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The evaluation of epicardial adipose tissue and carotid *intima-media* thickness in patients with Behçet's disease

Procena debljine epikardnog adipoznog tkiva i sloja *intima-media* karotidne arterije kod bolesnika sa Behčetovom bolešću

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Abstract

Background/Aim. Epidemiological studies indicate that cardiovascular disease (CVD) is common in almost all patients diagnosed with autoimmune disease. This study aimed to examine whether epicardial adipose tissue (EAT) thickness (EATT) and carotid *intima-media* (CIM) thickness (CIMT) differ between patients with Behçet's disease (BD) and healthy individuals. **Methods.** A total of 40 healthy subjects as controls and 40 BD patients with musculoskeletal complaints were enrolled in this cross-sectional prospective study. Socio-demographic, clinical, and laboratory data were obtained and compared between groups. The Behçet's Disease Current Activity Form was used to assess disease activity. Both groups underwent echocardiography in order to measure EATT and CIMT. **Results.** The mean thickness of EAT (5.70 ± 1.05 mm; 2.50 ± 0.61 mm, respectively, $p < 0.001$) and CIM (0.68 ± 0.05 mm; 0.63 ± 0.06 mm, respectively, $p = 0.002$) were significantly increased in BD patients compared to the control group. A positive correlation was observed between EATT and age ($r = 0.500$, $p = 0.001$), the duration of the disease ($r = 0.330$, $p < 0.001$), waist circumference ($r = 0.316$, $p = 0.013$), and disease activity ($r = 0.31$, $p < 0.001$) in the patient group. CIMT was positively correlated with age ($r = 0.594$, $p = 0.001$) and the duration of the disease ($r = 0.585$, $p = 0.001$). The use of glucocorticoids or clinical manifestations (joint involvements, genital ulcer, skin lesions, inflammatory back pain, and major organ involvement) of the patients were not found to be associated with EATT or CIMT. **Conclusion.** EATT and CIMT are increased in patients with BD and are associated with disease activity. Echocardiographic measurement of EATT and CIMT is an objective, noninvasive, and available method that can evaluate the risk of subclinical atherosclerosis in patients with BD.

Key words:
adipose tissue; atherosclerosis; autoimmune diseases; behcet syndrome; carotid artery, common; pericardium; risk; tunica intima; tunica media; ultrasonography.

Apstrakt

Uvod/Cilj. Epidemiološke studije pokazuju da su kardiovaskularne bolesti (KVB) česte kod gotovo svih bolesnika sa dijagnozom autoimunske bolesti. Cilj ove studije bio je da ispita da li se debljina epikardnog masnog tkiva [*epicardial adipose tissue (EAT) thickness (EATT)*] i debljina sloja *intima-media* karotidne arterije [*carotid intima-media (CIM) thickness (CIMT)*], razlikuju između bolesnika sa Behčetovom bolešću (BB) i zdravih osoba. **Metode.** Ukupno 40 zdravih ispitanika u kontrolnoj grupi i 40 bolesnika sa BB sa tegobama mišićno-zglobnog sistema uključeno je u ovu prospektivnu studiju preseka. Dobijeni su socio-demografski, klinički i laboratorijski podaci koji su upoređeni između grupa. Za procenu aktivnosti bolesti korišćen je Behčetov obrazac trenutne aktivnosti bolesti. Obe grupe su podvrgnute ehokardiografiji radi merenja EATT i CIMT. **Rezultati.** Srednja vrednost EATT (5,70 ± 1,05 mm; 2,50 ± 0,61 mm, redom, $p < 0,001$) i CIMT (0,68 ± 0,05 mm; 0,63 ± 0,06 mm, redom, $p = 0,002$) su bile značajno povećane kod bolesnika sa BB u poređenju sa kontrolnom grupom. Pozitivna korelacija je pokazana između EATT i starosti ($r = 0,500$, $p = 0,001$), vremena trajanja bolesti ($r = 0,330$, $p < 0.001$), obima struka ($r = 0,316$, $p = 0,013$) i aktivnosti bolesti ($r = 0,31$, $p < 0,001$) u grupi bolesnika. CIMT je pozitivno korelisao sa godinama života ($r = 0,594$, $p = 0,001$) i vremenom trajanja bolesti ($r = 0,585$, $p = 0,001$). Upotreba glukokortikoida ili kliničke manifestacije (zahvaćenost zglobova, ulceracija na genitalijama, kožne lezije, upalni bol u leđima i zahvaćenost velikih organa) kod bolesnika nije bila povezana sa EATT ili CIMT. **Zaključak.** EATT i CIMT su povećane kod bolesnika

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sa BB i povezane su sa aktivnošću bolesti. Ehokardiografsko merenje EATT i CIMT je objektivna, neinvazivna i dostupna metoda koja može proceniti rizik od supkliničke ateroskleroze kod bolesnika sa BB.

