has been suggested that the NLR rate is a new biomarker for cardiovascular events and prognosis [30]. Balta et al [31] investigated the relationship of NLR in isolated CAE patients and found it to be high. In our study, this rate was high in CAE patients.

Increase in Mean platelet volume (MPV) and platelet distribution width (PDW) in diabetic patients is thought to be related to diabetic vascular complications [32]. MPV and PDW levels have been found to be high in diabetic patients with macrovascular complications [33]. MPV and PDW were higher in diabetic patients with thromboembolic complications [34]. This confirms that CAE is an atherosclerotic disease. MPV, an indicator of platelet activation, has an independent effect on the pathophysiology of atherosclerosis. MPV levels were high in patients with acute myocardial infarction, unstable angina pectoris, and congestive heart failure [35]. As in our study, MPV levels were found to be high in CAE patients in previous studies [36]. In contrast to this study, in our study, all CAE patients were diabetic. In our study, patients with coronary artery ectasia had higher MPV than normal coronary arteries.

Platelets have an important role in the pathogenesis of homeostasis and thrombosis [37]. It has been shown in previous studies that platelet indices are increased in diabetic patients [38]. We also found these indexes high in our study.

Conclusions

Routine hematological analyzes are important, simple, effortless and cost-effective tests. These tests may be predictive of CAE, which requires prospective large-scale randomized control trials.

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Ethical statement: *The study was conducted in accordance with the ethical approval of the University Ethics Committee. (Date: 24/10/2019; Decision number: 2019/217).*

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