

Relationship Between Metabolic Syndrome and Non-Dipping Blood Pressure Pattern in Obese Patient

Obez Hastalarda Non-Dipper Kan Basıncı ile Metabolik Sendrom Arasındaki İlişki

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Abstract

Background: Metabolic syndrome and non-dipping blood pressure pattern are related with cardiovascular disease. It is considered that there may be common pathophysiological mechanisms of these clinical entities. We aimed to investigate the association between metabolic syndrome and non-dipping blood pressure pattern.

Method: 118 consecutive newly diagnosed metabolic syndrome patients with obesity who underwent 24-hour ambulatory blood pressure monitoring were included in the study. They were divided into dipper (n = 46) and non-dipper (n = 72) groups. Nocturnal non-dipping blood pressure pattern is defined as the lower than 10 % reduction in nocturnal mean systolic and/or diastolic blood pressure.

Results: In the whole population, mean 24-hour ambulatory blood pressure was 146/96 mmHg. Although, the two groups was similar in terms of basic characteristics; the frequency of metabolic syndrome was significantly greater in patients with non-dipping pattern (p=0.038).

Conclusion: In this study metabolic syndrome was found to be more prevalent among patients with non-dipping pattern of hypertension. This may indicate a common pathophysiological mechanism of metabolic syndrome and non-dipping blood pressure pattern in obese patient.

Özet

Amaç: Metabolik sendrom ve non-dipper kan basıncı paterni kardiyovasküler hastalıklarla ilişkilidir. Bu klinik durumların ortak patofizyolojik mekanizmalarıyla ilişkili olabilir. Metabolik sendrom ile non-dipper kan basıncı arasındaki ilişkiyi araştırmayı amaçladık.

Yöntem: 24 saatlik ambulatuar kan basıncı takibi yapılan yeni tanı almış 118 obez metabolik sendromlu hasta çalışmamıza dahil edildi. Bunlar dipper (n = 46) ve non-dipper (n = 72) olmak üzere iki gruba ayrıldı. Gece non-dipper kan basıncı, gece ortalama sistolik ve/veya diastolic kan basıncı azalması %10 dan daha az azalma oluşu olarak tanımlandı.

Bulgular: Çalışma gurubumuzun ortalama 24 saatlik kan basıncı ortalaması 146/96 mmHg idi. İki grubun temel karakteristik özellikleri benzer olmasına rağmen, non-dipper tansiyon paterni olan grupta metabolik sendrom sıklığı anlamlı derecede daha fazla idi (p=0.038).

Sonuç: Bu çalışmada non-dipper kan basıncı paterni olan hastalarda metabolik sendromun daha fazla bulunduğu saptandı. Bu durum, obez hastalarda metabolik sendrom ile non-dipper kan basıncının ortak bir patofizyolojik mekanizma içerdiğini belirtebilir.

Keywords: Metabolic syndrome, non-dipping blood pressure pattern, ambulatory blood pressure monitoring.

Anahtar Kelimeler: Metabolik sendrom, non-dipper kan basıncı, ambulatuar kan basıncı izlemi.

Introduction

As known, hypertension is strongly associated with cardiovascular disease, stroke, and cardiovascular mortality. Also, another clinical entity called non-dipping blood pressure (BP) pattern was shown to be associated with increased cardiovascular target organ damage and cardiovascular events in recent years (1). Non-dipping BP pattern is the decreased nocturnal reduction of BP (2). Normotensive subjects also may have non-dipping BP pattern as well as hypertensive patients (3). The relationship between non-dipping BP patterns with various diseases has been studied. For instance, it was found to be associated with coronary heart disease (4) and

diabetes mellitus (5). Metabolic syndrome (MS) is another clinical entity including severe cardiac risk factors such as abdominal obesity, hypertension, hyperglycemia and hyperlipidemia (6). MS and obesity are different clinical entities, but they were both shown to increase the cardiovascular mortality. Higher incidence of non-dipping BP pattern was shown in obese and diabetic population (7). It is considered that there may be common pathophysiological mechanisms of non-dipping BP pattern and MS. In this study, we aimed to evaluate the association between MS and non-dipping BP pattern in obese and hypertensive but untreated patients.

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Material and Method

Study Populations

118 consecutive untreated patients with essential hypertension who underwent 24-hour ambulatory blood pressure monitoring were analyzed. They were divided into dipper (n = 46) and non-dipper (n = 72) groups. Nocturnal non-dipping referred to a $\leq 10\%$ reduction in mean systolic and/or diastolic blood pressure at night compared with daytime mean values (5). MS was assessed according to the currently used Adult Treatment Panel III definition criteria, and also a strict criteria was used that all patients' body mass index to be higher than 30 kg/m² (6). Before BP monitoring, patient's medical history, smoking condition and other cardiac risk factors were recorded and fasting blood samples were obtained. Standard laboratory methods were used to obtain glucose, total cholesterol, LDL-cholesterol, HDL-cholesterol and triglyceride values.