Ključne reči:
masno tkivo; ateroskleroza; autoimunske bolesti; behčetov sindrom; a. carotis communis; perikard; rizik; tunica intima; tunica media; ultrasonografija.

Introduction

Behçet's disease (BD) is a rare multisystemic autoimmune inflammatory vasculitis characterized by a heterogeneous pattern of organ involvement with an unknown etiology [1]. The cardiovascular (CV) system may be affected on any level ranging from aneurysms to thrombosis and myocardial infarction, and has been found in between 2.4% and 6.4% of individuals with BD in two major datasets [2]. The presence of coronary artery disease (CAD) is associated with poor prognosis that may differ among geographic distribution [3, 4].

According to previous studies, it has been established that autoimmune inflammatory diseases are independent risk factors for atherosclerosis [5]. Understanding the cellular and molecular connections that govern the genesis and progression of atherosclerosis, as well as the designation of endothelial dysfunction as the primary lesion, is critical in these patients [6]. Since BD is mostly known as venous thrombotic disease, subclinical atherosclerosis was less investigated in patients with BD. In most previous cases, echocardiography (ECHO) was used to show the presence of thrombus and valvular lesions in patients with BD. Given the chronic inflammatory background of BD, premature atherosclerosis was addressed with conflicting evidence in the literature [7, 8].

Recent studies clarify the connection between the increased epicardial adipose tissue (EAT) thickness (EATT) and the development of CADs [9]. EAT is the visceral adipose tissue of the heart located between the visceral pericardium and the myocardium. Under physiological conditions, EAT acts as a buffer zone absorbing excess free fatty acids and protects the heart from exposure to high levels of acids. On the other hand, excessive EAT is an independent risk factor for occlusive coronary artery plaques, atherosclerosis, and ischemia [10–12]. The carotid *intima-media* thickness (CIMT) is also a widely used clinical marker to determine subclinical atherosclerosis measured simply and noninvasively with ECHO [13]. Measurement of CIMT is determined as a strong indicator of subclinical atherosclerosis and heart disease risk, and increased CIMT has been indicated for CV risk stratification [14].

So far, increased atherosclerosis is not a prominent reported feature of BD, unlike other inflammatory arthritis such as systemic lupus erythematosus, ankylosing spondylitis, psoriatic arthritis, and rheumatoid arthritis, whereas coronary aneurysms and stenotic lesions are the most frequent cardiac lesions observed in patients with BD [15]. This study aimed to compare the EATT and CIMT between BD patients and healthy controls and to assess the relationship between EATT and CIMT and various sociodemographic, clinical, and laboratory parameters in patients with BD.

Methods

This cross-sectional study was conducted with a total of 40 BD patients who complied with the criteria of the International study group for BD, were followed up with the diagnosis of BD, and did not have exclusion criteria. BD patients with any musculoskeletal complaints that were referred from outpatient clinics and admitted to orthopedic outpatient clinic, were investigated. As a control group, a total of 40 age and gender-matched healthy individuals were evaluated. Patients with a history of any reported CV disease (CVD) (myocardial infarction, atrial flutter or fibrillation, heart failure, valvular heart disease, CAD, transient ischemic attack, stroke, peripheral artery disease), any previous vascular complication, chronic obstructive pulmonary disease, with a diagnosis of any other significant systemic disease such as hypothyroidism, hyperlipidemia, diabetes mellitus (or fasting blood glucose > 125 mg/dL), or Cushing syndrome that could interfere with atherosclerosis were excluded from the study.

Relevant socio-demographic characteristics of BD patients and control subjects were questioned, and clinical data of BD patients, including smoking status and body mass index (BMI), were noted. The disease activity score was determined by the Behçet's Disease Current Activity Form (BDCAF) in patients with BD. The BDCAF is the most widely used instrument for evaluating the activity of BD, which is dependent on the history of symptoms. Scoring is based on an accurate history of clinical features that had been present over the preceding four weeks prior to the date of examination [16].

