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Evaluation of Biventricular Myocardial Performance Index in Patients with Behçet's Disease

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OBJECTIVE: The global function of both left ventricular (LV) and right ventricular (RV) functions were compared in patients with Behçet's disease (BD) versus healthy controls. METHODS: Biventricular function was evaluated by measurement of the myocardial performance index (MPI) evaluated from tissue Doppler echocardiographic measurements in 24 BD patients and was compared with measurements in 24 age- and sex-matched healthy controls. RESULTS: Significantly higher MPI values were associated with ventricular dysfunction. The study demonstrated impaired RV function in patients with BD compared with healthy controls, whereas normal LV function was observed both in patients with BD and in healthy controls. CONCLUSION: Early noninvasive evaluation of the properties of BD during the asymptomatic phase of this inflammatory disease may have prognostic value in the management of patients.

KEY WORDS: Behçet's disease; Ventricular dysfunction; Echocardiography; Tissue Doppler echocardiography; Myocardial performance index

Introduction

Behçet's disease (BD) is an autoimmune disease that was originally described in 1937 by the Turkish dermatologist, Hulusi Behçet,[1] and is now recognized as a systemic vasculitis that can affect arteries and veins.[2,3] BD has a progressive course and encompasses a wide variety of clinical presentations including those of a vascular, skin, ocular, joint, neurological, gastrointestinal, pulmonary, or cardiovascular nature.[2,3] Cardiac involvement is an important manifestation of BD that can cause cardiac pathologies including silent myocardial ischaemia, pericarditis, myocarditis, endocarditis, right-sided cardiac endomyocardial fibrosis, conduction system disturbances, coronary arteritis, acute myocardial infarction and dilated cardiomyopathy.[4 – 7]

Several studies have investigated ventricular dysfunction, notably left ventricular diastolic dysfunction (LVDD), in patients with BD.[8 – 12] Right ventricular (RV) function has, however, not been extensively assessed. The myocardial performance index

(MPI) may be used as a tool to investigate the global function of both the left and right ventricles.[13,14] The present study compared cardiac function between patients with BD and healthy controls by measuring LV and RV MPI.

Patients and methods

STUDY POPULATION

The study included consecutive male and female outpatients with BD who underwent examinations at the Department of Rheumatology, Pamukkale University Faculty of Medicine, Denizli, Turkey, between January and June 2008. All of these patients fulfilled the international study group diagnostic criteria for BD, which requires the presence of oral ulceration plus any two of genital ulceration, eye lesions, skin lesions, or a positive pathergy skin test.[15] Patients with BD included in the study were asymptomatic and showed no signs of active disease for at least 8 weeks prior to study enrolment, according to their echocardiographic evaluations. Healthy volunteers who were similar to the patient cohort in terms of age and sex, and who did not meet the BD diagnostic criteria, were selected as the control group. Healthy controls were chosen among persons who were admitted to the general internal medicine outpatient clinic in the Pamukkale University Faculty of Medicine for routine check-up. Patients and healthy controls with coronary or valvular heart disease, heart failure (LV ejection fraction ≤ 60%), atrial fibrillation, diabetes mellitus, renal failure, chronic obstructive pulmonary disease, or any other severe systemic disease were excluded from the study.

The study protocol received approval from the Ethics Committee of Pamukkale University Faculty of Medicine. All participants provided written informed consent prior to inclusion in the study.

ECHOCARDIOGRAPHIC EVALUATION

Echocardiography was performed by tissue Doppler echocardiography (VIVID 7®, GE-Vingmed, Horten, Norway) using a 3.5 MHz cardiac probe (VIVID 7®, GE-Vingmed). All echocardiographic measurements were performed on the same machine by the same cardiologist (O.K.) who was blinded to the study. The measurements were reviewed and verified by two additional cardiologists (D.S.K. and H.E.) who were also blinded to the study. No conflicting measurements were found during this data verification process. Isovolumetric contraction time (ICT), isovolumetric relaxation time (IRT) and ejection time (ET) were recorded for both ventricles. Both mitral and tricuspid annular tissue Doppler measurements were performed. Apical four-chamber plane was used for mitral and tricuspid septal and free wall measurements and apical two-chamber plane was used for measuring mitral anterior and posterior annular displacement. The MPI was calculated with the formula (ICT + IRT) / ET for each participant.[13]

STATISTICAL ANALYSES

Statistical analyses were performed using the SPSS® statistical package, version 11.0 (SPSS Inc., Chicago, IL, USA) for Windows®. Continuous variables were summarized as mean ± SD and categorical variables as percentages. Comparisons between groups were assessed with the Student's *t*-test. A *P*-value < 0.05 was considered to be statistically significant.

Results

The study enrolled a total of 24 patients with BD (17 males, seven females; mean ± SD age 33.8 ± 11.0 years) and 24 age- and sex-matched healthy controls (17 males, seven females; mean ± SD age 36.8 ± 11.2 years).

There were no significant between-group differences in cardiac risk factors including diabetes, hypertension, dyslipidaemia and tobacco consumption (Table 1).

As shown in Table 2, LV MPI evaluations were not significantly different between the patient and control groups. RV MPI evaluations were significantly greater in patients with BD than in healthy controls ($P < 0.05$). There was no significant difference in MPI between the male and female patients with BD.

