Interrelations between Serum N-Terminal Pro B-Type Natriuretic Peptide (Nt-ProBnp) Levels and Early Cardiovascular Risk Factors and Echocardiographic Parameters in Obese Adolescents

Mehmet Boyraz1, Ozgur Pirgon2*, Bumin Dundar3, Bedir Akyol4 and Nezaket Eren5
1Department of Pediatric Endocrinology and Diabetes, Faculty of Medicine, Fatih University, Ankara, Turkey
2Department of Pediatric Endocrinology and Diabetes, Faculty of Medicine, Suleyman Demirel University, Isparta, Turkey
3Department of Pediatric Endocrinology and Diabetes, Faculty of Medicine, Katip Celebi University, Izmir, Turkey
4Department of Pediatric Cardiology, Sadi Konuk Training and Research Hospital, Istanbul, Turkey
5Department of Biochemistry, Sisli Etfal Training and Research Hospital, Istanbul, Turkey

Abstract

Aim
This study aimed to evaluate the associations between the N-Terminal pro B-type Natriuretic Peptide (NT-proBNP) levels and the metabolic, echocardiographic parameters, carotid Intima-Media Thickness (IMT) and Epicardial Adipose Tissue Thickness (EATT) in adolescent obesity.

Materials and methods
The study participants consisted of 138 obese adolescents in the study group and 63 non-obese adolescents as control subjects. All the subjects underwent transthoracic echocardiographic examination for determination of Left Ventricular (LV) systolic function and mass index, myocardial tissue rates, and myocardial performance index. EATT and carotid IMT were also measured during echocardiography. Serum NT-proBNP levels were measured at the time of the evaluation.

Results
The NT-proBNP values averaged 67.2 ± 64.4 pg/ml in mildly-moderately obese and 76.0 ± 49.7 pg/ml in the severely obese group and 44.3 ± 23.3 pg/ml in the control group (p<0.007, p:0.002, respectively). The average carotid IMT was 0.91 ± 0.23 and 0.88 ± 0.18 mm in the obesity groups and 0.52 ± 0.08 mm in the control group (p<0.001), but differences were not observed between obesity groups and the EATT measurements that averaged 7.38 ± 1.76 and 7.42 ± 1.55 mm in the obesity groups and 4.28 ± 0.79 mm in the control group (p<0.001). The serum NT-proBNP levels showed positive correlations with LV systolic and diastolic functions, carotid IMT and EATT values especially in severely obese adolescents.

Conclusion
The study showed that serum NT-proBNP levels were higher in mildly-moderately and severely obese adolescents than lean group. NT-proBNP measurement might be useful a marker for predicting atherosclerosis and cardiac dysfunction in obese adolescents.

Keywords: Adolescent obesity; Atherosclerosis; Cardiovascular risk; Echocardiography; N-terminal pro B-type natriuretic peptide

Introduction
Childhood obesity is accompanied with an increased cardiovascular disease risk profile in adulthood [1]. Hypertension, dyslipidemia, cardiomyopathy and coronary heart disease are known as cardiovascular complications of obesity, together with insulin resistance, diabetes mellitus, and sleep apnea, which often accompany with obesity [2,3]. Epidemiological, echocardiographic, and autopsy studies have identified obesity cardiomyopathy as an isolated clinical entity [4-6]. In these studies, elevated Body Mass Index (BMI) is described as a risk factor for Left Ventricular (LV) remodeling and overt heart failure. LV enlargement and eccentric hypertrophy are the most common morphological cardiac abnormalities in obese individuals [5]. Cardiac remodeling depends on the intensity and duration of obesity and the influence of adverse loading conditions [7,8].

Natriuretic peptide signaling may actively influence differential body fat distribution. N-Terminal-pro-B-Natriuretic Peptide (NT-proBNP) and brain natriuretic peptide are useful for the diagnosis of heart failure, and their high levels in serum and plasma, respectively, are related to wall stress, which is often increased in severe obesity. High brain natriuretic peptide as well as high NT-proBNP are new promising cardiovascular risk markers and have been associated with high blood pressure, and LV hypertrophy [9,10]. These are sensitive markers of cardiac dysfunction and may be useful in the early diagnosis of cardiac loading.

NT-proBNP is extremely reliable due to the high negative predictive value so it is used more frequently than from brain natriuretic peptide [11,12]. Recent findings on the relationship between NT-proBNP and metabolic parameters, morphologic and dynamic cardiac abnormalities in adolescent obesity are still inconsistent and controversial. Therefore, the aim of the present study was to evaluate the associations of serum NT-proBNP levels to cardiovascular risk factors, echocardiographic and metabolic parameters in obese adolescents.