Laboratory parameters, including fasting blood glucose, creatinine, sedimentation, C-reactive protein, lipid profile, and other biochemical parameters, were recorded. Inflammatory joint involvements (arm, leg, shoulder, hip), oral ulcer, genital ulcer, skin lesions (pseudofolliculitis, erythema nodosum), inflammatory back pain, major organ involvement (ocular, neurologic, gastrointestinal, and vascular manifestations) and glucocorticoid treatment were noted from the medical charts. Systolic and diastolic blood pressure (mmHg) and waist circumference (cm) were also measured. An orthopedic surgeon recorded the baseline features of both BD patients and the control group. EATT and CIMT were assessed with ECHO by a single cardiologist blinded to the other assessments of all participants.

All procedures performed in this study were in accordance with the Helsinki declaration and its later amendments. This study was approved by Erzurum Regional

Training and Research Hospital ethics committee and patient recruitment took place in Erzurum Regional Training and Research Hospital. Informed consent was taken from all participants.

The measurement of EATT with transthoracic ECHO

Both groups in the study were examined with transthoracic ECHO (Vivid 7, GE-Vingmed Ultrasound AS, Horten, Norway) at the Cardiology Clinic ECHO Laboratory. After the 15-minute rest period, EATT measurements were done at the end of the diastole, using the ultrasound probe at the frequency of 2.5–3.5 MHz and with the 2-D and M mode method on the parasternal long axis in the left-lying position.

The measurement of CIMT with transthoracic ECHO

CIMT can be defined as the distance between the *media-adventitia* interface and the *lumen-intima* interface. Measurements were done using a duplex ultrasound system with a 10-MHz scanning frequency in the B-mode, pulsed Doppler mode, and color mode using the Vivid 5 device. CIMT was measured at three points, 10 mm proximal to the carotid bulb at the far wall of the right and left common carotid arteries. The CIMT of these three locations was used to obtain the mean thickness for each side.

Statistical analysis

IBM SPSS Statistics 22 (SPSS IBM, Turkey) program was used to analyze the results. Continuous variables were expressed as mean ± standard deviation. In comparisons between groups, the Mann-Whitney *U* test was used for continuous variables, and the Pearson's chi-squared test was used for categorical variables. Data were tested for normal distribution by the Kolmogorov-Smirnov test. The Pearson's correlation analysis was performed to examine the relationships between parameters. Statistical significance was evaluated at the level of $p < 0.05$.

Results

Our study was conducted on 80 cases, 44 (55%) male and 36 (45%) female, whose ages ranged from 20 to 66 years. Forty patients with BD were enrolled and 40 healthy individuals were evaluated as a control group. There were no differences between the groups regarding age, BMI, gender, waist circumference, active smoking rate, systolic or diastolic blood pressure, C-reactive protein, erythrocyte sedimentation rate, fasting plasma glucose, serum creatinine, or lipid profile. Mean EATT was determined as 5.70 ± 1.05 mm in the BD group and 2.50 ± 0.61 mm in the control group ($p < 0.001$). The mean value for CIMT was 0.68 ± 0.05 mm in the BD group and 0.63 ± 0.06 mm in the control group ($p = 0.002$) (Table 1). The mean disease duration was 7.8 ± 4.2 years, and the mean BDCAF score was 3.52 ± 1.04 in the BD group.

Table 2 shows the clinical features of BD patients. All patients had previous or present oral ulcers. BD patients were divided into groups regarding the presence of several clinical manifestations and glucocorticoid use. No significant association was observed between EATT, CIMT, and clinical characteristics of BD patients (Table 2).

EATT was positively correlated with age (r = 0.500, $p = 0.001$), the duration of the disease (r = 0.330, $p < 0.001$), waist circumference (r = 0.316, $p = 0.013$), and disease activity (r = 0.31, $p < 0.001$) in the patient group. CIMT was also positively correlated with age (r = 0.594, $p = 0.001$) and the duration of the disease (r = 0.585, $p = 0.001$). No significant correlation was found between EATT, CIMT, and other sociodemographic and clinical parameters (Table 3).