Discussion

Behçet's disease is recognized as a systemic vasculitis that affects arteries and veins.[2,3] Inflammation of the myocardial microvessels may lead to myocardial ischaemia and fibrosis; consequently, disturbances of the myocardial microcirculation may play a role in the development of ventricular dysfunction.[7] Pulmonary involvement may also lead to ventricular dysfunction. Increased pulmonary vascular resistance may develop

TABLE 1:
Demographic and clinical characteristics of patients with Behçet's disease (BD) and healthy controls evaluated for biventricular myocardial performance index

Characteristic	Patients with BD (*n* = 24)	Healthy controls (*n* = 24)
Age, years	34 ± 11	37 ± 11
Sex, *n* (%)		
Male	17 (70.8)	17 (70.8)
Female	7 (29.2)	7 (29.2)
BMI, kg/m^2	29 ± 4	26.4 ± 6.9
SBP, mmHg	136 ± 5	131 ± 9
DBP, mmHg	78 ± 5	78 ± 4
Smoking, *n* (%)	19 (79.2)	21 (87.5)
TC, mg/dl	179 ± 7	181 ± 12
TG, mg/dl	151 ± 22	148 ± 20
HDL-C, mg/dl	29 ± 8	30 ± 11
Fasting serum glucose, mg/dl	101 ± 11	99 ± 13

Data presented as mean ± SD, or *n* (%) patients.
No statistically significance between-group differences ($P > 0.05$); Student's *t*-test.
BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; TG, triglyceride, HDL-C, high-density lipoprotein cholesterol.

TABLE 2:
Comparison of left ventricular (LV) and right ventricular (RV) myocardial performance index (MPI) values in all studied Behçet's disease (BD) patients versus healthy controls and in male versus female BD patients

	All participants (*n* = 48)			Patients with BD (*n* = 24)		
Parameter	Patients with BD (*n* = 24)	Healthy controls (*n* = 24)	Statistical significance	Males (*n* = 17)	Females (*n* = 7)	Statistical significance
LV MPI, %	0.4 ± 0.2	0.5 ± 0.1	NS	0.4 ± 0.2	0.3 ± 0.2	NS
RV MPI, %	0.6 ± 0.1	0.4 ± 0.2	$P < 0.05$	0.6 ± 0.1	0.6 ± 0.1	NS

Data presented as mean ± SD.
NS, no statistically significance between-group differences ($P > 0.05$); Student's *t*-test.

due to pulmonary vascular or parenchymal involvement in patients with BD. The right ventricle is more sensitive to afterload changes and this sensitivity has led to the consideration of pulmonary involvement being a cause of RV dysfunction.[16 – 19] The prevalence of pulmonary manifestations in BD patients has been reported to be between 1.7% and 7.7%.[17] In a study by Ozer *et al.*,[18] high-resolution computed tomography scans found that 70.6% of the patients with BD had grade 3 or 4 expiratory air trapping (indicating the presence of small airway disease), despite having normal pulmonary function tests. The study by Ozer *et al.*[18] also demonstrated a variety of pulmonary parenchymal changes associated with BD, including transient focal or diffuse alveolar infiltrates and wedge-shaped opacities, reticular infiltrates and parenchymal hypovascular areas.

Several studies have investigated LVDD in BD. Komsuoglu *et al.*[8] found LVDD in 22% (5/22) of the patients with BD who were assessed. Other studies by Çalguneri *et al.*[9] and Gemici *et al.*[10] also demonstrated comparable LVDD rates in patients with BD (37% [9/24] and 30% [22/71], respectively). In the latter study by Gemici *et al.*,[10] patients with BD had a significantly higher incidence of impaired mitral ratio of peak early-to-late diastolic filling velocity and significantly longer LV isovolumic relaxation and mitral deceleration times compared with healthy controls. On the other hand, Kirimli *et al.*[20] found no difference between the patient and healthy control groups regarding heart rate variability measurements, suggesting there is no clear involvement of autonomic abnormality in BD. A study by Tavil *et al.*,[12] which evaluated tissue Doppler-derived MPI, found impaired LV MPI in patients with BD, although systolic and diastolic function parameters were comparable in the patient and control groups.

The present study measured MPI using tissue Doppler echocardiography in order to evaluate LV and RV global function in patients with BD compared with healthy controls. The MPI has been described by Tei[13] and represents both systolic and diastolic ventricular function. It is an easy, reproducible, reliable and relatively objective noninvasive method to obtain data on ventricular function.[13] In contrast to the findings by Tavil *et al.*,[12] the present study demonstrated increased RV MPI in patients with BD but normal LV MPI. The reasons for such contrasting findings between the two studies remain unclear. One potential explanation may concern the higher percentage of male patients with BD enrolled in the present study (70.8%) compared with 45.2% of male patients enrolled in the study by Tavil *et al.*[12] A possible gender effect remains to be elucidated.

There were some limitations to the present study including the relatively small numbers of patients with BD and healthy controls enrolled, and the short duration of follow-up for each participant. Future studies, enrolling larger numbers of patients in different phases of the disease course, would enable further investigation into the role of MPI and RV function in the screening and treatment of patients with BD.

In summary, the present study demonstrated impaired RV MPI and normal LV MPI in BD patients. Early noninvasive evaluation of the properties of this inflammatory disease, with accompanying vasculitis in the asymptomatic phase, may have a prognostic value in the management of BD.

Conflicts of interest

The authors had no conflicts of interest to declare in relation to this article.

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