ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Corrected Qt interval in patients with metabolic syndrome

Metabolik sendromlu hastalarda düzeltilmiş Qt süresi

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ABSTRACT

Objectives: Metabolic syndrome may be associated with increased cardiovascular mortality and morbidity. However, prolongation of QT intervals due to metabolic syndrome is still unclear. The purpose of this study was to investigate the incidence prolonged QT intervals in patients with metabolic syndrome and also demonstrate the relationship between them. Therefore, we aimed to investigate the relationship between metabolic syndrome and the QT prolongation in a large patient group.

Materials and methods: A total of 1009 individuals were enrolled in this study. Metabolic syndrome was defined according to the IDF criteria and the QTc intervals were measured by using Bazett Formula. QT ≤ 0.44 second was accepted as normal.

Results: Totally, 278 male and 731 female individuals of 1009 cases were enrolled in this study. The average duration of corrected QT of men according to the Bazzett formula were found as 0,448±0,04 second and QT interval of women were 0,449±0,05 second. QT intervals of both women and men with metabolic syndrome were significantly higher than normal limits of QT interval (p<0,01).

Conclusion: Metabolic syndrome found as associated with a prolonged QTc. Results of our study suggest that QTc interval length was increased in patients with metabolic syndrome.

Key words: Metabolic cardiovascular syndrome, arrhythmia, cardiovascular diseases, QT interval

ÖZET

Amaç: Metabolik sendrom artmış kardiyovasküler mortalite ve morbidite ile ilişkili olabilir. Fakat metabolik sendromun QT sürelerinin uzamasına neden olduğu halen belirsizdir. Bu çalışmanın amacı metabolik sendromla birlikte bulunan uzamış QT süresinin sıklığını araştırmak ve varsa aralarındaki ilişkiyi göstermektir. Bu amaçla geniş bir hasta grubunda metabolik sendromun QT uzaması ile ilişkisini araştırmayı amaçladık.

Gereç ve yöntem: Çalışmaya 1009 hasta dahil edildi. Metabolik sendrom IDF kriterlerine göre tanımlandı ve QT süresi Bazett formülü kullanılarak hesaplandı. QT≤0,44 sn normal olarak kabul edildi.

Bulgular: Çalışmaya alınan 1009 olgunun 278'i erkek, 731'i kadındı. Erkeklerin Bazett formülüne göre düzeltilmiş ortalama QT sureleri 0,448±0,040 sn, kadınların ise 0,449±0 ,050 sn idi. Hem erkek hem de kadın hastalarda QTc suresi normale göre anlamlı yüksek bulundu (p< 0,01).

Sonuç: Metabolik sendrom uzamış QT süresiyle ilişkili bulundu. Çalışmamızda elde ettiğimiz bulgular metabolik sendrom hastalarında QT süresinin artmış olduğunu desteklemektedir.

Anahtar kelimeler: Metabolik kardiyovasküler sendrom, aritmi, kalp ve damar hastalıkları, QT süresi

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INTRODUCTION

The QT interval reflects the duration of ventricular myocardial repolarization and depolarization, and is highly dependent on heart rate. QT interval is shorter at a faster heart rate, and longer at a slower heart rate. A prolonged QT interval has been found to be associated with electrical instability of myocardium and leads to adverse cardiovascular outcomes, including ventricular fibrillation and sudden death.[1,3] Prolongation of corrected QT (QTc) can also be used to predict cardiac death in patients after myocardial infarction, in patients with diabetes, or heart failure. [4,7] The prolongation of QT interval has been reported to be associated with cardiovascular morbidity and mortality in apparently healthy adults. [2,8]

Recent studies indicate a high prevalence of increased QTc interval length in patients affected by the metabolic syndrome (MetS). The purpose of the present study was to identify the prevalence of MetS along with a prolonged QTc interval, and to determine whether an association exists between prolonged QTc and MetS. To clarify the relationship between QTc and MetS, a large population was employed in this study, and the relationship was discussed.

MATERIALS AND METHODS

Totally 1009 patient, 278 male (27.55%) and 731 female (72.45%) with MetS were retrospectively studied in Hypertension Clinic of Şişli Etfal Education and Research Hospital. Metabolic syndrome was determined according to the IDF guidelines. Patients treated with antihypertensive, antidiabetes, and antidyslipidemia agents or taking any medication known to affect QT intervals were excluded from the study. The exclusion was also extended to subjects with histories of coronary heart disease, valvular heart disease, stroke, hepatic, renal, thyroid diseases, and arrhythmia including atrial flutter, atrial fibrillation, and third-degree atrioventricular block or with a cardiacpacemaker.