Table 1

Baseline characteristics of the study population

Characteristics	Behçet's disease (n = 40)	Control (n = 40)	*p*-value
Age (years)	37.55 ± 12.06	37.81 ± 15.17	0.973
Gender (male/female)	22/18	22/18	1.000
BMI (kg/m^2)	23.24 ± 11	21.90 ± 14.5	0.270
Waist circumference (cm)	77.69 ± 10.45	78.34 ± 9.85	0.849
Active smoking, n (%)	10 (25)	13(32)	0.350
Systolic blood pressure (mmHg)	124 ± 18	124 ± 13	0.504
Diastolic blood pressure (mmHg)	73.2 ± 6.1	74.1 ± 6.2	0.442
C-reactive protein (mg/dL)	2.87 ± 2.36	2.55 ± 1.95	0.356
Erythrocyte sedimentation rate (mm/hr)	21.5 ± 10.4	16.4 ± 70	0.767
Fasting plasma glucose (mg/dL)	86.50 ± 13.95	86.50 ± 15.87	0.126
Creatinine (mg/dL)	0.71 ± 0.11	0.71 ± 09	0.980
High-density lipoprotein cholesterol (mg/dL)	41.81 ± 7.0	42.86 ± 6.45	0.493
Low-density lipoprotein cholesterol (mg/dL)	125.52 ± 34.25	124.16 ± 33.387	0.528
Triglycerides (mg/dL)	131 ± 33	125 ± 66	0.741
Total cholesterol (mg/dL)	211.31 ± 47.38	203.70 ± 53.70	0.528
Epicardial adipose tissue thickness (mm)	5.7 ± 1.05	2.5 ± 0.61	**< 0.001**
Carotid *intima-media* thickness (mm)	0.68 ± 0.05	0.63 ± 0.06	**0.002**
BDCAF score	3.52 ± 1.04	–	–

Results are given as mean ± standard deviation or number of patients.
BMI – body mass index; BDCAF – Behçet's Disease Current Activity Form.
Bolded values are statistically significant.

Table 2

Comparison of epicardial adipose tissue thickness (EATT) and carotid *intima-media* thickness (CIMT) according to clinical features in patients with Behçet's disease

Parameters	Patients	EATT (mm)	*p*-value	CIMT(mm)	*p*-value
	n (%)	mean ± SD		mean ± SD	
Joint involvement (+)	22 (55)	5.80 ± 0.81	0.456	0.68 ± 0.07	0.675
Joint involvement (-)	18 (45)	5.57 ± 1.12		0.69 ± 0.08	
Genital ulcer (+)	17 (42.5)	5.71 ± 0.92	0.949	0.68 ± 0.08	1.000
Genital ulcer (-)	23 (57.5)	5.69 ± 1.02		0.68 ± 0.08	
Skin lesions (+)	9 (22.5)	5.70 ± 1.00	-	0.67 ± 0.09	-
Skin lesions (-)	31 (77.5)	5.70 ± 1.03		0.68 ± 0.03	
Inflammatory back pain (+)	10 (25)	5.78 ± 1.24	0.773	0.68 ± 0.08	1.000
Inflammatory back pain (-)	30 (75)	5.67 ± 0.97		0.68 ± 0.10	
Ocular involvement (+)	21 (52.5)	5.69 ± 1.02	0.907	0.70 ± 0.11	0.09
Ocular involvement (-)	19 (47.5)	5.73 ± 1.14		0.65 ± 0.07	
Neurologic involvement (+)	2 (5)	5.81 ± 0.90	-	0.68 ± 0.09	-
Neurologic involvement (-)	38 (95)	5.69 ± 1.07		0.68 ± 0.10	
Gastrointestinal involvement (+)	1 (2.5)	5.77 ± 1.26	-	0.67 ± 0.00	-
Gastrointestinal involvement (-)	39 (97.5)	5.69 ± 1.05		0.68 ± 1.02	
Glucocorticoid treatment (+)	22 (55)	5.54 ± 0.80	0.277	0.68 ± 0.10	0.810
Glucocorticoid treatment (-)	18 (45)	5.89 ± 1.20		0.69 ± 0.16	

SD – standard deviation.