Patients whose body mass index (BMI) were equal or lower than 30 kg/m² and who had recent acute coronary syndromes, previous coronary revascularization, significant valvular disease, dilated heart disease, significant arrhythmias, chronic renal failure, night-time workers, those with sleep disturbances and clinically overt pulmonary disease of any kind were not included in the study.

Statistical Analysis

Parametric data were expressed as mean \pm SD (Standard Deviation), and categorical data as percentages. SPSS 15.0 (SPSS Inc., Chicago, IL) was used to perform statistical procedures. Independent parametric data were evaluated by Mann Whitney U test. Temporal change of parametric data was evaluated by Wilcoxon signed rank test, and categorical data via chi square test. Correlation was evaluated by Spearman's correlation test. p value ≤ 0.05 was accepted significant.

Result

Patients in both groups were age and sex matched. Whole population's mean ambulatory blood pressure was 146/96 mmHg. Both groups

include similar percent's of diabetic patients (dipper 20% vs. non-dipper: 24%, p: 0.866 Table 1). Two groups did not differ by means of serum fasting glucose, LDL-cholesterol and patients' smoking status. There were slightly increased levels of triglyceride and total cholesterol levels and mildly decreased HDL-cholesterol levels in non-dipping hypertension group, without significance (Table 1). When we classify patients whether they are MS or not, non-dipper group had significantly higher percent of MS patients (dipper 30% vs. non-dipper: 50%, p: 0.038, Table 1).

There was not significant correlation between BMI and serum fasting glucose, LDL-cholesterol, HDL-cholesterol, triglyceride and total cholesterol levels in both groups (p>0.05).

Discussion

Our findings are similar to previous studies which were interested in non-dipper status and diabetes mellitus (8-10). Reduction in the nocturnal BP fall is related to cardiovascular mortality and morbidity (11). MS also constitutes increased risk for cardiovascular adverse events (12). We observed that MS was more prevalent among obese patients with non-dipping pattern of hypertension compared with patients with dipping pattern of hypertension. MS aggravates endothelial dysfunction and atherogenesis by causing hemodynamic and metabolic changes. The relationship may be explained with insulin resistance (13, 14).

Our study has some limitations. Firstly, study population is small to reach definite results. Second, because this was a retrospective analysis, patients' waist circumference measurements were absent, but, we could access to their height and weight records and used BMI instead of waist circumference. As mentioned in modified WHO definition, if patient's BMI is higher than 30 kg/m², this entity would be substitute for defining obese patients (15,16).

Previous studies have shown that obesity, central obesity in particular, is related to reduced cardiac automaticity, suggesting adverse effects on cardiac autonomic control in healthy subjects (17).



Table 1. Basic characteristics of study populations.

CHARACTERISTIC	DIPPER (N = 46)	NON-DIPPER (N = 72)	P VALUE
Age (years)	53 ± 13	56 ± 8	0.321
Gender (male)	20 (44%)	32 (44%)	0.883
Fasting glucose (mg/dL)	115 ± 52	118 ± 36	0.490
Total cholesterol (mg/dL)	194 ± 35	202 ± 39	0.055
LDL-cholesterol (mg/dL)	112 ± 31	113 ± 26	0.392
HDL-cholesterol (mg/dL)	38 ± 8	36 ± 10	0.059
Triglyceride (mg/dL)	147 ± 58	161 ± 79	0.060
Diabetes mellitus	9 (20%)	17 (24%)	0.866
Smoking	24 (52%)	34 (47%)	0.736
Metabolic syndrome	14 (30%)	36 (50%)	0.038

Piccirillo et al. (18) found a relationship between obesity and attenuated sympathetic and vagal baroreflex or a decrease in heart rate variability. Grassi et al. (19) reported that central obesity was characterized by greater sympathetic activation compared to peripheral obesity. Our findings indicate that central adiposity plays a role in the etiology and development of MetS and is a determinant of cardiovascular autonomic regulation.

Global cardiovascular risk assessment appears to be the most important step while evaluating hypertensive patients. Non-dipping status seems to be associated with increased risk of having MS, which is also important contributor of cardiovascular risk. We think that a more intensive approach is imperative when these two risk-increasing situations are found together, as usual.

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