Electrocardiograms were collected from the patients. QT and R-R intervals was averaged over 3 consecutive cycles on lead V2 or V3 using a graduated lens as QT in the anteroseptal leads provides the closest approximation to the maximum QT. [9] In accordance with the latest recommendations for clinical QT interval measurement. [10] QT intervals were measured from the beginning of the QRS complex to the visual return of the T-wave to the isoelectric line. Corrected QT interval was calculated using the Bazett formula ($QTc = QT/\sqrt{RR}$) and QT $\leq 0,440$ sn was accepted normal.

The data were analyzed using SPSS version 13.0 for Windows (SPSS Inc. Chicago, Illinois). A Student t test was used for the comparison of continuous variables. Analyses were also conducted to determine whether there was an association between a prolonged QTc interval and metabolic syndrome. A p value of <0,05 was considered significant.

RESULTS

The study included 278 (27.55%) male and 731 (72.45%) female individuals of a total of 1009 cases. The mean ages of men were 55.91±10.70 years and that of women was 55.09±9.65 years. The average duration of QTc of men according to the Bazzett formula were determined 0.448±0.04 second and QT interval of women were 0.449±0.05 second. 49.25% of all men and 50.34% of all women's QT interval were ≥0.44 sn (Table 1). QT interval of both women and men were significantly higher than accepted normal values of QT interval (p< 0,01). Data belonging to all study group is presented in Table 1.

Table 1. The data of all metabolic syndrome patients

	Male (n=278)	Female (n=731)
Age (year)	55,91±10,70	55,09±9,65
Waist circumference (cm)	101,18±6,35	103,47±8,56
Systolic blood pressure (mm Hg)	154,35±42,21	157,13±21,38
Diastolic blood pressure (mm Hg)	91,16±8,18	93,22±13,28
Glucose level (mg/dl)	114,20±42,20	118,84±51,76
Triglyceride level (mg/dl)	205,16±55,46	197,32±61,37
HDL level (mg/dl)	37,22±6,22	41,54±7,27
QTc interval	0,448±0,04	0,449±0,05

DISCUSSION

The MetS is highly prevalent and associated with increased risk for cardiovascular disease and stroke. [11,14] In 2002, The National Cholesterol Education Program Adult Treatment Panel III (ATP III) cate-

gorized the MetS as a constellation of hypertension, hyperglycemia, dyslipidemia, and increased waist circumference as a measure of visceral adiposity.[11] Recently, the International Diabetes Federation (IDF) redefined the MetS. [15] Their new definition varies from that of the ATP III in two fundamental ways. First, the IDF has adopted cutoff points to define elevated waist circumference that are lower than the traditional ATP III waist circumference cutoff points for women. Second, the IDF has made central obesity a requirement in their definition of the MetS, mandating that a person meet the waist circumference criterion and also two of the other four traditional criteria (increased triglycerides, low high density lipoprotein cholesterol, elevated blood pressure, or elevated fasting glucose). In our study MetS was determined according to the IDF guidelines

The QTc interval represents the time from onset of depolarization to completion of repolarization of the heart, adjusted for heart rate. Prolonged QTc interval is an indicator of increased risk for cardiac arrhythmia and sudden death. [16] Although a QTc interval of at least 500 ms generally has been shown to be associated with a higher risk of torsades de pointes, there is no established threshold below which prolongation of the QTc interval is considered free of proarrhythmic risk. [17,19] Individuals with prolonged QTc interval have higher risk for cardiovascular mortality. [16,20-23] Factors that predispose to QTc prolongation and higher risk of torsades de pointes include older age, female sex, low left ventricular ejection fraction, left ventricular hypertrophy, ischemia, bradycardia, and electrolyte abnormalities such as hypokalemia and hypomagnesemia. [19] The QTc interval has also been related to components of the insulin resistance syndrome including increased body mass index, upper body obesity, increased blood pressure, and increased fasting insulin during an oral glucose tolerance test. [24-26]

An association between QTc interval and the cardiometabolic syndrome has recently been reported by four separate studies. [27-30] In this study, the MS was correlated with increasing QTc interval length. This is one of the rare study showing a correlation between MS and QTc interval length. The results showed a marked increase in QTc interval with MS. The present study provides evidence that QTc is as-

sociated with MetS and showed that patients with MetS had a significantly longer QTcs.

In conclusion, MetS is a risk factor for prolonged QTc interval, which may further increase cardiovascular morbidity and mortality in the subjects with metabolic syndrome. It is well-known that increased QTc has a detrimental effect on cardiovascular outcomes, so prolongation of QTc might be an early marker for predicting the development of cardiovascular disease and a risk factor for adverse outcome in MetS. Treatment of metabolic parameter abnormality might improve morbidity and mortality by preventing the risk of the prolongation of the QTc. However, the results suggest that the relationship between QTc intervals and MetS warrants further study. Future prospective studies will be necessary to address this issue.

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