Table 3

Correlation of demographic and laboratory findings with epicardial adipose tissue thickness (EATT) and carotid *intima-media* thickness (CIMT)

Parameters	EATT		CIMT	
	r	*p*-value	r	*p*-value
Age	**0.500**	**0.001**	**0.594**	**0.001**
BMI	0.018	0.802	0.016	0.823
Gender (male/female)	0.047	0.798	0.044	0.857
Disease duration	**0.330**	**< 0.001**	**0.585**	**0.001**
Systolic blood pressure	0.249	0,177	0.254	0.180
Diastolic blood pressure	0.244	0.151	0.235	0.203
Waist circumference	**0.316**	**0.013**	0.04	0.654
C-reactive protein	0.111	0.124	0.05	0.640
Erythrocyte sedimentation rate	0.034	0.644	0.152	0.117
Fasting plasma glucose	0.150	0.092	0.120	0.226
High-density lipoprotein cholesterol	-0.224	0.226	-0.225	0.203
Low-density lipoprotein cholesterol	-0.196	0.292	-0.197	0.217
Triglycerides	0.017	0.362	0.017	0.254
Total cholesterol	-0.042	0.827	-0.052	0.810
BDCAF score	**0.310**	**< 0.001**	0.090	0.254
CIMT	**0.27**	**0.002**		

BMI – body mass index; BDCAF – Behçet's Disease Current Activity Form.
Bolded values are statistically significant.

Discussion

Endothelial functions were found to be impaired in patients with chronic inflammatory musculoskeletal diseases compared to healthy individuals in the absence of conventional risk factors or overt CADs [17, 18]. Visceral adipose tissue is metabolically more active than subcutaneous adipose tissue and, therefore, more dangerous for the development of CVD. Recent studies have demonstrated that EATT and CIMT have emerged as markers of CVDs [19, 20]. This study revealed that these indicators of early atherosclerosis were increased in BD patients compared to healthy individuals.

Endothelial dysfunction can be detected with the measurement of flow-mediated dilatation of the brachial artery. A few previous studies observed that flow-mediated dilatation was impaired in patients with BD due to vasculitis, which is a cornerstone of CV involvement in BD [21, 22]. Chen et al. [23] conducted a retrospective case-control study with 476 Chinese patients with BD and stated that 19 (4%) of them (17 males) had CAD. In a prospective Korean study, Sun et al. [24] used speckle-tracking ECHO to investigate early cardiac symptoms of BD in individuals with no history of heart disease. Despite no obvious abnormalities on standard ECHO, patients had intrinsic left ventricular dysfunction.

Chronic inflammation can lead to atherosclerosis, and there has been a significant focus on the inflammatory component of atherosclerosis in the last decades. Increased atherosclerosis is an important contributor to CV complications in most autoimmune diseases like systemic lupus erythematosus and rheumatoid arthritis [25]. However, some researchers have observed that atherosclerosis is characteristically not increased in BD patients in contrast to the finding of this present study [26]. While the incidence of overt atherosclerosis does not seem to be increased in patients with BD, Hong et al. [27] reported that *intima-media* thickness was increased in BD, which might be due to nonatherosclerotic causes of endothelial hyperactivity. Another study showed that the atherogenic index of plasma value and CIMT in BD patients were significantly higher compared to the control group, and there was a strong positive correlation between these values [6]. Keser et al. [28] investigated EATT and brachial artery flow-mediated dilatation in BD patients using ECHO. They found that the mean EATT was higher, and flow-mediated endothelium-dependent dilatation was significantly lower in patients with BD compared to the controls. They reported that flow-mediated dilatation was negatively correlated with disease activity and age, and EATT was positively correlated with disease duration, waist circumference, and disease activity. Similarly, the present study revealed that the mean value for EATT and CIMT in patients with BD determined by ECHO were found to be significantly higher than that of the healthy control group. This result occurred despite there being no significant CV involvement of BD.

Another indicator of BD examined in this study was CIMT, and concordant with the study of Taşolar et al. [29], CIMT was significantly thicker in BD patients, and CIMT was defined as a well-known marker of subclinical atherosclerosis. Recently, a study conducted with 100 BD patients and 30 healthy individuals showed that the frequency of subclinical atherosclerosis in the BD patients was significantly higher than that in the control group [30]. The CIMT cut-off value for BD patients was determined as 0.54 mm in a meta-analysis, while this present study determined a mean CIMT of 0.68 mm in BD patients [31]. Hassan et al. [32] evaluated CIMT formation in 30 patients with BD by doppler ultrasonography to gain morphologic evidence of subclinical atherosclerosis. Their results showed an association between CIMT and disease activity. Another additional finding of this study that is worth discussing here is that the mean CIMT was significantly correlated with urea, creatinine, cholesterol, and triglycerides in BD patients compared with the controls. In this study, there was no association between the CIMT, EATT, and several parameters, such as BMI. This result was in accordance with the results of other studies recruited with obese patients that also found no connection between CIMT and BMI [33, 34]. In contrast, some other studies reported a statistically significant correlation between CIMT and BMI [35].

Studies conducted with several other rheumatologic diseases observed that EATT increases with age, similarly to our analysis [36, 37]. Anthropometric variables such as waist circumference and BMI are other clinical parameters that may be related to EATT. Ormseth et al. [38] found that EATT is associated with waist circumference and waist/hip ratio in patients with rheumatoid arthritis (RA) compared with the control group. Lima-Martínez et al. [39] did not report a relationship between EATT and waist circumference in RA patients, and EATT had been proposed to constitute a better marker of visceral adiposity when compared with BMI and waist circumference. The results of this study also postulated the positive correlation between EATT and increased waist circumference caused by the increase of visceral fat. EATT may be more compatible with waist circumference, which is more related to abdominal obesity than BMI. This fact demonstrates that EATT and waist circumference are together more descriptive in determining CVD risk than BMI.

There may be a positive correlation between EATT and systolic and diastolic blood pressure levels in some chronic diseases; however, contradictory data was also reported [36, 39]. This study could not demonstrate a significant relationship between EATT measurements with neither systolic nor diastolic arterial blood pressure levels, whereas the findings of this study did not show a significant relationship between the EATT or CIMT and laboratory parameters.

In a recent large-scale prospective study, sustained treatment of inflammation and decreased disease activity was shown to lower the risk of CV events [40, 41]. A recent review indicated that glucocorticoids act on the vessel wall, which may suppress or increase the development of atherosclerotic lesions. Glucocorticoids affect cells involved in the formation of atherosclerotic lesions that can either promote or prevent the creation of the lesions [42]. Regardless of the inflammatory diseases, corticosteroids were linked to an elevated risk of CVDs [43]. We investigated the relationship between several clinical manifestations and glucocorticoid use with CIMT and EATT. However, these associations were not statistically significant, perhaps due to the sample size.

Noninvasive parameters such as EATT and CIMT are useful to determine disease progression and identify BD subjects at high risk of CADs. BDCAF is an important tool and may significantly suggest CV manifestation in BD patients. In the present study, disease activity evaluated by using BDCAF was also found to be associated with both EATT and CIMT. This study affirms that subclinical atherosclerosis is not as uncommon as previously reported in the literature, and constant evaluation of the CV system in asymptomatic patients is needed. The exclusion criteria were important to omit possible comorbidities leading to atherosclerosis for the power of the study. There was also no statistically significant difference between groups regarding several features such as age, gender, smoking status, BMI, and systolic and diastolic pressure. The presence of a control group and an evaluation of several clinical and laboratory variables can be counted as the contribution of our study to the literature in terms of BD and subclinical atherosclerosis relationship. Moreover, EATT and CIMT measurements were made by a blind cardiologist with ECHO, which is a reliable imaging method. However, this cross-sectional study

was single-centered as a limitation. Thus, the correlation between EATT and CIMT and some socio-demographic, clinical, and laboratory parameters could not be detected. Another limitation was the lack of other predictors of endothelial dysfunction, such as the markers of oxidative stress. Long-term follow-up of BD patients should be considered in terms of atherosclerotic events for future studies.

Cardiac involvement in BD can be seen frequently without symptoms. EATT and CIMT have recently emerged as new markers of subclinical atherosclerosis. They seem to be increased in patients with BD, similar to RA patients, as a prototype for a high risk of CVD. Patients suffering from BD should be followed up routinely for CV manifestations, even with a bizarre presentation. The measurement of EATT and CIMT may be considered a diagnostic test to screen the development of atherosclerosis in the BD patient population and can afford an opportunity for the patients to receive early and appropriate treatment for CVDs.

Conclusion

EATT and CIMT are markers to assess cardiometabolic and CV risk, and they seem to increase in patients with BD. Subclinical cardiac involvement in patients with BD can be detected easily and quickly by echocardiographic examinations so that it can be treated early, preventing mortality and providing necessary approaches.

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